Final Report

Operational and Process Improvements for the Avondale Water Reclamation Facility

Prepared for

City of Avondale

May 24, 2013

CH2MHILL®

1501 W. Fountainhead Parkway
Suite 401
Tempe, AZ 85282

Contents

Section **Page**

Executive Summary **1**

1 Introduction and Objectives **1-1**

2 Operational and Process Evaluation **2-1**
2.1 Flow Characteristics 2-1
2.2 Influent Pump Station and Headworks 2-8
2.2.1 Function and Design 2-8
2.2.2 Operational Observations and Performance 2-8
2.2.3 Process and Hydraulic Observations 2-9
2.2.4 Summary of Issues Identified 2-9
2.3 Equalization and Primary Clarification 2-9
2.3.1 Function and Design 2-9
2.3.2 Operational Observations and Performance 2-9
2.3.3 Process and Hydraulic Observations 2-9
2.3.4 Summary of Issues Identified 2-10
2.4 Secondary Treatment 2-10
2.4.1 Function and Design 2-10
2.4.2 Operational Observations and Performance 2-11
2.4.3 Process Observations 2-14
2.4.4 Summary of Issues Identified 2-15
2.5 Disinfection and Effluent Pump Station 2-15
2.5.1 Function and Design 2-15
2.5.2 Operational Observations and Performance 2-15
2.5.3 Process and Hydraulic Observations 2-15
2.5.4 Summary of Issues Identified 2-16
2.6 Solids Handling 2-16
2.6.1 Function and Design 2-16
2.6.2 Operational Observations and Performance 2-17
2.6.3 Process Observations 2-17
2.6.4 Summary of Issues Identified 2-17

3 Operational Enhancements Implemented **3-1**
3.1 Secondary Treatment 3-1
3.1.1 Issue: Insufficient Aeration in Aeration Basins 3-1
3.1.2 Issue: Filamentous bulking and foaming in Aeration Basins 3-1
3.1.3 Issue: High MLSS 3-1
3.2 Disinfection 3-1
3.2.1 Issue: Difficulties meeting effluent parameters and goals 3-1
3.3 Solids Handling 3-1
3.3.1 Issue: Secondary foam caused problems in the anaerobic digesters 3-1

4 Plant Capacity and Modification Requirements **4-1**
4.1 Primary Clarification and Equalization 4-1
4.2 Secondary Treatment 4-2
4.2.1 Aeration Basins 4-2
4.2.2 Secondary Clarifiers 4-3
4.3 Disinfection and Effluent Pump Station 4-4
4.4 Solids Handling System 4-5
4.5 Modification Requirements 4-5

Section **Page**

4.5.1 Primary Treatment 4-5
4.5.2 Secondary Treatment 4-5
4.5.3 Tertiary Treatment 4-6
4.5.4 Solids Handling 4-6

5 Recommendations 5-1
5.1 Planning 5-1
5.2 Staffing 5-1
5.3 Operational 5-4
5.4 Administrative 5-5
5.5 Capital 5-7
5.5.1 Primary Treatment 5-8
5.5.2 Secondary Treatment 5-8
5.5.3 Solids Handling 5-9
5.6 Conclusions 5-9

Appendices

A Background Information
B Weekly Updates
C Avondale WRF Boiler Room Evaluation Technical Memorandum
D Model Results
E Walk-Through Plan Template
F Presentations

Tables

1 Current WRF Raw Wastewater Loads Comparison with Design Criteria 2-6
2 WRF Current Primary Clarifier Loadings Comparison with Design Criteria 2-10
3 WRF Current Aeration Basin Loads Comparison with Design Criteria 2-14
4 WRF Current Secondary Clarifier Loadings Comparison with Design Criteria 2-14
5 WRF Effluent Quality and Permit Limits 2-16
6 WRF Primary Clarifier Future Rates Comparison with Design Criteria 4-1
7 WRF Future Aeration Basin Loads Comparison with Design Criteria 4-2
8 WRF Future Secondary Clarifier Rates Comparison with Design Criteria 4-3
9 WRF Future Disinfection Comparison with Design Criteria 4-4
10 WRF Future Anaerobic Digestion Comparison with Design Criteria 4-5
11 Recommended Capital Modifications 4-7
12 City of Avondale WRF Liquid Stream Operational Responsibilities 5-2
13 City of Avondale WRF Solids Stream Operational Responsibilities 5-2
14 WRF Regulatory Compliance and Reporting Requirements 5-6
15 Preliminary Cost Estimate for Significant Capital Improvements 5-7
16 Implementation Plan by Activity 5-9

Figures

1 WRF Process Flow Diagram 1-1
2 WRF Raw Wastewater Flow and Load Summary (30-Day Rolling Averages) 2-2
3 WRF Treated Effluent Flow and Load Summary (30-Day Rolling Averages) 2-3
4 WRF Treated Effluent Flow and Concentration Summary (30-Day Rolling Averages) 2-3
5 WRF Influent Flow Summary (30-Day Rolling Averages) 2-4
6 90th Percentile and 30-Day Average BOD Loadings for Raw Wastewater 2-5
7 90th Percentile and 30-Day Average TSS Loadings for Raw Wastewater 2-5

Section **Page**
8 WRF BOD Treatment Capacity at 9.0 mgd 2-7
9 WRF TSS Treatment Capacity at 9.0 mgd 2-8
10 Sludge Accumulation in Secondary Clarifier 2-12
11 Solids Floating in the Chlorine Contact Basin 2-13
12 Schematic of Modified Aeration Basins 4-6

Acronyms and Abbreviations

AA	annual average
AADF	annual average day flow
ADMM	average day maximum month
APP	Arizona Aquifer Protection Permit
AZPDES	Arizona Pollutant Discharge Elimination System
BOD	biological oxygen demand
CCT	Chlorine Contact Basin
CEPT	chemically enhanced primary treatment
CFU	colony-forming units
City	City of Avondale
CMMS	computerized maintenance management system
CT	concentration time
DO	dissolved oxygen
HRT	hydraulic residence time
IR	internal recycle
lb/d	pounds per day
lf	linear feet
mgd	million gallons per day
mg/L	milligram per liter
MM	maximum month
MLR	mixed liquor recycle
MLSS	mixed liquor suspended solids
NaOCl	sodium hypochlorite
NH_3	Ammonia
PFD	process flow diagram
ppd	pounds per day
P&ID	Process and Instrumentation Diagram
O&M	Operations and Maintenance
OUR	Oxygen Uptake Rate
QC	quality control
RAS	Return Activated Sludge
RDT	Rotary Drum Thickener
scfm	standard cubic feet per minute

sf	square feet
SCADA	supervisory control and data acquisition
SMRF	Self Monitoring Report Form
SOP	Standard Operating Procedure
SRT	solids retention time
SVI	Sludge Volume Index
TKN	Total Kjeldahl Nitrogen
TSS	total suspended solids
USEPA	United States Environmental Protection Agency
VSR	volatile solids reduction
WAS	Waste Activated Sludge
WRF	Water Reclamation Facility
µg/L	microgram per liter

Executive Summary

The City of Avondale (City) owns and operates a Water Reclamation Facility (WRF) which had an expansion in 2008 that included upgrades to existing treatment process units as well as addition of new treatment units. However, during the 4th quarter of 2012 the WRF was experiencing performance challenges with meeting permit requirements and treatment goals at less-than-design flows. The City hired CH2M HILL to conduct an operational and process evaluation to identify potential improvements that could be made to the WRF.

This Final Report provides details on operational changes that have been implemented along with recommendations to improve process performance based on current wastewater characterization and operations. The following items are a summary of the key points from this analysis:

- ***Applicability of Wastewater Master Plan:*** The WRF influent is stronger in concentration than the 2007 design conditions and revised design criteria need to be established in an updated plan to make sure the WRF has reliable capacity and can meet the permit requirements at all times. These new criteria can then be used to make important decisions about future facility improvements. Standard operating procedures established around these update criteria can then provide new tools for the WRF and the City staff to face the challenges faced at the WRF in the form of varying flow conditions and pending regulatory requirements.
- ***Current Operations:*** In addition to not meeting secondary treatment performance goals, foaming and poor settling in the secondary treatment process and incomplete denitrification have been resulting in downstream performance issues in the disinfection and solids handling systems as identified and addressed herein.
- ***Recommendations:*** Immediate, near-term, and long-term recommendations are identified as a result.

Immediate activities:	Near-term activities:	Long-term activities
▪ Update Wastewater Master Plan ▪ Relocate influent sample point ▪ Optimize aeration basins by monitoring dissolved oxygen(DO) levels ▪ Adjust wasting (WAS and scum) as need to meet SRT and MLSS goals, and monitor SVI and OUR (implemented) ▪ Apply chlorine spray to aeration basins to eliminate filamentous bacteria (completed) ▪ Inspect secondary clarifiers (started) ▪ Install online monitoring of key process control parameters ▪ Update staffing plan and training (initial plan and training complete) ▪ Prepare and implement a facility process control program, SOPs, computerized maintenance management system (initial stages implemented) ▪ Implement recommendations to ensure Boiler Room is compliant with code and safety ▪ Monitor solids accumulation in Chlorine Contact Basins (CCTs) and remove periodically as needed (has been added to SOPs)	▪ Provide automation for DO control in aeration basins, evaluate blower operation ▪ Reconfigure aeration basins (adjust zones and recycles) ▪ Evaluate CCT hydraulics and effectiveness ▪ Install flow meters for key in process flow streams like the mixed liquor recycle ▪ Construct new secondary clarifier ▪ Construct tertiary filters	▪ Install online analyzers on major flow streams to monitor key parameters ▪ Provide WAS storage ▪ Increase anaerobic digester capacity

SECTION 1

Introduction and Objectives

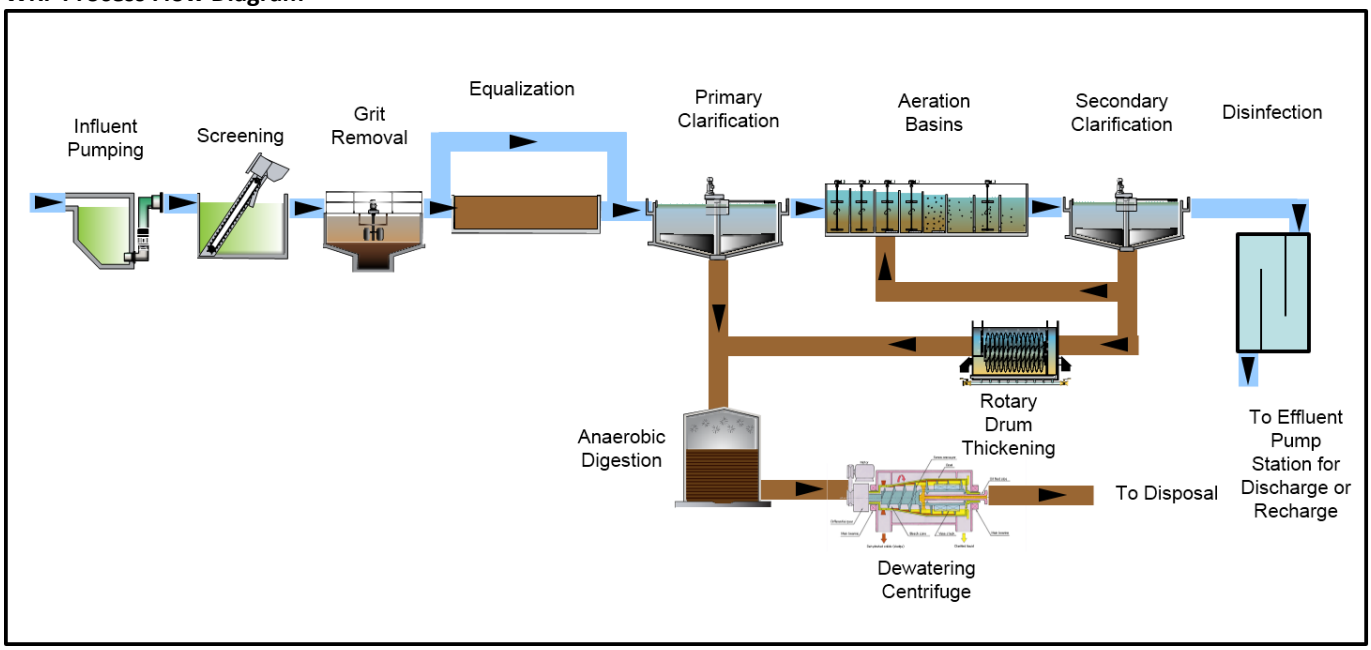
The City of Avondale's (City) Charles M. Wolf Water Resources Center (WRF) treats water from the City's collection system. Built in 1992 to treat annual average day flow (AADF) of 3.5 million gallons per day (mgd), it was expanded in 2001 to treat 6.4 mgd AADF and again in 2007-2008, known as Phase 1 Expansion, to treat 9.0 mgd, average day maximum month (ADMM).

The current operations of the facility, raw wastewater data (see Appendix A *Background Information*), and operational and performance data (see Appendix A and Appendix B *Weekly Updates*) from individual unit processes were evaluated in order to identify areas of concern and develop solutions.

The unit processes for the WRF include the following facilities and treatment processes as illustrated in the process flow diagram (PFD) presented in Figure 1:

- Influent pump station
- Headworks with screening and grit removal
- Flow equalization
- Primary clarification
- Secondary treatment (Conventional Activated Sludge)
- Chlorine disinfection
- Rotary drum thickening
- Anaerobic digestion
- Dewatering centrifuges
- Energy recovery (boiler) facility
- Chemical storage and feed systems
- Odor control

FIGURE 1
WRF Process Flow Diagram



Liquids stream processes are shown in blue and the solids stream processes are shown in brown in Figure 1. This report evaluates major unit processes including the primary and secondary treatment systems, disinfection, boiler facility, and the solids handling.

The Phase 1 expansion of the WRF included upgrades to existing treatment process units as well as addition of new treatment units. However, the WRF has been experiencing performance challenges with meeting permit requirements and treatment goals at less-than-design flows. This report provides the findings of multiple site visits and desktop analysis of the treatment processes, followed with recommendations for the City to improve immediate process performance as well as for the modifications necessary to be able to reliably treat 9.0 mgd going forward.

Before this project was initiated, the WRF experienced permit violations for two parameters – high solids concentrations and high bacterial counts in the effluent. They also were dealing with foaming in the aeration basins as well as rising sludge in the secondary clarifiers.

Based on the 2007 Final Design Report by DSWA, Carollo Engineers, and PCL, the WRF was sized to treat a maximum month (MM) flow of 9.0 mgd. Therefore facility or system components such as pumps and piping were not evaluated individually for hydraulic capacity and are assumed to be sized accordingly. However, each process facility has specific hydraulic criteria as well as loading criteria that must be met to ensure successful and efficient treatment. This evaluation included review of the process performance implications of the hydraulic loading of the unit processes as well as mass loading of the existing units to establish the performance and capacity enhancement needs.

SECTION 2

Operational and Process Evaluation

In the early stages of this project, CH2M HILL provided a senior operations specialist to spend a two-week period with the onsite staff to observe daily plant operations. The main focus of the field observations was the secondary treatment process (the aeration basins and secondary clarifiers) as the majority of the troubleshooting was needed in the biological processes and the secondary settling to be able to meet effluent compliance requirements. Subsequently, observations were also made by process engineers by reviewing information made available through interviews with operational staff as well as reviewing plant performance data. The main focus for these evaluations were the raw wastewater characterization at desk top level (comparing how flows and wastewater have changed from the design basis), and identifying how these changes affect the treatment processes of the WRF. In order to suggest quantifiable improvements, a baseline process simulation model was developed and used throughout this study.

Observations below are categorized as *Operational* and *Process*. Operational observations are those that were made by reviewing day-to-day operations while process observations involved analysis of wastewater characterization and plant operations data, as well as process configurations and operating conditions.

Two years of data were analyzed in order to make process observations. Data included raw wastewater characteristics as well as water quality at various stages within the treatment processes. Analysis of this data allowed observations to be made to determine how well unit processes were performing, in addition to the field evaluations.

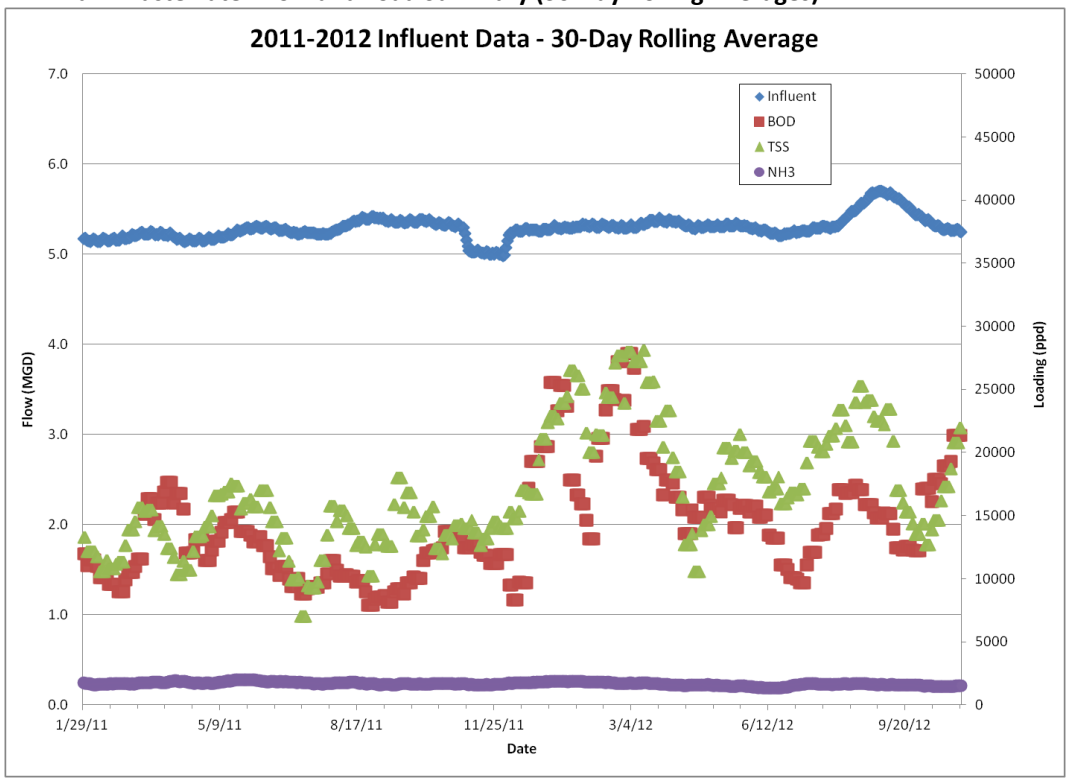
2.1 Flow Characteristics

Flow characteristics not only includes the flow quantity treated at the WRF, but also the strength of the wastewater, or the amount of contaminants in the wastewater, or the “mass loading” of the contaminants. It is important to review data over a period of time to identify whether flows and loads are varying, how fast they are changing, and whether they are still aligned with the criteria for which the WRF was designed to handle (considered the *design capacity* of the existing treatment plant). The most important loadings to review are total suspended solids (TSS), biological oxygen demand (BOD), and nutrients (nitrogen and phosphorus). Plant discharge permits include limits on these parameters, among others.

In areas where conservation practices are encouraged or required, it is common to see a decrease in flow but an increase in TSS and BOD concentrations. In areas of population or economic growth, it is common to see TSS and BOD loadings to increase proportionately with the flows.

To identify sustained trends the data is often reviewed as 7-day or 30-day rolling averages instead of the daily readings to observe sustained conditions that impact the facility in addition to the instantaneous (daily) conditions. Figure 2 graphically summarizes the 30-day rolling averages of the raw wastewater quality during the 2-year duration over 2011 through 2012.

FIGURE 2
WRF Raw Wastewater Flow and Load Summary (30-Day Rolling Averages)



During the evaluation period, the influent flows were stable between about 5.0 mgd and 5.75 mgd, with a peak period occurring in August-September 2012. Ammonia (NH_3) also was stable during this period. However, BOD and TSS exhibited fluctuations throughout each month and showed a generally increasing trend over time, indicating that the loads to the WRF were also increasing while influent flows were not generally increasing.

The effluent was also similarly evaluated. Figure 3 and Figure 4 illustrate flow and effluent quality (BOD, TSS, and NH_3 concentration, and turbidity) measured during the same evaluation period. Accordingly, similar to the influent, the effluent experienced an increase near the end of Summer 2012, even with the measured effluent flow values being greater than the influent flow values (see Figures 2 and 3). Ammonia concentrations were fairly stable until the end of Summer 2012 after when a sharp spike in ammonia, BOD and TSS values, with some TSS values exceeding the Arizona Pollutant Discharge Elimination System (AZPDES) permit were experienced for about a month. With the increased TSS values, the effluent turbidity also spiked, following the same pattern as TSS (Figure 4).

It appears that with the increased flows, the plant operations moved out of its stable operation point, and decline in effluent quality was triggered due to a combination of hydraulic and relatively high load conditions. It is at this point that CH2M HILL was hired to identify immediate operational solutions to help the WRF get back on their track of successful performance.

FIGURE 3
WRF Treated Effluent Flow and Load Summary (30-Day Rolling Averages)

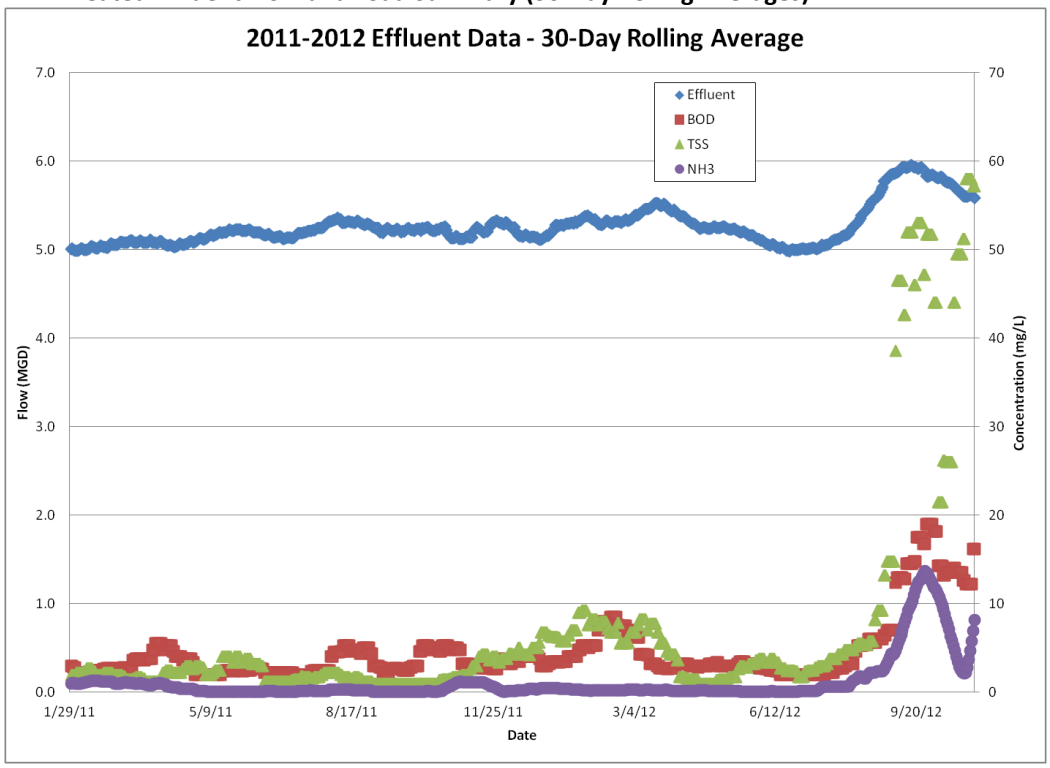
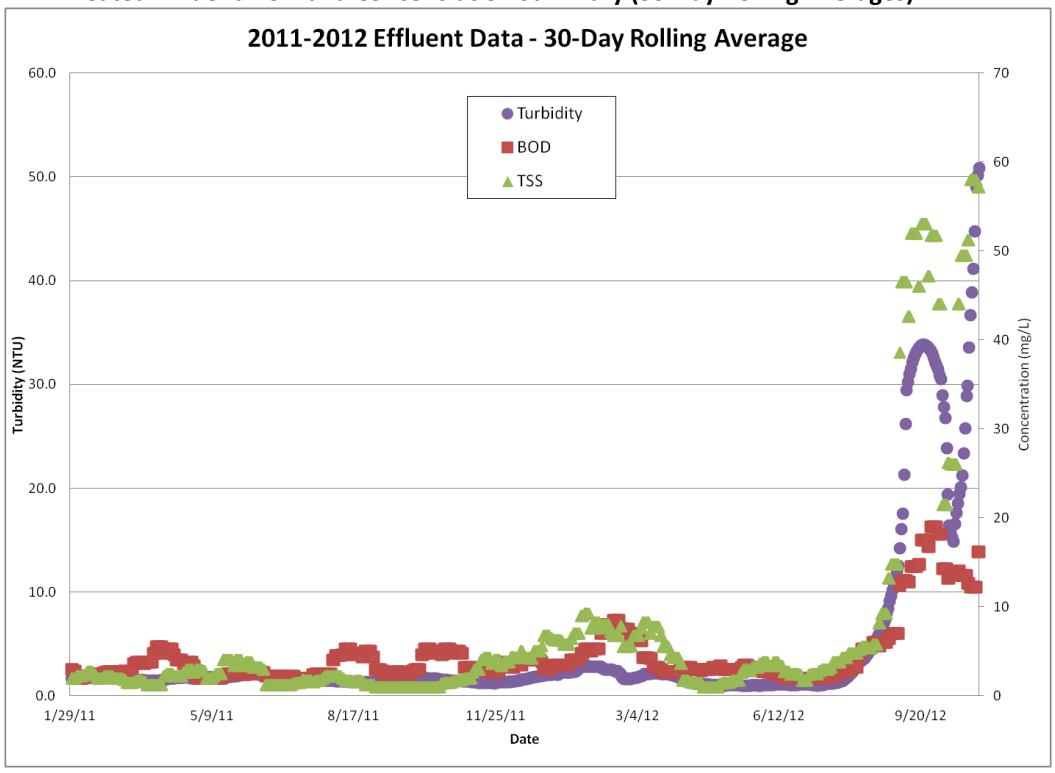


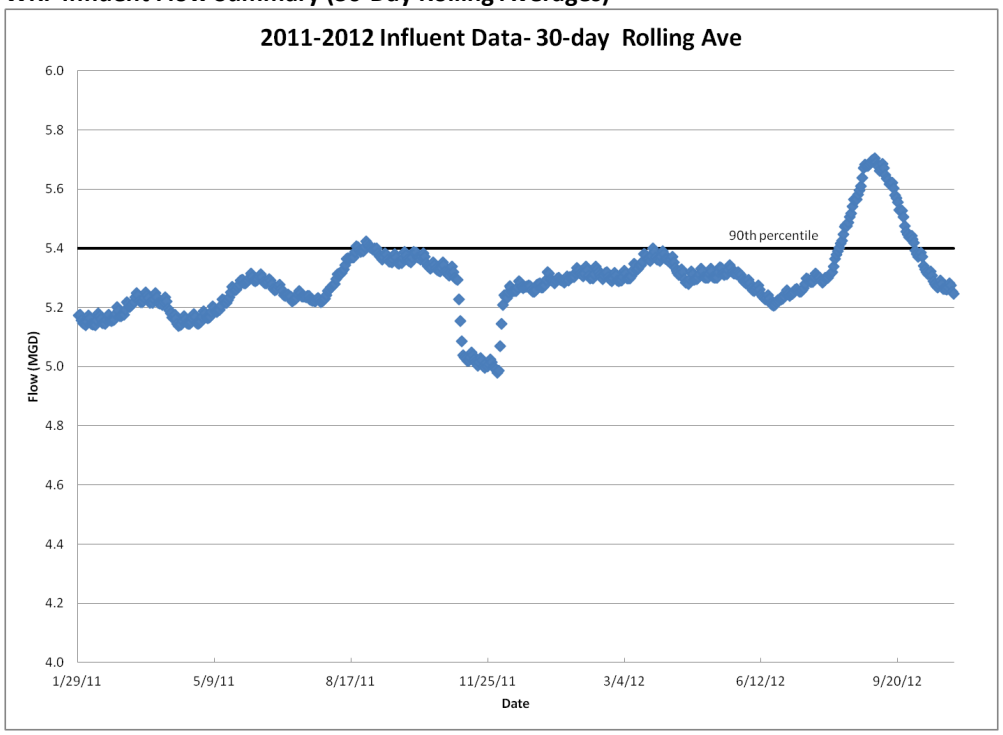
FIGURE 4
WRF Treated Effluent Flow and Concentration Summary (30-Day Rolling Averages)



The current flow conditions are illustrated in Figure 5 using the 30-day average raw wastewater flow values. The 90th percentile 30-day rolling average flow was also included in this figure representing the maximum sustained flow conditions that were experienced at WRF during the evaluation period. Using a rolling average and the 90th percentile values allows extreme spikes which may not represent sustained conditions, yet it allows identification

of a maximum flow value that the facility had to sustain performance under. Accordingly, the 90th percentile influent flow was calculated as 5.4 mgd, while the average flow was 5.2 mgd for the same period.

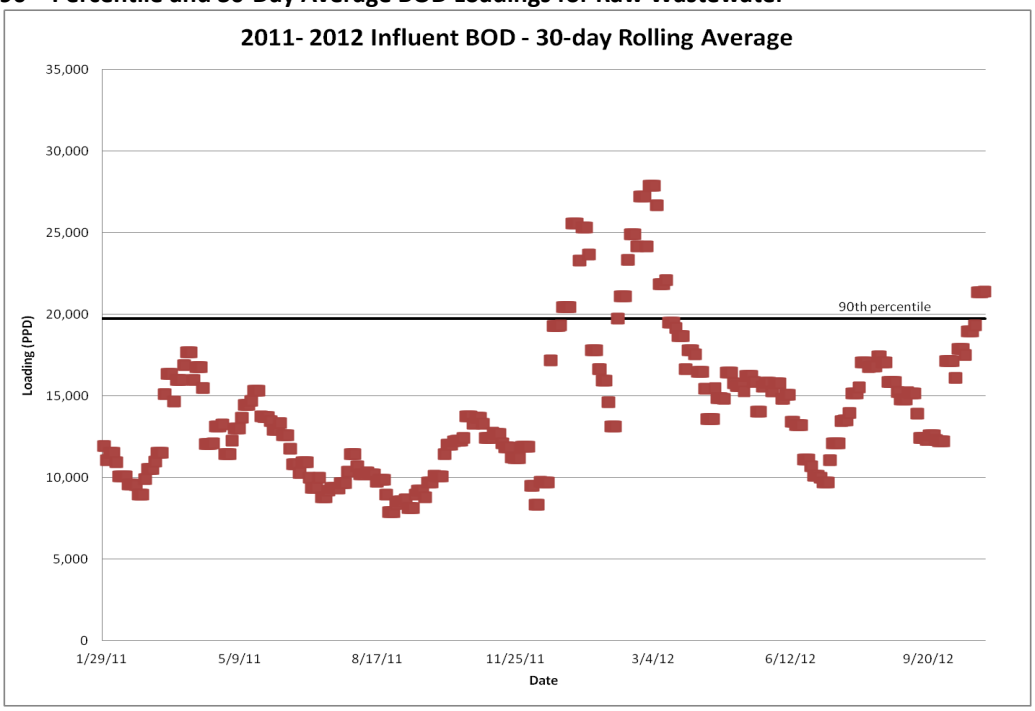
FIGURE 5
WRF Influent Flow Summary (30-Day Rolling Averages)



Throughout 2011 and 2012 the WRF influent flow was steady with a drop in Fall 2011 and an increase during the Summer 2012. The corresponding 90th percentile flowrate of 5.4 mgd is considered to be the current MM flow for the purposes of this evaluation, and this value is used to evaluate the current capacity of each treatment facility.

Similar to the flow evaluation, peak and average mass loading rates and concentration values were evaluated. Later in this evaluation, current strength of wastewater reaching the WRF will be used to establish the treatment requirements for the 9.0 mgd plant. If concentrations, and therefore loadings, are actually higher than what the WRF was designed for, the performance of the facility would be expected to deteriorate because of insufficient built capacity at the plant. The 90th percentile was used for this analysis to represent the maximum sustained load conditions while eliminating outliers in the dataset that may represent extreme conditions. Figure 6 illustrates the BOD loadings from 2011 and 2012 in the raw wastewater.

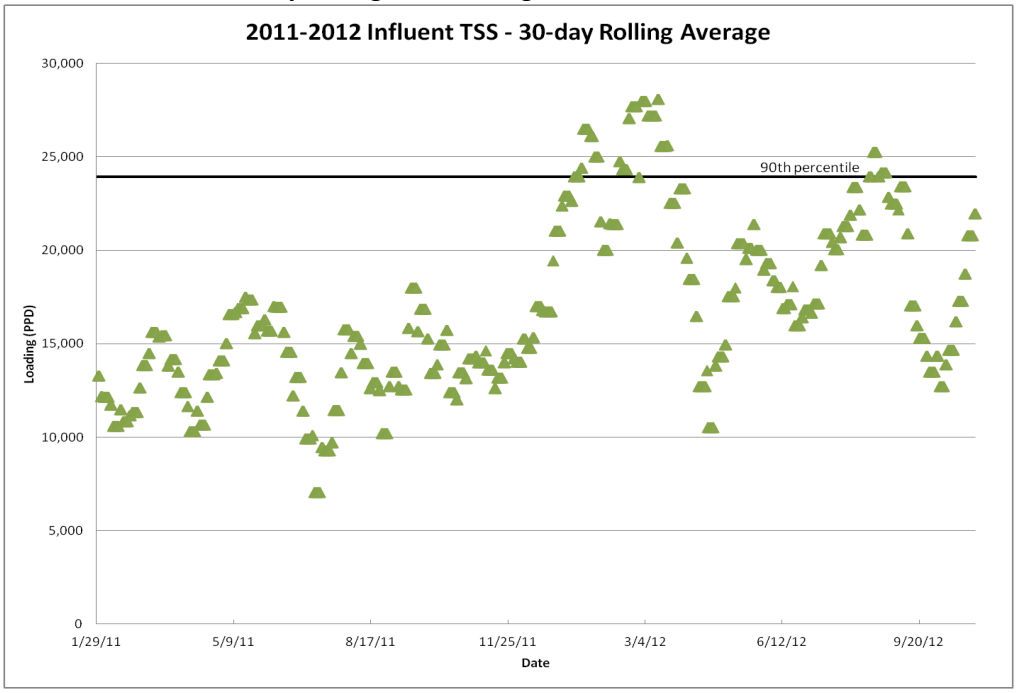
FIGURE 6
90th Percentile and 30-Day Average BOD Loadings for Raw Wastewater



The MM BOD loading was determined to be 19,722 pounds per day (lb/d). For the MM flow of 5.4 mgd described above, this represents a BOD concentration of 438 milligrams per liter (mg/L). At 9 mgd, this will correspond to a BOD loading of 32,870 lb/d. Per the Final Design Report, the WRF was designed to treat 24,695 lb/d. Therefore, based on the BOD in the raw wastewater, the WRF can only treat 6.76 mgd.

A similar analysis is done for TSS. Figure 7 illustrates the TSS loadings from 2011 and 2012 in the raw wastewater.

FIGURE 7
90th Percentile and 30-Day Average TSS Loadings for Raw Wastewater



The MM TSS loading was determined to be 23,918 lb/d. For the MM flow of 5.4 mgd, this represents a TSS concentration of 531 mg/L. At 9.0 mgd, this will correspond to a TSS of 39,863 lb/d. According to the *Final Design*

Report, the WRF was designed to treat 31,976 lb/d. Therefore, based on the TSS in the raw wastewater, the WRF can only treat 7.22 mgd.

From the resulting load and flow values, the concentrations were determined and used for the basis of analysis at 9.0 mgd maximum load condition. These values are shown in Table 1 which compares the resulting analysis with the original plant design criteria from the 2007 Final Design Report and indicates the available capacity in terms of flow rate. It also describes how much treatment capacity is currently being used. The first column, Design Criteria at 9.0 mgd, shows the values in the 2007 Final Design Report. The second column, Current Conditions, is the loading based on the concentration of the relevant parameter as determined from the two-year's operational data. More specifically, the annual average influent loading for each parameter is based on the current annual average concentration and the current annual average flowrate of 5.2 mgd. Similarly, maximum month loadings are based on current maximum month concentrations and the current maximum month flowrate of 5.4 mgd. The third column, Current Available Treatment Capacity, shows what the maximum flow is with the current concentrations and is used to determine how much available capacity, or the treatment capacity occupied which is the last column.

TABLE 1
Current WRF Raw Wastewater Loads Comparison with Design Criteria

Parameter	Design Criteria (at 9.0 mgd)	Current Conditions	Current Available Treatment Capacity (as mgd)	Occupied Treatment Capacity (as % of load capacity)
Influent Load @ AA 5.2 mgd				
BOD, lb/d	17,641	13,424	6.9	76
TSS, lb/d	21,314	15,742	7.1	74
TKN, lb/d	3,411	2,964[1]	10.0	52
NH_3-N, lb/d	2,671	1,404[2]	10.0	53
TP, lb/d	758	481	8.3	63
Influent Load @ MM 5.4 mgd				
BOD, lb/d	24,716	19,738	6.8	80
TSS, lb/d	31,994	23,928	7.2	75
TKN, ppd	4,657	4,6574[1]	13.1	41
NH_3-N, ppd	3,640	1,522[2]	12.9	42
TP, ppd	1,062	721	8	68

Notes:
(1) Values shown are based on design ratio of NH_3-N/TKN = 0.79, ratio used in the 2007 Final Design Report.
(2) Values shown in table were calculated based on provided NH_3 concentrations (NH_3-N was calculated based on NH_3 data)

During annual average (AA) conditions, the WRF has the least amount of treatment capacity available for BOD and TSS based on the calculated "occupied treatment capacity" presented in Table 1. For these parameters there is approximately an additional 25% treatment capacity available, for total of 7.0 mgd. During MM conditions the WRF has the least amount of treatment capacity available for BOD, only 20% treatment capacity available, or 6.8 mgd total. As is, with the current raw wastewater characteristics, the WRF may be unable to efficiently treat 9.0 mgd without significant modifications.

Although treatment capacity is evaluated and discussed in more detail later in this report, it is clear from Table 1 that the WRF may not be able to reliably treat flows at 9.0 mgd under current loadings. Figures 8 and 9 graphically represent the current 30-day rolling average loadings in relation to the 2007 Final Design Report 9.0 mgd design

conditions based on 2007 loads, and the estimated current 9.0 mgd design conditions based on current loads. In Figure 8, line labeled as "2011-2012 90th Percentile Loading" represent the maximum loads experienced under the current 5.4 mgd and BOD concentrations experienced at the WRF. The difference between this line and the line labeled as "MM 2007 Design Conditions @9.0 mgd" illustrates the BOD load capacity remaining at the WRF under current less than design flow conditions of WRF. The line labeled as "MM Load at Current Conditions at 9.0 mgd" represent the estimated 2013 design conditions based on current BOD concentrations and a design flow of 9.0 mgd.ne, the difference between this line and the "MM 2007 Design Conditions @9.0 mgd" line represent the load capacity shortage at WRF. Similar information was provided for TSS load capacity in Figure 9.

FIGURE 8
WRF BOD Treatment Capacity at 9.0 mgd

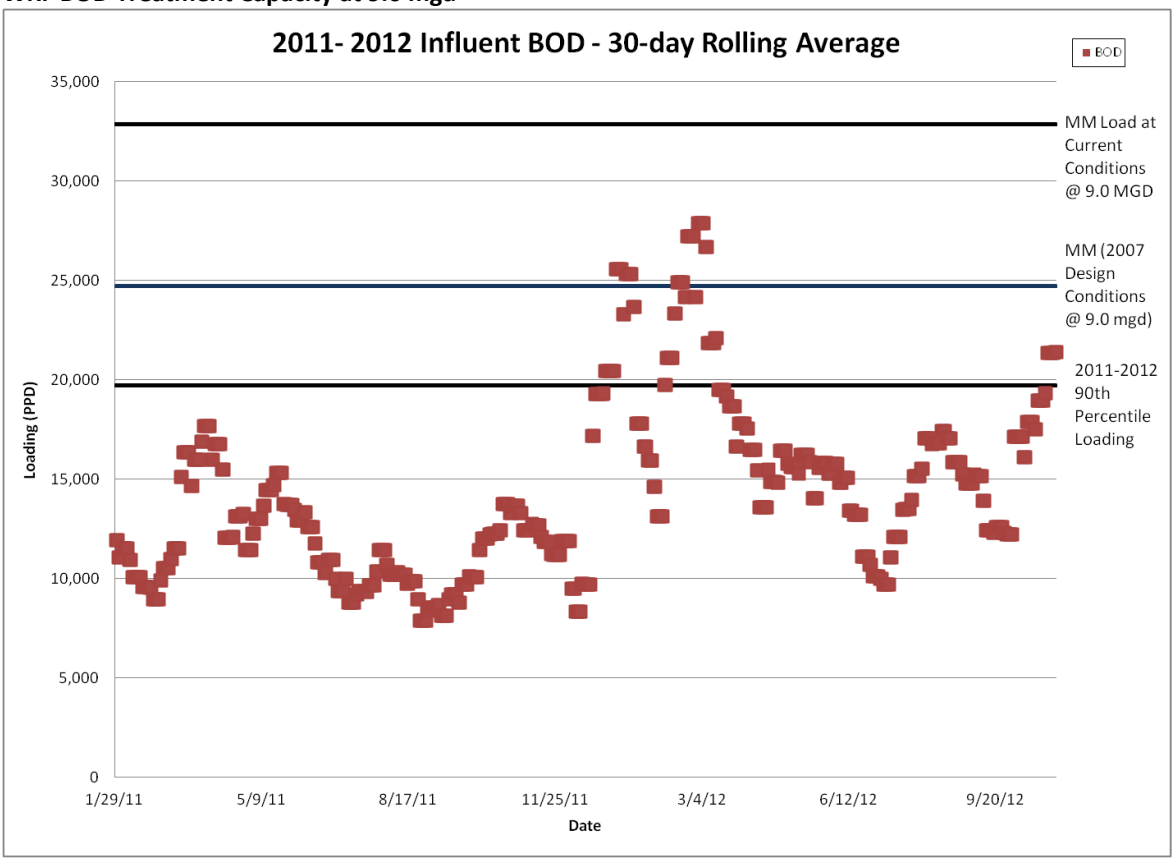
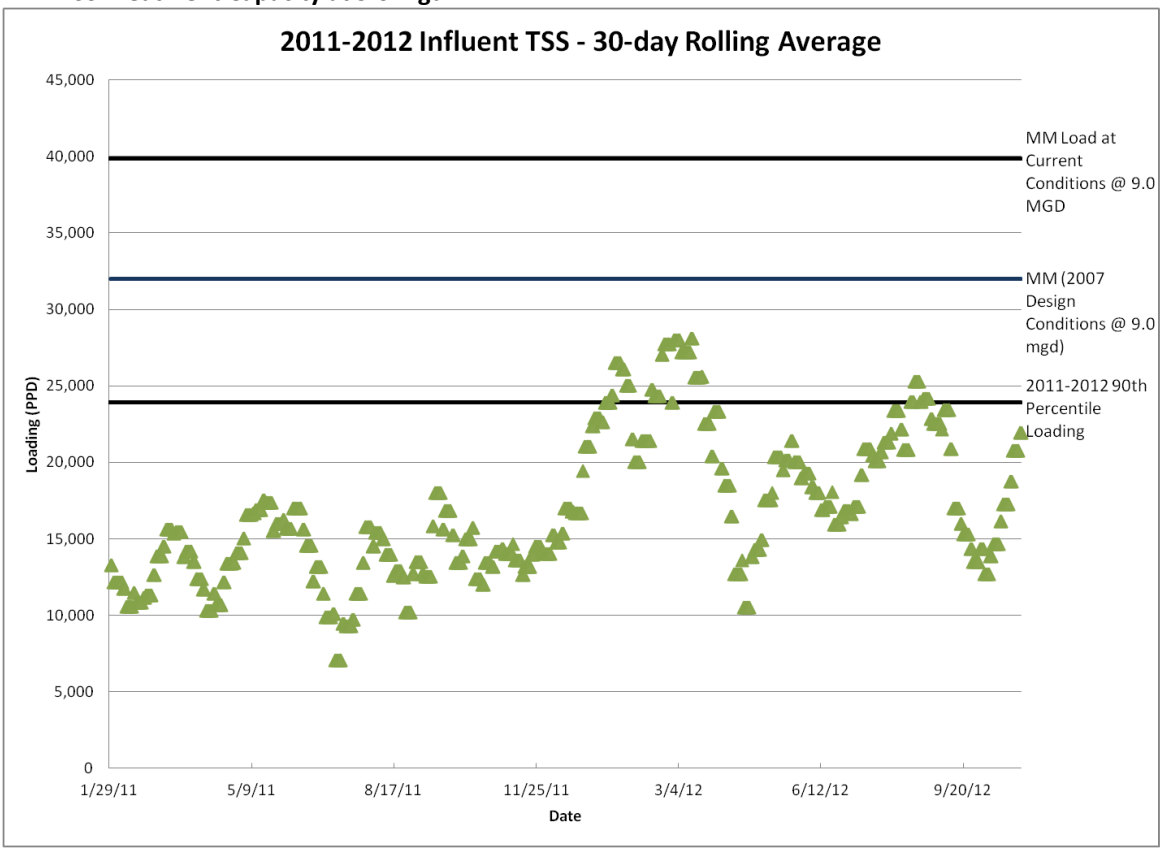


FIGURE 9
WRF TSS Treatment Capacity at 9.0 mgd



As shown on Figures 8 and 9, at 9.0 mgd, the MM load will exceed the MM design conditions established in the 2007 Final Design Report. Under these conditions it is recommended that further study of the influent flow and water quality characterization be conducted. This will allow update of the Master Plan to reflect the current and planned future wastewater conditions as well as the contribution of the Phoenix International Raceway so that decisions affecting future modifications and expansions can be based on the most accurate treatment scenarios and City needs. A more detailed characterization of the wastewater should be included, with emphasis on the seasonal nature of the flows and loads, as well as the volatile content of the suspended solids. Regular sampling for a solids mass balance through the plant should also be included.

Data was analyzed for separate flowstreams in order to evaluate the performance and capacity of each unit treatment facility. The next section describes the facility, the operations of the facility, and process and hydraulic observations which are based on the data.

2.2 Influent Pump Station and Headworks

Raw wastewater is pumped through the Influent Pump Station to Headworks where it goes through screens. Grit is then removed from the screened wastewater.

2.2.1 Function and Design

The Influent Pump Station is designed to accommodate flows up to 20 mgd. The influent screens are self-cleaning step screens. Screenings are dumped into a container and then hauled offsite for disposal. Screened wastewater then flows to a grit separator unit. Grit removed from the wastewater is washed so that organics are removed and put back into the wastewater. The remaining grit is carried to the screenings container for disposal.

2.2.2 Operational Observations and Performance

The headworks facility appeared to be performing satisfactorily at the time of the CH2M HILL site visit, hence no operational observations were made.

One issue that was identified is related to the location of the influent composite sampler and the quality of the samples collected and data generated subsequently. It is typical to install the influent sampling point at a location downstream of the influent screens. The composite sampler at the WRF is located ahead of the influent screens that collect the debris that reach the plant through sewer lines. Because the sampler is located prior to the screens, it is prone to clog with debris; thus the samples may not be representative of actual influent characteristics. TSS, and to some degree BOD and Total Kjeldahl Nitrogen (TKN), are strongly affected from the sampler errors where clogging due to large particulate material or collection of large quantities of inert material can result in an overestimate of the solids load to the downstream treatment facilities.

The recycles from solids handling operation and plant drains are also returned to the headworks and would have to be relocated so the influent sampler was not sampling recycled flows.

2.2.3 Process and Hydraulic Observations

No significant observations of the Influent Pump Station or Headworks were identified. Operating data or hydraulic capacity of the built systems was not reviewed for this facility.

2.2.4 Summary of Issues Identified

No issues other than the influent sampling location were identified.

2.3 Equalization and Primary Clarification

After raw wastewater is screened and the grit is removed, equalization and primary treatment are next steps in the overall treatment process. These facilities are constructed to operate with either the equalization basin online or bypassed.

2.3.1 Function and Design

By storing a portion or all of the flow during higher peak flows of the day and returning it to the system during lower flows of the day, plant staff is able to “trim” the flows so that a more continuous, or less fluctuating, flow is treated by the WRF, as well as peak flow conditions can be prevented from hitting the treatment units at once. This is known as *equalization*. The Equalization Basin at WRF is constructed to operate ahead of the primary treatment. Primary treatment consists of primary clarification where the wastewater becomes tranquil so that solids can physically settle to the bottom of the clarifier for removal from the flow stream. Removed solids are called *primary sludge* and are sent to the solids handling facility for further treatment. The supernatant, or Primary Effluent, leaves the clarifier to undergo more treatment by the secondary treatment system (Aeration Basins and Secondary Clarifiers).

2.3.2 Operational Observations and Performance

The only operational observations made for the primary clarifier is based on the most recent 6-month worth primary clarifier TSS data. Several of the primary effluent TSS data points appeared to be lower than average. Reasons for this anomaly may be due to the samples collected using the influent sampler being influenced by debris. Debris can also impact TSS measurements; or the variance in the analytical technique of operational staff on duty from day to day.

2.3.3 Process and Hydraulic Observations

WRF has one primary clarifier, which lacks process redundancy. For example, if the unit is to be taken out of service for routine maintenance, there is not another primary clarifier to take on the flow. The equalization basin is needed in those cases to store the incoming flow until the maintenance is completed.

Based on primary effluent sample data for 01/01/12-06/31/12, the primary clarifier has 71% removal efficiency. Typical performance of properly designed and loaded primary clarifiers is 50 to 70% TSS removal with no chemical enhancement of the settling (Water Environment Federation Manual of Practice 8, *Design of Municipal Wastewater Treatment Plants*, 2010), indicating that the WRF primary clarification process is performing as designed. The target primary sludge thickness is also being achieved.

Table 2 compares the resulting analysis with the original plant design criteria from the 2007 Final Design Report and indicates the available capacity. The surface overflow rate, weir loading rate, and hydraulic retention time are all factors of the volume of primary influent flow to be treated daily and the size of the primary clarifier.

Several other parameters are evaluated to determine the primary clarifier treatment capacity – the concentration of the sludge collected at the bottom, the amount of solids (sludge) removed, and the solids removal efficiency.

TABLE 2
WRF Current Primary Clarifier Loadings Comparison with Design Criteria

Parameter	Original Design Value	Current Conditions
No of Online Units	1	1
Surface Overflow Rate	700 - 1,000 gpd/square foot (sf) (1)	712
Weir Loading Rate	10,000 – 40,000 gpd/linear foot (lf) (2)	17,902
Hydraulic Retention Time	1.75 - 4 hours (1)	4.15
Primary Sludge Concentration	3.7% Total Solids (TS) (2)	3.7%
Max Solids Removal	26,080 lbs/day at 9.0 mgd (2)	23,255 (3)
Solids Removal Efficiency	50% – 70%	71% (4)

Notes:
(1) Source reference ADEQ Bulletin No. 11
(2) Source reference 2007 Final Design Report
(3) Source reference 2011-2012 Operational Data
(4) Source reference Avondale Primary Clarifier TSS2012.xlsx.

Based on the above table, although the peak hydraulic retention time is exceeded, the primary clarifier is adequate for current average conditions; however it is already near design capacity in terms of how much sludge it is designed to remove per day. This is likely due to the increased solids loading to the plant and not the primary clarifier itself, and the lack of process unit redundancy.

2.3.4 Summary of Issues Identified

Based on the data, no issues were identified, other than the sampling issues identified previously, affecting primary clarifier treatment performance, and the lack of redundancy in primary clarification.

2.4 Secondary Treatment

Secondary treatment includes the Aeration Basins and Secondary Clarifiers. It is the last step of the liquid treatment process before disinfection.

2.4.1 Function and Design

The Aeration Basins are designed to remove BOD and nutrients by providing the process conditions to allow growth of specialized activated sludge bacteria that will break down and consume the organics and nutrients. The process conditions such as dissolved oxygen concentration, flow recycles and tank configuration are set such that the desired types and amounts of activated sludge bacteria are sustained in the system. Secondary clarifiers are designed to further remove solids as well as the excess activated sludge from the system. The content of the aeration basins that includes the activated sludge and the wastewater going through biological treatment is known as *mixed liquor.*

A portion of settled solids from the secondary clarifiers which has a high concentration of biomass is returned to the Aeration Basins and called *Return Activated Sludge (RAS)*. This allows for activated sludge microbial populations to grow and mature which helps with the treatment process. The rest of the sludge, called *Waste*

Activated Sludge (WAS), is wasted through removal from the liquid treatment system to undergo further treatment at the solids handling facility. Ultimately waste solids are hauled away for offsite disposal. Less wasting means more biomass and solids are returned to the system, resulting in "older" biomass (increased sludge age). Additionally, in systems where longer sludge age is used as part of process conditions, the biomass will be allowed to die off and decay which results in reduced sludge quantities to be processed in the solids handling facility. An optimized balance of how much of the solids are processed in the activated sludge system versus the solids handling system is a site specific decision.

2.4.2 Operational Observations and Performance

The most apparent issues the WRF was facing during the CH2M HILL site visit were with the secondary treatment processes. This section summarizes the observations related to each issue area.

2.4.2.1 Dissolved Oxygen Concentration and Aeration

The right levels of dissolved oxygen are necessary for biological activity and vary throughout the aeration basin depending on the targeted treatment in the particular zones of the basin. For example, to remove nitrogen from wastewater (as nitrogen gas to the atmosphere), it must undergo a series of reactions. Depending on the reaction, different amounts of oxygen are needed. Therefore, it is imperative to have the correct amount of oxygen to ensure complete treatment. When this needs to be achieved concurrently with BOD removal, which is the case for WRF, having the ability to provide and control the dissolved oxygen concentration becomes crucial. Hence, understanding the oxygen levels in the aeration basins can provide valuable insight about treatment challenges a facility is facing.

During the initial visit to the plant site, the dissolved oxygen concentrations were evaluated and determined to be lower than the design condition of 2.0 mg/L. Lack of sufficient dissolved oxygen creates an environment that favors the growth of certain filamentous bacteria. These bacteria are useful to wastewater treatment, but in smaller amounts. When populations are too big they can become unmanageable which contribute to foaming and bulking conditions, resulting in poor settling conditions in the secondary clarifiers. This was validated by the Sludge Volume Index (SVI) test results of greater than 900 mL in the settleometer, representing SVI values exceeding 450 mL/g whereas an SVI of 120 mL/g is preferred. Additionally, nitrogen removal is affected by these lower oxygen levels in the zones that are supposed to contain higher dissolved oxygen levels which could result in permit violations ultimately due to high ammonia and total nitrogen values. Microscopic and lab evaluation of the bulking sludge showed that the predominant species were *Microthrix parvicella,* Type 1701 and *Nostocodia limicola*. These are all known to proliferate under low dissolved oxygen conditions.

2.4.2.2 Sludge Wasting

During the initial site visits, the wasting operations were observed to be ceased in order to increase the sludge age. Additionally, the mixers were not operating. These appeared to have caused activated sludge solids to settle in the aeration basins resulting in inefficient treatment as well as localized anaerobic zones in the basins. It is important to keep solids suspended in the aeration basins so that bacteria and oxygen adequately mix together with the food (the wastewater contaminants) the bacteria will break down. Allowing solids to settle in the aeration basins not only leads to incomplete treatment processes but also reduces the volume of basin available for treatment and thereby the amount of wastewater that can be treated adequately.

2.4.2.3 Scum Removal

Scum is the fraction of the wastewater solids and organics that is floatable and contains the oil and grease present in the raw wastewater along with other floatable material. It is removed physically through surface skimming, often combined with foam. Mechanical scum skimmers or even spray water can be used to direct the foam and scum to traps to be removed from the basin or tank. If allowed to stay, foam and scum can build up over the water surface causing odor and mechanical issues when they need to be removed. Additionally, the conditions in scum and foam trap can support growth of some bacteria such as *M. parvicella* which further exacerbates the foaming in return.

The scum removal system in the aeration basins was not in operation as staff believes this causes foaming or "burping" in the anaerobic digester. They noticed this condition in the digester ceased once the aeration basin foam removal system was discontinued. This is possible because the scum and foam material collects the bulking filamentous organisms. Returning the filamentous organisms causes foaming in the digesters. However, because scum still needs to be removed from the system to prevent nuisance conditions, means for separate scum management needs to be implemented. One way to achieve this is to thicken and dispose of the scum without diverting it to the digesters.

2.4.2.4 Rising Sludge in Secondary Clarifiers

Clarifiers are used for the physical separation of solids and liquids. The settled solids at the bottom is called "sludge blanket" and, as discussed previously, this is physically removed from the clarifiers to either be returned to the Aeration Basins or treated further in a solids handling process. If this sludge blanket is too thin (i.e.; low % TS) the solids handling process will be inefficient. This condition occurs when bulking sludge is experienced where the solids settling does not occur easily and the mixed liquor solids stay in suspension in the clarifier and result in (1) large volumes of underflow to be wasted to be able to waste a set mass of solids, (2) solids wash off from the clarifiers over the weirs.

Also, high blanket levels can be experienced if solids are allowed to build up in the clarifier resulting in anaerobic conditions in the absence of dissolved oxygen and release of nitrogen. Therefore, controlling the thickness of the sludge blanket in clarifiers is an important operating parameter. Operators must target a certain concentration of sludge at the bottom of the clarifier while ensuring the sludge does not build up too high and interrupt the physical separation processes occurring above the blanket. Successful treatment upstream, in the Aeration Basins, will result in sludge that is easier to settle.

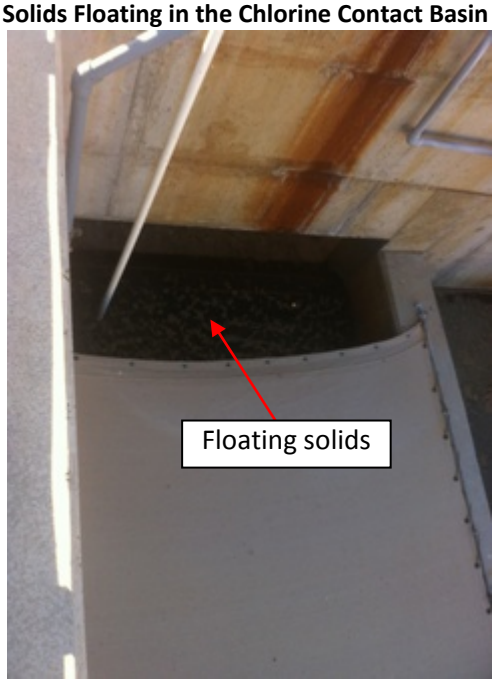
The secondary clarifiers of the WRF showed rising sludge during the early stages of the investigation. The outer portion of the clarifier between the tank wall and the effluent launder rings had large accumulations of rising sludge that appeared to be caused by improper sludge collection and removal at the bottom of the clarifiers due to improper functioning of the clarifier mechanism, and possibly bulking and denitrification occurring in the sludge blanket (see Figure 10).

Figure 10
Sludge Accumulation in Secondary Clarifier

An increased RAS rate did not mitigate this problem and caused concerns for the need of an inspection of the clarifiers. Denitrification is likely to occur if the sludge stays too long in the clarifiers. This can happen when the sludge removal system in the clarifier is set to a low rate or is experiencing a mechanical removal problem. Sludge blanket control was challenging due to unreliable RAS flow meters. This rising sludge allowed solids to pass over the effluent weirs and flow downstream into the Chlorine Contact Basins (CCT) resulting in a 2-foot accumulation of solids, possibly interfering with disinfection and increasing the chlorine demand. Once these solids accumulate in the effluent pumping station, removal becomes extremely difficult as the pump station will have to be taken offline for cleaning. Figure 11 shows solids in the CCT.

Because clarification is designed to be a physical treatment process, biological treatment that changes the populations of biomass in the sludge as well as the wastewater contaminants needs to be avoided. Consistent operation of the biological treatment system and stable sludge quality is not only important for proper operation of clarifiers but for the downstream treatment processes such as disinfection and solids handling. Once the wastewater leaves the secondary treatment system, there are no more treatment units to further treat the contaminants that were not captured in the secondary treatment system.

Figure 11
Solids Floating in the Chlorine Contact Basin



2.4.2.5 Standardized Operations Procedures and Efficiency

WRF operations staff is equipped with a process laboratory, and are trained in the various analytical procedures which is advantageous for having accurate onsite process control information and a benefit to the efficiency of plant process decision-making as the operations staff does not need to depend on an outside laboratory for the data.

A general observation made was the requirement of the operations staff to perform manual operation of the plant. Many facilities of the same size would have more automation in place to provide the operators with real time data and trending information to make process adjustments. The accuracy of various process flow meters such as RAS and WAS flow rate, and raw influent flow were questioned as the meter calibrations were not up to date. The plant staff recognized the inaccuracy of the RAS flow meter and was already in the process of installing new meters. The mixed liquor recycle (MLR) process stream did not have any flow monitoring device making it difficult to determine proper recycle rates for the denitrification process in the Aeration Basins.

One of the most important parameters in wastewater treatment is the concentration of oxygen in the Aeration Basins. Dissolved oxygen meters installed at the basins can allow easy assessment of the performance of the aeration blowers and activated sludge process. The site has meters to measure oxygen levels but they are not functional. The plant staff use hand-held meters to measure the dissolved oxygen levels, which is not only time consuming but also this practice only provides an instantaneous value when the staff is onsite taking measurements. The timing of the hand held meter readings may or may not be coinciding with the peak daily conditions (when the demand of oxygen is at the highest). The oxygen concentrations during other times of day, such as the low flow/loading periods, are also unknown. Control of the air flow to each zone is also a manual operation, involving the modulation of valves to allow adequate air flow to one basin while ensuring other basins still receive the required airflow and again requiring the manual oxygen measurements to be taken. This type of control strategy typically results in over or under aeration of the basins, and most commonly improper aeration of

the zones with the highest demand for oxygen. Also, blower operation is not tracked, and the only control point is one manual valve on the discharge of the blowers.

2.4.3 Process Observations

The treated secondary effluent can be analyzed to measure the effectiveness of the secondary treatment as this is where most of the treatment needs to be achieved. However, process parameters such as air demand, sludge age (i.e.; solids retention time [SRT]), and the mixed liquor suspended solids (MLSS) concentration can be used to indicate performance. If the aeration basins require more air than what the blowers can provide, then treatment is limited by blower capacity. If the MLSS is higher than the design, it can point to an unintended solids accumulation or possible downstream clarifier overloading condition. More sludge can be wasted from the clarifiers to help reduce the MLSS, but then the sludge handling equipment is being run more than design which causes greater wear and added operational costs. Table 3 lists the design parameters and current conditions for the Aeration Basins.

TABLE 3
WRF Current Aeration Basin Loads Comparison with Design Criteria

Parameter	Original Design Value	Current Conditions
No of Online Units	2	2
Total air supplied, scfm	6,950 (1)	N/A (2)
MLSS, mg/L	~3,000 (1)	2,700 (3)
Solids retention time, days	7-8 (1)	9 (4)

Notes:
(1) Source reference 2007 Final Design Report
(2) Operational data unavailable
(3) Source reference 2011-2012 Operational Data
(4) Source reference SRT 2.7.13.xlsx, SRT tracking tool completed by operations (2/7/13)

The resulting MLSS concentration from the data may be inaccurate due to poor settling of solids and improper aeration. Blower output data is unavailable for current conditions. Per the Final Design Report, all three basins would be used to treat flows of 6.1 mgd or more.

Similar parameters are evaluated for the secondary clarifiers as the primary clarifiers and are shown in Table 4.

TABLE 4
WRF Current Secondary Clarifier Loadings Comparison with Design Criteria

Parameter	Original Design Value	Current Conditions
No of Online Units	3	3
Surface overflow rate	800 - 1,000 gpd/sf (1)	355 (3)
Weir Loading Rate	15,000 - 25,000 gpd/lf (1)	7,162 (3)
Hydraulic Retention Time	1-2.5 hours (1)	8.1 hours
Solids Loading Rate	35 lb/d/sf	
WAS Sludge Concentration	0.7 – 1.0%	0.9%(2)
Max Solids Removed	9,162 lb/d	5,699 (2)

Notes:
(1) Source reference 2007 Final Design Report
(2) Source reference 2011-2012 Operational Data
(3) Based on state point analysis using an SVI value of 120 mL/g.

2.4.4 Summary of Issues Identified

The main issues experienced in secondary treatment are foaming due to filamentous bacteria and poor settling in the secondary clarifiers, as well as the poor nitrogen removal.

Data collection and management results in operational challenges for the plant operations staff. Flow metering, online metering, and water quality analysis of the key flow streams are lacking. This is further exacerbated by the fact that the key equipment such as sludge and recycle pumps and aeration blowers are operated manually. Hence, the plant operators have little control and a poor response time to react to process upsets or load changes.

In addition to the settling issues described as an operational observation, solids wash off over the clarifier launders are experienced. Secondary clarifier mechanisms were found to be functioning poorly.

Based on current data, the WRF has been experiencing a high MLSS concentration indicating that too much biomass was allowed to accumulate in the Aeration Basins and the mixers that should have been running were turned off. This is confirmed with the operational observations that describe the wasting and recycling strategies of the sludge.

2.5 Disinfection and Effluent Pump Station

The final step of the liquids treatment process is effluent disinfection prior to discharging at the Effluent Pump Station. This analysis looked at the CCTs but did not evaluate the Effluent Pump Station.

2.5.1 Function and Design

The disinfection process at the WRF includes a chemical feed system for sodium hypochlorite (NaOCl) and sodium bisulfate ($NaHSO_3$), and two CCTs. NaOCl serves as the disinfectant, and is injected ahead of the CCTs. The CCTs provide the necessary contact time where the disinfection of the indicator organisms are achieved. Bisulfite is added downstream of the CCTs and is used to remove residual chlorine.

2.5.2 Operational Observations and Performance

There appears to be a small opening in both CCT walls near the CCT outlets. This opening is not shown on the record drawings but can provide a path for short circuiting in the contact chamber further reducing the contact time.

Significant solids were detected in the bottom of both CCTs which could be one of the causes of the permit violations by contributing to the chlorine demand as well as reducing the treatment capacity. Eliminating the solids wash over the clarifier weirs, and into the downstream CCTs will be achieved if the sludge settleability and liquid/solids separation in the secondary clarifiers are improved and closely monitored.

Chlorine is added at the head end of the CCT, and the facility relies on hydraulics for mixing as there is no mechanical flash mixing or static in-line mixing device. Short-circuiting could result in inadequate mixing which could lead to inefficient or inadequate chemical feed and contact to provide adequate disinfection.

Performance of the CCTs based on chemical usage is difficult to measure as the pumps are on a constant feed with no real control or flow pacing, but only manual set point adjustments based on the total chlorine residual, which cannot be reliably measured due to identified interference from the water matrix. There is also occasional bleed through of ammonia due to the lack of a DO control/monitoring system, so there can be considerable chloramine formation, which is a weaker disinfectant compared to free chlorine hence requires longer contact time in the CCT compared to free chlorine.

2.5.3 Process and Hydraulic Observations

Review of the effluent turbidity, BOD, and TSS data indicate permit exceedances towards the end of Summer 2012 into Fall 2012. Review of the observed values of these parameters and the permit requirements was summarized in Table 5.

TABLE 5
WRF Effluent Quality and Permit Limits

Parameter	WRF Target	Permit	Dates Exceeded
BOD_5 (mg/L) 30 Day	15	30 (2)	None
TSS (mg/L) 30 Day	15	30(2)	9/5/12 – 10/5/12 10/16/12 – 10/31/12
Turbidity (NTU) Maximum at any time	5	No Limit (2) (3)	8/6/12 – 10/31/12
Ammonia-Nitrogen (mg/L) Daily Maximum	2.5 mg/L at 7.2 pH and 19°C 0.5 mg/L at 7.2 pH and 32°C	4.0 mg/L at 7.2 pH and 19°C (2) 1.72 mg/L at 7.2 pH and 32°C (2) No Limit (3)	3/9/11, 3/30/11, 8/1/11, 10/21-31/11, 12/20/11, 2/28/12, 7/12/12 – 10/22/12 (varied by day)

Notes:
(1) Source reference ADEQ Bulletin No. 11
(2) AZPDES Permit
(3) APP Permit

BOD was not exceeded; however, the 30-day TSS limit was exceeded in Fall 2012. Turbidity did not exceed the permit, but did exceed the WRF design target. The AZPDES permit level of daily maximum of ammonia was exceeded although the Arizona Aquifer Protection Permit (APP) permit has no limit.

2.5.4 Summary of Issues Identified

Solids accumulation in the CCTs may be due to rising sludge in secondary treatment processes, and would have resulted in additional chlorine demand in the CCT impacting the disinfection capacity of the system

Short circuiting due to structural openings and inadequate mixing may be occurring leading to an increase in chlorine demand and permit violations.

Due to the lack of DO control and monitor system (as described previously), the bleed-through of ammonia from the secondary treatment system may lead to chloramine formation.

2.6 Solids Handling

Collected sludge from both the primary clarifiers and secondary clarifiers are treated at the Solids Handling System before disposal.

2.6.1 Function and Design

The solids stream treatment includes a rotary drum thickener for the WAS before it is combined with the primary sludge in the anaerobic digesters. Anaerobic digestion of the sludge is provided to reduce the waste solids that need to be hauled off. Anaerobic digestion process produces biogas that contains methane which is captured and used as an energy source to heat the digesters. Excess gas is flared. The digested sludge is then dewatered by centrifuges prior to disposal offsite.

Specialized microbial populations complete a series of metabolic reactions during anaerobic digestion, and it is important that the sludge is contained in the digesters for a minimum period of time for these reactions to occur completely. Additionally, a fraction of the bacteria such as Methanogens are sensitive to changes in the digester environment and require a minimum amount of time to establish. Shorter hydraulic residence times (HRTs) do not allow the populations to grow in order to assist with proper completion of solids breakdown and digestion.

2.6.2 Operational Observations and Performance

Without WAS storage, the rotary drum thickeners must be run when the staff are wasting sludge. Therefore, wasting (and rotary drum thickener [RDT] operation) must occur during operational hours limiting the facility's flexibility for solids handling.

When the scum collection system is run at the aeration basins, operation staff noticed foaming in the digesters. This could be a result of the filamentous organisms as well as a sign of unstable digester operation.

It was also observed that the equipment inside the Boiler Room is not explosion proof and may not meet code. Therefore a walk-through was conducted on April 24, 2013 and the evaluation is summarized in Appendix C, *Avondale WRF Boiler Room Evaluation Technical Memorandum*. It was identified that the electrical installation within this facility is in violation of the National Electrical Code and correction requires the provision for continuous ventilation as well as push-pull ventilation, ventilation failure monitoring, interior space alarms, entry alarms, and combustible gas detection.

2.6.3 Process Observations

Data was not provided to determine performance of the Solids Handling System as this was not the focus of the study.

2.6.4 Summary of Issues Identified

Issues identified with the Solids Handling System are based on the observations from the site visit:

- Foaming in the digesters when the aeration basin scum system operates.
- Boiler Room does not meet code, see Appendix C.

SECTION 3

Operational Enhancements Implemented

After the initial observational site visit, CH2M HILL recommended some immediate operational changes to be implemented by the City. This section describes the changes and the improvements already achieved. A description of the issues is in the Operational and Process Evaluation section, by facility.

3.1 Secondary Treatment

3.1.1 Issue: Insufficient Aeration in Aeration Basins

Implemented Action: Staff have been operating the last zone as aerobic since mid-December 2012 and are already experiencing improvements in settling, higher oxygen concentrations, and complete nutrient removal. Although standard operating procedures involve turning mixers off when aerating this zone, it is important to keep the mixers running because the air is not sufficient for mixing, and solids settling occurs impacting the nitrogen removal performance.

3.1.2 Issue: Filamentous bulking and foaming in Aeration Basins

Implemented Action: Increased wasting is helping to manage the biomass populations for the desired treatment level. Additionally, increasing the oxygen levels helps inhibit the growth of the filamentous organisms. Chlorination for filamentous organism control through surface spray in the aeration basins was implemented. The WRF staff immediately started observing areas where the foam was thinner and are currently finding very little foam, if any.

3.1.3 Issue: High MLSS

Implemented Action: This was probably a symptom based on previous operation. Now that the WRF is operating at higher oxygen levels and wasting more consistently, the MLSS will be balanced at a desired level concomitant with the target SRT values. The inventory will consist of a “younger” population operating at a faster growth rate. Secondly, there was probably solids settling in the bioreactor zones that was not accounted for, and with better mixing in all the zones, not only is wasting more effective but also the dead spots are eliminated with the solids accounted for in the MLSS measurements more accurately. Data provided for 12/12/12 – 2/6/13 indicate an average MLSS of 2,050 mg/L which is lower than the calculated MLSS from the 2-year data set.

3.2 Disinfection

3.2.1 Issue: Difficulties meeting effluent parameters and goals

Implemented Action: Implementing the improvements for settling in the secondary clarifiers should reduce the carry over and settling of solids in the CCTs. Plant staff has already removed the solids from both CCTs and effluent quality has already improved.

3.3 Solids Handling

3.3.1 Issue: Secondary foam caused problems in the anaerobic digesters

Implemented Action: Foam was treated in the scum pit with granular bleach (NaHOCl) and the digester foam issue was alleviated.

SECTION 4

Plant Capacity and Modification Requirements

Plant capacity is analyzed two ways: hydraulically and treatment. The hydraulic analysis evaluates whether facilities are sized structurally to accommodate a determined volume or flow. Treatment analysis evaluates capacity based on what is in the wastewater and the limits of the technology or processes that are being used. For example, when a clarifier is loaded with large amounts of TSS, the removal of solids can be less efficient depending on the solids characteristics. Often engineering rules-of-thumb which are based on research and experience define these limitations. These loadings of pollutants are a result of the concentrations of pollutants in the wastewater upstream of the process and the flowrate of the wastewater. For example, a low flowrate with a high concentration of nitrogen could have a higher nitrogen loading than a high flowrate with a low concentration of nitrogen. Therefore, engineers look at mass loadings instead of concentrations.

The design of wastewater treatment plants is largely based on AA conditions as well as excursion conditions such as MM, maximum daily, minimum daily, and peak hour conditions. The average conditions are considered as the expected continuous conditions over the course of the year. Depending on the collection system and the size of the system, some facilities experience sharp daily and seasonal peaking conditions that make the annual average conditions not a suitable design criteria for the specific facility. The maximum month conditions are seasonal and can be considered as the design conditions for which plant performance must be attained. When evaluating the capacity of a treatment plant, the MM conditions are often used.

Process modeling allows simulation of the plant operating conditions in a computer environment through use of simultaneous solving of mass balance, stoichiometry and biological kinetics equations based on characteristics and simulation conditions for the model. Once a model is constructed representing the wastewater treatment plant, scenarios can be run to determine how that particular plant could be expected to perform under the given conditions. Process model results for the 9.0 mgd scenario based on current loads experienced at the WRF are included in Appendix D *Model Results* of this report. Data for the existing plant is used to fine-tune the model by making it more accurately represent real conditions. In lieu of sufficient data, sometimes typical values from industry experience are used. The next sections describe the predicted results for the WRF performing under a MM winter scenario at 9.0 mgd. This scenario was used because treatment is the most challenging and the WRF must be able to perform and meet anticipated permit requirements.

This analysis was done by creating a model of the WRF. Due to the flow metering and flow stream characterization inefficiencies during the time periods for which the data was collected, some assumptions were made in building the baseline model. However, the process model used for the 9.0 mgd scenario has taken into account the improved operating conditions that the WRF on track for achieving. The observations of the process unit were based on data provided specific for that treatment process, typical recommended design criteria, and predictions of how the processes would perform at 9.0 mgd.

4.1 Primary Clarification and Equalization

Table 6 compares the resulting analysis with the original plant design criteria from the 2007 Final Design Report and indicates the available capacity.

TABLE 6
WRF Primary Clarifier Future Rates Comparison with Design Criteria

Parameter	Original Design Value	Recommended or Typical Sizing Criteria	Future Conditions (at 9.0 mgd)
No of Online Units	1	N/A	1 (4)
Surface Overflow Rate	700 - 1,000 gpd/sf (1)	1,000 – 1,200 gpd/sf	944 gpd/sf
Weir Loading Rate	10,000 - 40,000 gpd/lf (2)	10,000 - 15,000 gpd/lf	23,602 gpd/lf
Primary Sludge Concentration	3.7% Total Solids (2)	4 – 6% TS	3.7%

TABLE 6
WRF Primary Clarifier Future Rates Comparison with Design Criteria

Parameter	Original Design Value	Recommended or Typical Sizing Criteria	Future Conditions (at 9.0 mgd)
Max Solids Removal	26,080 ppd (2)	N/A	24,767 ppd
Solids Removal Efficiency	50% – 70%	60% - 70% 80% to 85% with CEPT (3)	70% 85% with CEPT

Notes:
(1) Source reference ADEQ Bulletin No. 11
(2) Source reference 2007 Final Design Report
(3) CEPT = Chemically Enhanced Primary Treatment
(4) Primary clarification currently lacks redundancy with one unit.

Currently the primary clarifier is already near design capacity in terms of how much sludge it is designed to remove per day. Based on the maximum solids removal and increased amount of solids in the raw wastewater, the primary clarifier can remove sludge for up to approximately 9.5 mgd.

Although the surface overflow rate is not a concern at the 9-mgd scenario by industry standards, chemically enhanced primary treatment (CEPT) can be implemented to deal with the high mass load conditions. CEPT involves adding a dose of metal salt to the primary influent to facilitate the coagulation and settling of the solids. The increased primary treatment efficiency results in load shaving for the downstream secondary treatment process, reducing the aeration demand and secondary clarifier solids loading rates. Since CEPT is a chemical enhancement over the existing primary treatment facilities, it can be turned on and off as desired. This feature also allows for the primary clarifier to be reliable during a seasonal or short duration of a sustained increased load.

The primary treatment system lacks treatment redundancy because there is only one clarifier. If the equalization basin will remain in service, it can be assumed that flow equalization can provide some storage during normal plant operation, yet not complete redundancy for primary treatment.

4.2 Secondary Treatment

Secondary treatment includes both the aeration basins and the secondary clarifiers being operated together as one activated sludge process. This section will discuss capacity of the aeration basins and capacity of the secondary clarifiers.

4.2.1 Aeration Basins

The treated effluent can be analyzed to measure the effectiveness for secondary treatment as this is where most of the treatment gross parameters is achieved for the wastewater. However, process parameters such as air demand, SRT, and the MLSS concentration can be used to indicate performance. If the aeration basins require more air than what the blowers can provide, then treatment is limited by blower capacity. If the MLSS is higher than the design, then treatment could be limited. Table 7 summarizes the treatment capacity of the aeration basins for future conditions.

TABLE 7
WRF Future Aeration Basin Loads Comparison with Design Criteria

Parameter	Original Design Value	Recommended or Typical Sizing Criteria	Future Conditions (at 9.0 mgd)
No of Online Units	2	N/A	3
Solids retention time, days	7-8 (1)	5 - 10	8
Total air required, scfm without CEPT	6,950 (1)	N/A	21,700

TABLE 7
WRF Future Aeration Basin Loads Comparison with Design Criteria

Parameter	Original Design Value	Recommended or Typical Sizing Criteria	Future Conditions (at 9.0 mgd)
Total air required, scfm with CEPT		N/A	18,900
Mixed Liquor Suspended Solids (MLSS, mg/L) without CEPT	~3,000 (1)	3,000	3,538
MLSS (mg/L) with CEPT			2,800

Notes:
(1) Source reference Final Design Report
(2) Operational data unavailable
(3) Source reference 2011-2012 Operational Data
(4) Source reference SRT 2.7.13.xlsx, SRT tracking tool completed by operations (2/7/13)

Based on the current loadings of the WRF, at 9.0 mgd the aeration basins will require about 3 times the air as the original design, assuming 25% oxygen transfer efficiency that represent partly fouled old diffusers. The firm capacity of the blowers is only 14,763 scfm. An additional blower will be required to treat the additional flow or the aeration basins will need to be optimized for more efficient air supply and usage. Note that all three aeration basins will need to be in operation at 9.0 mgd. According to the 2007 *Final Design Report*, all three basins would be used to treat flows of 6.1 mgd or more at the original wastewater loading rates. Consideration of CEPT can relieve the aeration demand in the aeration basins, and decision to add blowers can be made after further and integrated evaluation of the whole plant improvement scenarios at WRF.

Another option is to reconfigure the aeration basins for a more efficient treatment configuration, such as expanding the volume of the aeration zones. This option is investigated further in the Modification Requirements section.

4.2.2 Secondary Clarifiers

Table 8 compares the future conditions at 9.0 mgd with the design criteria and recommended values.

TABLE 8
WRF Future Secondary Clarifier Rates Comparison with Design Criteria

Parameter	Original Design Value	Recommended or Typical Sizing Criteria	Future Conditions (at 9.0 mgd)
Number of Online Units	3	N/A	3
Surface Overflow rate (gpd/sf)	800 - 1,000 (1)	400 – 650 (average)	611
Weir Loading Rate (gpd/lf)	15,000 - 25,000 (1)	10,000 – 15,000 (average)	12,319
Solids Loading Rate (lb/d/sf) without CEPT	35	20-25	36 (4)
Solids Loading Rate (lb/d/sf) with CEPT		20-25	25
Limiting Solids Loading Rate[3]	N/A	N/A	49.
WAS Sludge Concentration (%)	0.7 – 1.0	0.6 - 1.0	0.6 - 0.7
Solids Removed (lb/d)	9,162	N/A	17,100
Solids Removed (lb/d) with CEPT		N/A	12,800
WAS Flow (mgd)	0.11 – 0.16	N/A	~0.30

TABLE 8
WRF Future Secondary Clarifier Rates Comparison with Design Criteria

Parameter	Original Design Value	Recommended or Typical Sizing Criteria	Future Conditions (at 9.0 mgd)

Notes:
(1) Source reference 2007 Final Design Report
(2) Source reference 2011-2012 Operational Data
(3) Based on state point analysis on the clarifiers using an SVI value of 120 mL/g.
(4) Indicates the potential need to add one more secondary clarifier, and to employ CEPT under MM conditions

Secondary clarifiers are limited especially by solids loading even when all three existing units are in service. The hydraulic loading rate is little over 600 gpd/sf, which is within the recommended sizing criteria value for secondary clarifiers operating at nitrifying/denitrifying facilities. Especially considering the history of filamentous bulking and SVI issues experienced at this facility, it is recommended that one additional secondary clarifier be added at WRF. Consideration of CEPT can relieve the solids loading to the secondary treatment system, and the decision to add a secondary clarifier can be made after further and integrated evaluation of the whole plant improvement scenarios at WRF.

4.3 Disinfection and Effluent Pump Station

Discharge to the aquifer must meet APP regulatory requirements, which include a fecal coliform single sample max of 500 Colony-Forming Units (CFU)/100 ml. For discharge to the Aqua Fria River, the AZPDES Permit requirement of daily maximum of 7.51 micrograms/liter (µg/L) chlorine residual shall be detected in the discharge. Table 9 summarizes the parameters for the disinfection system. Further analysis is required to determine requirements at 9.0 mgd as CCT hydraulics has significant bearing on the efficacy of disinfection.

TABLE 9
WRF Future Disinfection Comparison with Design Criteria

Parameter	Original Design Values	Recommended Value
No of Online Basins	2 (1)	2
Modal Contact Time at Max Month Flow (min)	25 (1)	60
Modal Contact Time at Peak Flow (min)	18 (1)	N/A
Chlorine Dose / Residual (mg/L)	4.2 / 1.0 (1)	N/A / 1.0
CT (min-mg/L)	30.2 (1)	N/A

Notes:
(1) Source reference 2007 Final Design Report
(2) Source reference 2011-2012 Operational Data

At 9.0 mgd, there will only be 28 minutes of detention time not counting the baffling factor requirements for proper chlorine contact sizing, whereas a higher contact time of 60 minutes at MM flow is recommended. The baffling efficiency of the existing CCTs are not known which influences the determination of the required concentration*contact time (CT) value. Not considering the baffling factor, to achieve a detention time of 60 minutes, the basins as sized can treat only 4.2 mgd. The 2007 Final Design Report is based on a contact time of 30.2 minutes which yields a MM flowrate of 8.4 mgd. More analysis is needed to determine the optimal concentration-time and dose for the disinfection system at 9.0 mgd.

Also, incomplete nitrification conditions will result in residual ammonia in the disinfection feed which will result in disinfection via contact with chloramines not free chlorine. Chloramines are not as effective as free chlorine as a disinfection agent, and require a greater contact time. It is recommended that tracer testing be conducted to establish the baffling factor of the existing CCBs and the actual modal contact time under various flow conditions.

4.4 Solids Handling System

Table 10 displays the parameters for the anaerobic digestion part of the Solids Handling system where it is apparent that an additional digester may be needed.

TABLE 10
WRF Future Anaerobic Digestion Comparison with Design Criteria

Parameter	Original Design Value	Recommended or Typical Sizing Criteria	Future Conditions (at 9.0 mgd)
Number of Online Digesters	2	N/A	2
Hydraulic Retention Time with one unit out of service (d)	--	>20	12 (2)
Minimum Hydraulic Retention Time with all units in service (d)	15 (1)	>15	6 (2)
VS Loading Rate (lb/d/cf)	0.12 (1)	0.25	0.30
VSR (%)	58 (1)	45-55	52 (3)

Notes:
(1) Source reference 2007 Final Design Report
(2) Indicates the need for additional digester capacity.
(3) Based on process model, assuming sufficient detention time with addition of two digesters.

The anaerobic digesters were designed for a 15-day HRT per the 2007 *Final Design Report*. Per United States Environmental Protection Agency (USEPA) Regulations (EPA Part 503), the residence time must be a minimum of 15 days for Class B biosolids. However, with the increase of sludge production expected for the WRF at 9.0 mgd, the hydraulic residence time will be reduced to only 12 days with two digesters in service. It is further reduced when only one is in service.

The performance of the anaerobic digesters is measured by volatile solids reduction (VSR). Volatile solids are the fraction that represent the organic content of the total solids contained in the waste sludge directed to the digesters. A digester that is performing well will break down 45 to 55% of the volatile solids typically. Per USEPA regulations (EPA Part 503), the VSR must be at least 38% to demonstrate stability of the anaerobically digested sludge.

Another digester is recommended so that complete digestion can occur when one digester is taken out of service and/or to reduce the loading to the two digesters at 9.0 mgd. Additionally, with limited digester capacity, the WRF may experience higher sludge hauling costs and/or lack of digester gas, as well as compliance with Part 503 Rule.

4.5 Modification Requirements

The WRF was found to have insufficient treatment capacity in some of the treatment units due to the increased BOD and TSS loadings in the raw wastewater. Based on the capacity analyses and performance from the process model, process-improvements are needed so the WRF can operate effectively at 9.0 mgd.

These improvements, along with the operational changes discussed previously include:

4.5.1 Primary Treatment

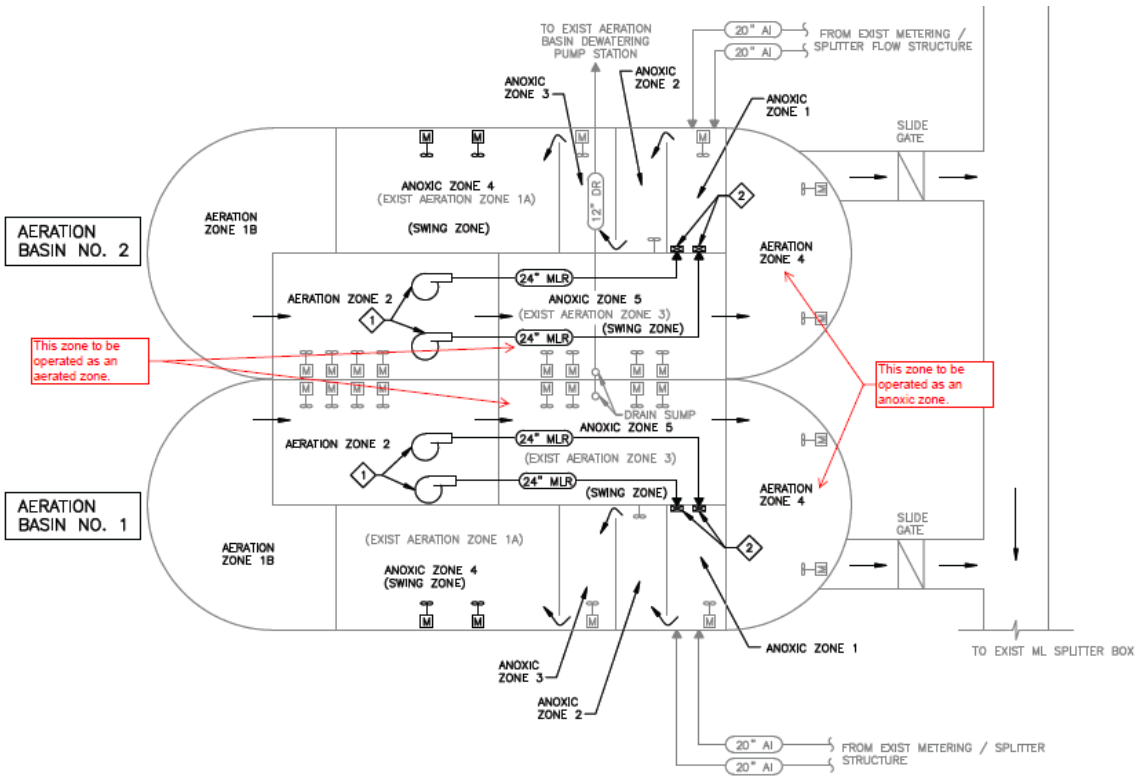
The performance of the primary clarifiers can be better assessed if the sample stream were not affected by the collection of rags. Therefore, the City may consider relocating the sample location.

4.5.2 Secondary Treatment

The aeration basin needs to be reconfigured so that 60% of the volume has air delivered to it. The last zone, Zone 4, would be operated without air and the internal recycle would be moved to draw from this zone. This configuration should be optimized in the Master Plan update effort. Condition of the process blowers and aeration diffusers also need to be evaluated as part of the Master Plan update. With this new configuration, the

total required air rate is 19,478 scfm, so an additional blower will still be needed. Figure 12 illustrates the modifications suggested for the aeration basins.

FIGURE 12
Schematic of Modified Aeration Basins



To allow the WRF to perform under all conditions in the future, it is recommended that another 90-foot secondary clarifier be constructed. While this clarifier is needed to treat the increased solids loading (unless CEPT is implemented), it would also provide some redundancy if another clarifier is out for maintenance and allow flexibility for more treatment during a plant upset.

4.5.3 Tertiary Treatment

To meet Class A+ reclaimed water standards in the future, tertiary filtration will be needed to meet turbidity goals and reduce the chlorine demand of the CCTs. A high-level analysis was conducted to determine that six duty sand filters would be implemented at a hydraulic loading rate of less than 4 gpm/sf with two units out of service. Each filter would be approximately 260 square feet. This assumption was made for the purposes of this report, and other filter types could be more thoroughly evaluated and considered in a Master Plan update.

4.5.4 Solids Handling

To meet the mean cell resident time requirements set by the USEPA and also maintain the performance of the anaerobic digesters, additional digestion capacity is needed and should be investigated in the update of the Master Plan.

Currently the mode of operation in terms of solids wasting is bulk wasting where a large volume of WAS is removed from the process over a short period of time. It is recommended that an equalization tank be installed to provide a wasting operation that is a more constant process as it will further stabilize the overall treatment process. If a tank is not provided, a wasting protocol needs to be developed. In this protocol the RDTs will be operational for a predetermined duration such as 8 hours per day, 7 days per week, during which wasting will be accomplished on a continuous basis.

Table 11 summarizes the capital requirements needed to implement the modifications described in this section.

TABLE 11
Recommended Capital Modifications

Item	Description
Headworks	Relocation of the sampling point
Primary Treatment	Addition of CEPT facilities and/or one additional primary clarifier
Secondary Treatment	Piping and structural modifications to reconfigure Aeration Basins
	Mechanical upgrades for existing secondary clarifiers
	New 90- ft Secondary Clarifier
	Additional RAS pumps for new secondary clarifier
Tertiary Treatment	8 new granular filters
Solids Handling	New WAS storage tank, pumps Digesters

SECTION 5

Recommendations

This project involved evaluating the WRF to determine operational changes for immediate performance improvement as well as capital improvements for the plant to treat up to 9.0 mgd Maximum Month. This project also involved analysis of the Avondale WRF from an administrative perspective. This section summarizes the recommendations made throughout this project.

The operations of the WRF has been focused on the process upset that has been evident over the last several months coupled with the replacement of operational and supervisory staff roles at the WRF. The interim supervisor expressed concerns with being properly prepared to supervise the new and existing staff. Specifically, the following tasks were identified as needing to be addressed:

1. Regulatory compliance and reporting requirements
2. Onsite staff work planning
3. Onsite staff communication
4. Standard Operations Procedures (SOPs) and process documentation

Recommendations provided in this report are on the information collected onsite and conversations with plant staff to better understand the status of the day-to-day operations of the facility.

5.1 Planning

An update to the Wastewater Treatment and Reclaimed Water Facilities Master Plan (Damon S. Williams and Associates, 2005) is necessary that considers the current higher loadings and anticipated raw wastewater conditions, including the future effluent from the Phoenix International Roadway, and a thorough analysis of the performance of each unit process. A characterization of the wastewater reaching the plant is recommended to understand the apparent increase in the wastewater strength as well as the sampling errors identified to be taking place due to the location of the composite sampler. The Master Plan update should review an updated 20 year planning horizon and modify flow if population and development projections support such an increase. Additionally, the Master Plan would consider anticipated changes to regulations and a phased-approach to improvements or updates required based on the changing conditions.

5.2 Staffing

An operations staffing plan was developed with the operations supervisor to identify required positions and responsibilities associated with each position. This plan is focused on the operations staff and does not cover responsibilities of the maintenance staff as they do not report to the operations supervisor. Six operations positions will comprise the operational plant staff at the WRF:

1. Operations Supervisor (1 position)
2. Operator III (2 positions)
3. Operator II (1 position)
4. Operator I (2 positions)

The daily duties of the operations staff will be organized by the two treatment streams -- liquids and solids. The majority of the job tasks associated with the liquids and solids stream will be the responsibility of the Operator I. The Operator II shall provide experience and support to the Operator I. It will be the responsibility of the Operator III to determine the areas of support that are needed to assist the Operator I. The primary responsibilities of the liquid stream are indicated in Table 12.

TABLE 12
City of Avondale WRF Liquid Stream Operational Responsibilities

Activity	Description
Log sheet completion	Perform daily plant inspection of equipment, processes, flow meters, totalizers, instrumentation, and populate daily plant log sheets. Processes include influent pumping, headworks, primary treatment, equalization, secondary processes, disinfection, and effluent pumping.
SCADA Review	In the beginning of the shift the operator will have a broad look at SCADA system liquid stream process to determine if any issues exist and need attention. The operator will also involve reviewing alarms indicated on SCADA system and reset/respond accordingly.
Process Sampling/Analysis	The operator will take appropriate samples related to process control, water quality, and regulatory compliance. Along with sampling, the necessary laboratory analysis will be performed and results will be recorded. These analyses will include TSS, pH, temperature, TS, SVI, and wet chemistry.
Field Process Control	The operator will perform field process control which include clarifier blanket depths, aeration basin dissolved oxygen levels, OUR, and chlorine residual.
Sampler/Instrumentation Check	The samplers will be checked for proper setup and operation. Online instrumentation will be maintained and checked for proper operation and calibration will be performed if necessary.
Visual Plant Walk-through	During the shift, the operator will walk through each liquid stream process and visually inspect each process area. Any issues will be reported to the Operator III that is present to ensure the issue is addressed.

The Operator I will be in a regular rotation between the liquid and solids stream areas which will occur at a pre-determined interval. The initial interval will be in the range of a two-week rotation. The job tasks associated with the solids stream are shown in Table 13.

TABLE 13
City of Avondale WRF Solids Stream Operational Responsibilities

Activity	Description
Log sheet completion	Perform daily plant inspection of equipment, processes, flow meters, totalizers, instrumentation, and populate daily plant log sheets. Processes include WAS thickening, sludge dewatering, digestion, boilers/heat exchanger, digester gas system, and sludge hauling activities.
SCADA Review	In the beginning of the shift the operator will have a broad look at SCADA system solids stream process to determine if any issues exist and need attention. The operator will also involve reviewing alarms indicated on SCADA system and reset/respond accordingly.
Rotary Drum Thickener (RDT) Operation	The RDT will be operated on an average of 7 to 8-hours per day. The operator will run this process and monitor throughout shift.
Digester Operation	The operator will monitor and maintain the anaerobic digester. This includes the recording of all necessary log data and/or required analyses to be performed on the process.
Boiler/Gas Handling System Operation	The operator will monitor and maintain the anaerobic digester. This includes flare, heat exchangers, and all ancillary systems associated with this process.
Centrifuge Operation	The operator will run the centrifuge for dewatering digested sludge on a schedule of four days on and three days off. This process also involves ensuring the cake produced is placed in disposal bin system used in storing and transport of biosolids to landfill.

TABLE 13
City of Avondale WRF Solids Stream Operational Responsibilities

Activity	Description
Visual Plant Walk-through	During the shift, the operator will walk through each liquid stream process and visually inspect each process area. Any issues will be reported to the operator III that is present to ensure the issue is addressed.

The Operator III is ultimately responsible for the work performed by the Operator I and Operator II for each of the two process streams. The following items below summarize the additional tasks of the Operator III position:

1. Status of plant process through review of process control data, log sheets, lab data, and general communications from the field staff
2. Process adjustments based on information described in item 1
3. Answer questions and provide guidance to Operator I and II
4. Regulatory reporting
5. Plant log book review
6. Quality control (QC) of lab data, log sheet information, and chemical inventory
7. Ordering chemicals, replacement parts, lab reagents, and supplies from appropriate vendor
8. Routine supervisory control and data acquisition (SCADA) monitoring
9. Assist Operations Supervisor in creation and maintaining of Standard Operations Procedures
10. Mentoring and monitoring of quality of work of the Operator I and II; provide assistance when necessary
11. Provide regular communication loop with Operations Supervisor regarding daily plant operations and any potential or existing issues
12. Establish communications with maintenance staff to ensure any requests for preventative maintenance and/or repairs are completed

The Operator III has the responsibility of ensuring the daily operation of the WRF is accomplished and so there is a need for a strong communication line between the Operations Supervisor and the operations staff. The Operations Supervisor is ultimately responsible for the planning, organizing, directing, and reviewing of the plant operational staff and associated activities. With the number of operational staff members responsible for the operation of this facility, the Operations Supervisor must have a team effort from the operators to make the facility run efficiently. Other responsibilities of the Operations Supervisor include:

1. Oversee production of monthly, quarterly, and annual reporting
2. Assist Superintendent in budget preparation
3. Provide open communication to Superintendent regarding plan status and any issues
4. Oversee contracted labor onsite
5. Implement, enforce and update safety program, emergency response, biosolids management plan, Operations and Maintenance (O&M) manual, process control program and other required programs and or plans
6. Oversee plant training activities
7. Review and comment on all construction, design, repair/replacement of equipment related to plant operations
8. Responsible for plant personnel issues such as discipline, evaluations, and work scheduling

The operators will work a 4-day week with each day comprising a 10-hour shift (4-10's). The first work week schedule will be Tuesday through Friday and the second will be Saturday through Tuesday. The entire plant operations staff will be onsite every Tuesday; therefore Tuesday is the best day to schedule staff meetings and any special projects that require staff numbers greater than a normal work day.

The scheduling for the Operator I positions will be rotated allowing for the particular process stream and counter-part Operator I to change so that the Operator I staff will learn all the plant processes and work with a different Operator I from a rotation frequency to be determined. The process area assigned and the rotation schedule will be the decision of the Operations Supervisor who will try various scheduling/rotating scenarios to identify the best fit for the WRF.

It is recommended that the facility staff (both operations and maintenance) hold a weekly meeting on Tuesdays to engage the entire staff in information exchange and topics relevant to the WRF. This meeting will allow the operations and maintenance staff to maintain close communication regarding ongoing projects and the status of any plant issues.

This weekly meeting should not only be only informative but interactive amongst the plant staff members. Meeting topics could be assigned to a different staff member each week to promote involvement from the staff during the meeting. One suggested topic is a "topic of the week" which would be assigned a week ahead of the meeting. With this assignment the operator (or maintenance) staff member would make note of a unique event, such as a troubleshooting method used for a plant issue, an interesting wastewater article, a recurring plant issue and any ideas to address, observed during the week and share this with the plant staff during the meeting. The topic is open for translation but the main point is the sharing of experiences at the plant with others that might find the subject beneficial. Another meeting topic to assign to a staff member is a safety moment. This could be an existing safety procedure, a story from another facility read online or an issue that has been observed in the field. Again, the goal of the assignment is to involve others in the meeting to keep the interest.

Various meeting subject matter was discussed with the Operations Supervisor including:

1. Outstanding/Ongoing projects and updates as to the status
2. Staff member upcoming schedules (vacation, conference attendance, etc)
3. Operations report (graphs of water quality, power usage, chemical usage, etc)
4. Maintenance report (status of repairs, equipment problems, etc)
5. City news or announcements

The weekly meeting will promote communications amongst the facility staff by allowing more involvement in the meeting than just the supervisors. This will also promote a dialogue between operations and maintenance groups that is vital to a successful working staff at a wastewater plant.

5.3 Operational

During the initial 2-week site investigation, the facility operation was observed during daily operations and comments were noted by CH2M HILL operations specialist and discussed with the onsite staff. Based on these observations and meetings with the onsite staff, a list of recommendations were made and summarized in this section. Some are also discussed in more detail in other sections of this report. The following recommendations are in no specific order of importance:

- Install an online dissolved oxygen monitoring system – With oxygen levels being one of the most important parameters in the treatment process, the operator needs to have the ability to monitor oxygen level in the aeration basins to make the necessary changes that ensure the concentration is in the correct range in each of the process zones. The current hand-held monitoring does not provide the necessary frequency of monitoring and trending.
- Automatic dissolved oxygen concentration control in the aeration basins – The manual operation of the air flow control valves is an inefficient and time consuming task requiring continuous attention from the plant staff during the day. An automated system will provide more efficient use of time, proper maintenance of oxygen levels throughout the biological process, and potential energy savings.

- Monitor and maintain solids inventory using SRT control – Currently the operations staff has instituted a solids wasting schedule based on maintaining a 10-day SRT. This combined with putting mixers into service has shown to have positive results in terms of foam reduction, nutrient removal, and improvements in sludge quality. It is recommended that this parameter be closely monitored and a follow-up investigation should be scheduled to review the SRT goal in the near future. A calculation sheet for SRT and corresponding wasting requirements can be provided for easy access by the plant staff.
- Routinely monitor process parameters to assure adequate treatment – The onsite staff was trained on using the Oxygen Uptake Rate (OUR) as a process control parameter to monitor the level of treatment in various locations of the aeration basins. This parameter allows the operator to readily determine the level of treatment based on process changes that are made. It is recommended that the staff institute this analysis as an important parameter along with the SRT to make the necessary process adjustments which will ensure compliant water quality. Other routine parameters to monitor should include SVI, DO profiling, SRT control, flow metering, etc.
- Revisit and upgrade if necessary aeration basin scum removal system – As previously discussed, the filamentous bacteria are partially entrapped in the foam that is produced. The fact that the foam is not being removed is not allowing adequate removal of the infestation of the *M. parvicella*, a foam removal system in the aeration basins is necessary to remove and dispose of these organisms completely and separate from the solids stream that is diverted to the anaerobic digesters. The concern for the effects of the filamentous organisms on the anaerobic digestion is valid and should be further investigated. A foam/ scum removal and disposal system should be immediately implemented.
- Install aeration basin internal recycle (IR) flow meters – Currently the operations staff does not have the ability to determine the ratio of IR to influent flows which is necessary to control the denitrification process in the anoxic zones. The recycle flow rate is adjusted to provide the necessary nitrate for the anoxic zones; however, rates that are too high can be energy inefficient and return too much oxygen into the anoxic zones adversely impacting the denitrification.

5.4 Administrative

Administrative recommendations are made regarding regulatory compliance and reporting as well as documentation of SOPs, data management software, data analysis and computerized maintenance management system, operator certifications, and facility process control program.

All existing facility permits were reviewed to determine what regulatory reporting is required at the WRF and the status of their reporting. Table 14 summarizes the findings of this review and the recommendations for the required reporting.

TABLE 14
WRF Regulatory Compliance and Reporting Requirements

Permit/Regulation	Reporting Requirement	Status	Recommendations
Maricopa County Air Quality Permit	1. Annual emissions inventory report	1. Calculations needed, report needed for boilers, flare, and generators	• Further follow-up to locate missing reports. • Maintain file of monthly maintenance records, and manufacturer's instructions and procedures for generator engine to be available for county review upon request. Ensure sulfur content of engine is compliant with permit requirements.
	2. Operation and maintenance plan	2. Plan not in WRF files	
Environmental Protection Agency 503 Requirements	1. Annual report including sampling results	1.Up to date	• BMP needs to be updated to reflect current biosolids disposal for landfill
	2. Biosolids Management Plan (BMP)	2. Requires an update	
Aquifer Protection Permit (APP)	Quarterly submittal of Self Monitoring Report Form (SMRF)	Up to date	• Update SMRF with Contingency and Emergency Response Plan. Some of this information can be extracted from the 2009 Facility O&M Manual but must ensure plan meets permit requirements • Review permit requirements for a log book and have plant staff provide the required operational records in log book
Arizona Pollution Discharge Elimination System (AZPDES)	Routine water quality reporting	Up to date	• Calculate annual biosolids disposal numbers to ensure reporting and testing is done only as required. • BMP needs to be included

All well-run wastewater treatment facilities have a documented standard operating program. The SOPs ensure that everyone is aware of daily requirements, staff responsibilities, and performance goals and that these tasks are performed correctly. Without proper documentation, various procedures can be missed or confusion to whether or not these tasks have been performed can occur. SOPs should include, but are not to be limited to, monitoring and removal of solids in the chlorine contact basins, monitoring key process parameters such as SRT and DO, and secondary scum removal.

The CH2M HILL operations specialist reviewed the WRF's current SOPs to identify how improvements to the documentation of WRF's procedures can be implemented. An SOP program is needed by the WRF and should start with the procedures that will provide the most benefit to staff. The SOP program should be developed based on needs established in the field. A tool that will allow for a good basis and starting place for a SOP program is the creation of "walk-through plans" for each process area. A "walk-through plan" is a training tool that starts at the basics for each process area and is an excellent reference for gaining knowledge for the less experienced staff members, especially those that will be joining the plant team very soon.

The "walk-through plan" is designed to have an operator, accompanied by a supervisor or more experienced operator, trace the steps of a given process in the field. This plan will ask questions related to basic process fundamentals, require equipment operation and identification, discuss troubleshooting scenarios that could arise during daily operations and promote the operator to learn to read process and Instrumentation Diagram (P&ID) drawings and SCADA screen shots. By having staff involvement in creating the "walk-through plans" and implementing the field exercises, the authors of these plans will realize which SOPs are needed and establish a priority of SOPs. A template to be used as a starting place for the creation of the walk through-plans is attached as Appendix E *Walk-Through Plan Template*.

The process control data and the documentation of this data were reviewed with the Operations Supervisor throughout this project. The data is kept on an Excel spreadsheet and is stored on an internal drive for the City of Avondale. The City has done research about software that would allow for efficient tracking and storage of the information in a database and it is recommended that the City continues to find data management software that could be more robust and efficient than a spreadsheet. Additional software research should include programs for maintenance records. A program for computerized maintenance management system (CMMS) should be created and implemented. During the site investigation there was considerable concern for the need for documentation and scheduling of equipment maintenance. It appeared that the current mode of operation was one that is termed “run to fail.” Equipment maintenance should be a proactive routine which allows for more efficient use of maintenance staff time, better forecasting of equipment failure/replacement, and most importantly, the ability to save funds on equipment repair and/or replacement.

A reduction in the frequency of data review is recommended. Due to the time involved in laboratory analysis, recording the data into the spreadsheet, and maintaining the file, the frequency of analysis should be reconsidered. Parameters such as MLSS, secondary effluent nutrients, and influent TSS and ammonia are currently analyzed on a daily basis. However, frequency of analysis of these parameters could be reduced as the process is now very stable and there is no significant benefit of daily analysis. This reduction would allow the liquid stream operator to dedicate time to other areas of the plant. The Operations Supervisor should determine the frequency based on his/her comfort in terms of having the information to make the right process decisions. This may be determined by trying different frequencies of analysis to see what works best.

Arizona Administrative Code requires an operator of record to have a level IV wastewater operator license and a level III operator to visit the site on a daily basis. The WRF requirements in terms of number of staff on duty and certification and training needs should be further investigated and addressed. The training of new and existing staff members should be performed on a routine basis during the fiscal year.

The overall plant process control program should be documented and reviewed with the entire plant staff to ensure that all involved with daily operations understand the goals of treatment. This will also serve as a training tool for operations refresher or new employee training to enhance the facility treatment goals from the start.

5.5 Capital

Results of the process modeling for the Avondale WRF conducted for a 9.0 mgd MM scenario indicate that several modifications and improvements are necessary to treat the increased flow. Combined with operational observations, it also identified improvements that would allow operations to be more efficient and flexible. The significant capital improvements are summarized as the following recommendations per facility below and all are summarized by time of implementation (immediate, near term, or long term) in Tables 15 and 16.

TABLE 15
Preliminary Cost Estimate for Significant Capital Improvements

Scope Item	Cost ($)
New 90-ft secondary clarifier	971,000
Upgrades for Existing Secondary Clarifiers (New mechanisms, baffle, and effluent launder improvements)	800,000
RAS pump station	741,000
Sand filters[1]	4,911,000
Wasting / RDT improvements (New WAS storage tank, pumps and blowers)	2,070,000
Additional Project Costs	
Overall site work (5%)	474,650
Yard electrical (5%)	474,650

TABLE 15
Preliminary Cost Estimate for Significant Capital Improvements

Scope Item	Cost ($)
Yard piping 5%)	474,650
I&C and Automation (10%)	949,300
Subtotal	*11,866,250*
Contractor Markups:	
Overhead (10%)	1,186,625
Profit (5%)	652,644
Mobilization/Bonds/Insurance (5%)	685,276
Contingency (30%)	4,317,238
Subtotal with Markups	*18,708,033*
Escalation to mid-point of construction (9.4%)	1,758,555
Location adjustment factor (88.5)	-2,151,424
TOTAL	**18,315,164**

Note:
1. Filters will be included if deemed necessary per the Master Plan update.
2. The cost estimates used in this analysis are considered order of magnitude estimates, and were developed by obtaining budgetary-level equipment costs from suppliers, and calculating facility costs using CH2M HILL's parametric cost estimating system (CPES). The Association for the Advancement of Cost Engineering (AACE) International defines order of magnitude costs as Class 5 cost estimates without detailed engineering data. Examples of order of magnitude costs include: (1) an estimate from cost capacity curves, (2) an estimate using scale-up or scale-down factors, and (3) an approximate ratio estimate. The estimates shown, and any resulting conclusions on project financial or economic feasibility or funding requirements, have been prepared to guide project evaluation and implementation from the information available at the time of cost estimation. The expected accuracy ranges for a Class 5 cost estimate are –15 to –30 percent on the low side and +20 to +50 percent on the high side. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope and details of engineering considerations, implementation schedule, continuity of personnel and engineering, and other variable factors.

The above items were sized and estimated based on the results of the process evaluation, and represent planning level conceptual costs. Some items were not included in the cost estimate but should be evaluated in more detail as part of the Master Plan update. They are as follows:

5.5.1 Primary Treatment

- Relocation of the sample stream location is recommended for more accurate measurement. CEPT needs to be implemented to deal with the high load conditions (i.e. to handle impacts of Phoenix International Raceway). As discussed previously, the increased primary treatment efficiency results in load shaving for the downstream secondary treatment process, reducing the aeration demand and secondary clarifier solids loading rates. Since CEPT is a chemical enhancement over the existing primary treatment facilities, it can be turned on and off as desired. This feature also allow it to be a reliable seasonal or short duration sustained load increases.

5.5.2 Secondary Treatment

- The aeration basin configuration is recommended to be modified to allow for a greater aerated volume and the internal recycle would be from the last zone. This configuration should be optimized in the Master Plan

update effort. Aeration blower capacity needs to be evaluated, as listed one additional blower is needed for the 9.0 mgd capacity, given the increased wastewater strength.

5.5.3 Solids Handling

- To meet the mean cell resident time requirements set by the USEPA, additional digestion capacity may be needed and should be investigated in the update of the Master Plan based on current digestion loading, temperature, VSR and digester maintenance data. For planning purposes, a 0.75 MG digester was estimated to contribute approximately $1.7M to the total in Table 15 before escalation and location adjustment.

5.6 Conclusions

Table 16 summarizes and classifies the recommended improvements by implementation outlook. Immediate activities are those that require lesser capital investment and investigation to implement. Near-term activities are required for the plant to reach 9.0 mgd, but require more analysis and engineering design. Long-term activities are those that would be discussed in the updated Master Plan. All activities should be discussed with the City to confirm priority and timing based on City's needs.

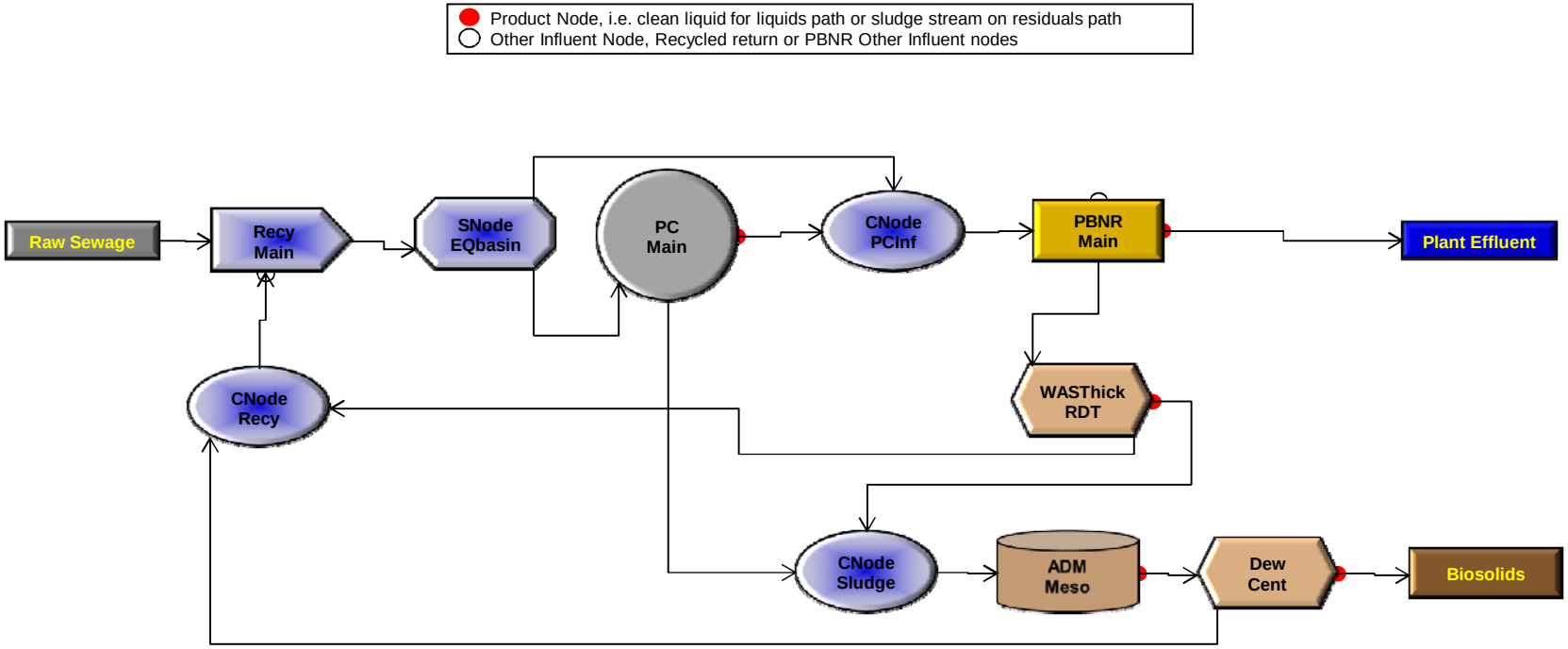
TABLE 16
Implementation Plan by Activity

Activity	Description
Immediate Activities	
Update Master Plan	Update master plan to establish latest design criteria for anticipated influent flows and loads including accepting wastewater from the Phoenix International Raceway. Should also include analysis for all treatment units of the facility. Optimal aeration basin configuration and air requirements would be identified, with necessary automation included for reliable process control. Solids handling systems would be closely evaluated, including WAS storage and increased digestion capacity.
Relocate influent sample point	To ensure accurate influent measurements, sample point should be relocated to avoid the influence of collected rags on accuracy.
Increase aeration zone and eliminate dead zones	Send air to Zones 3 and 4 and run all mixers. **ON-GOING**
Continue wasting in line with SRT goals, and routinely monitor SRT and MLSS	Currently wasting 10,000 ppd. Monitor SRT as an operational strategy and revisit the goal in the near future. **ON-GOING**
Chlorine application to aeration basins, and PAX-14 (poly aluminum chloride) dosing capability	Utilize the spray bars at Aeration Basins with diluted sodium hypochlorite to help break down foam. **ON-GOING, TO BE IMPLEMENTED AGAIN AS NEEDED** Dose sodium hypochlorite to RAS if needed at low dose levels. Evaluate and implement, if successful, PAX 14 dosing to treat the *M. parvicella*.
Secondary clarifier inspection	This inspection to determine condition of mechanisms and sludge collection should be conducted as soon as possible before flows increase and during low flow conditions. Otherwise, without secondary clarifier redundancy it cannot be conducted until a new secondary clarifier is built and online.
Raise DO levels in aeration basin	DO conditions need to be stable at 2.0 mg/L as described in the report. Routine monitoring is required until sensors are installed to provide real-time monitoring. **ON-GOING**
Update staffing plan and training	The facility requirements in terms of staffing numbers, certification, and training needs should be further investigated and addressed. **COMPLETED** The training of new and existing staff members should be performed on a routine basis during the fiscal year.

TABLE 16
Implementation Plan by Activity

Activity	Description
Facility process control program	The overall plant process control program should be documented and reviewed with the entire plant staff to ensure that all involved with daily operations understand the goals of treatment. **STARTED**
Monitor SVI and OUR routinely	Use the OUR as a process monitoring parameter to evaluate health of activated sludge in various locations of the aeration basins. It is recommended that the staff institute this analysis as an important parameter. Monitor SVI continuously. **ON-GOING**
Produce SOPs	SOPs ensure that everyone is aware of daily requirements and that these tasks are performed correctly. **STARTED**
Establish CMMS	Equipment maintenance should be a proactive routine allowing for more efficient use of maintenance staff time, better forecasting of equipment failure/replacement, and the ability to save funds on equipment repair and/or replacement.
Update Boiler Room for compliance and safety	Recommendations per Appendix C should be incorporated to bring the Boiler Room to code compliance.
Monitor solids accumulation in Chlorine Contact Basins	Monitor and periodically remove any solids accumulation in Chlorine Contact Basins. **ONGOING, ADDED TO SOPs**
Waste collected secondary scum	Determine whether secondary scum creates issues in the digesters and evaluate other treatment alternatives for it. **COMPLETE, NO LONGER AN ISSUE**
Near-Term Activities	
Conduct chlorine contact basin tracer test	Due to potential short circuiting in the chlorine contact basins, conduct field test to determine the contact time under different flow conditions, and establish proper chlorine dosing and control.
Chlorine mixing improvements	Improve chlorine mixing with baffles and/or mechanical mixing.
Include automation for aerobic basins	Requires more investigation and design to integrate an automated system for maintaining DO
Reconfigure aeration basins and provide reliable blower capacity	Requires more analysis and inspection to relocate internal recycle and determine aeration equipment condition and capacity. Evaluate the diffusers and blower operation, to ensure that as needed DO is available in the right zones of the aeration basins. Implement based on findings from Master Plan Update.
Install Mixed Liquor Recycle flow meters	Currently the operations staff does not have the ability to determine the ratio of internal recycle to influent flows, a key parameter for controlling denitrification.
New secondary clarifier	To provide redundancy for clarification at lower flows and ensure performance at 9 mgd, a new secondary clarifier is needed.
Tertiary filters	Need to evaluate the need to help polish effluent for TSS removal and to meet stringent bacteriological effluent requirements.
Long-Term Activities	
Online monitoring including raw wastewater and DO in aeration basins and flow metering	Online analyzers should be installed on major flow streams to monitor key parameters required for operational improvements.
WAS storage	Implement based on findings from Master Plan Update
Increase anaerobic digestion capacity	Implement based on findings from Master Plan Update

Appendix A – Background Information



This document is the property of CH2M HILL, Inc.
The expression of the information contained in this
document is protected under U.S. copyright law.

Pro2D Ver 10.02 Model Convergence 0.04%

Facility Operating Parameters					
Item		**Value**			**Value**
Influent Wastewater	(Metric)	(Metric)	(Metric=US*k)	(US)	(US)
Flow	m3/day			MG/day	
Design Average		**34,069**	3,785.44		**9.00**
Design Diurnal Peak		**36,113**	3,785.44		**9.54**
Design Peaking Factor for WW Diurnal flow		1.06	1.00		1.1
Design Peaking Factor for WW Diurnal loads		**1.3**	1.00		**1.3**
Carbonaceous Five-Day Biochemical Oxygen Demand (CBOD5)					
Design Average Concentration	mg/L	438	1.00	mg/L	438
Design Average Mass Loading	kg/day	**14,921**	0.45	lb/day	**32,896**
Design Diurnal Peak Mass Loading	kg/day	19,398	0.45	lb/day	42,765
Total Suspended Solids (TSS)					
Design Average Concentration	mg/L	531	1.00	mg/L	531
Design Average Mass Loading	kg/day	**18,090**	0.45	lb/day	**39,881**
Design Diurnal Peak Mass Loading	kg/day	23,516	0.45	lb/day	51,845
Volatile Suspended Solids (VSS)					
Percent VSS	%	**75%**	1.00	%	**75%**
Design Average Concentration	mg/L	398	1.00	mg/L	398
Design Average Mass Loading	kg/day	13,567	0.45	lb/day	29,911
Design Diurnal Peak Mass Loading	kg/day	17,637	0.45	lb/day	38,884
Total Kjeldahl Nitrogen (TKN as N)					
Design Average Concentration	mg/L	62	1.00	mg/L	62
Design Average Mass Loading	kg/day	**2,112**	0.45	lb/day	**4,657**
Design Diurnal Peak Mass Loading	kg/day	2,746	0.45	lb/day	6,053
Ammonia-Nitrogen (NH3-N as N)					
Design Average Concentration	mg/L	41	1.00	mg/L	41
Design Average Mass Loading	kg/day	**1,397**	0.45	lb/day	**3,079**
Design Diurnal Peak Mass Loading	kg/day	1,816	0.45	lb/day	4,003
Total Phosphorus (as P)					
Design Average Concentration	mg/L	16	1.00	mg/L	16
Design Average Mass Loading	kg/day	**545**	0.45	lb/day	**1,202**
Design Diurnal Peak Mass Loading	kg/day	709	0.45	lb/day	1,562
Alkalinity (as CaCO3)					
Design Average Concentration	mg/L	250	1.00	mg/L	250
Design Average Mass Loading	kg/day	**8,517**	0.45	lb/day	**18,776**
Design Diurnal Peak Mass Loading	kg/day	11,072	0.45	lb/day	24,409
Hydrogen Sulfide (H2S)					
Design Average Concentration	mg/L	6	1.00	mg/L	6
Design Average Mass Loading	kg/day	**204**	0.45	lb/day	**451**
Design Diurnal Peak Mass Loading	kg/day	266	0.45	lb/day	586
Chemical Addition:					
Select the Metal Salt (if used) **Ferric Chloride**				2	
Wastewater Temperature					
Raw Sewage Temperature	oC	**19**	1.00	oC	**19.0**
Plant Elevation	meters	**290**	3.28	feet	**950**
Ambient Atmospheric Pressure	kPa	98	6.89	psia	14.3
Is the Temperature Model Used? **No**					
Flow Splitter: EQbasin					
Splitter Influent Flow	m3/day	35,465	3,785	MGD	9.37
Flow Splits					
EQbasin Splitter Effluent (SplitE) PCMain	%	80%		%	80%
EQbasin Splitter Effluent (SplitE) CNodePClnf	%	**20%**		%	**20%**
Primary Clarifiers: Main					
Primary Clarifiers? **Yes**		TRUE			
Total Area	m2	**730**	0.09	ft2	**7,854**
Overflow Rate	m/day		0.04	gpd-sq.ft.	
Average		38	0.04		944
Diurnal Peak		56	0.04		1,379
Chemical Compound Applied to Primary Influen **No**	FALSE	2			
Percent of Soluble P that is ortho-P		**100%**	1.00		**100%**
Percent Removal of Colloidal Matter		**33%**			**33%**
TSS Removal Efficiency at Average Conditions		**70%**	1.00		**70%**
TSS Removal Efficiency at Diurnal Peak Conditions		**65%**	1.00		**65%**
Effective TSS Removal with Chemical Addition - Average Conditions(%)		70%	1.00		70%
Effective TSS Removal with Chemical Addition - Peak Conditions(%)		65%	1.00		65%
Percent BOD5 Removal		45%	1.00		45%
Primary Effluent	mg/L			mg/L	
TSS	172				172
TP	25.46				25.46
OP	22.76				22.76
Primary Sludge Concentration	mg/L	**37,000**	1.00	mg/L	**37,000**

This document is the property of CH2M HILL, Inc.
The expression of the information contained in this
document is protected under U.S. copyright law.

Biological Process - PBNR: Main					
Total SRT (anaerobic + anoxic + aerobic)	days	8.00	1.00	days	8.00
System pH		7.70	1.00		7.70
Nitrifier Minimum Aerobic SRT (SRT_{min})	days	1.79	1.00	days	1.79
Aerobic SRT	days	3.98	1.00		3.98
Nitrification Safety Factor		2.22	1.00		2.22
DO	mg/L	2.00	1.00	mg/L	2.00
Temperature in the Biological Process	oC	19	1.00	oC	19
SVI	mL/g	120	1.00	mL/g	120
Biosolids Production Rates					
Net Yield (mg TSS/mg BOD_5)	mg/mg	0.77	1.00	lb/lb	0.77
Volatile Fraction	%	68%	1.00	%	68%
Active Fraction	%	43%	1.00	%	43%
Nitrifier Fraction	%	2%	1.00	%	2%
Nitrogen Content, N/VSS	%	6%	1.00	%	6%
Phosphorus Content, P/VSS	%	12%	1.00	%	12%
Process Oxygen Requirements - Minus MBR Tank (if used)					
Carbonaceous AOR/BOD5 - wt/wt	kg/kg	1.24	1.00	lb/lb	1.24
Total AOR/BOD% - wt/wt	kg/kg	1.58	1.00	lb/lb	1.58
AOR (wt/day)	kg/day			lb/day	
Average		15,834	0.45		34,909
Diurnal Peak		27,373	0.45		60,347
AOR	mg/L-hr			mg/L-hr	
Average		35	1.00		35
Diurnal Peak		60	1.00		60
Bioreactor **With Secondary Clarifier**		1			
Total Bioreactor Volume	m3	18,889	3,785.44	MG	4.99
HRT	hr	12.89	1.00	hr	12.89
% non-aerobic	%	50%	1.00		50%
% aerobic	%	50%	1.00		50%
Average MLSS Concentration	mg/L	3,562	1.00	mg/L	3,562
No Media Reactors Included **AKI K1**					
Bulk Specific Surface Area (Biofilm Active)	m2/m3	No Media	3.28	ft2/ft3	No Media
Bulk Liquid Volume Displacement	-	No Media	1.00	-	No Media
Bioreactor Clarifier					
Total Area	m2	1,412	0.09	sq.ft.	15,197
Overflow Rate	m/day			gpd-sq.ft.	
Average		25	0.04		611
Diurnal Peak		36	0.04		893
Effluent TSS	mg/L			mg/L	
Average		20	1.00		20
Diurnal Peak		25	1.00		25
Underflow Rate					
Average Flow Ratio	%	100%	1.00		100%
Average Rate	m/day	25	0.04	gpd-sq.ft.	611
Peak Flow Ratio	%	150%	1.00		150%
Peak Rate	m/day	55	0.04	gpd-sq.ft.	1,340
Solids Loading Rate	kg/m2-day		4.88	lb/day-sq.ft.	
Average		176	4.88		36
Diurnal Peak		324	4.88		66
Limiting Solids Loading Rate	kg/m2-day	238	4.88	lb/day-sq.ft.	49
Return sludge rate at which limiting solids rate can be achieved					
RAS Flow Rate	m3/day	29,783	3,785.00	MGD	7.87
Percent of Influent to Bioreactor	%	85%		%	85%
RAS Concentration	mg/L			mg/L	
Average		6,837	1.00		6,837
Diurnal Peak		5,936	1.00		5,936
No Membrane Bioreactor Selected **GE/Zenon**					
Chemical Compound Applied before Secondary Clarifie		2			
WAS Thickening: RDT					
WAS Thickener? **Yes**		TRUE			
Solids Capture	%	75%	1.00	%	75%
Thickened Sludge Concentration	mg/L	50,000	1.00	mg/L	50,000
Belt Wash Water Flow Rate	m3/hr	0	0.23	gpm	0
Hours/Day of Operation		7	1.00		7
Days/Week of Operation		5	1.00		5
ADM Digester Model Meso					
Anaerobic Treatment Type **Digester**		TRUE			
Is this Unit Process in Service? **Yes**		TRUE			
Total Digester Volume	m3	5,640	3,785.00	MG	1.49
Percent of Volume that is Active	%	0.9	1.00	%	0.9
Total HRT	days	12	1.00	days	12
Total SRT	days	12	1.00	days	12
Digester Elevation	meters	290	3.28	feet	950
Digester Digester Feed pH		7.00			7.00
Volatile Solids Loading - wt VSS/vol-day	kg/m3-day	2.42	16.06	lb/ft3-day	0.15
Volatile Solids Reduction	%	52%	1.00	%	52%
Recuperative Thickening Hours/Day of Operation		8	1.00		8
Digester Gas Production	m3/day	6,587	0.03	ft3/day	232,750

This document is the property of CH2M HILL, Inc.
The expression of the information contained in this
document is protected under U.S. copyright law.

Digester Gas Production (vol/wt volatile solids destroyed)		m3/kg	1.03	0.06	ft3/lb	17
Dewatering: Cent						
Dewatering?	**Yes**		TRUE			
Solids Capture		%	**100%**	1.00	%	**99.5%**
Dewatered Sludge Concentration		%	**20%**	1.00	%	**20%**
Belt Wash Water Flow Rate		m3/hr	**0**	0.23	gpm	**0**
Hours/Day of Operation			**7**	1.00		**7**
Days/Week of Operation			**5**	1.00		**5**

This document is the property of CH2M HILL, Inc.
The expression of the information contained in this
document is protected under U.S. copyright law.

Mass Balance for Average Flow Conditions

Constituent	Raw Wastewater (RW)	Main Recycle Influent	Main Recycled Stream	Main Combined Recycle	EQbasin Splitter Influent	EQbasin Splitter Effluent	EQbasin Splitter Effluent	Main Primary Influent	Main Primary Effluent	PCInf Combined Discharge	Main Bioreactor Influent	Main Secondary Clarifier	Main Secondary Clarifier	Plant Effluent (PLE)	Main Primary Sludge	Main WAS	RDT WAS Thickener	RDT Thickened WAS	Sludge Combined Discharge	Meso Anaerobic Digester	Meso Anaerobic Digester	Cent Dewatering Influent	Cent Dewatered Sludge	Biosolids to Disposal
Flow (gallons/day)	9,000,000	9,000,000	368,759	9,368,759	9,368,759	7,495,007	1,873,752	7,495,007	7,414,799	9,288,551	9,288,551	18,577,101	8,989,929	8,989,929	80,208	298,621	298,621	30,626	110,834	110,834	110,834	110,834	10,071	10,071
Carbonaceous BOD_5 (lbs/day)	32,897	32,897	1,423	34,320	34,320	27,456	6,864	27,456	15,173	22,038	22,038	163,277	482	482	12,283	5,071	5,071	3,720	16,002	16,002	3,846	3,846	3,664	3,664
COD (lbs/day)	68,170	68,170	4,749	72,919	72,919	58,335	14,584	58,335	32,125	46,709	46,709	505,390	3,869	3,869	26,210	15,621	15,621	11,662	37,872	37,872	16,447	16,447	15,657	15,657
TSS (lbs/day)	39,882	39,882	4,344	44,227	44,227	35,381	8,845	35,381	10,614	19,460	19,460	548,546	1,501	1,501	24,767	17,039	17,039	12,780	37,547	37,547	16,893	16,893	16,809	16,809
VSS (lbs/day)	29,912	29,912	2,959	32,871	32,871	26,297	6,574	26,297	7,904	14,479	14,479	372,613	1,019	1,019	18,392	11,574	11,574	8,681	27,073	27,073	13,005	13,005	12,940	12,940
TKN (lbs/day)	4,657	4,657	801	5,458	5,458	4,366	1,092	4,366	3,649	4,740	4,740	28,213	285	285	718	870	870	648	1,366	1,366	1,366	1,366	786	786
NH_3-N (lbs-N/day)	3,079	3,079	557	3,636	3,636	2,909	727	2,909	2,878	3,605	3,605	136	66	66	31	2	2	0	31	31	610	610	55	55
NO_3-N (lbs-N/day)	0	0	7	7	7	5	1	5	5	7	7	474	230	230	0	8	8	1	1	1	0	0	0	0
TP (lbs-P/day)	1,202	1,202	1,272	2,473	2,473	1,979	495	1,979	1,575	2,070	2,070	48,232	587	587	403	1,484	1,484	1,103	1,507	1,507	1,507	1,507	616	616
Alkalinity (lbs/day as $CaCO_3$)	18,776	18,776	4,211	22,987	22,987	18,390	4,597	18,390	18,193	22,790	22,790	25,543	12,361	12,361	197	411	411	42	239	239	4,226	4,226	384	384
H_2S (lbs/day)	451	451	42	493	493	394	99	394	390	488	488	0	0	0	4	0	0	0	4	4	46	46	4	4
Temperature (°C)	19	19	24	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	35	35	35	35
BOD_5 (mg/L)	438	438	462	439	439	439	439	439	245	284	284	1,053	6	6	18,349	2,035	2,035	14,554	17,300	17,300	4,158	4,158	43,598	43,598
COD (mg/L)	908	908	1,543	933	933	933	933	933	519	603	603	3,260	52	52	39,156	6,268	6,268	45,629	40,945	40,945	17,781	17,781	186,295	186,295
TSS (mg/L)	531	531	1,412	566	566	566	566	566	172	251	251	3,538	20	20	37,000	6,837	6,837	50,000	40,592	40,592	18,264	18,264	200,000	200,000
VSS (mg/L)	398	398	961	420	420	420	420	420	128	187	187	2,403	14	14	27,476	4,644	4,644	33,964	29,269	29,269	14,060	14,060	153,971	153,971
TKN (mg-N/L)	62.00	62	260	70	70	70	70	70	59	61	61	182	4	4	1,072	349	349	2,535	1,476	1,476	1,476	1,476	9,357	9,357
NH_3-N (mg-N/L)	41.00	41	181	47	47	47	47	47	47	47	47	1	1	1	47	1	1	1	34	34	660	660	660	660
NO_3-N (mg-N/L)	0.00	0	2	0	0	0	0	0	0	0	0	3	3	3	0	3	3	3	1	1	0	0	0	0
TP (mg-P/L)	16.00	16	413	32	32	32	32	32	25	27	27	311	8	8	603	595	595	4,316	1,629	1,629	1,629	1,629	7,329	7,329
Alkalinity (mg/L as $CaCO_3$)	250	250	1,368	294	294	294	294	294	294	294	294	165	165	165	294	165	165	165	258	258	4,569	4,569	4,569	4,569
H_2S (mg/L)	6.00	6	14	6	6	6	6	6	6	6	6	0	0	0	6	0	0	0	5	5	50	50	50	50

Mass Balance for Diurnal Peak Flow Conditions

Constituent	Raw Wastewater (RW)	Main Recycle Influent	Main Recycled Stream	Main Combined Recycle	EQbasin Splitter Influent	EQbasin Splitter Effluent	EQbasin Splitter Effluent	Main Primary Influent	Main Primary Effluent	PCInf Combined Discharge	Main Bioreactor Influent	Main Secondary Clarifier	Main Secondary Clarifier	Plant Effluent (PLE)	Main Primary Sludge	Main WAS	RDT WAS Thickener	RDT Thickened WAS	Sludge Combined Discharge	Meso Anaerobic Digester	Meso Anaerobic Digester	Cent Dewatering Influent	Cent Dewatered Sludge	Biosolids to Disposal
Flow (gallons/day)	9,540,000	9,540,000	4,181,844	13,721,607	13,721,607	10,977,285	2,744,321	10,977,285	10,830,729	13,575,051	13,575,051	33,937,626	13,007,165	13,007,165	146,556	567,886	567,886	242,709	389,265	389,265	389,265	389,265	169,772	169,772
Carbonaceous BOD_5 (lbs/day)	42,766	42,766	5,491	48,257	48,257	38,605	9,651	38,605	23,407	33,059	33,059	171,552	482	482	15,172	4,641	4,641	7,245	22,417	22,417	13,620	13,620	62,308	62,308
COD (lbs/day)	89,652	89,652	48,186	137,834	137,834	110,267	27,567	110,267	63,377	90,944	90,944	1,036,824	13,969	13,969	46,890	27,752	27,752	98,337	145,227	145,227	57,763	57,763	263,948	263,948
TSS (lbs/day)	51,847	51,847	35,183	87,027	87,027	69,622	17,405	69,622	24,368	41,773	41,773	1,039,582	2,714	2,714	45,254	28,132	28,132	101,276	146,531	146,531	59,331	59,331	283,366	283,366
VSS (lbs/day)	38,885	38,885	24,932	63,815	63,815	51,052	12,763	51,052	17,893	30,656	30,656	733,994	1,916	1,916	33,159	19,863	19,863	71,506	104,664	104,664	45,677	45,677	218,151	218,151
TKN (lbs/day)	6,054	6,054	13,612	19,665	19,665	15,732	3,933	15,732	14,068	18,001	18,001	69,835	11,915	11,915	1,663	1,571	1,571	4,999	6,662	6,662	4,796	4,796	13,258	13,258
NH_3-N (lbs-N/day)	4,003	4,003	11,499	15,501	15,501	12,401	3,100	12,401	12,235	15,336	15,336	29,319	11,237	11,237	166	491	491	210	375	375	2,143	2,143	935	935
NO_3-N (lbs-N/day)	0	0	55	55	55	44	11	44	44	55	55	754	289	289	1	13	13	5	6	6	0	0	0	0
TP (lbs-P/day)	1,562	1,562	20,594	22,156	22,156	17,724	4,431	17,724	16,159	20,590	20,590	113,540	17,998	17,998	1,565	2,592	2,592	6,863	8,428	8,428	5,291	5,291	10,384	10,384
Alkalinity (lbs/day as $CaCO_3$)	24,409	24,409	80,647	105,052	105,052	84,041	21,010	84,041	82,919	103,929	103,929	216,964	83,155	83,155	1,122	3,631	3,631	1,552	2,674	2,674	14,843	14,843	6,474	6,474
H_2S (lbs/day)	586	586	709	1,295	1,295	1,036	259	1,036	1,022	1,281	1,281	0	0	0	14	0	0	0	14	14	162	162	71	71
BOD_5 (mg/L)	537	537	157	421	421	421	421	421	259	292	292	606	4	4	12,405	979	979	3,577	6,900	6,900	4,193	4,193	43,977	43,977
COD (mg/L)	1,126	1,126	1,381	1,204	1,204	1,204	1,204	1,204	701	803	803	3,661	129	129	38,338	5,856	5,856	48,549	44,704	44,704	17,781	17,781	186,295	186,295
TSS (mg/L)	651	651	1,008	760	760	760	760	760	270	369	369	3,670	25	25	37,000	5,936	5,936	50,000	45,106	45,106	18,264	18,264	200,000	200,000
VSS (mg/L)	488	488	714	557	557	557	557	557	198	271	271	2,592	18	18	27,111	4,191	4,191	35,302	32,218	32,218	14,060	14,060	153,971	153,971
TKN (mg-N/L)	76.03	76	390	172	172	172	172	172	156	159	159	247	110	110	1,360	332	332	1,985	2,051	2,051	1,476	1,476	9,357	9,357
NH_3-N (mg-N/L)	50.28	50	329	135	135	135	135	135	135	135	135	104	104	104	135	104	104	104	116	116	660	660	660	660
NO_3-N (mg-N/L)	0.00	0	2	0	0	0	0	0	0	0	0	3	3	3	0	3	3	3	2	2	0	0	0	0
TP (mg-P/L)	19.62	20	590	193	193	193	193	193	179	182	182	401	166	166	1,280	547	547	3,388	2,594	2,594	1,629	1,629	7,329	7,329
Alkalinity (mg/L as $CaCO_3$)	307	307	2,311	917	917	917	917	917	917	917	917	766	766	766	917	766	766	766	823	823	4,569	4,569	4,569	4,569
H_2S (mg/L)	7.36	7	20	11	11	11	11	11	11	11	11	0	0	0	11	0	0	0	4	4	50	50	50	50

This document is the property of CH2M HILL, Inc.
The expression of the information contained in this
document is protected under U.S. copyright law.

Mass Balance for Average Flow (

Constituent	RDT WAS Thickening	Cent Dewatering Recycle	Recy Combined Discharge
Flow (gallons/day)	267,995	100,764	368,759
Carbonaceous BOD_5 (lbs/day)	1,241	182	1,423
COD (lbs/day)	3,959	790	4,749
TSS (lbs/day)	4,260	84	4,344
VSS (lbs/day)	2,894	65	2,959
TKN (lbs/day)	222	579	801
NH_3-N (lbs-N/day)	2	555	557
NO_3-N (lbs-N/day)	7	0	7
TP (lbs-P/day)	381	891	1,272
Alkalinity (lbs/day as $CaCO_3$)	368	3,842	4,211
H_2S (lbs/day)	0	42	42
Temperature (°C)	19	35	24
BOD_5 (mg/L)	555	216	462
COD (mg/L)	1,770	939	1,543
TSS (mg/L)	1,905	100	1,412
VSS (mg/L)	1,294	77	961
TKN (mg-N/L)	99	689	260
NH_3-N (mg-N/L)	1	660	181
NO_3-N (mg-N/L)	3	0	2
TP (mg-P/L)	170	1,059	413
Alkalinity (mg/L as $CaCO_3$)	165	4,569	1,368
H_2S (mg/L)	0	50	14

Mass Balance for Diurnal Peak F

Constituent	RDT WAS Thickening	Cent Dewatering Recycle	Recy Combined Discharge
Flow (gallons/day)	2,483,143	1,698,700	4,181,844
Carbonaceous BOD_5 (lbs/day)	2,423	3,068	5,491
COD (lbs/day)	34,873	13,312	48,186
TSS (lbs/day)	33,759	1,424	35,183
VSS (lbs/day)	23,835	1,096	24,932
TKN (lbs/day)	3,848	9,764	13,612
NH_3-N (lbs-N/day)	2,145	9,354	11,499
NO_3-N (lbs-N/day)	55	0	55
TP (lbs-P/day)	5,579	15,015	20,594
Alkalinity (lbs/day as $CaCO_3$)	15,875	64,773	80,647
H_2S (lbs/day)	0	709	709
BOD_5 (mg/L)	117	216	157
COD (mg/L)	1,683	939	1,381
TSS (mg/L)	1,629	100	1,008
VSS (mg/L)	1,150	77	714
TKN (mg-N/L)	170	689	390
NH_3-N (mg-N/L)	104	660	329
NO_3-N (mg-N/L)	3	0	2
TP (mg-P/L)	269	1,059	590
Alkalinity (mg/L as $CaCO_3$)	766	4,569	2,311
H_2S (mg/L)	0	50	20

This document is the property of CH2M HILL, Inc.
The expression of the information contained in this
document is protected under U.S. copyright law.

Appendix B – Weekly Updates

CH2MHILL®

Avondale Water Reclamation Facility Operational Support and Process Assessment Project – for week ending December 7, 2012

PREPARED FOR: City of Avondale

PREPARED BY: CH2M Hill

DATE: December 10, 2012

PROJECT NUMBER: 463177

Given the short week, the daily report for Friday and the weekly report are being combined.

We saw significant improvement out at the WRF in just the two short days. The clarifiers showed dramatic improvement in the surface in terms of clarity and pin floc. The blankets were better defined, as could be seen in the sludge judge, than the day before when hard to distinguish due to the lack of settling.

On Thursday it was determined that the WRF had the following issues:

- Settling and oxygen characteristics were poor on the portion of the aeration train where no aeration was occurring
- Significant solids have been detected in the bottom of the chlorine contact chamber

Based on the first item, the process changes that have been made include the follow:

- RAS rate increased 20%
- Aeration turned on in last aerobic basin (mixer off)
- Started wasting 10,000 gallons/day

An oxygen uptake rate (OUR) test was conducted on the last basin on train #1 and the result indicated that the biomass was in endogenous respiration[1] which was great to see. Mixed liquor (activated sludge) samples out of the same location and filtered them to run nitrogen species. The ammonia was zero as was the nitrite. The nitrate was slightly elevated in train #1 but the key fact is that the OUR was not endogenous on Thursday and the ammonia results confirmed this with a concentration of 2.3 mg/L and today the basin was endogenous which was verified by the ammonia results.

Some calculations were performed to determine the disinfection chemical usage. The volume of sodium hypochlorite needed with zero demand was calculated and then compared that to what the WRF is actually using. The result was roughly an actual chemical usage of twice that of what they would need with no demand. That really emphasized the need to clean out the chlorine contact tank. We will be collaborating with plant staff to develop a plan to clean out the effluent wet well which will be a challenge.

Lance will be back out at the WRF on Monday thru Friday next week and we will continue to monitor and keep everyone in the loop.

Any questions, please contact us.

[1] *When endogenous respiration predominates, the growth of the microorganisms does not cease, but is exceeded by cellular degradation. This results in a net decrease in the mass of microbial cells.*

COPYRIGHT BY CH2M HILL ENGINEERS • COMPANY CONFIDENTIAL

Avondale Water Reclamation Facility Operational Support and Process Assessment Project – for week ending December 14, 2012

PREPARED FOR: City of Avondale

PREPARED BY: CH2M Hill

DATE: December 10, 2012

PROJECT NUMBER: 463177

Here is the overall summary for the week:

Overall there is slow, but visible progress for the WRF. Foam is seeing breakthrough as you can see in the following picture (12/14/12):

Activities and investigation results this week:

- Both the north and south contact chambers were drained and cleaned this week. Removal of significant solids will help reduce the threat of permit violations due to increased chlorine loads.
- A "window" between contact chamber wall was discovered by Miguel. It is located near the outlet of the basin and could contribute to short circuiting.
- Chlorine mixing prior to entering the contact chambers does not meet standard practice.
- Mixers in the aeration zone 4 need to remain on even when the zone is being aerated due to lack of energy from the aeration for mixing. Mixers have been turned on.
- Grit capacity was researched – based on vendor data, the model installed has a peak capacity of 20 MGD
- Regardless of foam, need to stay the course to stabilize growth rate and dissolved oxygen levels.
- Word for the week was "wasting". WRF needs to develop plan for more consistent, daily, wasting. This may involve WAS storage tank or other improvements to allow wasting 24/7.
- As the week ended, there were signs of improvement in the foam (see picture above).
- Data continues to show progress and the need to stay the course. Solids retention time and Dissolved Oxygen levels will continue to be monitored by Lance during the on-call period.
- Ken James from Maricopa County conducted his inspection on Friday:
    - Overall the inspection went well.

COPYRIGHT BY CH2M HILL ENGINEERS • COMPANY CONFIDENTIAL

- Only exception he took was the fact that the sodium bisulfite pumps were scavenged from the ferric chloride system.
- Ken mentioned that if the City of Avondale should keep the county informed of a process change (i.e. equipment relocation).
- There was discussion about an email that was sent to Ken from Todd Carpenter explaining why there were only 2 aeration basins online instead of 3 basins (this will be followed up during process review).

Lance will be back out at the WRF on Tuesday thru Thursday next week. This will conclude the initial two week "immersion" portion of our work. Lance will return the week of January 7, for the one week follow up and training. The training is tentatively set for three modules focused on General Process, Site Specific Process Control, and Operator Math.

Any questions, please contact us.

COPYRIGHT BY CH2M HILL ENGINEERS • COMPANY CONFIDENTIAL

Avondale Water Reclamation Facility Operational Support and Process Assessment Project – for week ending January 11, 2013

PREPARED FOR: City of Avondale

PREPARED BY: CH2M Hill

DATE: January 14, 2013

PROJECT NUMBER: 463177

Here is the overall summary for the week:

Activities and investigation results this week:

- Conducted three training modules
  - Module 1 - Process science in wastewater treatment
  - Module 2 - Process control parameters and applicability to Avondale WWTP
  - Module 3 - Operator Math
- Plant is currently wasting about 120,000 gallons per day
  - By increasing wasting the MLSS inventory has been reduced from around 100,000 lbs to approximately 50,000 lbs
  - The foam continues to decrease but the filaments are still preventing decent settling and compaction.
  - It's a continued effort of increasing the wasting and monitoring the process.
  - Adding a polymer to thicken the RAS and jump start the filament removal has been discussed. Some jar tests were completed, but it appears the costs associated with this would be quite high.
  - The nutrient removal continues to do well and the effluent TSS appears to be stable.
- Process model is in development and should be ready next Monday, January 14, 2013.
  - Model will need to address how the very large post anoxic zones are affecting the process.
  - Will also need to evaluate optimal sizing and need for carbon source for nutrient removal.
- We will stay the course with the current process parameters and wait to see the results of the modeling

Any questions, please contact us.

COPYRIGHT BY CH2M HILL ENGINEERS • COMPANY CONFIDENTIAL

CH2MHILL®

Avondale Water Reclamation Facility Operational Support and Process Assessment Project – for week ending April 5, 2013

PREPARED FOR: City of Avondale

PREPARED BY: CH2M Hill

DATE: April 11, 2013

PROJECT NUMBER: 463177

Here is the overall summary for the week:

During this week, Lance Mason, CH2M HILL Operations Specialist, reviewed the requirements for regulatory reporting and the current status. This was the first task on our additional work list (March 05, 2013). Lance reviewed the following permits:

1. APP
2. AZPDES
3. County Air Permit
4. Biosolids Management Plan (503 requirement)
5. Emergency Response/Contingency Plan (APP requirement)

Lance made notes on which items were in question and discussed with Miguel Ayala. Miguel showed Lance what reports/plans that were available. The good news is that the routine reporting requirements for the APP and AZPDES permits are up to date. Lance and Miguel also attended a meeting with Hach regarding a reporting/information management system called WIMS. According to Lance, the City is looking into purchasing this software which would save a tremendous amount of time in the regulatory reporting tasks.

The Maricopa County Air Permit had some issues with finding out the status of emissions reporting and some of the maintenance records that are required to be kept onsite and to be made available to a County Inspector. The Biosolids Management Plan and Emergency Response Plan are in need of some updating and were very vague. Lance is going to send Miguel some examples of these plans that he could use to update the existing plans.

The second task was to start on the onsite staffing plan. The first step was to have Lance meet with Miguel to see what his thoughts were on utilizing manpower, job descriptions, and training schedules. Lance will be putting together a draft plan per the discussions with Miguel. On Lance's next visit, he and Miguel will review the plan. Copies will also be sent to Wayne Janis and Marilyn DeRosa so they can be part of the discussion. There are still some questions regarding what the City is going to do in terms of the maintenance workers and who ultimately will supervise that group.

During this week, Lance has also been discussing various management issues and methods so that whatever transition Miguel will have in the future will be smooth.

Miguel wanted a couple of weeks to look for more of the required reports and to think about the standard operating procedures (SOPs) that he thinks are most important. Lance will return to the site to review this info with Miguel and start on the other tasks.

After the final site visit Lance will draft a technical memorandum to summarize everything that has been discussed, discovered, and our final recommendations for the City. This information will also be included in the final report.

Please let us know if you have any questions.

COPYRIGHT BY CH2M HILL ENGINEERS • COMPANY CONFIDENTIAL

Appendix C – Avondale WRF Boiler Room Evaluation Technical Memorandum

Avondale WRF Boiler Room Evaluation

PREPARED FOR: Doug Berschauer / PHX

COPY TO:

PREPARED BY: Neal Forester / CVO

DATE: April 29, 2013

PROJECT NUMBER: 472068.PS.B2

On April 24, 2013, CH2M HILL staff conduction an examination of the Boiler Room at the City of Avondale Water Reclamation Facility. This memorandum summarizes the evaluations of the Boiler Room for compliance with applicable codes and standards. This memorandum reviews the current condition of the existing spaces, and summarizes proposed HVAC, gas detection, monitoring and alarming modifications necessary for compliance.

Electrical Classification

The electrical classification of the space is determined in accordance with the 2011 version of NFPA 70, National Electrical Code (NEC) and the applicable reference standard of the 2012 version of NFPA 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities. The determination of the electrical classification is based upon the process exposure and any mitigating measures such as space ventilation. Under the terms of NFPA 820 the boiler room is categorized as an Anaerobic Digester Control Building. In installations such as this where the space is physically separated from any gas handling equipment, the classification is Class 1, Division 2, Group D unless the space is continuously ventilated at 6 air changes per hour (ACH) where the classification reduces to unclassified. An examination of the design drawings and O&M documentation for this facility indicate that the evaporative cooling unit (ECU) serving the space operates only based upon space temperature. So even though this unit provides up to 24 ACH it cannot be utilized to reduce the space classification. Therefore the space electrical classification is determined to be a Class 1, Division 2, Group D.

The installed electrical equipment, wiring systems and mechanical equipment do not appear to be rated from this classification. All observed installations appear to be for an unclassified space. As such the electrical installation within this facility is in violation of Article 500 of the NEC. It should be noted that the nature of the boiler equipment precludes operation within a classified space. Therefore, changing the installed electrical equipment to that suitable for operation in a classified electrical space is not an option. The only option for the correction of this space is to provide continuous ventilation at 6 ACH and the additional measures required by NFPA 820.

Additional Requirements

In addition to continuous ventilation there are five additional requirements for this space to achieve an unclassified electrical classification. These are push-pull ventilation, ventilation failure monitoring, interior space alarms, entry alarms, and combustible gas detection.

Modifications

The following is a summary of the recommended changes to the existing installation in order to achieve compliance with the applicable codes and standards. These are recommended modifications and other solutions are possible.

Ventilation Rate:

A minimum of 6 ACH of continuous ventilation is required. Continuous operation of the existing system at 24 ACH is not advised due to issues related to low temperatures. There are two general options for the provision of the required continuous ventilation. Both options are presented below. Option 2 is recommended for this facility.

COPYRIGHT CH2M HILL • COMPANY CONFIDENTIAL

Option 1:

The existing ECU can be converted to variable speed operation such that the minimum flow of 3,600 CFM can be provided on a continuous basis and the design cooling air flow rate of 15,000 CFM can still be provided as cooling is required. This will required extensive modification of the existing ECU controls.

Option 2:

The existing ECU can be retained as it is without modification to provide the design cooling air flow rate of 15,000 CFM and operate only as required for cooling. An additional air handling unit can be provided to supply the required minimum flow of 3,600 CFM. This unit could be provided without any internal heating or cooling. This option will not require any modification of the existing ECU controls.

Push-Pull Ventilation

The space will require push-pull ventilation. Mechanical exhaust equal to the continuous flow needs to be provided to meet this requirement. This would require the addition of an exhaust fan.

Ventilation Failure Monitoring

Each of the units providing the continuous ventilation is required to be monitored for ventilation failure. This can be done through the use of a current sensor on the fan electrical supply. At any time the unit is not operating the failure would be indicated.

Interior Space and Entry Alarms

A combination of both audible and visual alarms is required to be provided for the entire boiler room space. Either audible and visual alarms or a GO/NO-GO light system is required outside of each enter to the boiler room space. These alarms are required to activate whenever a ventilation failure or gas detection indication occurs. Additionally the alarms are required to report to monitored location within the plant. It is advised that all of these alarm functions be provided within the SCADA control system.

Combustible Gas Detection

A combustible gas detector is required to be installed within the space to detect the presence of gas. The alarm level is required to be set at 10% of the lower explosive limit of the gas. The alarm would report directly to SCADA for initiation of space and entry alarms. The detector would be located on the west side of the facility adjacent to the boilers due to the proximity of the gas piping and air flow patterns within the space.

COPYRIGHT CH2M HILL • COMPANY CONFIDENTIAL

Appendix D – Model Results

CITY OF AVONDALE, ARIZONA
January 2011 Monthly Report
1/01/2011 to 1/31/2011

CITY OF AVONDALE, ARIZONA
January 2011 Monthly Report
1/01/2011 to 1/31/2011

CITY OF
anuary 2011
1/01/2011 to

CITY OF AVONDALE, ARIZONA
January 2011 Monthly Report
1/01/2011 to 1/31/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE					SOLIDS HANDLING			EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
1/1/11	4.970	7.42	20.1				2,509	9,575	320	128	0.045324	3,619	11,439	23,699				1.63				3
1/2/11	5.524	7.59	21.0				2,528	9,544	320	127	0.045179	3,596	11,456	23,919				1.73				3
1/3/11	5.231	7.53	21.1		45.0		2,540	9,569	340	134	0.050049	3,994	12,273	24,074	2.00	0.90	0.012	2.03				2
1/4/11	5.087	7.62	21.8	290		218	2,533	9,518	330	130	0.050171	3,983	12,750	23,646				1.74	1	6	272	1
1/5/11	5.096	7.37	21.5		46.0		2,529	9,457	330	130	0.050138	3,955	13,602	23,678	0.30	1.20	0.008	1.74			6	1
1/6/11	5.069	7.67	22.6				2,513	9,367	340	135	0.100888	7,882	26,961	23,651				1.66				1
1/7/11	4.995	7.52	22.3		49.0		2,497	9,298	340	136	0.079063	6,131	19,771	23,696	0.30	2.00	0.006	1.64				<1
1/8/11	5.430	7.60	22.4				2,483	9,262	300	121	0.050070	3,868	11,826	23,369				1.47				<1
1/9/11	5.666	7.46	20.4				2,474	9,302	330	133	0.040567	3,147	8,857	24,155				1.65				<1
1/10/11	5.101	7.64	19.5		37.0		2,442	9,319	370	152	0.000000	0	0	22,679	1.00	0.60	0.011	2.04				<1
1/11/11	5.083	7.66	22.8	384		343	2,422	9,258	350	145	0.056998	4,401	13,969	22,997				1.69	1	2	6	<1
1/12/11	5.080	7.44	21.3		32.0		2,403	9,167	350	146	0.049982	3,821	11,942	23,032	0.03	1.80	0.000	1.73				<1
1/13/11	4.975	7.55	22.1				2,410	9,106	340	141	0.055068	4,182	14,478	23,008				1.56				<1
1/14/11	4.928	7.56	22.7		48.0		2,402	8,978	340	142	0.058230	4,360	15,231	23,116	0.30	2.00	0.000	1.48				<1
1/15/11	5.346	7.40	23.1				2,404	8,809	350	146	0.045232	3,323	10,924	23,183				1.29				1
1/16/11	5.295	7.31	22.7				2,397	8,734	350	146	0.063083	4,595	15,237	23,371				1.67				1
1/17/11	5.418	7.15	20.1		45.0		2,395	8,542	350	146	0.050050	3,566	11,740	22,941	2.00	1.00	0.018	1.71				<1
1/18/11	5.024	7.54	18.5	336		289	2,384	8,509	420	176	0.040011	2,839	9,642	23,049				1.60	4	2	22	<1
1/19/11	4.970	7.56	18.9		24.0		2,365	8,475	380	161	0.068685	4,855	16,996	24,945	0.30	1.00	0.025	1.68				<1
1/20/11	4.938	7.39	23.3				2,357	8,481	350	148	0.030065	2,127	7,073	28,498				1.27				<1
1/21/11	4.910	7.43	23.2		50.0		2,358	8,521	350	148	0.030130	2,141	7,234	24,026	2.00	2.40	0.002	1.72				<1
1/22/11	5.407	7.50	22.4				2,351	8,541	400	170	0.030070	2,142	7,089	21,872				1.47				<1
1/23/11	5.596	7.57	23.1				2,347	8,536	400	170	0.040417	2,877	9,263	20,692				1.86				1
1/24/11	5.195	7.67	18.8		35.0		2,355	8,642	340	144	0.040112	2,891	10,083	16,854	2.00	0.01	0.280	2.72				sample damaged
1/25/11	4.960	7.88	18.4	254		288	2,381	8,682	340	143	0.040145	2,907	9,261	21,206				1.78	2	2	5	<1
1/26/11	4.937	7.56	18.4		37.0		2,407	8,741	390	162	0.039989	2,915	9,165	22,337	0.30	1.60	0.000	1.98				<1
1/27/11	4.970	7.31	21.7				2,417	8,807	350	145	0.080062	5,880	19,866	21,724				1.72				<1
1/28/11	4.965	7.43	21.4		46.0		2,418	8,838	360	149	0.060094	4,429	14,875	22,615	1.00	3.10	0.000	2.30				<1
1/29/11	5.416	7.62	22.2				2,417	8,795	400	166	0.043050	3,158	9,767	22,382				1.29				<1
1/30/11	5.592	7.61	21.6				2,418	8,783	400	165	0.050062	3,667	10,822	19,401				1.81				<1
1/31/11	5.090	7.42	22.2		32.0		2,410	8,732	400	166	0.050087	3,648	11,594	21,516	2.00	0.90	0.007	1.96				<1
Average:	**5.170**	**7.52**	**21.3**	**316**	**40.5**	**285**	**2,428**	**8,964**	**356**	**147**	**0.049454**	**3,706**	**12,103**	**22,882**	**1.04**	**1.42**	**0.028**	**1.73**	**2**	**3**	**62**	**2**
Minimum:	**4.910**	**7.15**	**18.4**	**254**	**24.0**	**218**	**2,347**	**8,475**	**300**	**121**	**0.000000**	**0**	**0**	**16,854**	**0.03**	**0.01**	**0.000**	**1.27**	**1**	**2**	**5**	**1**
Maximum:	**5.666**	**7.88**	**23.3**	**384**	**50.0**	**343**	**2,540**	**9,575**	**420**	**176**	**0.100888**	**7,882**	**26,961**	**28,498**	**2.00**	**3.10**	**0.280**	**2.72**	**4**	**6**	**272**	**3**

CITY OF AVONDALE, ARIZONA
February 2011 Monthly Report
2/01/2011 to 2/28/2011

CITY OF AVONDALE, ARIZONA
February 2011 Monthly Report
2/01/2011 to 2/28/2011

TY OF
uary 2011
/2011 to

CITY OF AVONDALE, ARIZONA
February 2011 Monthly Report
2/01/2011 to 2/28/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE							SOLIDS HANDLING			EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
2/1/11	4.913	7.94	21.2	188		182	O/S	2,386	2,358	8,678	340	142	0.070122	5,075	17,628	20,677				1.55	2	2	13	<1
2/2/11	4.969	7.40	20.9		39.0		O/S	2,407	2,387	9,748	370	155	0.059691	4,853	14,264	21,796	1.00	1.20	0.009	1.42				<1
2/3/11	5.028	7.51	20.4				O/S	2,355	2,424	8,866	350	147	0.050058	3,701	11,777	22,609				1.86				<1
2/4/11	4.937	7.69	20.4		32.0		O/S	2,357	2,333	8,782	350	148	0.050123	3,671	11,802	20,636	0.30	8.40	0.013	1.63				<1
2/5/11	5.390	7.53	20.4				O/S	2,374	2,307	8,200	350	148	0.052132	3,565	11,744	19,572				1.68				<1
2/6/11	5.648	7.68	22.4				O/S	2,291	2,478	8,654	370	156	0.035408	2,556	7,409	20,403				2.08				1
2/7/11	5.180	7.37	20.0		37.0		O/S	2,442	2,384	9,300	400	168	0.038062	2,952	8,409	17,393	2.00	0.90	0.000	2.01				<1
2/8/11	5.059	7.53	17.7	238		208	O/S	2,452	2,352	8,980	380	160	0.040069	3,001	9,431	19,593				1.68	3	3	<1	<1
2/9/11	5.041	7.45	18.4		48.0		O/S	2,435	2,421	8,720	450	189	0.052147	3,792	12,551	20,870	2.00	1.00	0.042	1.45				<1
2/10/11	5.105	7.56	19.6				O/S	2,446	2,402	9,106	430	180	0.081295	6,174	20,561	21,706				1.97				<1
2/11/11	5.027	7.42	18.3		43.0		O/S	2,376	2,352	8,964	460	192	0.084683	6,331	21,121	21,896	1.00	3.40	0.002	1.83				<1
2/12/11	5.460	7.16	21.5				O/S	2,227	2,323	8,696	360	151	0.040123	2,910	9,158	22,015				2.14				<1
2/13/11	5.617	7.54	22.0				O/S	2,370	2,281	9,092	380	160	0.040025	3,035	8,776	19,297				2.48				<1
2/14/11	5.073	7.61	18.5		35.0		O/S	2,314	2,319	10,886	330	140	0.039991	3,631	8,482	21,261	1.00	1.00	0.021	3.12				<1
2/15/11	4.974	7.59	18.3	362		244	O/S	2,429	2,448	9,048	650	275	0.050090	3,780	7,645	18,721				1.33	1	3	2	<1
2/16/11	4.984	7.57	19.8		55.0		O/S	3,006	2,985	8,976	500	204	0.050450	3,777	8,489	21,332	2.00	1.50	0.013	1.04				<1
2/17/11	5.034	7.35	20.2				O/S	3,048	3,116	8,892	550	216	0.085060	6,308	14,167	22,521				1.30				<1
2/18/11	4.958	7.25	21.0		40.0		O/S	2,969	3,001	8,902	600	228	0.080015	5,941	12,695	20,128	0.30	1.10	0.002	1.21				<1
2/19/11	5.343	7.51	23.0				O/S	2,942	2,812	8,722	550	202	0.100356	7,300	14,627	21,331				1.83				1
2/20/11	5.325	7.52	22.7				O/S	3,050	2,960	8,540	650	231	0.100031	7,125	14,136	20,974				2.04				<1
2/21/11	5.479	7.43	19.6		38.0		O/S	3,076	2,937	8,588	660	227	0.145136	10,395	25,770	18,455	1.00	0.90	0.034	2.69				<1
2/22/11	5.058	7.55	21.2	296		224	O/S	2,889	2,704	8,456	450	152	0.111500	7,863	20,326	21,313				2.03	3	3	20	<1
2/23/11	5.077	7.66	19.9		40.0		O/S	2,961	2,840	8,380	650	220	0.099962	6,986	17,863	21,539	2.00	1.00	0.033	1.68				<1
2/24/11	5.028	7.44	20.7				O/S	2,765	2,616	8,290	650	225	0.099952	6,911	17,864	19,529				1.13				<1
2/25/11	5.023	7.48	21.8		48.0		O/S	2,622	2,570	8,168	800	282	0.204105	13,904	36,296	22,253	0.30	2.10	0.002	1.38				<1
2/26/11	5.542	7.65	22.9				O/S	2,479	2,498	8,039	550	198	0.204195	13,690	32,003	21,550				1.66				<1
2/27/11	5.648	7.47	22.4				O/S	2,526	2,426	7,459	450	166	0.080138	4,985	10,355	20,585				1.41				<1
2/28/11	5.091	7.53	20.3		36.0		O/S	2,567	2,483	7,662	540	205	0.083801	5,355	12,083	20,276	0.30	0.90	0.010	1.91				<1
Average:	**5.179**	**7.51**	**20.6**	**271**	**40.9**	**215**	**#DIV/0!**	**2,591**	**2,554**	**8,743**	**485**	**188**	**0.079597**	**5,699**	**14,908**	**20,723**	**1.10**	**1.95**	**0.015**	**1.77**	**2**	**3**	**12**	**1**
Minimum	**4.913**	**7.16**	**17.7**	**188**	**32.0**	**182**	**0**	**2,227**	**2,281**	**7,459**	**330**	**140**	**0.035408**	**2,556**	**7,409**	**17,393**	**0.30**	**0.90**	**0.000**	**1.04**	**1**	**2**	**2**	**1**
Maximu	**5.648**	**7.94**	**23.0**	**362**	**55.0**	**244**	**0**	**3,076**	**3,116**	**10,886**	**800**	**282**	**0.204195**	**13,904**	**36,296**	**22,609**	**2.00**	**8.40**	**0.042**	**3.12**	**3**	**3**	**20**	**1**

CITY OF AVONDALE, ARIZONA
March 2011 Monthly Report
3/01/2011 to 3/31/2011

CITY OF AVONDALE, ARIZONA
March 2011 Monthly Report
3/01/2011 to 3/31/2011

TY OF
011 Monthly
/2011 to

CITY OF AVONDALE, ARIZONA
March 2011 Monthly Report
3/01/2011 to 3/31/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE							SOLIDS HANDLING			EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
3/1/11	5.005	7.41	19.8	428		328	O/S	2,511	2,474	7,684	800	321	0.083095	5,325	11,654	18,571				1.10	1	2	19	<1
3/2/11	5.118	7.49	21.0		25.0		O/S	2,541	2,420	7,674	450	181	0.120175	7,691	16,583	21,468	0.01	0.80	0.009	1.00				<1
3/3/11	5.056	7.53	21.3				O/S	2,450	2,346	7,576	380	158	0.125406	7,924	17,250	20,670				1.09				<1
3/4/11	4.986	7.46	21.3		35.0		O/S	2,414	2,415	7,246	400	166	0.101444	6,130	13,063	21,270	0.30	2.80	0.002	1.21				<1
3/5/11	5.487	7.58	23.0				O/S	2,369	2,471	7,126	400	165	0.080149	4,763	10,158	20,899				1.47				<1
3/6/11	5.739	7.50	23.0				O/S	2,402	2,367	7,051	430	180	0.080041	4,707	9,272	19,525				1.67				<1
3/7/11	5.245	7.54	23.6		31.0		O/S	2,693	2,376	7,352	430	170	0.082771	5,075	11,572	16,246	2.00	0.60	0.020	1.84				<1
3/8/11	5.296	7.69	23.0	386		292	O/S	2,492	2,431	7,492	460	187	0.063463	3,965	9,151	34,072				1.26	1	3	3	<1
3/9/11	5.302	7.53	21.4		55.0		O/S	2,449	2,548	7,672	350	140	0.110130	7,047	15,743	28,709	3.00	1.20	0.052	1.20				<1
3/10/11	5.234	7.41	20.7				O/S	2,314	2,322	7,392	380	164	0.120249	7,413	17,202	20,531				1.36				<1
3/11/11	5.230	7.38	19.9		51.0		O/S	2,315	2,270	7,596	440	192	0.138769	8,791	18,603	21,958	1.00	2.30	0.012	1.49				<1
3/12/11	5.567	7.67	23.1				O/S	2,332	2,299	6,849	400	173	0.087800	5,015	10,455	21,825				1.43				<1
3/13/11	5.479	7.74	23.0				O/S	2,349	2,244	6,771	390	170	0.080042	4,520	9,582	20,401				1.63				<1
3/14/11	5.240	7.65	23.3		38.0		O/S	2,379	2,312	7,066	400	171	0.084625	4,987	10,161	21,770	0.30	0.40	0.004	1.73				<1
3/15/11	5.031	7.61	21.8	342		700	O/S	2,350	2,313	7,164	380	163	0.096183	5,747	11,894	22,795				1.12	2	7	2	<1
3/16/11	4.960	7.71	21.8		49.0		O/S	2,337	2,402	7,070	390	165	0.080882	4,769	9,752	21,547	0.30	0.20	0.014	1.24				1
3/17/11	4.985	7.61	22.1				O/S	2,415	2,476	6,948	400	164	0.120294	6,971	14,244	21,943				1.38				<1
3/18/11	5.063	7.55	22.1		55.0		O/S	2,280	2,417	6,808	370	158	0.121274	6,886	13,621	20,372	2.00	2.30	0.024	1.38				<1
3/19/11	5.384	7.50	23.8				O/S	2,330	2,284	6,697	400	173	0.080155	4,477	8,341	20,972				1.73				<1
3/20/11	5.504	7.40	23.4				O/S	2,208	2,262	6,761	400	179	0.080963	4,565	8,131	22,158				1.94				<1
3/21/11	5.090	7.34	23.6		55.0		O/S	2,286	2,202	6,644	380	169	0.080086	4,438	8,583	17,991	0.30	2.00	0.003	1.45				<1
3/22/11	5.005	7.63	19.4	176		190	O/S	2,349	2,324	6,644	420	180	0.080089	4,438	8,618	21,168				1.33	1	3	12	<1
3/23/11	5.014	7.48	21.5		35.0		O/S	2,305	2,234	6,662	400	176	0.080223	4,457	10,311	22,354	0.30	2.70	0.036	2.04				<1
3/24/11	5.074	7.37	22.8				O/S	2,352	2,166	6,448	360	159	0.120232	6,466	15,394	20,076				1.86				<1
3/25/11	5.047	7.56	21.8		37.0		O/S	2,320	2,147	6,358	360	161	0.120173	6,372	14,399	20,465	0.30	1.90	0.021	1.80				<1
3/26/11	5.403	7.48	22.3				O/S	2,178	2,114	6,032	370	172	0.060105	3,024	6,938	22,069				1.15				<1
3/27/11	5.616	7.51	22.6				O/S	2,281	2,059	6,384	330	152	0.063070	3,358	7,571	16,857				1.36				1
3/28/11	5.145	7.61	21.6		42.0		O/S	2,457	2,081	6,098	340	150	0.060036	3,053	7,488	20,146	0.67	0.70	0.014	1.55				1
3/29/11	5.061	7.57	22.5	256		485	O/S	2,400	2,178	6,336	360	157	0.080066	4,231	10,516	21,626				1.45	1	9	25	<1
3/30/11	5.010	7.46	22.9		37.0		O/S	2,305	2,158	6,453	390	175	0.060196	3,240	7,371	19,088	2.65	2.90	0.060	1.66				<1
3/31/11	4.997	7.33	23.3				O/S	2,181	2,188	6,291	380	174	0.055220	2,897	8,594	20,848				1.43				<1
Average:	**5.206**	**7.53**	**22.2**	**318**	**41.9**	**399**	**#DIV/0!**	**2,366**	**2,300**	**6,914**	**405**	**173**	**0.090239**	**5,250**	**11,362**	**21,303**	**1.01**	**1.60**	**0.021**	**1.46**	**1**	**5**	**12**	**1**
Minimum	**4.960**	**7.33**	**19.4**	**176**	**25.0**	**190**	**0**	**2,178**	**2,059**	**6,032**	**330**	**140**	**0.055220**	**2,897**	**6,938**	**16,246**	**0.01**	**0.20**	**0.002**	**1.00**	**1**	**2**	**2**	**1**
Maximu	**5.739**	**7.74**	**23.8**	**428**	**55.0**	**700**	**0**	**2,693**	**2,548**	**7,684**	**800**	**321**	**0.138769**	**8,791**	**18,603**	**34,072**	**3.00**	**2.90**	**0.060**	**2.04**	**2**	**9**	**25**	**1**

CITY OF AVONDALE, ARIZONA
April 2011 Monthly Report
4/01/2011 to 4/30/2011

CITY OF AVONDALE, ARIZONA
April 2011 Monthly Report
4/01/2011 to 4/30/2011

TY OF
11 Monthly
/2011 to

CITY OF AVONDALE, ARIZONA
April 2011 Monthly Report
4/01/2011 to 4/30/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
4/1/11	4.994	7.52	23.5		39.0		O/S	2,357	2,256	6,781	400	173	0.106199	6,006	14,544	21,332	0.12	3.70	0.011	1.48				<1
4/2/11	5.326	7.49	23.1				O/S	2,487	2,421	7,010	440	179	0.060094	3,513	7,853	19,445				1.22				<1
4/3/11	5.511	7.61	24.2				O/S	2,435	2,419	7,516	390	161	0.060083	3,766	8,790	21,708				1.45				<1
4/4/11	5.086	7.37	22.9		55.0		O/S	2,414	2,391	6,280	430	179	0.070111	3,672	13,598	21,143	0.13	0.20	0.009	2.44				<1
4/5/11	4.990	7.68	23.4	210		224	O/S	2,546	2,471	7,350	550	219	0.070067	4,295	9,971	19,553				2.30	6	2	8	<1
4/6/11	5.009	7.31	23.3		38.0		O/S	2,550	2,479	7,224	540	215	0.070250	4,232	11,472	22,171	0.22	4.00	0.000	2.26				<1
4/7/11	5.034	7.53	23.7				O/S	2,464	2,378	7,160	460	190	0.100107	5,978	18,762	22,204				2.28				<1
4/8/11	4.907	7.46	22.8		42.0		O/S	2,380	2,316	7,075	400	170	0.102170	6,029	19,136	19,845	0.11	3.40	0.003	1.88				1
4/9/11	5.296	7.64	21.2				O/S	2,486	2,319	6,740	540	225	0.070075	3,939	9,111	21,693				2.38				1
4/10/11	5.462	7.75	21.2				O/S	2,461	2,324	7,030	470	196	0.070072	4,108	10,191	19,492				1.52				<1
4/11/11	5.095	7.54	23.9		55.0		O/S	2,361	2,329	6,803	550	235	0.074205	4,210	12,028	17,274	0.26	1.50	0.007	3.12				1
4/12/11	5.002	7.57	22.4	378		250	O/S	2,473	2,420	7,254	440	180	0.070309	4,254	11,631	20,941				1.79	1	2	3	<1
4/13/11	5.053	7.50	23.1		35.0		O/S	2,495	2,395	7,328	540	221	0.081593	4,987	15,331	19,480	0.04	3.60	0.000	1.75				<1
4/14/11	5.090	7.92	24.9				O/S	2,433	2,302	7,278	500	211	0.106607	6,471	20,223	19,845				1.32				<1
4/15/11	5.019	7.54	23.3		37.0		O/S	2,388	2,315	7,162	540	230	0.125025	7,468	25,294	21,685	0.05	4.60	0.005	1.20				<1
4/16/11	5.351	7.50	24.5				O/S	2,216	2,236	6,845	550	247	0.081112	4,630	14,542	21,370				2.64				<1
4/17/11	5.529	7.55	24.8				O/S	2,345	2,271	6,939	500	217	0.083053	4,806	13,031	19,788				1.78				<1
4/18/11	5.123	7.60	24.8		32.0		O/S	2,291	2,187	7,020	500	223	0.079713	4,667	12,120	20,671	0.11	1.10	0.022	1.94				<1
4/19/11	5.054	7.58	24.4	430		291	O/S	2,359	2,324	7,053	540	231	0.070535	4,149	10,368	20,899				1.91	4	2	6	<1
4/20/11	5.019	7.41	24.8		38.0		O/S	2,415	2,405	7,134	490	203	0.066054	3,930	9,391	21,291	0.08	3.60	0.000	1.67				1
4/21/11	5.021	7.54	25.1				O/S	2,373	2,318	7,046	520	222	0.107321	6,307	14,355	21,377				1.50				<1
4/22/11	5.150	7.53	24.3		49.0		O/S	2,360	2,316	6,614	470	201	0.112231	6,191	13,726	21,152	0.20	5.20	0.000	1.36				<1
4/23/11	5.478	7.66	24.8				O/S	2,377	2,300	6,692	450	192	0.061343	3,424	7,203	21,120				2.19				<1
4/24/11	5.466	7.53	24.7				O/S	2,388	2,342	6,843	520	220	0.062908	3,590	7,339	18,564				1.91				<1
4/25/11	5.145	7.61	22.8		33.0		O/S	2,385	2,291	6,950	440	188	0.060093	3,483	7,961	19,952	0.11	0.50	0.002	1.48				<1
4/26/11	4.987	7.53	24.4	330		332	O/S	2,488	2,378	6,802	540	222	0.061135	3,468	8,448	21,789				1.68	1	2	41	<1
4/27/11	5.050	7.65	26.2		42.0		O/S	2,511	2,444	6,932	530	214	0.062448	3,610	8,100	20,333	0.08	2.10	0.000	1.35				<1
4/28/11	5.179	7.61	26.7				O/S	2,447	2,402	6,836	540	223	0.121049	6,901	16,074	20,787				1.28				<1
4/29/11	5.163	7.48	25.7		42.0		O/S	2,384	2,286	6,902	520	223	0.120010	6,908	13,345	23,504	0.09	1.80	0.000	1.34				<1
4/30/11	5.481	7.60	25.0				O/S	2,305	2,245	6,555	550	242	0.060037	3,282	5,925	20,448				1.73				<1
							O/S																	
Average:	**5.169**	**7.56**	**24.0**	**337**	**41.3**	**274**	**#DIV/0!**	**2,412**	**2,343**	**6,972**	**495**	**208**	**0.081534**	**4,742**	**12,329**	**20,695**	**0.12**	**2.72**	**0.005**	**1.81**	**3**	**2**	**15**	**1**
Minimum	**4.907**	**7.31**	**21.2**	**210**	**32.0**	**224**	**0**	**2,216**	**2,187**	**6,280**	**390**	**161**	**0.060037**	**3,282**	**5,925**	**17,274**	**0.04**	**0.20**	**0.000**	**1.20**	**1**	**2**	**3**	**1**
Maximu	**5.529**	**7.92**	**26.7**	**430**	**55.0**	**332**	**0**	**2,550**	**2,479**	**7,516**	**550**	**247**	**0.125025**	**7,468**	**25,294**	**23,504**	**0.26**	**5.20**	**0.022**	**3.12**	**6**	**2**	**41**	**1**

CITY OF AVONDALE, ARIZONA
May 2011 Monthly Report
5/01/2011 to 5/31/2011

CITY OF AVONDALE, ARIZONA
May 2011 Monthly Report
5/01/2011 to 5/31/2011

TY OF
11 Monthly
/2011 to

CITY OF AVONDALE, ARIZONA
May 2011 Monthly Report
5/01/2011 to 5/31/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE							SOLIDS HANDLING			EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
5/1/11	5.558	7.49	24.7				O/S	2,445	2,344	6,233	600	251	0.064058	3,330	6,766	20,523				2.00				<1
5/2/11	5.128	7.52	25.2		31.0		O/S	2,428	2,329	6,559	650	273	0.080773	4,418	10,111	20,921	0.13	1.70	0.000	2.57				<1
5/3/11	5.041	7.51	25.5	444		369	O/S	2,557	2,432	7,344	500	200	0.073454	4,499	10,043	20,427				2.12	2	2	70	<1
5/4/11	5.044	7.59	24.2		55.0		O/S	2,571	2,499	7,050	570	225	0.072047	4,236	9,711	21,847	0.07	4.00	0.004	1.80				<1
5/5/11	5.063	7.62	23.5				O/S	2,483	2,490	6,834	500	201	0.115137	6,562	17,634	21,863				1.85				<1
5/6/11	5.089	7.69	24.1		55.0		O/S	2,507	2,463	6,744	470	189	0.135347	7,613	20,113	21,479	0.06	5.60	0.008	1.71				<1
5/7/11	5.507	7.66	25.5				O/S	2,406	2,302	6,607	500	212	0.080294	4,424	10,920	21,889				1.32				<1
5/8/11	5.434	7.57	25.3				O/S	2,369	2,312	6,542	500	214	0.080119	4,371	10,951	20,959				1.41				<1
5/9/11	5.193	7.52	25.3		55.0		O/S	2,336	2,321	6,684	600	258	0.083091	4,632	11,424	21,503	0.00	1.10	0.003	2.12				<1
5/10/11	5.070	7.51	22.5	404		385	O/S	2,442	2,336	6,706	460	193	0.080413	4,497	11,251	20,978				1.95	3	2	460	<1
5/11/11	5.037	7.62	23.7		55.0		O/S	2,435	2,433	6,578	500	205	0.070195	3,851	9,902	21,674	0.00	4.90	0.002	1.79				<1
5/12/11	5.130	7.62	23.6				O/S	2,453	2,417	6,778	520	214	0.100707	5,693	15,939	22,216				1.91				<1
5/13/11	5.171	7.59	24.5		55.0		O/S	2,440	2,410	6,928	500	206	0.106382	6,147	15,956	21,851	0.05	4.50	0.003	1.77				<1
5/14/11	5.500	7.62	26.7				O/S	2,467	2,390	6,748	600	247	0.085279	4,799	11,327	21,685				1.61				<1
5/15/11	5.652	7.47	27.9				O/S	2,422	2,333	6,789	620	261	0.080044	4,532	11,107	21,938				1.96				<1
5/16/11	5.283	7.69	25.6		29.0		O/S	2,284	2,199	6,472	540	241	0.085172	4,597	12,420	20,185	0.01	1.00	0.008	2.20				<1
5/17/11	5.256	7.64	25.2	454		356	O/S	2,454	2,403	7,044	530	218	0.085076	4,998	11,429	22,209				2.13	10	4	26	<1
5/18/11	5.122	7.68	24.1		55.0		O/S	2,451	2,377	6,896	500	207	0.082749	4,759	11,296	22,120	0.00	4.00	0.005	2.05				3
5/19/11	5.297	7.59	24.0				O/S	2,596	2,478	7,092	480	189	0.120106	7,104	16,923	21,550				1.99				<1
5/20/11	5.339	7.64	25.0		55.0		O/S	2,455	2,418	6,686	490	201	0.120037	6,693	17,670	22,081	0.02	4.10	0.003	2.15				<1
5/21/11	5.535	7.62	26.2				O/S	2,341	2,343	6,604	600	256	0.049649	2,735	6,286	22,215				2.03				<1
5/22/11	5.664	7.55	26.2				O/S	2,381	2,302	6,738	560	239	0.080732	4,537	10,516	21,868				2.52				<1
5/23/11	5.377	7.65	26.0		34.0		O/S	2,391	2,315	6,848	590	251	0.080425	4,593	11,129	21,723	0.06	1.00	0.009	2.37				<1
5/24/11	5.213	7.56	26.1	190		172	O/S	2,498	2,418	6,889	600	244	0.080997	4,654	10,713	21,731				2.01	1	2	15	<1
5/25/11	5.245	7.70	26.9		44.0		O/S	2,510	2,452	6,758	480	193	0.080084	4,514	12,998	22,074	0.86	4.40	0.008	1.93				<1
5/26/11	5.252	7.54	27.1				O/S	2,450	2,348	6,992	660	275	0.059166	3,450	7,909	21,954				1.81				<1
5/27/11	5.279	7.64	27.6		35.0		O/S	2,418	2,393	6,834	640	266	0.085122	4,852	10,510	22,135	0.02	6.10	0.005	2.40				<1
5/28/11	5.574	7.52	27.7				O/S	2,414	2,352	6,715	610	256	0.122505	6,861	15,347	22,237				2.25				<1
5/29/11	5.275	7.63	26.6				O/S	2,288	2,174	6,744	580	260	0.106309	5,979	13,324	22,117				2.27				<1
5/30/11	5.485	7.46	25.8		39.0		O/S	2,330	2,221	6,607	500	220	0.099503	5,483	11,522	22,281	0.09	1.30	0.006	2.41				<1
5/31/11	5.226	7.45	25.4	400		285	O/S	2,334	2,258	6,558	650	283	0.081681	4,467	10,538	22,243				2.32	1	2	29	<1
Average:	**5.292**	**7.59**	**25.4**	**378**	**45.9**	**313**	**#DIV/0!**	**2,431**	**2,363**	**6,761**	**552**	**231**	**0.087957**	**4,964**	**12,054**	**21,693**	**0.11**	**3.36**	**0.005**	**2.02**	**3**	**2**	**120**	**3**
Minimum	**5.037**	**7.45**	**22.5**	**190**	**29.0**	**172**	**0**	**2,284**	**2,174**	**6,233**	**460**	**189**	**0.049649**	**2,735**	**6,286**	**20,185**	**0.00**	**1.00**	**0.000**	**1.32**	**1**	**2**	**15**	**3**
Maximu	**5.664**	**7.70**	**27.9**	**454**	**55.0**	**385**	**0**	**2,596**	**2,499**	**7,344**	**660**	**283**	**0.135347**	**7,613**	**20,113**	**22,281**	**0.86**	**6.10**	**0.009**	**2.57**	**10**	**4**	**460**	**3**

CITY OF AVONDALE, ARIZONA
June 2011 Monthly Report
6/01/2011 to 6/30/2011

CITY OF AVONDALE, ARIZONA
June 2011 Monthly Report
6/01/2011 to 6/30/2011

TY OF
011 Monthly
/2011 to

CITY OF AVONDALE, ARIZONA
June 2011 Monthly Report
6/01/2011 to 6/30/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
6/1/11	5.109	7.46	26.5		38.0		O/S	2,420	2,359	6,506	670	280	0.080092	4,346	10,551	22,035	0.10	2.40	0.002	2.42				1
6/2/11	5.137	7.48	26.0				O/S	2,443	2,352	6,732	680	284	0.120094	6,743	16,627	22,213				2.15				1
6/3/11	5.183	7.39	26.3		48.0		O/S	2,362	2,294	6,394	690	296	0.120087	6,404	15,611	22,162	0.13	5.70	0.000	1.94				<1
6/4/11	5.397	7.63	26.3				O/S	2,341	2,251	6,280	600	261	0.090332	4,731	11,098	21,695				2.87				<1
6/5/11	5.509	7.60	26.9				O/S	2,281	2,208	6,213	550	245	0.091520	4,742	11,340	22,085				2.23				<1
6/6/11	5.134	7.50	27.1		35.0		O/S	2,236	2,149	6,322	600	274	0.093136	4,911	11,858	22,178	0.02	1.40	0.001	2.50				<1
6/7/11	5.103	7.65	26.9	524		350	O/S	2,380	2,286	6,450	660	283	0.090089	4,846	11,197	22,275				1.65	1	3	46	<1
6/8/11	5.098	7.43	26.8		46.0		O/S	2,296	2,283	6,182	650	284	0.090096	4,645	11,935	22,262	0.03	4.10	0.004	1.62				<1
6/9/11	5.129	7.37	27.1				O/S	2,264	2,255	6,144	550	243	0.120188	6,159	12,868	22,180				1.68				<1
6/10/11	5.194	7.44	26.5		41.0		O/S	2,206	2,183	5,982	540	246	0.120120	5,993	12,552	22,227	0.01	6.30	0.003	1.32				<1
6/11/11	5.388	7.60	26.1				O/S	2,185	2,146	5,795	500	231	0.085079	4,112	8,224	21,824				1.47				<1
6/12/11	5.440	7.50	26.6				O/S	2,194	2,163	6,053	500	230	0.085849	4,334	8,887	21,717				1.67				<1
6/13/11	5.190	7.48	27.2		37.0		O/S	2,227	2,125	5,989	640	294	0.088818	4,436	10,207	22,062	0.07	1.50	0.004	1.94				<1
6/14/11	5.122	7.38	28.5	238		197	O/S	2,210	2,213	4,712	430	194	0.087658	3,445	9,917	21,931				1.68	2	2	15	5
6/15/11	5.181	7.28	28.0		55.0		O/S	2,182	2,232	6,008	450	204	0.085080	4,263	9,291	22,279	0.07	3.50	0.006	1.45				<1
6/16/11	5.249	7.38	27.9				O/S	2,235	2,205	5,856	420	189	0.123723	6,043	14,234	22,220				1.60				<1
6/17/11	5.253	7.53	26.9		55.0		O/S	2,197	2,175	5,676	400	183	0.120667	5,712	12,991	22,300	0.04	3.00	0.005	1.40				<1
6/18/11	5.582	7.50	27.4				O/S	2,007	1,988	5,477	400	200	0.098766	4,511	10,147	22,194				1.42				<1
6/19/11	5.240	7.41	27.6				O/S	1,601	1,679	5,691	300	183	0.070084	3,326	11,461	22,258				1.66				<1
6/20/11	5.163	7.40	27.7		35.0		O/S	1,921	1,861	5,990	350	185	0.055102	2,753	4,405	22,262	0.32	2.30	0.008	1.40				<1
6/21/11	5.165	7.49	27.3	66		188	O/S	2,034	1,947	5,706	380	191	0.055964	2,663	6,013	22,160				1.35	1	2	48	<1
6/22/11	5.244	7.57	27.3		48.0		O/S	2,134	2,195	5,746	390	180	0.076123	3,648	8,361	22,230	0.04	0.40	0.005	1.55				<1
6/23/11	5.229	7.25	28.6				O/S	2,210	2,162	5,876	380	174	0.100061	4,904	10,881	22,211				1.32				<1
6/24/11	5.327	7.28	28.2		37.0		O/S	2,197	2,171	5,927	400	183	0.121945	6,028	13,144	22,305	0.13	3.50	0.007	1.74				<1
6/25/11	5.578	7.46	28.3				O/S	2,109	2,044	5,846	400	193	0.083166	4,055	8,602	22,261				1.47				<1
6/26/11	5.432	7.37	28.1				O/S	2,110	2,091	5,877	360	171	0.093382	4,577	9,391	22,275				2.00				<1
6/27/11	5.134	7.52	29.0		30.0		O/S	2,098	2,098	5,846	330	157	0.085200	4,154	8,946	22,263	0.42	1.20	0.002	1.72				1
6/28/11	5.023	7.48	27.1	102		145	O/S	2,199	2,036	5,816	360	170	0.087808	4,259	9,069	22,235				1.56	1	2	33	1
6/29/11	5.118	7.37	28.8		39.0		O/S	2,187	2,166	5,834	340	156	0.087547	4,260	8,998	22,276	0.01	3.20	0.009	1.48				<1
6/30/11	5.123	7.33	29.8				O/S	2,075	2,104	5,662	330	158	0.121012	5,714	10,762	22,320				1.71				1
Average:	**5.239**	**7.45**	**27.4**	**233**	**41.8**	**220**	**#DIV/0!**	**2,185**	**2,147**	**5,953**	**475**	**217**	**0.094293**	**4,691**	**10,652**	**22,163**	**0.11**	**2.96**	**0.004**	**1.73**	**1**	**2**	**36**	**2**
Minimum	**5.023**	**7.25**	**26.0**	**66**	**30.0**	**145**	**0**	**1,601**	**1,679**	**4,712**	**300**	**156**	**0.055102**	**2,663**	**4,405**	**21,695**	**0.01**	**0.40**	**0.000**	**1.32**	**1**	**2**	**15**	**1**
Maximu	**5.582**	**7.65**	**29.8**	**524**	**55.0**	**350**	**0**	**2,443**	**2,359**	**6,732**	**690**	**296**	**0.123723**	**6,743**	**16,627**	**22,320**	**0.42**	**6.30**	**0.009**	**2.87**	**2**	**3**	**48**	**5**

CITY OF AVONDALE, ARIZONA
July 2011 Monthly Report
7/01/2011 to 7/31/2011

CITY OF AVONDALE, ARIZONA
July 2011 Monthly Report
7/01/2011 to 7/31/2011

TY OF
11 Monthly
/2011 to

CITY OF AVONDALE, ARIZONA
July 2011 Monthly Report
7/01/2011 to 7/31/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE							SOLIDS HANDLING			EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
7/1/11	5.170	7.49	28.1		42.0		O/S	2,088	2,100	5,784	340	162	0.121639	5,868	12,236	22,340	0.04	1.20	0.005	1.31				1
7/2/11	5.207	7.31	29.1				O/S	1,928	2,019	5,571	330	167	0.080159	3,724	7,511	22,356				1.54				<1
7/3/11	5.067	7.29	28.7				O/S	2,096	2,115	5,738	300	142	0.093429	4,471	7,545	22,351				1.82				<1
7/4/11	5.291	7.42	29.2		36.0		O/S	2,106	2,112	6,800	300	142	0.091565	5,193	7,134	22,352	0.07	1.10	0.004	2.00				<1
7/5/11	5.062	7.38	28.6	258		298	O/S	2,170	2,189	5,850	310	142	0.095145	4,642	8,900	22,348				1.61	2	2	53	<1
7/6/11	5.228	7.42	28.3		41.0		O/S	2,158	2,108	5,914	330	155	0.090117	4,445	8,772	22,361	0.15	1.40	0.004	1.63				3
7/7/11	5.160	7.50	28.7				O/S	2,187	2,154	5,893	350	161	0.120106	5,903	11,584	22,364				1.31				<1
7/8/11	5.301	7.22	28.9		35.0		O/S	2,095	2,111	5,703	360	171	0.120118	5,713	11,655	22,369	0.10	2.30	0.002	1.50				<1
7/9/11	5.528	7.42	29.1				O/S	2,046	2,020	5,712	300	148	0.090084	4,291	7,560	22,369				1.35				<1
7/10/11	5.444	7.05	29.8				O/S	2,044	1,995	5,862	300	149	0.091855	4,491	10,641	22,363				2.00				<1
7/11/11	5.193	7.35	28.5		39.0		O/S	2,147	2,175	5,800	320	148	0.090270	4,367	10,127	22,358	0.08	0.90	0.001	1.45				<1
7/12/11	5.089	7.33	29..5	450		254	O/S	2,089	2,128	5,720	300	142	0.090110	4,299	10,611	22,371				1.45	3	2	310	<1
7/13/11	5.180	7.28	29.6		38.0		O/S	2,085	2,059	5,760	370	179	0.090192	4,333	11,527	22,375	0.26	1.60	0.001	1.68				<1
7/14/11	5.113	7.41	29.1				O/S	2,123	2,109	5,856	350	165	0.120151	5,868	15,747	22,356				1.32				1
7/15/11	5.146	7.39	28.2		37.0		O/S	2,074	2,040	5,741	370	180	0.120120	5,751	14,309	22,331	0.17	1.50	0.003	1.23				<1
7/16/11	5.357	7.30	28.7				O/S	2,087	2,053	5,571	350	169	0.082204	3,819	7,415	22,193				1.73				<1
7/17/11	5.288	7.44	29.3				O/S	2,057	2,047	5,756	350	171	0.086956	4,174	9,635	22,117				2.08				<1
7/18/11	5.187	7.35	29.9		45.0		O/S	2,121	2,075	5,776	350	167	0.090692	4,369	10,730	21,673	0.80	0.80	0.003	1.46				<1
7/19/11	5.179	7.49	29.3	264		213	O/S	2,186	2,135	5,819	360	167	0.090097	4,372	11,365	21,456				1.28	1	4	65	<1
7/20/11	5.137	7.39	29.0		45.0		O/S	2,177	2,226	5,882	320	145	0.090094	4,420	11,443	21,767	0.08	1.20	0.007	1.58				<1
7/21/11	5.124	7.44	29.4				O/S	2,180	2,207	5,878	330	150	0.110196	5,402	13,264	21,387				1.23				<1
7/22/11	5.194	7.54	29.3		33.0		O/S	2,089	2,094	5,612	330	158	0.130339	6,100	15,075	22,178	0.17	2.10	0.009	1.21				<1
7/23/11	5.441	7.47	29.9				O/S	2,057	2,021	5,314	340	167	0.091125	4,039	9,184	22,285				1.22				<1
7/24/11	5.484	7.53	28.5				O/S	2,064	2,022	5,376	300	147	0.093206	4,179	9,983	22,099				1.15				<1
7/25/11	5.336	7.33	29.5		55.0		O/S	1,361	1,427	5,120	280	201	0.098404	4,202	13,453	22,288	0.11	2.10	0.009	1.74				<1
7/26/11	5.217	7.44	29.7	496		302	O/S	1,837	1,809	5,572	320	176	0.109196	5,074	11,812	22,171				1.50	3	2	9	<1
7/27/11	5.214	7.50	29.4		32.0		O/S	1,921	1,856	5,216	320	169	0.081815	3,559	7,931	22,276	0.11	2.80	0.000	1.37				<1
7/28/11	5.186	7.45	29.7				O/S	1,897	1,891	5,362	310	164	0.091379	4,086	10,636	22,263				1.15				<1
7/29/11	5.226	7.43	30.1		38.0		O/S	1,961	1,955	5,402	340	174	0.091073	4,103	11,064	22,243	0.12	2.50	0.006	1.04				<1
7/30/11	5.510	7.44	29.8				O/S	1,979	1,930	5,392	330	169	0.080149	3,604	10,083	22,346				1.21				<1
7/31/11	5.581	7.42	30.0				O/S	1,980	1,970	5,531	330	167	0.108078	4,985	12,890	20,339				1.62				<1
Average:	**5.253**	**7.39**	**29.2**	**367**	**39.7**	**267**	**#DIV/0!**	**2,045**	**2,037**	**5,687**	**329**	**162**	**0.097744**	**4,640**	**10,704**	**22,143**	**0.17**	**1.65**	**0.004**	**1.48**	**2**	**3**	**109**	**2**
Minimum	**5.062**	**7.05**	**28.1**	**258**	**32.0**	**213**	**0**	**1,361**	**1,427**	**5,120**	**280**	**142**	**0.080149**	**3,559**	**7,134**	**20,339**	**0.04**	**0.80**	**0.000**	**1.04**	**1**	**2**	**9**	**1**
Maximu	**5.581**	**7.54**	**30.1**	**496**	**55.0**	**302**	**0**	**2,187**	**2,226**	**6,800**	**370**	**201**	**0.130339**	**6,100**	**15,747**	**22,375**	**0.80**	**2.80**	**0.009**	**2.08**	**3**	**4**	**310**	**3**

CITY OF AVONDALE, ARIZONA
August 2011 Monthly Report
8/01/2011 to 8/31/2011

CITY OF AVONDALE, ARIZONA
August 2011 Monthly Report
8/01/2011 to 8/31/2011

TY OF
ust 2011
/2011 to

CITY OF AVONDALE, ARIZONA
August 2011 Monthly Report
8/01/2011 to 8/31/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
8/1/11	5.337	7.42	29.8		55.0		O/S	1,991	2,038	5,592	380	189	0.095473	4,453	12,801	22,166	2.17	0.00	0.032	2.08				<1
8/2/11	5.303	7.64	30.0	214		175	O/S	2,037	2,020	5,511	370	182	0.093500	4,297	11,035	22,267				1.26	2	10	24	<1
8/3/11	5.324	7.55	30.0		36.0		O/S	2,028	1,942	5,500	390	196	0.096150	4,410	10,901	22,214	0.11	1.80	0.005	1.58				<1
8/4/11	5.292	7.48	30.1				O/S	2,011	1,962	5,538	350	176	0.093700	4,328	9,885	22,238				1.20				<1
8/5/11	5.331	7.52	30.0		35.0		O/S	2,003	1,973	5,454	370	186	0.097110	4,417	10,748	22,347	0.07	4.90	0.003	1.24				<1
8/6/11	5.638	7.43	30.1				O/S	1,976	1,988	5,355	350	177	0.094484	4,220	10,255	22,164				1.36				<1
8/7/11	5.799	7.46	30.0				O/S	1,916	1,889	5,616	350	184	0.091090	4,266	11,197	22,208				1.47				<1
8/8/11	5.557	7.41	30.3		35.0		O/S	1,931	1,955	5,697	350	180	0.091364	4,341	11,806	22,175	0.05	1.10	0.002	1.56				<1
8/9/11	5.373	7.71	29.7	298		240	O/S	1,964	1,911	5,630	410	212	0.093432	4,387	11,595	22,232				1.09	1	5	<1	<1
8/10/11	5.347	7.87	30.2		42.0		O/S	2,008	1,974	5,560	400	201	0.103125	4,782	11,095	22,081	0.11	3.30	0.000	1.24				<1
8/11/11	5.357	7.71	28.3				O/S	1,525	1,516	4,140	300	197	0.094334	3,257	5,885	22,220				1.07				<1
8/12/11	5.299	7.48	30.1		48.0		1,487	1,528	1,490	4,100	280	186	0.100536	3,438	5,897	22,086	0.08	6.10	0.000	1.05				<1
8/13/11	5.540	7.42	29.8				1,472	1,510	1,551	4,116	260	172	0.041724	1,432	1,862	24,997				1.33				<1
8/14/11	5.738	7.43	30.1				1,544	1,582	1,524	4,473	260	168	0.045166	1,685	2,952	21,566				1.42				<1
8/15/11	5.431	7.81	31.4		34.0		1,578	1,637	1,645	4,822	290	179	0.101000	4,062	7,888	22,114	0.01	2.20	0.000	1.53				<1
8/16/11	5.275	7.54	29.8	164		179	1,654	1,635	1,643	4,577	300	182	0.060338	2,303	4,668	22,105				0.94	1	2	57	<1
8/17/11	5.284	7.33	29.9		28.0		1,720	1,664	1,649	4,605	300	179	0.060317	2,317	4,782	22,205	0.06	4.60	0.001	1.78				<1
8/18/11	5.198	7.51	29.6				1,695	1,670	1,681	4,633	310	184	0.060092	2,322	4,945	22,184				1.13				<1
8/19/11	5.162	7.56	28.3		35.0		1,712	1,705	1,703	4,648	290	170	0.080110	3,105	6,731	22,161	0.03	3.70	0.008	1.27				<1
8/20/11	5.685	7.48	30.2				1,669	1,669	1,602	4,484	270	164	0.097014	3,628	6,814	22,258				1.08				<1
8/21/11	5.741	7.43	29.6				1,687	1,655	1,676	4,816	260	155	0.101884	4,092	8,418	22,193				1.20				1
8/22/11	5.358	7.81	30.2		32.0		1,715	1,679	1,687	4,828	260	154	0.075301	3,032	7,057	22,083	0.05	1.80	0.001	1.40				<1
8/23/11	5.104	7.40	29.9	254		123	1,729	1,698	1,719	4,714	260	152	0.000000	0	0	21,447				1.23	1	3	17	<1
8/24/11	5.254	7.36	30.3		29.0		1,794	1,755	1,757	4,780	260	147	0.080099	3,193	9,039	21,923	0.07	4.80	0.011	1.15				<1
8/25/11	5.232	7.53	30.6				1,746	1,769	1,724	4,790	270	155	0.110168	4,401	13,599	22,298				1.35				<1
8/26/11	5.210	7.73	30.4		54.0		1,688	1,703	1,681	4,752	260	154	0.110117	4,364	11,552	22,075	0.09	6.40	0.000	1.74				<1
8/27/11	5.635	7.60	30.1				1,643	1,609	1,643	4,250	250	153	0.081094	2,874	5,845	22,163				1.54				<1
8/28/11	5.770	7.47	31.1				1,685	1,645	1,624	4,622	240	145	0.082447	3,178	5,301	22,199				1.67				<1
8/29/11	5.357	7.47	28.8		36.0		1,710	1,728	1,680	5,098	230	135	0.082558	3,510	6,417	22,179	0.08	1.20	0.001	1.57				<1
8/30/11	5.235	7.58	30.4	518		238	1,693	1,667	1,624	4,544	250	150	0.060156	2,280	5,903	22,147				1.46	1	2	63	<1
8/31/11	5.239	7.66	30.5		30.0		1,697	1,677	1,684	4,768	250	148	0.060135	2,391	5,674	21,624	0.04	1.60	0.011	1.75				1
Average:	**5.400**	**7.54**	**30.0**	**290**	**37.8**	**191**	**1,666**	**1,760**	**1,747**	**4,904**	**302**	**171**	**0.081743**	**3,380**	**7,824**	**22,204**	**0.22**	**3.11**	**0.005**	**1.38**	**1**	**4**	**40**	**1**
Minimu	**5.104**	**7.33**	**28.3**	**164**	**28.0**	**123**	**1,472**	**1,510**	**1,490**	**4,100**	**230**	**135**	**0.000000**	**0**	**0**	**21,447**	**0.01**	**0.00**	**0.000**	**0.94**	**1**	**2**	**17**	**1**
Maximu	**5.799**	**7.87**	**31.4**	**518**	**55.0**	**240**	**1,794**	**2,037**	**2,038**	**5,697**	**410**	**212**	**0.110168**	**4,782**	**13,599**	**24,997**	**2.17**	**6.40**	**0.032**	**2.08**	**2**	**10**	**63**	**1**

CITY OF AVONDALE, ARIZONA
September 2011 Monthly Report
9/01/2011 to 9/30/2011

CITY OF AVONDALE, ARIZONA
September 2011 Monthly Report
9/01/2011 to 9/30/2011

TY OF
nber 2011
/2011 to

CITY OF AVONDALE, ARIZONA
September 2011 Monthly Report
9/01/2011 to 9/30/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
9/1/11	5.216	7.52	30.4				1,754	1,746	1,750	4,870	240	137	0.060157	2,443	6,038	21,874				1.71				<1
9/2/11	5.181	7.61	30.7		34.0		1,702	1,667	1,676	4,740	240	144	0.060124	2,377	5,919	22,011	0.01	4.30	0.015	1.64				<1
9/3/11	5.442	7.56	29.6				1,757	1,730	1,601	4,644	210	126	0.080584	3,121	5,408	22,277				1.85				<1
9/4/11	5.277	7.47	30.4				1,754	1,708	1,612	4,842	210	127	0.080598	3,255	5,219	22,140				1.70				<1
9/5/11	5.701	7.61	30.4		44.0		1,726	1,712	1,677	4,604	220	130	0.060037	2,305	3,888	22,066	0.00	1.70	0.012	1.54				<1
9/6/11	5.302	7.78	29.3	216		206	1,761	1,748	1,738	5,664	240	138	0.072690	3,434	5,742	22,136				1.54	1	2	8	2
9/7/11	5.258	7.74	30.3		33.0		1,796	1,750	1,754	4,994	260	148	0.070115	2,920	7,163	22,194	0.04	2.10	0.042	1.80				<1
9/8/11	5.263	7.54	30.3				1,655	1,676	1,677	4,694	210	125	0.125662	4,919	10,864	22,200				1.43				1
9/9/11	5.110	7.47	30.1		43.0		1,740	1,659	1,653	4,858	210	127	0.100107	4,056	9,560	22,260	0.01	3.40	0.007	1.71				<1
9/10/11	5.588	7.61	30.3				1,645	1,618	1,643	4,643	200	123	0.080820	3,130	5,705	22,162				1.63				1
9/11/11	5.728	7.40	29.7				1,709	1,706	1,704	4,898	210	123	0.081064	3,311	7,022	21,562				1.83				<1
9/12/11	5.359	7.61	29.0		33.0		1,788	1,729	1,731	5,023	230	133	0.099750	4,179	11,255	21,236	0.29	1.30	0.005	1.76				<1
9/13/11	5.253	7.50	30.2	662		277	1,675	1,658	1,690	4,841	200	119	0.080972	3,269	8,400	21,890				1.88	1	4	54	<1
9/14/11	5.210	7.55	29.6		43.0		1,695	1,687	1,721	4,743	200	117	0.060033	2,375	6,006	21,924	0.09	2.90	0.010	1.92				1
9/15/11	5.307	7.64	29.9				1,690	1,672	1,652	4,714	210	126	0.103616	4,074	10,016	23,396				1.91				<1
9/16/11	5.161	7.48	30.0		47.0		1,693	1,631	1,708	4,542	210	126	0.102721	3,891	9,177	21,842	0.38	5.30	0.033	2.12				<1
9/17/11	5.551	7.55	29.7				1,672	1,628	1,646	4,772	220	134	0.082338	3,277	5,474	22,111				2.05				1
9/18/11	5.665	7.61	30.1				1,713	1,667	1,602	4,900	210	128	0.071462	2,920	5,184	21,149				2.09				<1
9/19/11	5.336	7.46	28.7		38.0		1,753	1,733	1,721	5,077	220	127	0.060615	2,567	5,852	21,949	0.09	2.30	0.008	2.13				1
9/20/11	5.206	7.68	28.8	142		164	1,770	1,716	1,753	4,940	210	121	0.060576	2,496	5,578	22,145				1.88	1	2	8	<1
9/21/11	5.280	7.60	28.3		34.0		1,714	1,706	1,687	4,822	200	118	0.063500	2,554	5,552	22,190	0.22	2.40	0.009	1.75				<1
9/22/11	5.275	7.60	30.0				1,753	1,760	1,766	4,862	210	119	0.099869	4,050	8,981	22,163				2.10				<1
9/23/11	5.176	7.53	29.6		35.0		1,741	1,731	1,722	4,763	210	122	0.080108	3,182	5,461	22,222	0.10	6.30	0.000	1.90				<1
9/24/11	5.681	7.55	29.7				1,708	1,699	1,705	4,893	220	129	0.086675	3,537	5,774	22,316				1.86				1
9/25/11	5.867	7.62	29.3				1,766	1,737	1,667	5,106	210	123	0.081330	3,463	5,651	22,057				1.43				<1
9/26/11	5.292	7.56	28.8		33.0		1,741	1,698	1,704	5,150	220	129	0.079788	3,427	6,673	22,132	0.03	1.40	0.007	1.76				<1
9/27/11	5.304	7.84	28.3	202		268	1,755	1,725	1,722	4,926	230	133	0.080483	3,306	6,501	22,218				1.34	1	4	3	<1
9/28/11	5.232	7.79	28.5		45.0		1,717	1,756	1,732	4,874	220	126	0.083594	3,398	6,762	23,125	0.03	3.30	0.020	1.36				<1
9/29/11	5.240	7.28	28.8				1,744	1,706	1,747	4,738	210	122	0.103162	4,076	8,353	22,184				1.38				<1
9/30/11	5.114	7.59	28.1		31.0		1,690	1,689	1,731	4,806	200	117	0.100534	4,030	8,296	22,134	0.03	3.30	0.008	1.30				<1
Average:	**5.353**	**7.58**	**29.6**	**306**	**37.9**	**229**	**1,726**	**1,702**	**1,696**	**4,865**	**216**	**127**	**0.081769**	**3,311**	**6,916**	**22,109**	**0.10**	**3.08**	**0.014**	**1.74**	**1**	**3**	**18**	**1**
Minimu	**5.110**	**7.28**	**28.1**	**142**	**31.0**	**164**	**1,645**	**1,618**	**1,601**	**4,542**	**200**	**117**	**0.060033**	**2,305**	**3,888**	**21,149**	**0.00**	**1.30**	**0.000**	**1.30**	**1**	**2**	**3**	**1**
Maximu	**5.867**	**7.84**	**30.7**	**662**	**47.0**	**277**	**1,796**	**1,760**	**1,766**	**5,664**	**260**	**148**	**0.125662**	**4,919**	**11,255**	**23,396**	**0.38**	**6.30**	**0.042**	**2.13**	**1**	**4**	**54**	**2**

CITY OF AVONDALE, ARIZONA
October 2011 Monthly Report
10/01/2011 to 10/31/2011

CITY OF AVONDALE, ARIZONA
October 2011 Monthly Report
10/01/2011 to 10/31/2011

TY OF
ber 2011
/2011 to

CITY OF AVONDALE, ARIZONA
October 2011 Monthly Report
10/01/2011 to 10/31/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
10/1/11	5.693	7.59	29.6				1,704	1,616	1,644	4,581	200	121	0.080141	3,062	5,450	22,208				1.80				<1
10/2/11	5.767	7.49	29.1				1,703	1,648	1,712	4,870	200	119	0.080202	3,257	6,131	22,262				1.79				1
10/3/11	5.388	7.58	28.8		32.0		1,755	1,718	1,711	5,168	210	122	0.080202	3,457	6,466	23,218	0.03	1.50	0.014	1.67				<1
10/4/11	5.228	7.47	28.4	360		388	1,749	1,667	1,676	4,322	200	118	0.071462	2,576	5,797	22,257				1.58	1	11	<1	<1
10/5/11	5.219	7.99	27.0		36.0		1,773	1,725	1,715	4,808	210	121	0.072874	2,922	5,947	22,249	0.01	3.90	0.003	1.61				<1
10/6/11	5.263	7.93	26.6		37.0		1,793	1,676	1,665	4,746	210	123	0.045956	1,819	7,380	22,177	0.17	4.00	0.000	1.24				<1
10/7/11	5.117	7.59	23.2		37.0		1,783	1,709	1,703	4,910	200	115	0.092261	3,778	11,593	22,130	0.10	4.00	0.003	1.10				<1
10/8/11	5.501	7.62	28.2		42.0		1,729	1,676	1,768	4,763	200	116	0.055081	2,188	5,096	22,137	0.12	5.30		1.48				<1
10/9/11	5.468	7.49	27.9		34.0		1,711	1,695	1,738	4,856	200	117	0.055126	2,233	6,188	22,342	0.11	4.60		1.61				<1
10/10/11	5.266	7.63	28.0		45.0		1,818	1,789	1,839	5,176	200	110	0.061538	2,656	6,429	20,481	0.18	2.90	0.003	1.75				<1
10/11/11	5.106	7.81	28.4	440	49.0	309	1,895	1,814	1,806	5,382	200	109	0.062104	2,788	8,400	22,312	0.08	1.60		1.63	1	3	22	<1
10/12/11	5.084	7.89	28.5		41.0		1,884	1,892	1,893	5,274	220	116	0.060212	2,648	5,749	23,181	0.01	1.90	0.004	1.47				<1
10/13/11	5.074	7.80	28.4		41.0		1,905	1,906	1,917	5,348	220	115	0.061164	2,728	7,459	24,981	0.05	2.30		1.76				1
10/14/11	5.108	7.52	26.1		38.0		1,932	1,829	1,897	5,289	210	111	0.108315	4,778	10,933	22,500	0.09	1.70	0.001	1.20				<1
10/15/11	5.449	7.48	28.5		46.0		1,900	1,891	1,908	5,383	220	116	0.070862	3,181	8,011	23,153	0.22	3.20		1.39				<1
10/16/11	5.595	7.45	28.1		42.0		1,857	1,773	1,784	5,435	220	122	0.070074	3,176	5,727	23,193	0.29	2.10		1.47				<1
10/17/11	5.320	7.22	28.0		31.0		1,994	1,949	1,996	5,345	240	121	0.101411	4,521	12,670	22,732	0.15	1.70		1.46				<1
10/18/11	5.291	7.40	28.3	236	37.0	298	2,172	2,093	O/S	6,090	250	117	0.130311	6,619	17,180	23,275	0.78	3.70	0.024	1.33	3	3	80	<1
10/19/11	5.182	7.54	28.4		45.0		2,133	2,121	O/S	6,260	250	118	0.060089	3,137	8,411	23,140	0.17	6.30	0.002	1.41				1
10/20/11	5.135	7.82	28.5		32.0		2,162	2,193	O/S	7,220	270	124	0.060109	3,619	11,243	23,246	1.18	7.00		1.45				<1
10/21/11	5.222	7.83	27.4		34.0		2,298	2,428	O/S	6,594	270	114	0.100130	5,507	14,209	23,198	2.52	5.30		1.46				<1
10/22/11	5.591	7.78	28.6		38.0		2,469	2,474	O/S	6,844	280	113	0.088421	5,047	10,201	23,169	2.71	4.50		1.47				<1
10/23/11	5.755	7.66	27.1		42.0		2,516	2,475	O/S	7,123	310	124	0.101274	6,016	11,949	22,786	2.54	2.70		1.33				<1
10/24/11	5.399	7.36	26.3		34.0		1,592	1,933	O/S	7,939	170	96	0.112806	7,469	19,061	22,723	2.75	1.10	0.068	2.05				<1
10/25/11	5.223	7.62	26.3	274	38.0	261	2,334	2,333	O/S	6,847	280	120	0.103676	5,920	14,845	23,280	2.26	2.30		1.30	2	3	6	<1
10/26/11	5.199	7.79	28.9		30.0		2,297	2,242	O/S	6,470	290	128	0.060125	3,244	8,999	23,125	2.57	3.20		1.35				<1
10/27/11	5.143	7.64	28.4		30.0		2,372	2,411	O/S	6,745	290	121	0.062583	3,521	9,250	23,038	2.22	4.70		1.17				<1
10/28/11	5.071	7.57	27.0		34.0		2,427	2,474	O/S	6,704	290	118	0.060530	3,384	7,990	23,048	2.54	5.80		1.21				1
10/29/11	5.596	7.60	27.3		35.0		2,389	2,365	O/S	6,692	290	122	0.080378	4,486	7,448	23,136	2.33	4.60		1.53				<1
10/30/11	5.667	7.63	26.5		42.0		2,383	2,373	O/S	6,754	270	114	0.071560	4,031	6,063	22,956	2.70	3.50		1.37				<1
10/31/11	5.172	7.84	26.1		35.0		2,250	2,341	O/S	6,827	290	126	0.060233	3,429	6,610	22,743	2.41	1.60		1.30				<1
Average:	**5.332**	**7.63**	**27.7**	**328**	**37.8**	**314**	**2,022**	**2,007**	**1,787**	**5,831**	**237**	**118**	**0.076813**	**3,781**	**8,996**	**22,786**	**1.12**	**3.46**	**0.012**	**1.48**	**2**	**5**	**36**	**1**
Minimu	**5.071**	**7.22**	**23.2**	**236**	**30.0**	**261**	**1,592**	**1,616**	**1,644**	**4,322**	**170**	**96**	**0.045956**	**1,819**	**5,096**	**20,481**	**0.01**	**1.10**	**0.000**	**1.10**	**1**	**3**	**6**	**1**
Maximu	**5.767**	**7.99**	**29.6**	**440**	**49.0**	**388**	**2,516**	**2,475**	**1,996**	**7,939**	**310**	**128**	**0.130311**	**7,469**	**19,061**	**24,981**	**2.75**	**7.00**	**0.068**	**2.05**	**3**	**11**	**80**	**1**

CITY OF AVONDALE, ARIZONA
November 2011 Monthly Report
11/01/2011 to 11/30/2011

CITY OF AVONDALE, ARIZONA
November 2011 Monthly Report
11/01/2011 to 11/30/2011

CITY OF
nber 2011
1/2011 to

CITY OF AVONDALE, ARIZONA
November 2011 Monthly Report
11/01/2011 to 11/30/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE							SOLIDS HANDLING			EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
11/1/11	5.190	7.94	25.0	344	41.0	277	2,525	2,430	O/S	6,683	290	117	0.070899	3,952	7,752	23,279	2.75	2.40	0.105	1.23	2	4	28	<1
11/2/11	5.219	7.55	27.4		43.0		2,466	2,493	O/S	6,728	310	125	0.070135	3,935	9,071	22,838	1.46	6.60		1.14				<1
11/3/11	5.169	7.93	27.5		45.0		2,471	2,460	O/S	6,410	300	122	0.052402	2,801	5,649	22,875	0.11	7.60		1.05				<1
11/4/11	3.267	7.90	26.7		36.0		2,419	2,459	O/S	7,565	260	107	0.068952	4,350	8,635	22,915	0.06	8.80		1.18				<1
11/5/11	3.019	7.63	25.7		40.0		2,408	2,394	O/S	7,219	260	108	0.059299	3,570	6,975	22,602	0.03	8.20		1.31				1
11/6/11	3.089	7.59	25.1		32.0		2,623	2,639	O/S	7,474	300	114	0.041092	2,561	6,028	22,691	0.09	7.10		1.29				<1
11/7/11	4.090	7.74	24.5		38.0		2,665	2,703	O/S	7,540	300	112	0.060468	3,802	9,853	22,387	0.02	2.10		1.01				1
11/8/11	5.232	7.59	24.3		55.0		2,477	2,694	O/S	7,944	310	120	0.065111	4,314	11,547	22,144	0.16	2.60	0.004	1.00				No Sample
11/9/11	5.119	7.81	24.5	402	45.0	332	2,597	2,593	O/S	7,551	310	119	0.050082	3,154	7,990	22,987	0.08	5.90		1.03	5	2	28	2
11/10/11	4.939	7.77	26.7		20.0		2,597	2,614	O/S	7,995	320	123	0.040087	2,673	6,597	22,700	0.12	9.60		1.29				<1
11/11/11	5.070	7.44	26.9		37.0		2,692	2,740	O/S	7,574	380	140	0.041704	2,634	5,145	22,706	0.11	8.50		0.88				<1
11/12/11	5.416	7.51	26.7		33.0		2,642	2,663	O/S	7,439	320	121	0.040068	2,486	5,965	21,727	0.07	4.60		1.08				<1
11/13/11	5.582	7.43	26.8		44.0		2,783	2,768	O/S	7,903	360	130	0.040017	2,638	5,247	21,938	0.09	1.60		1.32				<1
11/14/11	5.197	7.37	26.7		33.0		2,793	2,904	O/S	8,126	380	133	0.039993	2,710	5,603	20,416	0.16	0.60	0.000	1.54				<1
11/15/11	5.147	7.80	27.4	202	37.0	229	2,850	2,881	O/S	7,790	440	154	0.075016	4,874	10,384	22,700	0.00	1.30	0.000	1.25	8	2	56	<1
11/16/11	5.138	7.52	26.5		38.0		2,844	2,846	O/S	8,469	400	141	0.060576	4,279	8,792	23,196	0.00	3.70		1.02				<1
11/17/11	5.068	7.45	26.6		53.0		2,845	2,829	O/S	8,222	390	137	0.062802	4,306	9,426	21,914	0.00	4.90		1.38				<1
11/18/11	4.983	7.56	25.6		39.0		2,852	2,816	O/S	8,275	390	138	0.060112	4,149	9,282	23,195	0.00	4.60		1.05				<1
11/19/11	5.495	7.51	26.0		36.0		2,902	2,889	O/S	7,758	400	138	0.060149	3,892	8,194	22,706	0.03	5.30		1.64				<1
11/20/11	5.655	7.40	26.3		55.0		2,928	2,792	O/S	8,256	400	140	0.077896	5,364	13,203	19,934	0.00	3.90		1.65				<1
11/21/11	5.328	7.81	26.3		30.0		3,026	2,885	O/S	7,986	450	152	0.100077	6,665	14,725	21,645	0.02	3.20		1.49				<1
11/22/11	5.158	7.80	26.7	400	37.0	204	2,895	2,717	O/S	8,206	400	143	0.100272	6,862	15,586	21,728	0.05	1.90	0.005	0.87	1	<2	38	<1
11/23/11	5.267	7.71	24.2		39.0		2,829	2,737	O/S	8,120	400	144	0.065101	4,409	10,039	22,574	0.06	3.70		1.18				<1
11/24/11	5.659	7.69	24.1		30.0		2,819	2,746	O/S	8,040	430	155	0.050181	3,365	7,953	21,909	0.02	4.00		1.12				<1
11/25/11	4.878	7.28	24.7		52.0		2,928	2,861	O/S	8,236	480	166	0.050403	3,462	8,050	20,982	1.76	0.09		2.63				<1
11/26/11	5.330	7.26	25.0		45.0		3,201	3,162	O/S	7,926	500	157	0.060200	3,979	7,221	20,927	0.03	1.00		1.62				<1
11/27/11	5.617	7.43	25.1		42.0		3,038	3,016	O/S	8,110	460	152	0.060313	4,079	9,549	20,977	0.01	0.60		2.15				<1
11/28/11	5.293	7.49	23.3		29.0		2,904	2,844	O/S	8,539	440	153	0.103947	7,403	18,633	19,557	0.13	0.50		1.11				<1
11/29/11	5.160	7.45	23.2	302	48.0	343	3,033	2,937	O/S	8,549	440	147	0.100011	7,131	16,165	21,141	0.08	0.08	0.007	1.41	1	7	<1	<1
11/30/11	5.133	7.36	23.6		39.0		2,955	2,901	O/S	8,542	420	143	0.080170	5,711	12,737	21,798	0.03	3.10		1.77				<1
Average:	**4.997**	**7.59**	**25.6**	**330**	**39.7**	**277**	**2,767**	**2,747**	**#DIV/0!**	**7,839**	**375**	**135**	**0.063585**	**4,184**	**9,400**	**22,036**	**0.25**	**3.94**	**0.020**	**1.32**	**3**	**4**	**38**	**1**
Minimu	**3.019**	**7.26**	**23.2**	**202**	**20.0**	**204**	**2,408**	**2,394**	**0**	**6,410**	**260**	**107**	**0.039993**	**2,486**	**5,145**	**19,557**	**0.00**	**0.08**	**0.000**	**0.87**	**1**	**2**	**28**	**1**
Maximu	**5.659**	**7.94**	**27.5**	**402**	**55.0**	**343**	**3,201**	**3,162**	**0**	**8,549**	**500**	**166**	**0.103947**	**7,403**	**18,633**	**23,279**	**2.75**	**9.60**	**0.105**	**2.63**	**8**	**7**	**56**	**2**

CITY OF AVONDALE, ARIZONA
December 2011 Monthly Report
12/01/2011 to 12/31/2011

CITY OF AVONDALE, ARIZONA
December 2011 Monthly Report
12/01/2011 to 12/31/2011

TY OF
nber 2011
1/2011 to

CITY OF AVONDALE, ARIZONA
December 2011 Monthly Report
12/01/2011 to 12/31/2011

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING			EFFLUENT FLOWS AND CONCENTRATIONS						
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
12/1/11	5.002	7.80	24.5		45.0		2,875	2,824	O/S	8,364	490	172	0.060271	4,204	9,582	21,680	0.01	4.50		1.88				<1
12/2/11	4.901	7.71	24.3		38.0		2,987	2,919	O/S	8,246	450	152	0.070000	4,814	10,788	21,788	0.06	4.60		1.78				<1
12/3/11	5.388	7.31	23.0		45.0		3,036	3,024	O/S	8,441	470	155	0.070093	4,934	10,440	21,719	0.05	3.10		1.21				<1
12/4/11	5.753	7.79	21.8		45.0		2,857	2,815	O/S	8,348	430	152	0.071029	4,945	10,709	20,862	0.11	3.50		1.21				<1
12/5/11	5.221	7.81	22.5		36.0		2,778	2,797	O/S	8,358	450	161	0.101400	7,068	17,175	21,701	0.91	1.10		1.43				<1
12/6/11	5.051	7.83	25.6	480	35.0	3036	2,800	2,815	O/S	8,458	400	142	0.070190	4,951	11,512	18,655	0.06	2.40	0.000	1.11	7	2	73	<1
12/7/11	5.045	7.86	22.3		27.0		3,000	2,845	O/S	8,332	450	154	0.070289	4,884	11,204	20,634	0.06	6.20		1.67				1
12/8/11	5.049	7.71	23.0		38.0		2,831	2,822	O/S	8,061	460	163	0.071585	4,813	10,040	21,379	0.09	7.00		1.78				<1
12/9/11	5.006	7.81	21.1		39.0		2,841	2,771	O/S	8,016	500	178	0.070468	4,711	11,241	20,414	0.08	5.30		1.71				<1
12/10/11	5.542	7.69	22.8		45.0		2,863	2,864	O/S	8,337	500	175	0.085128	5,919	12,906	22,730	0.03	1.10		1.53				<1
12/11/11	5.706	7.44	22.1		37.0		2,875	2,778	O/S	10,637	500	177	0.080349	7,128	12,304	22,826	1.77	2.60		1.75				<1
12/12/11	5.267	7.67	22.3		38.0		2,726	2,666	O/S	8,146	510	189	0.124189	8,437	19,845	21,089	1.21	0.60		1.79				1
12/13/11	5.141	7.68	22.1	408	40.0	356	2,860	2,795	O/S	8,060	520	184	0.070164	4,716	10,937	23,543	0.94	1.10	0.027	3.00	8	3	14	<1
12/14/11	5.263	7.90	22.6		39.0		2,796	2,764	O/S	7,991	450	162	0.070185	4,677	11,125	22,795	0.03	4.00		1.75				<1
12/15/11	5.178	7.82	22.7		41.0		2,756	2,717	O/S	8,093	480	175	0.070133	4,734	11,173	21,626	0.03	7.40		1.90				<1
12/16/11	5.102	7.80	22.9		39.0		2,735	2,696	O/S	7,975	490	180	0.070140	4,665	11,839	22,969	0.01	8.90		1.82				<1
12/17/11	5.454	7.49	22.9		45.0		2,718	2,747	O/S	7,980	480	176	0.070309	4,679	11,148	20,384	0.06	6.10		2.16				<1
12/18/11	5.602	7.35	22.1		44.0		2,754	2,697	O/S	7,473	480	176	0.070200	4,375	11,317	21,792	0.05	6.70		2.18				<1
12/19/11	5.396	7.85	25.0		52.0		2,595	2,572	O/S	7,288	500	194	0.080193	4,874	12,942	18,577	1.50	1.30		2.97				<1
12/20/11	5.180	7.68	24.6	372	39.0	1090	2,697	2,694	O/S	7,969	440	163	0.050044	3,326	8,626	20,991	2.75	1.20	0.060	1.94	4	4	17	1
12/21/11	5.223	7.89	23.6		40.0		2,820	2,764	O/S	8,494	500	179	0.052082	3,689	9,349	22,582	0.02	3.70		2.63				<1
12/22/11	5.291	7.48	23.5		44.0		2,932	2,796	O/S	8,368	520	182	0.078374	5,470	13,378	19,922	0.02	4.80		1.86				1
12/23/11	5.275	7.45	23.7		44.0		2,835	2,848	O/S	7,912	500	176	0.071401	4,711	11,561	21,217	0.03	7.20		2.56				<1
12/24/11	5.742	7.34	23.1		35.0		2,940	2,723	O/S	7,898	490	173	0.070236	4,626	11,783	21,010	0.05	5.80		1.68				<1
12/25/11	4.919	7.23	23.5		41.0		2,831	2,781	O/S	7,884	550	196	0.100189	6,588	17,231	18,122	0.08	1.40		2.76				<1
12/26/11	5.260	7.64	23.2		55.0		2,841	2,809	O/S	7,590	590	209	0.100060	6,334	15,615	21,945	0.04	1.00		2.31				<1
12/27/11	5.204	7.31	23.1		55.0		2,892	2,822	O/S	8,782	590	207	0.076159	5,578	12,290	20,959	1.81	1.50	0.029	2.64				1
12/28/11	5.129	7.07	21.8	710	37.0	455	2,868	2,814	O/S	7,692	500	176	0.073761	4,732	11,686	22,611	0.95	1.40		2.87	8	3	13	<1
12/29/11	5.183	7.74	22.0		41.0		2,854	2,779	O/S	7,740	570	202	0.100067	6,459	15,801	21,475	1.01	2.30		2.42				<1
12/30/11	5.258	7.37	21.7		42.0		3,060	3,003	O/S	7,502	660	218	0.178009	11,137	27,680	20,348	0.24	2.80		1.88				<1
12/31/11	5.591	7.42	23.0		47.0		2,856	2,810	O/S	7,246	600	212	0.090150	5,448	14,754	21,865	0.08	3.00		2.37				<1
Average:	**5.268**	**7.61**	**23.0**	**493**	**41.5**	**1234**	**2,842**	**2,793**	**#DIV/0!**	**8,119**	**501**	**178**	**0.080221**	**5,407**	**12,838**	**21,297**	**0.46**	**3.66**	**0.029**	**2.02**	**7**	**3**	**29**	**1**
Minimu	**4.901**	**7.07**	**21.1**	**372**	**27.0**	**356**	**2,595**	**2,572**	**0**	**7,246**	**400**	**142**	**0.050044**	**3,326**	**8,626**	**18,122**	**0.01**	**0.60**	**0.000**	**1.11**	**4**	**2**	**13**	**1**
Maximu	**5.753**	**7.90**	**25.6**	**710**	**55.0**	**3036**	**3,060**	**3,024**	**0**	**10,637**	**660**	**218**	**0.178009**	**11,137**	**27,680**	**23,543**	**2.75**	**8.90**	**0.060**	**3.00**	**8**	**4**	**73**	**1**

CITY OF AVONDALE, ARIZONA
January 2012 Monthly Report
1/01/2012 to 1/31/2012

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE						SOLIDS HANDLING				EFFLUENT FLOWS AND CONCENTRATIONS								
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
1/1/12	4.961	7.33	23.4		46.0		2,879	2,802	O/S	7,380	660	232	0.095386	5,871	17,567	20,861	0.07	2.30		2.05				<1
1/2/12	5.462	7.64	21.6		55.0		2,956	2,870	O/S	5,863	650	223	0.100514	4,915	19,488	21,850	0.06	0.70		1.48				>200
1/3/12	5.318	7.58	23.9	624	37.0	461	2,764	2,821	O/S	7,428	620	222	0.100129	6,203	17,752	20,937	1.72	1.40	0.041	1.41	5	4	140	<1
1/4/12	5.242	7.72	23.4		40.0		2,706	2,767	O/S	7,675	550	201	0.083444	5,341	14,905	21,861	0.00	2.70		2.03				<1
1/5/12	5.232	7.57	23.6		40.0		2,755	2,745	O/S	8,304	580	211	0.100181	6,938	17,045	21,932	0.00	5.20		1.89				<1
1/6/12	5.067	7.59	23.1		37.0		2,676	2,775	O/S	10,686	590	216	0.122671	10,933	16,389	22,543	0.02	8.10		1.41				<1
1/7/12	5.608	7.39	22.0		43.0		2,699	2,896	O/S	7,401	650	232	0.101068	6,238	15,503	20,684	0.04	7.70		1.44				<1
1/8/12	5.784	7.87	22.0		48.0		2,631	2,685	O/S	7,221	600	226	0.100179	6,033	15,938	18,962	0.01	1.60		1.65				<1
1/9/12	5.386	7.39	21.2		34.0		2,516	2,531	O/S	7,185	610	242	0.175191	10,498	24,948	19,208	0.83	5.00		5.30				<1
1/10/12	5.128	7.50	23.0	504	40.0	333	2,557	2,616	O/S	6,920	550	213	0.050717	2,927	7,339	20,868	0.06	4.20	0.008	3.18	6	3	2000	<1
1/11/12	5.133	7.65	23.6		27.0		2,564	2,676	O/S	6,502	570	218	0.081159	4,401	12,708	20,697	0.09	6.60		3.76				1
1/12/12	5.106	7.66	23.6		44.0		2,587	2,568	O/S	6,341	650	252	0.080297	4,246	11,284	20,698	0.10	8.50		2.15				<1
1/13/12	5.027	7.58	23.1		41.0		2,574	2,660	O/S	6,731	700	267	0.031485	1,767	4,358	20,634	0.08	10.10		2.21				<1
1/14/12	5.456	7.77	20.9		42.0		3,163	2,873	O/S	7,012	780	258	0.046190	2,701	6,553	20,678	0.15	7.90		1.01				<1
1/15/12	5.303	7.47	20.2		45.0		2,409	2,388	O/S	6,294	690	288	0.041985	2,204	3,993	21,013	0.84	8.70		1.21				<1
1/16/12	5.541	7.60	22.1		40.0		2,109	2,111	1,907	5,230	560	274	0.040494	1,766	3,654	15,709	0.11	5.20		2.15				1
1/17/12	5.404	7.61	21.9	584	39.0	379	2,194	2,251	2,127	5,615	650	297	0.103149	4,830	11,804	19,814	0.50	4.20	0.060	3.56	9	6	4	<1
1/18/12	5.325	7.47	20.5		38.0		2,141	2,122	2,086	5,606	710	335	0.100106	4,680	11,628	23,107	0.16	3.00	0.003	3.46				<1
1/19/12	5.118	7.97	21.0		43.0		2,129	2,116	2,084	5,650	710	337	0.100089	4,716	10,628	18,215	0.14	3.80		2.74				<1
1/20/12	5.081	7.71	21.2		47.0		2,237	2,169	2,114	5,426	720	331	0.150036	6,790	16,105	2,067	0.19	5.00		1.60				<1
1/21/12	5.479	7.41	21.4		46.0		2,096	1,980	2,001	5,456	830	410	0.100222	4,560	8,961	20,741	0.10	4.60		3.99				<1
1/22/12	5.726	7.44	21.5		46.0		2,201	2,127	2,042	5,286	820	386	0.100703	4,440	7,391	21,841	0.10	2.30		6.94				<1
1/23/12	5.324	7.38	21.3		48.0		1,922	1,879	1,881	5,430	740	391	0.144026	6,522	11,510	22,361	0.10	3.90		7.32				<1
1/24/12	5.276	7.72	20.7	556	47.0	272	1,902	1,818	1,771	4,980	700	382	0.133698	5,553	15,350	22,015	0.18	1.40	0.000	8.34	17	8	260	<1
1/25/12	5.229	7.76	21.0		39.0		1,887	1,891	2,071	5,380	680	349	0.107053	4,803	14,583	23,090	0.15	3.80		2.71				<1
1/26/12	5.235	7.75	20.0		40.0		2,011	1,967	2,653	4,858	670	303	0.113079	4,581	11,207	24,591	0.94	4.30		2.35				<1
1/27/12	5.108	7.70	20.6		40.0		1,977	1,983	1,905	5,136	700	358	0.105001	4,498	12,387	24,107	0.18	6.80		1.62				<1
1/28/12	5.596	7.51	21.8		45.0		2,021	1,994	1,970	3,846	620	311	0.100883	3,236	9,346	22,267	0.08	7.70		2.01				<1
1/29/12	5.727	7.58	17.7		34.0		2,000	1,970	1,950	4,550	600	304	0.119773	4,545	18,642	22,748	0.08	4.10		2.50				<1
1/30/12	5.264	7.47	22.8		35.0		2,023	2,012	1,920	5,075	700	353	0.108159	4,578	12,928	23,764	0.08	1.80	0.000	1.48				1
1/31/12	5.086	7.77	23.3	180	40.0	219	2,102	2,157	2,079	4,038	590	279	0.118547	3,992	15,601	24,252	0.42	3.10		1.74	1	4	3	<1
Average:	**5.314**	**7.60**	**21.9**	**490**	**41.5**	**333**	**2,367**	**2,362**	**2,035**	**6,145**	**660**	**287**	**0.098568**	**5,010**	**12,822**	**20,778**	**0.24**	**4.70**	**0.019**	**2.80**	**8**	**5**	**481**	**1**
Minimum:	**4.961**	**7.33**	**17.7**	**180**	**27.0**	**219**	**1,887**	**1,818**	**1,771**	**3,846**	**550**	**201**	**0.031485**	**1,766**	**3,654**	**2,067**	**0.00**	**0.70**	**0.000**	**1.01**	**1**	**3**	**3**	**1**
Maximum:	**5.784**	**7.97**	**23.9**	**624**	**55.0**	**461**	**3,163**	**2,896**	**2,653**	**10,686**	**830**	**410**	**0.175191**	**10,933**	**24,948**	**24,591**	**1.72**	**10.10**	**0.060**	**8.34**	**17**	**8**	**2000**	**1**

CITY OF AVONDALE, ARIZONA
February 2011 Monthly Report
2/01/2012 to 2/29/2012

CITY OF AVONDALE, ARIZONA
February 2011 Monthly Report
2/01/2012 to 2/29/2012

TY OF
uary 2011
/2012 to

CITY OF AVONDALE, ARIZONA
February 2011 Monthly Report
2/01/2012 to 2/29/2012

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE							SOLIDS HANDLING			EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
2/1/12	5.112	7.50	20.7		41.0		2,057	2,173	2,042	4,098	600	287	0.117096	4,002	15,284	24,339	0.00	4.00		2.04				1
2/2/12	5.188	7.93	22.3		38.0		2,009	2,062	2,070	4,344	690	337	0.123174	4,462	11,693	23,873	0.00	4.70		1.54				<1
2/3/12	5.078	7.59	19.8		45.0		2,006	1,882	2,001	4,869	580	295	0.105182	4,271	11,253	24,350	0.70	5.80		1.35				<1
2/4/12	5.549	7.17	22.2		41.0		1,968	1,252	2,047	4,067	500	285	0.106549	3,614	11,633	24,126	0.00	6.90		1.18				1
2/5/12	5.779	7.40	21.4		36.0		1,939	1,935	1,904	4,070	520	270	0.116088	3,940	13,077	23,857	0.00	6.20		1.44				<1
2/6/12	5.276	7.83	23.1		35.0		1,873	1,946	1,914	4,946	500	262	0.114009	4,703	14,249	23,187	1.50	3.00		1.96				<1
2/7/12	5.158	7.91	23.6	630	40.0	1070	1,979	1,964	2,018	4,618	440	221	0.104085	4,009	12,161	24,281	0.17	2.10	0.011	1.71	5	14	5	<1
2/8/12	5.140	7.83	22.4		44.0		1,916	1,935	1,942	4,204	400	207	0.102797	3,604	11,451	24,241	0.08	5.50		2.15				<1
2/9/12	5.194	7.96	24.4		40.0		2,063	2,008	2,025	4,534	380	187	0.096107	3,634	11,781	24,197	0.06	8.80		1.25				<1
2/10/12	5.053	7.67	22.4		41.0		1,997	2,012	2,012	4,713	430	214	0.091644	3,602	10,041	22,068	0.13	9.80		0.96				<1
2/11/12	5.532	7.38	22.7		30.0		1,939	1,920	1,963	4,450	400	206	0.098312	3,649	10,338	23,125	0.04	7.30		1.82				<1
2/12/12	5.803	7.89	23.6		31.0		1,998	2,044	1,976	3,656	340	169	0.113228	3,452	11,622	22,724	0.01	2.60		1.58				<1
2/13/12	5.211	7.41	23.1		40.0		1,939	1,973	1,929	5,488	380	195	0.050159	2,296	6,927	22,148	>2.75	0.30		1.48				<1
2/14/12	5.016	7.42	23.1	912	37.0	774	1,875	1,929	1,869	4,440	400	212	0.050166	1,858	7,103	23,071	>2.75	0.80	0.061	1.86	4	8	4	<1
2/15/12	5.226	7.67	19.9		48.0		1,919	1,945	1,885	5,555	390	204	0.068410	3,169	10,328	23,733	0.76	2.10		1.14				<1
2/16/12	5.197	7.74	23.4		46.0		1,909	1,947	1,880	5,349	390	204	0.072824	3,249	9,907	23,471	0.05	2.60		1.11				2
2/17/12	5.117	7.45	22.0		39.0		1,940	1,893	1,872	4,915	400	210	0.072576	2,975	9,445	23,700	0.52	1.80		1.27				<1
2/18/12	5.457	7.39	23.1		38.0		1,971	1,990	2,189	4,384	400	195	0.080124	2,930	11,934	21,184	0.11	4.00		1.38				1
2/19/12	5.380	7.46	22.8		31.0		1,964	1,944	1,930	5,055	320	164	0.070121	2,956	8,467	22,636	0.06	2.30		2.98				<1
2/20/12	5.577	7.28	23.6		36.0		2,063	2,074	2,199	4,719	330	156	0.075085	2,955	9,115	22,486	0.03	1.80		1.46				<1
2/21/12	5.178	7.65	22.1	878	38.0	490	2,142	2,046	2,017	5,676	350	169	0.063491	3,006	10,663	23,738	0.55	2.20	0.000	1.57	12	4	9	1
2/22/12	5.164	7.84	19.6		37.0		2,262	2,265	2,050	5,033	360	164	0.083825	3,519	13,223	24,277	0.17	3.50		1.15				1
2/23/12	5.145	7.52	21.3		40.0		2,232	2,102	2,078	5,644	340	159	0.074098	3,488	9,563	24,256	0.09	4.10		1.24				<1
2/24/12	5.082	7.70	22.6		40.0		2,373	2,124	2,326	5,890	340	149	0.081620	4,009	9,285	22,783	0.17	7.00		1.34				<1
2/25/12	5.544	7.61	23.0		37.0		2,185	2,262	2,292	5,038	350	156	0.095258	4,002	9,630	22,816	0.12	6.00		2.77				<1
2/26/12	5.705	7.43	23.1		33.0		2,140	2,132	2,278	4,953	290	133	0.098171	4,055	8,712	20,751	0.13	3.60		2.22				<1
2/27/12	5.316	7.87	22.0		32.0		2,194	2,149	2,047	5,506	290	136	0.087302	4,009	11,236	22,466	0.80	1.00		1.64				<1
2/28/12	5.171	6.42	23.3	202	41.0	276	2,173	2,283	2,839	5,093	310	127	0.083007	3,526	10,404	22,410	2.14	1.10	0.024	2.45	6	2	4	<1
2/29/12	5.222	7.88	21.3		48.0		2,175	2,074	1,997	5,495	310	149	0.076565	3,509	8,918	22,020	0.17	1.10		2.27				1
Average:	**5.296**	**7.58**	**22.3**	**656**	**38.7**	**653**	**2,041**	**2,009**	**2,055**	**4,855**	**404**	**201**	**0.088658**	**3,533**	**10,670**	**23,183**	**0.32**	**3.86**	**0.024**	**1.67**	**7**	**7**	**6**	**1**
Minimum:	**5.016**	**6.42**	**19.6**	**202**	**30.0**	**276**	**1,873**	**1,252**	**1,869**	**3,656**	**290**	**127**	**0.050159**	**1,858**	**6,927**	**20,751**	**0.00**	**0.30**	**0.000**	**0.96**	**4**	**2**	**4**	**1**
Maximum:	**5.803**	**7.96**	**24.4**	**912**	**48.0**	**1070**	**2,373**	**2,283**	**2,839**	**5,890**	**690**	**337**	**0.123174**	**4,703**	**15,284**	**24,350**	**2.14**	**9.80**	**0.061**	**2.98**	**12**	**14**	**9**	**2**

CITY OF AVONDALE, ARIZONA
March 2012 Monthly Report
3/01/2012 to 3/31/2012

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
3/1/12	5.147	7.3	21.8		48		2,099	2,080	1,987	5,451	300	146	0.097200	4,419	12,702	20,796	0.18	7.90		2.45				<1
3/2/12	5.129	7.8	22.4		49		2,108	2,055	1,984	5,248	290	142	0.076608	3,353	9,499	23,450	0.74	9.30		4.20				<1
3/3/12	5.559	7.6	21.6		39		2,101	2,082	1,979	5,946	260	127	0.072317	3,586	7,373	23,450	0.03	9.30		1.70				<1
3/4/12	5.699	7.4	21.0		42		2,190	2,182	2,055	4,249	260	121	0.072844	2,581	6,985	22,850	0.09	7.50		1.88				<1
3/5/12	5.285	7.8	21.6		30		2,190	2,174	1,988	7,419	290	137	0.060026	3,714	7,388	22,821	0.07	4.50		3.31				<1
3/6/12	5.239	7.6	20.8	550	37	502	2,302	2,322	2,153	6,783	280	124	0.078421	4,436	10,702	22,908	0.04	1.80	0.006	2.38	11	3	1	<1
3/7/12	5.272	8.0	22.2		43		2,171	2,165	2,066	5,621	280	131	0.074340	3,485	9,483	23,418	0.19	5.10		3.23				<1
3/8/12	5.192	7.5	20.9		43		2,197	2,189	2,093	5,970	280	130	0.075670	3,768	10,061	19,047	0.13	6.30		3.12				<1
3/9/12	5.367	7.5	21.7		41		2,191	2,176	2,071	5,711	300	140	0.075339	3,588	7,760	24,335	0.00	11.20		5.48				<1
3/10/12	5.766	7.7	23.6		40		2,189	2,204	2,122	6,223	290	134	0.116090	6,025	10,806	23,256	0.15	9.10		1.37				<1
3/11/12	5.710	8.0	22.4		30		2,061	2,058	1,991	5,926	280	137	0.121125	5,986	16,627	20,406	0.05	4.40		1.44				<1
3/12/12	5.425	7.7	24.7		37		2,050	2,015	1,946	6,834	250	125	0.072263	4,119	7,628	21,576	0.53	2.30		2.76				<1
3/13/12	5.326	7.8	23.4	710	47	518	2,090	2,024	2,003	6,168	270	132	0.075347	3,876	9,139	18,488	0.04	5.00	0.002	1.88	2	4	26	<1
3/14/12	5.339	7.8	22.4		55		2,050	2,039	1,939	6,114	270	134	0.075731	3,862	9,942	19,262	0.14	5.50		1.68				<1
3/15/12	5.322	8.0	24.0		31		2,018	2,074	2,018	6,230	270	133	0.080525	4,184	9,498	18,815	0.19	4.40		1.77				<1
3/16/12	5.275	7.5	23.4		26		2,047	2,010	1,913	6,067	270	136	0.077917	3,943	8,902	19,339	0.07	5.20		1.61				<1
3/17/12	5.558	7.4	23.1		27		2,020	2,057	1,988	5,966	270	134	0.120453	5,993	17,185	18,289	0.03	1.70		1.44				1
3/18/12	5.836	7.3	22.5		28		2,030	2,009	1,960	6,376	290	145	0.124751	6,634	13,384	18,596	0.02	0.20		1.29				<1
3/19/12	5.515	7.5	22.0		32		2,016	1,993	1,964	6,314	270	136	0.082573	4,348	10,159	18,496	0.06	2.00		1.59				1
3/20/12	5.228	7.8	23.4	590	35	409	2,000	1,976	1,934	6,083	280	142	0.052528	2,665	5,965	19,373	0.04	2.50	0.002	1.59	3	2	1	<1
3/21/12	5.234	7.8	23.5		41		2,037	2,037	1,985	5,898	280	139	0.080853	3,977	12,148	17,980	0.40	6.40		1.32				<1
3/22/12	5.129	8.0	24.9		34		2,029	1,993	1,976	5,884	270	135	0.075491	3,705	11,819	18,539	0.18	7.10		1.29				<1
3/23/12	5.000	7.8	24.6		34		1,999	2,005	1,966	5,851	250	126	0.078077	3,810	9,988	18,801	0.08	7.80		1.41				<1
3/24/12	5.616	7.7	25.1		28		2,047	2,009	1,997	5,598	260	129	0.124618	5,818	11,545	18,932	0.05	5.10		1.27				<1
3/25/12	5.846	7.6	24.9		28		2,038	2,016	2,021	6,138	250	123	0.130776	6,695	10,601	17,979	0.05	1.70		1.89				<1
3/26/12	5.218	7.5	23.9		33		2,036	1,980	2,004	6,266	260	130	0.078337	4,094	9,464	18,953	1.97	1.00		1.58				<1
3/27/12	5.113	7.9	24.7	280	34	199	2,062	2,068	2,007	5,761	260	127	0.074247	3,567	8,573	18,290	0.23	1.40	0.010	0.83	1	2	86	<1
3/28/12	5.090	7.7	24.0		40		2,068	2,004	2,006	5,913	260	128	0.075000	3,699	9,974	19,221	0.03	1.60		1.07				<1
3/29/12	5.163	7.9	24.8		33		2,102	1,966	1,981	5,749	250	124	0.070151	3,364	8,643	19,654	0.00	2.90		0.89				<1
3/30/12	5.094	7.6	24.4		32		2,039	1,987	1,990	5,828	250	125	0.055118	2,679	6,446	18,692	0.10	3.60		1.00				<1
3/31/12	5.580	7.5	23.7		41		2,162	2,197	1,867	5,912	350	169	0.124658	6,146	10,846	16,626	0.15	3.50		0.99				<1
Average:	**5.364**	**7.68**	**23.1**	**533**	**36.7**	**407**	**2,088**	**2,069**	**1,999**	**5,984**	**274**	**133**	**0.085464**	**4,262**	**10,040**	**20,085**	**0.19**	**4.75**	**0.005**	**1.93**	**4**	**3**	**29**	**1**
Minimum:	**5.000**	**7.30**	**20.8**	**280**	**26.0**	**199**	**1,999**	**1,966**	**1,867**	**4,249**	**250**	**121**	**0.052528**	**2,581**	**5,965**	**16,626**	**0.00**	**0.20**	**0.002**	**0.83**	**1**	**2**	**1**	**1**
Maximum:	**5.846**	**8.01**	**25.1**	**710**	**55.0**	**518**	**2,302**	**2,322**	**2,153**	**7,419**	**350**	**169**	**0.130776**	**6,695**	**17,185**	**24,335**	**1.97**	**11.20**	**0.010**	**5.48**	**11**	**4**	**86**	**1**

CITY OF AVONDALE, ARIZONA
April 2012 Monthly Report
4/01/2012 to 4/30/2012

CITY OF AVONDALE, ARIZONA
April 2012 Monthly Report
4/01/2012 to 4/30/2012

TY OF
12 Monthly
/2012 to

CITY OF AVONDALE, ARIZONA
April 2012 Monthly Report
4/01/2012 to 4/30/2012

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
4/1/12	5.687	7.50	24.9		31		2,046	2,009	1,987	6,035	370	181	0.121284	6,104	10,721	19,494	0.10	2.50		1.00				<1
4/2/12	5.313	7.82	21.9		49		2,088	2,080	1,938	6,490	260	125	0.070095	3,794	7,235	17,533	0.08	1.00		1.21				<1
4/3/12	5.210	7.91	23.8	106	36	381	2,177	2,132	2,119	6,218	280	129	0.072982	3,785	9,260	19,375	0.08	2.30	0.000	1.24	1	5	10	<1
4/4/12	5.178	7.79	25.3		35		2,188	2,070	2,070	5,949	280	128	0.070650	3,505	11,352	18,652	0.15	4.10		0.67				<1
4/5/12	5.119	7.74	24.2		32		2,079	2,058	2,076	6,176	300	144	0.070696	3,641	8,902	19,195	0.11	3.90		0.99				<1
4/6/12	5.105	7.55	24.5		33		2,069	2,046	2,044	6,094	290	140	0.055327	2,812	5,987	19,175	0.05	3.20		0.91				<1
4/7/12	5.526	7.48	23.6		41		2,174	2,174	2,136	6,557	290	133	0.110094	6,021	10,495	19,470	0.05	2.40		0.97				<1
4/8/12	5.610	7.35	23.4		42		2,148	1,996	2,048	6,584	280	130	0.115597	6,347	10,877	17,776	0.03	1.00		1.02				<1
4/9/12	5.202	7.44	23.9		27		2,085	2,050	2,092	6,316	280	134	0.054951	2,895	5,755	10,501	0.02	0.60		1.61				<1
4/10/12	5.159	7.63	24.1	198	33	265	2,274	2,180	2,157	6,539	290	128	0.070036	3,819	9,302	14,036	0.03	1.00	0.008	0.99	1	3	8	<1
4/11/12	5.150	7.51	24.3		33		2,213	2,157	2,131	6,598	280	127	0.070049	3,855	11,093	17,754	0.03	1.20		0.84				<1
4/12/12	5.109	7.74	21.5		39		2,231	2,168	2,186	6,970	290	130	0.080025	4,652	11,743	19,168	0.03	1.00	0.012	1.16				<1
4/13/12	5.083	7.57	23.6		40		3,139	2,111	2,099	6,756	290	92	0.080038	4,510	13,408	20,813	0.11	1.70		0.81				<1
4/14/12	5.420	7.49	22.3		47		2,125	2,081	2,136	6,734	300	141	0.113544	6,377	17,154	19,967	0.09	2.30		1.24				1
4/15/12	5.756	7.42	24.0		44		2,069	2,076	2,055	7,003	300	145	0.105394	6,156	15,204	19,769	0.20	2.40		1.31				<1
4/16/12	5.321	7.36	23.3		34		2,089	2,010	2,083	7,064	300	144	0.078885	4,647	14,356	19,014	0.07	2.60		1.78				<1
4/17/12	5.103	7.68	22.6		40		2,181	2,139	2,135	6,719	300	138	0.000000	0	0	20,047	0.09	1.30		0.77				<1
4/18/12	5.188	7.58	24.1	394	39	534	2,269	2,224	2,224	5,356	300	132	0.083134	3,714	9,583	20,171	1.89	0.80		1.29	1	2	13	<1
4/19/12	5.176	7.89	24.7		31		2,231	2,175	2,171	6,844	300	134	0.070024	3,997	10,176	19,957	0.20	1.30		0.96				1
4/20/12	5.134	7.63	24.0		30		2,189	2,180	2,153	6,651	300	137	0.072776	4,037	9,580	18,732	0.11	1.80		1.07				<1
4/21/12	5.634	7.41	24.9		28		2,095	2,139	2,142	6,430	280	134	0.110538	5,928	14,957	20,411	0.00	2.00		1.10				<1
4/22/12	5.719	7.35	25.9		36		2,189	2,136	2,162	6,596	310	142	0.100366	5,521	14,004	19,131	0.11	0.70		1.19				<1
4/23/12	5.380	7.96	26.8		32		2,179	2,138	2,145	6,706	300	138	0.105187	5,883	16,570	19,517	0.03	0.50		1.15				<1
4/24/12	5.235	7.94	26.6	618	37	336	2,071	2,054	2,049	6,479	300	145	0.038348	2,072	5,405	18,560	0.12	0.80	0.015	0.02	1	3	30	<1
4/25/12	5.295	7.71	25.4		36		2,133	2,104	2,108	6,473	280	131	0.100427	5,422	11,536	18,982	0.01	1.70		1.10				<1
4/26/12	5.126	7.72	25.4		39		2,132	2,082	2,066	6,352	270	127	0.100541	5,326	9,997	18,982	0.01	3.10		0.95				<1
4/27/12	5.236	7.82	25.4		40		2,050	1,987	1,968	6,298	290	141	0.092489	4,858	10,981	19,628	0.01	5.10		0.91				<1
4/28/12	5.550	7.55	25.9		35		1,997	2,017	1,973	6,074	300	150	0.090035	4,561	11,845	18,858	0.14	5.20		1.10				<1
4/29/12	5.614	7.84	26.3		34		2,061	2,036	2,014	6,165	300	146	0.090057	4,630	8,100	17,815	0.08	3.60		1.07				<1
4/30/12	5.289	7.50	26.3		27		2,088	2,039	2,034	5,396	320	153	0.090177	4,058	10,261	19,250	0.08	1.70		0.74				<1
Average:	**5.321**	**7.63**	**24.4**	**329**	**36.0**	**379**	**2,169**	**2,095**	**2,090**	**6,421**	**294**	**137**	**0.082792**	**4,431**	**10,528**	**18,724**	**0.14**	**2.09**	**0.009**	**1.04**	**1**	**3**	**15**	**1**
Minimum:	**5.083**	**7.35**	**21.5**	**106**	**27.0**	**265**	**1,997**	**1,987**	**1,938**	**5,356**	**260**	**92**	**0.000000**	**0**	**0**	**10,501**	**0.00**	**0.50**	**0.000**	**0.02**	**1**	**2**	**8**	**1**
Maximum:	**5.756**	**7.96**	**26.8**	**618**	**49.0**	**534**	**3,139**	**2,224**	**2,224**	**7,064**	**370**	**181**	**0.121284**	**6,377**	**17,154**	**20,813**	**1.89**	**5.20**	**0.015**	**1.78**	**1**	**5**	**30**	**1**

CITY OF AVONDALE, ARIZONA
May 2012 Monthly Report
5/01/2012 to 5/31/2012

CITY OF AVONDALE, ARIZONA
May 2012 Monthly Report
5/01/2012 to 5/31/2012

TY OF
12 Monthly
/2012 to

CITY OF AVONDALE, ARIZONA
May 2012 Monthly Report
5/01/2012 to 5/31/2012

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE							SOLIDS HANDLING			EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
5/1/12	5.176	7.53	26.4	406	24	306	2,059	2,030	2,015	6,364	340	167	0.090815	4,820	8,327	19,250	0.08	0.60	0.005	0.72	3	4	16	<1
5/2/12	5.219	7.91	27.5		34		2,058	2,024	1,996	6,342	280	138	0.102689	5,431	9,445	19,772	0.05	4.60		1.01				<1
5/3/12	5.214	7.43	25.4		32		1,908	1,897	1,856	6,216	280	148	0.120149	6,229	10,333	18,585	0.18	4.80		0.88				1
5/4/12	5.194	7.89	26.5		34		1,892	1,860	1,864	6,086	270	144	0.120313	6,107	10,470	18,690	0.10	5.20		0.77				1
5/5/12	5.527	7.42	26.3		40		1,837	1,872	1,809	5,935	300	163	0.111234	5,506	7,919	20,129	0.20	6.10		0.84				1
5/6/12	5.572	7.44	26.4		31		1,844	1,822	1,802	6,034	280	154	0.080020	4,027	7,090	19,284	0.13	1.30		1.56				<1
5/7/12	5.230	7.41	26.3		23		1,905	1,905	2,007	6,760	290	150	0.070067	3,950	6,676	18,429	0.09	0.40		1.37				<1
5/8/12	5.096	7.36	25.3		38		1,934	1,921	1,828	6,652	300	158	0.065083	3,611	6,121	18,961	0.10	2.00	0.004	1.11				<1
5/9/12	5.121	7.42	26.1	464	39	326	2,072	1,963	1,938	6,218	260	131	0.072076	3,738	6,503	19,437	0.04	2.80		0.97	2	3	93	<1
5/10/12	5.156	7.39	25.5		30		2,062	1,986	1,981	6,148	280	139	0.090071	4,618	7,685	18,903	0.10	3.50		0.98				<1
5/11/12	5.167	7.39	25.9		37		1,947	1,937	1,898	6,103	280	145	0.106132	5,402	8,134	19,449	0.18	3.50		1.07				<1
5/12/12	5.635	7.41	26.5		29		1,891	1,870	1,842	5,959	240	129	0.115587	5,744	8,007	19,448	0.14	4.70		1.02				2
5/13/12	5.614	7.32	25.1		24		1,843	1,821	1,812	6,276	270	148	0.125068	6,546	9,512	20,035	0.10	4.30		1.18				<1
5/14/12	5.330	7.26	25.5		40		1,854	1,839	1,851	6,167	290	157	0.098945	5,089	8,294	19,487	0.07	1.10		0.89				<1
5/15/12	5.201	7.86	28.2		35		1,863	1,890	1,844	5,964	280	150	0.103474	5,147	8,311	18,314	0.14	1.20	0.003	1.02				<1
5/16/12	5.199	7.71	27.9	372	32	331	1,794	1,749	1,763	5,734	260	147	0.094346	4,512	7,548	18,846	0.11	3.50		0.88	6	4	1	<1
5/17/12	5.164	7.89	27.3		25		1,780	1,789	1,766	5,742	250	141	0.085099	4,075	6,598	13,298	0.14	4.60		1.14				<1
5/18/12	5.132	7.72	27.0		46		1,732	1,675	1,726	5,807	250	146	0.085176	4,125	6,385	17,020	0.14	4.70		1.09				<1
5/19/12	5.606	7.49	26.5		35		1,662	1,788	1,745	5,499	240	139	0.115064	5,277	7,819	18,380	0.10	6.30		1.14				<1
5/20/12	5.692	7.46	28.0		37		1,718	1,700	1,648	5,646	250	148	0.115265	5,428	8,702	15,626	0.12	5.80		1.02				2
5/21/12	5.345	7.85	26.8		45		1,699	1,719	1,727	6,391	250	146	0.085069	4,534	6,953	18,866	0.13	1.50		0.97				<1
5/22/12	5.262	7.60	26.0	604	37	495	1,773	1,777	1,767	5,740	250	141	0.093176	4,460	6,976	17,226	0.14	2.30	0.011	1.22	2	2	5	1
5/23/12	5.233	7.53	26.9		33		1,713	1,707	1,711	5,222	260	152	0.092026	4,008	6,706	17,230	0.24	4.00		1.10				<1
5/24/12	5.212	7.10	27.8		39		1,715	1,726	1,711	5,404	250	146	0.092056	4,149	6,477	16,505	0.00	2.80		1.07				1
5/25/12	5.224	7.81	27.6		36		1,768	1,743	1,727	5,576	250	143	0.092085	4,282	6,230	18,432	0.03	6.60		1.26				<1
5/26/12	5.405	7.70	27.0		31		1,809	1,765	1,730	5,509	260	147	0.092111	4,232	5,891	17,615	0.03	5.10		0.63				<1
5/27/12	5.063	7.54	26.7		26		1,770	1,792	1,774	5,944	250	141	0.092072	4,564	5,354	17,097	0.09	3.00		0.77				3
5/28/12	5.394	7.81	26.5		25		1,786	1,768	1,790	5,652	250	140	0.096109	4,530	5,285	18,435	0.03	1.40		0.72				<1
5/29/12	5.168	7.46	27.4	342	24	304	1,836	1,825	1,864	5,682	270	147	0.077062	3,652	5,972	20,838	0.03	1.20	0.024	0.99	5	2	19	<1
5/30/12	5.108	7.41	27.2		25		1,887	1,861	1,826	5,905	260	140	0.096904	4,772	7,306	17,930	0.04	1.50		1.02				1
5/31/12	5.090	7.77	27.0		19		1,791	1,829	1,818	5,832	270	149	0.092061	4,478	6,863	19,803	0.10	2.40		0.91				<1
Average:	**5.282**	**7.56**	**26.7**	**438**	**32.4**	**352**	**1,845**	**1,834**	**1,821**	**5,952**	**268**	**146**	**0.095723**	**4,743**	**7,416**	**18,430**	**0.10**	**3.32**	**0.009**	**1.01**	**4**	**3**	**27**	**1**
Minimum:	**5.063**	**7.10**	**25.1**	**342**	**19.0**	**304**	**1,662**	**1,675**	**1,648**	**5,222**	**240**	**129**	**0.065083**	**3,611**	**5,285**	**13,298**	**0.00**	**0.40**	**0.003**	**0.63**	**2**	**2**	**1**	**1**
Maximum:	**5.692**	**7.91**	**28.2**	**604**	**46.0**	**495**	**2,072**	**2,030**	**2,015**	**6,760**	**340**	**167**	**0.125068**	**6,546**	**10,470**	**20,838**	**0.24**	**6.60**	**0.024**	**1.56**	**6**	**4**	**93**	**3**

CITY OF AVONDALE, ARIZONA
June 2012 Monthly Report
6/01/2012 to 6/30/2012

CITY OF AVONDALE, ARIZONA
June 2012 Monthly Report
6/01/2012 to 6/30/2012

TY OF
012 Monthly
/2012 to

CITY OF AVONDALE, ARIZONA
June 2012 Monthly Report
6/01/2012 to 6/30/2012

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature °C	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
6/1/12	5.086	7.49	27.2		23.0		1,820	1,800	1,777	5,621	260	145	0.092121	4,319	6,410	18,947	0.07	3.60		1.00				1
6/2/12	5.414	7.42	27.6		26.0		1,756	1,765	1,772	5,444	270	153	0.092173	4,185	6,375	19,228	0.07	4.80		1.07				2
6/3/12	5.388	7.55	28.5		24.0		1,775	1,784	1,760	5,594	260	147	0.092073	4,296	6,501	19,734	0.07	4.30		1.12				2
6/4/12	5.169	7.59	28.0		28.0		1,766	1,757	1,740	5,640	260	148	0.092150	4,335	6,353	19,613	0.07	1.40		1.21				<1
6/5/12	5.043	7.91	28.6	350	27.0	264	1,737	1,720	1,733	5,361	250	145	0.092314	4,127	6,732	18,515	0.19	1.00	0.020	1.19	2	2	59	1
6/6/12	5.046	7.71	28.5		29.0		1,755	1,780	1,759	5,511	250	142	0.092136	4,235	5,649	19,501	0.28	3.10		1.80				<1
6/7/12	5.033	7.67	26.3		39.0		1,740	1,751	1,767	5,312	240	137	0.092073	4,079	4,522	17,101	0.20	4.20		1.27				<1
6/8/12	5.226	7.61	26.9		28.0		1,797	1,756	1,767	5,509	240	135	0.092068	4,230	5,078	17,262	0.26	5.00		1.47				2
6/9/12	5.373	7.52	28.6		28.0		1,696	1,699	1,675	5,248	250	148	0.092022	4,028	4,293	17,880	0.20	5.10		1.72				<1
6/10/12	5.377	7.38	28.0		27.0		1,712	1,770	1,710	5,491	240	139	0.100740	4,613	4,747	17,538	0.14	4.20		1.51				<1
6/11/12	5.188	7.41	28.5		22.0		1,763	1,788	1,740	5,647	240	136	0.092062	4,336	5,714	17,591	0.03	1.40		1.07				95
6/12/12	5.165	7.33	27.9	288	25.0	160	1,754	1,724	1,691	5,263	240	139	0.092077	4,042	6,467	18,158	0.07	1.50	0.024	0.97	2	2	39	2
6/13/12	5.071	7.35	27.6		38.0		1,780	1,698	1,734	5,324	230	132	0.092071	4,088	6,062	17,769	0.01	1.40		0.92				<1
6/14/12	5.083	7.42	27.9		35.0		1,704	1,705	1,684	5,473	240	141	0.092067	4,202	6,091	18,086	0.01	1.80		0.87				<1
6/15/12	5.031	7.44	27.8		36.0		1,776	1,735	1,701	5,580	230	132	0.092064	4,284	5,942	17,743	0.04	1.60		0.95				<1
6/16/12	5.338	7.28	28.2		42.0		1,710	1,751	1,707	5,406	230	134	0.097603	4,401	4,946	17,788	0.03	0.70		0.91				<1
6/17/12	5.395	7.39	28.2		39.0		1,737	1,698	1,734	5,740	250	145	0.092281	4,418	4,787	21,580	0.03	0.80		0.98				<1
6/18/12	5.260	7.41	28.7		39.0		1,746	1,730	1,673	5,621	240	140	0.092007	4,313	4,964	17,839	0.07	0.30		1.03				<1
6/19/12	5.230	7.51	28.1		50.0		1,744	1,748	1,768	5,538	250	143	0.092012	4,250	6,071	17,775	0.06	0.80	0.017	0.95				<1
6/20/12	5.159	7.48	28.5	510	49.0	308	1,770	1,750	1,753	5,623	230	131	0.095964	4,500	5,584	17,713	0.08	1.40		0.93	1	2	461	<1
6/21/12	5.197	7.84	28.5		38.0		1,760	1,757	1,761	5,172	240	136	0.091997	3,968	5,139	17,291	0.09	0.30		0.95				1
6/22/12	5.283	7.38	29.1		30.0		1,755	1,798	1,760	5,164	230	130	0.092227	3,972	5,170	17,415	0.08	0.90		0.71				1
6/23/12	5.493	7.56	28.5		46.0		1,785	1,775	1,751	4,848	240	136	0.093217	3,769	4,141	16,151	0.08	1.30		1.06				1
6/24/12	5.482	7.30	29.3		40.0		1,834	1,836	1,812	4,996	240	131	0.097802	4,075	4,389	19,610	0.10	0.70		1.38				<1
6/25/12	5.302	7.78	29.2		31.0		1,775	1,743	1,805	4,894	240	135	0.103280	4,215	6,010	14,934	0.03	0.10		1.05				1
6/26/12	5.302	7.62	29.4	412	44.0	208	1,748	1,778	1,741	4,880	230	131	0.112095	4,562	6,495	16,758	0.23	0.50	0.010	1.15	2	2	<1	<1
6/27/12	5.313	7.51	30.1		35.0		1,726	1,751	1,733	4,797	230	132	0.110099	4,405	6,101	15,506	0.26	1.30		1.04				<1
6/28/12	5.274	7.72	29.6		47.0		1,702	1,727	1,717	4,893	220	128	0.095000	3,877	5,831	16,489	0.28	1.20		0.93				<1
6/29/12	5.270	7.73	29.9		55.0		1,707	1,693	1,675	4,916	220	130	0.095079	3,898	6,233	17,385	0.26	1.90		1.11				<1
6/30/12	5.429	7.41	29.1		29.0		1,636	1,585	1,631	4,548	230	142	0.095083	3,607	5,709	26,677	0.34	1.60		0.94				<1
Average:	**5.247**	**7.52**	**28.4**	**390**	**35.0**	**235**	**1,749**	**1,745**	**1,734**	**5,302**	**241**	**138**	**0.094865**	**4,188**	**5,617**	**18,186**	**0.12**	**1.94**	**0.018**	**1.11**	**2**	**2**	**186**	**10**
Minimum:	**5.031**	**7.28**	**26.3**	**288**	**22.0**	**160**	**1,636**	**1,585**	**1,631**	**4,548**	**220**	**128**	**0.091997**	**3,607**	**4,141**	**14,934**	**0.01**	**0.10**	**0.010**	**0.71**	**1**	**2**	**39**	**1**
Maximum:	**5.493**	**7.91**	**30.1**	**510**	**55.0**	**308**	**1,834**	**1,836**	**1,812**	**5,740**	**270**	**153**	**0.112095**	**4,613**	**6,732**	**26,677**	**0.34**	**5.10**	**0.024**	**1.80**	**2**	**2**	**461**	**95**

CITY OF AVONDALE, ARIZONA
July 2012 Monthly Report
7/01/2012 to 7/31/2012

CITY OF AVONDALE, ARIZONA
July 2012 Monthly Report
7/01/2012 to 7/31/2012

TY OF
12 Monthly
/2012 to

CITY OF AVONDALE, ARIZONA
July 2012 Monthly Report
7/01/2012 to 7/31/2012

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
7/1/12	5.423	7.45	29.2		40.0		1,658	1,600	1,652	5,299	230	141	0.095975	4,241	5,482	17,101	0.33	0.80		0.92				<1
7/2/12	5.039	7.41	29.6		40.0		1,728	1,704	1,793	4,940	230	132	0.095289	3,926	6,593	18,000	0.28	0.70		1.18				3
7/3/12	5.157	7.48	29.0	370	32.0	219	1,716	1,732	1,745	5,294	230	133	0.095051	4,197	7,214	17,528	0.10	0.40		0.98	5	2	11	<1
7/4/12	5.319	7.77	29.3		36.0		1,781	1,526	1,753	5,367	220	130	0.096990	4,341	5,750	19,340	0.12	2.00		1.09				<1
7/5/12	5.124	7.72	28.7		38.0		1,738	1,701	1,718	5,335	220	128	0.096047	4,274	6,768	17,454	0.22	3.40		0.80				<1
7/6/12	5.185	7.89	29.2		34.0		1,620	1,656	1,635	5,406	230	141	0.095115	4,288	6,849	19,631	0.18	1.10		0.74				<1
7/7/12	5.322	7.43	29.0		40.0		1,629	1,659	1,606	5,142	230	141	0.095058	4,076	5,911	14,670	0.19	1.00		1.02				1
7/8/12	5.296	7.44	29.0		36.0		1,667	1,686	1,655	5,204	230	138	0.095062	4,126	6,188	15,601	0.14	0.50		0.89				<1
7/9/12	5.247	7.54	30.2		41.0		1,695	1,727	1,699	5,185	220	129	0.095069	4,111	6,591	15,854	0.24	0.60		1.43				<1
7/10/12	5.195	7.44	28.5	634	40.0	382	1,647	1,640	1,583	5,282	220	136	0.095066	4,188	6,853	16,411	0.04	0.50	0.002	1.70	4	2	>2420	<1
7/11/12	5.203	7.60	29.1		40.0		1,634	1,647	1,643	5,281	220	134	0.095041	4,186	6,290	16,324	0.12	0.70		1.66				<1
7/12/12	5.312	7.59	28.2		26.0		1,650	1,668	1,651	4,921	220	133	0.096915	3,978	5,983	16,129	2.39	1.30		1.60			1	<1
7/13/12	5.304	7.55	28.8		32.0		1,611	1,654	1,611	5,213	210	129	0.090060	3,915	5,946	13,992	5.00	0.70		1.57				2
7/14/12	5.502	7.43	30.2		39.0		1,602	1,611	1,630	5,156	200	124	0.090010	3,871	5,056	14,341	3.00	1.10		2.10				<1
7/15/12	5.558	7.43	29.4		29.0		1,545	1,625	1,566	5,027	210	133	0.090024	3,774	5,729	13,562	2.66	0.70		1.94				<1
7/16/12	5.301	7.60	28.5		36.0		1,531	1,688	1,672	5,123	200	123	0.090077	3,849	5,707	17,707	2.60	0.20		1.90				<1
7/17/12	5.145	7.46	29.3		32.0		1,531	1,534	1,497	5,633	200	132	0.090106	4,233	5,899	15,185	0.88	0.70	0.005	1.24				<1
7/18/12	5.211	7.58	30.1	428	33.0	434	1,916	1,932	1,759	4,969	190	102	0.090084	3,733	6,167	15,418	0.07	2.10		1.11	4	3	690	<1
7/19/12	5.216	7.50	29.6		36.0		2,191	3,738	3,645	4,911	190	60	0.090099	3,690	5,474	13,774	0.21	2.90		1.41				<1
7/20/12	5.202	7.50	29.7		45.0		3,449	3,164	3,805	4,909	150	43	0.090076	3,688	6,794	20,419	0.08	5.50		0.92				<1
7/21/12	5.708	7.43	29.7		32.0		1,964	2,241	2,988	4,825	200	83	0.090185	3,629	6,384	12,542	0.07	5.70		1.43				1
7/22/12	5.590	7.50	30.1		33.0		1,617	1,644	2,602	5,033	150	77	0.090079	3,781	5,118	17,786	0.11	2.30		1.21				<1
7/23/12	5.362	7.61	30.1		35.0		2,932	2,720	3,579	5,767	190	62	0.090036	4,330	5,749	20,479	0.02	0.90		1.50				<1
7/24/12	5.299	7.73	30.2	524	38.0	358	1,501	2,018	1,580	4,954	150	88	0.090021	3,719	5,845	18,645	0.08	0.50	0.005	2.79	4	4	130	<1
7/25/12	5.191	7.71	29.9		55.0		1,893	4,347	1,717	4,622	100	38	0.029314	1,130	1,403	17,966	0.12	2.70		2.98				<1
7/26/12	5.048	7.79	28.9		46.0		2,812	2,517	1,268	3,980	110	50	0.000000	0	0	18,199	0.03	8.90	0.020	2.12				<1
7/27/12	5.114	7.55	29.6		29.0		3,748	2,784	1,353	4,120	120	46	0.050033	1,719	2,189	18,010	0.03	9.00	0.022	3.21				1
7/28/12	5.398	7.51	29.1		33.0		4,863	2,264	1,319	8,544	110	39	0.052648	3,752	1,725	17,490	0.03	7.50		4.15				<1
7/29/12	5.618	7.45	29.7		31.0		4,100	1,788	1,633	4,378	140	56	0.050053	1,828	1,849	17,326	0.03	6.20		3.24				<1
7/30/12	5.446	7.84	29.2		55.0		1,808	2,080	1,636	4,576	140	76	0.052674	2,010	2,947	24,067	0.03	3.60		3.97				<1
7/31/12	5.389	7.87	30.2	540	43.0	378	5,856	2,289	1,898	4,515	140	42	0.055460	2,088	3,699	22,099	0.17	2.80	0.000	5.17	7	4	<1	<1
Average:	**5.304**	**7.57**	**29.4**	**499**	**37.3**	**354**	**2,214**	**2,051**	**1,900**	**5,126**	**187**	**100**	**0.081217**	**3,506**	**5,166**	**17,195**	**0.63**	**2.48**	**0.009**	**1.87**	**5**	**3**	**208**	**2**
Minimum:	**5.039**	**7.41**	**28.2**	**370**	**26.0**	**219**	**1,501**	**1,526**	**1,268**	**3,980**	**100**	**38**	**0.000000**	**0**	**0**	**12,542**	**0.02**	**0.20**	**0.000**	**0.74**	**4**	**2**	**1**	**1**
Maximum:	**5.708**	**7.89**	**30.2**	**634**	**55.0**	**434**	**5,856**	**4,347**	**3,805**	**8,544**	**230**	**141**	**0.096990**	**4,341**	**7,214**	**24,067**	**5.00**	**9.00**	**0.022**	**5.17**	**7**	**4**	**690**	**3**

CITY OF AVONDALE, ARIZONA
August 2012 Monthly Report
8/01/2012 to 8/31/2012

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
8/1/12	5.308	7.39	28.7		26.0		3,858	2,223	1,622	4,712	150	58	0.060240	2,367	2,742	17,283	0.19	3.60		5.79				<1
8/2/12	5.342	7.66	30.2		46.0		4,453	2,582	2,180	5,226	170	55	0.061330	2,673	4,252	17,540	0.18	2.40		5.32				<1
8/3/12	5.418	7.43	29.9		30.0		8,156	2,195	2,003	5,260	170	41	0.060122	2,637	3,978	18,283	0.08	2.90		5.52				1
8/4/12	5.749	7.57	29.9		36.0		1,805	1,822	1,736	5,522	250	140	0.060060	2,766	4,651	17,551	9.00	0.90		11.00				<1
8/5/12	5.959	7.34	29.6		38.0		1,817	2,007	1,945	5,822	270	140	0.071071	3,451	5,614	17,638	7.00	0.40		8.23				<1
8/6/12	5.690	7.79	30.4		55.0		2,493	1,996	1,912	5,859	270	127	0.072781	3,556	6,136	19,358	5.00	0.50		4.18				<1
8/7/12	5.657	7.66	30.3	366	35.0	330	2,043	2,382	1,918	5,946	300	142	0.070163	3,479	5,302	18,730	3.00	0.40	0.059	6.19	7	10	<1	<1
8/8/12	5.629	7.49	31.3		32.0		1,929	1,920	2,062	6,134	220	112	0.070106	3,586	4,505	20,229	3.00	0.80		4.60				<1
8/9/12	5.616	7.99	30.5		29.0		2,206	1,734	2,196	5,828	390	191	0.070782	3,440	3,976	17,888	4.00	1.50		3.87				<1
8/10/12	5.504	7.69	30.7		34.0		2,739	2,373	2,586	5,664	350	136	0.085248	4,027	5,632	20,588	4.00	1.50		4.85				<1
8/11/12	5.942	7.38	30.2		27.0		2,743	1,915	1,715	4,569	320	151	0.080154	3,054	4,417	17,888	2.75	1.80		5.05				<1
8/12/12	6.074	8.00	30.1		24.0		2,072	1,849	1,684	5,569	400	214	0.080118	3,721	4,863	23,277	2.65	1.40		5.52				<1
8/13/12	5.659	7.95	30.9		55.0		3,078	2,879	2,369	6,012	450	162	0.083435	4,183	6,590	17,883	0.36	1.00		6.08				<1
8/14/12	5.475	8.05	31.1	796	28.0	434	4,211	3,701	2,300	5,667	500	147	0.080300	3,795	6,264	20,434	1.61	0.90	0.016	8.19	5	6	330	1
8/15/12	5.645	7.83	31.1		31.0		2,615	3,328	2,700	4,846	390	135	0.080309	3,246	7,805	17,879	3.00	1.00		7.83				<1
8/16/12	5.687	7.81	30.1		32.0		2,211	2,031	3,236	5,933	500	201	0.080203	3,969	6,317	19,435	8.00	0.03		10.30				<1
8/17/12	5.608	7.85	29.3		32.0		2,288	2,322	3,254	5,418	410	156	0.087312	3,945	5,301	17,904	6.00	1.20		9.10				<1
8/18/12	5.880	7.58	30.4		35.0		2,742	2,243	2,450	4,581	450	182	0.090224	3,447	4,795	18,678	5.00	3.30		6.64				<1
8/19/12	5.967	7.45	31.1		33.0		2,331	2,111	2,117	5,776	470	215	0.080149	3,861	4,788	17,894	1.00	3.80		8.51				<1
8/20/12	5.579	7.61	31.3		38.0		2,780	3,316	1,850	5,626	550	208	0.087106	4,087	5,120	18,673	0.20	2.10	0.008	9.47				<1
8/21/12	5.684	7.52	30.6	394	33.0	234	5,700	4,866	6,318	6,885	700	124	0.037490	2,153	1,257	17,879	1.24	1.10	0.010	11.30	18	4	<1	<1
8/22/12	5.888	7.60	29.7		31.0		2,038	3,600	2,456	7,783	650	241	0.093452	6,066	5,546	22,629	2.26	1.30		9.23				1
8/23/12	5.713	7.61	29.9		39.0		4,279	3,847	4,217	4,940	650	158	0.093292	3,844	5,202	18,112	0.79	3.10		11.00				9
8/24/12	5.582	7.54	30.0		31.0		3,840	2,883	5,288	4,638	670	167	0.090576	3,504	3,494	17,857	0.73	3.90		12.50				<1
8/25/12	5.954	7.81	30.4		23.0		4,156	2,216	2,050	4,564	700	249	0.100166	3,813	5,492	18,587	0.25	5.60		15.10				11
8/26/12	6.075	7.56	31.1		29.0		2,498	2,534	2,096	4,912	850	358	0.100078	4,100	6,227	17,965	0.09	4.00		13.80				>200
8/27/12	5.748	7.63	30.8		32.0		1,632	1,447	1,484	5,804	800	526	0.100029	4,842	6,868	18,125	1.07	2.20		17.50				86
8/28/12	5.469	7.56	30.4	388	31.0	277	2,144	O/S	1,795	4,929	850	432	0.100062	4,113	7,623	18,315	5.00	1.00		16.90	29	8		2
8/29/12	5.467	7.79	31.4		39.0		2,474	O/S	2,120	5,350	1,000	435	0.110040	4,910	9,658	17,880	8.00	0.80		24.60				5
8/30/12	5.508	7.72	31.6		28.0		2,413	O/S	3,052	5,170	1,000	366	0.110000	4,743	7,449	18,959	11.00	0.70		21.40				<1
8/31/12	5.508	7.79	28.8		28.0		2,299	O/S	2,336	4,986	1,000	431	0.080036	3,328	5,215	20,888	11.00	1.00		21.60			<1	<1
Average:	**5.677**	**7.67**	**30.4**	**486**	**33.5**	**319**	**2,969**	**2,530**	**2,485**	**5,482**	**511**	**206**	**0.081498**	**3,700**	**5,390**	**18,782**	**3.47**	**1.81**	**0.023**	**10.04**	**15**	**7**	**330**	**15**
Minimum:	**5.308**	**7.34**	**28.7**	**366**	**23.0**	**234**	**1,632**	**1,447**	**1,484**	**4,564**	**150**	**41**	**0.037490**	**2,153**	**1,257**	**17,283**	**0.08**	**0.03**	**0.008**	**3.87**	**5**	**4**	**330**	**1**
Maximum:	**6.075**	**8.05**	**31.6**	**796**	**55.0**	**434**	**8,156**	**4,866**	**6,318**	**7,783**	**1,000**	**526**	**0.110040**	**6,066**	**9,658**	**23,277**	**11.00**	**5.60**	**0.059**	**24.60**	**29**	**10**	**330**	**86**

CITY OF AVONDALE, ARIZONA
September 2012 Monthly Report
9/01/2012 to 9/30/2012

CITY OF AVONDALE, ARIZONA
September 2012 Monthly Report
9/01/2012 to 9/30/2012

CITY OF
mber 2012
/2012 to

CITY OF AVONDALE, ARIZONA
September 2012 Monthly Report
9/01/2012 to 9/30/2012

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
9/1/12	5.587	7.62	30.1		47.0		2,456	O/S	1,881	4,602	990	457	0.080100	3,074	3,690	26,873	11.00	0.30		23.00				<1
9/2/12	5.456	7.39	30.3		38.0		1,958	O/S	1,651	4,484	990	549	0.080039	2,993	4,030	27,038	12.00	0.70		21.40				180
9/3/12	5.897	7.77	30.6		55.0		3,014	O/S	2,277	4,171	990	374	0.081672	2,841	3,936	27,057	6.00	0.20		31.20				>200
9/4/12	5.520	8.03	30.8		53.0		1,471	O/S	1,651	4,065	1,000	641	0.100027	3,391	4,712	25,002	11.00	0.50	0.074	24.70				>200
9/5/12	5.459	7.20	30.1	458	21.0	374	1,418	O/S	1,476	4,032	990	684	0.075002	2,522	3,917	22,679	16.00	0.50		56.40	134	34	370	>1018
9/6/12	5.479	7.52	30.6		26.0		1,462	O/S	1,699	4,035	800	506	0.060015	2,020	2,828	26,644	16.00	0.70		59.60				88
9/7/12	5.239	7.42	30.6		27.0		1,577	O/S	1,585	4,006	900	569	0.060038	2,006	2,647	22,371	18.00	0.50		50.90				>200
9/8/12	5.820	7.43	30.2		32.0		1,343	O/S	1,574	4,011	800	549	0.061553	2,059	1,708	22,227	16.00	1.00		116.00				69
9/9/12	5.998	7.52	30.5		31.0		1,288	O/S	1,116	3,359	650	541	0.065011	1,821	1,776	23,867	17.00	0.60		150.00				>569
9/10/12	5.523	7.87	30.5		47.0		1,245	O/S	1,145	2,855	520	435	0.040615	967	1,120	22,127	17.00	1.00		103.00				49
9/11/12	5.369	7.71	30.0	242	33.0	199	1,863	O/S	1,734	4,236	420	234	0.040065	1,415	784	22,040	21.00	0.40	0.063	28.80	27	12	<1	<1
9/12/12	5.311	7.48	30.2		33.0		1,307	O/S	1,738	5,690	560	368	0.040513	1,923	700	21,710	15.00	0.40		29.50				<1
9/13/12	5.325	7.39	30.3		35.0		1,365	O/S	1,589	4,231	550	372	0.043208	1,525	843	21,901	17.00	0.40		24.30				<1
9/14/12	5.219	7.44	30.2		33.0		1,367	O/S	1,439	4,011	600	428	0.075800	2,536	2,568	24,309	22.00	0.50		26.70				<1
9/15/12	5.629	7.46	29.6		34.0		1,562	O/S	1,697	4,381	600	368	0.054522	1,992	1,698	22,020	18.00	0.70		22.10				<1
9/16/12	5.760	7.41	29.4		31.0		1,574	O/S	1,673	4,153	600	370	0.028238	978	1,364	25,970	16.00	0.20		19.80				<1
9/17/12	5.370	7.98	30.1		35.0		1,645	O/S	1,710	4,800	590	352	0.027430	1,098	1,233	19,394	19.00	0.80		16.10				<1
9/18/12	5.253	7.58	29.9	268	32.0	269	1,858	O/S	1,774	5,628	800	441	0.025529	1,198	1,760	23,389	19.00	0.60	0.036	15.70	22	16	<1	<1
9/19/12	5.287	7.36	29.7		34.0		1,794	O/S	1,852	6,060	600	329	0.030185	1,526	1,925	19,461	19.00	0.60		14.80				<1
9/20/12	5.225	7.52	29.2		41.0		1,968	O/S	1,852	6,034	700	366	0.026123	1,315	2,010	23,599	16.00	0.60		15.00				150
9/21/12	5.141	7.41	29.5		40.0		1,808	O/S	1,926	6,274	700	375	0.025009	1,309	1,173	21,719	13.00	0.50		11.80				<1
9/22/12	5.577	7.41	29.6		35.0		1,726	O/S	1,902	6,760	1,000	551	0.025148	1,418	1,219	23,216	8.00	0.60		11.00				1
9/23/12	5.669	7.36	29.0		32.0		1,942	O/S	1,975	6,734	450	230	0.025127	1,411	1,573	22,744	5.00	0.30		9.70				<1
9/24/12	5.292	7.81	31.2		41.0		2,072	O/S	2,122	6,737	440	210	0.025054	1,408	2,068	22,369	7.00	0.20		12.70				<1
9/25/12	5.125	7.52	30.4	246	24.0	260	1,950	O/S	2,036	6,926	700	351	0.025131	1,452	2,531	24,329	11.00	0.60	0.005	12.80	24	14	<1	<1
9/26/12	5.208	7.77	28.3		32.0		2,033	O/S	2,135	7,274	700	336	0.025088	1,522	1,539	23,661	9.00	0.30		11.80				<1
9/27/12	5.170	7.64	28.5		26.0		2,078	O/S	2,116	6,928	1,000	477	0.025117	1,451	1,576	22,891	1.66	0.60		12.80				<1
9/28/12	5.189	7.44	28.7		33.0		2,094	O/S	2,144	6,920	1,000	472	0.045125	2,604	2,952	22,668	1.60	1.60		14.40				1
9/29/12	5.509	7.40	29.8		29.0		1,964	O/S	1,989	6,487	320	162	0.025007	1,353	1,675	22,102	0.43			8.82				<1
9/30/12	5.637	7.42	29.4		35.0		2,043	O/S	2,050	6,725	400	195	0.025004	1,402	2,089	22,282	0.03			9.63				<1
Average:	**5.441**	**7.54**	**29.9**	**304**	**34.8**	**276**	**1,775**		**1,784**	**5,220**	**712**	**410**	**0.045550**	**1,818**	**2,121**	**23,255**	**12.62**	**0.57**	**0.045**	**32.15**	**52**	**19**	**370**	**77**
Minimum:	**5.125**	**7.20**	**28.3**	**242**	**21.0**	**199**	**1,245**		**1,116**	**2,855**	**320**	**162**	**0.025004**	**967**	**700**	**19,394**	**0.03**	**0.20**	**0.005**	**8.82**	**22**	**12**	**370**	**1**
Maximum:	**5.998**	**8.03**	**31.2**	**458**	**55.0**	**374**	**3,014**		**2,277**	**7,274**	**1,000**	**684**	**0.100027**	**3,391**	**4,712**	**27,057**	**22.00**	**1.60**	**0.074**	**150.00**	**134**	**34**	**370**	**180**

CITY OF AVONDALE, ARIZONA
October 2012 Monthly Report
10/01/2012 to 10/31/2012

CITY OF AVONDALE, ARIZONA
October 2012 Monthly Report
10/01/2012 to 10/31/2012

CITY OF AVONDALE, ARIZONA
October 2012 Monthly Report
10/01/2012 to 10/31/2012

	INFLUENT FLOWS AND CONCENTRATIONS						ACTIVATED SLUDGE								SOLIDS HANDLING		EFFLUENT FLOWS AND CONCENTRATIONS							
DATE	Total Influent Flow (MGD)	Influent pH	Influent Temperature oC	Influent TSS (mg/L)	Influent Ammonia (mg/L)	Influent BOD5 (mg/L)	Aeration Basin #1 MLSS (mg/L)	Aeration Basin #2 MLSS (mg/L)	Aeration Basin #3 MLSS (mg/L)	RAS (mg/L)	30 Minute Settled Volume	SVI	Actual Waste Flow (MGD)	Waste Flow (lbs)	Total TWAS Flow (gallons)	Total Primary Sludge Flow (gallons)	Effluent Ammonia (NH3) (mg/L)	Effluent Nitrate (NO3) (mg/L)	Effluent Nitrite (NO2) (mg/L)	Effluent Turbidity (NTU)	Effluent TSS (mg/L)	Effluent BOD5 (mg/L)	Ecoli (MPN)	Fecal Coliform (cfu)
10/1/12	5.254	7.66	29.3		42.0		2,110	O/S	2,068	6,550	500	239	0.025035	1,368	1,807	25,443	0.82	0.60		11.30				<1
10/2/12	5.091	7.47	29.4	418	29.0	866	2,046	O/S	2,124	6,906	700	336	0.025096	1,445	1,853	24,649	0.12	0.70		11.10	13	15	<1	<1
10/3/12	5.142	7.78	29.3		29.0		2,255	O/S	2,185	6,616	600	270	0.025123	1,386	1,578	23,315	0.13	3.40		15.60				4
10/4/12	5.179	7.53	29.7		47.0		2,137	O/S	2,252	7,443	700	319	0.020101	1,248	1,362	23,033	4.00	4.40		13.50				<1
10/5/12	5.131	7.57	28.6		35.0		2,351	O/S	2,341	7,547	700	298	0.050094	3,153	3,785	23,104	5.00	6.90		10.00				<1
10/6/12	5.608	7.95	29.4		31.0		2,151	O/S	2,095	11,188	540	254	0.040616	3,790	3,953	22,256	4.00	2.80		24.40				<1
10/7/12	5.531	7.44	29.3		27.0		2,137	O/S	2,011	7,618	570	275	0.025149	1,598	2,655	22,203	5.00	2.80		20.00				<1
10/8/12	5.407	7.57	29.6		26.0		2,110	O/S	2,085	9,659	590	281	0.025003	2,014	2,162	24,249	4.00	1.40		28.20				<1
10/9/12	5.107	7.35	28.6	436	33.0	279	2,278	O/S	2,178	6,596	1,000	449	0.025079	1,380	1,767	23,655	3.00	1.30		15.70	45	9	<1	<1
10/10/12	5.124	7.80	28.0		32.0		2,244	O/S	2,076	7,204	950	440	0.025080	1,507	2,162	22,149	0.88	1.50		15.50				<1
10/11/12	5.082	7.46	28.8		28.0		2,306	O/S	2,500	7,620	800	333	0.025079	1,594	2,166	21,141	0.65	2.00		11.60				<1
10/12/12	5.103	7.36	26.1		26.0		2,143	O/S	2,282	7,660	800	362	0.000000	0	0	22,260	0.09	3.40		11.30				<1
10/13/12	5.386	7.49	27.9		36.0		2,588	O/S	2,320	7,614	850	346	0.000000	0	0	22,628	0.05	4.30		11.60				<1
10/14/12	5.458	7.39	28.1		31.0		1,788	O/S	1,772	8,718	1,000	562	0.000000	0	0	21,842	0.29	3.10		78.30				<1
10/15/12	5.237	7.40	28.5		32.0		1,947	O/S	1,797	7,384	850	454	0.000000	0	0	22,435	0.97	1.20		53.80				4
10/16/12	5.132	7.42	28.3	520	36.0	374	2,264	O/S	2,386	7,536	1,000	430	0.000000	0	0	22,199	0.63	1.10		46.70	116	16	2	>780
10/17/12	5.120	7.55	27.8		32.0		2,388	O/S	2,164	7,602	1,000	439	0.000000	0	0	22,300	0.24	1.40		44.10				2
10/18/12	5.036	7.47	27.6		34.0		2,400	O/S	2,370	7,248	1,000	419	0.000000	0	0	22,227	0.23	2.70		34.30				<1
10/19/12	5.134	7.50	27.3		29.0		2,816	O/S	2,596	6,988	900	333	0.035846	2,089	4,180	22,186	0.22	3.70		49.30				<1
10/20/12	5.466	7.37	28.7		50.0		1,699	O/S	2,289	7,008	850	426	0.041447	2,422	4,637	22,583	0.61	2.80		79.00				>470
10/21/12	5.608	7.34	28.7		40.0		2,133	O/S	2,022	6,426	1,000	481	0.000000	0	0	22,233	1.31	3.20		84.40				>400
10/22/12	5.246	7.86	28.7		49.0		2,054	O/S	1,805	5,534	850	441	0.025333	1,169	1,689	22,091	2.26	0.50		105.00				>457
10/23/12	5.194	7.39	28.3	566	33.0	480	2,376	O/S	2,244	5,268	1,000	433	0.026907	1,182	771	22,231	1.08	1.80		38.30	58	9	7	6
10/24/12	5.253	7.68	27.9		40.0		1,956	O/S	2,048	5,088	800	400	0.040584	1,722	992	22,220	6.00	0.30		123.00				<1
10/25/12	5.159	7.59	26.6		37.0		2,084	O/S	1,838	4,800	750	382	0.025826	1,034	774	22,264	13.00	0.80		107.00				<1
10/26/12	5.118	7.44	26.1		30.0		2,018	O/S	1,758	4,689	700	371	0.025930	1,014	1,638	22,292	25.00	0.70	0.042	78.40				>603
10/27/12	5.411	7.53	26.3		38.0		2,016	O/S	1,826	4,698	750	390	0.033308	1,305	1,679	22,170	29.00	0.60		80.00				<1
10/28/12	5.612	7.42	28.8		41.0		1,513	O/S	1,465	4,254	740	497	0.027376	971	1,435	22,261	33.00	0.60		123.00				<1
10/29/12	5.244	7.81	27.5		38.0		1,344	O/S	1,365	4,282	600	443	0.015097	539	653	22,092	32.00	0.90		137.00				<1
10/30/12	5.042	7.60	26.0	632	35.0	510	1,464	O/S	1,518	4,636	700	469	0.000000	0	0	23,006	35.00	0.50		43.30	54	32	>2419	<1
10/31/12	5.019	7.73	25.2		32.0		1,778	O/S	1,506	4,778	750	457	0.000000	0	0	22,249	37.00	0.50	0.036	31.40				<1
Average:	**5.246**	**7.55**	**28.1**	**514**	**34.8**	**502**	**2,093**		**2,041**	**6,683**	**792**	**388**	**0.019649**	**1,095**	**1,410**	**22,612**	**7.92**	**2.00**	**0.039**	**49.55**	**57**	**16**	**5**	**4**
Minimum:	**5.019**	**7.34**	**25.2**	**418**	**26.0**	**279**	**1,344**		**1,365**	**4,254**	**500**	**239**	**0.000000**	**0**	**0**	**21,141**	**0.05**	**0.30**	**0.036**	**10.00**	**13**	**9**	**2**	**2**
Maximum:	**5.612**	**7.95**	**29.7**	**632**	**50.0**	**866**	**2,816**		**2,596**	**11,188**	**1,000**	**562**	**0.050094**	**3,790**	**4,637**	**25,443**	**37.00**	**6.90**	**0.042**	**137.00**	**116**	**32**	**7**	**6**

Appendix E – Walk-Through Plan Template

City of Avondale, Arizona

Logo??

CHARLES M. WOLF WATER RECLAMATION FACILITY OPERATOR TRAINING

Walkthrough Guide

System Name: Disinfection

Discipline: Operator I

Trainee Name:

BACKGROUND INFORMATION ON A WALKTHROUGH GUIDE:

The Walkthrough Guide provides a structural framework for performance-based training in the field for the Disinfection area. As closely as possible, the training should simulate actual performance under typical working conditions.

Follow the instructions for each section, checking off requirements as completed. If and when the you have demonstrated the ability to perform the task correctly and without supervision, sign off in the appropriate column provided. This will ensure you are ready for formal assessment.

LEARNING OBJECTIVES

For successful completion of this walkthrough guide, you must be able to:

- Draw a diagram of the Disinfection system.
- Identify the boundaries of the system.
- Describe difference of total and free chlorine residual.
- Describe the process of breakpoint chlorination.
- Describe the process of nitrite lock.
- Locate, identify, and demonstrate how to use all the PPE required for the Disinfection area.
- Identify all hazards in the Disinfection area.
- Locate, identify, and state the purpose of the listed components for the system.
- Trace the process flows to and from all major equipment within the system.
- Describe the operating principles and critical issues of all the major equipment.
- Perform the following procedures correctly and without supervision:

.

RESOURCES

- P&IDs for the Disinfection area
- Mechanical drawings of the Disinfection area
- Access to SCADA
- Latest copy of each procedure

GUIDELINES

- Follow all safety procedures.
- Perform steps in the proper sequence.
- All steps must be completed to the standards for successful completion of this Walkthrough Guide.

PREREQUISITES

- Read Sodium hypochlorite MSDS
- Read Sodium bisulfite MSDS

LOGO??

Disinfection Area System Knowledge

	Instructions/Guidelines	Notes	Date	Trainee Initials
1	Draw a diagram of the system, with key equipment, flows, and controls, using P&ID styles. Diagram should show the boundaries of the Disinfection system.			
2	Identify the major hazards in the Disinfection system. Ensure appropriate PPE while in the field. Review the location of all safety equipment in the Disinfection area. Arrange field tour with supervisor or operator III			
3	Refer to P&IDs, and trace the equipment and process flows through the Disinfection system. While in the field, examine and ask questions. Using the component list below: • locate, identify, and state the purpose of the listed equipment • trace the process flows to and from the major pieces of equipment • locate, identify, and state the function of the main controls and associated valves in the system • describe the operating principles and critical issues of the main pieces of equipment			

LOGO??

	Instructions/Guidelines	Notes	Date	Trainee Initials
4	Answer the following questions: • What is the appropriate PPE for this area/system? • What are the potential hazards specific to the system? • Where is the equipment located on SCADA?			
5	A loss of chlorine residual has occurred, while in field troubleshoot the problem and answer the following questions: • Is the low or loss of chlorine residual a result of a mechanical failure? • Is the low or loss of chlorine residual the result of a chemical cause i.e breakpoint chlorination or nitrite lock? If so, what parameters will diagnose the cause of this problem? • What precautions or steps should be taken to prevent the recurrence of this event?			
6	Draw out and describe the reactions that take place in disinfection with sodium hypochlorite and sodium bisulfite and what affects they have on the water chemistry and what is the result of sodium hypochlorite and sodium bisulfite being inadvertently mixed?			

LOGO??

	Component Table	Notes	Date	Complete
Sodium Hypochlorite System				
	Sodium Hypochlorite Solution Tanks 1 and 2 L-TNK-50-035 / L-TNK-50-036			
	Hypochlorite Solution Feed Pump L-DCD-50-037 / L-DCD-50-038			
	Hypochlorite Solution Pressure Regulating Valve L-PRV-037A / L-PRV-038A			
	Hypochlorite Solution Pump Discharge Backpressure Valve L-PRV-50-037B / G-PRV-50-038B			
	Chlorine Contact Tank Mixer L-MXR-50-039			
	Chlorine Contact Tank L-TNK-50-002			

LOGO??

	Component Table	Notes	Date	Complete
Sodium Bisulfite System				
	Sodium Bisulfite Solution Tanks 1 and 2 (SBS TNK 1 and 2) L-TNK-50-044 / L-TNK-50-045			
	Sodium Bisulfite Solution Feed Pump (SBS Feed Pump 1 and 2) L-P-50-046 / L-P-50-047			
	SBS Solution Feed Pump Variable Frequency Drive L-P-VFD-046 / L-VFD-50-047			
	SBS Solution Calibration Tube L-LG-50-046A / L-LG-50-047A			
	SBS Solution Pressure Relief Valve L-PRV-50-046 / L-PRV-50-047			
	SBS Solution Back Pressure Valve L-PCV-50-046 / L-PCV-50-047			

LOGO??

Disinfection System Procedures

	Instructions/Guidelines	Notes	Date	Trainee Initials
For each procedure in the Disinfection system:				
1	Obtain copies of the procedure, and read through the procedure on your own.			
2	Wherever possible, walk/talk through with the supervisor or operator III the steps associated with the procedure. Think about these questions and how they relate to each procedure: • When is it necessary to perform this procedure? • Is there any additional equipment or materials that are needed to carry out this procedure? • What is happening, in general, during this procedure? • How does performing this procedure affect other systems? • What happens if the sequence of the procedure is not followed? • How do you know that you have completed the procedure correctly?			

LOGO??

	Instructions/Guidelines	Notes	Date	Trainee Initials
For each procedure, use the following guidelines to ensure procedure specific knowledge and tasks are covered:				
	Sodium Hypochlorite Storage Tank Draining and Flushing			
3	Answer the following questions: • What is the date range for the seasonal chlorination/dechlorination requirements? • Which valves must be closed/opened to isolate the tank for safe job completion? • What considerations should be taken in regard to the dechlorination (SBS) system? • What PPE is required to perform this task? Under supervision, walk through the procedure.			
4	**Sodium Hypochlorite Handling Safe Job Procedure**			
	Answer the following questions: • What affects do strong acids have on sodium hypochlorite? What strong acids exist on the plant site? • Who should be contacted to deal with minor leaks and what considerations should be taken when introducing into plant process? • Where are the storage tank isolation valves located? • What are the steps required and equipment involved in the chemical feed pump isolation? • What are the steps required to calibrate the chemical feed pump with the calibration tube?			

LOGO??

	Instructions/Guidelines	Notes	Date	Trainee Initials
	• What concentration of chlorine will initiate an alarm at the chlorine gas monitor? Under supervision, walk through the procedure.			

Appendix F – Presentations

CH2MHILL®

City of Avondale
Wastewater Treatment Plant

Process Review Meeting

Agenda

1. Avondale WRF operations support
2. Tertiary filtration technologies (pros/cons)
3. CH2M HILL process model for Avondale WRF (demo and results)
4. PIR hook-up impact on WRF process
5. Secondary clarification capacity and settling (4th clarifier? Polymer?)
6. Other items

Concept of Contract Operations

- Peter Cohlmia, CH2M HILL OMBG

Tertiary Filters

- Sand Filters
  - Tried and true technology
  - Larger footprint
  - Chemical usage
  - Higher capital cost
- Cloth filters
  - Type of media varies by vendor
  - Operator friendly
  - Not compatible with chemical enhanced secondary clarifiers
  - Colloidal material can be an issues
- Membranes
  - High quality effluent
  - High cost

Pro2D Process Model

- Difficult to calibrate model with plant data
  - Not consistent operation
  - Certain flow data not available
- Model comparisons to plant data
  - More aeration is needed – especially challenged during hot weather
  - Secondary Clarifiers are overloaded from a solids standpoint
  - WAS removal needs to increase (in line with operational changes)
  - Last anoxic zone needs to be aerobic (low DO)
  - Primary clarifier low removal - potentially not removing enough
- Other observations
  - Need improved flow measurement
  - Overflow rate for Secondary Clarifiers higher than they should be
  - BOD TSS concentrations higher than design

Impact of PIR

- Due to current issues, this effort would not be effective
- Need to establish new design criteria
  - Can include PIR in new criteria
  - Can evaluate impact against revised criteria
- Modify plant to handle revised design criteria

Secondary Clarifiers

- Current clarifiers are overloaded from solids standpoint
- Have higher than optimal overflow rates
- Recommendations
  - Install new 4th clarifier
  - Rehabilitate older clarifiers after new clarifier on line
    - Sludge removal mechanism
    - Reconfigure clarifier, i.e. Baffles
- Type and size to be based on revised criteria

Path Forward

- Due to the fact that the current secondary clarifiers are overloaded from solids standpoint, difficult to recommend that it is “safe” to return to recharge
- Finish this initial work and technical memorandum
- Potential recommendations
  - Update Facility Plan to address revised design criteria
  - Reconfiguration of the secondary process
    - Additional aeration
    - Basin modification
    - More clarification
    - Ability to waste more consistently (WAS Storage)
  - Other issues
    - Chlorine mixing
    - Effluent filtration

CH2MHILL®

City of Avondale
Wastewater Treatment Plant

Process Review Meeting

Agenda

1. Draft Report Review
   - Critical Findings
   - Operational Evaluation
   - Issues/Solutions
   - Operational Recommendations
   - Implementation Plan
2. Wastewater Master Plan Update
3. Rate Analysis
4. Information requested concerning Contract Operations
5. Truck Routing Optimization

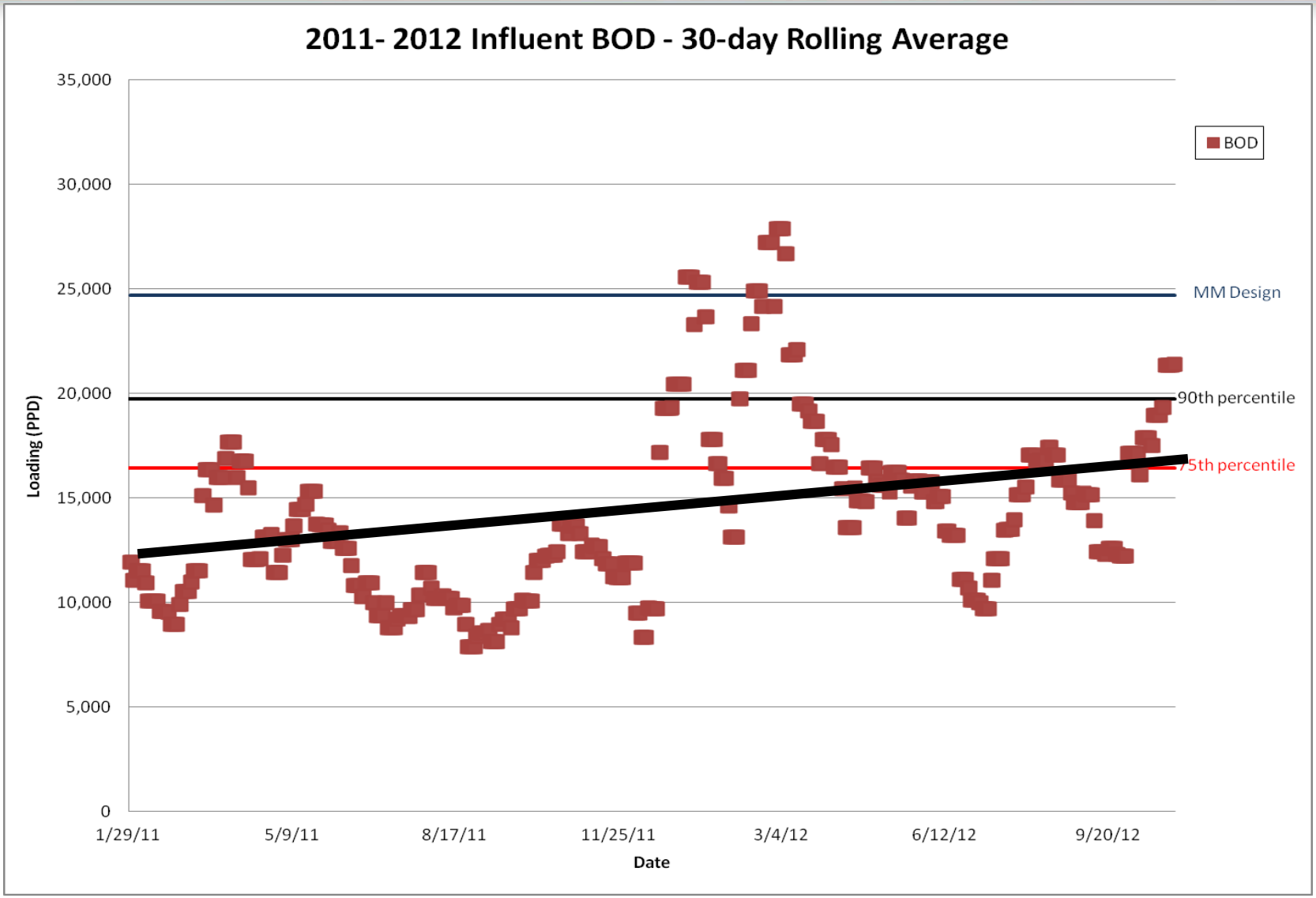
Draft Report

- Critical Findings
  - Wastewater loading has significantly increased
  - Current Design Criteria
    - 9 MGD
    - 329 mg/l or 24,695 lb/day BOD
    - 426 mg/l or 31,976 lb/day TSS
  - 90th Percentile 30 day running average (2010 – 2012)
    - 5.4 MGD
    - 438 mg/l or 19,722 lb/day BOD
    - 531 mg/l or 23,918 lb/day TSS

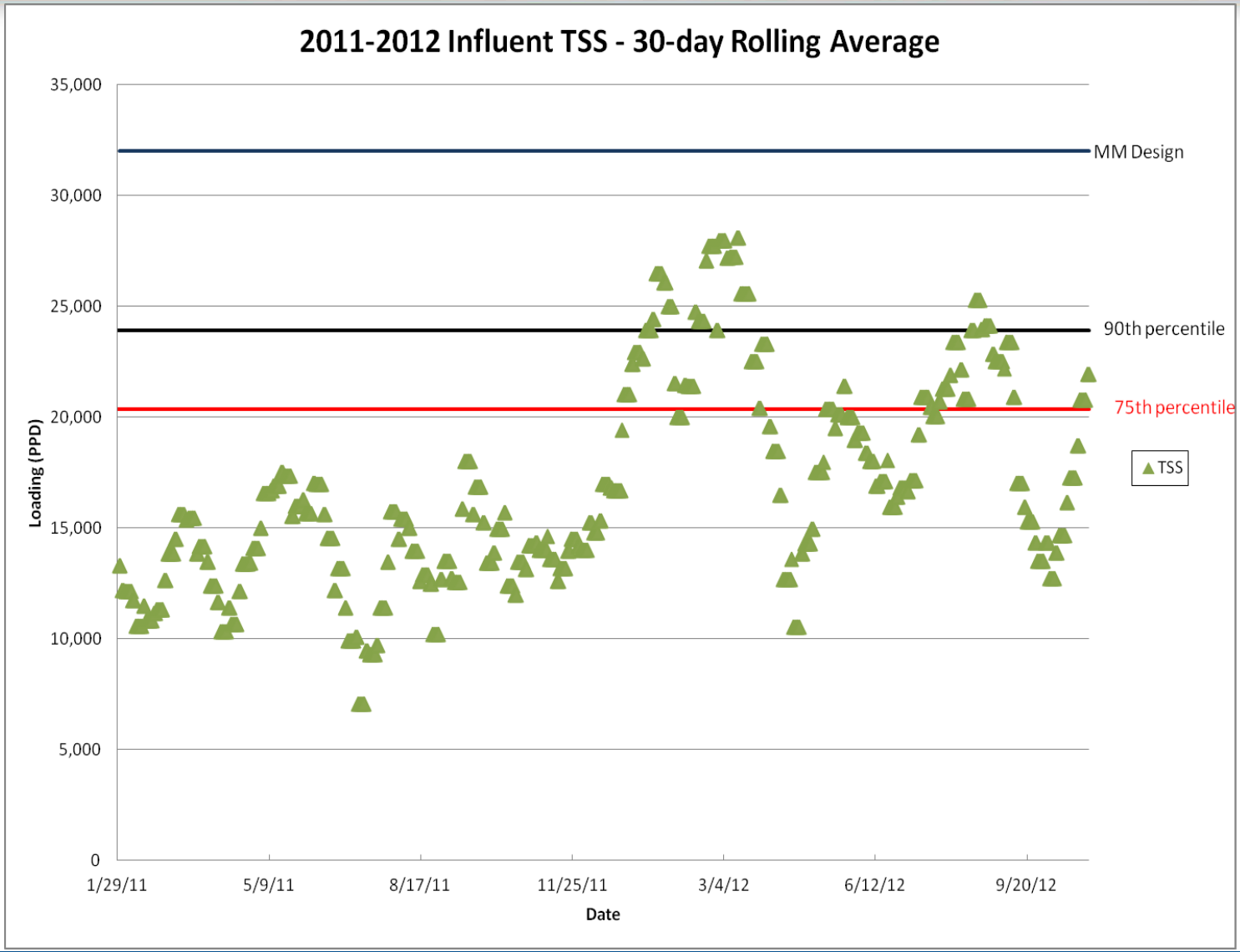
Draft Report

- Critical Findings
  - In terms of capacity (using 90th percentile criteria)
    - BOD = 6.76 MGD
    - TSS = 7.22 MGD
  - Questions remain
    - Does 90th percentile capture needed information
    - Has plant exceeded loading capacity?
      - Secondary Clarifiers have exceeded solids loading criteria
      - Influent BOD load?

Influent BOD Load



Influent TSS Load



Operational Evaluation

- At the start of the evaluation
  - High solids inventory in the process (too many bugs)
    - Overloading Clarifiers (solids loading)
      - Floating sludge
      - Contact basin collecting solids
    - Low DO conditions
  - Control issues
    - DO measurement
    - Flow measurement (RAS)
- Implemented program of higher level of wasting

Issues and Solutions

- ***Issue: Exceeds Design Conditions in Final Design Report***
- ***Solution:***
  - Update Wastewater Master Plan
  - Determine correct future loadings and flow

Issues and Solutions

- ***Issue: Primary Clarifiers do not meet industry standard for efficiency (should be 50% to 70%, plant at 35% to 40%)***
- ***Solution:***
  - More investigation is needed
    - Monitoring influent and effluent
    - Determination if septic conditions in the EQ basin
    - Jar testing with Ferric Chloride (settling aid)
  - Include as part of Master Plan Update

Issues and Solutions

- ***Issue: Insufficient Aeration in Process Basins***
  - Aerated zones is 40%, should be 60%
  - Blowers may not have sufficient capacity
- ***Solution:***
  - Last zone being operated as aerobic zone (has significantly assisted in process) – mixers must be on
  - Maintain 2 mg/l DO in the aerobic zones
  - Develop oxygen profiles and aeration analysis
  - Final recommendations will depend on future loading

Issues and Solutions

- ***Issue: Filamentous bulking and foaming in aeration basins***
  - *M. parvicella* causes foaming and poor settling sludge
- ***Solution:***
  - Increased and consistent wasting
    - WAS Storage Tank
  - Chlorinated spray
  - Scum removal with treatment
  - Maintain proper DO levels

Issues and Solutions

- ***Issue: Secondary clarifier operation and settling***
  - *Ineffective mechanisms (oldest clarifiers)*
  - *Solids overloading*
- ***Solution:***
  - New Secondary Clarifier
  - Rehabilitation of two oldest clarifiers
    - New mechanisms
    - Stamford baffle
    - Reconfigure effluent weir

Issues and Solutions

- ***Issue: Difficulties meeting effluent parameters and goals***
- ***Solution:***
  - New SOP cleaning contact basins on an annual basis
  - Remove window in contact basin to eliminate short circuit
  - Increase chlorine mixing
  - Consider additional contact time (28 minutes at 9 MGD)
  - Implement previous recommendations to meet nutrient removal goals
  - Consider effluent filter – effluent “insurance policy”

Issues and Solutions

- ***Issue: Plant process control***
- ***Solution:***
  - DO meters at critical locations in the process basins
  - Automated control system (may require blower replacement)
  - Flow meters on the mixed liquor return
  - Consider on line monitoring to allow plant to react quickly to changing influent loads
  - Calibrate meters and instruments on a regular basis

Issues and Solutions

- ***Issue: Limited Digester Capacity***
  - Residence time is currently 13 days (Design 15 days)
  - Volatile reduction is 39% (typical is 45% to 55%)
  - Concern on meeting 503 regulations
- ***Solution:***
  - Additional digester capacity to meet 20 day HRT
  - Determine sizing based on future loading

Operational Recommendations

- Online DO monitoring system
- Automatic DO control in process basins
- Update staffing plan and training for operator certification
- Monitor and maintain solids inventory using SRT control
- Routinely monitor process parameters to assure adequate treatment (Oxygen Uptake Rate or OUR)
- Document and maintain facility process control program
- Revisit and upgrade if necessary aeration basin scum removal system

Operational Recommendations

- Install aeration basin internal recycle (IR) flow meters
- Waste activated sludge (WAS) storage and equalization tank
- Create and implement a program for producing SOP's
- Create and implement a program for computerized maintenance management system (CMMS)

Near term improvements

New 90-ft secondary clarifier	971,000
Upgrades for Existing Secondary Clarifiers (New mechanisms, baffle, and effluent launder improvements)	800,000
RAS pump station (for new clarifier)	741,000
Sand filters[1]	4,911,000
Wasting / RDT improvements (New WAS storage tank, pumps and blowers)	2,070,000
Additional Project Costs	
Overall site work (5%)	474,650
Yard electrical (5%)	474,650
Yard piping 5%)	474,650
I&C and Automation (10%)	949,300
Subtotal	*11,866,250*
Contractor Markups:	
Overhead (10%)	1,186,625
Profit (5%)	652,644
Mobilization/Bonds/Insurance (5%)	685,276
Contingency (30%)	4,317,238
Subtotal with Markups	*18,708,033*
Escalation to mid-point of construction (9.4%)	1,758,555
Location adjustment factor (88.5)	-2,151,424
TOTAL	**18,315,164**

Wastewater Master Plan Update

- Draft Scope has been developed
- Request that City review
- Possible to start key efforts under current authorization
  - Aeration analysis
  - Investigation of primary clarifier

Rate Analysis

- See scope of work

Contract Ops Information

- Confirm receipt of information
- Need for anything else?

Truck Routing Optimization

- If City still interested, need more information
  - Residential Service:
    - Number of trucks
    - Number of households
    - Streams of service – refuse, recycled, organic waste, etc.
  - Commercial Service
    - Number of trucks
    - Number of stops
- Request for non-standard approach
  - Mutual risk sharing approach
  - Fee based on percentage of savings gained