



# ORANGE WATER AND SEWER AUTHORITY

*A public, non-profit agency providing water, sewer and reclaimed water services  
to the Carrboro-Chapel Hill community.*

January 15, 2010

Mr. Roger Stancil, Town Manager  
Town of Chapel Hill  
405 Martin Luther King Jr. Boulevard  
Chapel Hill, NC 27514

**SUBJECT: ANNUAL REPORT ON ODOR ELIMINATION PROGRAM AT THE MASON  
FARM WASTEWATER TREATMENT PLANT**

Dear Roger:

Enclosed is our report on the odor elimination program at the Mason Farm Wastewater Treatment Plant (WWTP) in the 2009 calendar year. This report is submitted in accord with the Special Use permit for the WWTP.

As you know, we completed the covering of our primary settling tanks and related odor control equipment in September.

The next phase of odor control work will include covering eight of the sixteen biological treatment tanks (aeration basins).

If there is a need for an OWASA representative to be present when this report is submitted to the Town Council, please let me know.

Sincerely,

Ed Kerwin  
Executive Director

c: OWASA Board of Directors  
John Greene, P.E., General Manager of Operations  
Damon Forney, Manager of Wastewater Treatment and Biosolids Recycling

Attachments



# ORANGE WATER AND SEWER AUTHORITY

*A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill community.*

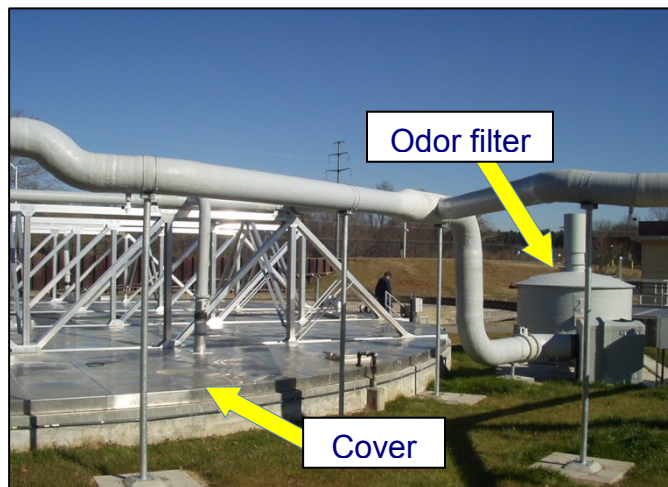
## ODOR ELIMINATION PROGRAM AT OWASA'S MASON FARM WASTEWATER TREATMENT PLANT

### 2009 ANNUAL REPORT TO THE TOWN OF CHAPEL HILL

January 15, 2010



Left: A settling tank before installation of the cover and odor filter



Right: A settling tank after installation of the cover and odor filter

*In September, 2009, we completed the installation of covers and an odor filter for the three primary settling tanks at our Mason Farm Wastewater Treatment Plant (WWTP).*

## HIGHLIGHTS

- The major milestone in our odor elimination program in 2009 was the installation of covers and a filter to capture and treat foul air from our primary settling tanks. The settling tanks are one of the places where solids are separated from wastewater in our treatment process. The work on the primary settling tanks cost \$1.35 million and was completed in September, 2009.
- Our odor monitoring data indicates that completion of the settling tank covers in September was associated with some reduction in already low hydrogen sulfide (H<sub>2</sub>S) levels, but this may reflect the normal seasonal trend of lower H<sub>2</sub>S production in cold weather. We will review future odor monitoring results to better evaluate the effect of the new settling tank covers.
- On September 10, 2009 the OWASA Board adopted a resolution committing to completing the “Phase 3” work of covering eight of our sixteen biological treatment tanks by 2014.
- We will continue to keep our WWTP neighbors and the Town informed about our odor elimination program including key actions, the status of capital projects and our quarterly and annual reports to the Town about the odor monitoring program, etc.

## BACKGROUND

### Draft definition of odor elimination

Following a public forum in November, 2006, the Town Council directed OWASA to develop a definition of odor elimination in consultation with WWTP neighbors and to develop a plan and timetable for odor elimination. In 2007, we completed our Draft Definition of Odor Elimination (Attachment 1) in consultation with representatives of the Highland Woods neighborhood and the North Carolina Botanical Garden. The definition is marked as a draft because we believe it should be reviewed and improved in the future based on experience and future technology.

### Completed odor elimination improvements and costs

IMPROVEMENTS	APPROXIMATE COST	YEAR COMPLETED
Covered all three primary settling tanks, added odor filter and related piping.	\$1,350,000	2009
Review by Bowker & Associates, consultants, of planned odor elimination actions.	\$12,000	2008
Improved removal of foam from biological treatment tanks (also called "aeration basins").	\$196,000	2007
Odor control components of new covered "headworks" (area where wastewater enters the WWTP).	\$272,000	2007

IMPROVEMENTS	APPROXIMATE COST	YEAR COMPLETED
Installed piping to carry foul air from the Morgan Creek pump station (at the WWTP site) to the odor scrubber.	\$50,000	2007
Built a new facility to receive septage (solids removed from septic tanks by private contractors) for treatment at the WWTP.	\$47,000	2007
Covered the "splitter box" structures, which carry wastewater to and from the primary settling tanks and a pump station; covered a channel that carries wastewater to the biological treatment tanks; and installed filters to treat foul air from the splitter boxes and channel.	\$421,000	2007
Installed permanent H <sub>2</sub> S monitors at WWTP perimeter and made connections to computerized monitoring and alarm system. H <sub>2</sub> S has the rotten egg smell associated with wastewater.	\$55,000	2007
Improvements to treat foul air from the biosolids dewatering press. Biosolids are treated wastewater solids suitable for recycling on farmland, etc.	\$104,000	2007
Odor study by Black & Veatch, consultants.	\$107,000	2007
Purchased portable H <sub>2</sub> S monitoring equipment for odor sampling at various locations around the WWTP.	\$9,000	2006
Replaced piping that carries foul air away from the "digesters" (tanks where wastewater solids are treated). The previously used underground pipes were an odor source.	\$214,000	2006
Improvements to reduce the amount of odorous solids put in the biological treatment basins.	\$500,000	2005
Odor monitoring program set up.	\$20,000	2005
Replaced the cover at a digester.	\$578,000	2005
Installed fixed covers on three other solids digesters.	\$1,600,000	2005
Covered the tanks that hold biosolids before they are recycled; and installed the odor scrubber, which treats odor from the biosolids tanks, etc.	\$666,000	2004

<b>IMPROVEMENTS</b>	<b>APPROXIMATE COST</b>	<b>YEAR COMPLETED</b>
Odor study by Hazen & Sawyer, consultants.	\$78,000	2004
Installed natural gas pilot light to ensure more reliable burning of foul air (methane) from solids digesters.	\$4,000	2004
Built a "biofilter" (tank with organic material which treats foul air from the solids handling facility).	\$350,000	2000
<b>TOTAL</b>	<b>\$6,633,000</b>	

The operating and maintenance costs for odor elimination work in 2009 totaled about \$98,000:

- \$12,000 for maintenance of carbon odor filters and H<sub>2</sub>S odor monitors;
- \$70,000 for chemicals used in the odor scrubber; and
- \$16,000 for labor associated with maintenance of odor control equipment.

## **DISCUSSION**

### Next phase of improvements

The next odor-related capital improvement will be the "Phase 3" project to cover and treat foul air from eight of our sixteen biological treatment tanks. The estimated cost of Phase 3 is \$3.1 million.

On September 10, 2009 the OWASA Board adopted a resolution committing to completing the "Phase 3" work by 2014. The Board's action followed discussion on June 8<sup>th</sup> with the Chapel Hill Town Council. OWASA representatives presented the resolution to the Council on September 28<sup>th</sup>.

Design of the Phase 3 improvements was completed in January, 2009.

### Odor monitoring program at the WWTP

The Draft Definition of Odor Elimination includes the following commitments:

- Continuous monitoring of H<sub>2</sub>S levels with at least four devices in addition to checking every 8 hours for odor at the boundary of the WWTP site.
- Evaluation of portable odor testing equipment. (As previously reported, we have concluded that the "nasal ranger" device is not useful because it requires subjective judgments by the person using the device.)

- Performance requirements
  1. H<sub>2</sub>S limit: 0.0
  2. Number of verified off-site odor events per year: three
  3. For other odors, a criterion called the “dilution to threshold” ratio shall be 5 or less (as further discussed in Attachment 1).

Attachments 2 through 4 provide information on the number of odor reports since January, 2002; odor events since January, 2007; and the results of our monitoring program.

### Public communications

As requested in a neighborhood meeting in 2004, we communicate primarily by e-mail with our WWTP neighbors. We invited neighbors to meetings of the OWASA Board to discuss the timing of the Phase 3 improvements on April 23<sup>rd</sup>, May 28<sup>th</sup>, June 11<sup>th</sup> and September 10<sup>th</sup>; gave notices of actions by the OWASA Board and potential odor releases due to maintenance; gave WWTP neighbors our quarterly and annual reports to the Town; and provided updates on capital improvements.

## **CONCLUSION**

We look forward to the completion of the additional capital improvements at the Mason Farm WWTP. We welcome any questions or comments you may have.

### Attachments

1. Draft definition of odor elimination (2007)
2. Monthly summary of neighbors’ reports of odor in the WWTP area; and odor events from 2007 to 2009 in accord with the draft definition of odor elimination
3. Summary of on-site inspections and number of times odor was detected at the various monitoring sites
4. Summary of on-site H<sub>2</sub>S odor monitoring

DRAFT

Definition of Odor Elimination – May 2007  
Mason Farm Wastewater Treatment Plant (WWTP)

We are proposing a set of standards and measures pursuant to the commitment OWASA made during the Town of Chapel Hill's Special Use Permitting process for the upgrade and expansion of the Mason Farm Wastewater Treatment Plant (WWTP):

**Operating Measures and Performance Standards Provide Two Benefits:**

- 1) Give WWTP staff a set of alerts to monitor normal operating parameters, identify out of standard conditions in real time and enable corrective action to eliminate off-site odor.
- 2) Determine whether the physical changes made to the plant structures and processes given increased and projected increases in volume are adequate to eliminate off-site odor or whether additional potential improvements should be made.

Based on odor measurements made during the summer of 2006 and software modeling of expected odor following current plant expansion and improvements the following additional odor elimination measure have been found to be necessary. These improvements have been included in the draft Capital Improvements Plan which the OWASA Board expects to consider at their June 14, 2007 Board meeting:

- Covering 8 (of 16) aeration basins in FY 2009
- Covering the 3 primary clarifiers in FY 2010/2011

Odor monitoring and measuring proposed in this standard would continue for at least three years beyond the completion of these projects.

**Impact Performance Standard:**

The goal of odor elimination is fully embraced by OWASA. Ultimately the measure of success of odor elimination is the absence of odor from the experience of OWASA neighbors.

OWASA's goal is zero off-site odor so that the quality of life for those living in close proximity to the WWTP is not adversely impacted.

Like OWASA's goal of zero wastewater spills/overflows, there may be occasions when, despite OWASA's best efforts to prevent or minimize the duration and intensity of any odor releases, there may be occasional odor releases during scheduled (preventive maintenance) and unscheduled (failure of equipment) maintenance events at the WWTP.

**The Performance Standard proposed by OWASA for verified odor events experienced by WWTP neighbors is three (3) or less per year.**

OWASA continues to encourage the WWTP neighbors to immediately contact OWASA by telephone at 537-4376 to report that an objectionable odor has been detected at their home and/or in the vicinity of the WWTP. One or more odor reports timely received during a 24 hour period from WWTP neighbor(s) shall be considered as a single odor event. OWASA will also track the number of odor reports in intervals of four and eight hours. Each odor event shall be considered to be “verified” unless OWASA determines conclusively that an alternative source other than the WWTP created the odor.

OWASA will undertake operating, engineering, structural and funding measures necessary to minimize the frequency, duration and intensity of odor releases associated with instances of scheduled and unscheduled maintenance events. OWASA will provide WWTP neighbors timely notice in advance of scheduled events and as soon as possible for unscheduled off-site odor events.

### **Monitoring Standards for Odor Elimination**

1) The “rotten egg” smell associated with hydrogen sulfide is generally accepted as the primary cause of WWTP odors. Hydrogen sulfide is relatively easy to measure and an industry accepted compound for monitoring odor.

OWASA will continuously measure hydrogen sulfide at or near the WWTP property boundary at a minimum of four locations. OWASA staff has consulted with the hydrogen sulfide monitor manufacturer regarding the optimum placement of these monitors. These monitors are solar powered and will transmit the hydrogen sulfide measurements to the WWTP’s process monitoring system which will alarm the on duty operator of any high readings. This hydrogen sulfide monitoring system is projected to be fully operational by May 31, 2007.

**Standard: hydrogen sulfide measured at or near the WWTP property boundary shall be 0.0 parts per million.**

2) Compounds other than hydrogen sulfide can produce odor at the WWTP, but are more difficult to measure. To determine the overall odor level, an air sample is collected in a bag and sent to a specialized laboratory which performs sensory analysis (nose testing) using a dilution apparatus known as a dynamic olfactometer. The dynamic olfactometer delivers odorous air in a range of dilutions to trained panelists who then determine the Dilution-to-Threshold ratio (D/T). The D/T is a measure of the number of dilutions needed to make the odorous ambient air non-detectable.

**Standard: D/T measured at or near the WWTP property boundary shall be 5 or less**

OWASA has purchased a portable olfactometer (Nasal Ranger) which is expected to be delivered by early June 2007. OWASA staff will evaluate the effectiveness of this device as a possible improvement over the current “sniff tests” which are routinely conducted by WWTP staff. The Nasal Ranger will also be evaluated in an attempt to quantify (measure D/T) at the WWTP boundary and/or at the site of reported odor. The OWASA staff expects to complete its initial evaluation of the Nasal Ranger by October 26, 2007 and will share this information with the WWTP neighbors.



MONTHLY SUMMARY OF CALLS AND E-MAILS TO OWASA  
FROM NEIGHBORS REPORTING ODOR  
IN THE MASON FARM WASTEWATER TREATMENT PLANT AREA

**January, 2002 to December, 2009**

	2002	2003	2004	2005	2006	2007 Reports	2007 Events	2008 Reports	2008 Events	2009 Reports	2009 Events
January	11	3	9	0	8	3	3	11	8	1	1
February	7	5	2	0	8	0	0	6	4	1	1
March	9	0	7	1	10	6	4	1	1	1	1
April	9	2	4	0	9	3	3	1	1	1	1
May	6	0	2	5	8	4	3	2	2	8	5
June	4	1	1	1	5	1	1	13	8	9	8
July	1	0	2	0	0	4	2	6	6	4	3
August	1	0	4	3	11	2	2	12	9	0	0
September	2	5	2	2	9	3	3	1	1	1	1
October	2	6	1	1	8	9	8	2	2	0	0
November	0	0	1	7	2	11	6	7	7	1	1
December	3	3	2	5	8	16	10	2	2	1	1
<b>TOTALS</b>	<b>55</b>	<b>25</b>	<b>37</b>	<b>25</b>	<b>86</b>	<b>62</b>	<b>45</b>	<b>64</b>	<b>51</b>	<b>28</b>	<b>23</b>

An “odor event” is defined as: One or more odor reports received during a 24 hour period from WWTP neighbor(s). Each odor event shall be considered to be “verified” unless OWASA determines conclusively that an alternative source other than the WWTP created the odor.

**SUMMARY OF ON-SITE ODOR INSPECTIONS AND NUMBER OF TIMES  
ODOR WAS DETECTED AT THE VARIOUS MONITORING SITES**

<b>Month and year</b>	<b>Total Inspections</b>	<b>Entrance Gate (1)</b>	<b>Generator Bldg. (2)</b>	<b>Old Outfall (3)</b>	<b>UV Complex (4)</b>	<b>Solids Tanks (5)</b>	<b>Odor Scrubber (6)</b>	<b>Head-works (7)</b>	<b>Digesters (8)</b>	<b>UNC Bldg. (9)</b>
<b>Jan. 2009</b>	37	10	9	2	0	6	12	15	17	12
<b>Feb. 2009</b>	38	8	7	0	0	5	12	16	14	7
<b>Mar. 2009</b>	33	12	8	7	1	9	13	19	19	14
<b>Apr. 2009</b>	42	6	6	3	0	4	6	13	16	7
<b>May 2009</b>	38	12	11	4	0	15	18	20	21	16
<b>Jun. 2009</b>	38	7	6	0	0	9	14	26	23	14
<b>Jul. 2009</b>	40	1	0	0	0	5	10	15	14	2
<b>Aug. 2009</b>	24	0	0	0	0	1	1	7	7	0
<b>Sept. 2009</b>	21	0	0	0	0	0	1	4	4	2
<b>Oct. 2009</b>	17	0	0	0	0	0	0	3	7	0
<b>Nov. 2009</b>	11	0	0	0	0	0	3	3	7	0
<b>Dec. 2009</b>	3	0	0	0	0	0	1	1	1	1
<b>Totals</b>	<b>342</b>	<b>56</b>	<b>47</b>	<b>16</b>	<b>1</b>	<b>54</b>	<b>91</b>	<b>142</b>	<b>150</b>	<b>75</b>
<b>%</b>		<b>9%</b>	<b>7%</b>	<b>3%</b>	<b>0%</b>	<b>9%</b>	<b>14%</b>	<b>22%</b>	<b>24%</b>	<b>12%</b>

**Notes:**

- 1) All on-site odor events were characterized by the WWTP Operators as “Mild” with odors that would not be expected to create an off-site problem.

SUMMARY OF ON-SITE H<sub>2</sub>S ODOR MONITORING

Month and year	Headworks Monitor			UNC Monitor			Digester Monitor			Switchgear Monitor		
	Average H2S Reading (ppm)	Minimum H2S Reading (ppm)	Maximum H2S Reading (ppm)	Average H2S Reading (ppm)	Minimum H2S Reading (ppm)	Maximum H2S Reading (ppm)	Average H2S Reading (ppm)	Minimum H2S Reading (ppm)	Maximum H2S Reading (ppm)	Average H2S Reading (ppm)	Minimum H2S Reading (ppm)	Maximum H2S Reading (ppm)
January 2009	OS	OS	OS	0.0000	0.0000	0.0073	0.0003	0.0000	0.0092	0.0000	0.0000	0.0014
February 2009	OS	OS	OS	0.0006	0.0000	0.2381	0.0004	0.0000	0.4923	0.0002	0.0000	0.4698
March 2009	OS	OS	OS	0.0002	0.0000	0.4425	0.0004	0.0000	0.5578	0.0002	0.0000	0.5676
April 2009	OS	OS	OS	0.0001	0.0000	0.0194	0.0007	0.0000	0.0450	0.0000	0.0000	0.0124
May 2009	0.0000	0.0000	0.0005	0.0006	0.0000	0.0519	0.0023	0.0000	0.4952	0.0001	0.0000	0.0471
June 2009	0.0000	0.0000	0.0000	0.0016	0.0000	0.4020	0.0003	0.0000	0.5800	0.0001	0.0000	0.5050
July 2009	0.0000	0.0000	0.0000	0.0019	0.0000	0.1805	0.0002	0.0000	0.0322	0.0001	0.0000	0.0214
August 2009	0.0000	0.0000	0.0000	0.0002	0.0000	0.0508	0.0002	0.0000	0.0013	0.0003	0.0000	0.0086
September 2009	0.0000	0.0000	0.0000	0.0027	0.0000	0.0606	0.0004	0.0000	0.0825	0.0002	0.0000	0.0305
October 2009	0.0015	0.0006	0.0591	0.0005	0.0000	0.0105	0.0002	0.0000	0.0200	0.0002	0.0000	0.0038
November 2009	0.0008	0.0002	0.4671	0.0001	0.0000	0.0042	0.0002	0.0000	0.0264	0.0003	0.0000	0.0005
December 2009	0.0006	0.0000	0.3079	0.0001	0.0000	0.0013	0.0003	0.0000	0.0542	0.0003	0.0000	0.0064

**Monitor Locations:**

Headworks Monitor (#1) – Monitor located between Headworks Facility and Septage Receiving Station on south side of plant property.

Digester Monitor (#2) – Monitor located between Digester #1 and Digester #4 on west side of plant property.

UNC Monitor (#3) – Monitor located between UNC Research Building and Trickling Filter on north side of plant property.

Switchgear Monitor (#4) – Monitor located across from Switchgear building on north side of plant property.

OS-Out of Service