Revised REPORT ON

LANDFILL OPERATIONS

APEX SANITARY LANDFILL

RECEIVED
OCT 19 2012
Ohio Environmental Protection Agency
Southeast District

Pursuant To Order No. 6
Director's Final Findings and Orders
Effective December 22, 2011

PREPARED FOR:

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CEC PROJECT NO. 110-007.025

MARCH 29, 2012
REVISED OCTOBER 19, 2012

ENVIRONMENTAL
LOGISTICS SERVICES

Apex Environmental, LLC

October 19, 2012

Mr. Dale W. Warner
Environmental Specialist
Division of Materials and Waste Management
Ohio Environmental Protection Agency
2195 Front Street
Logan, Ohio 43138

RE: Response to June 15, 2012 Notice of Deficiency Letter
Report on Landfill Operations…Pursuant to Order No. 6
Director's Final Finding and Orders, Effective December 22, 2011
Apex Sanitary Landfill

Dear Mr. Warner:

Apex Environmental, LLC (Apex) received your June 15, 2012 letter which identified deficiencies in the report referenced above. We have modified the report to address the issues that you raised and, in this letter are providing the Ohio EPA with a response to each of the noted deficiencies. Many of our responses are based on discussions that Mr. Brendon Pantano and Mr. Anthony Rizzo had with you and other members of the Ohio EPA on July 13, 2012. We have included your deficiencies in *italics* and our responses following in plain text.

1. *The report did not include a detailed analysis of required information that may distinguish which types of wastes generate odors. Apex must provide a detailed analysis that compares on a daily basis waste types and waste acceptance methods with odor control logs and odor complaint databases. In particular, Apex must evaluate the variability of odors produced from sewage sludge from different customers as well as determine the potential for odors caused by long-hauled containerized municipal solid waste. Therefore, Apex should present, in separate charts or graphs, data that compares: daily amounts of types of sewage sludge received with odor control log entries; daily amounts of types of sewage sludge received with odor complaints received; daily amounts of long haul waste (LHW) received with odor control log entries; and daily amounts of LHW received with odor complaints received. After presenting this information, Apex should note any correlations or patterns that exist and provide a detailed explanation, including supporting assumptions, of how it determined*

whether there was or was not a correlation or pattern that emerged from the data comparisons.

Response: Section 6.6 of the original report has been rewritten as a new section in the report called Section 7 – Daily Odor Analyses. The revised report is dated October 19, 2012 and is transmitted with this letter.

As agreed in the July 13, 2012 meeting, a sample set of days was selected which included an average of three days per month in 2010 and the first and second quarters of 2011 (after the second quarter 2011, fugitive landfill gas was the predominant odor source and so odor observations from that period cannot be relied upon for examining operational workface issues). The sample days were selected to provide data from the days during which the most OCR occurred and the days where little or no OCR occurred. Comparing these contrasting days presents a clear understanding that there is no correlation between hours of operation and waste types and quantities and OCR. Appendix E of the revised report contains a list of the sample days.

In the revised report, Apex attempted to find correlations or patterns that emerged from the data comparisons and determined that there were none. Appendix F of the revised report contains the daily odor analyses including number and location of complaints, types of waste received, and notations on the gas control (flare) operation for each day. Appendix G of the revised report contains daily graphs showing OCR vs. waste type received each day including a breakdown of aerobic and anaerobic sludge and long-haul waste.

2. *The report did not include analysis of the comparison between the number of odor complaints received with waste acceptance and handling methods used at the working face or at other locations, such as the rail handling area. The change in operations for the timing of waste receipt and placement as described in Section 3.2 of the report is an example that deserves more analysis. Apex must perform this analysis and include additional examples of waste acceptance and handling methods that have been piloted or considered. Apex must also provide an analysis on how daily hours of operation may affect odor complaints received (OCR).*

Response: Revised Section 6.4 of the revised report contains an examination of the effect of the site hours of operation on the OCR. Apex's handling methods were consistent throughout the study time period. Improvements and adjustments have been made to the waste handling procedures in 2012, and these are summarized in the revised report in Section 10.0.

3. *Much of the analyses in the report are based on monthly totals of data; however, in most cases the analyses provide inconclusive correlations. Apex must provide the analysis of daily information maintained by the facility.*

Response: See response to Comment 1, above.

4. *Section 6.6 of the report includes an analysis of daily information for June 2010 to compare odor complaints received with total waste and sludge tonnages. Data for June 3, 2010 and June 27, 2010 should be added to the table associated with Figure 6.6 as 12 odor complaints were reported on each of those days. Apex must expand on this analysis to include onsite odor monitoring information and types of waste received. Two consecutive days with large numbers of odor complaints and three within one week should be investigated and analyzed.*

Response: See response to Comment 1, above. Also, data from June 3, 2010 and June 27, 2010 has been added to the table as requested, and Section 6.6 of the report has been significantly expanded and now comprises Section 7.0 of the revised report.

5. *The report did not include a detailed analysis of the daily information kept by the operator in the odor control logs that would show when changes in odor control methods were attempted and reevaluated for their effectiveness. Apex must provide this analysis in the report.*

Response: The daily odor control logs are presented along with other daily analyses in Appendix F of the revised report. These logs contain notations of equipment adjustments, although more adjustments were actually made than noted. Examination of the notations on the logs does not reveal a cause/effect regarding use of odor control equipment and OCR. A list of odor neutralization equipment and dates purchased has been included in Appendix G of the revised report.

6. *The report did not include detailed analysis of the information collected by Apex during their onsite odor surveillance routes. Apex must provide this analysis in the report.*

Response: Daily odor surveillance routes for the sample days are included in Appendix F of the revised report. These routes have only been conducted on weekdays, early in the morning before significant operations have begun. In addition, the route used during these morning surveys includes less than half of the entire compass of possible wind directions. Therefore, Apex has improved the methodology of the daily odor surveillance routes in an attempt to provide more meaningful data.

7. *The report did not include any documented outages of odor control systems that may have allowed migration of odors off-site. Apex must provide this analysis in the report.*

Response: The daily odor analyses contained in Appendix F of the revised report contain information for the operation of the odor neutralizers and for the landfill gas flare for the sample set of days. Discussion of these items is contained in Section 7.2 of the revised report.

8. *The report contains a finding that the rail area and open top leachate tank are not a source of odor contributing to odor complaints. On a recent inspection, strong sludge odors from sludge containers were present in this area. The report must provide a detailed analysis and procedures for the ongoing surveillance of the rail area for odors.*

Response: In 2012 Apex modified waste handling procedures in an attempt address this issue. These operational modifications are discussed in Section 10.0 of the revised report.

9. *Based on these analyses, the report must propose revisions to operations to control the release of odors such as change to daily hours of operation, a reduction in AMDWR, and adoption of odor control measures and waste handling procedures. Please identify any operational changes that are already being utilized.*

Response: Apex has already adopted many significant operational changes which are discussed in Section 10.0 and in the Executive Summary of the revised report.

A revised Odor Management Plan (OMP) will be submitted that may include all or part of the above operational modifications. Apex anticipates that submission of this revised OMP will allow closure of the DFFO. The revised OMP will be submitted as a facility permit alteration within 30 business days of the Ohio EPA's approval of this report

As previously demonstrated, operational hours and/or volume and type of waste received do not show a correlation to OCR. Therefore, Apex respectfully requests that the facility be reinstated to operate under permit conditions for PTI Number 06-08438 dated 12/31/2009, including the currently permitted Allowable Maximum Daily Waste Receipt.

Based on the results of Apex's odor monitoring, combined with the Ohio EPA's and JCHD's odor monitoring and inspections, it is evident that the controls and operational modifications that have been implemented have resulted in control of fugitive emissions, significant reduction in OCR, an even greater reduction in actual frequency and intensity of odor, and have resulted in full compliance with regard to odors.

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In addition, Apex respectfully requests that the Ohio EPA resume review of the contiguous lateral expansion PTI application that was submitted in October 2011.

Please contact me if you have further questions about our responses.

Best regards,

Dave Matthews MRB

Dave Matthews, General Manager
Apex Environmental, LLC

Attachments
cc: Joe Tatarek, Environmental Logistic Services (w/ attachments)
Anthony Rizzo, Environmental Logistic Services (w/ attachments)

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Appendix B – ASTM E544-99 Standard Practices for Referencing Suprathreshold Odor Intensity
Appendix C – Nasal Ranger Operating Manual
Appendix D – Graphs of Daily OCR vs. Waste Type
Appendix E – Daily Odor Analysis Data Set
Appendix F – Detailed Daily OCR and Waste Received
Appendix G – Daily Waste Types vs. OCR Graphs
Appendix H – Odor Control Equipment Timeline
Appendix I – Letters of Compliance

AVAILABLE FOR INSPECTION AT THE FACILITY

Daily Operation Log – Ohio EPA Form 2, January 2010 to Present
Daily Operation Log – Ohio EPA Form 3, January 2010 to Present
Apex Daily "Odor Monitoring Data Sheets", January 2010 to Present
Apex "Off-Site Monitoring Circuit Date Sheets", December 2011 to Present

EXECUTIVE SUMMARY

Purpose of Study

In response to a higher number of odor complaints made to the Jefferson County Health Department (JCHD) and/or the Ohio Environmental Protection Agency (Ohio EPA) in the Fall of 2011, the Ohio EPA prepared a set of Director's Final Findings and Orders (DFFOs). In the spirit of cooperation, Apex Environmental LLC (Apex) agreed to comply with the DFFOs, without admitting to the factual premise of the DFFOs and subject to a reservation of its rights. Pursuant to Order No. 6 of the DFFOs, Apex agreed to submit a report analyzing waste acceptance practices and operations in 2010 and 2011 and to propose operational changes to further control the release of odors.

This report is made pursuant to Order No. 6. However, in addition to the studies and analyses requested in Order No. 6, this report also contains information from studies and analyses that are above and beyond those required by Order No. 6. These additional studies and analyses were voluntarily performed by Apex in an effort to determine whether any additional measures can be taken to attempt to further address the complaints made by individuals who live near to the Apex Landfill. While analyzing the odor complaints received (OCR), this study did not attempt to eliminate complaints resulting from odors that could not or did not come from the landfill, but rather has assumed for the purpose of this analysis that all OCR apply to the landfill. OCR is more completely defined in Section 5.

Studies Performed

The studies performed and reported upon in this report include:

- 2010-2011 Historical Review. Detailed compilation, review, and analyses of historical information and OCR from 2010 and 2011 as a direct response to the DFFO requirements (Sections 1.0 – 8.0, excluding Section 5.3 of this report),
- Winter 2012 On-Site Investigation. Voluntary performance and analyses of an intense, four-week, on-site odor monitoring event by CEC Consultants (Section 5.3 of this report), and
- Effectiveness Review. Voluntary detailed examination of OCR in 2012 after and during the implementation of some operational modifications (Section 9.0 of this report).

Compiled Findings of Studies

Summaries and conclusions drawn from these studies and analyses include:

- Apex is a 24-hour per day, 7-day per week operation that accepted approximately 4,800 tons per day, 7 days per week, during the study periods. Approximately 65% of the

waste was municipal solid waste (MSW), 18% construction and demolition debris (CCD), 10% sludge, and 7% contaminated soil, during the study period (Section 3.0).

- Odor neutralizers are applied in the waste unloading area and in the ambient air; however, there is no direct statistical or other evidence correlating the use of neutralizers to a decrease or increase in odor complaints (Section 4.0).
- Landfill gas production increased in 2011; because of this increase and the odors typically found in landfill gas, there is a statistical and scientific likelihood that the increase in landfill gas production had a correlation on OCR toward the end of 2011 (Section 5.0).
- The leachate storage tank and rail unloading area are not source of odor that are contributing to odor complaints (Section 5.3).
- Some sludge is more odorous than other sludge, which can be quantified with sampling and laboratory testing (Section 5.4).
- There is no strong correlation between the amount or type of waste received with OCR (Section 6.2).
- Hours of operation do not appear to affect OCR (Section 6.4).

Proposed Operational Modifications

As discussed above, it does not appear to be possible to attribute OCR to certain, identifiable issues or situations that can be controlled through traditional operational modifications. This study found that specific hours of operation do not appear to affect OCR and that volume of waste received and/or type of waste received do not appear to affect OCR.

Rather, OCR seem to result from a confluence of events that include meteorological conditions and site conditions. Apex has always operated within permit requirements and applied best management practices to its operation. We believe that continuation of that philosophy, together with some deliberate and comprehensive operational modifications, will continue to reduce OCR. Therefore, we suggest that the following operational steps be implemented or continued when and if appropriate in an attempt to reduce OCR at the Apex Landfill. These steps may include:

1. Continue the planning and installation of GCCS components which may include:
    - Bi-annual submission of the updated GCCS plans,
    - Vertical gas extraction wells,
    - Horizontal gas collectors,
    - Gas collectors in the leachate collection system,
    - Installation of gas grid within the leachate collection system for the sole purpose of collecting gas and minimizing gas escape at the edges of the landfill,
    - Improved inter-cell berm design to contain gas at edges, and
    - Capability for dual gas/leachate removal at select gas extraction wells.

2. Continue routine surface scanning and reactive measures to reduce detected emission (e.g. placing soil over exposed leachate collection layer edges.).
3. Minimize the size of the work face to the greatest practical extent so that cover can be applied shortly after it is determined that a disposal area will receive no more fill on that day.
4. When necessary, screen soil material to be applied as a portion of the transitional cover to maximize compaction and minimize potential gas paths.
5. Do not allow untarping of odorous waste containers in the rail yard.
6. Perform daily odor monitoring around the leachate storage tank and be prepared to employ odor neutralizing equipment in the area if necessary.
7. When deemed appropriate, Apex will perform a third-party sludge odor characterization study on potential new sludge materials. Procedures for these studies, as well as criteria for acceptance and special handling methods required will be submitted in a revised Waste Analysis Plan (WAP). Apex will submit a revised WAP to the Ohio EPA within 30 business days of the Ohio EPA's approval of this report.
8. Continue the on-site personnel communication system and documentation of communications with frequent and direct communication between the OCR Team and operations personnel. OCR Team members should be able to convey the odor character description to operations personnel.
9. Apex Environmental implemented an OCR Team in November 2011 and will continue use of an OCR Team. The team consists of employee(s) that monitor the community for odors. Team member(s) are trained in the use of the Nasal Ranger (determines odor concentration), N-Butanol Scale (0-8 Scale to determine odor intensity), and Character of Odor (MSW, sewage sludge, landfill gas, etc.). A full description of the OCR Team functions can be found in Section 10.0 of this report.
10. A revised Odor Management Plan (OMP) will be submitted that may include all or part of the above operational modifications. Apex anticipates that submission of this revised OMP will allow closure of the DFFO. The revised OMP will be submitted as a facility permit alteration within 30 business days of the Ohio EPA's approval of this report.

Effectiveness Review of Operational Modifications

The implemented operational modifications have been proven effective by the following:

- Apex has been inspected by the Ohio EPA 16 times and by the Jefferson County Health Department (JCHD) 11 times since March 2012 without odor violation. Letters of compliance were issued by the Ohio EPA and by the JCHD as a result of Apex having no violations since March 2012. In total, five letters of compliance were issued (attached in Appendix I). This agency monitoring supports Apex's conviction that the measures taken at the facility have been successful, and will be successful into the future.

- An intensive 54-hour continuous monitoring study performed by Southeast District Ohio EPA employees in August 2012 determined that there were no violations during the period and resulted in a letter of compliance. During the monitoring period, the Ohio EPA observed Apex's OCR Team conducting prompt investigations and complaint resolutions. Comparison of Apex and Ohio EPA field notes indicated strong correlation and consistency between odor observations.
- Many of the proposed operational modifications listed above have been implemented, starting in March 2012. These modifications have resulted in a significant reduction in OCR. In addition to the reduced frequency of OCR in 2012, reported odors appear to be lighter and ephemeral in nature.

Summary and Conclusions

As previously demonstrated, operational hours and/or volume and type of waste received have not been correlated to OCR. Therefore, Apex concludes that the facility should be reinstated to operate under permit conditions for PTI Number 06-08438 dated 12/31/2009, including the currently permitted Allowable Maximum Daily Waste Receipt.

Based on the results of Apex's odor monitoring, combined with the Ohio EPA's and JCHD's odor monitoring and inspections, it is evident that the controls and operational modifications that have been implemented have resulted in control of fugitive emissions, significant reduction in OCR, an even greater reduction in actual frequency and intensity of odor, and have resulted in full compliance with regard to odors.

1.0 INTRODUCTION

This report has been prepared pursuant to Order No. 6 of the Director's Final Findings and Orders (DFFOs), which were issued by the Ohio Environmental Protection Agency (Ohio EPA) to Apex Environmental LLC (Apex) effective December 22, 2011. Order No. 6 states:

> *By no later than March 31, 2012, Respondent shall submit to Ohio EPA a report that analyzes correlations between waste types received by Respondent for disposal at the Facility, including sewage waste, long haul waste and other odorous wastes; waste acceptance methods utilized by Respondent for such wastes; and the following information: Respondent's odor control logs, odor complaint database, and all daily operating logs since January 1, 2010. The report shall also analyze all of the above information in relation to operations at the Facility including the daily hours of operation and the total amount of wastes received for disposal at the Facility, including the authorized maximum daily waste receipts ("AMDWR"). The report shall include proposed revisions to the Facility operations, such as potential changes to the daily hours of operation and reductions in the total amount of wastes received for disposal at the Facility including the AMDWR, and include revisions to Respondent's waste acceptance procedures in order to control the release of odors. Upon the receipt of written notice from Ohio EPA, Respondent shall provide additional information as requested by Ohio EPA. Additionally, Respondent shall implement revisions to Facility operations and Respondent's waste acceptance procedures in light of the information outlined in the report and as directed by Ohio EPA. If Ohio EPA requires changes to Facility operations or waste acceptance procedures, it will require those changes in the form of a final action. After the effective date of these Orders, Respondent shall limit the total amount of wastes received for disposal at the Facility, including solid waste, construction and demolition debris, and other types of waste, to 6,500 tons per day unless either of the following occurs:*
>
> A. *Ohio EPA informs Respondent in writing that Respondent may discontinue the limitation on the total amount of wastes received for disposal at the Facility because odors associated with the Facility have been abated for an extended period of time; or*
> B. *Ohio EPA issues a final action consistent with this Order regarding Facility operation or Respondent's waste acceptance procedures that has been agreed to by Respondent, or Respondent is legally required to implement and comply with the final action.*

This report is organized as follows (italicized text represents language contained in Order No. 6 to which a particular section responds).

Section 2.0 Site Setting – Describes area surrounding Apex including population and topography.

Section 3.0 Waste Receipt and Disposal – Describes the *waste types received by Respondent for disposal at the Facility,* and *waste acceptance methods utilized by Respondent for such wastes.* Also describes and references *all daily operating logs since January 1, 2010.*

Section 4.0 On-Site Odor Controls – Describes the odor control measures currently used at the facility and references *Respondent's odor control logs.*

Section 5.0 Odor Complaints Received (OCR) and Odor Investigations – Presents the site *odor complaint database* and describes how complaints are tracked, investigated, and addressed. This section also presents the result of supplemental odor studies performed by Apex in an attempt to further understand potential sources of complaints.

Section 6.0 Historical Odor Complaint Analyses – This section examines the information described in Sections 2.0-5.0 in order to *analyze correlations between waste types received by Respondent for disposal at the Facility* and *analyze all of the above information in relation to operations at the Facility including the daily hours of operation and the total amount of wastes received for disposal at the Facility.*

Section 7.0 Daily Odor Complaints Received Analyses – Examines days with high OCR and low OCR in an attempt to identify daily operational factors that may affect OCR.

Section 8.0 Conclusions from Investigations and Analyses – This section summarizes the major findings of the previous sections.

Section 9.0 Recent (2012) Experience with OCR – This section describes odor monitoring and results achieved by implementing several operational modifications.

Section 10.0 Proposed Operational Modifications – Presents *the proposed revisions to the Facility operations, such as potential changes to the daily hours of operation and reductions in the total amount of wastes received for disposal at the Facility including the AMDWR, and include revisions to Respondent's waste acceptance procedures in order to control the release of odors.*

2.0 SITE SETTING

The Apex Landfill is located in a rural area in Jefferson County, Ohio. The town of Amsterdam—located about 2.5 miles northwest of the facility—has a population of about 530 residents. Most occupied homes are scattered and spread apart; however, a neighborhood cluster of about 50 homes is located within 1.5 miles northeast of the landfill facility along Red Dog Road. See Figure 1 (attached) for a map of the site relative to homes in the area.

The area has been subjected to fairly extensive strip coal mining in previous years and the area is strewn with unreclaimed and reclaimed strip mines. In addition, oil and gas extraction has been present in the area for many years and is currently undergoing a new boom in activity.

Topography in the area is characterized by rolling hills which are dissected by ephemeral and perennial streams, forming a dendritic pattern of gentle valleys within the rolling peaks. Topography can affect local wind patterns with the potential for valleys to form channels for air movement.

3.0 WASTE RECEIPT AND DISPOSAL

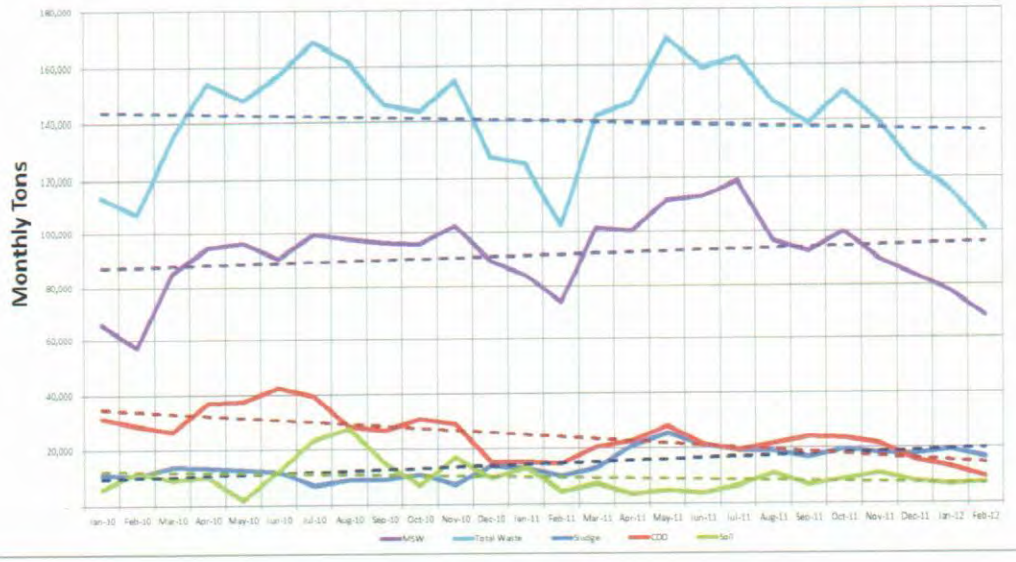
3.1 WASTE COMPOSITON

Since 2010, Apex has received an average of approximately 4,800 tons of waste per day, seven-days per week. Apex uses four main categories for classifying and tracking waste received and disposed at the landfill:

- Municipal Solid Waste (MSW) – Typical household and commercial waste which is a mix of paper, cardboard, plastic, food waste, etc. Since 2010, approximately 65% of the waste received at Apex was MSW.
- Construction and Demolition Debris (CDD) – Debris from residential, commercial, and industrial construction and demolition projects. Includes wood, wallboard, carpeting, concrete, etc. Since 2010, approximately 18% of the waste received at Apex was CDD.
- Sludge – Semi-solid byproduct of municipal or industrial wastewater treatment. Approximately 10% of the waste received at Apex was sludge.
- Soil – Contaminated soil from environmental cleanup activities. Since 2010, approximately 7% of the waste received at Apex was soil.

Figure 3.1 shows the distribution of waste types on a monthly basis as well as lines indicating the trends (upward or downward) for disposal volumes for each waste category. Daily logs that include the weight, waste type, and origination of every load accepted at the facility are maintained and stored on-site on "Ohio EPA Form 2 – Municipal Solid Waste Landfill Facility Daily Log of Operations." Form 2 was used to compile the information contained on Figure 3.1

Figure 3.1 APEX Waste Types



3.2 WASTE RECEIPT AND UNLOADING

In addition to the information contained on Form 2, Apex maintains records of the daily site operation including waste handling equipment used, daily operating hours, weather conditions, and notations regarding special operational problems or corrective actions needed. This information is maintained and stored on site on "Ohio EPA Form 3 – Municipal Solid Waste Landfill Facility Daily Log of Operations." These forms were used to prepare the following section of this report and to look at potential odor generation (described in Section 6.0).

Receiving Waste: Waste arrives on-site in intermodal rail containers, open top rail cars, rolloffs, walking floors, transfer trailers, front-end loaders, rear-end loaders, long bed dump trucks, local Municipal trucks and similar refuse vehicles. Enclosed intermodal rail containers are unloaded using top-picks which place the containers on trucks for transport to the working face. Open top rail cars are unloaded using an excavator operating on a platform which then places waste in trucks for transport to the working face.

Handling and Placement of Solid Waste: Waste receipt, waste placement, and landfill management activities at Apex are a 24-hour per day operation. Beginning in August 2011 Apex modified its operation to concentrate waste placement activities into a shorter period of the day. Figure 3.2.1 shows the waste placement for a typical day during 2010 and 2011 (prior to operational change) and Figure 3.2.2 shows waste placement for a typical day after the changes were made.

Normal operations utilize the area method of landfilling and typically use one working face. Each working face is filled in a series of horizontal lifts. As an area reaches final waste elevations at the end of a phase, operations may need to be divided and two working faces used to provide safe placement and optimum compaction of the waste.

To reduce the potential for odors resulting from active waste disposal operations, Apex and its transporters minimize transit time from the source and time spent dumping at the working face. Sludge is disposed at the working face and immediately covered with non-odorous waste. intermediate and/or transitional cover is placed on all exterior or long-term interior waste slopes.

Apex complies with the approved phase development plans to fill to the permitted final waste grades to allow the installation of transitional cover as soon as possible. Apex progressively places intermediate or transitional covers and establishes vegetation as soon as practical (seed germination weather conditions are necessary) to minimize odors.

4.0 ON-SITE ODOR CONTROLS

4.1 ODOR NEUTRALIZING SYSTEMS

Odor neutralizing products are available to attempt to reduce, mask, or modify odors. A household example of such a product is Febreeze©. Concentrated industrial odor neutralizing products have been used by Apex and applied into the air or onto waste products using a variety of delivery systems as described below. Depending on conditions and circumstances, none, some, or all of these systems may be in operation at any given time.

- HLDA (Hinsilblon Laboratories Diffused Air) Vapor Diffusion Stanchion System - a waterless vapor odor control system utilizes heated eco-scent essential oils.
- Mobile Water-based Misting Units - can be moved or relocated readily to respond to field conditions, allow for the introduction of odor neutralizers into the misting water supply and the finer, aerosol nature of a mist will be most effective at dispersing odors.
- HVMU (High Volume Misting Unit) - a modified snow making machine with modified spray nozzles to offer superior misting coverage. This type of mobile unit is typically mounted on a trailer to facilitate movement around the facility.
- Mobile Sprayers - several mobile sprayers and neutralizing liquid which is pumped through a variety of nozzles then ejected by a fan creating a mist capable of covering the entire tipping area.
- Water Truck Direct Application - odor control products can be added to a water truck and the mixture is directly applied to odor emitting areas quickly.
- Rail Yard High Pressure System - a high pressure system in the rail yard can be used to control odors during the staging and unloading of rail cars.

Daily, at approximately 5 AM to 6 AM, a trained on-site odor technician performs an odor survey at the north end of the landfill at 40 established monitoring points. In addition, during waste disposal operations, Apex's on-site odor control personnel perform on-site perimeter monitoring to assess the effectiveness of the applied odor control measure(s). When odors are detected, personnel determine what operational changes, if any, can be made to abate the odors.

Apex keeps records of the quantity of odor neutralizing product used each month, and, as of October 19, 2011, also added illustrations and notations to the daily on-site "Odor Monitoring Data Sheets" indicating which particular system was in use at the time of monitoring. The "Odor Monitoring Data Sheets" are available for inspection at the site.

4.2 LANDFILL GAS COLLECTION AND CONTROL SYSTEMS

At all solid waste landfills, anaerobic decomposition of solid waste produces landfill gas consisting of methane, carbon dioxide, and trace volatile organic compounds (VOCs). Methane and carbon dioxide are both odorless but other landfill gas constituents have the potential to produce odors.

In 2005, Apex began accepting waste in compliance with air and solid waste permits issued by Ohio EPA. Similarly, the air permits required compliance with New Source Performance Standards for municipal Solid Waste Landfills (NSPS), found at 40 C.F.R. Part 60, Subpart WWW. The NSPS for municipal solid waste landfills require that a gas collection and control system (GCCS) be installed when certain conditions are met. In conjunction with the NSPS requirements, in 2010, Apex conducted calculations using the Tier II methodology identified in the NSPS to determine the Non-Methane Organic Compound (NMOC) rate for the Apex Landfill. The Ohio EPA accepted the site-specific Tier II testing and calculations in 2010, which showed that NMOCs were below the required threshold. Based on the calculations from the Tier II testing, Apex is not required to install a GCCS and is in full compliance with NSPS regulations and the facility's Air PTI.

Notwithstanding these determinations, in 2010, Apex began installation of a (GCCS), starting with the installation of 12 gas collection wells on the north slope of the landfill. The GCCS applies a vacuum to the waste mass to collect the landfill gas, transmits the gas through a piping system, and combusts the gas, which destroys the odors.

In late 2011, Apex began an aggressive installation of additional gas collection wells to account for increasing gas production. Apex's aggressive GCCS installation in late 2011 and throughout 2012 has increased the collection and destruction efficiency, reducing gas emissions and odors.

As of this writing, the landfill GCCS includes the following main components:

- Extraction wells;
- Horizontal gas collectors;
- Leachate collection cleanout pipes;
- Header pipes, valves and condensate management system; and
- Landfill gas combustor(s).

In accordance with Order No. 4 of the DFFO, on February 1, 2012 Apex submitted a document that showed the GCCS system in place as of that date, and illustrated proposed minimum additions to the system that are planned for the near future.

Recent additions to the GCCS are gradually reducing odors as landfill gas is withdrawn from within the waste mass. This process, along with future aggressive GCCS installation, will provide further control of landfill gas at the facility.

4.3 OTHER ODOR CONTROL MEASURES

Apex has also undertaken a number of other measures to control odors including:

- Use of surface emission scans to identify areas where fugitive gas may be emanating, and then using the results to improve cover, install additional GCCS features local to the emission area, or to cover leachate collection system material that is releasing gas,
- Installation of a gas grid within drainage layers of new cells for the sole purpose of collecting gas and preventing gas escape at the edges of the landfill,
- Screening the upper 6 inches of transitional soil cover material to provide better resistance to gas emission, and
- Removing water from landfill gas extraction wells to improve their efficiency.

5.0 ODOR COMPLAINTS RECEIVED (OCR) AND ODOR INVESTIGATIONS

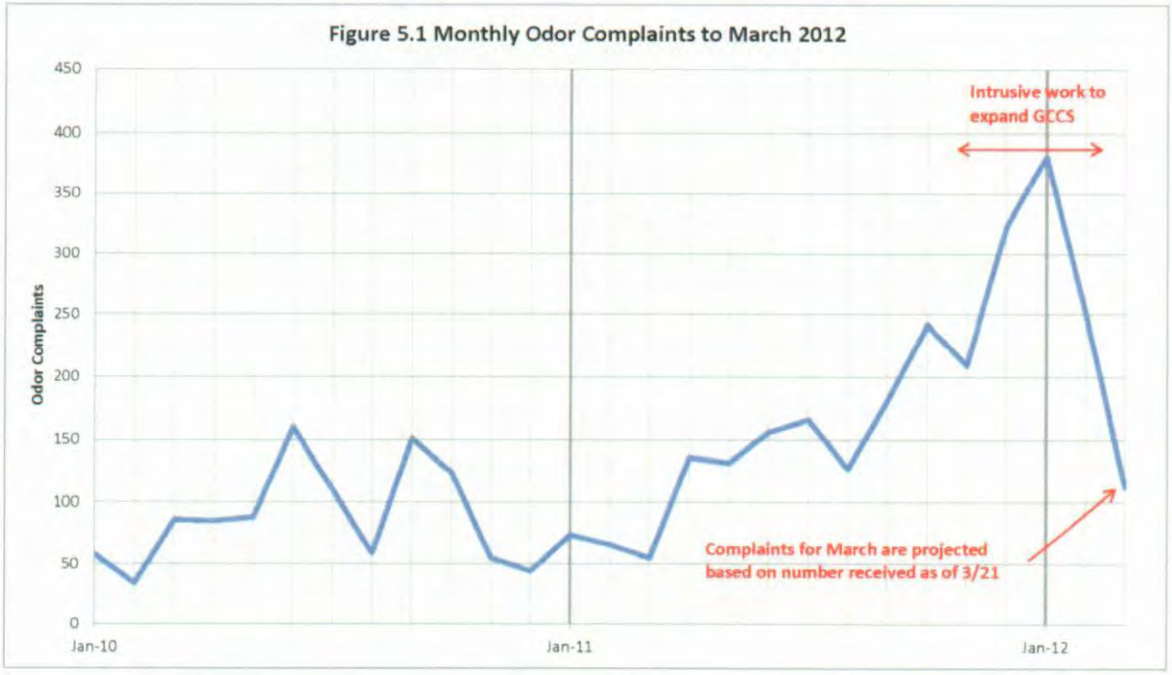
5.1 OCR

Odor Complaints Received (OCR) are conveyed to Apex in several ways. Most complaints are called into the JCHD who, in turn, emails them to Apex. Some complaints are reported directly to Apex who utilizes a 24-hour per day answering service to receive and convey calls to the OCR team via text message and email. All complaints, regardless of their origin, and whether Apex receives them in a timely manner are logged into an electronic site odor complaint database.

Figure 5.1 shows the number of OCR logged per month as tabulated in the site odor complaint database. Appendix A contains a printout of the OCR database since the start of 2010. The number of complaints is highly variable, but there was an increase of OCR in mid to late 2011. It is likely that a large number of complaints from late 2011 relate to an increase in gas production and to odors resulting from the intrusive work associated with GCCS expansion activities.

However, in early 2012, after commencing implementation of the recent additions to the GCCS, OCR decreased. This has occurred despite the fact that odor-generating intrusive activities continued as the GCCS was expanded through mid-March 2012.

Figure 5.1 Monthly Odor Complaints to March 2012



5.2 OCR INVESTIGATION

Apex logs all complaints received in the complaint database (Appendix A) and responds to complaints by making on-site adjustments to operations or adjustments to the odor neutralizer systems as applicable. In November 2011, Apex augmented its odor monitoring and complaint investigation and resolution programs as described below.

Four new staff were hired and trained by an Odor Science Engineering, Inc. (OSE), a well-known and reputable odor science firm from Bloomfield, Connecticut, to detect, quantify, and characterize odors. This staff will be referred to as the OCR team. The OCR team provides 24/7 off-site odor monitoring and complaint investigation.

The OCR team utilizes:

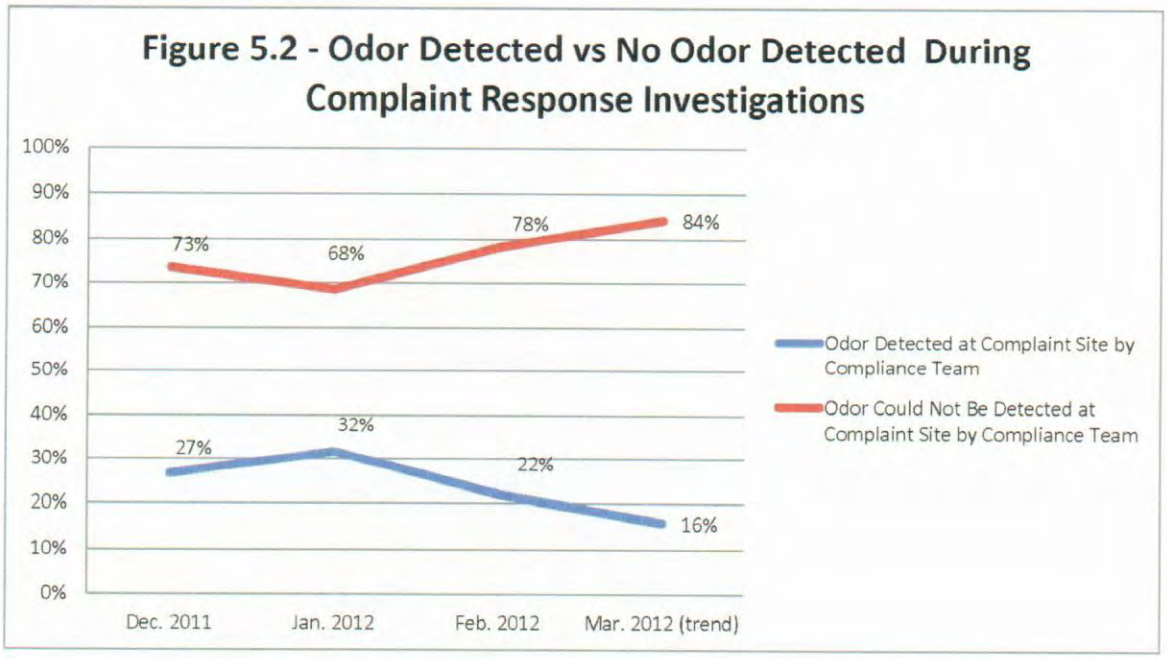
- Odor Intensity. Defined as the perceived strength of an odor sensation, it is identified using the 8-point n-butanol Scale (see Appendix B for detailed description),
- Odor Concentration. Defined as an odor's pervasiveness, it is quantified using dilution to threshold characterization employing the Nasal Ranger (see Appendix C for detailed description), and
- Odor Character. Defined as the quality or sensation of the odor, it is given a subjective assignment of odor source (e.g. landfill gas, sludge, smoke, etc.).

5.2.1 Response to OCR

Starting in November 2011, the on-duty OCR team member is immediately dispatched to the site of the odor complaint. If an odor is detected at the site of the complaint, the complaint, regardless of its source, is considered "verified" and it is quantified using the n-butanol scale, using a Nasal Ranger, or both. In addition to being quantified, a detected odor is characterized (i.e. workface odor (and if possible, a particular waste type), landfill gas odor, another odor, or some combination thereof).

When an odor is verified—and believed to be attributed to the landfill—a multi-stepped, iterative process begins in an attempt to identify the source of the odor, and to make operational adjustments if possible. The site of the complaint may be revisited until the odor is no longer detected or until it is believed that all appropriate measures have been employed. It should be noted that, in some cases, odor is "verified" at a complaint location, but then attributed to sources other than the landfill. Notations concerning all of the items presented above, as well as Apex's response to an odor complaint are maintained in the odor complaint database in Appendix A.

Figure 5.2 illustrates that, in addition to the number of complaints decreasing through early 2012 (see Figure 5.1), the percentage of complaints that could be "verified" (confirmed by a rapidly-deployed OCR team technician to be a detectable odor) was dropping; this suggests that odors present in the community during early 2012 are more quickly dispersing and more ephemeral in nature.



5.2.2 Off Site Monitoring Circuits

In addition to the enhanced odor complaint and resolution made possible by the new OCR team, Apex has been able to use the OCR team to perform off-site odor monitoring "circuits" since November 2011. These circuits allow a trained odor technician to drive the public roads surrounding the landfill, stop at certain monitoring locations, and make odor observations of intensity using the n-butanol scale and odor character. Figure 5.3 shows the locations where odor observations are performed and recorded.

Figure 5.3 Off-Site Odor Monitoring Location

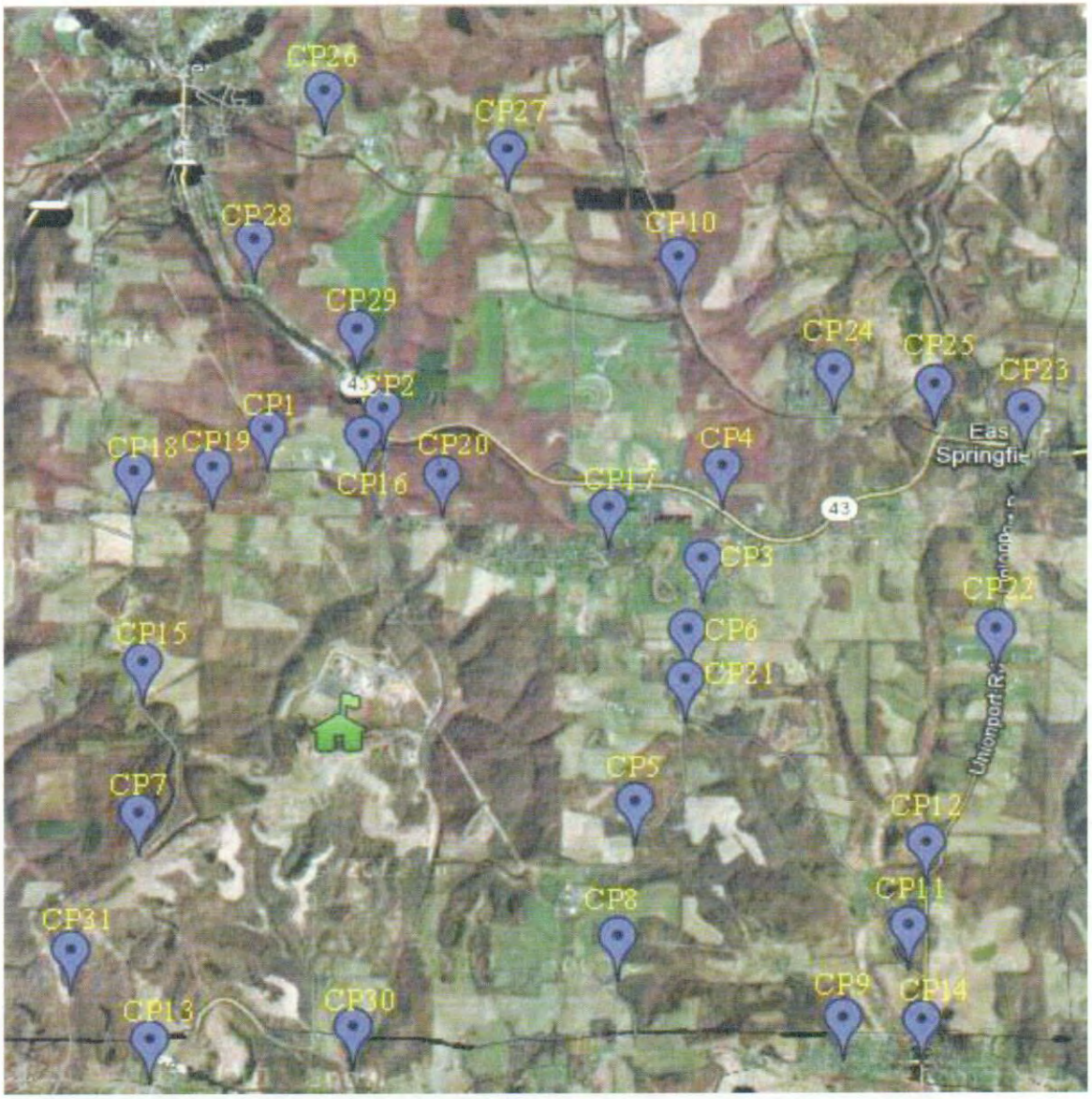
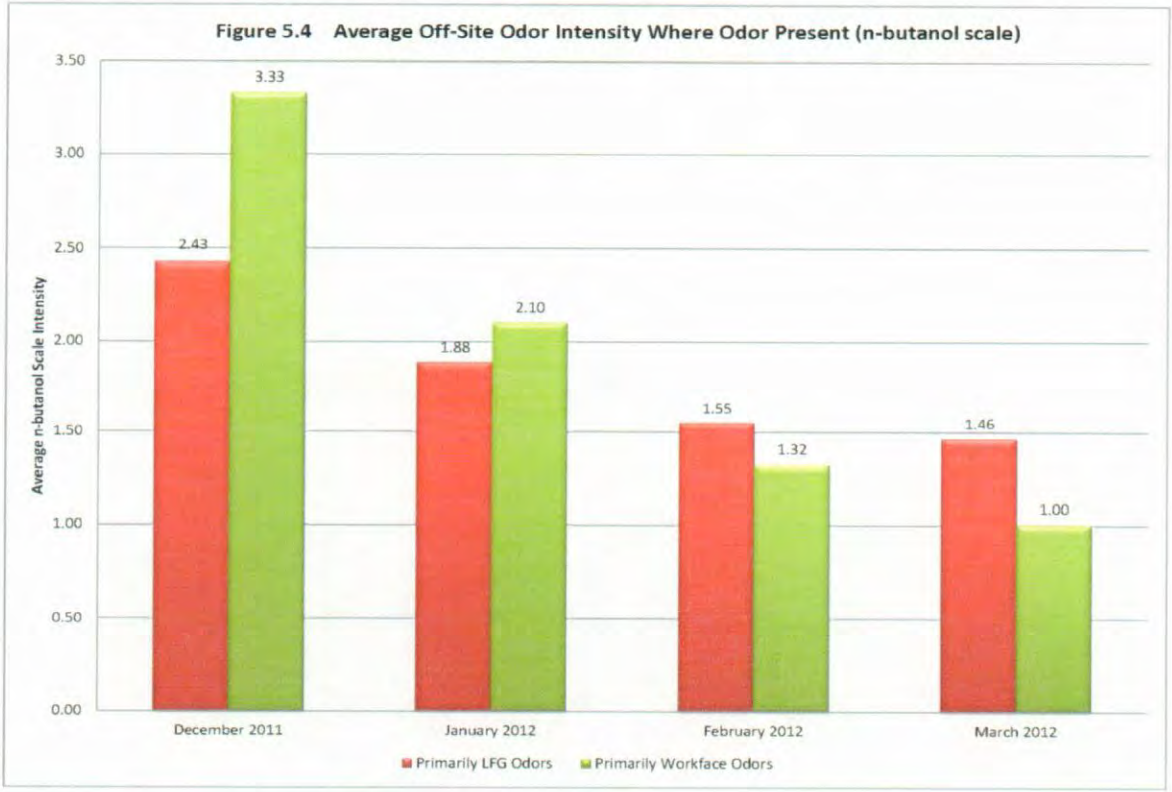


Figure 5.4 shows that the odor intensity observed during off-site monitoring circuits, using the n-butanol scale, has been dropping steadily since the suspension, in December of 2011, of three

sludge waste streams that were identified as particularly odorous (see Section 5.4 of this report), and since improvements were made to the GCCS.



5.2.3 Other Potential Odor Sources

Many non-landfill sources of odor also exist in the community. For instance, many OCR are described to have a character of raw sewage (sewage sludge that has been received at Apex has been treated and does not generally exhibit a raw sewage character). Other odors noted in the community may be related to open burning, dead animals, oil and gas activities, etc.

Caution is warranted when evaluating OCR as a number of odor complaints received may be unrelated to the Apex Landfill. Therefore, OCR should not be used as the sole criterion for suggesting possible operational changes at the facility.

5.3 FOCUSED ON-SITE ODOR INVESTIGATION

Between February 7 and March 3, 2012, CEC performed an intense, focused on-site monitoring investigation. Typically, four odor monitoring circuits were completed around the disposal area.

- Circuit No. 1 6 AM-9 AM
- Circuit No. 2 9 AM-Noon
- Circuit No. 3 Noon-3 PM
- Circuit No. 4 3 PM-6 PM

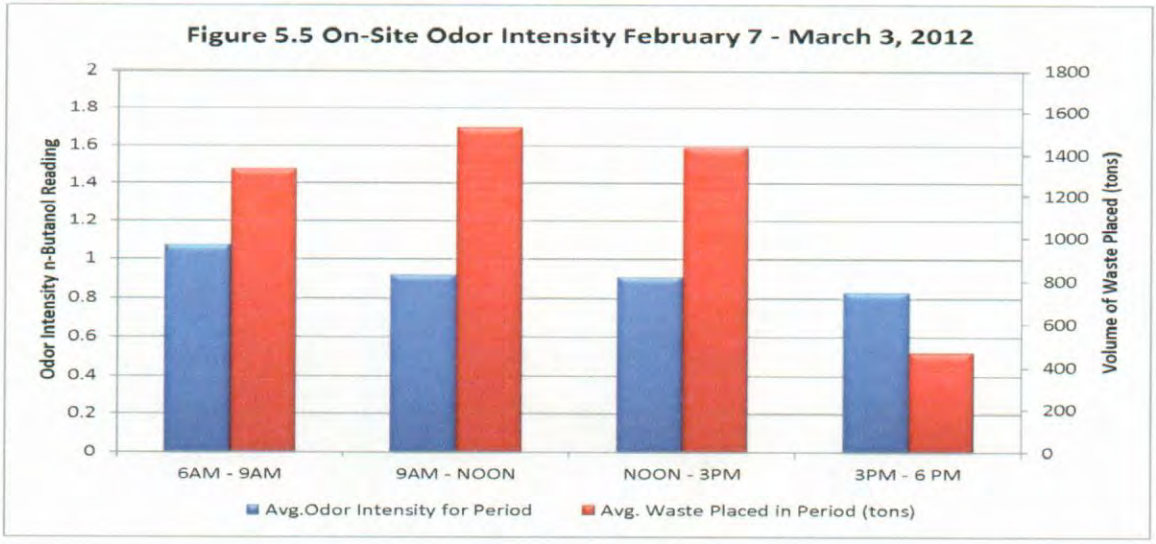
Odor monitoring observations were made at 38 on-site monitoring points located around the perimeter of the landfill disposal area as indicated on Figure 2 (attached). At each monitoring location, the following was among the information recorded:

- Odor intensity using n-butanol scale
- Odor concentration using Nasal Ranger
- Odor character
- Apparent odor source

During the focused on-site odor investigation, over 3,600 odor observations were made and documented. Results from the focused odor monitoring on-site investigation are discussed in the following sections. Daily field data sheets from this investigation are available for inspection at the facility.

5.3.1 Odor Intensity Around Landfill Perimeter

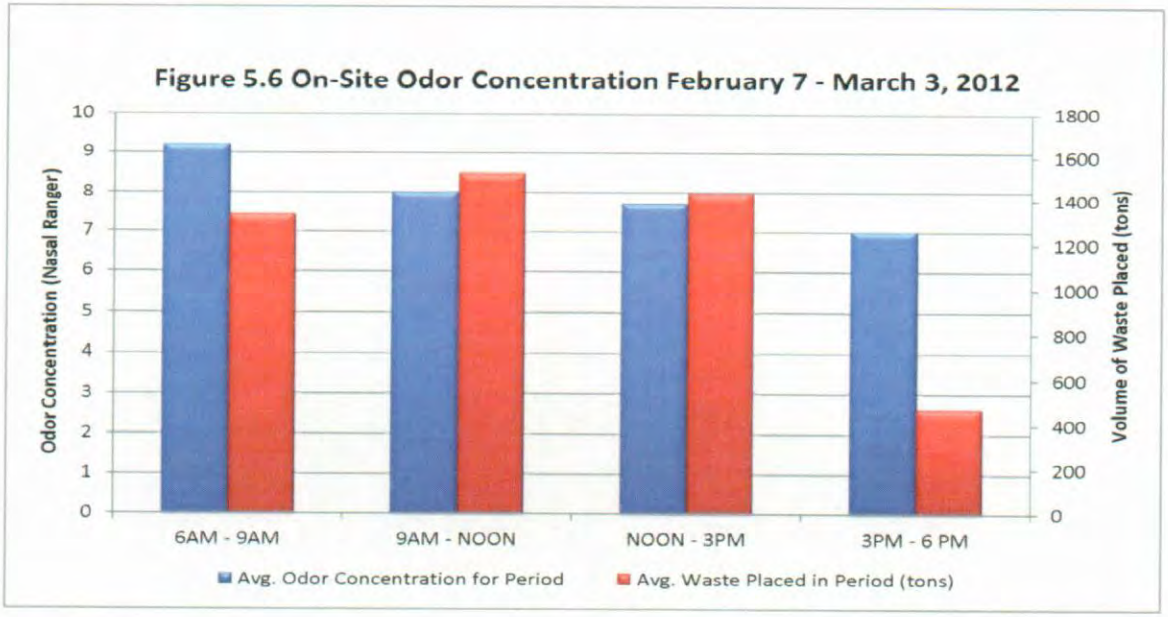
Odor intensity was noted using the 8-point n-butanol scale (see Appendix B). Although the odor intensity reading varied, the average of all readings was 0.95. Given that OCR are higher in the early morning and late afternoon, we have examined average n-butanol readings during each of the circuits and included our observations in Figure 5.5.



It appears that odor intensity (blue bar) is higher in the early morning and drops slightly but steadily through the day. The height of the red bar indicates the rate of waste placement (i.e. tons per hour). On-site odor intensity does not have a notable correlation to the rate of waste placed in a particular time period.

5.3.2 Odor Concentration Around Landfill Perimeter

Odor concentration was noted using the Nasal Ranger method (see Appendix C). Given that OCR are higher in the early morning and late afternoon, we have looked at average Nasal Ranger readings during each of the circuits, see Figure 5.6.

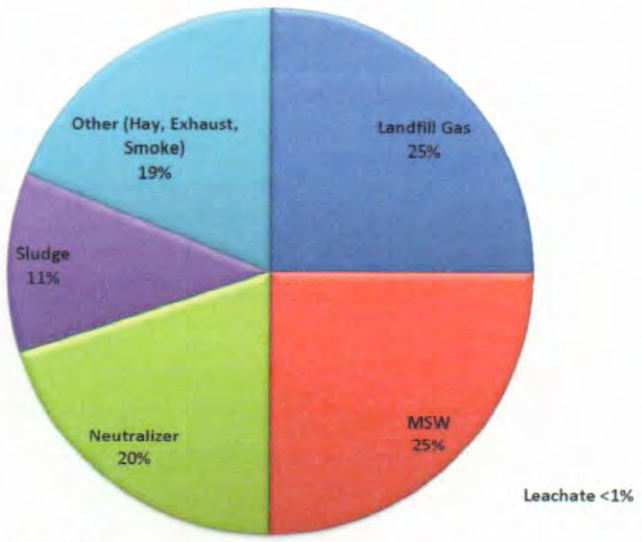


As with odor intensity, it appears that odor concentration was observed to be slightly higher in the early morning and drop slightly through the day regardless of the rate of waste placement. Since both odor intensity and odor concentration drop through the work day, while waste disposal rate is fluctuating, it appears that on-site odor intensity and concentration are not strongly influenced by the rate of waste placement.

5.3.3 Odor Character Around Landfill Perimeter

During the course of this focused on-site odor monitoring, over 3,600 odor observations were made. The distribution of the noted odor character is presented on Figure 5.7

Figure 5.7 Odor Character During On-Site Monitoring



Many of the odor characteristic observations are "non-detect" (ND). Figure 5.7 reflects the distribution of odor character when odors were able to be detected and excludes the times when odors where not detected.

5.3.4 Apparent Odor Source Around Landfill Perimeter

When the CEC odor monitor noted a particularly strong odor, it was reported to site personnel. When possible, operation adjustments were made in attempt to reduce the odor. However, many of the strong odors were attributed to GCCS installation activities, which could not be stopped as they were either voluntary measures aimed at long-term reduction in odor or were performed in response to the DFFOs.

5.3.5 On-Site Leachate Tank and Rail Unloading Odor Monitoring

Between February 29 and March 3, 2012, CEC performed on-site odor monitoring around the perimeter of the leachate storage tank and rail unloading area. Results are as follows:

Monitoring February 29 – March 3, 2012		
	Around Rail Unloading Area	**Around Leachate Storage Tank**
Average Odor Concentration (Nasal Ranger max. 60)	0.9	0.4
Maximum Odor Concentration (Nasal Ranger max. 60)	7	4
Predominate Odor Character	New MSW	Leachate

As can be seen in the table above, the leachate tank and the rail unloading area are not major odor sources. These results demonstrate that leachate storage, long-haul rail waste, rail transit, and rail storage times are not odor sources that contribute to OCR.

5.4 SLUDGE ODOR CHARACTERIZATION STUDY

In January 2012, Apex sent a number of sludge samples to Odor Science and Engineering (OSE) for determination of odor generation potential. OSE characterized the odor emission potential of each sludge sample and found that odor emission potential varied greatly with the source of sludge. In mid-February, Apex suspended the three most odorous sludge streams identified by the OSE study. Based on the success of this study, it may be possible to perform a further study to help guide current and/or future sludge acceptance practices.

6.0 HISTORICAL ODOR COMPLAINT ANALYSES

The previous four sections described geography, waste receipt, OCR, odor studies and site odor monitoring practices. In this section we attempt to address the portion of Order No. 6 that requires Apex to *analyze correlations between waste types received by Respondent for disposal at the Facility* [since 2010 and] *analyze all of the above information in relation to operations at the Facility including the daily hours of operation and the total amount of wastes received for disposal at the Facility.*

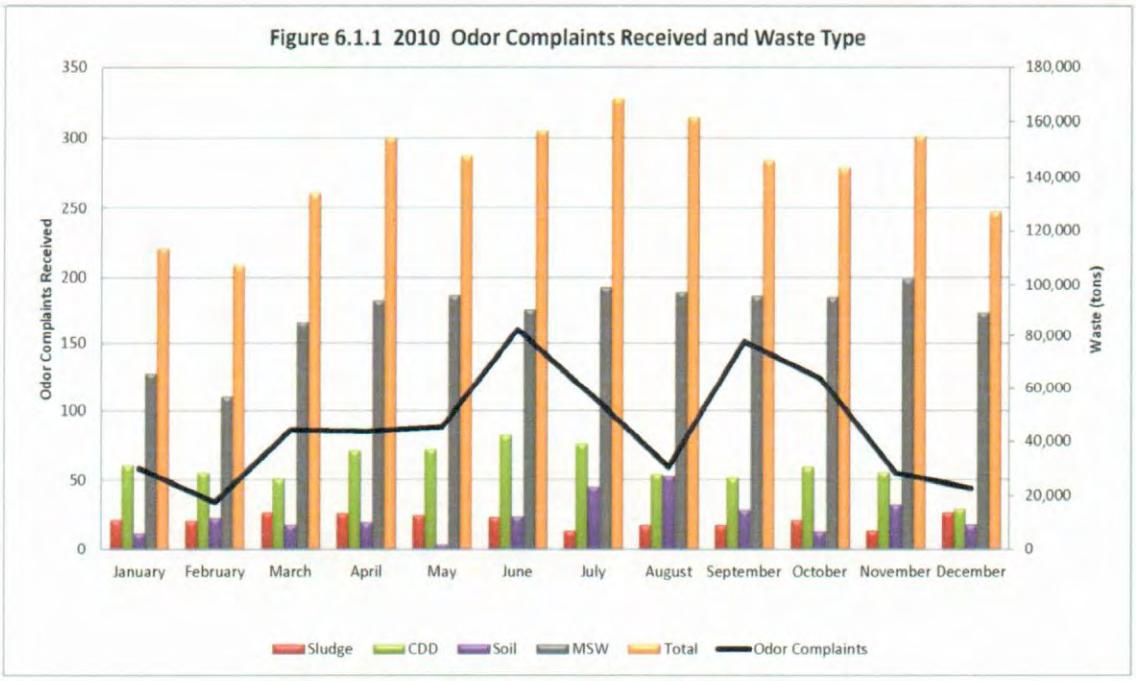
6.1 COMPLAINTS RECEIVED VS. WASTE TYPES (Monthly Analysis)

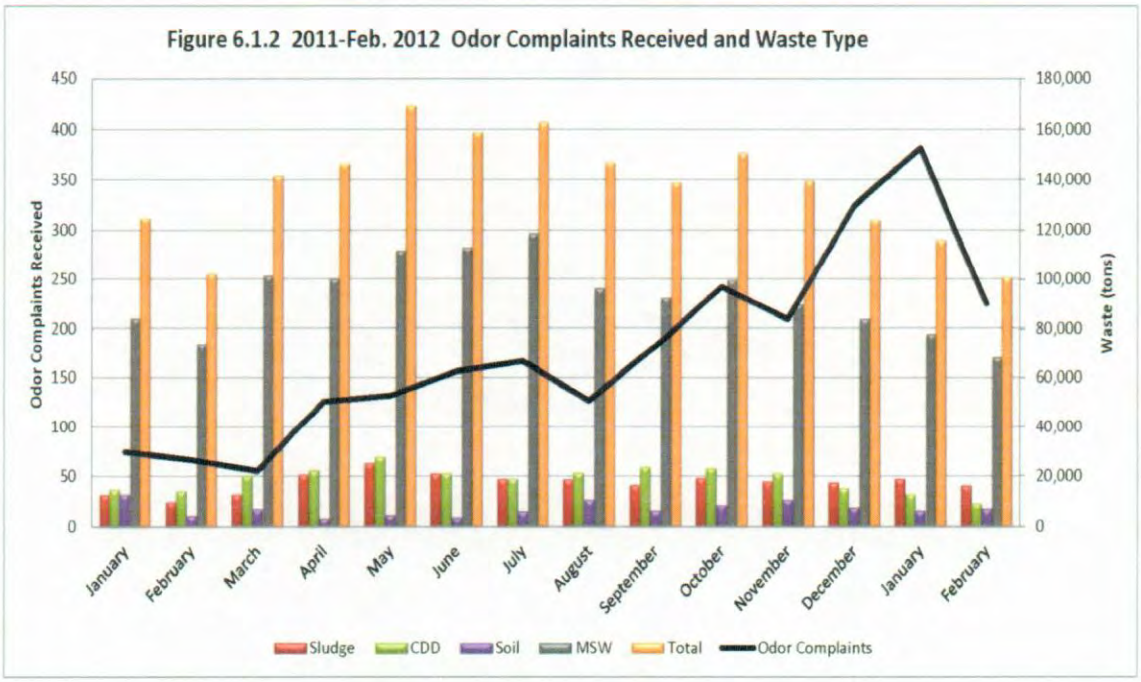
Apex uses four main categories for classifying and tracking waste received and disposed at the landfill:

- Municipal Solid Waste (MSW) – Typical household and commercial waste which is a mix of paper, cardboard, plastic, food waste, etc.
- Construction and Demolition Debris (CDD) – Debris from residential, commercial, and industrial construction and demolition projects. Includes wood, wallboard, carpeting, concrete, etc.
- Sludge – Semi-solid byproduct of municipal or industrial wastewater treatment.
- Soil – Contaminated soil from environmental cleanup activities.

Apex has complete and accurate records of waste type and date received, all of which are provided on the Ohio EPA "Form 2 – Municipal Solid Waste Landfill Facility Daily Log of Operations" (available for inspection at the facility).

Figure 6.1.1 and Figure 6.1.2 present graphs of the number of monthly OCR and the corresponding monthly quantity of each of the four waste categories received.





The increase of OCR in late 2011 and January 2012 in light of decreasing waste receipts during the same time period, demonstrates that the volume of waste received had no correlation to OCR.

6.2 CORRELATIONS BETWEEN OCR AND WASTE ACCEPTANCE (Monthly Analysis)

CEC attempted to apply best-fit linear regression lines and establish correlations between particular waste streams and odor complaints. However, in nearly every case, the correlation coefficients (R) were weak and the coefficients of determination (R^2) were so low that most of the data variability could not be explained. Nevertheless, the following sections look at relationships between site disposal activity and OCR and, when appropriate, draw conclusions regarding the relationships.

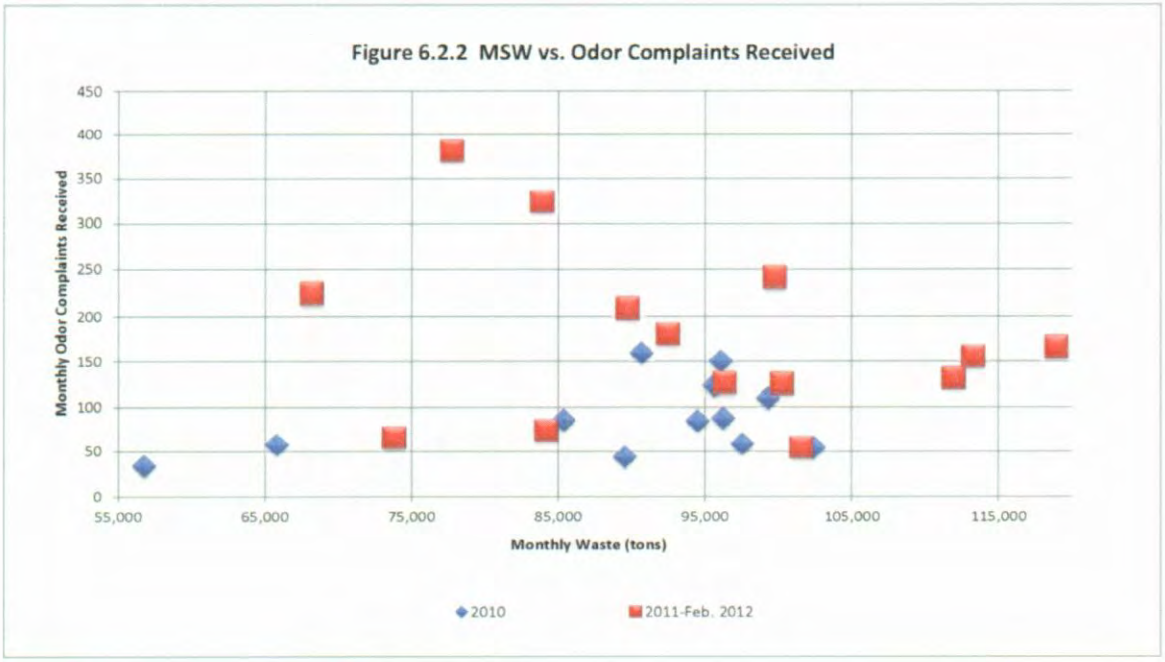
Note that landfill gas, which may impact the correlations described below, is unaffected by variations in daily waste acceptance and therefore is not addressed in this Section. Neither are other non-landfill odor sources in the community, which also may impact the correlations described below.

6.2.1 OCR vs. Total Waste Accepted

Figure 6.2.1 plots monthly OCR relative to the total quantity of waste accepted per month. There does not appear to be a direct correlation between OCR and total volume of waste received.

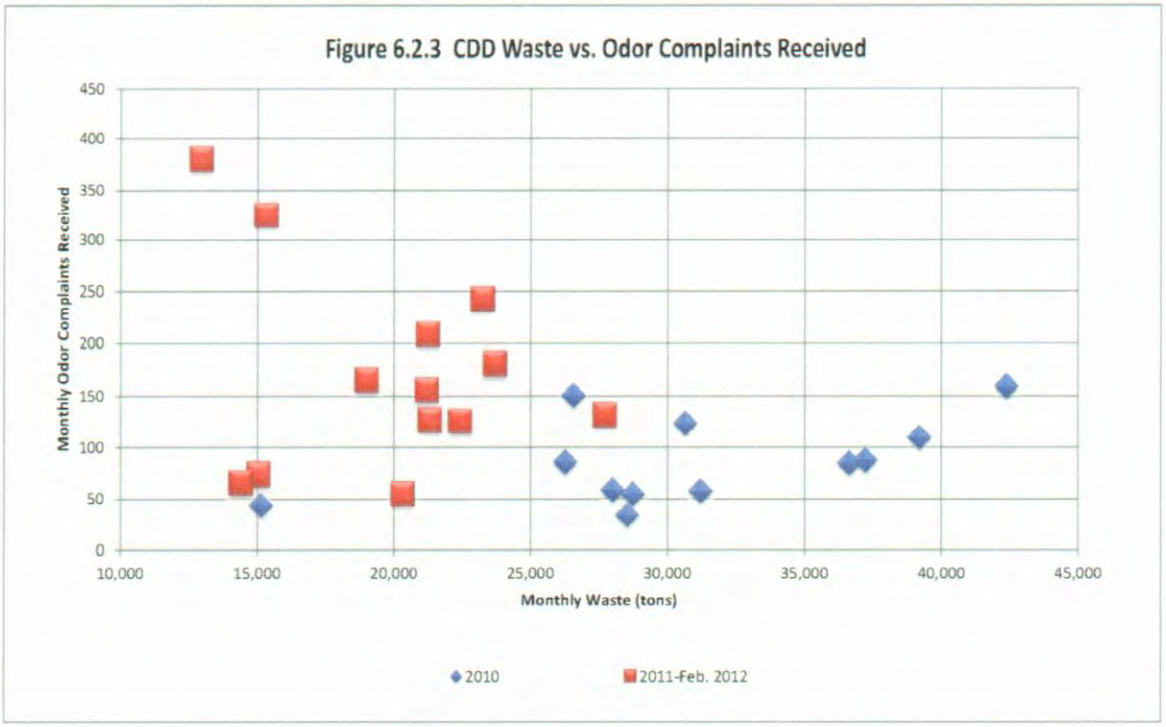
6.2.2 OCR vs. MSW Accepted

Figure 6.2.2 plots monthly OCR relative to the quantity of municipal solid waste (MSW) accepted per month. There does not appear to be a direct correlation between OCR and volume of MSW received.



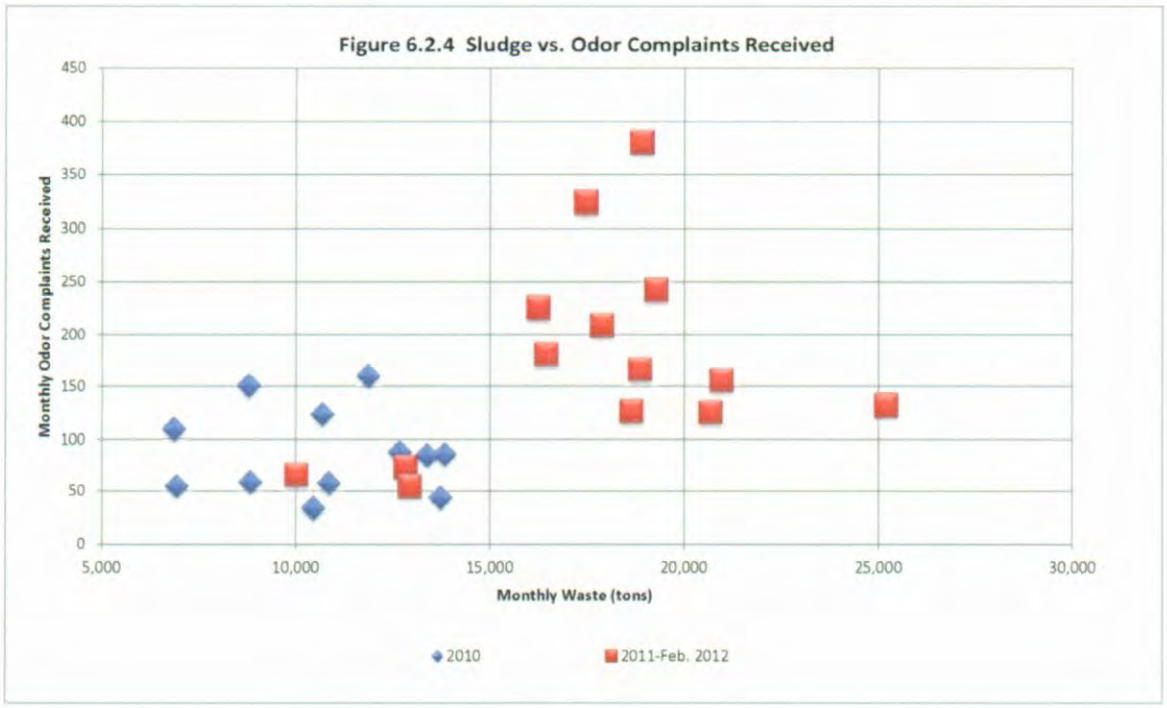
6.2.3 OCR vs. CDD Accepted

Figure 6.2.3 plots monthly OCR relative to the quantity of construction and demolition debris (CDD) accepted per month. There does not appear to be a direct correlation between OCR and volume of CDD waste received.



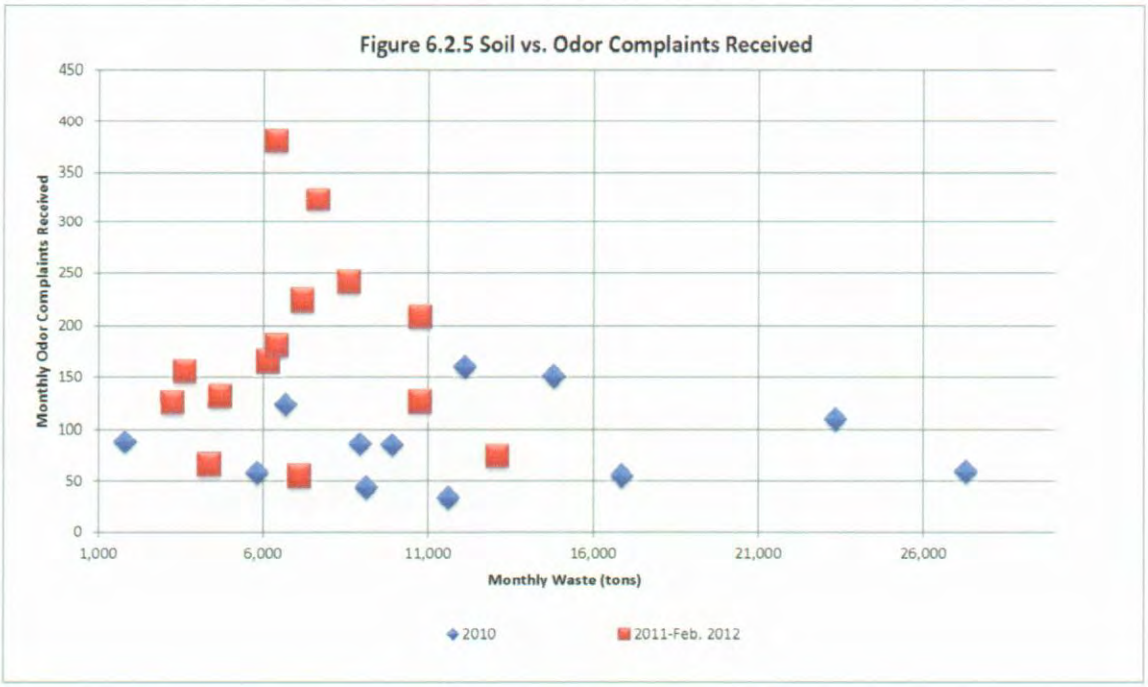
6.2.4 OCR vs. Sludge Accepted

Figure 6.2.4 plots monthly OCR relative to the quantity of sludge accepted per month. There does not appear to be a significant correlation between OCR and volume of sludge waste received. However, while there is not a significant correlation, there is some indication that the months that contained the highest sludge volumes also had a higher number of odor complaints. Because certain sludge waste streams are more odorous than others (see Section 5.4), the total volume of sludge may be less important than the particular sludge odor streams that are being disposed.



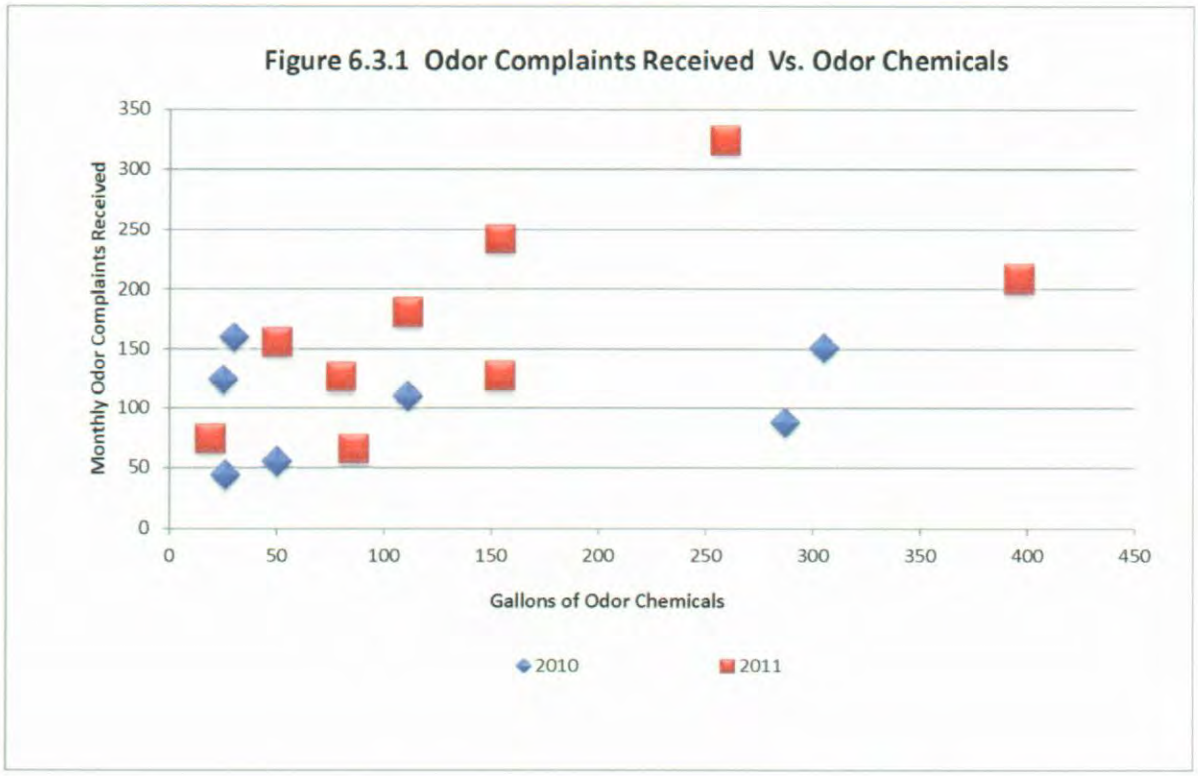
6.2.5 OCR vs. Soil Accepted

Figure 6.2.5 plots monthly OCR relative to the quantity of soil accepted per month. There does not appear to be a correlation between OCR and volume of soil waste received.



6.3 CORRELATIONS BETWEEN OCR AND ODOR NEUTRALIZER (Monthly Analysis)

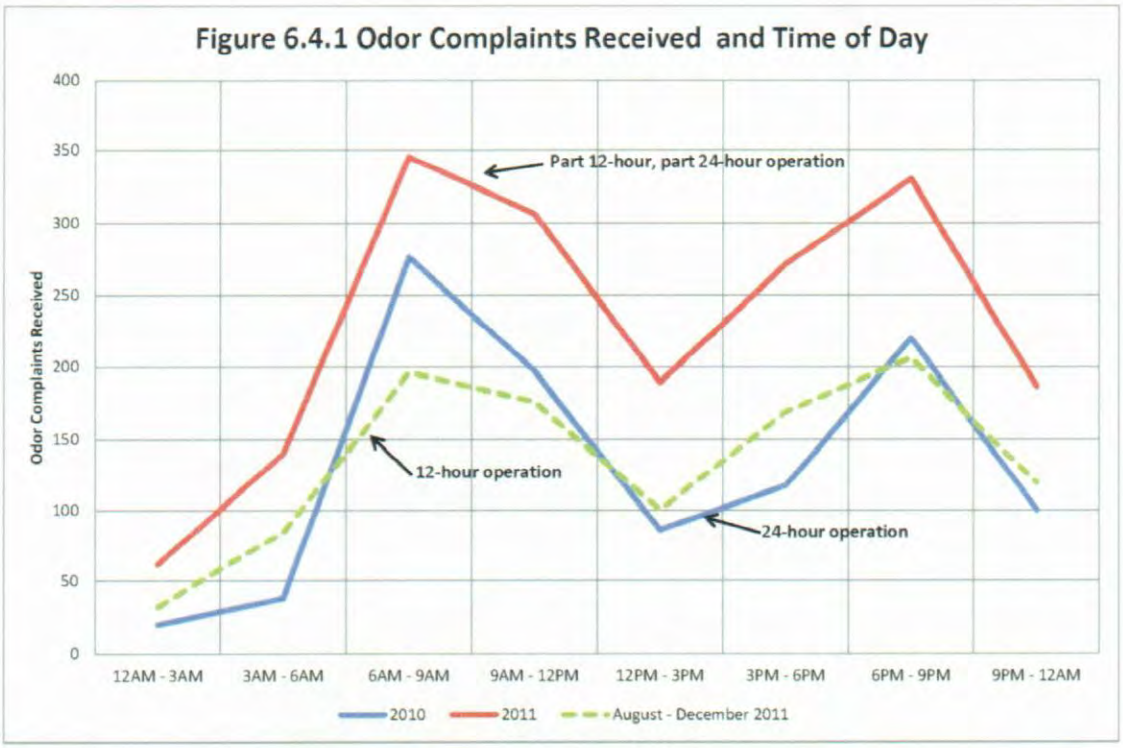
Apex keeps a record of the amount of concentrated odor neutralizer product that is used each month (this concentrated product is diluted with water in accordance with the manufacturer's recommendations before application; see Section 4.0 for more information). Figure 6.3.1 examines monthly OCR relative to the quantity of neutralizer product used per month. A moderate correlation suggests that odor neutralizer use was increased in response to receiving heavier volume of OCR.



Use of odor neutralizer and neutralizer delivery equipment increased throughout 2010 and 2011. See Appendix H for timeline of equipment implementation.

6.4 COMPLAINTS VS. TIME-OF-DAY AND OPERATIONAL HOURS

Figure 6.4.1 shows the relationship between the times of day that complaints are made to the frequency of complaints. Generally it appears that complaints subside between 9 AM to 4 PM.



A separate line was provided for a subset of months, August 2011 to December 2011 above. During these months, Apex reduced operating hours to a 12-hour (rather than 24-hour) waste receipt and placement operations. As seen in the graph, there is no significant difference in the pattern of the timing of OCR based on the distribution of operating hours.

Typical distributions of operating hours (shown in Figure 3.2.1 and 3.2.2) added to these daily OCR/time graphs results in figures 6.4.2 and 6.4.3. These figures support the conclusion that operating hours do not have a noticeable effect on OCR.

Figure 6.4.2 Waste Placement Timeline vs. Daily OCR (24-Hour Operation)

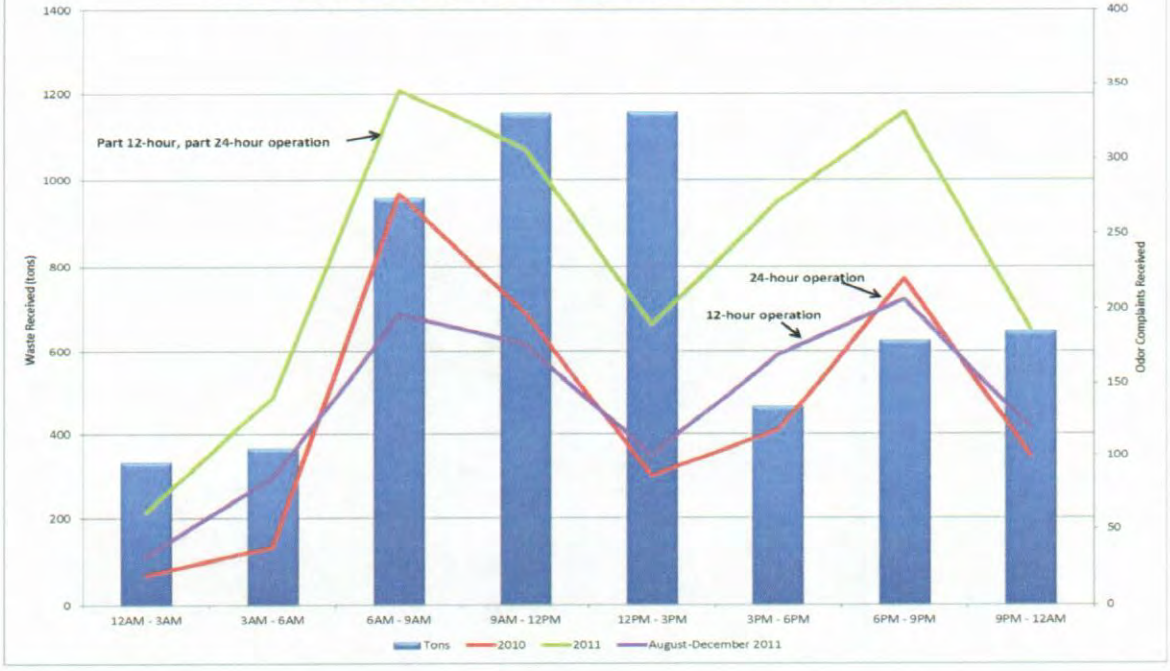
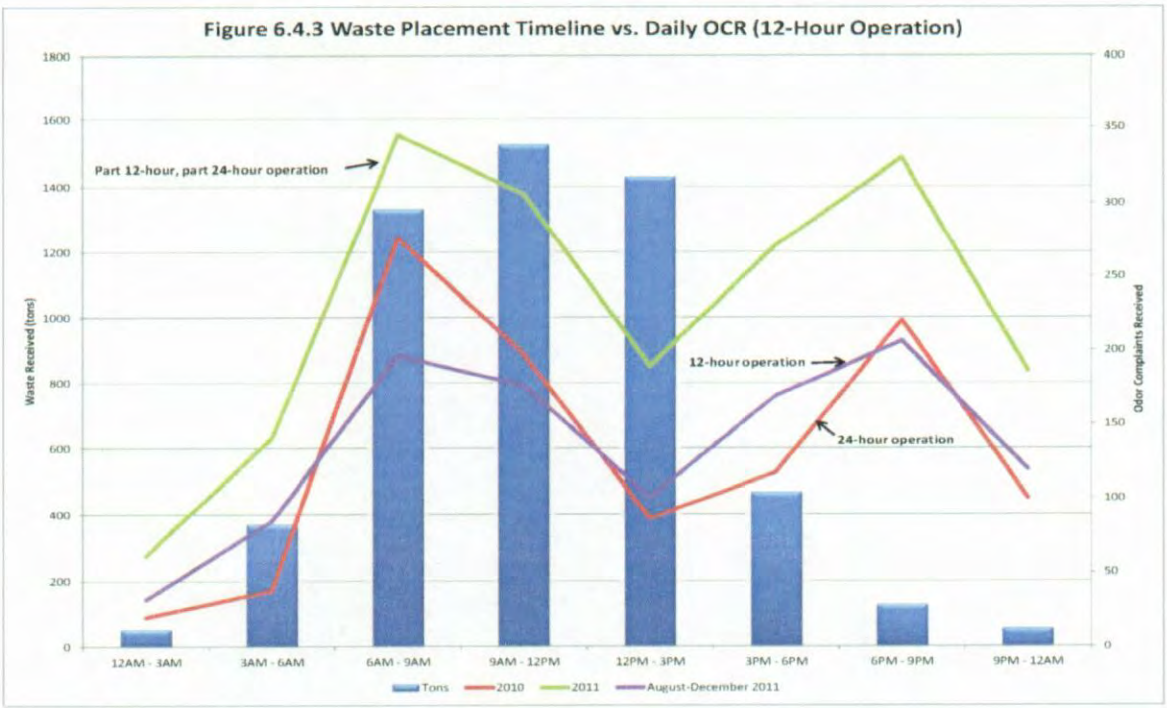


Figure 6.4.3 Waste Placement Timeline vs. Daily OCR (12-Hour Operation)

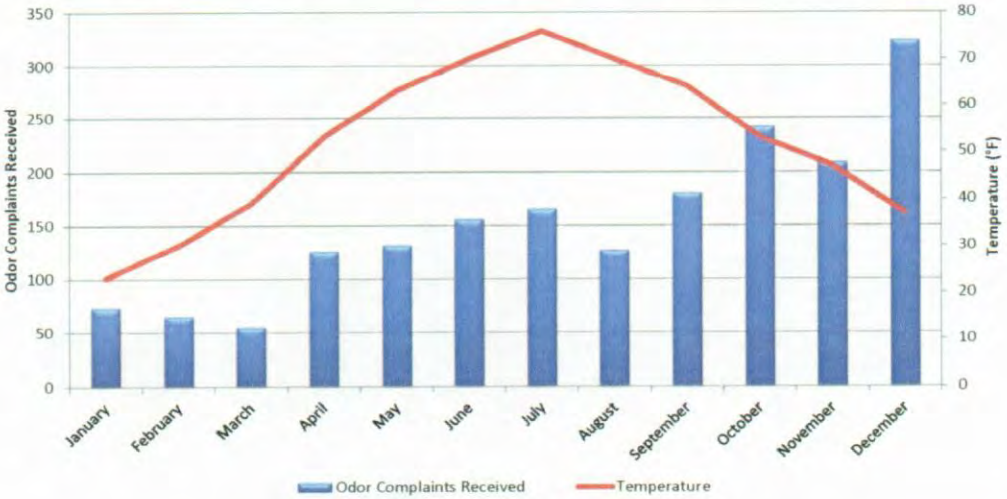


6.5 COMPLAINTS VS. AVERAGE TEMPERATURE (Monthly Analyses)

Figures 6.5.1 and 6.5.2 present graphs showing the number of complaints and average monthly temperatures. January through March in 2010 and 2011, as well as November and December 2010, have relatively fewer complaints than the rest of the months. However, steady increase in OCR occurred after September 2011 despite steadily decreasing temperatures. This ramp-up of complaints cannot therefore be attributed to temperature.

Figure 6.5.1 2010 Odor Complaints Received and Average Monthly Temperature

Figure 6.5.2 2011 Odor Complaints Received and Average Monthly Temperature

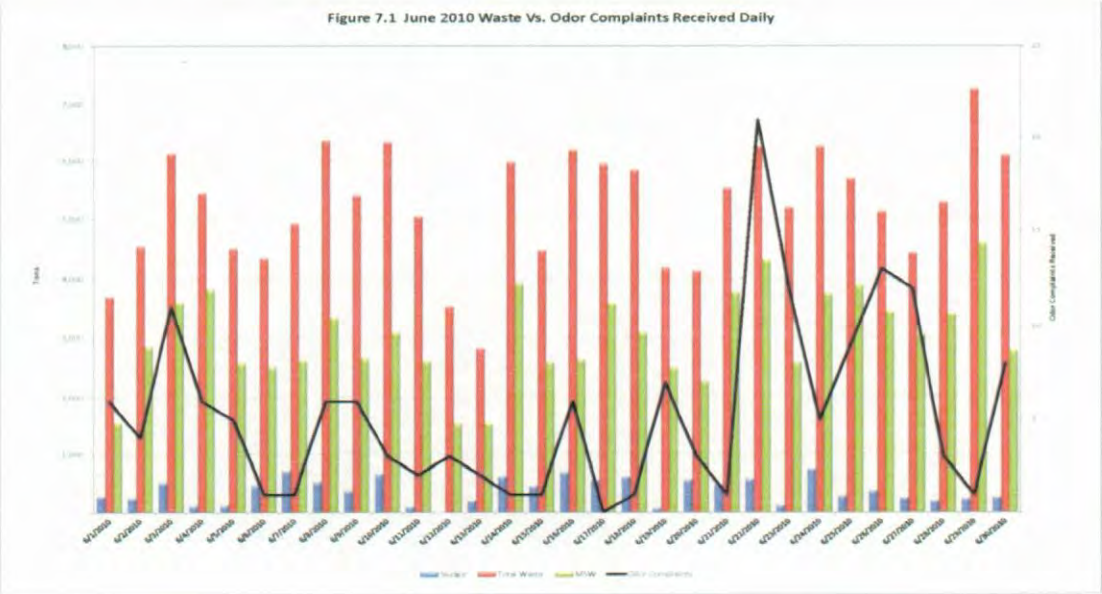


7.0 DAILY ODOR COMPLAINTS RECEIVED ANALYSES

7.1 DAILY WASTE RECEIVED VS. OCR

In addition to the monthly correlations discussed in Section 6, we have looked at the potential for correlations between daily waste acceptance and OCR. We have graphed OCR vs. waste received for every day of every month in 2010 and 2011. June 2010 is presented as an example below because June had the highest number of OCR in 2010. Similar graphs for all other months are contained in Appendix D.

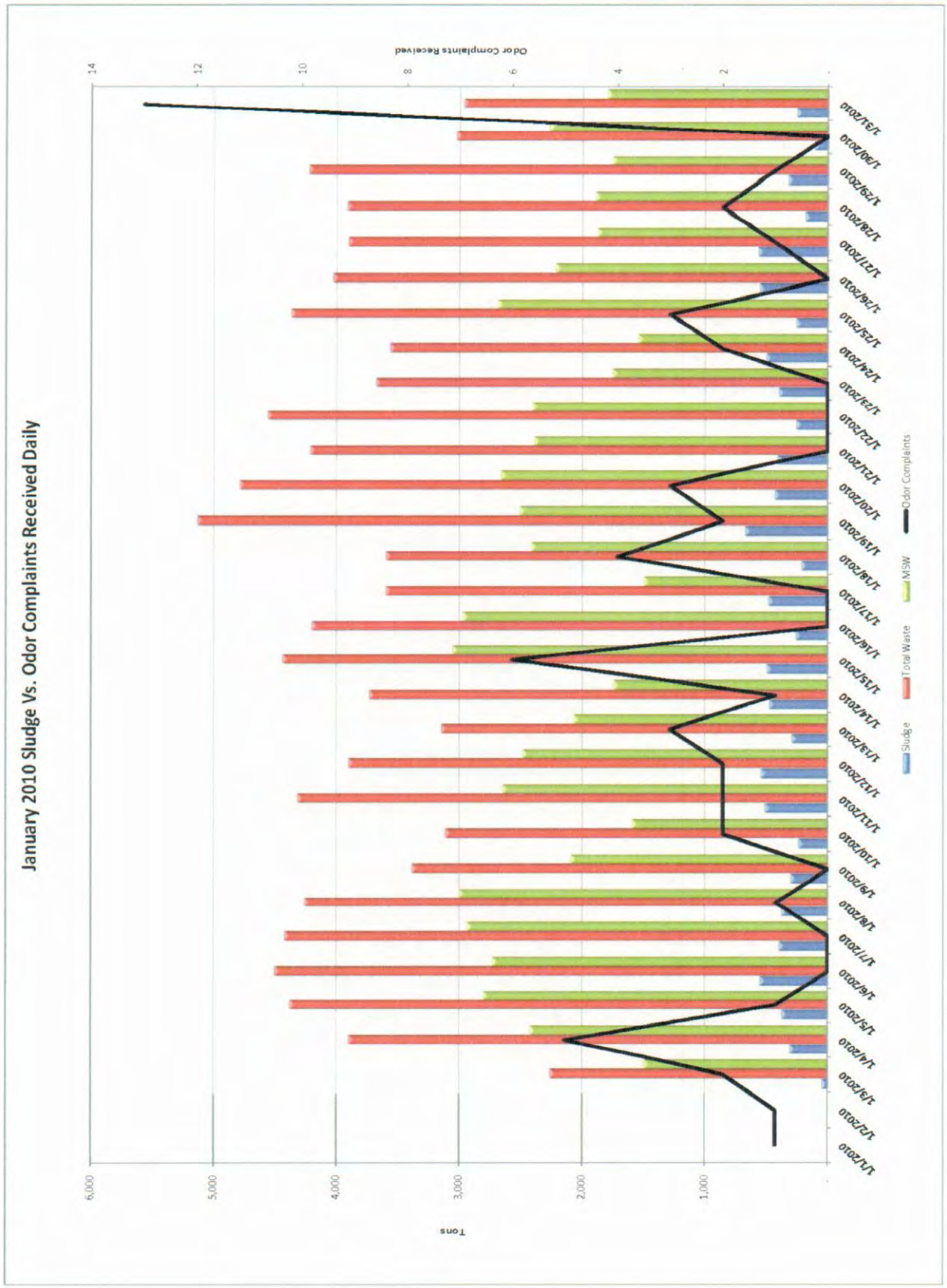
Figure 7.1 June 2010 Waste Vs. Odor Complaints Received Daily



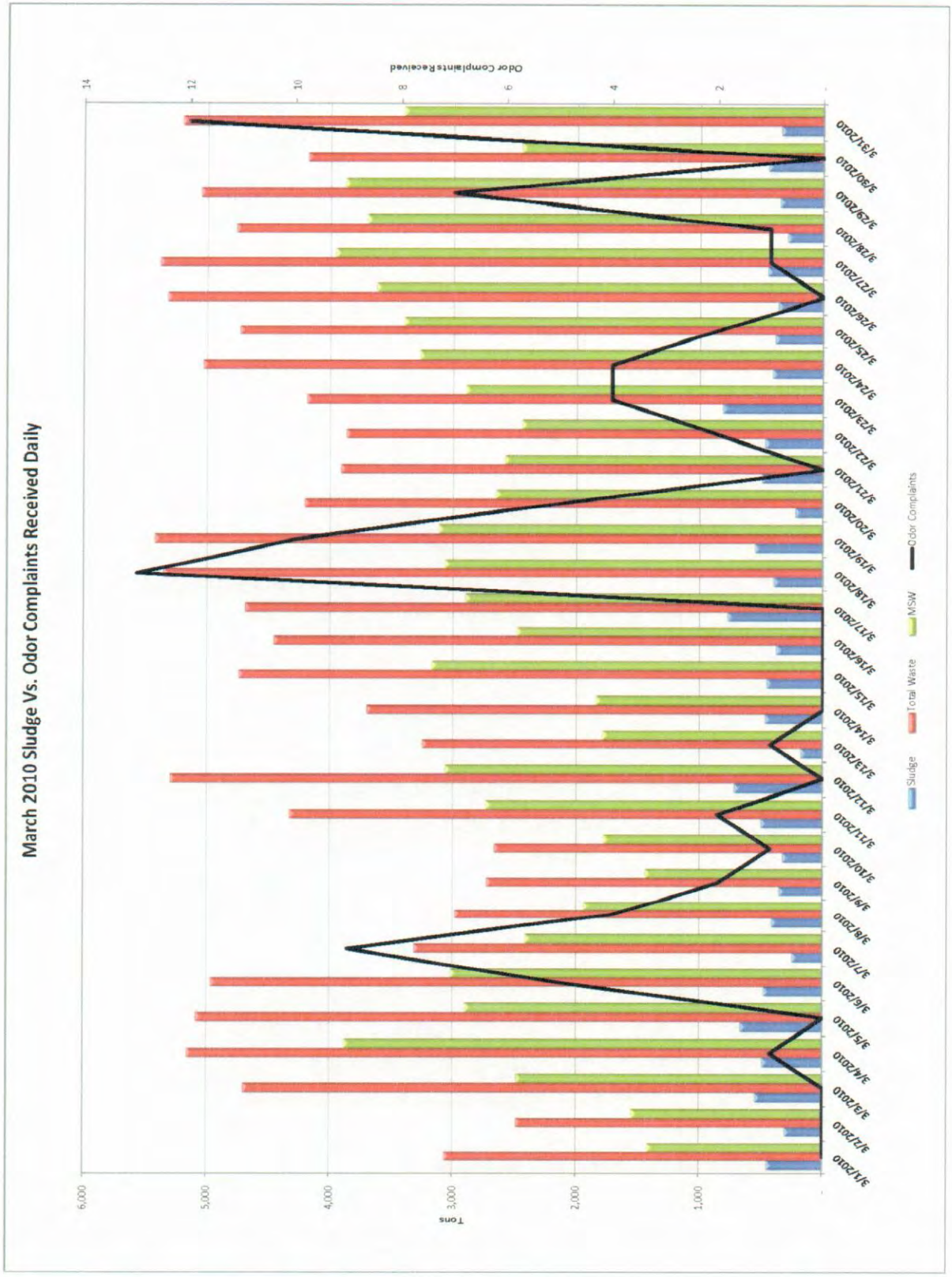
This graph demonstrates that the number of OCR in a particular day cannot be attributed to the total amount of waste received or the volume of sludge received in a particular day. The following chart further illustrates this point:

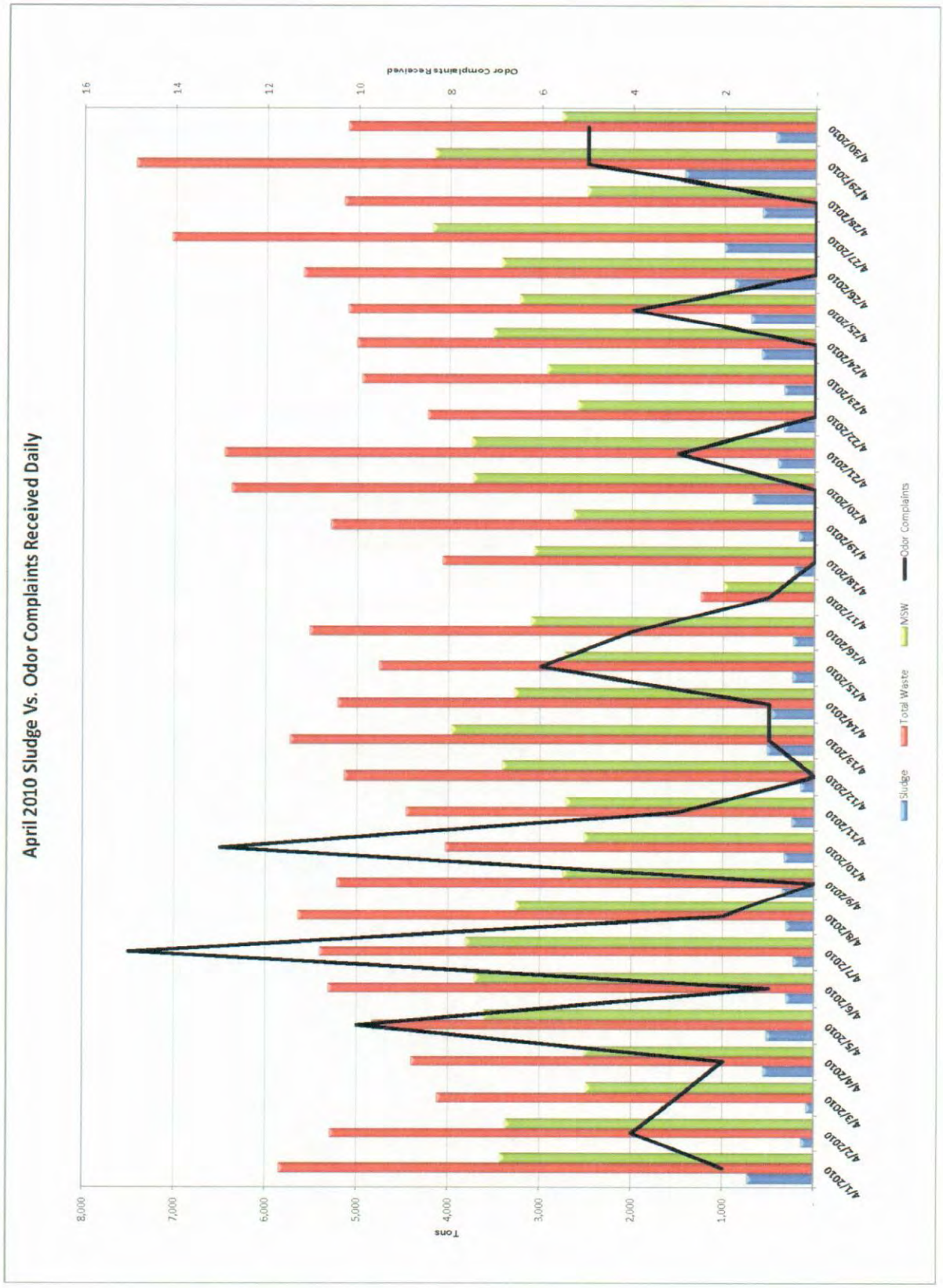
Date	OCR	Total Waste (tons)	Sludge	Weather
June 3, 2010	10	6,121	534	Pt. Cl 65 deg., no rain
June 7, 2010	1	4,935	722	Pt. Cl. 71 deg. no rain
June 10, 2010	3	6,326	665	Cldy. 80 deg. lt. rain
June 16, 2010	6	6,188	700	Sunny 82 deg. no rain
June 17, 2010	0	5,956	571	Pt. Cl. 75 deg. no rain
June 22, 2010	21	6,238	589	Cldy. 86 deg. rain
June 26, 2010	13	5,136	394	Cldy. 87 deg. rain
June 27, 2010	12	4,427	273	Pt. Cl. 80 deg. no rain
June 29, 2010	1	6,093	282	Cldy. 77 deg. lt. rain

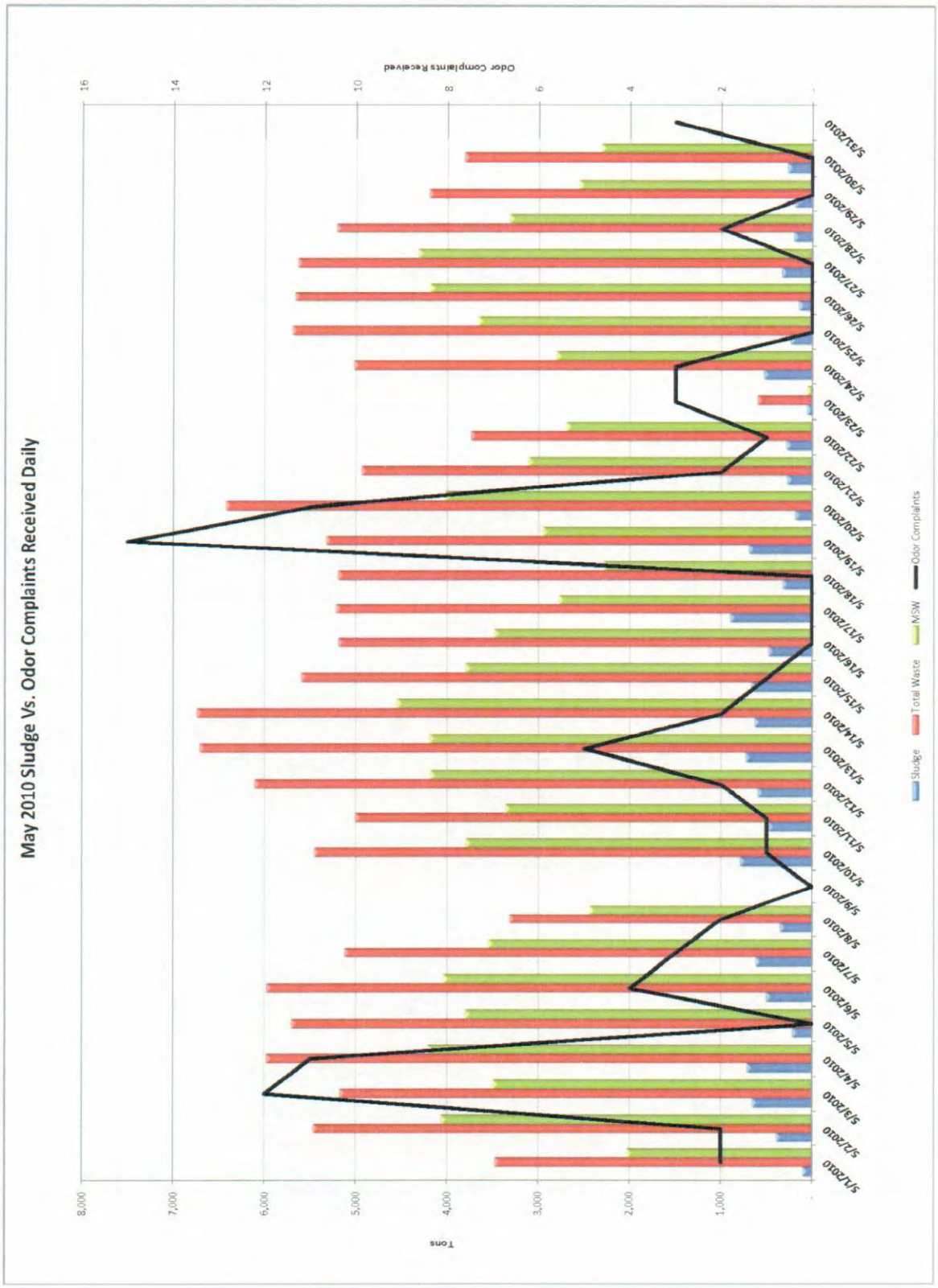
Daily data for the remaining months in the study period follow.


January 2010 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints

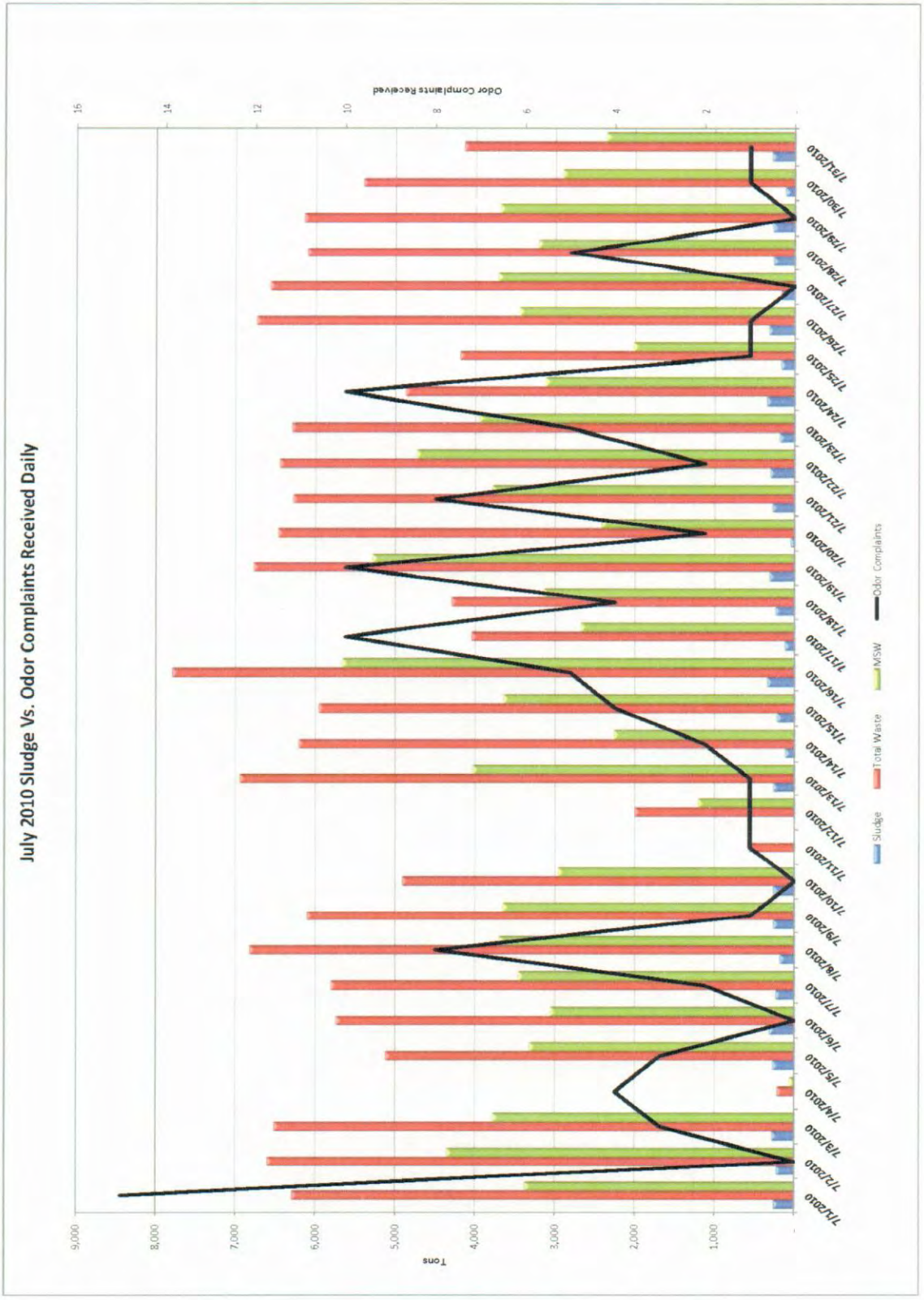
February 2010 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints

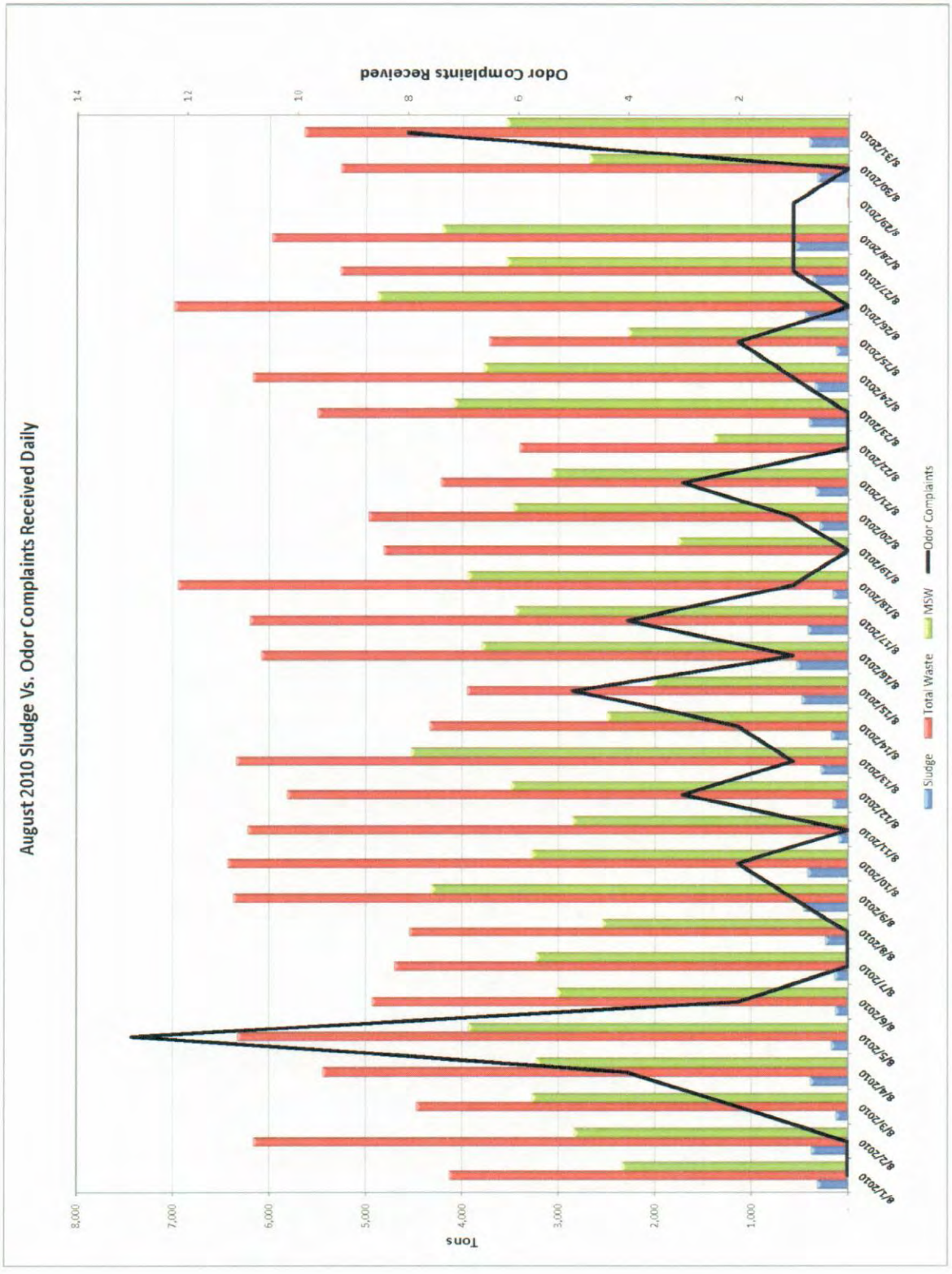

March 2010 Sludge Vs. Odor Complaints Received Daily
Odor Complaints Received
Tons
Sludge
Total Waste
MSW
Odor Complaints

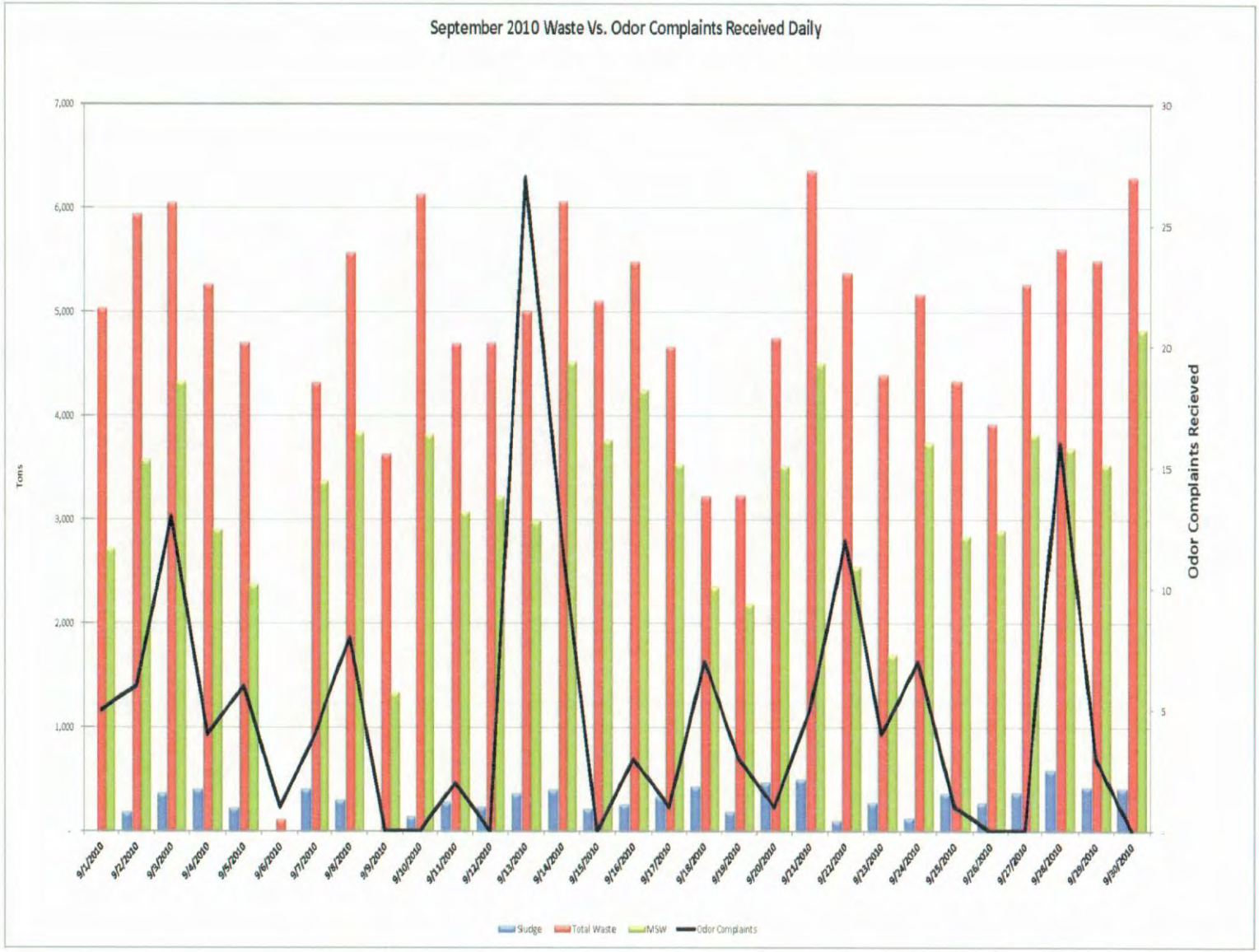

April 2010 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
16
14
12
10
8
6
4
2
4/1/2010
4/2/2010
4/3/2010
4/4/2010
4/5/2010
4/6/2010
4/7/2010
4/8/2010
4/9/2010
4/10/2010
4/11/2010
4/12/2010
4/13/2010
4/14/2010
4/15/2010
4/16/2010
4/17/2010
4/18/2010
4/19/2010
4/20/2010
4/21/2010
4/22/2010
4/23/2010
4/24/2010
4/25/2010
4/26/2010
4/27/2010
4/28/2010
4/29/2010
4/30/2010

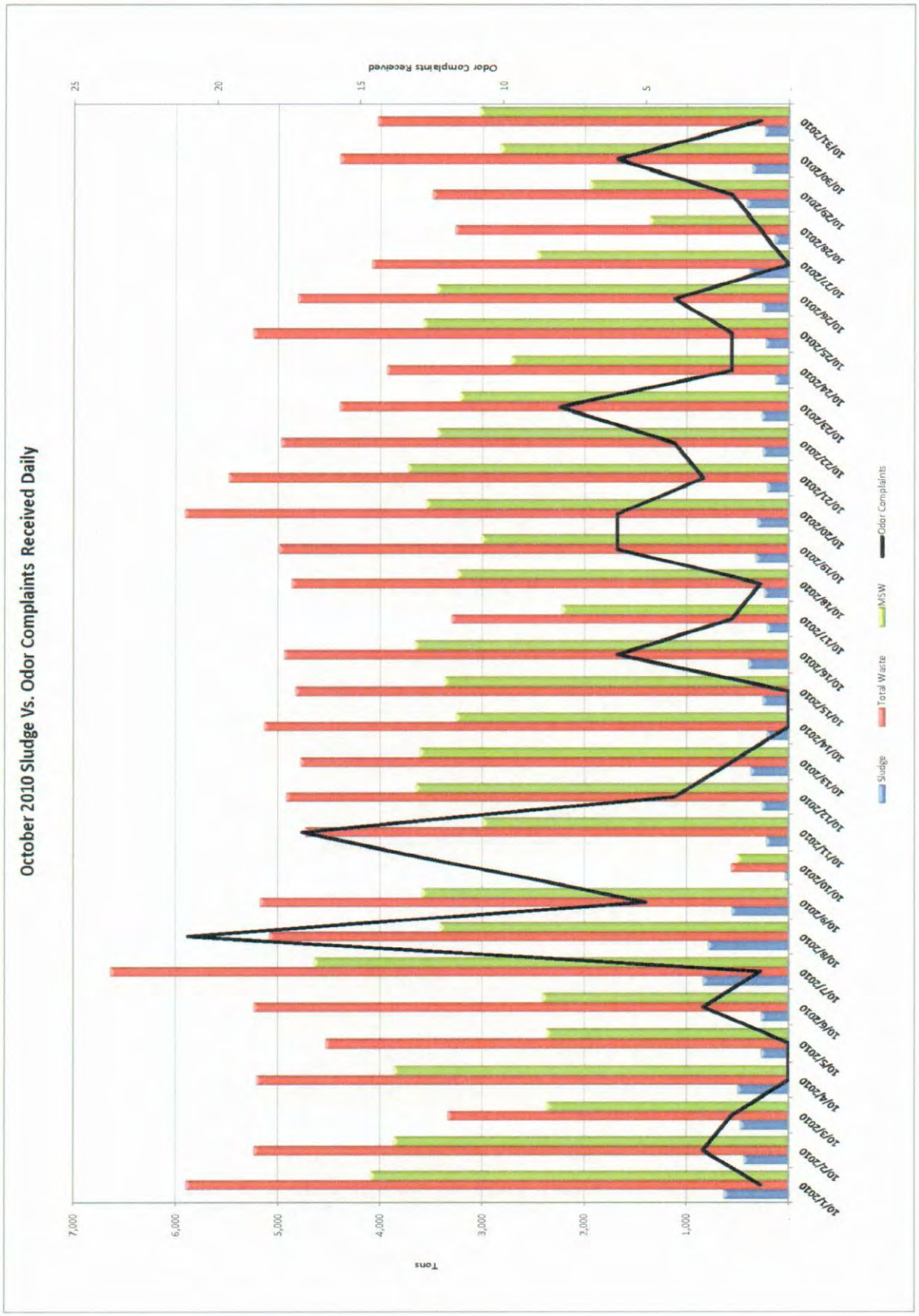

May 2010 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints

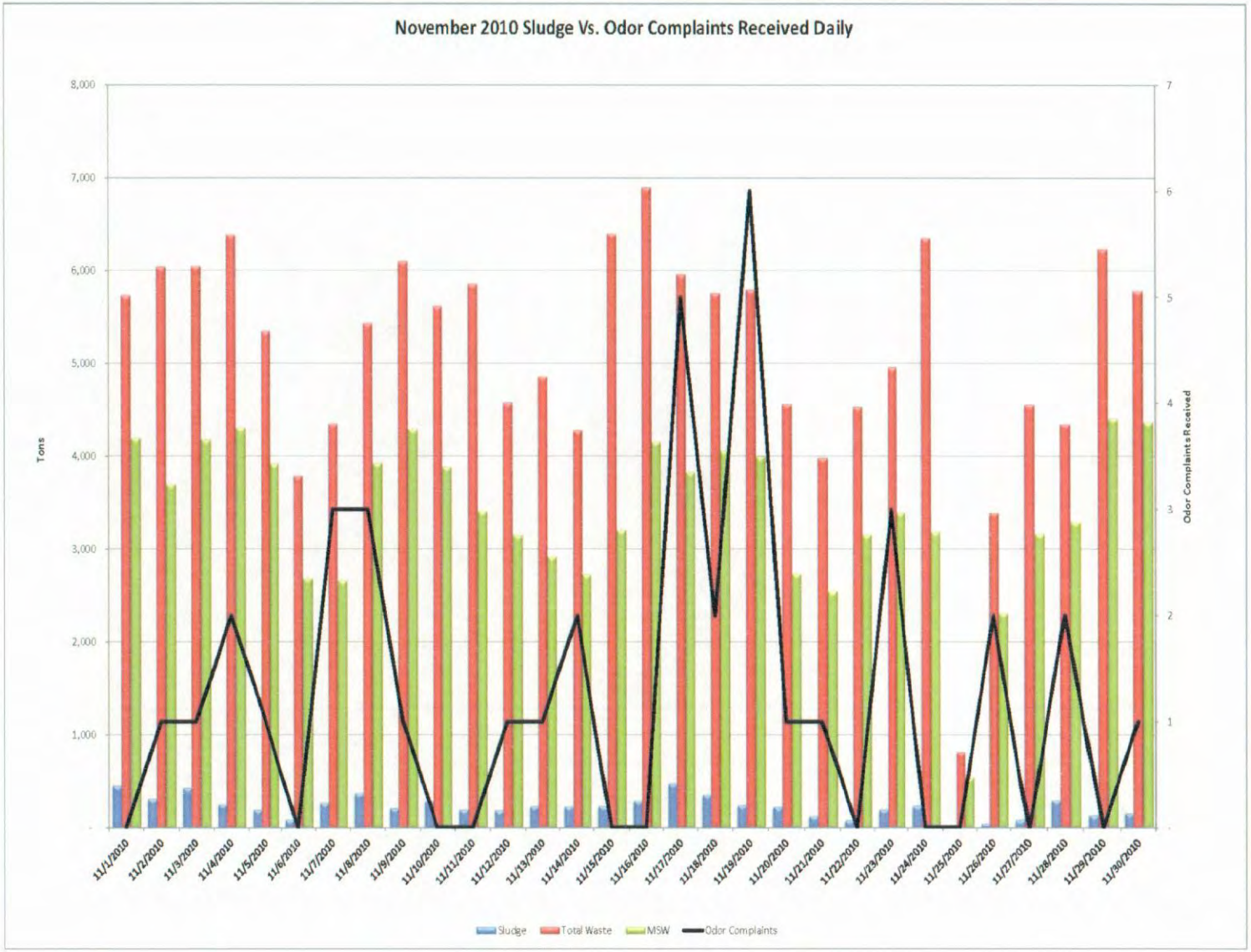
June 2010 Waste Vs. Odor Complaints Received Daily
Odor Complaints Received
Tons
Sludge
Total Waste
MSW
Odor Complaints

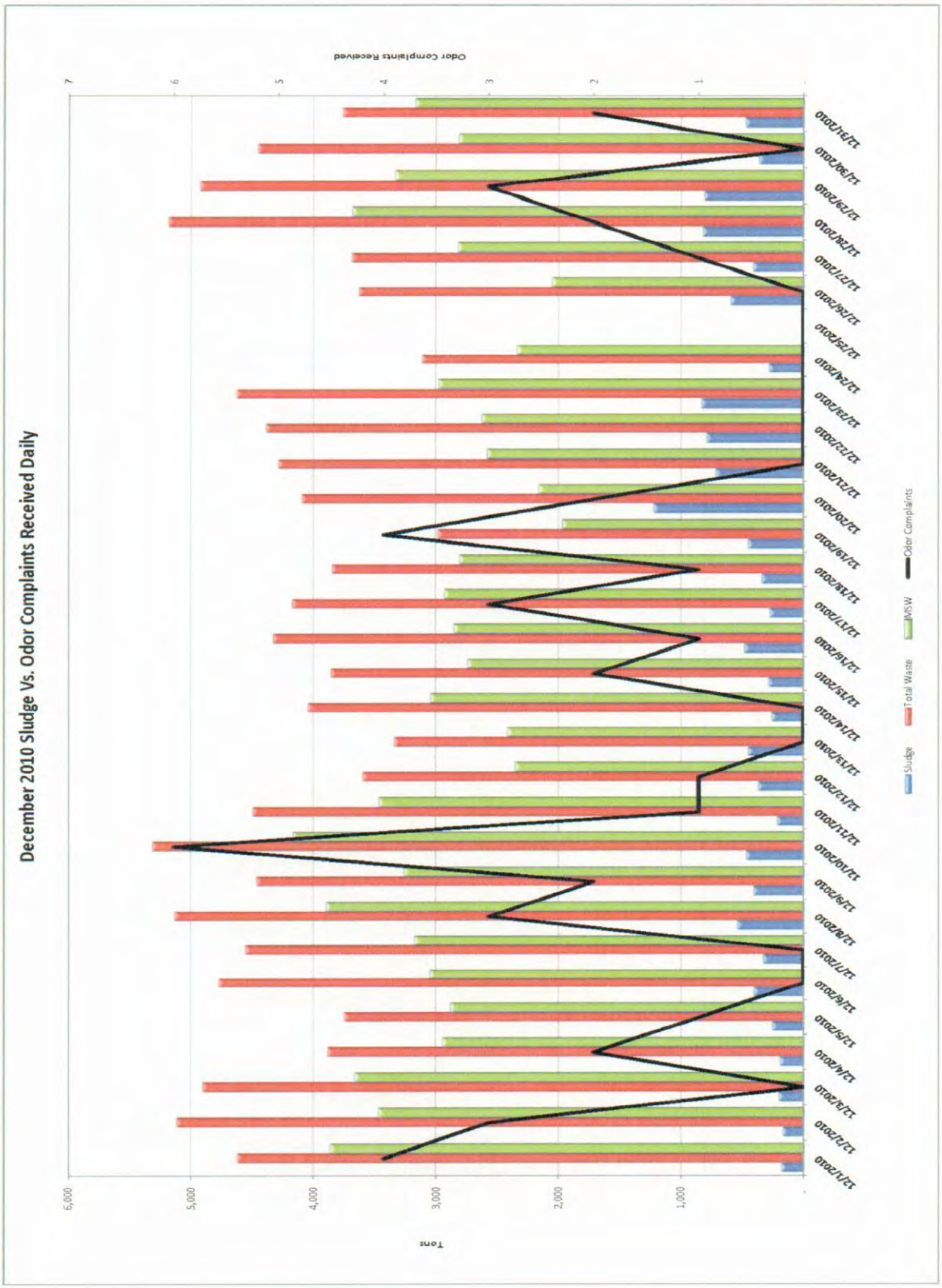

July 2010 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints

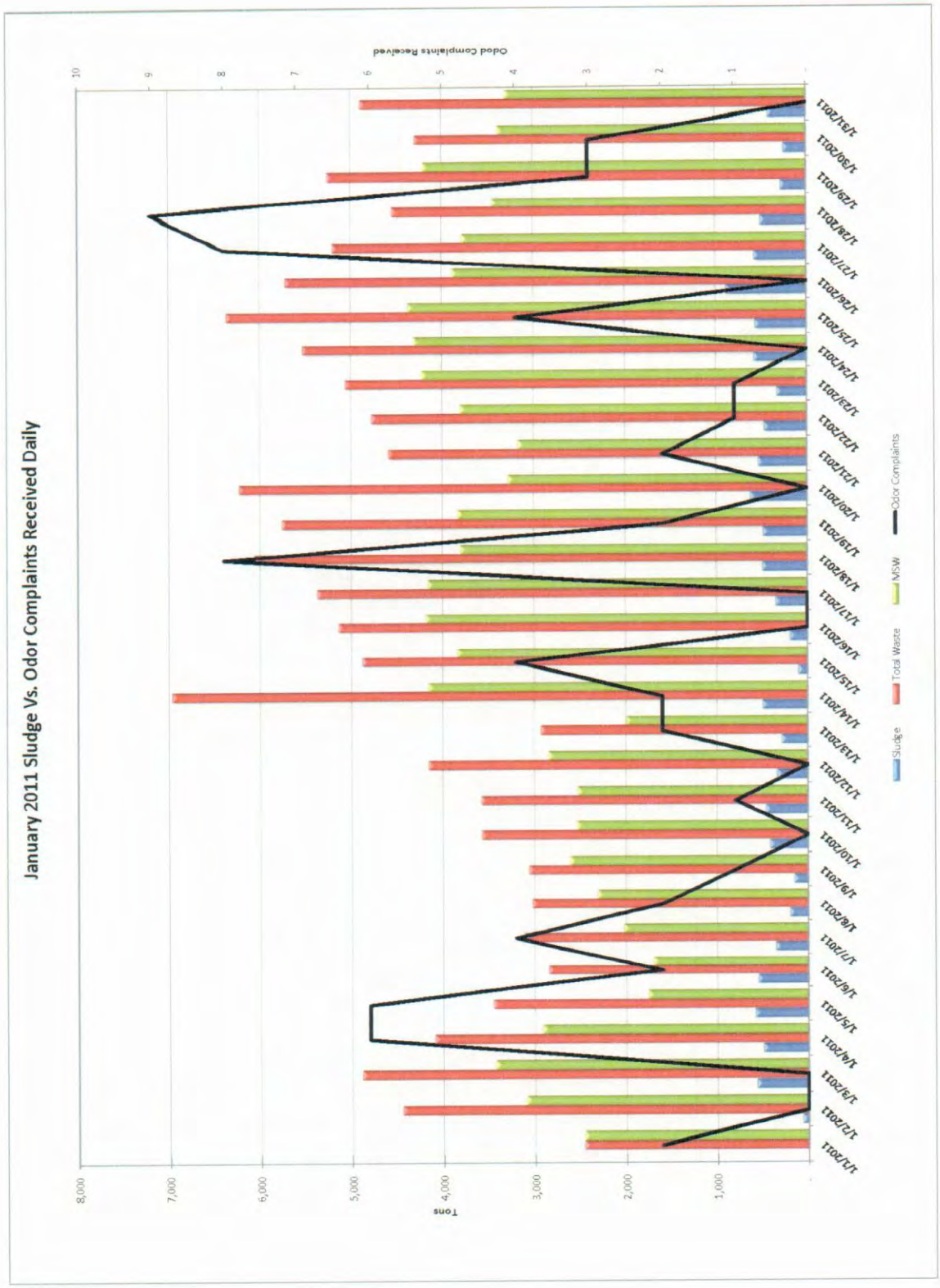

August 2010 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints

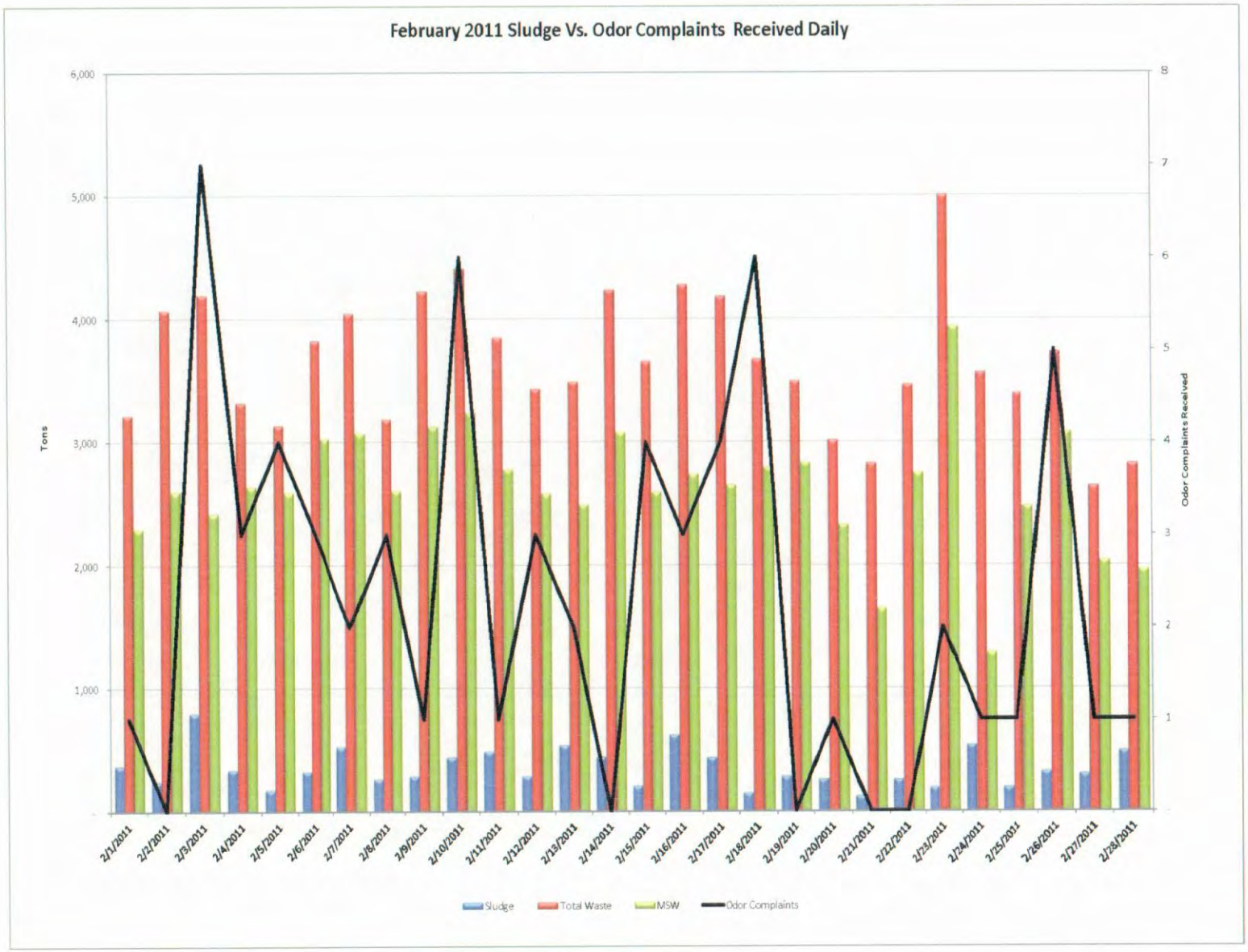

September 2010 Waste Vs. Odor Complaints Received Daily
Tons
Odor Complaints Recieved
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
30
25
20
15
10
5
-
9/1/2010
9/2/2010
9/3/2010
9/4/2010
9/5/2010
9/6/2010
9/7/2010
9/8/2010
9/9/2010
9/10/2010
9/11/2010
9/12/2010
9/13/2010
9/14/2010
9/15/2010
9/16/2010
9/17/2010
9/18/2010
9/19/2010
9/20/2010
9/21/2010
9/22/2010
9/23/2010
9/24/2010
9/25/2010
9/26/2010
9/27/2010
9/28/2010
9/29/2010
9/30/2010
Sludge
Total Waste
MSW
Odor Complaints

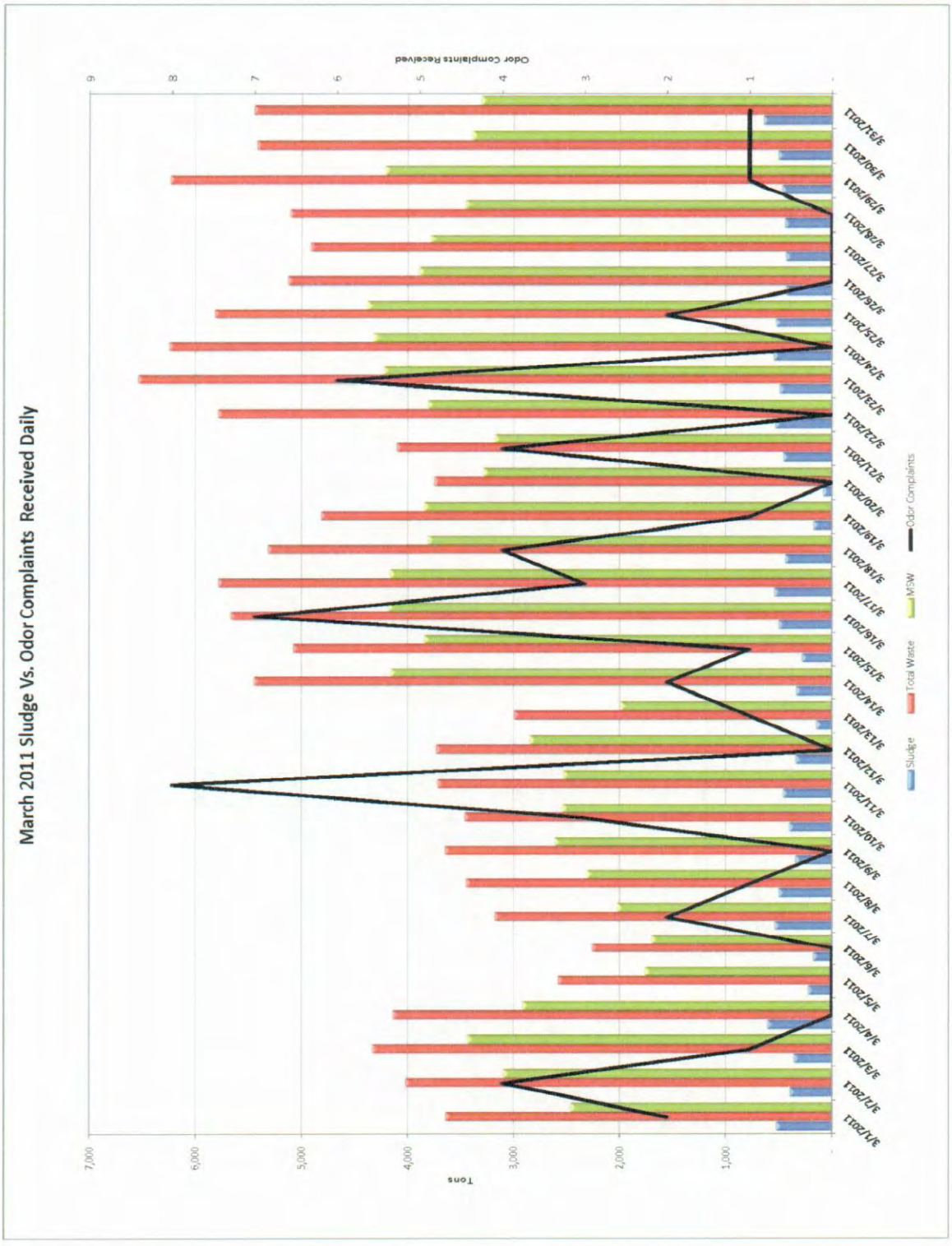

October 2010 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints

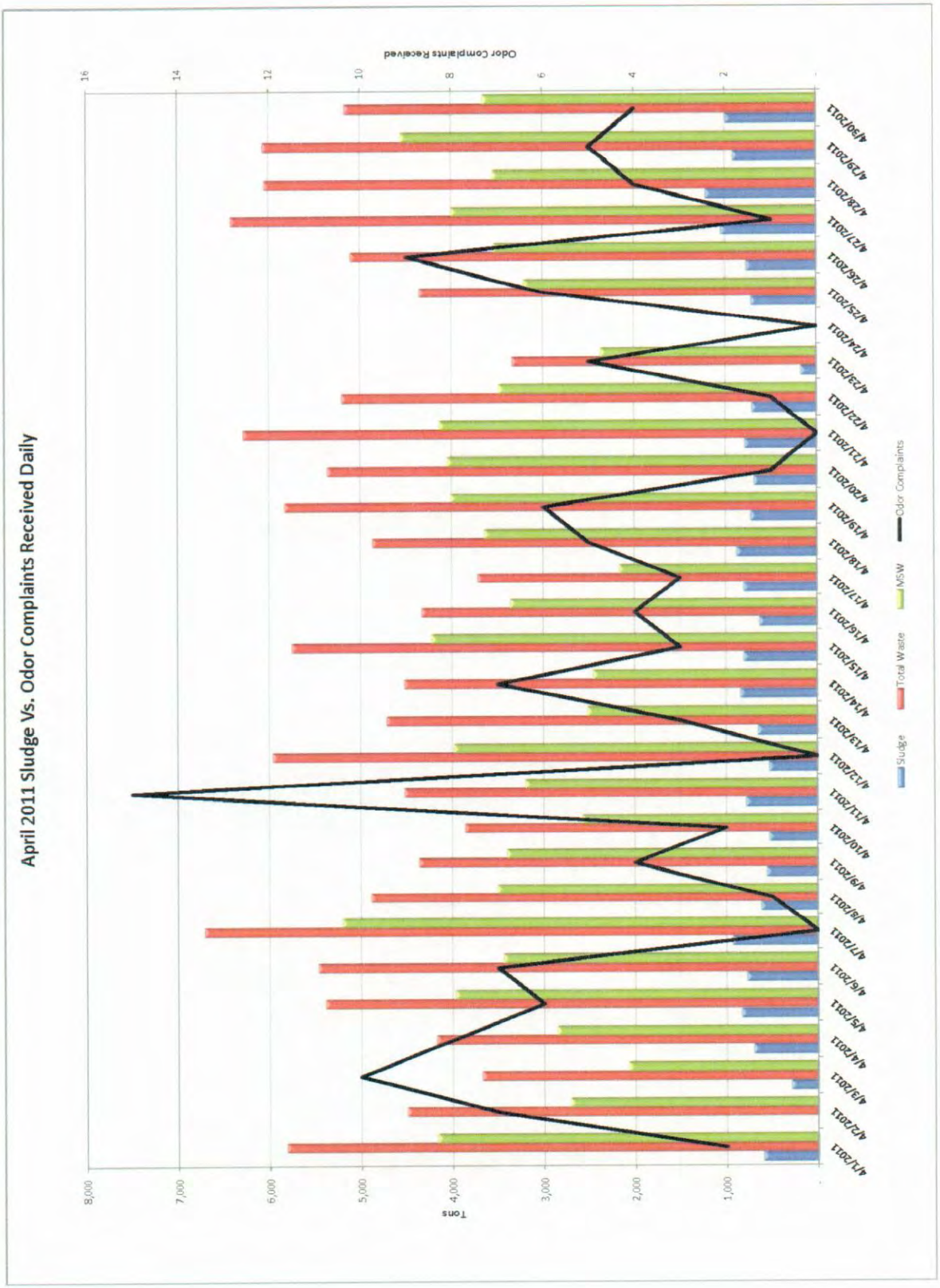

November 2010 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
7
6
5
4
3
2
1
11/1/2010
11/2/2010
11/3/2010
11/4/2010
11/5/2010
11/6/2010
11/7/2010
11/8/2010
11/9/2010
11/10/2010
11/11/2010
11/12/2010
11/13/2010
11/14/2010
11/15/2010
11/16/2010
11/17/2010
11/18/2010
11/19/2010
11/20/2010
11/21/2010
11/22/2010
11/23/2010
11/24/2010
11/25/2010
11/26/2010
11/27/2010
11/28/2010
11/29/2010
11/30/2010
Sludge
Total Waste
MSW
Odor Complaints

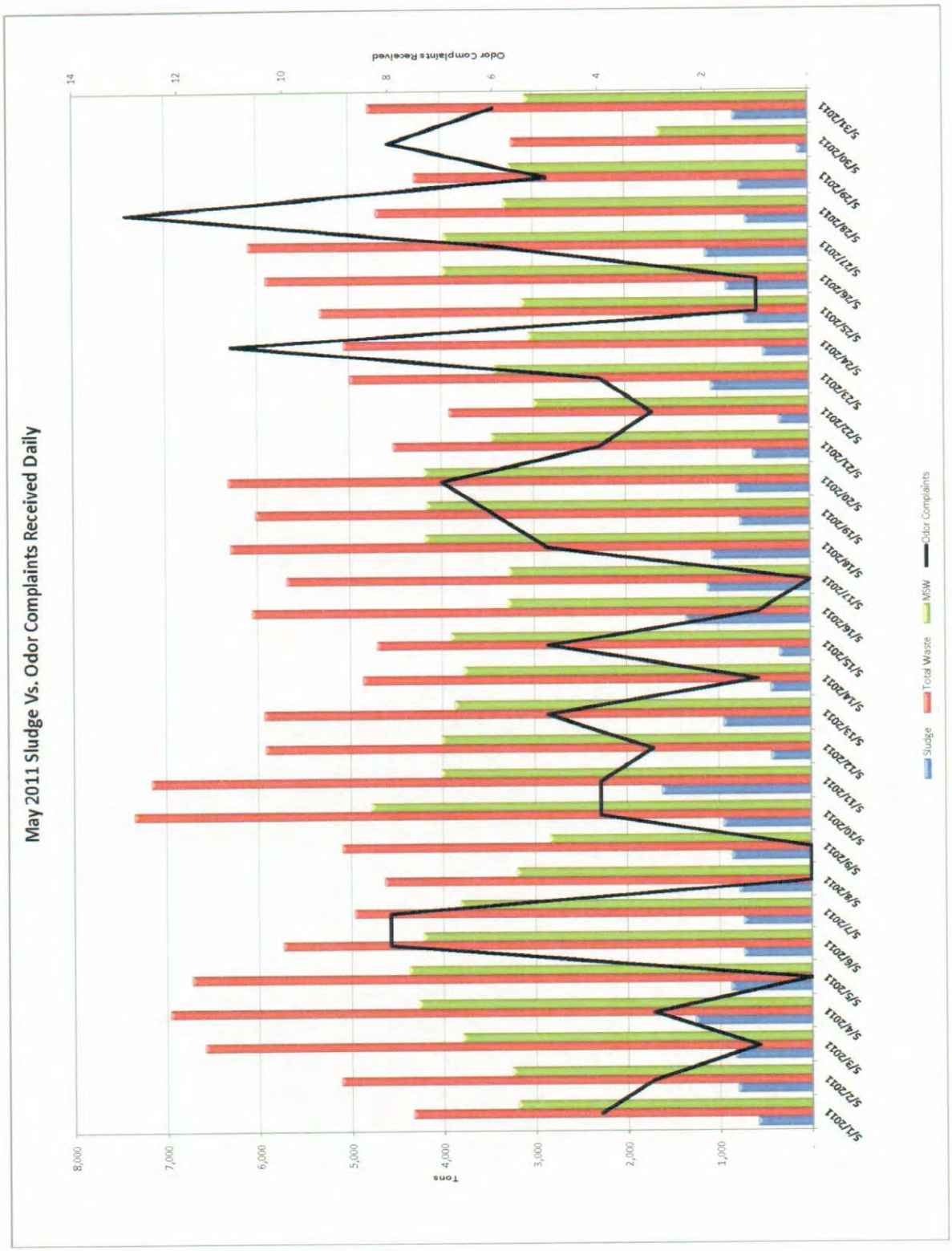

December 2010 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints

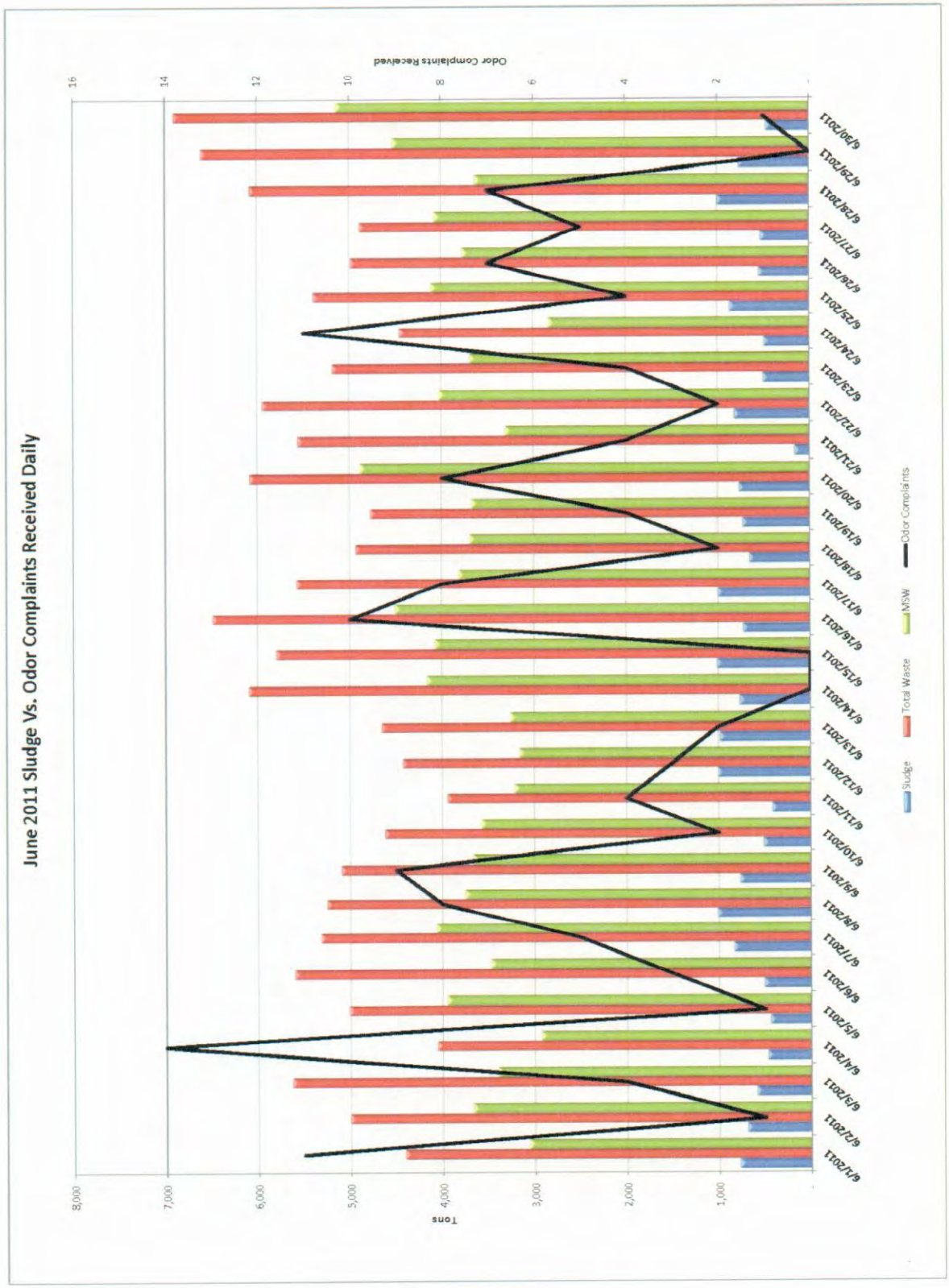

January 2011 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints


February 2011 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
6,000
5,000
4,000
3,000
2,000
1,000
8
7
6
5
4
3
2
1
2/1/2011
2/2/2011
2/3/2011
2/4/2011
2/5/2011
2/6/2011
2/7/2011
2/8/2011
2/9/2011
2/10/2011
2/11/2011
2/12/2011
2/13/2011
2/14/2011
2/15/2011
2/16/2011
2/17/2011
2/18/2011
2/19/2011
2/20/2011
2/21/2011
2/22/2011
2/23/2011
2/24/2011
2/25/2011
2/26/2011
2/27/2011
2/28/2011
Sludge
Total Waste
MSW
Odor Complaints


March 2011 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints


April 2011 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints


May 2011 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints


June 2011 Sludge Vs. Odor Complaints Received Daily
Odor Complaints Received
Tons
16
14
12
10
8
6
4
2
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
Sludge
Total Waste
MSW
Odor Complaints
6/1/2011
6/2/2011
6/3/2011
6/4/2011
6/5/2011
6/6/2011
6/7/2011
6/8/2011
6/9/2011
6/10/2011
6/11/2011
6/12/2011
6/13/2011
6/14/2011
6/15/2011
6/16/2011
6/17/2011
6/18/2011
6/19/2011
6/20/2011
6/21/2011
6/22/2011
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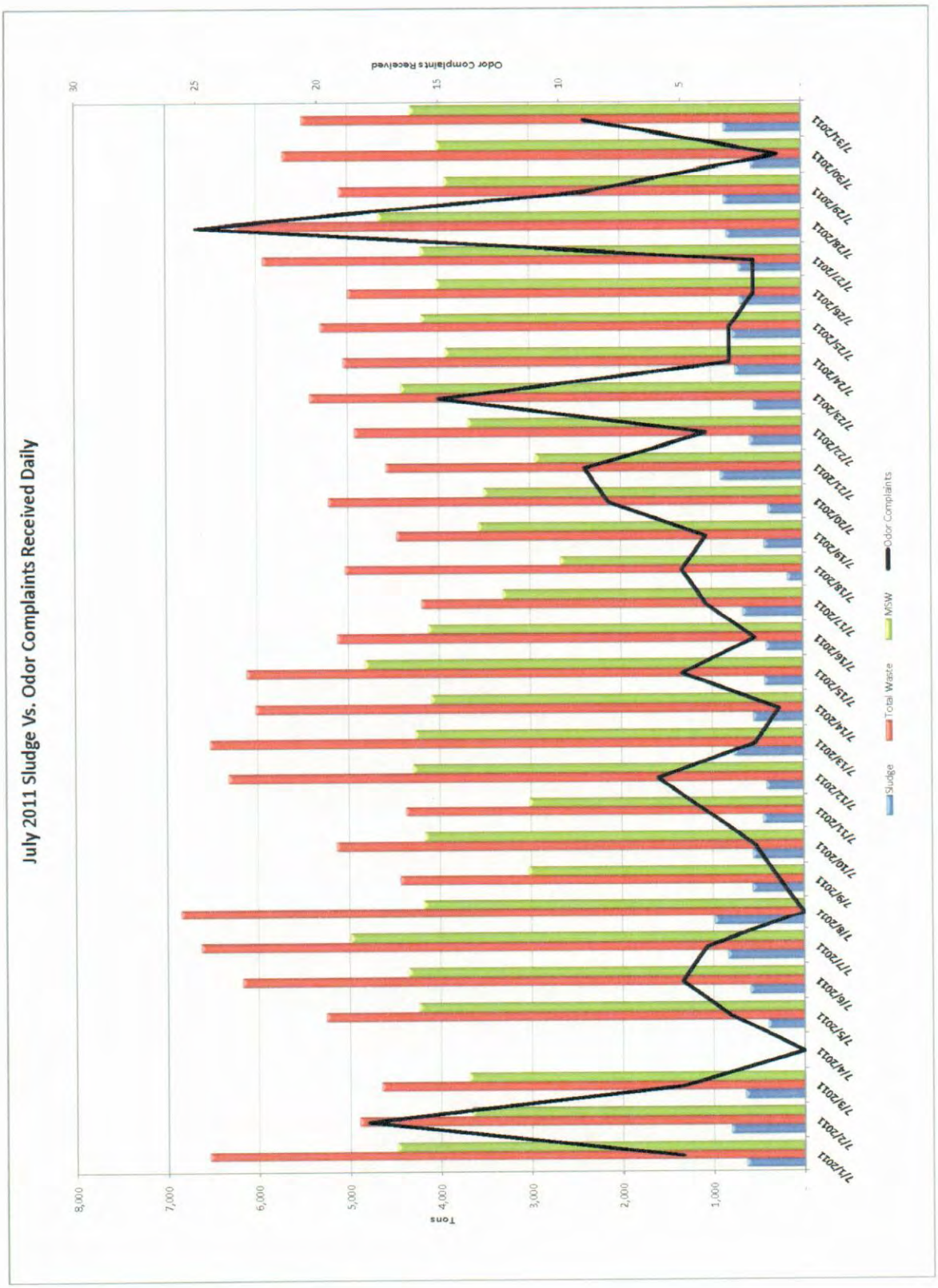
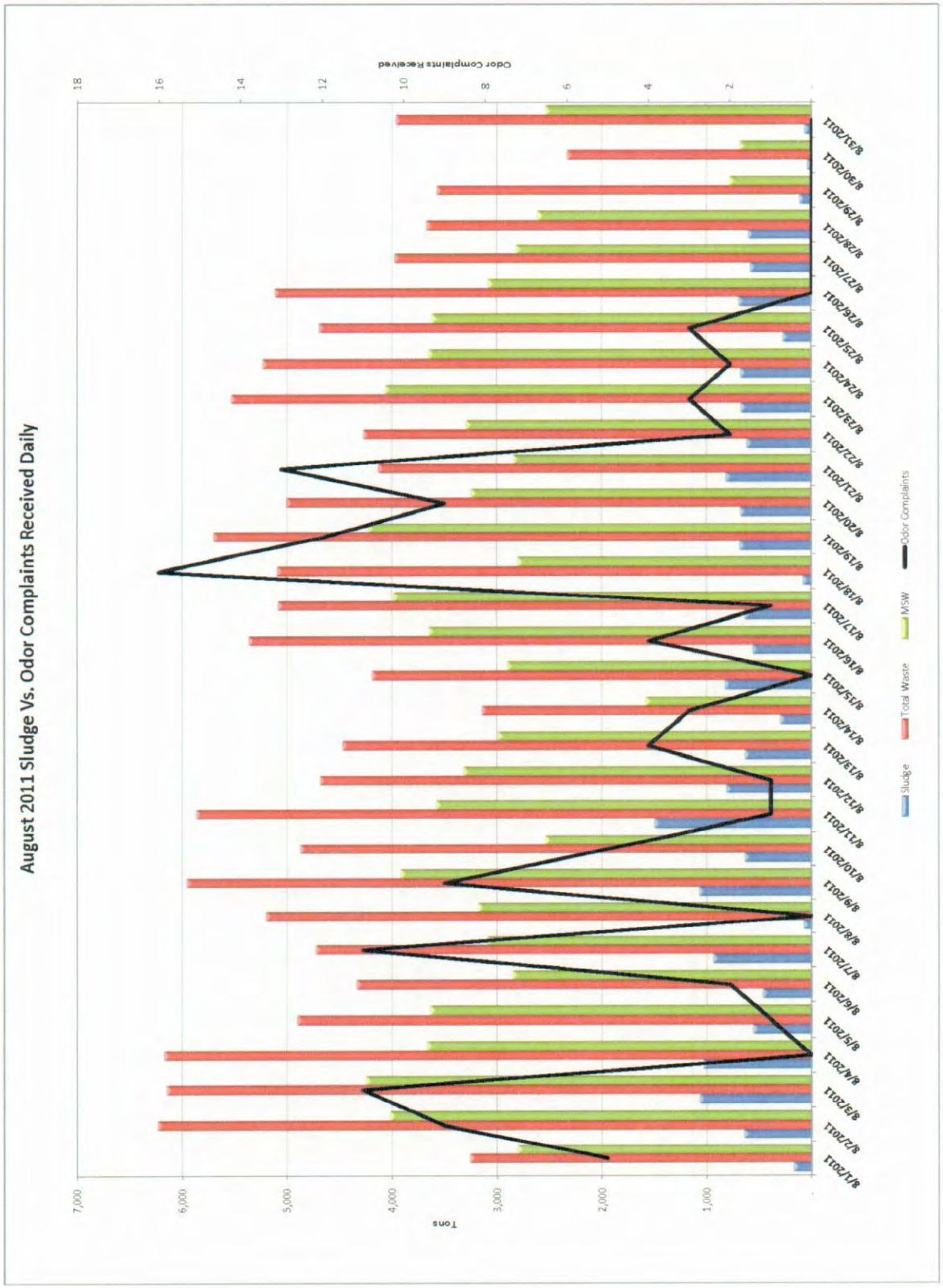
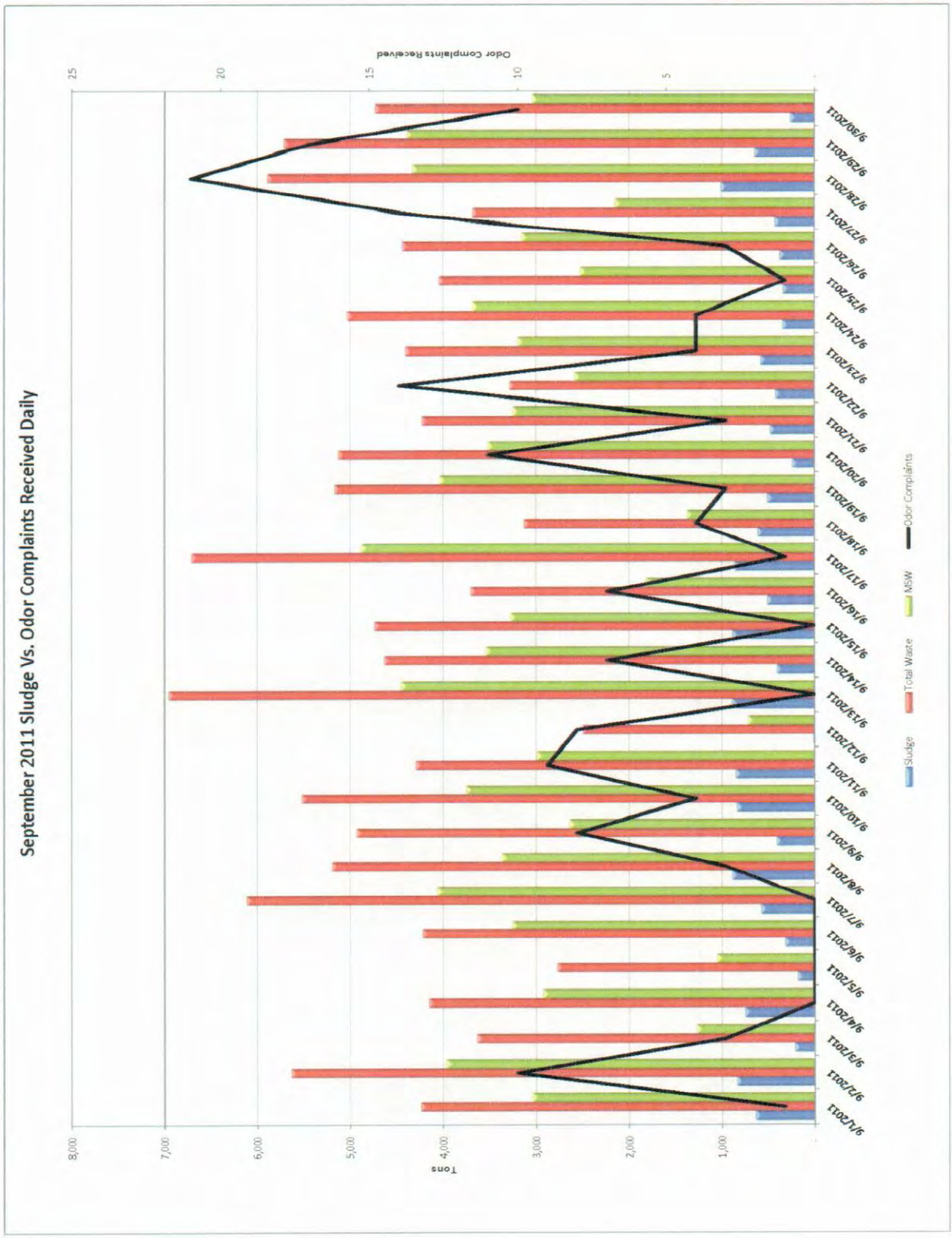
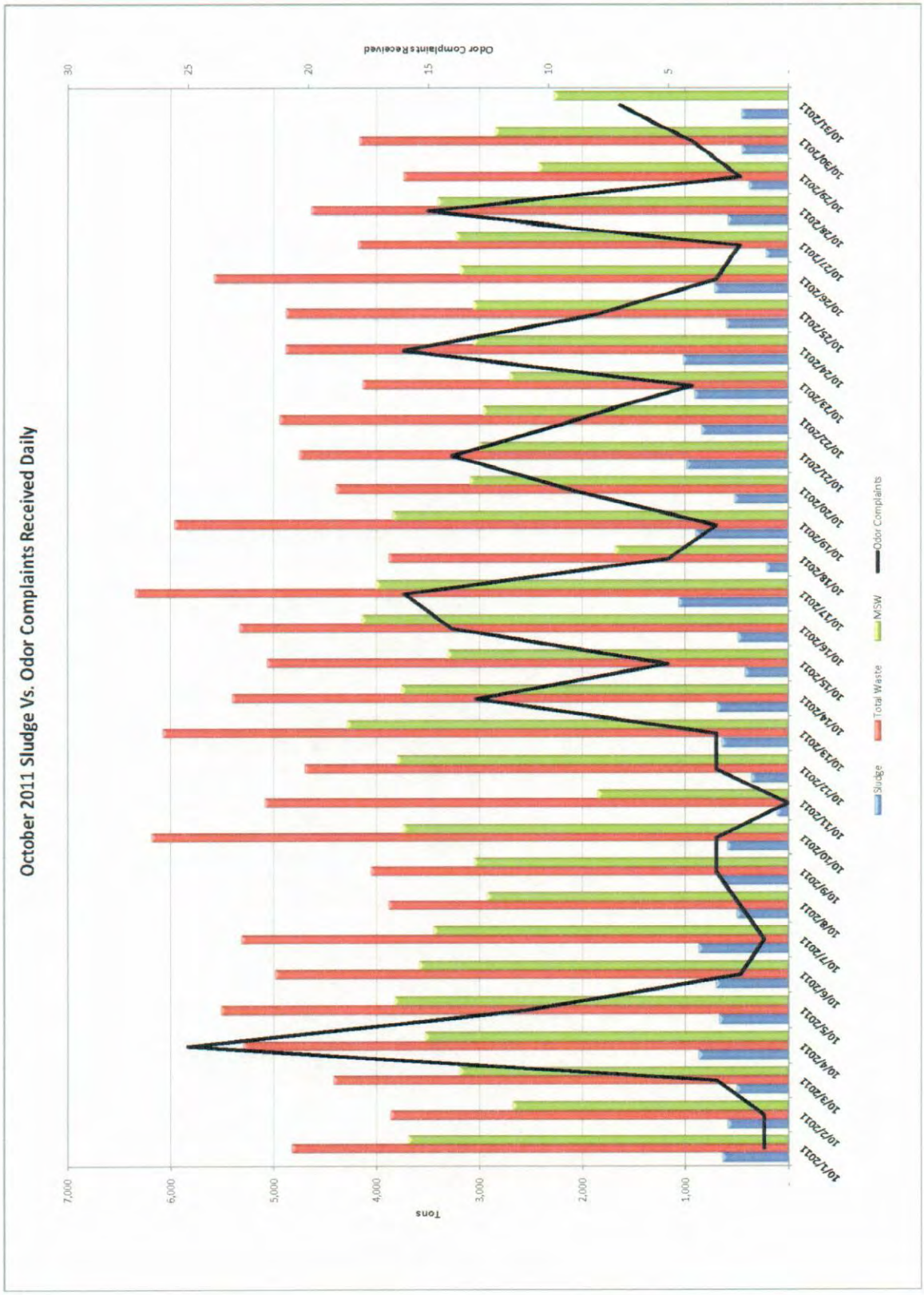
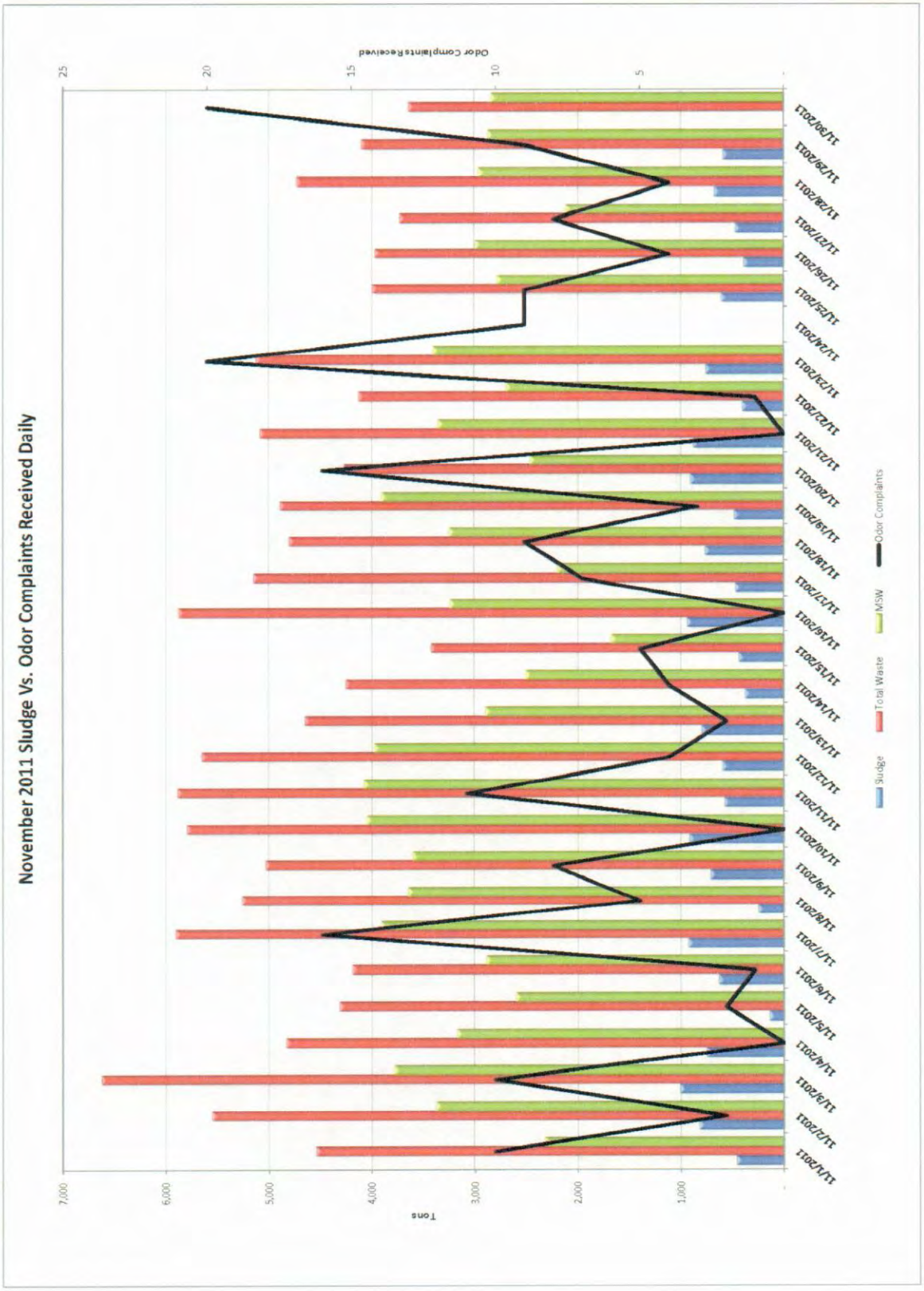
6/26/2011
6/27/2011
6/28/2011
6/29/2011
6/30/2011

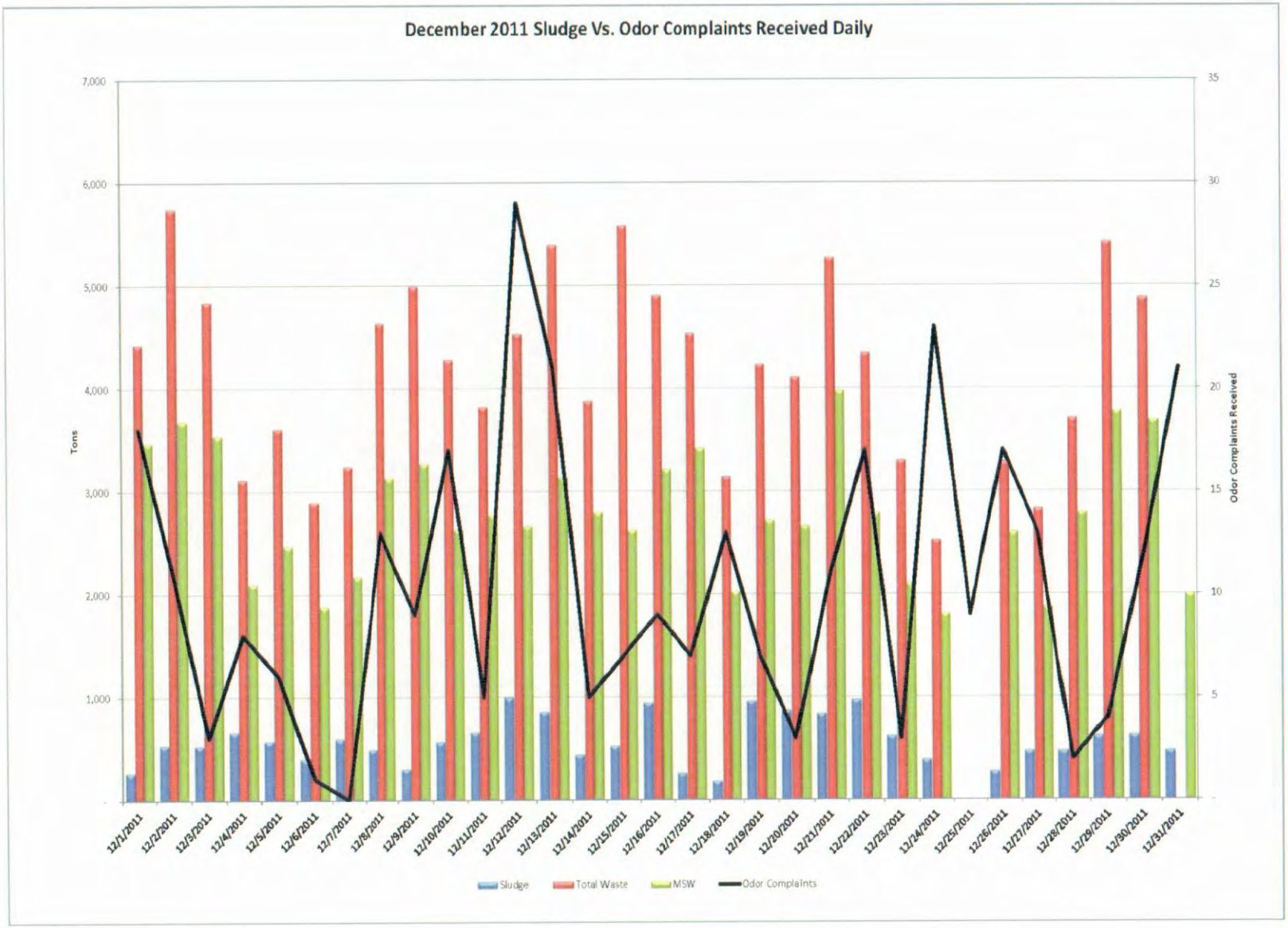

July 2011 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
Sludge
Total Waste
MSW
Odor Complaints


August 2011 Sludge Vs. Odor Complaints Received Daily
Odor Complaints Received
Tons
Sludge
Total Waste
MSW
Odor Complaints

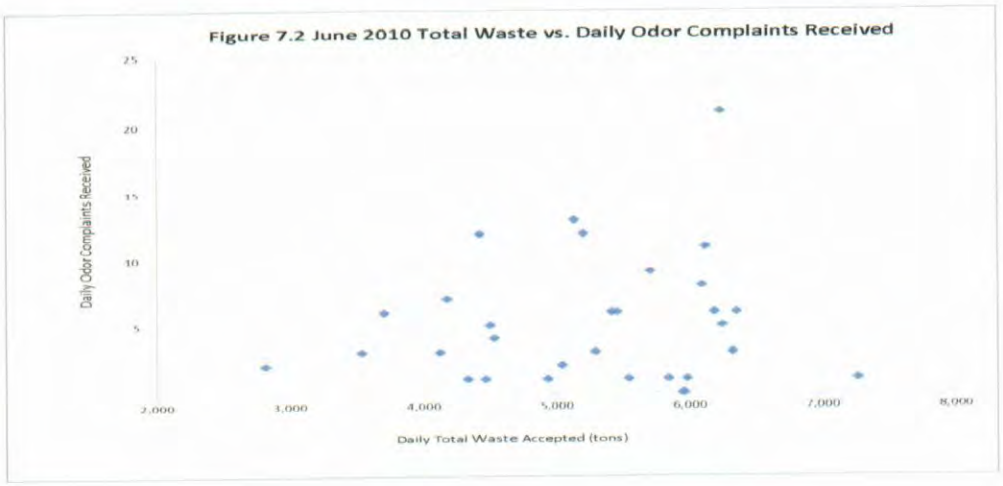

September 2011 Sludge Vs. Odor Complaints Received Daily
Odor Complaints Received
Tons
Sludge
Total Waste
MSW
Odor Complaints

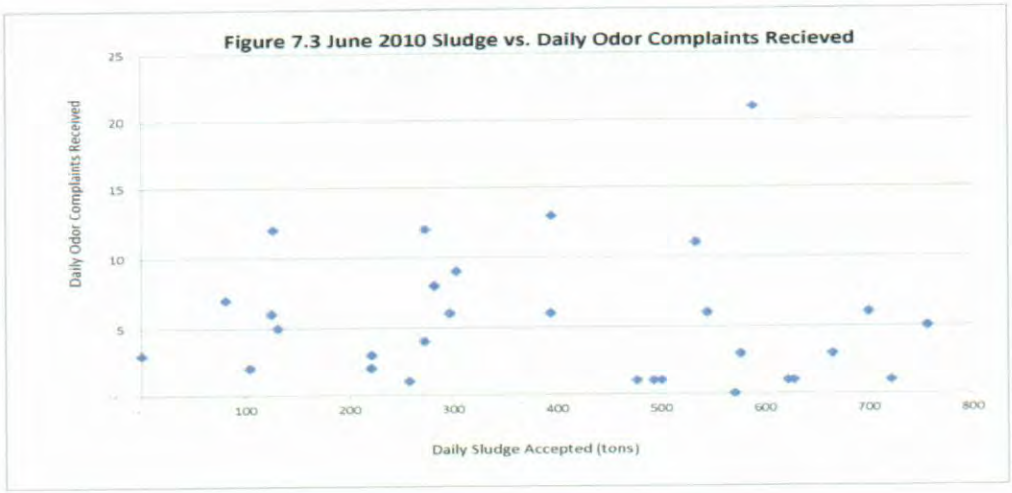

October 2011 Sludge Vs. Odor Complaints Received Daily
Odor Complaints Received
Tons
Sludge
Total Waste
MSW
Odor Complaints


November 2011 Sludge Vs. Odor Complaints Received Daily
Odor Complaints Received
Tons
Sludge
Total Waste
MSW
Odor Complaints


December 2011 Sludge Vs. Odor Complaints Received Daily
Tons
Odor Complaints Received
7,000
6,000
5,000
4,000
3,000
2,000
1,000
35
30
25
20
15
10
5
12/1/2011
12/2/2011
12/3/2011
12/4/2011
12/5/2011
12/6/2011
12/7/2011
12/8/2011
12/9/2011
12/10/2011
12/11/2011
12/12/2011
12/13/2011
12/14/2011
12/15/2011
12/16/2011
12/17/2011
12/18/2011
12/19/2011
12/20/2011
12/21/2011
12/22/2011
12/23/2011
12/24/2011
12/25/2011
12/26/2011
12/27/2011
12/28/2011
12/29/2011
12/30/2011
12/31/2011
Sludge
Total Waste
MSW
Odor Complaints

Figures 7.2 and 7.3 show complaints received in June 2010 plotted with quantity of total waste and sludge. No distinct linear correlation exists.





Attempts at similar graphs were made for 2011, but the correlations were even more tenuous. The daily logs (Forms 2 and 3, which are available for inspection at the facility) have been examined but do not offer any insight on the relationship between daily operations and OCR.

7.2 COMPARISON OF HIGH OCR AND LOW OCR DAYS

In an attempt to better understand how landfill operations were affecting OCR, a subset of days has been selected for more detailed examination. This subset was selected from 2010 and the 1st and 2nd Quarter of 2011. Data from the 3rd and 4th Quarter of 2011 was not selected as fugitive landfill gas had undisputedly become the predominant odor, thereby masking odors that are affected by landfill operations.

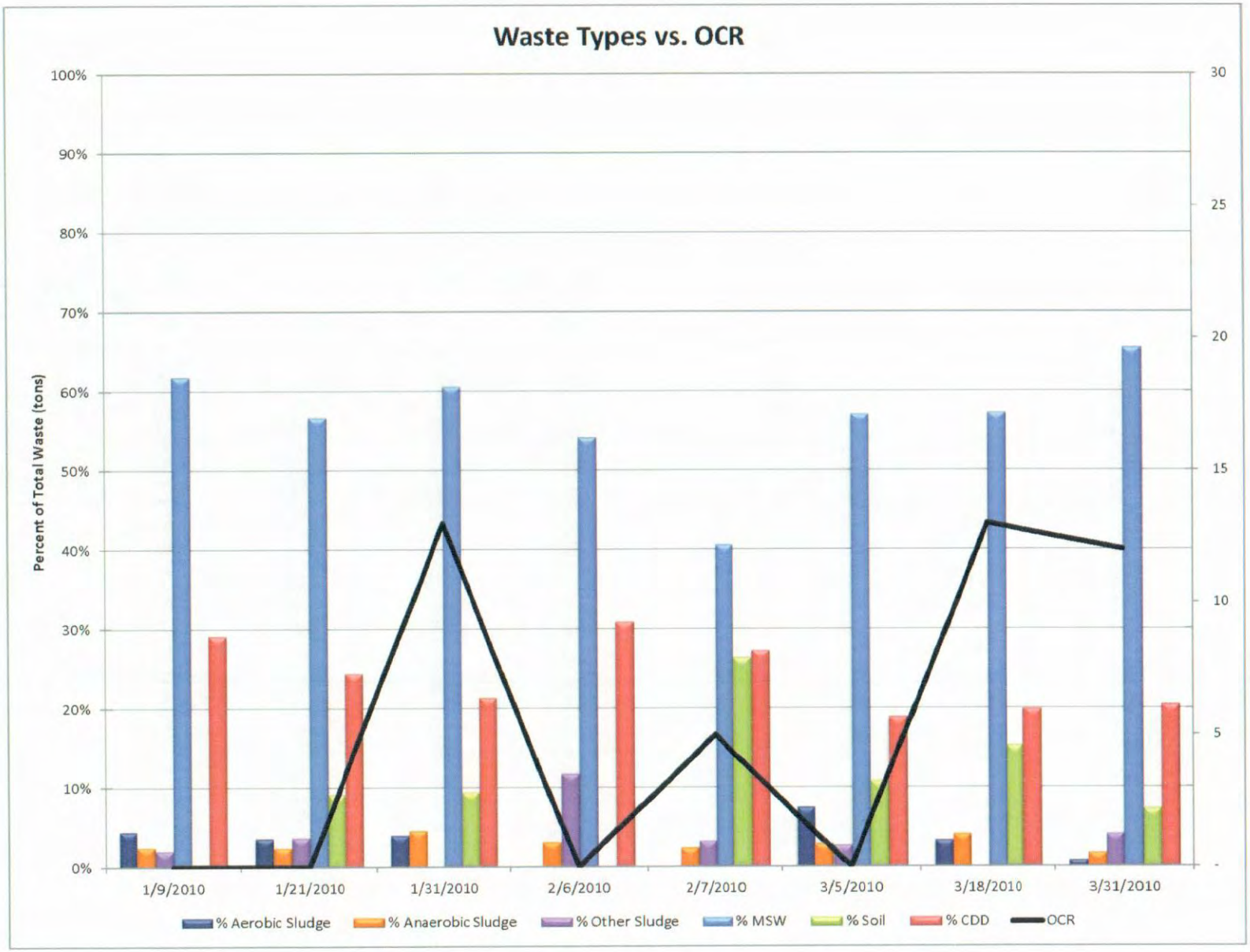
The subset of days selected is presented in Appendix E. These days were picked to represent about 10% of all days (an average of three days per month). In order to develop a strong contrast, about half of the selected days had a very high number of OCR and about half had a very low OCR (typically none).

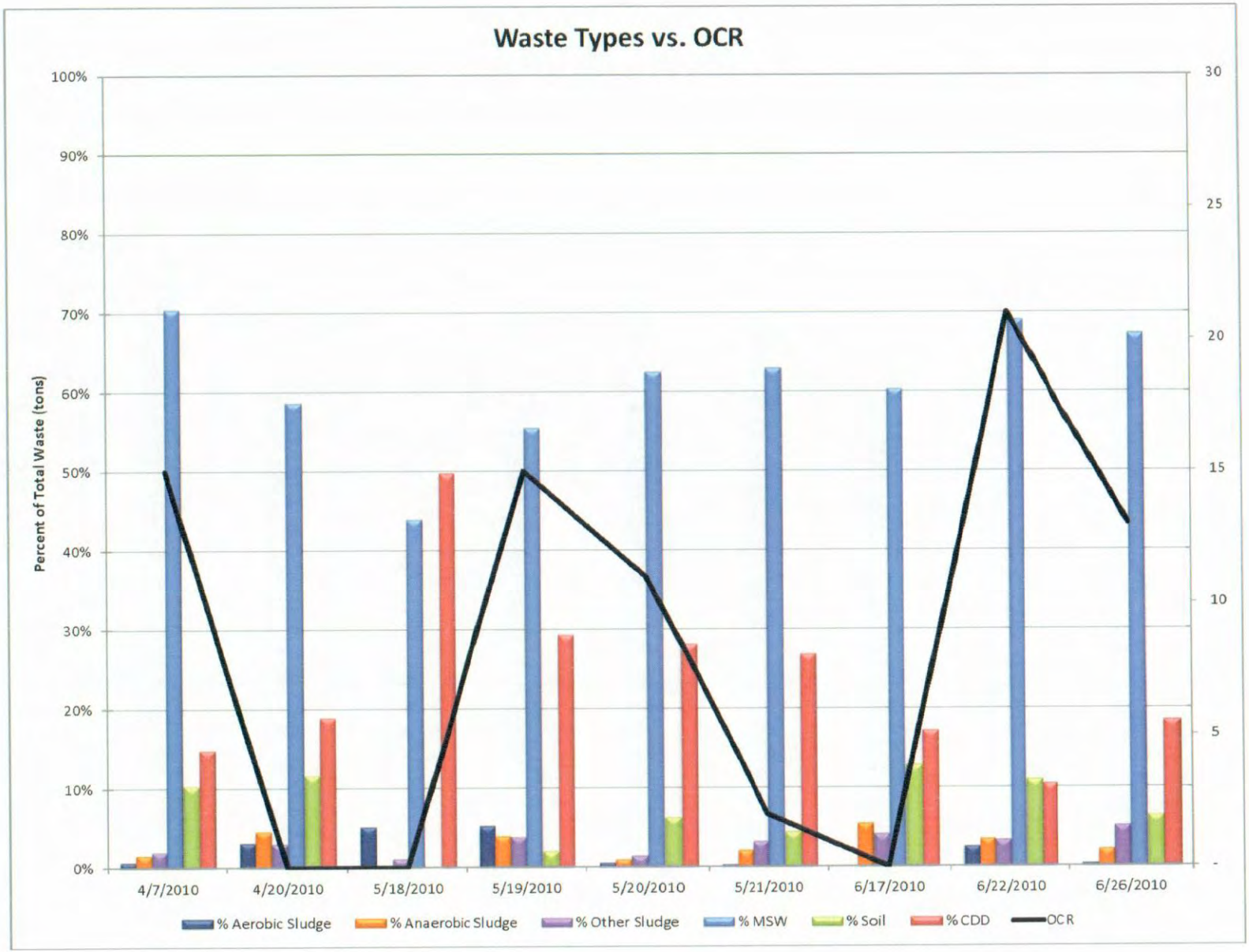
For each of the selected days, the following items were determined and are presented in Appendix F:

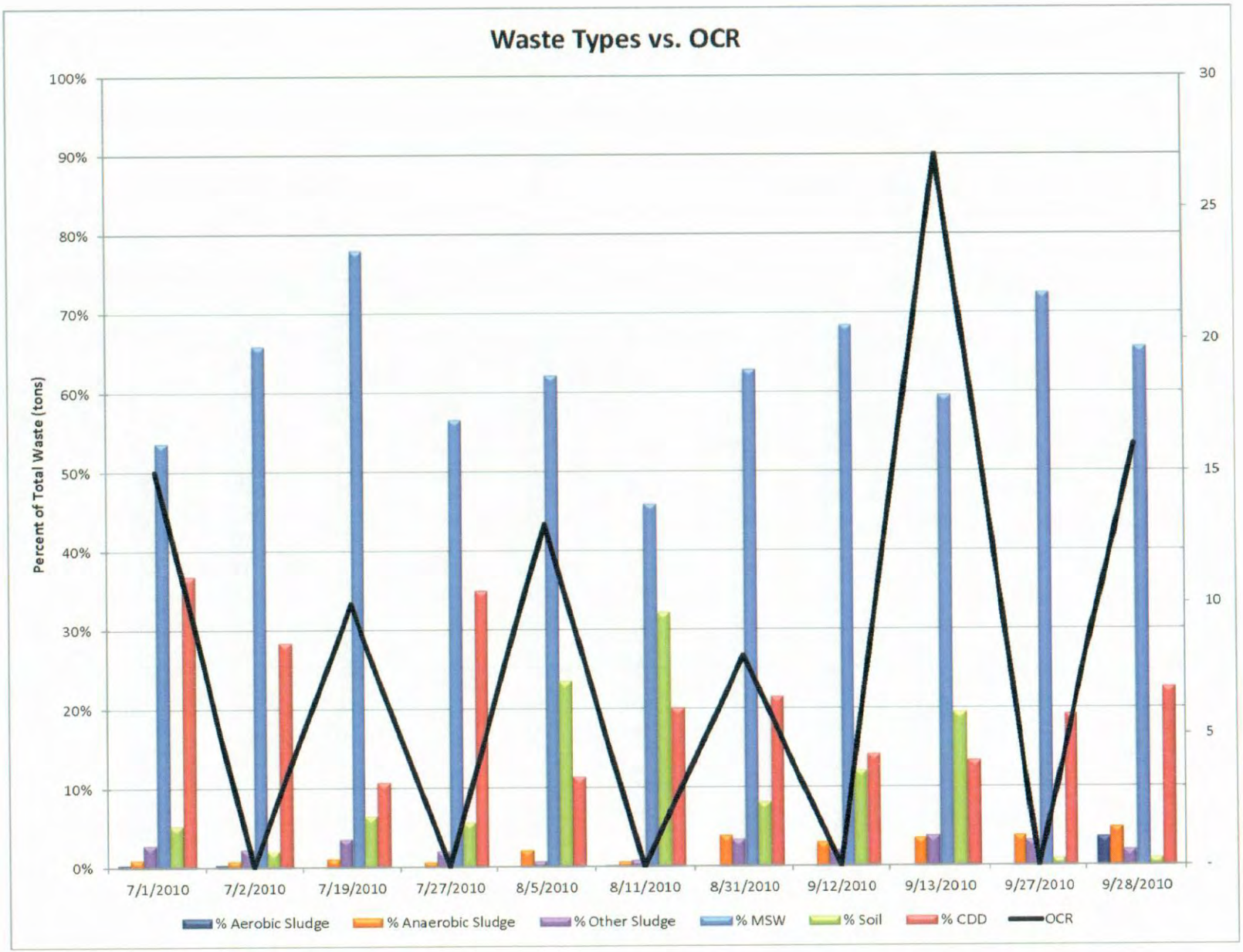
Daily Data Examined

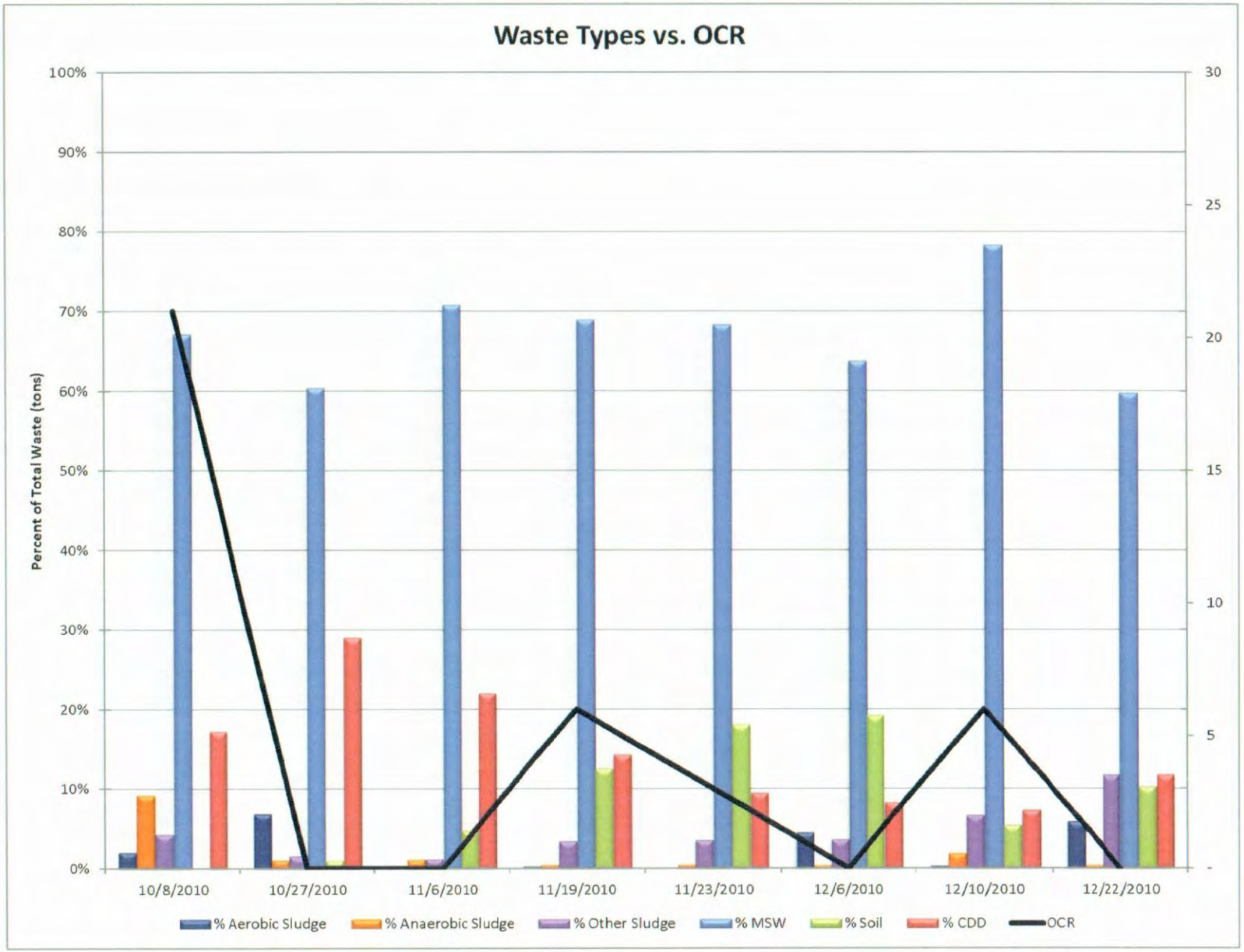
- Number of odor complains received (OCR)
- Location of odor complaints
- Predominant wind direction (also indicated in Appendix E)
- Daily waste received
    - Total waste
    - Sludge
        - Aerobic
        - Anaerobic
        - Other
    - MSW
        - Long-Haul (trucked waste from outside solid waste district)
        - Other
    - Soil
    - CDD
- Notations regarding flare operations
- Daily Odor Monitoring Data Sheet (no sheet available for weekend days)
- Daily Odor Control System Operation Log (no sheet available for weekend days)

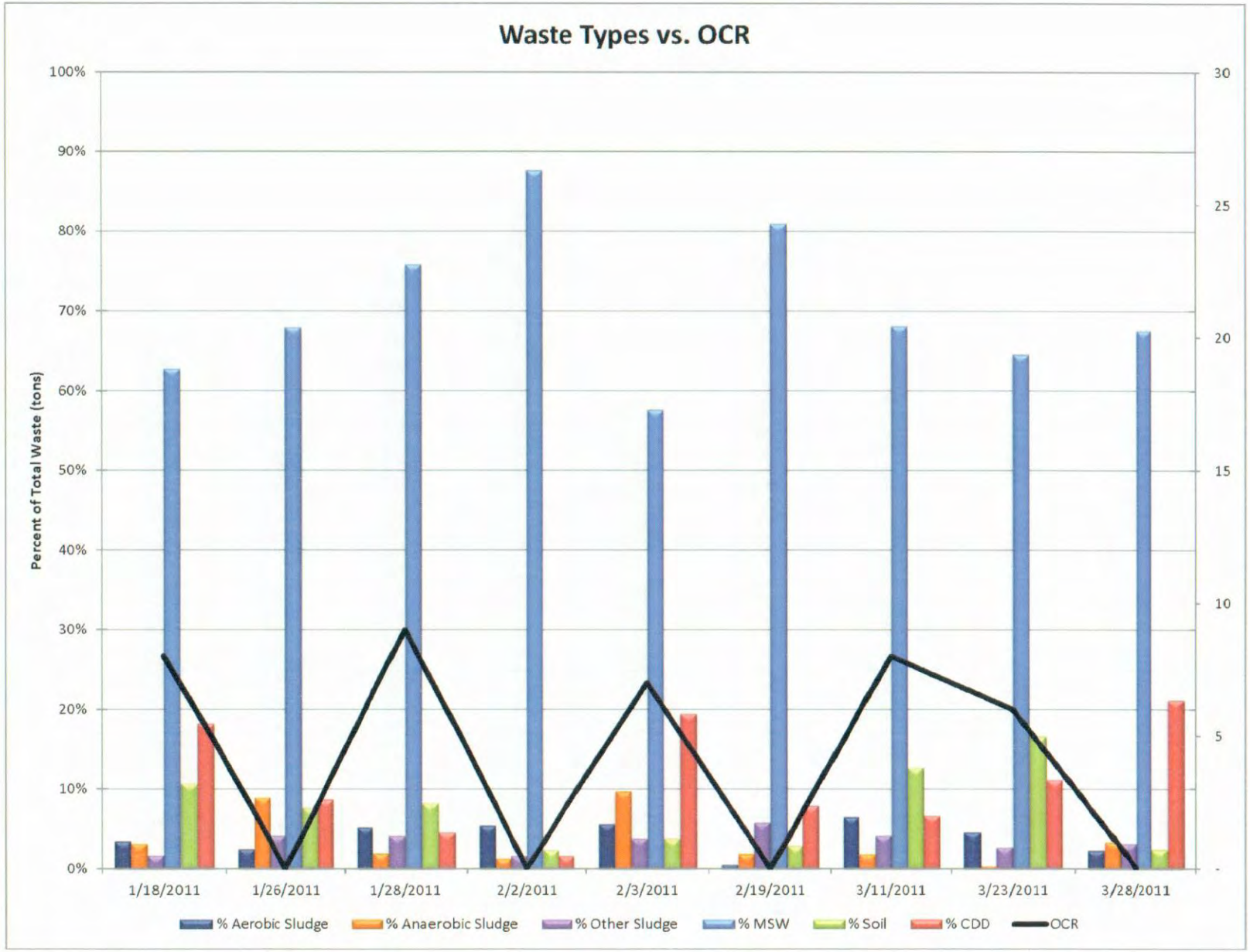
For the sample set of days, graphs have been prepared to show the OCR relative to the main categories of particular waste received on each day. These graphs are presented below and all graphs are also presented in Appendix G. Note that supporting information for these graphs can be found in the detailed daily reports contained in Appendix F.

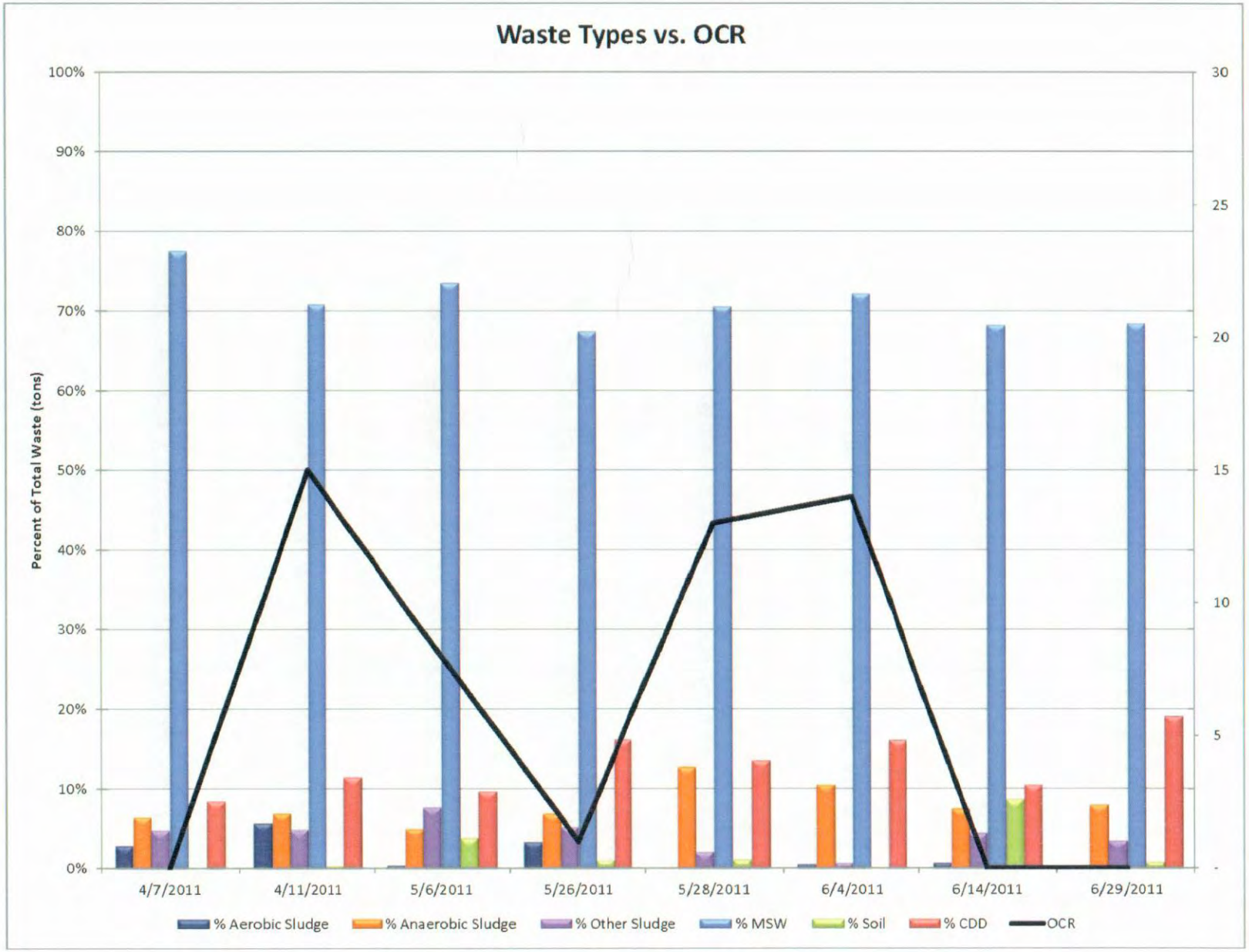

Waste Types vs. OCR
Percent of Total Waste (tons)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
30
25
20
15
10
5
-
1/9/2010
1/21/2010
1/31/2010
2/6/2010
2/7/2010
3/5/2010
3/18/2010
3/31/2010
% Aerobic Sludge
% Anaerobic Sludge
% Other Sludge
% MSW
% Soil
% CDD
OCR


Waste Types vs. OCR
Percent of Total Waste (tons)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
30
25
20
15
10
5
-
4/7/2010
4/20/2010
5/18/2010
5/19/2010
5/20/2010
5/21/2010
6/17/2010
6/22/2010
6/26/2010
% Aerobic Sludge
% Anaerobic Sludge
% Other Sludge
% MSW
% Soil
% CDD
OCR


Waste Types vs. OCR
Percent of Total Waste (tons)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
30
25
20
15
10
5
-
7/1/2010
7/2/2010
7/19/2010
7/27/2010
8/5/2010
8/11/2010
8/31/2010
9/12/2010
9/13/2010
9/27/2010
9/28/2010
% Aerobic Sludge
% Anaerobic Sludge
% Other Sludge
% MSW
% Soil
% CDD
OCR

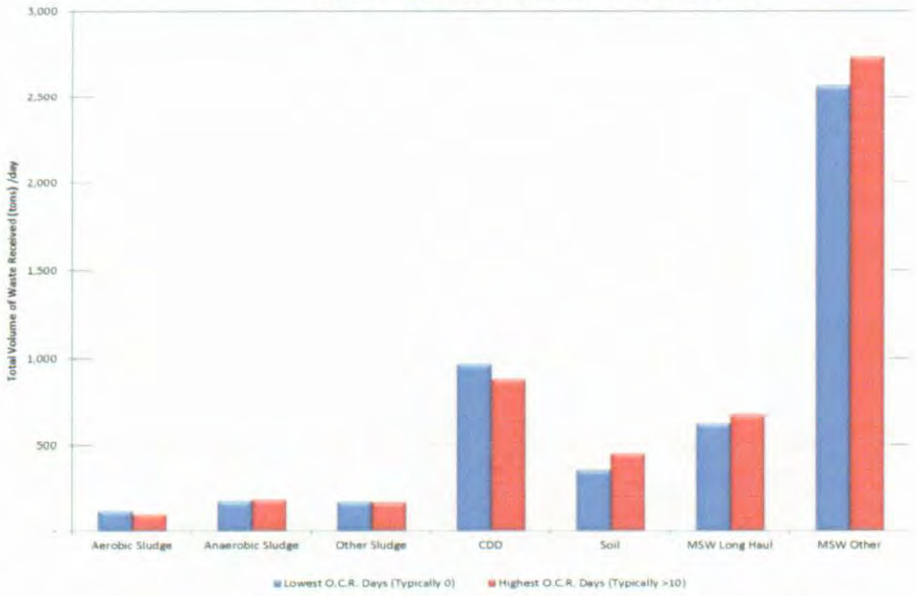

Waste Types vs. OCR
Percent of Total Waste (tons)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
30
25
20
15
10
5
-
10/8/2010
10/27/2010
11/6/2010
11/19/2010
11/23/2010
12/6/2010
12/10/2010
12/22/2010
% Aerobic Sludge
% Anaerobic Sludge
% Other Sludge
% MSW
% Soil
% CDD
OCR


Waste Types vs. OCR
Percent of Total Waste (tons)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
30
25
20
15
10
5
-
1/18/2011
1/26/2011
1/28/2011
2/2/2011
2/3/2011
2/19/2011
3/11/2011
3/23/2011
3/28/2011
% Aerobic Sludge
% Anaerobic Sludge
% Other Sludge
% MSW
% Soil
% CDD
OCR


Waste Types vs. OCR
Percent of Total Waste (tons)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
30
25
20
15
10
5
-
4/7/2011
4/11/2011
5/6/2011
5/26/2011
5/28/2011
6/4/2011
6/14/2011
6/29/2011
% Aerobic Sludge
% Anaerobic Sludge
% Other Sludge
% MSW
% Soil
% CDD
OCR

A graph showing the daily volume of different types of waste received for lowest OCR days and highest OCR days is provided below. If, for example, anaerobic sludge was a major cause of OCR, one would expect very little anaerobic sludge received on low OCR days. However, for anaerobic sludge, and for all waste components, there is no significant volume difference on high OCR days vs. low OCR days. This further suggests that the type of waste accepted does not significantly affect OCR.

Figure 7.4 OCR vs. Waste Received (tons/day)



Note: Data taken for 53 days selected from 2010 and January - June 2011. Two to four days were selected from each month to represent days with highest O.C.R. and days with lowest O.C.R.

Examination of this data, as well as the information in Appendices F and G, leads to the following conclusions:

1. There is no strong correlation between the amount of waste received, sludge received, the type of sludge, or the amount of long-haul waste received with OCR.
2. There is no discernible correlation, on a daily level, that shows that a temporary interruption in flare operation results in OCR.
3. Site operations personnel typically make adjustments to the odor control system when OCR are reported.

8.0 RESULTS OF 2010-2011 INVESTIGATIONS AND ANALYSES

The following observations and conclusions regarding the Order No. 6 examination of data from 2010-2011 are drawn from the previous sections of this report.

Effect of Fugitive Gas Emissions

- The large number of complaints from late 2011 are likely attributed to the acceleration in landfill gas production and the intrusive work associated with GCCS expansion activities.
- In early 2012, it appears recent additions to the GCCS have started to reduce complaints related to fugitive gas emissions; this has occurred despite the fact that odor-generating intrusive activities continued as the GCCS was expanded through mid-March 2012.

Off-Site Odor Investigations by Apex "OCR Team"

- The number of OCR decreased through early 2012, likely as a result of improved gas collection and suspension of three particularly odorous sludge waste streams.
- The percentage of complaints that could be "verified" (confirmed by a rapidly-deployed OCR team technician to be a detectable odor) dropped in early 2012, suggesting that odors present in the community during early 2012 are more quickly dispersing and are more ephemeral in nature.
- Many other odor sources are present in the community as confirmed by the Apex OCR team.

On-Site Odor Investigations by Third Party

- Odor intensity and odor concentration both drop steadily during the daytime hours and do not appear to be directly correlated to the volume of waste placed during certain hours.
- The leachate tank and the rail unloading area do not appear to be odor sources that cause complaints. These results demonstrate that leachate storage, long-haul rail waste, rail transit, and rail storage times are not the cause of any odor complaints.
- Some sludge is much more odorous than other sludge, and this can be quantified with sampling and lab testing.

Correlations Between Historical OCR and Operations

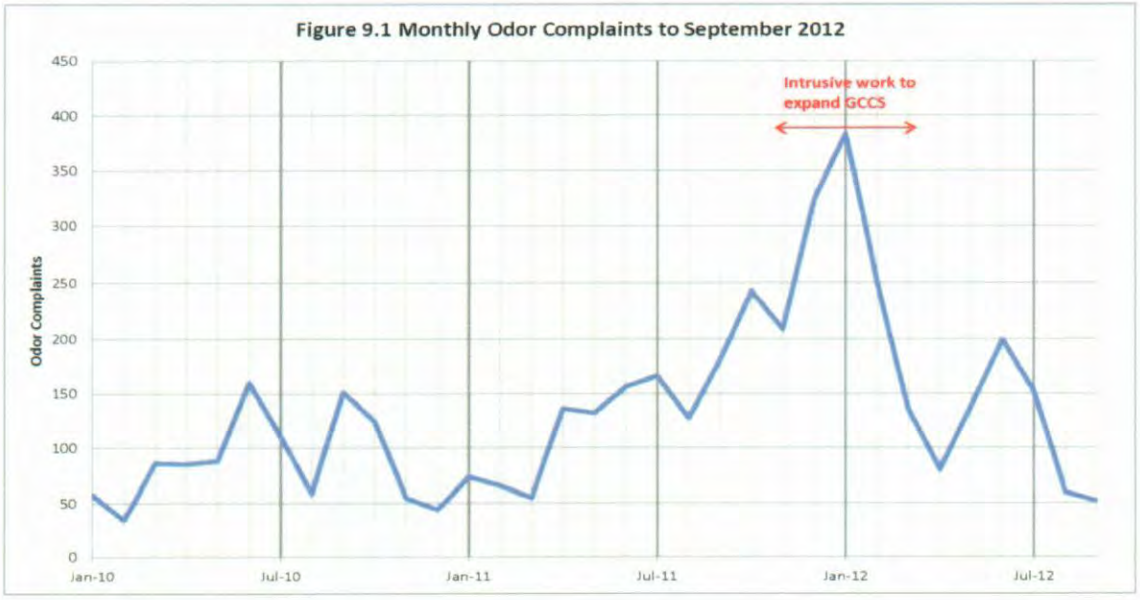
- Other than sludge waste, no meaningful correlation was found between particular waste stream volume and number of odor complaints. There is no indication that a reduction in Authorized Maximum Daily Waste Receipt would result in a reduction of odor complaints.
- For sludge, a moderate correlation suggests that higher volume of sludge disposal results in more OCR.
- The presence of other odors in the community, from sources not related to landfill waste acceptance operations, are an impediment to drawing correlations between volumes of particular waste streams and OCR.
- There is no direct correlation between the use of neutralizer and OCR. The heaviest use of odor neutralizer appears to occur during times with the highest number of complaints, which suggests that neutralizer use is increased as a response to an increase in odor complaints.
- Complaints subside between 9 AM and 4 PM.
- Generally, the number of OCR is higher in warmer months.
- A vast majority of OCR come from the northeast direction.
- Examination of OCR alone is not helpful in evaluating facility operations or modifications to facility operations.

9.0 RECENT (2012) EXPERIENCE WITH OCR

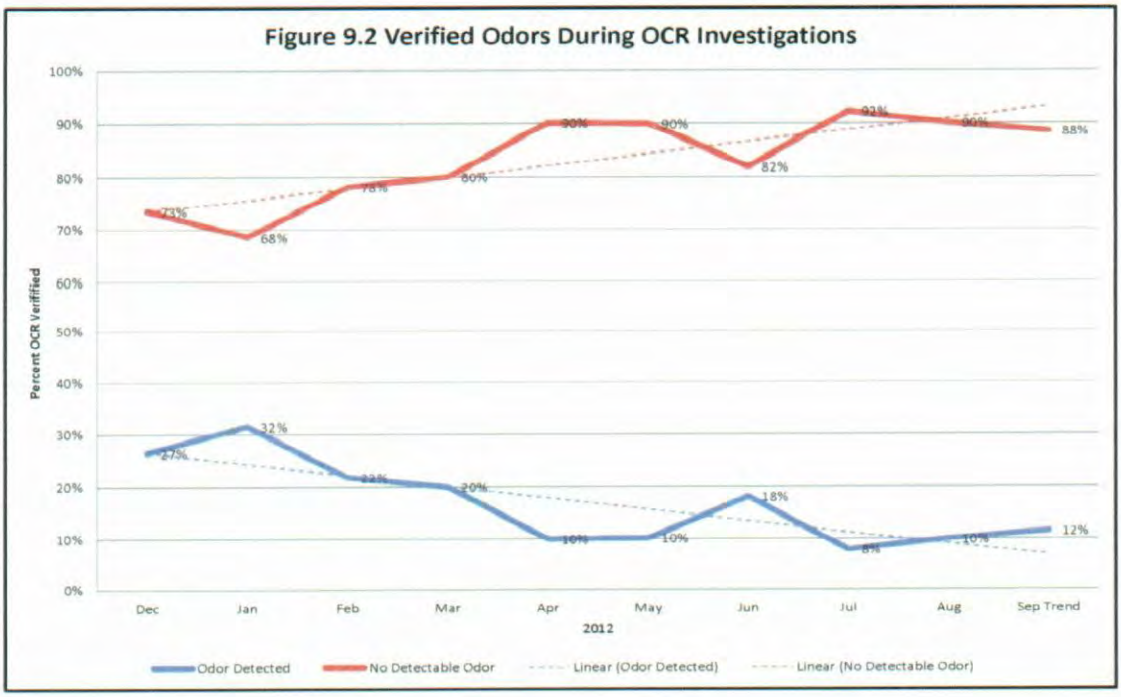
As previously discussed, improvements to the GCCS were made in late 2011 and throughout 2012. In addition, as part of a continuous improvement effort, Apex has made several other operational changes and odor control measures throughout 2012.

While the previous eight sections of this report have provided a detailed examination of the 2010 and 2011 odor complaints and analyses of causation, this section will look at OCR data for 2012 to see how well the GCCS and operational changes are reducing OCR.

Figure 9.1 shows the total number of monthly OCR from January 2010 to September 2012. The rapid rise in OCR in late 2011 has been attributed to fugitive gas emissions which were enhanced by intrusive GCCS construction work and then subsequently improved when the changes to the GCCS were implemented.



Further evidence of the diminishing intensity and duration of actual odors is illustrated on Figure 9.2. At the beginning of 2012, approximately 30% of all investigated OCR were "verified" (confirmed by the investigator as present at the OCR location). April through September 2012, this fraction is closer to 10%. This means that the majority of odors causing the OCR are either not landfill-related and/or are extremely light and/or ephemeral in nature, and are not able to be detected even by a rapid OCR Team member investigation.



Also, in August 2012, the Ohio EPA conducted a period of 54 hours of continuous perimeter odor monitoring around the Apex facility and did not detect any odors that rose to the level of a violation. This was recognized in a notice of compliance issued by the Ohio EPA to Apex Environmental. Additionally, Apex has been inspected by the Ohio EPA 15 times and the Jefferson County Health Department 10 times since March 2012 and has not had any notices of violation(s). This also has resulted in an additional notice of compliance from the Ohio EPA.

Apex believes that the improvement attained in 2012 is the result of the rapid improvements made to the GCCS and due to the progressive implementation of operational modifications that are specifically aimed at reducing OCR. Section 10.0 of this report describes the current efforts and proposes new operational modifications.

10.0 PROPOSED OPERATIONAL MODIFICATIONS

As discussed in Section 8, it does not appear to be possible to attribute OCR to certain, identifiable issues or situations that can be controlled through specific operational modifications. Rather, OCR seem to result from a confluence of events that include meteorological conditions and site conditions. Apex has always operated within permit requirements and applied best management practices to its operation. We believe that continuation of that philosophy, together with some deliberate and comprehensive operational modifications, will continue to reduce OCR. Therefore, we suggest that the following operational steps be implemented or continued when and if appropriate in an attempt to reduce OCR at the Apex Landfill. These steps may include:

1. Continue the planning and installation of GCCS components which may include:
    - Bi-annual submission of the updated GCCS plans,
    - Vertical gas extraction wells,
    - Horizontal gas collectors,
    - Gas collectors in the leachate collection system,
    - Installation of gas collectors within the leachate collection system for the sole purpose of collecting gas and minimizing gas escape at the edges of the landfill,
    - Improved inter-cell berm design to contain gas at edges, and
    - Capability for dual gas/leachate removal at select gas extraction wells.
2. Continue routine surface scanning and reactive measures to reduce detected emission (e.g. placing soil over exposed leachate collection layer edges.).
3. Minimize the size of the work face to the greatest practical extent so that cover can be applied shortly after it is determined that a disposal area will receive no more fill on that day.
4. When necessary, screen soil material to be applied as a portion of the transitional cover to maximize compaction and minimize potential gas paths.
5. Do not allow untarping of odorous waste containers in the rail yard.
6. Perform daily odor monitoring around the leachate storage tank and be prepared to employ odor neutralizing equipment in the area if necessary.
7. When deemed appropriate, Apex will perform a third-party sludge odor characterization study on potential new sludge materials. Procedures for these studies, as well as criteria for acceptance and special handling methods required will be submitted in a revised Waste Analysis Plan (WAP). Apex will submit a revised WAP to the Ohio EPA within 30 days of the Ohio EPA's approval of this report.
8. Continue the on-site personnel communication system and documentation of communications with frequent and direct communication between the OCR Team and operations personnel. OCR Team members should be able to convey the description to operations personnel.

9. Apex Environmental implemented an OCR Team in November 2011 and will continue use of an OCR Team. The team consists of employee(s) that monitor the community for odors. Team member(s) are trained in the use of the Nasal Ranger (determines odor concentration), N-Butanol Scale (0-8 Scale to determine odor intensity), and Character of Odor (MSW, sewage sludge, landfill gas, etc.). A full description of the OCR Team functions can be found in Section 10.0 of this report.
10. A revised Odor Management Plan (OMP) will be submitted that may include all or part of the above operational modifications. Apex anticipates that submission of this revised OMP will allow closure of the DFFO. The revised OMP will be submitted as a facility permit alteration within 30 days of the Ohio EPA's approval of this report.

The OCR Team investigates complaints that Apex receives to the extent practical. Steps typically followed by the OCR Team include:

- Evaluation. The team first determines the probability that Apex is a likely source of the reported odor. If it is likely that Apex is the source, then the OCR Team will investigate at or near the location from which the OCR was reported. If an odor is present and may be attributed to Apex, then the odor is classified as "verified" and the team will perform the following:
    - Document the character of odor (if possible).
    - Document the concentrations of the odor by using the Nasal Ranger.
    - Document the intensity of the odor by applying the N-Butanol Scale.
    - Record weather conditions.

- Communication. If an odor is verified the OCR Team immediately begins communications with on-site operations. The OCR Team will inform lead operations members where the odor was found, intensity, of odor, and directions of prevailing wind in relation to Apex. Operations will investigate to determine a potential source of odors such as soil cover cracking, broken or non-functional gas extraction well, etc.

- Remediation. The OCR Team may suggest operational changes. Apex has a large arsenal of tools and technologies available for odor control. Examples include:
    - Surface emission scans to identify gas seeps through cover,
    - On-site gas analyzer for tuning and optimizing gas extraction system,
    - HDLA Perimeter A& B odor neutralizer application systems,
    - Agricultural sprayer(s) for local neutralizer application,
    - A high-volume mobile misting unit for local neutralizer application,
    - A tote-based fogger for local neutralizer application,
    - A water truck with water cannon for direct, high-volume application of water and/or neutralizer,
    - High-capacity soil screening operation for preparation of transitional cover,
    - Soil roller/compactor for sealing cover soils, and
    - Weather monitoring equipment.

Additional tools and technologies might be added to the arsenal or replace one of these existing tools. If a tool or technology is deemed to be no longer needed or ineffective, it may be eliminated.

- Re-Evaluation. The OCR Team will determine the effectiveness of operational changes with a re-evaluation at the OCR location when possible.

In addition, the OCR Team will continue, to the extent practical, perform circuit monitoring on the public roads surrounding the facility. This consists of odor measurements at multiple checkpoints. If a landfill generated odor is discovered, the team will follow the complaint investigation process protocol.

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