PALMDALE WATER DISTRICT

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October 10, 2013

Agenda for a Meeting
of the Facilities Committee of the Palmdale Water District
Committee Members: Robert Alvarado-Chair, Gordon Dexter
to be held at the District's office at 2029 East Avenue Q, Palmdale

Monday, October 14, 2013

5:15 p.m.

NOTE: To comply with the Americans with Disabilities Act, to participate in any Board meeting please contact Dawn Deans at 661-947-4111 x1003 at least 48 hours prior to a Board meeting to inform us of your needs and to determine if accommodation is feasible.

Agenda item materials, as well as materials related to agenda items submitted after distribution of the agenda packets, are available for public review at the District's office located at 2029 East Avenue Q, Palmdale. Please call Dawn Deans at 661-947-4111 x1003 for public review of materials.

PUBLIC COMMENT GUIDELINES: The prescribed time limit per speaker is three-minutes. Please refrain from public displays or outbursts such as unsolicited applause, comments, or cheering. Any disruptive activities that substantially interfere with the ability of the District to carry out its meeting will not be permitted and offenders will be requested to leave the meeting.

Each item on the agenda shall be deemed to include any appropriate motion, resolution, or ordinance to take action on any item.

1) Roll Call.

2) Adoption of Agenda.

3) Public Comments.

4) Action Items: (The public shall have an opportunity to comment on any action item as each item is considered by the Committee prior to action being taken.)

4.1) Consideration and possible action on approval of minutes of regular meeting held September 16, 2013.

4.2) Consideration and possible action on proposals for security improvements to facilities located at 20th Street East and Avenue Q. (Information Technology Manager Stanton/Facilities Manager Moore)

5) Information Items.

5.1) Update on Facilities Committee goals and District projects. (Chair Alvarado)

5.2) Update on pending water quality regulations. (Operations Manager Thompson II)

5.3) Review and discussion of Granular Activated Carbon Operations and Testing. (Water Quality Supervisor Williams)

5.4) Status report on wind turbine performance. (Engineering Manager Knudson)

5.5) Update on development of lists for deferred maintenance and/or repair items (current and future).

5.6) Pipe and parts supplies/inventory. (Chair Alvarado)

5.7) Other.

6) Board members' requests for future agenda items.

7) Adjournment.

DENNIS D. LaMOREAUX,
General Manager

DDL/dd

Granular Activated Carbon

A Review of Operations and Testing

Prepared by PWD Water Quality and Operations Staff

10/1/2013

Introduction

The Palmdale Water District began using "Post Filtration" Granular Activated Carbon (GAC) contactors to remove Disinfection By-Product precursors in November of 2008. The Total Organic Carbon (TOC) contained in our source water has been specifically targeted for removal. This was done in an effort to reduce the concentration of Total Trihalomethanes (TTHMs) within the distribution system. Since that time, the operational protocol has been to run all treated water through the GAC contactors. *Graph 1* displays the average TTHM levels within the distribution system for the years 2008 through 2013. Beginning in April of 2010, Water Quality and Plant Operations staff began working to optimize the operation of the GAC contactors in an effort to maximize the life of each contactor while meeting the current and future TTHM regulations in the distribution system. This optimization work will continue through 2013 as we continue to collect data and refine our operational strategy.

This report is intended to provide a summary of the information the Palmdale Water District (PWD) has gained through the operation of Granular activated Carbon (GAC) contactors, as well as from extensive testing of various types of GAC. The first section will provide information about the actual operational results achieved during a 59 month period ending September 30, 2013. While the second section will discuss information gained through two Full-Scale Comparisons completed this year.

Section I: Operational Results

System TTHM Levels

The PWD began collecting TTHM samples at the 16 Stage 1 Disinfection By-Products Rule (DBPR) locations in 2002. The maximum contaminant level (MCL) for TTHM is 80 ug/L and is based on a running annual average of quarterly results. The Stage 1 DBPR has given way to the Stage 2 DBPR which requires compliance to be based on a Locational Running Annual Average (LRAA) of 8 Stage 2 DBPR locations which began in April 2012. This requires all locations to have a TTHM running annual average of less than 80 ug/L. *Table 1* shows the system Running Annual Averages for TTHMs.

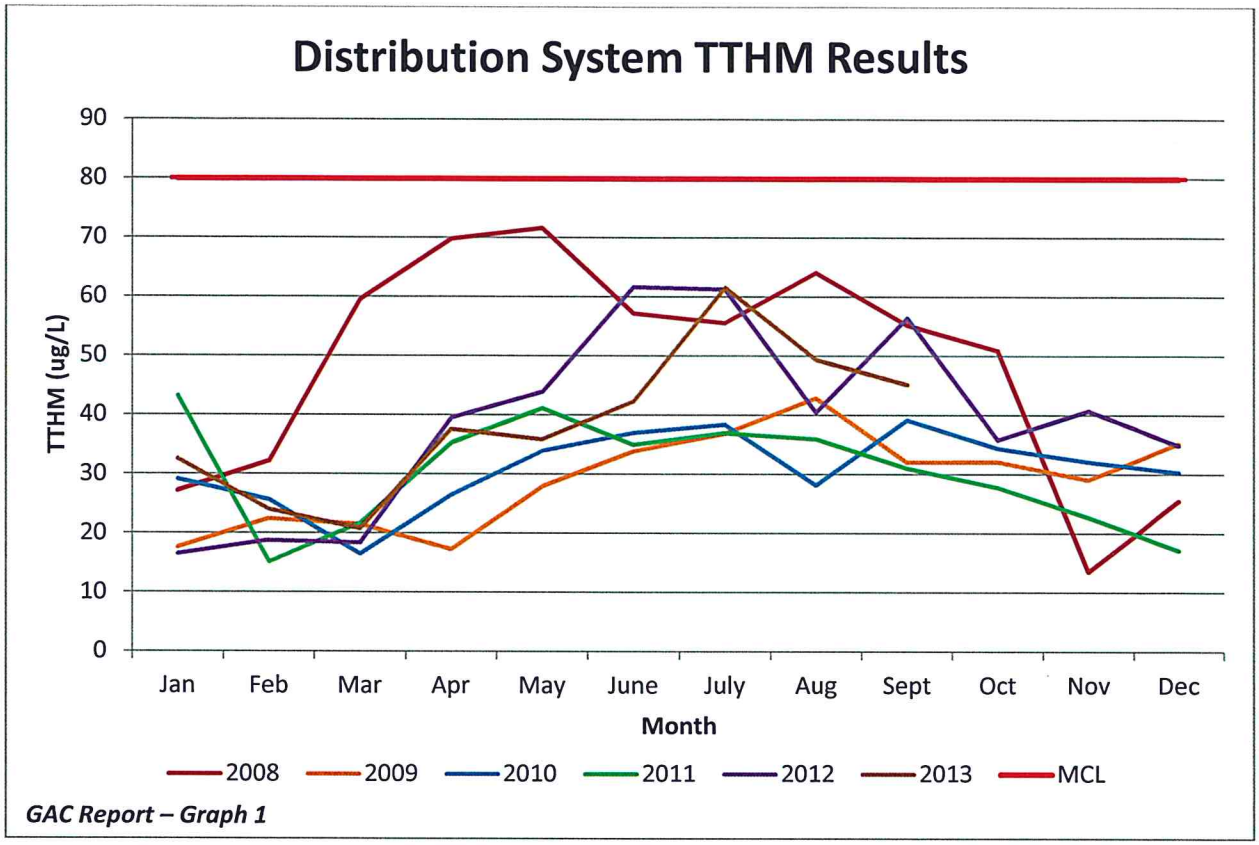
Table 1

Year	Stage 1: TTHMs RAA (µg/L)	Stage 2: TTHMs RAA (µg/L)
2002	73.5	
2003	73.0	
2004	49.5	
2005	53.7	
2006	51.1	
2007	54.6	
2008*	48.5	
2009	29.1	
2010	30.9	
2011	30.4	
2012	28.2	46.1
2013**	-----	32.2

**GAC effective: 4th Quarter 2008*

***2013 only includes 1st, 2nd and 3rd Quarter data*

Below is a graphical representation of TTHM levels prior to operation of the GAC contactors in 2008, as well as the five years following.



GAC Report – Graph 1

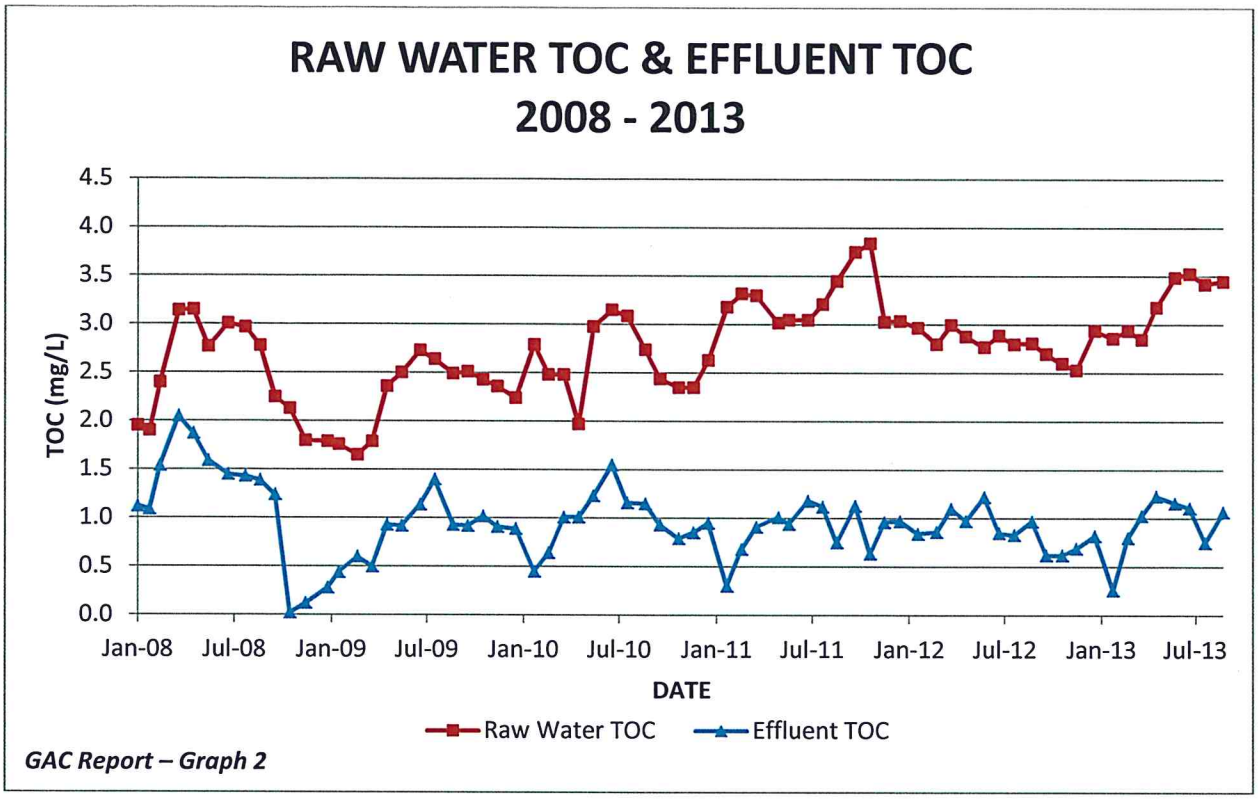
Raw Water Quality

There are two Raw Water parameters that we are primarily concerned with as they will have an impact on the formation of TTHMs. These parameters are Total Organic Carbon (TOC) and Bromide. This is due to the fact that three of the four species of TTHMs are made up of a combination of Carbon, Bromine, Hydrogen and Chlorine. Therefore, as TOC and Bromide concentrations increase, so does the potential for TTHM formation within our chlorinated distribution system. Currently, we are not able to remove the Bromide from our source water before it undergoes a reaction with the chlorine added in the treatment process. However, we are able to remove TOC to a certain extent and thus, TOC removal is the focus in our attempt to minimize TTHM formation. *Table 2* shows that despite higher raw water TOC in recent years, the average effluent TOC has been consistently lower than in 2008.

Table 2

Year	Average Raw TOC (mg/L)	Average Effluent TOC (mg/L)
2008	2.5	1.2
2009	2.2	0.8
2010	2.7	1.0
2011	3.2	0.9
2012	2.8	0.9
2013*	3.0	1.0

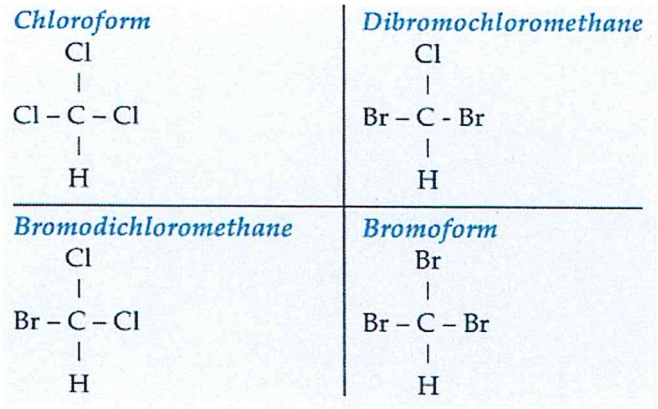
**2013 average only includes 1st, 2nd and 3rd Quarter data*



GAC Report – Graph 2

As discussed previously, the average TOC level leaving the plant prior to bringing the GAC contactors online in November of 2008 was higher than the average TOC leaving the plant from 2009-2013. It must be noted that it is possible to reduce the Plant Effluent TOC to a level approaching zero mg/L as can be seen on *Graph 2* in November of 2008. It must also be noted that removal rates of this magnitude will quickly exhaust the GAC. This will greatly increase the cost of treatment using GAC and is in fact cost prohibitive. For this reason, the PWD has been working to develop an operational strategy that will reduce TOC levels to the point required for compliance with the Stage 2 DBPR, while at the same time extending the useful life of each GAC contactor. To achieve this balance, it is essential to regularly monitor treatment plant performance and GAC contactor performance for the reduction of TOC. This is achieved through the use of a TOC analyzer as well as regular grab samples from various points of the treatment process. These grab samples are analyzed by water quality staff in the PWD lab.

As previously mentioned, three of the four regulated TTHM species contain Bromine. Currently, there is no cost effective way to achieve large scale removal of Bromide from our source water. Below is an illustration of the four Trihalomethane compounds which shows the contribution of Bromine to each.



Cost Analysis

Post filtration GAC contactors have been shown to be very effective in the reduction of Total Organic Carbon. The current issue we face is that of balancing the cost of treatment with achieving our water quality goals. On the financial side of water treatment is the question, "How much does this technology cost per acre-ft of water treated?" There is not a simple answer to this question as each water source and treatment plant is unique. We have endeavored to create some "rules of thumb" that may be helpful to other water districts considering the use of GAC. Looking at the last fifty-nine months of operation using GAC contactors, we were able to determine the cost per acre-ft of water treated at current market cost for GAC. The following is the summary data used to calculate treatment cost.

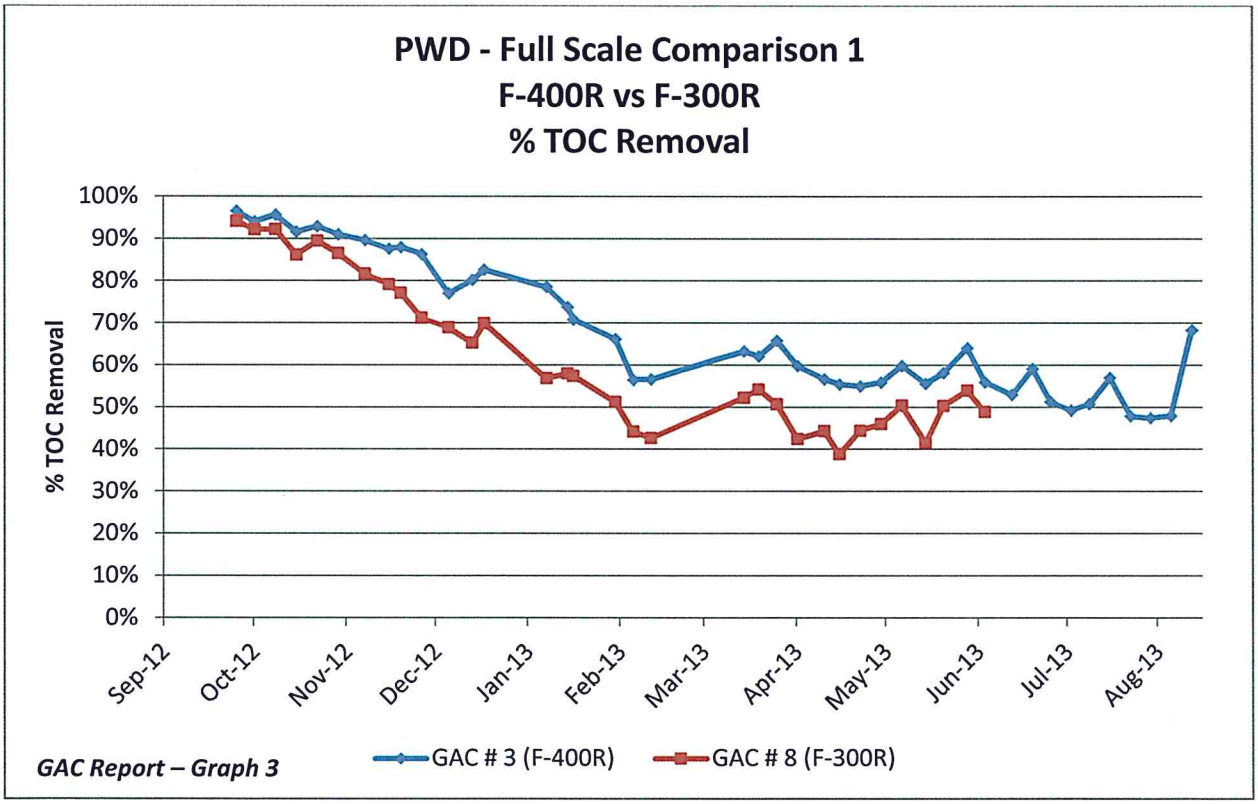
2008 – 2013: Year Totals

Plant Production (acre-ft)	**64,678**
GAC Used (lbs)	**5,280,000**
TOC Removed (lbs)	**175,664**
GAC/TOC (lbs)	**30.1**
Cost/acre-ft ($)	**$78.85**

Section II: Full-Scale Comparisons

During 2012 and 2013, two different full-scale comparisons were conducted to evaluate which product will be most cost-effective for TOC reduction.

The first full-scale comparison was used to evaluate the efficiency of two different varieties of bituminous coal based GAC (Calgon: F-300R and F-400R). The graph below shows that the F-400R is more effective at removing TOC than the F-300 currently in use. Over the course of this comparison, the F-400R provided 35% more production capability (ac-ft) and removed 11% more TOC (lbs) than the F-300R. In this comparison, each GAC contactor was considered to be exhausted when the percent of TOC removal stabilized below 50%.

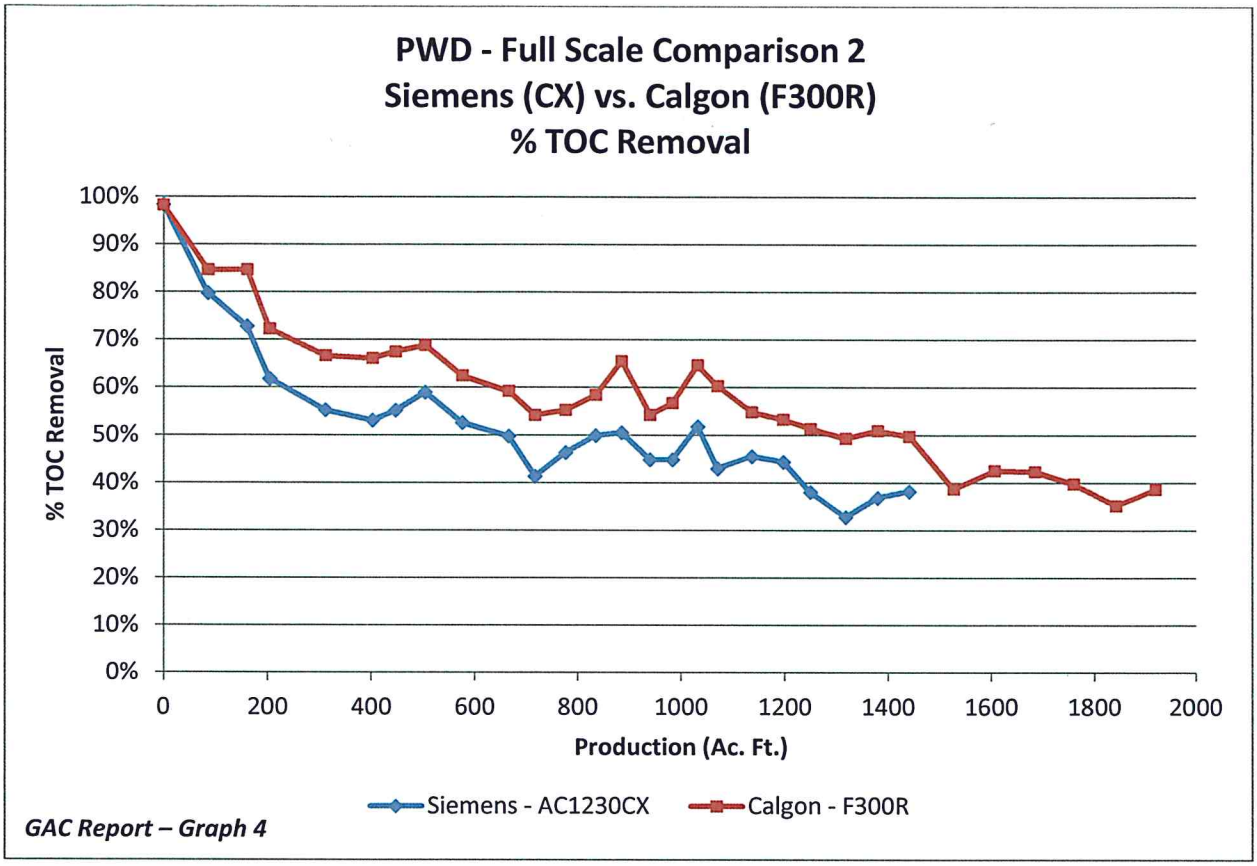


GAC Report – Graph 3

Full-Scale Comparison 1 - Results

GAC # 3 (F-400R):		**GAC # 8 (F-300R):**	
GAC Production (acre-ft)	**2,410**	GAC Production (acre-ft)	**1,789**
GAC Used (lbs)	**220,000**	GAC Used (lbs)	**220,000**
TOC Removed (lbs)	**8,875**	TOC Removed (lbs)	**5,662**
GAC/TOC (lbs)	**24.8**	GAC/TOC (lbs)	**38.9**

The first phase of the second full-scale comparison operated from February 2013 through August 2013 and was used to evaluate the effectiveness of coconut based GAC (Siemens AC1230CX) and bituminous coal based GAC (Calgon F-300R).



GAC Report – Graph 4

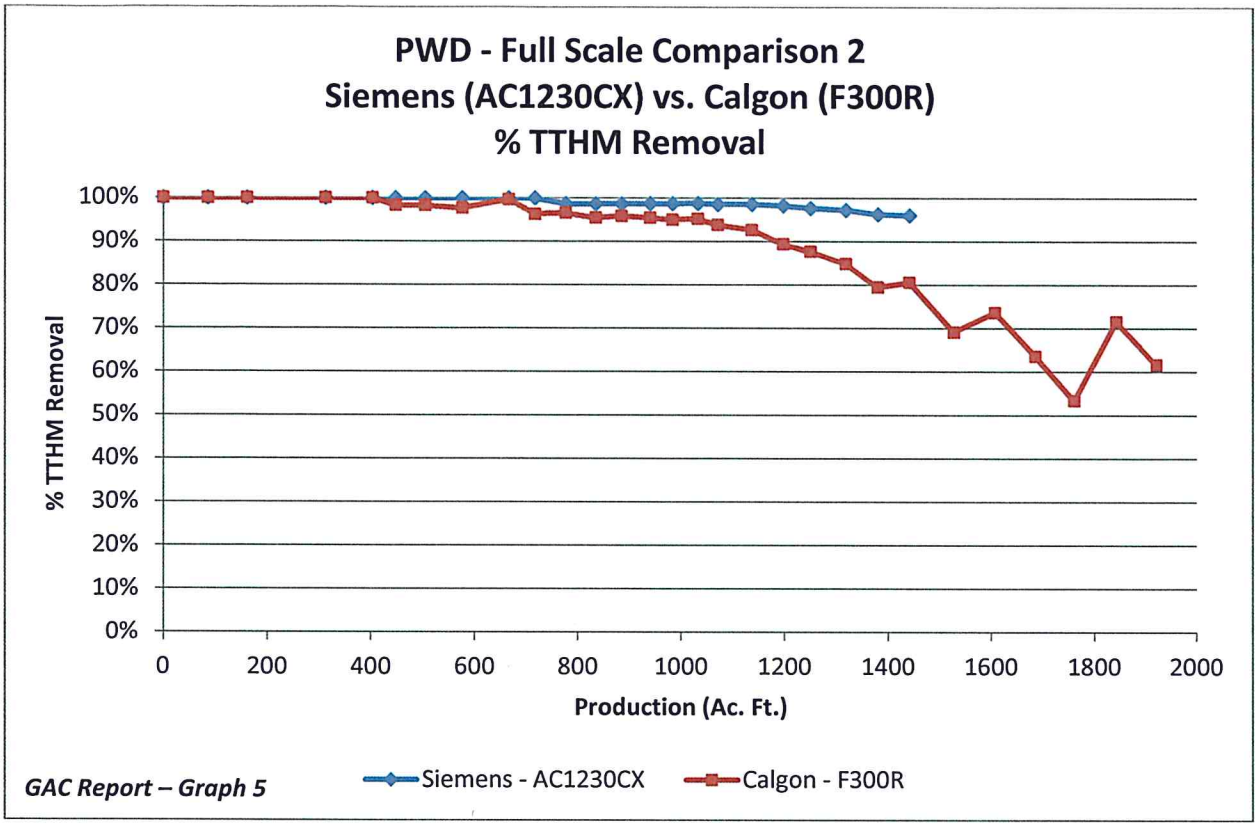
Full-Scale Comparison 2 - Results

GAC # 4 (Siemens-AC1230CX):	
GAC Production (acre-ft)	**1,476**
GAC Used (lbs)	**220,000**
TOC Removed (lbs)	**4,388**
GAC/TOC (lbs)	**50.1**

GAC # 5 (Calgon F-300R):	
GAC Production (acre-ft)	**1,976**
GAC Used (lbs)	**220,000**
TOC Removed (lbs)	**6,753**
GAC/TOC (lbs)	**32.6**

Based on the results, it is unlikely that we would choose to use the coconut based AC1230CX in place of the bituminous coal based F-300R (*Graph 4*). The Calgon F-300R provided 34% more production capability and removed 54% more TOC (lbs).

However, the coconut based GAC (AC1230CX) was very efficient at TTHM reduction (*Graph 5*). This information further supports our decision to use coconut based GAC at Underground Tank for TTHM reduction.



GAC Report – Graph 5

The second phase of the second full-scale comparison began at the end of September 2013. The focus of this comparison will be to evaluate the effectiveness of regenerated coconut based GAC (Siemens AC1230CXS) and regenerated bituminous coal based GAC (Calgon F-400R). The GAC Quality Control results indicate that the regenerated coconut based GAC may be more efficient than its virgin counterpart.

Conclusions and Expectations

- The F-400R results indicate that it would be more cost effective for TOC reduction at the WTP.
- The virgin "Enhanced Coconut" product (AC1230CX) was not as efficient as our current bituminous coal based GAC (F-300R) and therefore would not likely be cost effective for TOC reduction at the WTP.
- However, the virgin "Enhanced Coconut" product continued to show that it is very effective for TTHM reduction and further supports our decision to use a coconut based GAC for the Localized GAC system at Underground Tank.
- The second phase of this full-scale comparison began testing at the end of September 2013 and results should be available early 2014. Interestingly, the regenerated "Enhanced Coconut" quality control results indicate that it may outperform F-400R and may prove to be more cost effective for TOC reduction.

Please direct questions regarding this report to:

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