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## **APPENDIX E**

### **MASS BALANCE CALCULATIONS**

#### **E.1 CALCULATION ASSUMPTIONS**

The mass balance presented in this Appendix has been prepared to provide a basis for the sizing and design of the equipment, pumps, and pipelines that will be utilized in the various sediment management activities that are described in this Draft Final Design Report. Since the submission of the Intermediate Design Report, the mass balance process flow diagrams (PFD) have been revised as part of the Final Design. The mass balance calculations have been revised accordingly.

The selected dredge contractor has proposed three dredges for the project. The production rates and slurry flow rates of each dredge have been calculated by the contractor based on the dredge characteristics, sediment geotechnical properties, booster pump locations, and pipeline size. These production rates and slurry flow rates are the basis for the mass balance calculations. As presented in this Appendix, two scenarios have been evaluated for each of Remediation Areas A, C, D, and E with the average precipitation, namely, the maximum flow produced by the dredge, and the average flow. The maximum flow scenario represents the mass balance of flows while dredging operations are ongoing using the largest dredge planned for each area. The average flow scenario incorporates the dredging “up-time” (assumed to be 70%) and estimated usage percentage of each dredge to produce combined average flows over the course of dredging in each area.

Due to the nature of dredging operations, the achieved percent solids produced will vary significantly over short periods of time, which will result in significant short-term variation in the proportion of water versus solids entering the system at a given time. The impact of these changes on processing equipment is expected to be minimal. Due to the time required for geotextile tube filtrate to flow through the gravel and/or drainage channels, water within the SCA will effectively have some residence time before reaching the basin sumps. This residence time will attenuate fluctuating solids content, limiting any potential impacts to the SCA WTP.

**E.2 MATHCAD CALCULATIONS**

## Sediment Management Design Mass Balance Calculation

### 1.0 Introduction

This package provides the mass balance calculations of the slurry transport, pre-processing, and geotextile tube dewatering for the Onondaga Lake project. The hydraulically dredged lake sediment will be transported as a slurry to the sediment consolidation area (SCA) located on Wastebed 13 via a pipeline. Upon reaching the SCA, the slurry will go through several steps of pre-processing and then the final geotextile tube dewatering. The geotextile tube filtrate, along with water from screened material stockpiles and surface contact water with the active SCA, will be treated in the water treatment plant located on Wastebed 13. The clarifier underflow and backwash water generated from the water treatment plant (WTP) will be sent back to the SCA and dewatered by geotextile tubes.

Following this introduction, Section 2 presents the definition of terms used in this calculation. Section 3 provides the assumptions. Section 4 contains a step-by-step mass balance calculation of the maximum flow scenario (5,500 gpm) for Remediation Areas (RA) D and E. Section 5 assembles the results in a table format. The calculations include average precipitation. The calculation of the average flow scenario (70% of the maximum flow or 3,850 gpm) uses the same set of equations and steps. The spreadsheets contained in this appendix present calculations for both the maximum and average flow scenarios. Mass balance calculation associated with the water treatment process has been provided in a separate submittal (DP#3) by O'Brien & Gere.

### 2.0 Definitions

**Primary screening:** The process of removing gravel-sized particles (> 1/4-inch) by passing the slurry through 1/4-inch screens.

**Geotextile tube initial dewatering:** The first 24 hours after the geotextile tube is filled.

**Geotextile tube consolidation dewatering:** The duration of 60 days after the initial dewatering. It is assumed that the primary consolidation within the geotextile tubes will complete during this period of time. Longer term consolidation or dewatering (secondary consolidation) is not considered in this calculation.

**Filtrate:** Including water and total suspended solids.

**Geotextile tube filtrate:** The summation of filtrate from the geotextile tube initial and consolidation dewatering.

**Stockpile filtrate:** The filtrate generated by change in water content of screened material stockpile (gravel-sized particles).

**Total filtrate:** The summation of geotextile tube filtrate and stockpile filtrate. The total filtrate will be sent to the SCA water treatment plant for treatment.

**RA-D:** For slurry from Remediation Areas D, the dewatering process includes primary screening for gravel-sized particle removal, polymer injection, and geotextile tube dewatering. It is expected the slurry from Remediation Area C will undergo the same process.

**RA-E:** For slurry from Remediation Area E, the dewatering process includes primary screening for gravel-sized particle removal, polymer and coagulant injection, and geotextile tube dewatering. It is expected the slurry from Remediation Areas A and B will undergo the same process.

**3.0 Parameters and Assumptions**

- Geotextile tube consolidation dewatering is assumed to complete in 60 days after the initial dewatering. This calculation considers consolidation dewatering peak flow scenario , which starts from 61 days after the first tube is filled and ends at one day after the last tube is filled for the season.
- Polymer and coagulant particles injected to the slurry will be captured in the geotextile tube during the initial dewatering.
- Water density:  $\rho_w := 1 \frac{\text{gm}}{\text{cm}^3}$        $\rho_w = 62.4279606 \frac{\text{lb}}{\text{ft}^3}$
- Maximum slurry flow rate:  $q := 5500 \text{gpm}$  , where gpm is gallons per minute.
- Average slurry flow rate:  $q_a := q \cdot 70\%$        $q_a = 3850 \cdot \text{gpm}$
- maximum slurry solids content by weight (**Table 1**):
  - RA-D:  $P_{s\_D} := 12.0\%$
  - RA-E:  $P_{s\_E} := 18.5\%$
- Specific gravity of lake sediment (**Table 1**):
  - RA-D:  $G_{sD} := 2.52$
  - RA-E:  $G_{sE} := 2.58$
- The specific gravity of total suspended solids in geotextile tube filtrate and precipitation runoff is assumed to be the same as lake sediment of each remediation area.
- Initial water content of screened material stockpile:  $WC_{\text{istock}} := 25\%$  , based on vendor's estimate.
- Final water content of screened material stockpile:  $WC_{\text{fstock}} := 15\%$  , assumed value.
- Total suspended solids (TSS) in geotextile tube filtrate, based on O'Brien & Gere's estimate:
 
$$TSS_{\text{tube\_filtrate}} := 200 \frac{\text{mg}}{\text{L}}$$
- Assumed TSS in stockpile filtrate (filtrate generated by change in stockpile water content) :
 
$$TSS_{\text{stock\_filtrate}} := 200 \frac{\text{mg}}{\text{L}}$$
- Stockpile runoff area (Sump#1):  $A_{S1} := 40000 \text{ft}^2$
- Assumed TSS in runoff to stockpile area sump (Sump#1):  $TSS_{S1} := 200 \frac{\text{mg}}{\text{L}}$
- Screen runoff area (Sump#2):  $A_{S2} := 53483 \text{ft}^2$
- Assumed TSS in runoff to screen area sump (Sump#2):  $TSS_{S2} := 200 \frac{\text{mg}}{\text{L}}$
- Polymer and decon runoff area (Sump#3):  $A_{S3} := 37711 \text{ft}^2$

- Assumed TSS in runoff to polymer/decon area sump (Sump#3):  $TSS_{S3} := 200 \frac{mg}{L}$
- WTP runoff area (Sump#4):  $A_{S4} := 236949ft^2$
- Assumed TSS in runoff to WTP area sump (Sump#4):  $TSS_{S4} := 200 \frac{mg}{L}$
- Assumed specific gravity of TSS in runoff to Sump#1,2,3,4:  $G_{s_{runoff}} := 2.6$
- Maximum booster pump seal water (each)  $q_{booster} := 0gpm$  , booster pumps will use slurry decant water for seal water.
- Average booster pump seal water (each):  $q_{booster\_a} := q_{booster} \cdot 70\%$   $q_{booster\_a} = 0 \cdot gpm$
- Number of booster pumps:  $N_{booster} := 4$
- Maximum geotextile tube feed pump seal water (each):  $q_{tube\_pump} := 12gpm$
- Average geotextile tube feed pump seal water (each):  $q_{tube\_pump\_a} := q_{tube\_pump} \cdot 70\%$   $q_{tube\_pump\_a} = 8.4 \cdot gpm$
- Number of active geotextile tube feed pumps:  $N_{tube\_pump} := 2$
- Maximum primary screen wash water:  $q_{primary} := 306.72gpm$  , based on vendor's estimate.
- Average primary screen wash water:  $q_{primary\_a} := q_{primary} \cdot 70\%$   $q_{primary\_a} = 214.7 \cdot gpm$
- Clarifier underflow from the SCA water treatment plant , based on WTP DP#3.:  
 $q_{clarifier} := 708.4gpm$   $TSS_{clarifier} := 1571 \frac{mg}{L}$  , where TSS is total suspended solids.
- Spent MMF backwash from the SCA water treatment plant, based on WTP DP#3:  
 $q_{MMF} := 166.3gpm$   $TSS_{MMF} := 159.2 \frac{mg}{L}$
- Spent GAC backwash from the SCA water treatment plant, based on WTP DP#3:  
 $q_{GAC} := 117.7gpm$   $TSS_{GAC} := 128.4 \frac{mg}{L}$
- Average percentage of gravel-sized particle (removed by primary screen) (**Table 1**):
  - RA-D:  $P_{gravel\_D} := 0.5\%$
  - RA-E:  $P_{gravel\_E} := 0.4\%$
- Average percentage of fines (silt and clay-sized particles) (**Table 1**):
  - RA-D:  $P_{fine\_D} := 90.0\%$
  - RA-E:  $P_{fine\_E} := 43.3\%$

Note: The polymer and coagulant dosage is based on dry weight of fines, not the total dry solids weight.

- Solids content by weight after initial dewatering in geotextile tubes (i.e., after the first 24 hrs):

$$P_{s2} := 38\% \quad , \text{based on P-GDT results.}$$

- Consolidation dewatering in the geotextile tube will take 60 days to complete, with equal daily filtrate volume. Total days of consolidation dewatering:

$$t_c := 60 \text{day}$$

- Solids content by weight after consolidation dewatering in geotextile tubes (i.e., 60 days after the first 24 hrs):

$$P_{s3} := 50\%$$

- SCA and basins open area:  $A_{SCA} := 71.25 \text{acre}$

- SCA WTP design capacity, based on WTP DP#3:

$$q_{\text{WTP\_influent}} := 5663 \text{gpm}$$

$$\text{TSS}_{\text{WTP\_influent}} := 200.5 \frac{\text{mg}}{\text{L}}$$

- Maximum discharge to Metro WTP from SCA WTP, based on WTP DP#3:

$$\text{MAX}_{\text{discharge}} := 6.5 \cdot 10^6 \frac{\text{gal}}{\text{day}} \quad \text{MAX}_{\text{discharge}} = 4513.9 \cdot \text{gpm}$$

$$\text{TSS}_{\text{discharge}} := 4.5 \frac{\text{mg}}{\text{L}}$$

- Precipitation:  $\text{PRE}_{\text{daily}} := 0.15 \frac{\text{in}}{\text{day}}$  daily average precipitation based on onsite met data

$$\text{PRE}_{25\text{yr}} := 4.5 \frac{\text{in}}{\text{day}} \quad 25\text{-year 24-hour storm}$$

$$\text{PRE}_{100\text{yr}} := 6 \frac{\text{in}}{\text{day}} \quad 100\text{-year 24-hour storm}$$

**4.0 Calculations**

**4.1 Incoming Slurry**

***Slurry water content:***

$$\text{RA-D:} \quad \text{WC}_D := \frac{1 - P_{s\_D}}{P_{s\_D}} \quad \text{WC}_D = 733.3\%$$

$$\text{RA-E:} \quad \text{WC}_E := \frac{1 - P_{s\_E}}{P_{s\_E}} \quad \text{WC}_E = 440.5\%$$

***Water in slurry:***

$$\text{RA-D:} \quad \text{Volume} \quad q_{w\_D} := \frac{q \cdot (1 - P_{s\_D}) \cdot G_{sD}}{P_{s\_D} + (1 - P_{s\_D}) \cdot G_{sD}} \quad q_{w\_D} = 7513429 \cdot \frac{\text{gal}}{\text{day}}$$

$$\text{Weight} \quad W_{w\_D} := q_{w\_D} \cdot \rho_w \quad W_{w\_D} = 62702608.2 \cdot \frac{\text{lb}}{\text{day}}$$



RA-E:

$$\text{Volume } q_{w\_E} := \frac{q(1 - P_{s\_E}) \cdot G_{sE}}{P_{s\_E} + (1 - P_{s\_E}) \cdot G_{sE}} \quad q_{w\_E} = 7279531 \cdot \frac{\text{gal}}{\text{day}}$$

$$\text{Weight } W_{w\_E} := q_{w\_E} \cdot \rho_w \quad W_{w\_E} = 60750636.8 \cdot \frac{\text{lb}}{\text{day}}$$

**Solids in slurry:**

RA-D:

$$\text{Volume (zero void ratio) } q_{s\_D} := \frac{q \cdot P_{s\_D}}{P_{s\_D} + (1 - P_{s\_D}) \cdot G_{sD}} \quad q_{s\_D} = 406570.8 \cdot \frac{\text{gal}}{\text{day}}$$

$$\text{Weight } W_{s\_D} := q_{s\_D} \cdot G_{sD} \cdot \rho_w \quad W_{s\_D} = 8550356 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$\text{Volume (zero void ratio) } q_{s\_E} := \frac{q \cdot P_{s\_E}}{P_{s\_E} + (1 - P_{s\_E}) \cdot G_{sE}} \quad q_{s\_E} = 640469 \cdot \frac{\text{gal}}{\text{day}}$$

$$\text{Weight } W_{s\_E} := q_{s\_E} \cdot G_{sE} \cdot \rho_w \quad W_{s\_E} = 13790022 \cdot \frac{\text{lb}}{\text{day}}$$

**4.2 Primary Screening for Gravel-Sized Particle Removal**

**Weight of removed gravel-sized particles:**

$$\text{RA-D: } W_{\text{gravel\_D}} := W_{s\_D} \cdot P_{\text{gravel\_D}} \quad W_{\text{gravel\_D}} = 42751.8 \cdot \frac{\text{lb}}{\text{day}}$$

$$\text{RA-E: } W_{\text{gravel\_E}} := W_{s\_E} \cdot P_{\text{gravel\_E}} \quad W_{\text{gravel\_E}} = 55160.1 \cdot \frac{\text{lb}}{\text{day}}$$

**Volume of removed gravel-sized particles (zero void ratio):**

$$\text{RA-D: } q_{\text{gravel\_D}} := q_{s\_D} \cdot P_{\text{gravel\_D}} \quad q_{\text{gravel\_D}} = 2032.9 \cdot \frac{\text{gal}}{\text{day}}$$

$$\text{RA-E: } q_{\text{gravel\_E}} := q_{s\_E} \cdot P_{\text{gravel\_E}} \quad q_{\text{gravel\_E}} = 2561.9 \cdot \frac{\text{gal}}{\text{day}}$$

**Weight of water removed with gravel-sized particles:**

$$\text{RA-D: } W_{w\_gravel\_D} := W_{\text{gravel\_D}} \cdot WC_{\text{istock}} \quad W_{w\_gravel\_D} = 10687.9 \cdot \frac{\text{lb}}{\text{day}}$$

$$\text{RA-E: } W_{w\_gravel\_E} := W_{\text{gravel\_E}} \cdot WC_{\text{istock}} \quad W_{w\_gravel\_E} = 13790 \cdot \frac{\text{lb}}{\text{day}}$$

**Volume of water removed with gravel-sized particles:**

$$\text{RA-D: } q_{w\_gravel\_D} := \frac{W_{w\_gravel\_D}}{\rho_w} \quad q_{w\_gravel\_D} = 1280.7 \cdot \frac{\text{gal}}{\text{day}}$$

$$\text{RA-E: } q_{w\_gravel\_E} := \frac{W_{w\_gravel\_E}}{\rho_w} \quad q_{w\_gravel\_E} = 1652.4 \cdot \frac{\text{gal}}{\text{day}}$$

**Remaining dry solids weight in the slurry:**

RA-D:  $W_{sr1\_D} := W_{s\_D} - W_{gravel\_D}$        $W_{sr1\_D} = 8507603.9 \frac{lb}{day}$

RA-E:  $W_{sr1\_E} := W_{s\_E} - W_{gravel\_E}$        $W_{sr1\_E} = 13734861.8 \frac{lb}{day}$

**Remaining solids volume in the slurry (zero void ratio):**

RA-D:  $q_{sr1\_D} := q_{s\_D} - q_{gravel\_D}$        $q_{sr1\_D} = 404538 \frac{gal}{day}$

RA-E:  $q_{sr1\_E} := q_{s\_E} - q_{gravel\_E}$        $q_{sr1\_E} = 637906.7 \frac{gal}{day}$

**Remaining water weight in the slurry:**

with screen wash water and geotextile tube feed pump seal water

RA-D:  
 $W_{wr1\_D} := W_{w\_D} - W_{w\_gravel\_D} + (q_{primary} + q_{tube\_pump} \cdot N_{tube\_pump}) \cdot \rho_w$        $W_{wr1\_D} = 66666309.2 \frac{lb}{day}$

RA-E:  
 $W_{wr1\_E} := W_{w\_E} - W_{w\_gravel\_E} + (q_{primary} + q_{tube\_pump} \cdot N_{tube\_pump}) \cdot \rho_w$        $W_{wr1\_E} = 64711235.6 \frac{lb}{day}$

**Remaining water volume in the slurry:**

with screen wash water and geotextile tube feed pump seal water

RA-D:  
 $q_{wr1\_D} := q_{w\_D} - q_{w\_gravel\_D} + q_{primary} + q_{tube\_pump} \cdot N_{tube\_pump}$        $q_{wr1\_D} = 7988385.3 \frac{gal}{day}$

RA-E:  
 $q_{wr1\_E} := q_{w\_E} - q_{w\_gravel\_E} + q_{primary} + q_{tube\_pump} \cdot N_{tube\_pump}$        $q_{wr1\_E} = 7754115.8 \frac{gal}{day}$

**4.5 Total Flow from SCA WTP (Clarifier Underflow and MMF and GAC Backwash Water)**

**Total flow from WTP:**

$q_{WTP} := q_{clarifier} + q_{MMF} + q_{GAC}$        $q_{WTP} = 992.4 \text{ gpm}$        $q_{WTP} = 1429056 \frac{gal}{day}$

**Weight of total suspended solids (TSS) from SCA WTP:**

All Remediation Areas:

$W_{WTP\_TSS} := q_{clarifier} \cdot TSS_{clarifier} + q_{MMF} \cdot TSS_{MMF} + q_{GAC} \cdot TSS_{GAC}$

$W_{WTP\_TSS} = 9.6 \frac{lb}{min}$        $W_{WTP\_TSS} = 13873.8768703 \frac{lb}{day}$

**Volume of total suspended solids (TSS) from SCA WTP (zero void ratio):**

RA-D:

$$q_{WTP\_TSS\_D} := \frac{W_{WTP\_TSS}}{G_{sD} \cdot \rho_w} \quad q_{WTP\_TSS\_D} = 0.458 \cdot \text{gpm} \quad q_{WTP\_TSS\_D} = 659.7 \cdot \frac{\text{gal}}{\text{day}}$$

RA-E:

$$q_{WTP\_TSS\_E} := \frac{W_{WTP\_TSS}}{G_{sE} \cdot \rho_w} \quad q_{WTP\_TSS\_E} = 0.447 \cdot \text{gpm} \quad q_{WTP\_TSS\_E} = 644.4 \cdot \frac{\text{gal}}{\text{day}}$$

**Volume of water from SCA WTP:**

RA-D:

$$q_{W\_WTP\_D} := q_{\text{clarifier}} \cdot \left( 1 - \frac{TSS_{\text{clarifier}}}{G_{sD} \cdot \rho_w} \right) + q_{\text{MMF}} \cdot \left( 1 - \frac{TSS_{\text{MMF}}}{G_{sD} \cdot \rho_w} \right) + q_{\text{GAC}} \cdot \left( 1 - \frac{TSS_{\text{GAC}}}{G_{sD} \cdot \rho_w} \right) \quad q_{W\_WTP\_D} = 991.9 \cdot \text{gpm}$$

RA-E:

$$q_{W\_WTP\_E} := q_{\text{clarifier}} \cdot \left( 1 - \frac{TSS_{\text{clarifier}}}{G_{sE} \cdot \rho_w} \right) + q_{\text{MMF}} \cdot \left( 1 - \frac{TSS_{\text{MMF}}}{G_{sE} \cdot \rho_w} \right) + q_{\text{GAC}} \cdot \left( 1 - \frac{TSS_{\text{GAC}}}{G_{sE} \cdot \rho_w} \right) \quad q_{W\_WTP\_E} = 992.0 \cdot \text{gpm}$$

**Weight of water from SCA WTP:**

RA-D:

$$W_{W\_WTP\_D} := q_{W\_WTP\_D} \cdot \rho_w \quad W_{W\_WTP\_D} = 8278.2 \cdot \frac{\text{lb}}{\text{min}} \quad W_{W\_WTP\_D} = 11920545.4 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$W_{W\_WTP\_E} := q_{W\_WTP\_E} \cdot \rho_w \quad W_{W\_WTP\_E} = 8278.2 \cdot \frac{\text{lb}}{\text{min}} \quad W_{W\_WTP\_E} = 11920673.4 \cdot \frac{\text{lb}}{\text{day}}$$

**4.6 Screened Material Stockpile Filtrate**

**Weight of water in filtrate from screened material stockpile:**

RA-D:

$$W_{w\_stock\_filtrate\_D} := (WC_{\text{istock}} - WC_{\text{fstock}}) \cdot W_{\text{gravel\_D}} \quad W_{w\_stock\_filtrate\_D} = 4275.2 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$W_{w\_stock\_filtrate\_E} := (WC_{\text{istock}} - WC_{\text{fstock}}) \cdot W_{\text{gravel\_E}} \quad W_{w\_stock\_filtrate\_E} = 5516 \cdot \frac{\text{lb}}{\text{day}}$$

**Volume of water in filtrate from screened material stockpile:**

RA-D:

$$q_{w\_stock\_filtrate\_D} := \frac{W_{w\_stock\_filtrate\_D}}{\rho_w} \quad q_{w\_stock\_filtrate\_D} = 512.3 \cdot \frac{\text{gal}}{\text{day}}$$

RA-E:

$$q_{w\_stock\_filtrate\_E} := \frac{W_{w\_stock\_filtrate\_E}}{\rho_w} \quad q_{w\_stock\_filtrate\_E} = 661 \cdot \frac{\text{gal}}{\text{day}}$$

**Weight of total suspended solids in stockpile filtrate:**

RA-D:

$$W_{TSS\_stock\_filtrate\_D} := \frac{q_{w\_stock\_filtrate\_D} \cdot TSS_{stock\_filtrate} \cdot G_{sD} \cdot \rho_w}{G_{sD} \cdot \rho_w - TSS_{stock\_filtrate}}$$

$$W_{TSS\_stock\_filtrate\_D} = 0.86 \cdot \frac{\text{lb}}{\text{day}} \quad W_{TSS\_stock\_filtrate\_D} = 0.000269 \cdot \frac{\text{kg}}{\text{min}}$$

RA-E:

$$W_{TSS\_stock\_filtrate\_E} := \frac{q_{w\_stock\_filtrate\_E} \cdot TSS_{stock\_filtrate} \cdot G_{sE} \cdot \rho_w}{G_{sE} \cdot \rho_w - TSS_{stock\_filtrate}}$$

$$W_{TSS\_stock\_filtrate\_E} = 1.1 \cdot \frac{\text{lb}}{\text{day}} \quad W_{TSS\_stock\_filtrate\_E} = 0.0003 \cdot \frac{\text{kg}}{\text{min}}$$

**Volume of total suspended solids in stockpile filtrate (zero void ratio):**

RA-D:

$$q_{TSS\_stock\_filtrate\_D} := \frac{W_{TSS\_stock\_filtrate\_D}}{G_{sD} \cdot \rho_w}$$

$$q_{TSS\_stock\_filtrate\_D} = 0.041 \cdot \frac{\text{gal}}{\text{day}} \quad q_{TSS\_stock\_filtrate\_D} = 2.82363 \times 10^{-5} \cdot \text{gpm}$$

RA-E:

$$q_{TSS\_stock\_filtrate\_E} := \frac{W_{TSS\_stock\_filtrate\_E}}{G_{sE} \cdot \rho_w}$$

$$q_{TSS\_stock\_filtrate\_E} = 0.051 \cdot \frac{\text{gal}}{\text{day}} \quad q_{TSS\_stock\_filtrate\_E} = 3.558 \times 10^{-5} \cdot \text{gpm}$$

**Weight of stockpile filtrate:**

RA-D:

$$W_{stock\_filtrate\_D} := W_{w\_stock\_filtrate\_D} + W_{TSS\_stock\_filtrate\_D} \quad W_{stock\_filtrate\_D} = 4276 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$W_{stock\_filtrate\_E} := W_{w\_stock\_filtrate\_E} + W_{TSS\_stock\_filtrate\_E} \quad W_{stock\_filtrate\_E} = 5517.1 \cdot \frac{\text{lb}}{\text{day}}$$

**Volume of stockpile filtrate:**

RA-D:

$$q_{stock\_filtrate\_D} := q_{w\_stock\_filtrate\_D} + q_{TSS\_stock\_filtrate\_D} \quad q_{stock\_filtrate\_D} = 512.3 \cdot \frac{\text{gal}}{\text{day}}$$

RA-E:

$$q_{stock\_filtrate\_E} := q_{w\_stock\_filtrate\_E} + q_{TSS\_stock\_filtrate\_E} \quad q_{stock\_filtrate\_E} = 661 \cdot \frac{\text{gal}}{\text{day}}$$

**Weight of final dry solids in stockpile (total minus TSS):**

RA-D:

$$W_{s\_stock\_D} := W_{gravel\_D} - W_{TSS\_stock\_filtrate\_D} \quad W_{s\_stock\_D} = 42750.9 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$W_{s\_stock\_E} := W_{gravel\_E} - W_{TSS\_stock\_filtrate\_E} \quad W_{s\_stock\_E} = 55159 \frac{lb}{day}$$

**Volume of final solids in stockpile (zero void ratio, total minus TSS):**

RA-D:

$$q_{s\_stock\_D} := \frac{W_{s\_stock\_D}}{G_{sD} \cdot \rho_w} \quad q_{s\_stock\_D} = 2032.8 \frac{gal}{day}$$

RA-E:

$$q_{s\_stock\_E} := \frac{W_{s\_stock\_E}}{G_{sE} \cdot \rho_w} \quad q_{s\_stock\_E} = 2561.8 \frac{gal}{day}$$

#### 4.7 Runoff from WTP and Processing Area

##### 4.7.1 Runoff from stockpile area (Sump#1)

**Volume of water in runoff from stockpile area (Sump#1):**

$$q_{w\_S1} := A_{S1} \cdot PRE_{daily} \quad q_{w\_S1} = 3740.3 \frac{gal}{day} \quad q_{w\_S1} = 2.6 \text{ gpm}$$

**Weight of water in runoff from stockpile area (Sump#1):**

$$W_{w\_S1} := q_{w\_S1} \cdot \rho_w \quad W_{w\_S1} = 31214 \frac{lb}{day} \quad W_{w\_S1} = 21.7 \frac{lb}{min}$$

**Weight of total suspended solids in runoff from stockpile area (Sump#1):**

RA-D:

$$W_{TSS\_S1\_D} := \frac{q_{w\_S1} \cdot TSS_{S1} \cdot G_{sD} \cdot \rho_w}{G_{sD} \cdot \rho_w - TSS_{S1}} \quad W_{TSS\_S1\_D} = 6.24 \frac{lb}{day} \quad W_{TSS\_S1\_D} = 0.001967 \frac{kg}{min}$$

RA-E:

$$W_{TSS\_S1\_E} := \frac{q_{w\_S1} \cdot TSS_{S1} \cdot G_{sE} \cdot \rho_w}{G_{sE} \cdot \rho_w - TSS_{S1}} \quad W_{TSS\_S1\_E} = 6.24 \frac{lb}{day} \quad W_{TSS\_S1\_E} = 0.001967 \frac{kg}{min}$$

**Volume of total suspended solids in runoff from stockpile area (Sump#1, zero void ratio):**

RA-D:

$$q_{TSS\_S1\_D} := \frac{W_{TSS\_S1\_D}}{G_{sD} \cdot \rho_w} \quad q_{TSS\_S1\_D} = 0.297 \frac{gal}{day} \quad q_{TSS\_S1\_D} = 2.06159 \times 10^{-4} \text{ gpm}$$

RA-E:

$$q_{TSS\_S1\_E} := \frac{W_{TSS\_S1\_E}}{G_{sE} \cdot \rho_w} \quad q_{TSS\_S1\_E} = 0.29 \frac{gal}{day} \quad q_{TSS\_S1\_E} = 2.01365 \times 10^{-4} \text{ gpm}$$

**Weight of runoff from stockpile area (Sump#1):**

RA-D:

$$W_{S1\_D} := W_{w\_S1} + W_{TSS\_S1\_D} \quad W_{S1\_D} = 31220.2 \frac{lb}{day}$$

RA-E:

$$W_{S1\_E} := W_{w\_S1} + W_{TSS\_S1\_E} \qquad W_{S1\_E} = 31220.2 \frac{\text{lb}}{\text{day}}$$

**Volume of runoff from stockpile area (Sump#1):**

RA-D:

$$q_{S1\_D} := q_{w\_S1} + q_{TSS\_S1\_D} \qquad q_{S1\_D} = 3740.6 \frac{\text{gal}}{\text{day}} \qquad q_{S1\_D} = 2.6 \text{ gpm}$$

RA-E:

$$q_{S1\_E} := q_{w\_S1} + q_{TSS\_S1\_E} \qquad q_{S1\_E} = 3740.5 \frac{\text{gal}}{\text{day}} \qquad q_{S1\_E} = 2.6 \text{ gpm}$$

**4.7.2 Runoff from screen area (Sump#2)**

**Volume of water in runoff from screen area (Sump#2):**

$$q_{w\_S2} := A_{S2} \cdot PRE_{\text{daily}} \qquad q_{w\_S2} = 5001 \frac{\text{gal}}{\text{day}} \qquad q_{w\_S2} = 3.47 \text{ gpm}$$

**Weight of water in runoff from screen area (Sump#2):**

$$W_{w\_S2} := q_{w\_S2} \cdot \rho_w \qquad W_{w\_S2} = 41735.4 \frac{\text{lb}}{\text{day}} \qquad W_{w\_S2} = 29 \frac{\text{lb}}{\text{min}}$$

**Weight of total suspended solids in runoff from screen area (Sump#2):**

RA-D:

$$W_{TSS\_S2\_D} := \frac{q_{w\_S2} \cdot TSS_{S2} \cdot G_{S2} \cdot \rho_w}{G_{S2} \cdot \rho_w - TSS_{S2}} \qquad W_{TSS\_S2\_D} = 8.35 \frac{\text{lb}}{\text{day}} \qquad W_{TSS\_S2\_D} = 0.002629 \frac{\text{kg}}{\text{min}}$$

RA-E:

$$W_{TSS\_S2\_E} := \frac{q_{w\_S2} \cdot TSS_{S2} \cdot G_{S2} \cdot \rho_w}{G_{S2} \cdot \rho_w - TSS_{S2}} \qquad W_{TSS\_S2\_E} = 8.35 \frac{\text{lb}}{\text{day}} \qquad W_{TSS\_S2\_E} = 0.002629 \frac{\text{kg}}{\text{min}}$$

**Volume of total suspended solids in runoff from screen area (Sump#2, zero void ratio):**

RA-D:

$$q_{TSS\_S2\_D} := \frac{W_{TSS\_S2\_D}}{G_{S2} \cdot \rho_w} \qquad q_{TSS\_S2\_D} = 0.397 \frac{\text{gal}}{\text{day}} \qquad q_{TSS\_S2\_D} = 2.75651 \times 10^{-4} \text{ gpm}$$

RA-E:

$$q_{TSS\_S2\_E} := \frac{W_{TSS\_S2\_E}}{G_{S2} \cdot \rho_w} \qquad q_{TSS\_S2\_E} = 0.388 \frac{\text{gal}}{\text{day}} \qquad q_{TSS\_S2\_E} = 2.6924 \times 10^{-4} \text{ gpm}$$

**Weight of runoff from screen area (Sump#2):**

RA-D:

$$W_{S2\_D} := W_{w\_S2} + W_{TSS\_S2\_D} \qquad W_{S2\_D} = 41743.8 \frac{\text{lb}}{\text{day}}$$

RA-E:  
 $W_{S2\_E} := W_{w\_S2} + W_{TSS\_S2\_E} \qquad W_{S2\_E} = 41743.8 \cdot \frac{\text{lb}}{\text{day}}$

**Volume of runoff from screen area (Sump#2):**

RA-D:  
 $q_{S2\_D} := q_{w\_S2} + q_{TSS\_S2\_D} \qquad q_{S2\_D} = 5001.4 \cdot \frac{\text{gal}}{\text{day}} \qquad q_{S2\_D} = 3.5 \cdot \text{gpm}$

RA-E:  
 $q_{S2\_E} := q_{w\_S2} + q_{TSS\_S2\_E} \qquad q_{S2\_E} = 5001.4 \cdot \frac{\text{gal}}{\text{day}} \qquad q_{S2\_E} = 3.5 \cdot \text{gpm}$

**4.7.3 Runoff from polymer/decon area (Sump#3)**

**Volume of water in runoff from polymer/decon area (Sump#3):**

$q_{w\_S3} := A_{S3} \cdot PRE_{\text{daily}} \qquad q_{w\_S3} = 3526.2 \cdot \frac{\text{gal}}{\text{day}} \qquad q_{w\_S3} = 2.45 \cdot \text{gpm}$

**Weight of water in runoff from polymer/decon area (Sump#3):**

$W_{w\_S3} := q_{w\_S3} \cdot \rho_w \qquad W_{w\_S3} = 29427.8 \cdot \frac{\text{lb}}{\text{day}} \qquad W_{w\_S3} = 20.4 \cdot \frac{\text{lb}}{\text{min}}$

**Weight of total suspended solids in runoff from polymer/decon area (Sump#3):**

RA-D:  
 $W_{TSS\_S3\_D} := \frac{q_{w\_S3} \cdot TSS_{S3} \cdot G_{SD} \cdot \rho_w}{G_{SD} \cdot \rho_w - TSS_{S3}} \qquad W_{TSS\_S3\_D} = 5.89 \cdot \frac{\text{lb}}{\text{day}} \qquad W_{TSS\_S3\_D} = 0.001854 \cdot \frac{\text{kg}}{\text{min}}$

RA-E:  
 $W_{TSS\_S3\_E} := \frac{q_{w\_S3} \cdot TSS_{S3} \cdot G_{SE} \cdot \rho_w}{G_{SE} \cdot \rho_w - TSS_{S3}} \qquad W_{TSS\_S3\_E} = 5.89 \cdot \frac{\text{lb}}{\text{day}} \qquad W_{TSS\_S3\_E} = 0.001854 \cdot \frac{\text{kg}}{\text{min}}$

**Volume of total suspended solids in runoff from polymer/decon area (Sump#3, zero void ratio):**

RA-D:  
 $q_{TSS\_S3\_D} := \frac{W_{TSS\_S3\_D}}{G_{SD} \cdot \rho_w} \qquad q_{TSS\_S3\_D} = 0.28 \cdot \frac{\text{gal}}{\text{day}} \qquad q_{TSS\_S3\_D} = 1.94362 \times 10^{-4} \cdot \text{gpm}$

RA-E:  
 $q_{TSS\_S3\_E} := \frac{W_{TSS\_S3\_E}}{G_{SE} \cdot \rho_w} \qquad q_{TSS\_S3\_E} = 0.273 \cdot \frac{\text{gal}}{\text{day}} \qquad q_{TSS\_S3\_E} = 1.89842 \times 10^{-4} \cdot \text{gpm}$

**Weight of runoff from polymer/decon area (Sump#3):**

RA-D:  
 $W_{S3\_D} := W_{w\_S3} + W_{TSS\_S3\_D} \qquad W_{S3\_D} = 29433.6 \cdot \frac{\text{lb}}{\text{day}}$

RA-E:

$$W_{S3\_E} := W_{w\_S3} + W_{TSS\_S3\_E} \qquad W_{S3\_E} = 29433.6 \frac{\text{lb}}{\text{day}}$$

**Volume of runoff from polymer/decon area (Sump#3):**

RA-D:

$$q_{S3\_D} := q_{w\_S3} + q_{TSS\_S3\_D} \qquad q_{S3\_D} = 3526.5 \frac{\text{gal}}{\text{day}} \qquad q_{S3\_D} = 2.4 \text{ gpm}$$

RA-E:

$$q_{S3\_E} := q_{w\_S3} + q_{TSS\_S3\_E} \qquad q_{S3\_E} = 3526.5 \frac{\text{gal}}{\text{day}} \qquad q_{S3\_E} = 2.4 \text{ gpm}$$

**4.7.4 Runoff from WTP area (Sump#4)**

**Volume of water in runoff from WTP area (Sump#4):**

$$q_{w\_S4} := A_{S4} \cdot PRE_{\text{daily}} \qquad q_{w\_S4} = 22156.3 \frac{\text{gal}}{\text{day}} \qquad q_{w\_S4} = 15.39 \text{ gpm}$$

**Weight of water in runoff from WTP area (Sump#4):**

$$W_{w\_S4} := q_{w\_S4} \cdot \rho_w \qquad W_{w\_S4} = 184903 \frac{\text{lb}}{\text{day}} \qquad W_{w\_S4} = 128.4 \frac{\text{lb}}{\text{min}}$$

**Weight of total suspended solids in runoff from WTP area (Sump#4):**

RA-D:

$$W_{TSS\_S4\_D} := \frac{q_{w\_S4} \cdot TSS_{S4} \cdot G_{SD} \cdot \rho_w}{G_{SD} \cdot \rho_w - TSS_{S4}} \qquad W_{TSS\_S4\_D} = 36.98 \frac{\text{lb}}{\text{day}} \qquad W_{TSS\_S4\_D} = 0.01165 \frac{\text{kg}}{\text{min}}$$

RA-E:

$$W_{TSS\_S4\_E} := \frac{q_{w\_S4} \cdot TSS_{S4} \cdot G_{SE} \cdot \rho_w}{G_{SE} \cdot \rho_w - TSS_{S4}} \qquad W_{TSS\_S4\_E} = 36.98 \frac{\text{lb}}{\text{day}} \qquad W_{TSS\_S4\_E} = 0.01165 \frac{\text{kg}}{\text{min}}$$

**Volume of total suspended solids in runoff from WTP area (Sump#4, zero void ratio):**

RA-D:

$$q_{TSS\_S4\_D} := \frac{W_{TSS\_S4\_D}}{G_{SD} \cdot \rho_w} \qquad q_{TSS\_S4\_D} = 1.759 \frac{\text{gal}}{\text{day}} \qquad q_{TSS\_S4\_D} = 1.22123 \times 10^{-3} \text{ gpm}$$

RA-E:

$$q_{TSS\_S4\_E} := \frac{W_{TSS\_S4\_E}}{G_{SE} \cdot \rho_w} \qquad q_{TSS\_S4\_E} = 1.718 \frac{\text{gal}}{\text{day}} \qquad q_{TSS\_S4\_E} = 1.19283 \times 10^{-3} \text{ gpm}$$



**Weight of runoff from WTP area (Sump#4):**

RA-D:

$$W_{S4\_D} := W_{w\_S4} + W_{TSS\_S4\_D} \qquad W_{S4\_D} = 184940 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$W_{S4\_E} := W_{w\_S4} + W_{TSS\_S4\_E} \qquad W_{S4\_E} = 184940 \cdot \frac{\text{lb}}{\text{day}}$$

**Volume of runoff from WTP area (Sump#4):**

RA-D:

$$q_{S4\_D} := q_{w\_S4} + q_{TSS\_S4\_D} \qquad q_{S4\_D} = 22158 \cdot \frac{\text{gal}}{\text{day}} \qquad q_{S4\_D} = 15.4 \cdot \text{gpm}$$

RA-E:

$$q_{S4\_E} := q_{w\_S4} + q_{TSS\_S4\_E} \qquad q_{S4\_E} = 22158 \cdot \frac{\text{gal}}{\text{day}} \qquad q_{S4\_E} = 15.4 \cdot \text{gpm}$$

**4.8 Polymer Injection**

Under normal operation condition, polymer/coagulant injection is applied to the screened slurry only. The WTP sludge/back wash water and runoff collected from the four area sumps will be sent to dedicated geotextile tube(s) directly.

**Dry polymer density:**

$$DEN_{\text{polymer}} := 0.7 \frac{\text{gm}}{\text{cm}^3}, \text{ based on Ashland 2520 MSDS.}$$

**Dry polymer dosage rate:**

$$DOS_{\text{polymer}} := 1.59 \frac{\text{lb}}{\text{ton}}, \text{ based on P-GDT report.}$$

**Weight and volume of dry polymer:**

RA-D:

$$W_{\text{drypolymer\_D}} := DOS_{\text{polymer}} W_{s\_D} P_{\text{fine\_D}}$$

$$W_{\text{drypolymer\_D}} = 4.248 \cdot \frac{\text{lb}}{\text{min}} \qquad W_{\text{drypolymer\_D}} = 6117.78 \cdot \frac{\text{lb}}{\text{day}}$$

$$q_{\text{drypolymer\_D}} := \frac{W_{\text{drypolymer\_D}}}{DEN_{\text{polymer}}} \qquad q_{\text{drypolymer\_D}} = 0.7273 \cdot \text{gpm} \qquad q_{\text{drypolymer\_D}} = 1047.2 \cdot \frac{\text{gal}}{\text{day}}$$

RA-E:

$$W_{\text{drypolymer\_E}} := DOS_{\text{polymer}} W_{s\_E} P_{\text{fine\_E}}$$

$$W_{\text{drypolymer\_E}} = 3.3 \cdot \frac{\text{lb}}{\text{min}} \qquad W_{\text{drypolymer\_E}} = 4747 \cdot \frac{\text{lb}}{\text{day}}$$

$$q_{\text{drypolymer\_E}} := \frac{W_{\text{drypolymer\_E}}}{DEN_{\text{polymer}}} \qquad q_{\text{drypolymer\_E}} = 0.6 \cdot \text{gpm} \qquad q_{\text{drypolymer\_E}} = 813 \cdot \frac{\text{gal}}{\text{day}}$$

**Weight and volume of polymer makeup water:**

RA-D:

$$q_{\text{polymerwater\_D}} := \frac{W_{\text{drypolymer\_D}} \cdot 200\text{mL}}{0.4\text{gm}}$$

$$q_{\text{polymerwater\_D}} = 254.5 \cdot \text{gpm}$$

$$W_{\text{polymerwater\_D}} := q_{\text{polymerwater\_D}} \cdot \rho_w$$

$$W_{\text{polymerwater\_D}} = 3058889.7 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$q_{\text{polymerwater\_E}} := \frac{W_{\text{drypolymer\_E}} \cdot 200\text{mL}}{0.4\text{gm}}$$

$$q_{\text{polymerwater\_E}} = 197.5 \cdot \text{gpm}$$

$$W_{\text{polymerwater\_E}} := q_{\text{polymerwater\_E}} \cdot \rho_w$$

$$W_{\text{polymerwater\_E}} = 2373504.1 \cdot \frac{\text{lb}}{\text{day}}$$

Note: Assume polymer dissolves in makeup water. Makeup water volume is the polymer emulsion volume.

**4.9 Coagulant Injection (emulsion, Remediation Areas A, B, E, and F only)**

**Coagulant emulsion dosage rate:**

$$\text{DOS}_{\text{coag}} := 5.71 \frac{\text{lb}}{\text{ton}}, \text{ based on P-GDT report.}$$

**Coagulant emulsion density:**

$$\text{DEN}_{\text{coag}} := 1.03 \frac{\text{gm}}{\text{cm}^3}, \text{ based on Ashland 492 MSDS.}$$

**Coagulant emulsion weight:**

$$W_{\text{coag\_E}} := \text{DOS}_{\text{coag}} \cdot W_{\text{s\_E}} \cdot P_{\text{fine\_E}}$$

$$W_{\text{coag\_E}} = 17047.4 \cdot \frac{\text{lb}}{\text{day}} \quad W_{\text{coag\_E}} = 11.8 \cdot \frac{\text{lb}}{\text{min}}$$

**Coagulant emulsion volume:**

$$q_{\text{coag\_E}} := \frac{\text{DOS}_{\text{coag}} \cdot W_{\text{s\_E}} \cdot P_{\text{fine\_E}}}{\text{DEN}_{\text{coag}}}$$

$$q_{\text{coag\_E}} = 1983.236 \cdot \frac{\text{gal}}{\text{day}} \quad q_{\text{coag\_E}} = 1.38 \cdot \text{gpm}$$

**Coagulant emulsion makeup water (make down to 1% dilution):**

$$q_{\text{coagwater\_E}} := \frac{W_{\text{coag\_E}} \cdot 100\text{mL}}{1\text{gm}}$$

$$q_{\text{coagwater\_E}} = 141.9 \cdot \text{gpm} \quad q_{\text{coagwater\_E}} = 204273.3 \cdot \frac{\text{gal}}{\text{day}}$$

$$W_{\text{coagwater\_E}} := q_{\text{coagwater\_E}} \cdot \rho_w$$

$$W_{\text{coagwater\_E}} = 1704743.2 \cdot \frac{\text{lb}}{\text{day}} \quad W_{\text{coagwater\_E}} = 1183.8494 \cdot \frac{\text{lb}}{\text{min}}$$

**4.10 Geotextile Tube Dewatering**

The screened and polymer/coagulant-added Slurry, stockpile filtrate, WTP sludge/backwash water, and runoff collected by the four area sumps (Sump#1,2,3,4) will be dewatered by the geotextile tubes at the SCA.

**4.10.1 Initial dewatering (the first 24 hrs)**

Assume all dry polymer and/or coagulant are retained in the geotextile tubes during the initial dewatering.

**Weight of dry solids retained in tubes after initial dewatering:**

RA-D:

$$W_{s\_ret2\_D} := W_{sr1\_D} + W_{WTP\_TSS} + W_{TSS\_stock\_filtrate\_D} + W_{TSS\_S1\_D} \dots \\ + W_{TSS\_S2\_D} + W_{TSS\_S3\_D} + W_{TSS\_S4\_D} + W_{drypolymer\_D}$$

$$W_{s\_ret2\_D} = 8527654 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$W_{s\_ret2\_E} := W_{sr1\_E} + W_{WTP\_TSS} + W_{TSS\_stock\_filtrate\_E} + W_{TSS\_S1\_E} \dots \\ + W_{TSS\_S2\_E} + W_{TSS\_S3\_E} + W_{TSS\_S4\_E} + W_{drypolymer\_E} + W_{coag\_E}$$

$$W_{s\_ret2\_E} = 13770589 \cdot \frac{\text{lb}}{\text{day}}$$

**Weight of water retained in tubes after initial dewatering:**

RA-D:

$$W_{w\_ret2\_D} := \frac{(1 - P_{s2}) \cdot W_{s\_ret2\_D}}{P_{s2}}$$

$$W_{w\_ret2\_D} = 13913541 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$W_{w\_ret2\_E} := \frac{(1 - P_{s2}) \cdot W_{s\_ret2\_E}}{P_{s2}}$$

$$W_{w\_ret2\_E} = 22467802.5 \cdot \frac{\text{lb}}{\text{day}}$$

**Volume of water retained in tubes after initial dewatering:**

RA-D:

$$q_{w\_ret2\_D} := \frac{W_{w\_ret2\_D}}{\rho_w}$$

$$q_{w\_ret2\_D} = 1667209.8 \cdot \frac{\text{gal}}{\text{day}}$$

RA-E:

$$q_{w\_ret2\_E} := \frac{W_{w\_ret2\_E}}{\rho_w}$$

$$q_{w\_ret2\_E} = 2692236 \cdot \frac{\text{gal}}{\text{day}}$$

**Weight of Water in initial filtrate:**

RA-D:

$$W_{w\_if\_D} := W_{wr1\_D} + W_{W\_WTP\_D} + W_{w\_stock\_filtrate\_D} + W_{polymerwater\_D} \dots \\ + (q_{w\_S1} + q_{w\_S2} + q_{w\_S3} + q_{w\_S4} + q_{booster} \cdot N_{booster} + q_{tube\_pump} \cdot N_{tube\_pump}) \cdot \rho_w - W_{w\_ret2\_D}$$

$$W_{w\_if\_D} = 68312176 \cdot \frac{\text{lb}}{\text{day}}$$



RA-E:

$$W_{w\_if\_E} := W_{wr1\_E} + W_{W\_WTP\_E} + W_{w\_stock\_filtrate\_E} + W_{polymerwater\_E} + W_{coagwater\_E} \dots \\ + (q_{w\_S1} + q_{w\_S2} + q_{w\_S3} + q_{w\_S4} + q_{booster} \cdot N_{booster} + q_{tube\_pump} \cdot N_{tube\_pump}) \cdot \rho_w - W_{w\_ret2\_E}$$

$$W_{w\_if\_E} = 58823567 \cdot \frac{lb}{day}$$

**Volume of water in initial filtrate:**

RA-D:

$$q_{w\_if\_D} := q_{wr1\_D} + q_{W\_WTP\_D} + q_{w\_stock\_filtrate\_D} + q_{polymerwater\_D} \dots \\ + q_{w\_S1} + q_{w\_S2} + q_{w\_S3} + q_{w\_S4} + q_{booster} \cdot N_{booster} + q_{tube\_pump} \cdot N_{tube\_pump} - q_{w\_ret2\_D}$$

$$q_{w\_if\_D} = 8185603.6 \cdot \frac{gal}{day}$$



RA-E:

$$q_{w\_if\_E} := q_{wr1\_E} + q_{W\_WTP\_E} + q_{w\_stock\_filtrate\_E} + q_{polymerwater\_E} + q_{coagwater\_E} \dots \\ + q_{w\_S1} + q_{w\_S2} + q_{w\_S3} + q_{w\_S4} + q_{booster} \cdot N_{booster} + q_{tube\_pump} \cdot N_{tube\_pump} - q_{w\_ret2\_E}$$

$$q_{w\_if\_E} = 7048618 \cdot \frac{gal}{day}$$

**4.10.2 Consolidation dewatering (during 60 days after initial dewatering)**

**Weight of water retained in tubes after consolidation dewatering:**

RA-D:

$$W_{w\_ret3\_D} := \frac{(1 - P_{s3}) \cdot W_{s\_ret2\_D}}{P_{s3}} \quad W_{w\_ret3\_D} = 8527654 \cdot \frac{lb}{day}$$



RA-E:

$$W_{w\_ret3\_E} := \frac{(1 - P_{s3}) \cdot W_{s\_ret2\_E}}{P_{s3}} \quad W_{w\_ret3\_E} = 13770589 \cdot \frac{lb}{day}$$

**Volume of water retained in tubes after consolidation dewatering:**

RA-D:

$$q_{w\_ret3\_D} := \frac{W_{w\_ret3\_D}}{\rho_w} \quad q_{w\_ret3\_D} = 1021838 \cdot \frac{gal}{day}$$



RA-E:

$$q_{w\_ret3\_E} := \frac{W_{w\_ret3\_E}}{\rho_w} \quad q_{w\_ret3\_E} = 1650080 \cdot \frac{gal}{day}$$

**Peak weight of water in consolidation dewatering filtrate:**

RA-D:

$$W_{w\_cf\_D} := W_{w\_ret2\_D} - W_{w\_ret3\_D} \quad W_{w\_cf\_D} = 5385887 \cdot \frac{lb}{day}$$

RA-E:

$$W_{w\_cf\_E} := W_{w\_ret2\_E} - W_{w\_ret3\_E} \quad W_{w\_cf\_E} = 8697214 \cdot \frac{\text{lb}}{\text{day}}$$

**Peak volume of water in consolidation dewatering filtrate:**

RA-D:

$$q_{w\_cf\_D} := \frac{W_{w\_cf\_D}}{\rho_w} \quad q_{w\_cf\_D} = 645372 \cdot \frac{\text{gal}}{\text{day}}$$

RA-E:

$$q_{w\_cf\_E} := \frac{W_{w\_cf\_E}}{\rho_w} \quad q_{w\_cf\_E} = 1042156 \cdot \frac{\text{gal}}{\text{day}}$$

Note: Peak consolidation dewatering is assumed to start from 61 days after the first tube in filled and ends at 1 day after the last tube is filled for the season.

**4.10.3 Geotextile tube filtrate**

**Volume of water in geotextile tube filtrate:**

RA-D:

$$q_{w\_tube\_filtrate\_D} := q_{w\_if\_D} + q_{w\_cf\_D} \quad q_{w\_tube\_filtrate\_D} = 8830975 \cdot \frac{\text{gal}}{\text{day}}$$

RA-E:

$$q_{w\_tube\_filtrate\_E} := q_{w\_if\_E} + q_{w\_cf\_E} \quad q_{w\_tube\_filtrate\_E} = 8090774 \cdot \frac{\text{gal}}{\text{day}}$$

**Weight of total suspended solids in geotextile tube filtrate:**

RA-D:

$$W_{TSS\_tube\_filtrate\_D} := \frac{(q_{w\_if\_D} + q_{w\_cf\_D}) \cdot TSS_{tube\_filtrate} \cdot G_{sD} \cdot \rho_w}{G_{sD} \cdot \rho_w - TSS_{tube\_filtrate}}$$

$$W_{TSS\_tube\_filtrate\_D} = 14740.8 \cdot \frac{\text{lb}}{\text{day}} \quad W_{TSS\_tube\_filtrate\_D} = 4.64 \cdot \frac{\text{kg}}{\text{min}}$$

RA-E:

$$W_{TSS\_tube\_filtrate\_E} := \frac{(q_{w\_if\_E} + q_{w\_cf\_E}) \cdot TSS_{tube\_filtrate} \cdot G_{sE} \cdot \rho_w}{G_{sE} \cdot \rho_w - TSS_{tube\_filtrate}}$$

$$q_{w\_if\_E} = 7048617.6 \cdot \frac{\text{gal}}{\text{day}}$$

$$q_{w\_cf\_E} = 1042156 \cdot \frac{\text{gal}}{\text{day}}$$

$$W_{TSS\_tube\_filtrate\_E} = 13505 \cdot \frac{\text{lb}}{\text{day}} \quad W_{TSS\_tube\_filtrate\_E} = 4.25 \cdot \frac{\text{kg}}{\text{min}}$$

**Volume of total suspended solids in geotextile tube filtrate (zero void ratio):**

RA-D:

$$q_{TSS\_tube\_filtrate\_D} := \frac{W_{TSS\_tube\_filtrate\_D}}{G_{sD} \cdot \rho_w} \quad q_{TSS\_tube\_filtrate\_D} = 0.487 \cdot \text{gpm} \quad q_{TSS\_tube\_filtrate\_D} = 701 \cdot \frac{\text{gal}}{\text{day}}$$

RA-E:

$$q_{TSS\_tube\_filtrate\_E} := \frac{W_{TSS\_tube\_filtrate\_E}}{G_{SE} \cdot \rho_w} \quad q_{TSS\_tube\_filtrate\_E} = 0.436 \cdot \text{gpm} \quad q_{TSS\_tube\_filtrate\_E} = 627.2 \cdot \frac{\text{gal}}{\text{day}}$$

**Weight of geotextile tube filtrate (water and TSS):**

RA-D:

$$W_{tube\_filtrate\_D} := W_{w\_if\_D} + W_{w\_cf\_D} + W_{TSS\_tube\_filtrate\_D}$$

$$W_{tube\_filtrate\_D} = 73712803.8 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$W_{tube\_filtrate\_E} := W_{w\_if\_E} + W_{w\_cf\_E} + W_{TSS\_tube\_filtrate\_E}$$

$$W_{tube\_filtrate\_E} = 67534286.3 \cdot \frac{\text{lb}}{\text{day}}$$

**Volume of geotextile tube filtrate (water and TSS):**

RA-D:

$$q_{tube\_filtrate\_D} := q_{w\_if\_D} + q_{w\_cf\_D} + q_{TSS\_tube\_filtrate\_D}$$

$$q_{tube\_filtrate\_D} = 8831676 \cdot \frac{\text{gal}}{\text{day}}$$

RA-E:

$$q_{tube\_filtrate\_E} := q_{w\_if\_E} + q_{w\_cf\_E} + q_{TSS\_tube\_filtrate\_E}$$

$$q_{tube\_filtrate\_E} = 8091401 \cdot \frac{\text{gal}}{\text{day}}$$

**Weight of final dry solids retained in geotextile tubes (total minus TSS):**

RA-D:

$$W_{s\_ret\_D} := W_{sr1\_D} + W_{WTP\_TSS} + W_{TSS\_stock\_filtrate\_D} + W_{TSS\_S1\_D} \dots$$

$$+ W_{TSS\_S2\_D} + W_{TSS\_S3\_D} + W_{TSS\_S4\_D} + W_{drypolymer\_D} - W_{TSS\_tube\_filtrate\_D}$$

$$W_{s\_ret\_D} = 8512913.1 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$W_{s\_ret\_E} := W_{sr1\_E} + W_{WTP\_TSS} + W_{TSS\_stock\_filtrate\_E} + W_{TSS\_S1\_E} \dots$$

$$+ W_{TSS\_S2\_E} + W_{TSS\_S3\_E} + W_{TSS\_S4\_E} + W_{drypolymer\_E} + W_{coag\_E} - W_{TSS\_tube\_filtrate\_E}$$

$$W_{s\_ret\_E} = 13757083.4 \cdot \frac{\text{lb}}{\text{day}}$$

**Volume of final solids retained in geotextile tubes (zero void ratio, total minus TSS):**

RA-D:

$$q_{s\_ret\_D} := \left( \frac{W_{sr1\_D} + W_{WTP\_TSS} + W_{TSS\_stock\_filtrate\_D} + W_{TSS\_S1\_D} \dots}{G_{SD} \cdot \rho_w} \right) + q_{drypolymer\_D}$$

$$q_{s\_ret\_D} = 405546.8 \cdot \frac{\text{gal}}{\text{day}} \quad q_{s\_ret\_D} = 281.63 \cdot \text{gpm}$$

RA-E:

$$q_{s\_ret\_E} := \left( \frac{W_{sr1\_E} + W_{WTP\_TSS} + W_{TSS\_stock\_filtrate\_E} + W_{TSS\_S1\_E} \dots + W_{TSS\_S2\_E} + W_{TSS\_S3\_E} + W_{TSS\_S4\_E} - W_{TSS\_tube\_filtrate\_E}}{G_{sE} \cdot \rho_w} \right) + q_{drypolymer\_E} + q_{coag\_E}$$

$$q_{s\_ret\_E} = 640722.4 \cdot \frac{\text{gal}}{\text{day}} \quad q_{s\_ret\_E} = 444.9 \cdot \text{gpm}$$

**4.11 Precipitation**

Precipitation flow:

$$q_{PRE} := PRE_{daily} \cdot A_{SCA} \quad q_{PRE} = 201.5 \cdot \text{gpm} \quad q_{PRE} = 290211.4 \cdot \frac{\text{gal}}{\text{day}}$$

**4.12 Influent to SCA WTP**

**Weight of TSS in WTP influent:**

$$W_{TSS\_influent} := q_{WTP\_influent} \cdot TSS_{WTP\_influent} \quad W_{TSS\_influent} = 13644.9 \cdot \frac{\text{lb}}{\text{day}}$$

**Volume of TSS in WTP influent:**

RA-D:

$$q_{TSS\_WTP\_influent\_D} := \frac{W_{TSS\_influent}}{G_{sD} \cdot \rho_w} \quad q_{TSS\_WTP\_influent\_D} = 0.45057 \cdot \text{gpm}$$

RA-E:

$$q_{TSS\_WTP\_influent\_E} := \frac{W_{TSS\_influent}}{G_{sE} \cdot \rho_w} \quad q_{TSS\_WTP\_influent\_E} = 0.44009 \cdot \text{gpm}$$

**Weight of water in WTP influent:**

RA-D:

$$W_{w\_WTP\_influent\_D} := (q_{WTP\_influent} - q_{TSS\_WTP\_influent\_D}) \cdot \rho_w \quad W_{w\_WTP\_influent\_D} = 68049025.3 \cdot \frac{\text{lb}}{\text{day}}$$

RA-E:

$$W_{w\_WTP\_influent\_E} := (q_{WTP\_influent} - q_{TSS\_WTP\_influent\_E}) \cdot \rho_w \quad W_{w\_WTP\_influent\_E} = 68049151.2 \cdot \frac{\text{lb}}{\text{day}}$$

**Volume of water in WTP influent:**

RA-D:

$$q_{w\_WTP\_influent\_D} := q_{WTP\_influent} - q_{TSS\_WTP\_influent\_D} \quad q_{w\_WTP\_influent\_D} = 5662.5 \cdot \text{gpm}$$

RA-E:

$$q_{w\_WTP\_influent\_E} := q_{WTP\_influent} - q_{TSS\_WTP\_influent\_E} \quad q_{w\_WTP\_influent\_E} = 5662.6 \cdot \text{gpm}$$

**4.13 Discharge from SCA WTP to Metro**

**Weight of TSS in discharge:**

$$W_{TSS\_dis} := MAX_{discharge} \cdot TSS_{discharge} \qquad W_{TSS\_dis} = 244.1 \frac{lb}{day}$$

**Volume of TSS in discharge:**

RA-D:

$$q_{TSS\_dis\_D} := \frac{W_{TSS\_dis}}{G_{SD} \cdot \rho_w} \qquad q_{TSS\_dis\_D} = 0.00806 \text{ gpm}$$

RA-E:

$$q_{TSS\_dis\_E} := \frac{W_{TSS\_dis}}{G_{SE} \cdot \rho_w} \qquad q_{TSS\_dis\_E} = 0.008 \text{ gpm}$$

**Weight of water in discharge:**

RA-D:

$$W_{w\_dis\_D} := (MAX_{discharge} - q_{TSS\_dis\_D}) \cdot \rho_w \qquad W_{w\_dis\_D} = 54245034.7 \frac{lb}{day}$$

RA-E:

$$W_{w\_dis\_E} := (MAX_{discharge} - q_{TSS\_dis\_E}) \cdot \rho_w \qquad W_{w\_dis\_E} = 54245037 \frac{lb}{day}$$

**Volume of water in discharge:**

RA-D:

$$q_{w\_dis\_D} := MAX_{discharge} - q_{TSS\_dis\_D} \qquad q_{w\_dis\_D} = 4513.9 \text{ gpm}$$

RA-E:

$$q_{w\_dis\_E} := MAX_{discharge} - q_{TSS\_dis\_E} \qquad q_{w\_dis\_E} = 4513.9 \text{ gpm}$$

**5.0 Mass and Water Balance Tables**

This section provides the mass and water balance calculations of the maximum flow rate (5,500 gpm) for Remediation Areas D and E shown on Drawing D-002. The stream numbers are defined on Drawing D-001. Some of the stream numbers represent individual components, including the pre-processing steps, geotextile tube dewatering, and precipitation. The flow associated with these stream numbers is shown as positive if the component adds flow to the slurry (e.g., polymer injection); whereas, the flow is shown as negative if the component subtracts flow from the slurry (e.g., gravel-sized particle removal). The other stream numbers represents the subtotal flow at a given location along the flow streamline.

The flow at each Stream Number is shown as an array in the following format:  
 (total flow rate, water flow rate, solids flow rate).



**5.1 RA-D Stream Numbers**

Stream Number 1: Incoming slurry

$$S1_D := (q \quad q_{w\_D} \quad q_{s\_D}) \quad S1_D = (5500 \quad 5217.7 \quad 282.3) \cdot \text{gpm}$$

Stream number 1A: Supplemental lake water intake (normally zero)

$$S1A_D := (0 \quad 0 \quad 0) \cdot \text{gpm}$$

Stream Number 2: booster pump seal water

$$S2_D := (N_{\text{booster}} \cdot q_{\text{booster}} \quad N_{\text{booster}} \cdot q_{\text{booster}} \quad 0 \cdot \text{gpm}) \quad S2_D = (0 \quad 0 \quad 0) \cdot \text{gpm}$$

Stream Number 3: Subtotal

$$S3_D := S1_D + S1A_D + S2_D \quad S3_D = (5500 \quad 5217.7 \quad 282.3) \cdot \text{gpm}$$

Stream Number 4: Primary Screen Wash Water

$$S4_D := (q_{\text{primary}} \quad q_{\text{primary}} \quad 0 \cdot \text{gpm}) \quad S4_D = (306.7 \quad 306.7 \quad 0) \cdot \text{gpm}$$

Stream Number 5: gravel-sized Particle Removal

$$S5_D := [-(q_{w\_gravel\_D} + q_{gravel\_D}) \quad -q_{w\_gravel\_D} \quad -q_{gravel\_D}]$$

$$S5_D = (-2.3 \quad -0.9 \quad -1.4) \cdot \text{gpm}$$

Stream Number 6: Subtotal

$$S6_D := S3_D + S4_D + S5_D \quad S6_D = (5804.4 \quad 5523.5 \quad 280.9) \cdot \text{gpm}$$

Stream Number 7: Geotextile tube feed pump seal water

$$S7_D := (N_{\text{tube\_pump}} \cdot q_{\text{tube\_pump}} \quad N_{\text{tube\_pump}} \cdot q_{\text{tube\_pump}} \quad 0 \cdot \text{gpm})$$

$$S7_D = (24 \quad 24 \quad 0) \cdot \text{gpm}$$

Stream Number 8: Subtotal

$$S8_D := S6_D + S7_D \quad S8_D = (5828.4 \quad 5547.5 \quad 280.9) \cdot \text{gpm}$$

Stream Number 9: SCA WTP clarifier underflow and filter backwash

$$S9_D := (q_{\text{WTP}} \quad q_{w\_WTP\_D} \quad q_{\text{TSS\_D}})$$

$$S9_D = (992.4 \quad 991.942 \quad 0.458) \cdot \text{gpm}$$

Stream Number 10: Stockpile filtrate

$$S10_D := (q_{\text{stock\_filtrate\_D}} \quad q_{w\_stock\_filtrate\_D} \quad q_{\text{TSS\_stock\_filtrate\_D}})$$

$$S10_D = (0.35578 \quad 0.35575 \quad 0.00003) \cdot \text{gpm}$$

Stream Number 10a: Runoff to stockpile area sump (Sump#1)

$$S10a_D := (q_{S1\_D} \quad q_{w\_S1} \quad q_{TSS\_S1\_D})$$

$$S10a_D = (2.6 \quad 2.6 \quad 0) \cdot \text{gpm}$$



Stream Number 10b: Runoff to screen area sump (Sump#2)

$$S10b_D := (q_{S2\_D} \quad q_{w\_S2} \quad q_{TSS\_S2\_D})$$

$$S10b_D = (3.5 \quad 3.5 \quad 0) \cdot \text{gpm}$$



Stream Number 10c: Runoff to polymer/decon area sump (Sump#3)

$$S10c_D := (q_{S3\_D} \quad q_{w\_S3} \quad q_{TSS\_S3\_D})$$

$$S10c_D = (2.4 \quad 2.4 \quad 0) \cdot \text{gpm}$$



Stream Number 10d: Runoff to WTP area sump (Sump#4)

$$S10d_D := (q_{S4\_D} \quad q_{w\_S4} \quad q_{TSS\_S4\_D})$$

$$S10d_D = (15.4 \quad 15.4 \quad 0) \cdot \text{gpm}$$



Stream Number 11: Polymer and makeup water

$$S11_D := (q_{\text{polymerwater\_D}} + q_{\text{drypolymer\_D}} \quad q_{\text{polymerwater\_D}} \quad q_{\text{drypolymer\_D}})$$

$$S11_D = (255.266 \quad 254.5388 \quad 0.7273) \cdot \text{gpm}$$

Stream Number 12: Subtotal

$$S12_D := S8_D + S9_D + S10_D + S10a_D + S10b_D + S10c_D + S10d_D + S11_D \quad S12_D = (7100.3 \quad 6818.2 \quad 282.1) \cdot \text{gpm}$$



Stream Number 13: Geotextile tube retention

$$S13_D := [-(q_{w\_ret3\_D} + q_{s\_ret\_D}) \quad -q_{w\_ret3\_D} \quad -q_{s\_ret\_D}]$$

$$S13_D = (-991.2 \quad -709.6 \quad -281.6) \cdot \text{gpm}$$



Stream Number 14: Precipitation

$$S14_D := (q_{PRE} \quad q_{PRE} \quad 0 \text{gpm})$$

$$S14_D = (201.5 \quad 201.5 \quad 0) \cdot \text{gpm}$$



Stream Number 15: Subtotal

$$S15_D := S12_D + S13_D + S14_D$$

$$S15_D = (6310.644 \quad 6310.157 \quad 0.487) \cdot \text{gpm}$$



Stream Number 16: Primary screen wash water

$$S16_D := (-q_{\text{primary}} \quad -q_{\text{primary}} \quad 0 \text{gpm})$$

$$S16_D = (-306.7 \quad -306.7 \quad 0) \cdot \text{gpm}$$

Stream Number 17: Net flow to SCA basins

Three parameters define the net flow to SCA basins. The maximum flow is the WTP design capacity, which indicates the maximum flow the WTP can accept at any time. The allowable flow is the summation of WTP maximum allowable discharge to Metro (6.5MGD) and the flows that recycle through the WTP system (polymer makeup water, geotextile tube feed pump seal water, clarifier underflow, and GAC MMF backwash water). The available flow is what is available to the WTP from SCA dewatering process.

The smallest of the three flows controls the design and is the influent to the WTP. The difference between the available flow and WTP influent will be stored in the SCA basins, and sent to WTP for treatment when capacity allows.

$$MAX_D := (q_{WTP\_influent} \quad q_{w\_WTP\_influent\_D} \quad q_{TSS\_WTP\_influent\_D})$$

$$MAX_D = (5663 \quad 5662.5 \quad 0.5) \cdot \text{gpm}$$

$$\text{Discharge}_D := (MAX_{\text{discharge}} \quad q_{w\_dis\_D} \quad q_{TSS\_dis\_D})$$

$$WTP_{BWPS\_D} := (q_{WTP} \quad q_{W\_WTP\_D} \quad q_{WTP\_TSS\_D})$$

$$\text{Polymerwater}_D := (q_{\text{polymerwater}_D} \quad q_{\text{polymerwater}_D} \quad 0 \text{gpm})$$

$$\text{Sealwater} := (N_{\text{tube\_pump}} \cdot q_{\text{tube\_pump}} \quad N_{\text{tube\_pump}} \cdot q_{\text{tube\_pump}} \quad 0 \text{gpm})$$

$$\text{ALLOWABLE}_D := \text{Discharge}_D + WTP_{BWPS\_D} + \text{Polymerwater}_D + \text{Sealwater} \quad \text{ALLOWABLE}_D = (5784.828 \quad 5784.361 \quad 0.466) \cdot \text{gpm}$$

$$\text{AVAILABLE}_D := S15_D + S16_D \quad \text{AVAILABLE}_D = (6003.9 \quad 6003.4 \quad 0.5) \cdot \text{gpm}$$

$$\text{Min}_D := \min(MAX_{D,0,0}, \text{ALLOWABLE}_{D,0,0}, \text{AVAILABLE}_{D,0,0}) \quad \text{Min}_D = 5663 \cdot \text{gpm}$$

$$\text{INFLUENT}_D := \text{if}(\text{Min}_D = MAX_{D,0,0}, MAX_D, \text{if}(\text{Min}_D = \text{ALLOWABLE}_{D,0,0}, \text{ALLOWABLE}_D, \text{AVAILABLE}_D))$$

$$\text{INFLUENT}_D = (5663 \quad 5662.5 \quad 0.5) \cdot \text{gpm}$$

$$\text{Basin}_D := \text{if}[\text{AVAILABLE}_{D,0,0} > \text{INFLUENT}_{D,0,0}, \text{AVAILABLE}_D - \text{INFLUENT}_D, (0 \quad 0 \quad 0) \text{gpm}]$$

$$\text{Basin}_D = (340.92 \quad 340.89 \quad 0.04) \cdot \text{gpm}$$

$$S17_{\text{water}} := -\text{Basin}_{D,1} \quad S17_{\text{water}} = -340.9 \cdot \text{gpm}$$

$$S17_{\text{TSS}} := -\text{Basin}_{D,2} \quad S17_{\text{TSS}} = -0.036 \cdot \text{gpm}$$

$$S17_D := -\text{Basin}_D$$



Stream Number 18: Effluent to SCA WTP

$$S18_D := S15_D + S16_D + S17_D \quad S18_D = (5663 \quad 5662.5 \quad 0.5) \cdot \text{gpm}$$

$$S18_{D\_25\text{yr}} := S15_{D\_25\text{yr}} + S16_D + S17_{D\_25\text{yr}} \quad S18_{D\_25\text{yr}} = (5784.6 \quad 5784.4 \quad 0.3) \cdot \text{gpm}$$

**5.2 Mass and Water Balance Tables: Remediation Area D with Average Precipitation**

Mass balance tables

$T_D =$

"Description"	"Total (gpm)"	"Water (gpm)"	"Solids (gpm)"
"1. Incoming Slurry"	5500	5217.7	282.3
"2. Booster Pump Seal Water"	0	0	0
"3. Subtotal"	5500	5217.7	282.3
"4. Primary Screen Wash Water"	306.7	306.7	0
"5. Oversized Particle Removal"	-2.3	-0.9	-1.4
"6. Subtotal"	5804.4	5523.5	280.9
"7. Geotextile tube Feed Pump Seal Water"	24	24	0
"8. Subtotal"	5828.4	5547.5	280.9
"9. WTP Underflow and Backwash"	992.4	991.9	0.5
"10. Stockpile Filtrate"	0.4	0.4	0
"10a. Stockpile Area Runoff"	2.6	2.6	0
"10b. Screen Area Runoff"	3.5	3.5	0
"10c. Polymer/Decon Area Runoff"	2.4	2.4	0
"10d. WTP Area Runoff"	15.4	15.4	0
"11. Polymer and Makeup Water"	255.3	254.5	0.7
"12. Subtotal"	7100.3	6818.2	282.1
"13. Geotextile tube Retention"	-991.2	-709.6	-281.6
"14. Precipitation"	201.5	201.5	0
"15. Subtotal"	6310.6	6310.2	0.5
"16. Primary Screen Wash Water"	-306.7	-306.7	0
"17. Net Flow to SCA Basins"	-340.9	-340.9	-0
"18. Effluent to WTP"	5663	5662.5	0.5

· gpm

$S_D =$

"Description"	"Solids (lbs/min)"
"1. Incoming Slurry"	5937.7
"2. Booster Pump Seal Water"	0
"3. Subtotal"	5937.7
"4. Primary Screen Wash Water"	0
"5. Oversized Particle Removal"	-29.7
"6. Subtotal"	5908.1
"7. Geotextile tube Feed Pump Seal Water"	0
"8. Subtotal"	5908.1
"9. WTP Underflow and Backwash"	9.6
"10. Stockpile Filtrate"	0
"10a. Stockpile Area Runoff"	0
"10b. Screen Area Runoff"	0
"10c. Polymer/Decon Area Runoff"	0
"10d. WTP Area Runoff"	0
"11. Polymer and Makeup Water"	4.2
"12. Subtotal"	5922
"13. Geotextile tube Retention"	-5911.7
"14. Precipitation"	0
"15. Subtotal"	10.2
"16. Primary Screen Wash Water"	0
"17. Net Flow to SCA Basins"	-0.8
"18. Effluent to WTP"	9.5

·  $\frac{\text{lb}}{\text{min}}$

	"Description"	"Concentration"	
$C_D =$	"1. Incoming Slurry"	129363.4	$\frac{mg}{L}$
	"2. Booster Pump Seal Water"	0	
	"3. Subtotal"	129363.4	
	"4. Primary Screen Wash Water"	0	
	"5. Oversized Particle Removal"	1546012.3	
	"6. Subtotal"	121966	
	"7. Geotextile tube Feed Pump Seal Water"	0	
	"8. Subtotal"	121463.7	
	"9. WTP Underflow and Backwash"	1163.3	
	"10. Stockpile Filtrate"	200	
	"10a. Stockpile Area Runoff"	200	
	"10b. Screen Area Runoff"	200	
	"10c. Polymer/Decon Area Runoff"	200	
	"10d. WTP Area Runoff"	200	
	"11. Polymer and Makeup Water"	1994.3	
	"12. Subtotal"	99940.2	
	"13. Geotextile tube Retention"	714643.8	
	"14. Precipitation"	0	
"15. Subtotal"	194.4		
"16. Primary Screen Wash Water"	0		
"17. Net Flow to SCA Basins"	267.5		
"18. Effluent to WTP"	200.5		

Note: Stream Number 1A: Supplemental Lake Water Intake is not shown on these tables.

**5.3 RA-E Stream Numbers**

Stream Number 1: Incoming slurry

$$S1_E := (q_{w\_E} \quad q_{s\_E}) \quad S1_E = (5500 \quad 5055.2 \quad 444.8) \cdot gpm$$

Stream number 1A: Supplemental lake water intake (normally zero)

$$S1A_E := (0 \quad 0 \quad 0) \cdot gpm$$

Stream Number 2: booster pump seal water

$$S2_E := (N_{booster} \cdot q_{booster} \quad N_{booster} \cdot q_{booster} \quad 0 \cdot gpm) \quad S2_E = (0 \quad 0 \quad 0) \cdot gpm$$

Stream Number 3: Subtotal

$$S3_E := S1_E + S1A_E + S2_E \quad S3_E = (5500 \quad 5055.2 \quad 444.8) \cdot gpm$$

Stream Number 4: Primary Screen Wash Water

$$S4_E := (q_{primary} \quad q_{primary} \quad 0 \cdot gpm) \quad S4_E = (306.7 \quad 306.7 \quad 0) \cdot gpm$$

Stream Number 5: Gravel-sized Particle Removal

$$S5_E := [-(q_{w\_gravel\_E} + q_{gravel\_E}) \quad -q_{w\_gravel\_E} \quad -q_{gravel\_E}]$$

$$S5_E = (-2.9 \quad -1.1 \quad -1.8) \cdot gpm$$

**Stream Number 6: Subtotal**

$$S6_E := S3_E + S4_E + S5_E \quad S6_E = (5803.8 \ 5360.8 \ 443) \cdot \text{gpm}$$

**Stream Number 7: Geotextile tube feed pump seal water**

$$S7_E := (N_{\text{tube\_pump}} \cdot q_{\text{tube\_pump}} \ N_{\text{tube\_pump}} \cdot q_{\text{tube\_pump}} \ 0 \ \text{gpm}) \quad S7_E = (24 \ 24 \ 0) \cdot \text{gpm}$$

**Stream Number 8: Subtotal**

$$S8_E := S6_E + S7_E \quad S8_E = (5827.8 \ 5384.8 \ 443) \cdot \text{gpm}$$

**Stream Number 9: SCA WTP clarifier underflow and filter backwash**

$$S9_E := (q_{\text{WTP}} \ q_{\text{W\_WTP\_E}} \ q_{\text{WTP\_TSS\_E}}) \quad S9_E = (992.4 \ 992 \ 0.4) \cdot \text{gpm}$$

**Stream Number 10: Stockpile filtrate**

$$S10_E := (q_{\text{stock\_filtrate\_E}} \ q_{\text{w\_stock\_filtrate\_E}} \ q_{\text{TSS\_stock\_filtrate\_E}}) \quad S10_E = (0.45904 \ 0.459 \ 0.00004) \cdot \text{gpm}$$

**Stream Number 10a: Runoff to stockpile area sump (Sump#1)**

$$S10a_E := (q_{S1\_E} \ q_{\text{w\_S1}} \ q_{\text{TSS\_S1\_E}})$$

$$S10a_E = (2.6 \ 2.6 \ 0) \cdot \text{gpm}$$

**Stream Number 10b: Runoff to screen area sump (Sump#2)**

$$S10b_E := (q_{S2\_E} \ q_{\text{w\_S2}} \ q_{\text{TSS\_S2\_E}})$$

$$S10b_E = (3.5 \ 3.5 \ 0) \cdot \text{gpm}$$

**Stream Number 10c: Runoff to polymer/decon area sump (Sump#3)**

$$S10c_E := (q_{S3\_E} \ q_{\text{w\_S3}} \ q_{\text{TSS\_S3\_E}})$$

$$S10c_E = (2.4 \ 2.4 \ 0) \cdot \text{gpm}$$

**Stream Number 10d: Runoff to WTP area sump (Sump#4)**

$$S10d_E := (q_{S4\_E} \ q_{\text{w\_S4}} \ q_{\text{TSS\_S4\_E}})$$

$$S10d_E = (15.4 \ 15.4 \ 0) \cdot \text{gpm}$$

**Stream Number 11: Coagulant, polymer, and makeup water**

$$S11_E := (q_{\text{coagwater\_E}} + q_{\text{coag\_E}} + q_{\text{polymerwater\_E}} + q_{\text{drypolymer\_E}} \ q_{\text{coagwater\_E}} + q_{\text{polymerwater\_E}} \ q_{\text{coag\_E}} + q_{\text{drypolymer\_E}})$$

$$S11_E = (341.304 \ 339.362 \ 1.942) \cdot \text{gpm}$$

**Stream Number 12: Subtotal**

$$S12_E := S8_E + S9_E + S10_E + S10a_E + S10b_E + S10c_E + S10d_E + S11_E \quad S12_E = (7185.9 \ 6740.5 \ 445.4) \cdot \text{gpm}$$

**Stream Number 13: Geotextile tube retention**

$$S13_E := [- (q_{\text{w\_ret3\_E}} + q_{\text{s\_ret\_E}}) \ -q_{\text{w\_ret3\_E}} \ -q_{\text{s\_ret\_E}}]$$

$$S13_E = (-1590.835244 \ -1145.889138 \ -444.946106) \cdot \text{gpm}$$

Stream Number 14: Average precipitation

$$S14_E := (q_{PRE} \quad q_{PRE} \quad 0 \text{ gpm}) \quad S14_E = (201.5 \quad 201.5 \quad 0) \cdot \text{gpm}$$

Stream Number 15: Subtotal

$$S15_E := S12_E + S13_E + S14_E$$

$$S15_E = (5796.564 \quad 5796.128 \quad 0.436) \cdot \text{gpm}$$

Stream Number 16: Primary screen wash water

$$S16_E := (-q_{primary} \quad -q_{primary} \quad 0 \text{ gpm}) \quad S16_E = (-306.7 \quad -306.7 \quad 0) \cdot \text{gpm}$$

Stream Number 17: Net flow to SCA basins

$$MAX_E := (q_{WTP\_influent} \quad q_{w\_WTP\_influent\_E} \quad q_{TSS\_WTP\_influent\_E})$$

$$MAX_E = (5663 \quad 5662.6 \quad 0.4) \cdot \text{gpm}$$

$$Discharge_E := (MAX_{discharge} \quad q_{w\_dis\_E} \quad q_{TSS\_dis\_E})$$

$$WTP_{BWPS\_E} := (q_{WTP} \quad q_{W\_WTP\_E} \quad q_{WTP\_TSS\_E})$$

$$Polymerwater_E := (q_{polymerwater\_E} + q_{coagwater\_E} \quad q_{polymerwater\_E} + q_{coagwater\_E} \quad 0 \text{ gpm})$$

$$Sealwater := (N_{tube\_pump} \cdot q_{tube\_pump} \quad N_{tube\_pump} \cdot q_{tube\_pump} \quad 0 \text{ gpm})$$

$$ALLOWABLE_E := Discharge_E + WTP_{BWPS\_E} + Polymerwater_E + Sealwater \quad ALLOWABLE_E = (5869.651 \quad 5869.196 \quad 0.455) \cdot \text{gpm}$$

$$AVAILABLE_E := S15_E + S16_E \quad AVAILABLE_E = (5489.8 \quad 5489.4 \quad 0.4) \cdot \text{gpm}$$

$$Min_E := \min(MAX_{E,0,0}, ALLOWABLE_{E,0,0}, AVAILABLE_{E,0,0}) \quad Min_E = 5489.8 \cdot \text{gpm}$$

$$INFLUENT_E := \text{if}(Min_E = MAX_{E,0,0}, MAX_E, \text{if}(Min_E = ALLOWABLE_{E,0,0}, ALLOWABLE_E, AVAILABLE_E))$$

$$INFLUENT_E = (5489.8 \quad 5489.4 \quad 0.4) \cdot \text{gpm}$$

$$Basin_E := \text{if}[AVAILABLE_{E,0,0} > INFLUENT_{E,0,0}, AVAILABLE_E - INFLUENT_E, (0 \quad 0 \quad 0) \text{ gpm}]$$

$$Basin_E = (0 \quad 0 \quad 0) \cdot \text{gpm}$$

$$S17_{water} := -Basin_{E,0,1} \quad S17_{water} = 0 \cdot \text{gpm}$$

$$S17_{TSS} := -Basin_{E,0,2} \quad S17_{TSS} = 0 \cdot \text{gpm}$$

$$S17_E := -Basin_E$$

Stream Number 18: Effluent to SCA WTP

$$S18_E := S15_E + S16_E + S17_E \quad S18_E = (5489.8 \quad 5489.4 \quad 0.4) \cdot \text{gpm}$$

**5.4 Mass and Water Balance Tables: Remediation Area E with Average Precipitation**

	"Description"	"Total (gpm)"	"Water (gpm)"	"Solids (gpm)"
T <sub>E</sub> =	"1. Incoming Slurry"	5500	5055.2	444.8
	"2. Booster Pump Seal Water"	0	0	0
	"3. Subtotal"	5500	5055.2	444.8
	"4. Primary Screen Wash Water"	306.7	306.7	0
	"5. Oversized Particle Removal"	-2.9	-1.1	-1.8
	"6. Subtotal"	5803.8	5360.8	443
	"7. Geotextile tube Feed Pump Seal Water"	24	24	0
	"8. Subtotal"	5827.8	5384.8	443
	"9. WTP Underflow and Backwash"	992.4	992	0.4
	"10. Stockpile Filtrate"	0.5	0.5	0
	"10a. Stockpile Area Runoff"	2.6	2.6	0
	"10b. Screen Area Runoff"	3.5	3.5	0
	"10c. Polymer/Decon Area Runoff"	2.4	2.4	0
	"10d. WTP Area Runoff"	15.4	15.4	0
	"11. Coag, Polymer, and Makeup Water"	341.3	339.4	1.9
	"12. Subtotal"	7185.9	6740.5	445.4
	"13. Geotextile tube Retention"	-1590.8	-1145.9	-444.9
	"14. Average Precipitation"	201.5	201.5	0
"15. Subtotal"	5796.6	5796.1	0.4	
"16. Primary Screen Wash Water"	-306.7	-306.7	0	
"17. Net Flow to SCA Basins"	0	0	0	
"18. Effluent to WTP"	5489.8	5489.4	0.4	

	"Description"	"Solids (lbs/min)"
S <sub>E</sub> =	"1. Incoming Slurry"	9576.4
	"2. Booster Pump Seal Water"	0
	"3. Subtotal"	9576.4
	"4. Primary Screen Wash Water"	0
	"5. Oversized Particle Removal"	-38.3
	"6. Subtotal"	9538.1
	"7. Geotextile tube Feed Pump Seal Water"	0
	"8. Subtotal"	9538.1
	"9. WTP Underflow and Backwash"	9.6
	"10. Stockpile Filtrate"	0
	"10a. Stockpile Area Runoff"	0
	"10b. Screen Area Runoff"	0
	"10c. Polymer/Decon Area Runoff"	0
	"10d. WTP Area Runoff"	0
	"11. Coag, Polymer, and Makeup Water"	15.1
	"12. Subtotal"	9562.9
	"13. Geotextile tube Retention"	-9553.5
	"14. Average Precipitation"	0
"15. Subtotal"	9.4	
"16. Primary Screen Wash Water"	0	
"17. Net Flow to SCA Basins"	0	
"18. Effluent to WTP"	9.4	



	"Description"	"Concentration"
$C_E =$	"1. Incoming Slurry"	208637.5
	"2. Booster Pump Seal Water"	0
	"3. Subtotal"	208637.5
	"4. Primary Screen Wash Water"	0
	"5. Oversized Particle Removal"	1568389.1
	"6. Subtotal"	196925.7
	"7. Geotextile tube Feed Pump Seal Water"	0
	"8. Subtotal"	196114.7
	"9. WTP Underflow and Backwash"	1163.3
	"10. Stockpile Filtrate"	200
	"10a. Stockpile Area Runoff"	200
	"10b. Screen Area Runoff"	200
	"10c. Polymer/Decon Area Runoff"	200
	"10d. WTP Area Runoff"	200
	"11. Coag, Polymer, and Makeup Water"	5313.7
	"12. Subtotal"	159464.4
	"13. Geotextile tube Retention"	719600.2
	"14. Average Precipitation"	0
"15. Subtotal"	193.9	
"16. Primary Screen Wash Water"	0	
"17. Net Flow to SCA Basins"	0	
"18. Effluent to WTP"	204.7	

$\frac{mg}{L}$

Note: Stream Number 1A: Supplemental Lake Water Intake is not shown on these tables.

**Table 1. Weighted-Average Sediment Properties in Dredge Prism**

Remediation Area	Average Water Content	Average Specific Gravity	Average in-situ Solids Content by Weight	Average Percent Gravel-Sized	Average Percent Sand-Sized	Average Percent Fines	Average Percent Silt-Sized	Average Percent Clay-Sized	Maximum Slurry Solids Content by Weight
	(%)		(%)	(%)	(%)	(%)	(%)	(%)	(%)
<b>A</b>	77.2	2.68	56.4	0.3	23.0	76.7	58.7	18.0	16.2
<b>B</b>	77.2	2.68	56.4	0.3	23.0	76.7	58.7	18.0	8.1
<b>C</b>	76.0	2.74	56.8	15.6	30.2	54.2	32.6	21.6	10.3
<b>D (ILWD)</b>	126.3	2.52	44.2	0.5	9.5	90.0	62.5	27.5	12.0
<b>E</b>	61.9	2.58	61.8	0.4	56.3	43.3	31.8	11.5	18.5

**E.3 EXCEL CALCULATIONS**

Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date:1/11/2011	Rev:0	Preparer:	Date:
Project Name: Sediment Management Design	Calculation Title: Mass Balance	Reviewer: MTO	Date: 1/14/2011	Reviewer:	Date:	

Table 1. Weighted-Average Sediment Properties in Dredge Prism

Remediation Area	Average Water Content (%)	Average Specific Gravity	Average in-situ Solids Content by Weight (%)	Average Percent Gravel Sized (%)	Average Percent Sand Sized (%)	Average Percent Fines (%)	Average Percent Silt-Sized (%)	Average Percent Clay-Sized (%)
A	77.2	2.68	56.4	0.3	23.0	76.7	58.7	18.0
B (1)	77.2	2.68	56.4	0.3	23.0	76.7	58.7	18.0
C	76.0	2.74	56.8	15.6	30.2	54.2	32.6	21.6
D (ILWD)	126.3	2.52	44.2	0.5	9.5	90.0	62.5	27.5
E	61.9	2.58	61.8	0.4	56.3	43.3	31.8	11.5

Table 2. Production Rate Calculations

Remediation Area	16X16 - 43" Cutter w/30'Spud Carriage (10' stroke)			14X14-34" Cutter w/30'Spud Carriage (10'stroke)			8X8-28" Cutter			Weighted-Average Production Rate (icy/hr)	Weighted-Average Flow Rate (gpm)
	Production Rate (2) (icy/hr)	Flow Rate (2) (gpm)	Estimated Usage	Production Rate (2) (icy/hr)	Flow Rate (2) (gpm)	Estimated Usage	Production Rate (2) (icy/hr)	Flow Rate (2) (gpm)	Estimated Usage		
A	338	5,500	20%	215	5,500	60%	30	1,500	20%	203	4,700
B	178	5,500	0%	159	5,500	100%	24	1,500	0%	159	5,500
C	216	5,500	0%	203	5,500	80%	22	1,500	20%	167	4,700
D (ILWD)	351	5,500	80%	224	5,500	20%	38	1,500	0%	326	5,500
E	342	5,500	40%	218	5,500	40%	30	1,500	20%	230	4,700

Table 3. Slurry Characteristics - Weighted-Average Production Rate

Remediation Area	Weighted-Average Production Rate (icy/hr)	Weighted-Average Flow Rate (gpm)	Production (gal/hr)	Average Water Content (%)	Solids Specific Gravity	In-situ Dry Density (pcf)	Solids Weight (lb/hr)	Solids Volume (gal/hr)	Slurry Flow (gal/hr)	Water Volume (gal/hr)	Water weight (lb/hr)	Slurry Specific Gravity	Slurry Density (pcf)	Slurry Weight (lb/hr)	In-situ Percent Solids by volume	Solids Content by Weight	Solids Content by Volume
A	203	4,700	40,925	77.2	2.68	54.5	298,127	13,335	282,000	268,665	2,240,669	1.08	67.3	2,538,795	14.5%	11.7%	4.1%
B	159	5,500	32,118	77.2	2.68	54.5	233,969	10,465	330,000	319,535	2,664,922	1.05	65.7	2,898,891	9.7%	8.1%	2.9%
C	167	4,700	33,694	76.0	2.74	55.5	249,783	10,937	282,000	271,063	2,260,668	1.07	66.6	2,510,451	11.9%	9.9%	3.4%
D (ILWD)	326	5,500	65,771	126.3	2.52	37.6	330,651	15,720	330,000	314,280	2,621,092	1.07	66.9	2,951,743	19.9%	11.2%	4.2%
E	230	4,700	46,460	61.9	2.58	62.0	385,017	17,893	282,000	264,107	2,202,654	1.10	68.6	2,587,671	16.5%	14.9%	5.3%

Table 4. Slurry Characteristics - Average Production Rate of the Largest Dredge Used in Each Remediation Area

Remediation Area	Average Production (icy/hr)	Flow Rate (gpm)	Production (gal/hr)	Average Water Content (%)	Solids Specific Gravity	In-situ Dry Density (pcf)	Solids Weight (lb/hr)	Solids Volume (gal/hr)	Slurry Flow (gal/hr)	Water Volume (gal/hr)	Water weight (lb/hr)	Slurry Specific Gravity	Slurry Density (pcf)	Slurry Weight (lb/hr)	In-situ Percent Solids by volume	Solids Content by Weight	Solids Content by Volume
A	338	5,500	68,276	77.2	2.68	54.5	497,369	22,246	330,000	307,754	2,566,665	1.11	69.5	3,064,033	20.7%	16.2%	5.5%
B	159	5,500	32,118	77.2	2.68	54.5	233,969	10,465	330,000	319,535	2,664,922	1.05	65.7	2,898,891	9.7%	8.1%	2.9%
C	203	5,500	41,006	76.0	2.74	55.5	303,993	13,310	330,000	316,690	2,641,192	1.07	66.8	2,945,185	12.4%	10.3%	3.5%
D (ILWD)	351	5,500	70,902	126.3	2.52	37.6	356,445	16,947	330,000	313,053	2,610,865	1.08	67.3	2,967,309	21.5%	12.0%	4.4%
E	342	5,500	69,084	61.9	2.58	62.0	572,504	26,606	330,000	303,394	2,530,307	1.13	70.3	3,102,811	20.9%	18.5%	6.4%

Table 5. Slurry Characteristics - Maximum Production Rate of the Largest Dredge Used in Each Remediation Area

Remediation Area	Max Production Rate (icy/hr)	Flow Rate (gpm)	Production (gal/hr)	Average Water Content (%)	Solids Specific Gravity	In-situ Dry Density (pcf)	Solids Weight (lb/hr)	Solids Volume (gal/hr)	Slurry Flow (gal/hr)	Water Volume (gal/hr)	Water weight (lb/hr)	Slurry Specific Gravity	Slurry Density (pcf)	Slurry Weight (lb/hr)	In-situ Percent Solids by volume	Solids Content by Weight	Solids Content by Volume
A	485	5,500	97,970	77.2	2.68	54.5	713,680	31,922	330,000	298,078	2,485,973	1.16	72.5	3,199,653	29.7%	22.3%	7.3%
B	234	5,500	47,268	77.2	2.68	54.5	344,332	15,401	330,000	314,599	2,623,752	1.08	67.3	2,968,085	14.3%	11.6%	4.0%
C	304	5,500	61,408	76.0	2.74	55.5	455,241	19,933	330,000	310,067	2,585,962	1.10	68.9	3,041,203	18.6%	15.0%	5.0%
D (ILWD)	485	5,500	97,970	126.3	2.52	37.6	492,523	23,416	330,000	306,584	2,556,908	1.11	69.1	3,049,431	29.7%	16.2%	5.8%
E	490	5,500	98,980	61.9	2.58	62.0	820,254	38,120	330,000	291,880	2,434,283	1.18	73.8	3,254,537	30.0%	25.2%	8.5%

Notes:

1. Remediation Area B only has two available sample locations within the dredge prism for calculations; therefore, weighted-average analysis was not performed, and Remediation Area B design parameters are assumed to be the same as Remediation Area A.
2. Production rates and flow rates are based on Appendix J - Dredging and Capping Equipment Selection and Production Rates, Draft Onondaga Lake Capping, Dredging and Habitat Intermediate Design, Parsons and Anchor QEA, January 24, 2011.



Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date: 1/11/2011	Rev: 0	Preparer:	Date:
Project Name: Sediment Management Design			Calculation Title: Mass Balance		Reviewer: MTO	Date: 1/14/2011
				Reviewer:	Date:	

**RA-A Maximum Flow Scenario 5,500 GPM**  
**Average Precipitation Solids Content by Weight 16.2%**

Stream Number	1	1A	2	3	4	5	6	7	8	9	10	10a	10b	10c	10d	11	12	13	14	15	16	17	18
Description	Dredge Slurry	Supplemental Lake Water Intake	Booster Pumps Seal Water	Subtotal	Primary Screen Wash Water	Gravel-Sized Removed from Primary Screen	Subtotal	Geotextile Tube Feed Pumps Seal Water from WTP	Subtotal	Clarifier Underflow and Filter Backwash from WTP	Filtrate from Screened Material Stockpile	Runoff to Stockpile Sump (Sump#1)	Runoff to Screen Area Sump (Sump#2)	Runoff to Polymer/Dec on Area Sump (Sump#3)	Runoff to WTP Area Sump (Sump#4)	Coagulant, Polymer, and Makeup Water from WTP	Subtotal	Geotextile Tube Retention	Precipitation in SCA and Basins	Subtotal	Primary Screen Wash Water	Net Flow to SCA Basins	Dewatering Effluent to SCA WTP Influent
Total (gpm)	5,500	0	0	5,500	307	(1.9)	5,805	24	5,829	992	0.3	2.6	3.5	2.4	15.4	522	7,368	(1364.6)	202	6,205	(307)	(235)	5,663
Water (gpm)	5,130	0	0	5,130	307	(0.7)	5,436	24	5,460	992	0.3	2.6	3.5	2.4	15.4	520	6,996	(992.7)	202	6,204	(307)	(235)	5,663
Solids (gpm) (Note 2)	370	0.0	0	370	0	(1.1)	369	0	369	0.4	0.00002	0.00019	0.00026	0.00018	0.00115	3.0	372	(371.9)	0	0.4	0	(0.03)	0.4
Solids (lbs/min) (Note 2)	8,276.2	0.0	0.0	8,276.2	0.0	(24.8)	8,251.4	0.0	8,251.4	9.6	0.0	0.0	0.0	0.0	0.0	23.2	8,284.2	(8274.2)	0.0	10.1	0.0	(0.6)	9.5
Concentration (mg/L)	180,311.0	NA	NA	180,311.0	0.0	1,604,790.4	170,328.7	0.0	169,627.4	1,163.3	200.0	200.0	200.0	200.0	200.0	5,313.7	134,728.0	726,584.1	0.0	194.3	0.0	NA	200.5

**RA-C Maximum Flow Scenario 5,500 GPM**  
**Average Precipitation Solids Content by Weight 10.3%**

Stream Number	1	1A	2	3	4	5	6	7	8	9	10	10a	10b	10c	10d	11	12	13	14	15	16	17	18
Description	Dredge Slurry	Supplemental Lake Water Intake	Booster Pumps Seal Water	Subtotal	Primary Screen Wash Water	Gravel-Sized Removed from Primary Screen	Subtotal	Geotextile Tube Feed Pumps Seal Water from WTP	Subtotal	Clarifier Underflow and Filter Backwash from WTP	Filtrate from Screened Material Stockpile	Runoff to Stockpile Sump (Sump#1)	Runoff to Screen Area Sump (Sump#2)	Runoff to Polymer/Dec on Area Sump (Sump#3)	Runoff to WTP Area Sump (Sump#4)	Polymer and Makeup Water from WTP	Subtotal	Geotextile Tube Retention	Precipitation in SCA and Basins	Subtotal	Primary Screen Wash Water	Net Flow to SCA Basins	Dewatering Effluent to SCA WTP Influent
Total (gpm)	5,500	0	0	5,500	307	(58.2)	5,749	24	5,773	992.4	9.5	2.6	3.5	2.4	15.4	131.0	6,929	(700.1)	202	6,431	(307)	(463)	5,661
Water (gpm)	5,279	0	0	5,279	307	(23.6)	5,562	24	5,586	992.0	9.5	2.6	3.5	2.4	15.4	130.6	6,742	(513.0)	202	6,430	(307)	(463)	5,660
Solids (gpm) (Note 2)	221.2	0.0	0.0	221.2	0.0	(34.5)	186.7	0.0	186.7	0.4	0.00069	0.00019	0.00025	0.00018	0.00112	0.4	187.5	(187.1)	0.0	0.5	0.0	(0.03)	0.4
Solids (lbs/min) (Note 2)	5,058.5	0.0	0.0	5,058.5	0.0	(789.1)	4,269.4	0.0	4,269.4	9.6	0.0158	0.0043	0.0058	0.0041	0.0257	2.2	4,281.3	(4,270.8)	0.0	10.4	0.0	(0.8)	9.7
Concentration (mg/L)	110,208.6	NA	NA	110,208.6	0.0	1,626,112.8	88,994.0	0.0	88,624.0	1,163.3	200.0	200.0	200.0	200.0	200.0	1,994.3	74,035.0	731,020.8	0.0	194.5	0.0	194.5	205.0

**RA-D Maximum Flow Scenario 5,500 GPM**  
**Average Precipitation Solids Content by Weight 12.0%**

Stream Number	1	1A	2	3	4	5	6	7	8	9	10	10a	10b	10c	10d	11	12	13	14	15	16	17	18
Description	Dredge Slurry	Supplemental Lake Water Intake	Booster Pumps Seal Water	Subtotal	Primary Screen Wash Water	Gravel-Sized Removed from Primary Screen	Subtotal	Geotextile Tube Feed Pumps Seal Water from WTP	Subtotal	Clarifier Underflow and Filter Backwash from WTP	Filtrate from Screened Material Stockpile	Runoff to Stockpile Sump (Sump#1)	Runoff to Screen Area Sump (Sump#2)	Runoff to Polymer/Dec on Area Sump (Sump#3)	Runoff to WTP Area Sump (Sump#4)	Polymer and Makeup Water from WTP	Subtotal	Geotextile Tube Retention	Precipitation in SCA and Basins	Subtotal	Primary Screen Wash Water	Net Flow to SCA Basins	Dewatering Effluent to SCA WTP Influent
Total (gpm)	5,500	0	0	5,500	307	(2.3)	5,804	24	5,828	992.4	0.4	2.6	3.5	2.4	15.4	255.3	7,100	(991.2)	202	6,311	(307)	(341)	5,663
Water (gpm)	5,218	0	0	5,218	307	(0.9)	5,523	24	5,547	991.9	0.4	2.6	3.5	2.4	15.4	254.5	6,818	(709.6)	202	6,310	(307)	(341)	5,663
Solids (gpm) (Note 2)	282.3	0.0	0.0	282.3	0.0	(1.4)	280.9	0.0	280.9	0.5	0.00003	0.00021	0.00028	0.00019	0.00122	0.7	282.1	(281.6)	0.0	0.5	0.0	(0.04)	0.5
Solids (lbs/min) (Note 2)	5,937.7	0.0	0.0	5,937.7	0.0	(29.7)	5,908.1	0.0	5,908.1	9.6	0.0006	0.0043	0.0058	0.0041	0.0257	4.2	5,922.0	(5,911.7)	0.0	10.2	0.0	(0.8)	9.5
Concentration (mg/L)	129,363.5	NA	NA	129,363.5	0.0	1,546,012.3	121,966.0	0.0	121,463.7	1,163.3	200.0	200.0	200.0	200.0	200.0	1,994.3	99,940.2	714,643.8	0.0	194.4	0.0	267.5	200.5

**RA-E Maximum Flow Scenario 5,500 GPM**  
**Average Precipitation Solids Content by Weight 18.5%**

Stream Number	1	1A	2	3	4	5	6	7	8	9	10	10a	10b	10c	10d	11	12	13	14	15	16	17	18
Description	Dredge Slurry	Supplemental Lake Water Intake	Booster Pumps Seal Water	Subtotal	Primary Screen Wash Water	Gravel-Sized Removed from Primary Screen	Subtotal	Geotextile Tube Feed Pumps Seal Water from WTP	Subtotal	Clarifier Underflow and Filter Backwash from WTP	Filtrate from Screened Material Stockpile	Runoff to Stockpile Sump (Sump#1)	Runoff to Screen Area Sump (Sump#2)	Runoff to Polymer/Dec on Area Sump (Sump#3)	Runoff to WTP Area Sump (Sump#4)	Coagulant, Polymer, and Makeup Water from WTP	Subtotal	Geotextile Tube Retention	Precipitation in SCA and Basins	Subtotal	Primary Screen Wash Water	Net Flow to SCA Basins	Dewatering Effluent to SCA WTP Influent
Total (gpm)	5,500	0	0	5,500	307	(2.9)	5,804	24	5,828	992	0.5	2.6	3.5	2.4	15.4	341	7,186	(1590.8)	202	5,797	(307)	0	5,490
Water (gpm)	5,055	0	0	5,055	307	(1.1)	5,361	24	5,385	992	0.5	2.6	3.5	2.4	15.4	339	6,740	(1145.9)	202	5,796	(307)	0	5,489
Solids (gpm) (Note 2)	445	0.0	0	445	0	(1.8)	443	0	443	0.4	0.00004	0.00020	0.00027	0.00019	0.00119	1.9	445	(444.9)	0	0.4	0	0.00	0.4
Solids (lbs/min) (Note 2)	9,576.4	0.0	0.0	9,576.4	0.0	(38.3)	9,538.1	0.0	9,538.1	9.6	0.0	0.0	0.0	0.0	0.0	15.1	9,562.9	(9,553.5)	0.0	9.4	0.0	0.0	9.4
Concentration (mg/L)	208,637.5	NA	NA	208,637.5	0.0	1,568,389.1	196,925.7	0.0	196,114.7	1,163.3	200.0	200.0	200.0	200.0	200.0	5,313.7	159,464.4	719,600.2	0.0	193.9	0.0	NA	204.7

- Notes:**  
 (1). Numbers within parenthesis represent diverted flows.  
 (2). Theoretical dry weight basis.  
 (3). NA indicates not applicable.



Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date: 1/11/2011	Rev: 0	Preparer:	Date:
Project Name: Sediment Management Design	Calculation Title: Mass Balance	Reviewer: MTO	Date: 1/14/2011	Reviewer:	Date:	

**RA-A Average Flow Scenario** **3,850 GPM**  
**Average Precipitation Solids Content by Weight** **11.7%**

Stream Number	1	1A	2	3	4	5	6	7	8	9	10	10a	10b	10c	10d	11	12	13	14	15	16	17	18
Description	Dredge Slurry	Supplemental Lake Water Intake	Booster Pumps Seal Water	Subtotal	Primary Screen Wash Water	Gravel-Sized Removed from Primary Screen	Subtotal	Geotextile Tube Feed Pumps Seal Water from WTP	Subtotal	Clarifier Underflow and Filter Backwash from WTP	Filtrate from Screened Material Stockpile	Runoff to Stockpile Sump (Sump#1)	Runoff to Screen Area Sump (Sump#2)	Runoff to Polymer/Dec on Area Sump (Sump#3)	Runoff to WTP Area Sump (Sump#4)	Coagulant, Polymer, and Makeup Water from WTP	Subtotal	Geotextile Tube Retention	Precipitation in SCA and Basins	Subtotal	Primary Screen Wash Water	Net Flow to SCA Basins	Dewatering Effluent to SCA WTP Influent
Total (gpm)	3,850	0	0	3,850	215	(0.9)	4,064	17	4,081	992	0.1	2.6	3.5	2.4	15.4	256	5,353	(669.5)	202	4,885	(215)	0.0	4,670
Water (gpm)	3,669	0	0	3,669	215	(0.4)	3,883	17	3,900	992	0.1	2.6	3.5	2.4	15.4	255	5,170	(487.2)	202	4,885	(215)	0.0	4,670
Solids (gpm) (Note 2)	181	0.0	0	181	0	(0.5)	181	0	181	0.4	0.00001	0.00019	0.00026	0.00018	0.00115	1.5	183	(182.4)	0	0.4	0	0.00	0.4
Solids (lbs/min) (Note 2)	4,056.7	0.0	0.0	4,056.7	0.0	(12.2)	4,044.6	0.0	4,044.6	9.6	0.0	0.0	0.0	0.0	0.0	11.4	4,065.6	(4057.7)	0.0	7.8	0.0	0.0	7.8
Concentration (mg/L)	126,260.3	NA	NA	126,260.3	0.0	1,604,790.4	119,259.0	0.0	118,768.0	1,163.3	200.0	200.0	200.0	200.0	200.0	5,313.7	91,005.1	726,206.0	0.0	192.4	0.0	NA	201.3

**RA-C Average Flow Scenario** **3,850 GPM**  
**Average Precipitation Solids Content by Weight** **9.9%**

Stream Number	1	1A	2	3	4	5	6	7	8	9	10	10a	10b	10c	10d	11	12	13	14	15	16	17	18
Description	Dredge Slurry	Supplemental Lake Water Intake	Booster Pumps Seal Water	Subtotal	Primary Screen Wash Water	Gravel-Sized Removed from Primary Screen	Subtotal	Geotextile Tube Feed Pumps Seal Water from WTP	Subtotal	Clarifier Underflow and Filter Backwash from WTP	Filtrate from Screened Material Stockpile	Runoff to Stockpile Sump (Sump#1)	Runoff to Screen Area Sump (Sump#2)	Runoff to Polymer/Dec on Area Sump (Sump#3)	Runoff to WTP Area Sump (Sump#4)	Polymer and Makeup Water from WTP	Subtotal	Geotextile Tube Retention	Precipitation in SCA and Basins	Subtotal	Primary Screen Wash Water	Net Flow to SCA Basins	Dewatering Effluent to SCA WTP Influent
Total (gpm)	3,850	0	0	3,850	215	(39.0)	4,026	17	4,042	992.4	6.3	2.6	3.5	2.4	15.4	87.9	5,153	(470.2)	202	4,884	(215)	0	4,670
Water (gpm)	3,702	0	0	3,702	215	(15.9)	3,900	17	3,917	992.0	6.3	2.6	3.5	2.4	15.4	87.6	5,027	(344.6)	202	4,884	(215)	0	4,669
Solids (gpm) (Note 2)	148.4	0.0	0.0	148.4	0.0	(23.2)	125.3	0.0	125.3	0.4	0.00046	0.00019	0.00025	0.00018	0.00112	0.3	126.0	(125.6)	0.0	0.3	0.0	0.00	0.3
Solids (lbs/min) (Note 2)	3,394.2	0.0	0.0	3,394.2	0.0	(529.5)	2,864.7	0.0	2,864.7	9.6	0.0106	0.0043	0.0058	0.0041	0.0257	1.5	2,875.9	(2,868.0)	0.0	7.8	0.0	0.0	7.8
Concentration (mg/L)	105,641.5	NA	NA	105,641.5	0.0	1,626,112.8	85,270.3	0.0	84,916.0	1,163.3	200.0	200.0	200.0	200.0	200.0	1,994.3	66,874.9	730,865.5	0.0	192.4	0.0	NA	201.3

**RA-D Average Flow Scenario** **3,850 GPM**  
**Average Precipitation Solids Content by Weight** **11.2%**

Stream Number	1	1A	2	3	4	5	6	7	8	9	10	10a	10b	10c	10d	11	12	13	14	15	16	17	18
Description	Dredge Slurry	Supplemental Lake Water Intake	Booster Pumps Seal Water	Subtotal	Primary Screen Wash Water	Gravel-Sized Removed from Primary Screen	Subtotal	Geotextile Tube Feed Pumps Seal Water from WTP	Subtotal	Clarifier Underflow and Filter Backwash from WTP	Filtrate from Screened Material Stockpile	Runoff to Stockpile Sump (Sump#1)	Runoff to Screen Area Sump (Sump#2)	Runoff to Polymer/Dec on Area Sump (Sump#3)	Runoff to WTP Area Sump (Sump#4)	Polymer and Makeup Water from WTP	Subtotal	Geotextile Tube Retention	Precipitation in SCA and Basins	Subtotal	Primary Screen Wash Water	Net Flow to SCA Basins	Dewatering Effluent to SCA WTP Influent
Total (gpm)	3,850	0	0	3,850	215	(1.5)	4,063	17	4,080	992.4	0.2	2.6	3.5	2.4	15.4	165.9	5,262	(644.8)	202	4,819	(215)	0	4,605
Water (gpm)	3,666	0	0	3,666	215	(0.6)	3,881	17	3,897	991.9	0.2	2.6	3.5	2.4	15.4	165.4	5,079	(461.6)	202	4,819	(215)	0	4,604
Solids (gpm) (Note 2)	183.5	0.0	0.0	183.5	0.0	(0.9)	182.6	0.0	182.6	0.5	0.00002	0.00021	0.00028	0.00019	0.00122	0.5	183.5	(183.2)	0.0	0.4	0.0	0.00	0.4
Solids (lbs/min) (Note 2)	3,859.3	0.0	0.0	3,859.3	0.0	(19.3)	3,840.0	0.0	3,840.0	9.6	0.0004	0.0043	0.0058	0.0041	0.0257	2.8	3,852.4	(3,844.7)	0.0	7.7	0.0	0.0	7.7
Concentration (mg/L)	120,114.4	NA	NA	120,114.4	0.0	1,546,012.3	113,242.6	0.0	112,776.3	1,163.3	200.0	200.0	200.0	200.0	200.0	1,994.3	87,719.2	714,500.9	0.0	192.3	0.0	NA	201.3

**RA-E Average Flow Scenario** **3,850 GPM**  
**Average Precipitation Solids Content by Weight** **14.9%**

Stream Number	1	1A	2	3	4	5	6	7	8	9	10	10a	10b	10c	10d	11	12	13	14	15	16	17	18
Description	Dredge Slurry	Supplemental Lake Water Intake	Booster Pumps Seal Water	Subtotal	Primary Screen Wash Water	Gravel-Sized Removed from Primary Screen	Subtotal	Geotextile Tube Feed Pumps Seal Water from WTP	Subtotal	Clarifier Underflow and Filter Backwash from WTP	Filtrate from Screened Material Stockpile	Runoff to Stockpile Sump (Sump#1)	Runoff to Screen Area Sump (Sump#2)	Runoff to Polymer/Dec on Area Sump (Sump#3)	Runoff to WTP Area Sump (Sump#4)	Coagulant, Polymer, and Makeup Water from WTP	Subtotal	Geotextile Tube Retention	Precipitation in SCA and Basins	Subtotal	Primary Screen Wash Water	Net Flow to SCA Basins	Dewatering Effluent to SCA WTP Influent
Total (gpm)	3,850	0	0	3,850	215	(1.6)	4,063	17	4,080	992	0.3	2.6	3.5	2.4	15.4	188	5,284	(875.7)	202	4,610	(215)	0.0	4,395
Water (gpm)	3,605	0	0	3,605	215	(0.6)	3,819	17	3,836	992	0.3	2.6	3.5	2.4	15.4	187	5,039	(630.9)	202	4,610	(215)	0.0	4,395
Solids (gpm) (Note 2)	245	0.0	0	245	0	(1.0)	244	0	244	0.4	0.00002	0.00020	0.00027	0.00019	0.00119	1.1	245	(244.9)	0	0.3	0	0.00	0.3
Solids (lbs/min) (Note 2)	5,268.0	0.0	0.0	5,268.0	0.0	(21.1)	5,247.0	0.0	5,247.0	9.6	0.0	0.0	0.0	0.0	0.0	8.3	5,265.0	(5,257.6)	0.0	7.4	0.0	0.0	7.4
Concentration (mg/L)	163,961.1	NA	NA	163,961.1	0.0	1,568,389.1	154,740.5	0.0	154,103.4	1,163.3	200.0	200.0	200.0	200.0	200.0	5,313.7	119,390.2	719,381.4	0.0	192.0	0.0	NA	201.4

**Notes:**  
(1). Numbers within parenthesis represent diverted flows.  
(2). Theoretical dry weight basis.  
(3). NA indicates not applicable.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	<b>PARSONS</b>	Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date:1/11/2011	Rev:0	Preparer:	Date:						
2		Project Name: Sediment Management Design	Calculation Title: Mass Balance	Reviewer: MTO	Date: 1/14/2011	Reviewer:	Date:							
3														
4														
5														
6	<b>Incoming Slurry</b>													
7	Slurry Flow Rate, $q$	5,500	gpm											
8	Working Hours, $t$	24	hr/day											
9	Daily Slurry Volume, $q_T$	7,920,000	gallons/day	1,058,750	ft <sup>3</sup> /day									
10	Solids Content by Weight of Incoming Slurry, $P_s$	10.3%												
11	Specific Gravity of Solids, $G_s$	2.74												
12	Unit Weight of Water, $\gamma_w$	62.4279606	pcf											
13	Slurry Water Content, $WC$	871%												
14	Water Flow Rate, $q_w$	5279	gpm											
15	Dry Solids Flow Rate, $q_s$	221	gpm											
16	Daily Water Volume, $q_w$	7,601,441	gallons/day	1,016,165	ft <sup>3</sup> /day									
17	Daily Water Weight, $W_w$	63,437,101	lbs/day											
18	Daily Dry Solids Volume, $q_s$	318,559	gallons/day	42,585	ft <sup>3</sup> /day									
19	Daily Dry Solids Weight, $W_s$	7,284,305	lbs/day											
20	Slurry Concentration, $C_{s1}$	0.92	lbs/gallon	6.9	lb/ft <sup>3</sup>									
21	% Water in Slurry (by Volume)	96%												
22														
23														
24	<b>Booster Pump Seal Water</b>													
25	Booster Pump Seal Water (each), $q_{booster}$	0	gpm											
26	Number of Booster Pumps, $N_{booster}$	4												
27	Daily Volume of Booster Pump Seal Water	0	gallons/day	0	ft <sup>3</sup> /day									
28	Daily Weight of Booster Seal Water	0	lbs/day											
29														
30	<b>Primary Screen Wash Water</b>													
31	Primary Screen Wash Water (each), $q_{screen-wash}$	51.1	gpm											
32	Number of Screens, $N_{screen}$	6												
33	Daily Volume of Screen Wash Water	441,677	gallons/day	59,044	ft <sup>3</sup> /day									
34	Daily Weight of Screen Wash Water	3,685,972	lbs/day											
35														
36	<b>Geotextile Tube Feed Pump Seal Water</b>													
37	Geotextile Tube Feed Pump Seal Water (each), $q_{tube-pump}$	12	gpm											
38	Number of Geotextile Tube Feed Pumps, $N_{tube-pump}$	2												
39	Daily Volume of Tube Feed Pump Seal Water	34,560	gallons/day	4,620	ft <sup>3</sup> /day									
40	Daily Weight of Tube Feed Pump Seal Water	288,417	lbs/day											
41														
42	<b>Primary Screens (Gravel-Sized Particle Removal, &gt;1/4-inch)</b>													
43	Average Percentage of Gravel-Sized Particles, $P_{gravel-sized}$	15.60%												
44	Daily Dry Weight of Removed Gravel-Sized Particle, $W_{gravel-sized}$	1,136,352	lbs/day											
45	Daily Volume of Removed Gravel-Sized Particle, $q_{gravel-sized}$	49,695	gallons/day	6,643	ft <sup>3</sup> /day									
46	Initial Water Content of Removed Gravel-Sized Particles in Stockpile, $WC_{istock}$	25%												
47	Daily Weight of Water Removed with Gravel-Sized Particles, $W_{w-gravel-sized}$	284,088	lbs/day											
48	Daily Volume of Water Removed with Gravel-Sized Particles, $q_{w-gravel-sized}$	34,041	gallons/day	4,551	ft <sup>3</sup> /day									
49	Remaining Daily Dry Solids Weight in Slurry, $W_{sr1}$	6,147,953	lbs/day											
50	Remaining Daily Water Weight Slurry, $W_{wr1}$	67,127,402	lbs/day											
51	Remaining Daily Solids Volume Slurry, $q_{sr1}$	268,864	gallons/day	35,942	ft <sup>3</sup> /day									
52	Remaining Daily Water Volume Slurry, $q_{wr1}$	8,043,636	gallons/day	1,075,278	ft <sup>3</sup> /day									

**Notes**  
 Maximum flow  
 Tab "Properties", based on weighted average production rate.  
 Tab "Properties", volume and dry density-weighted average value.

Booster pumps use slurry as seal water

Vendor's data

Tab "Properties"

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
53														
54	<b>SCA WTP</b>													
55	I.P Clarifier Sludge (OBG line number 18)													
56	Total Suspended Solids, TSS <sub>clarifier</sub>	1571 mg/L		5946.9 mg/gallon		0.001 gallon/gallon								
57	Clarifier Sludge Flow Rate, q <sub>clarifier</sub>	708.4 gpm												
58	Flow Rate of Solids in Clarifier Sludge, q <sub>TSS-clarifier</sub>	0.41 gpm												
59	Flow Rate of Water in Clarifier Sludge, q <sub>w-clarifier</sub>	708.0 gpm												
60	Weight of Dry Solids in Clarifier Sludge, W <sub>TSS-clarifier</sub>	4.21 kg/min		557.3 lbs/hr		13,374 lbs/day								
61	Spent MMF Backwash (OBG line number 24)													
62	Total Suspended Solids, TSS <sub>MMF</sub>	159.2 mg/L		602.6 mg/gallon		0.0001 gallon/gallon								
63	MMF Backwash Flow Rate, q <sub>MMF</sub>	166.3 gpm												
64	Flow Rate of Solids in MMF Backwash, q <sub>TSS-MMF</sub>	0.01 gpm												
65	Flow Rate of Water in MMF Backwash, q <sub>w-MMF</sub>	166.3 gpm												
66	Weight of Dry Solids in MMF Backwash, W <sub>TSS-MMF</sub>	0.10 kg/min		13.3 lbs/hr		318 lbs/day								
67	Spent GAC Backwash (OBG line number 25)													
68	Total Suspended Solids, TSS <sub>GAC</sub>	128.4 mg/L		486.0 mg/gallon		0.00005 gallon/gallon								
69	GAC Backwash Flow Rate, q <sub>GAC</sub>	117.7 gpm												
70	Flow Rate of Solids in GAC Backwash, q <sub>TSS-GAC</sub>	0.006 gpm												
71	Flow Rate of Water in GAC Backwash, q <sub>w-GAC</sub>	117.7 gpm												
72	Weight of Dry Solids in GAC Backwash, W <sub>TSS-GAC</sub>	0.06 kg/min		7.6 lbs/hr		182 lbs/day								
73	<b>SCA WTP Total</b>													
74	Total Flow Rate, q <sub>WTP</sub>	992.4 gpm		1,429,056 gallons/day		191,037 ft <sup>3</sup> /day								
75	Solid Flow Rate, q <sub>WTP-TSS</sub>	0.4 gpm		607 gallons/day		81 ft <sup>3</sup> /day								
76	Water Flow Rate, q <sub>w-WTP</sub>	992.0 gpm		1,428,449 gallons/day		190,956 ft <sup>3</sup> /day								
77	Water Weight, W <sub>w-WTP</sub>	11,920,987 lbs/day												
78	Solids Weight, W <sub>WTP-TSS</sub>	13,874 lbs/day												
79														
80	<b>Water from Screened Material Stockpile (&gt;1/4 in)</b>													
81	Typical Solids Content of Sand from Hydrocyclone Shaker (TotalClean) (75-85%)	80%					DeITank TCW-3000							
82	Sand Water Content	25%												
83	Assumed Initial Water Content of Screened Material Stockpile, WC <sub>istock</sub>	25%												
84	Assumed Final Water Content of Screened Material Stockpile, WC <sub>fstock</sub>	15%												
85														
86	Weight of Water Removed from Stockpile (Water Content from 25% to 15%), W <sub>w-stock</sub>	113,635 lbs/day												
87	Volume of Water Removed from Stockpile (Water Content from 25% to 15%), q <sub>w-stock</sub>	13,616 gallons/day		1,820 ft <sup>3</sup> /day										
88	Weight of Water Remained in Stockpile, W <sub>wr-stock</sub>	170,453 lbs/day												
89	Volume of Water Remained in Stockpile, q <sub>wr-stock</sub>	20,425 gallons/day		2,730 ft <sup>3</sup> /day										
90														
91	<b>Total Suspended Solids in Stockpile Filtrate</b>													
92	Total Suspended Solids, TSS <sub>stock-filtrate</sub>	200 mg/L		757.1 mg/gallon		0.0001 gallon/gallon								
93	Total Stockpile Filtrate Flow Rate, q <sub>stock-filtrate</sub>	9.5 gpm		13617 gallons/day										
94	Flow Rate of Solids in Stockpile Filtrate, q <sub>s-stock-filtrate</sub>	0.000690262 gpm		0.99 gallons/day		0 ft <sup>3</sup> /day								
95	Flow Rate of Water in Stockpile Filtrate, q <sub>w-stock-filtrate</sub>	9.46 gpm		13616.49 gallons/day										
96	Weight of Dry Solids in Stockpile Filtrate, W <sub>TSS-stock-filtrate</sub>	0.007159 kg/min		22.73 lbs/day										
97	Weight of Water in Stockpile Filtrate, W <sub>w-stock-filtrate</sub>	113,635 lbs/day												
98														

**Notes**  
WTP DP#3. Under normal operation condition, WTP sludge and backwash water will be sent to a dedicated geotextile tube directly, without polymer addition.

Under normal operation condition, stockpile filtrate and runoff collected by the area sumps (Sump#1 through 4) will be sent to a dedicated geotextile tube directly, without polymer addition.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
99	<b>Runoff from Stockpile Area (Sump#1)</b>													
100	<b>Stockpile Area</b>	40,000	ft <sup>2</sup>											
101	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
102	<b>Runoff Flowrate, q<sub>S1</sub></b>	2.60	gpm	3740.3	gallons/day									
103	Total Suspended Solids, TSS <sub>S1</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
104	Total Sump#1 Flow Rate, q <sub>S1</sub>	2.60	gpm	3741	gallons/day									
105	Flow Rate of Solids in Sump#1 Flow, q <sub>s-S1</sub>	0.000190	gpm	0.273	gallons/day	0	ft <sup>3</sup> /day							
106	Flow Rate of Water in Sump#1 Flow, q <sub>w-S1</sub>	2.60	gpm	3740.26	gallons/day									
107	Weight of Dry Solids in Sump#1 Flow, W <sub>TSS-S1</sub>	0.001967	kg/min	6.24	lbs/day									
108	Weight of Water in Sump#1 Flow, W <sub>w-S1</sub>	31,214	lbs/day											
109														
110	<b>Runoff from Screen Area (Sump#2)</b>													
111	<b>Screen Area</b>	53,483	ft <sup>2</sup>											
112	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
113	<b>Runoff Flowrate, q<sub>S2</sub></b>	3.47	gpm	5001.0	gallons/day									
114	Total Suspended Solids, TSS <sub>S2</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
115	Total Sump#2 Flow Rate, q <sub>S2</sub>	3.47	gpm	5001	gallons/day									
116	Flow Rate of Solids in Sump#2 Flow, q <sub>s-S2</sub>	0.000254	gpm	0.37	gallons/day	0	ft <sup>3</sup> /day							
117	Flow Rate of Water in Sump#2 Flow, q <sub>w-S2</sub>	3.47	gpm	5001.01	gallons/day									
118	Weight of Dry Solids in Sump#2 Flow, W <sub>TSS-S2</sub>	0.002629	kg/min	8.35	lbs/day									
119	Weight of Water in Sump#2 Flow, W <sub>w-S2</sub>	41,735	lbs/day											
120														
121	<b>Runoff from Polymer and Decon Area (Sump#3)</b>													
122	<b>Polymer and Decon Area</b>	37,711	ft <sup>2</sup>											
123	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
124	<b>Runoff Flowrate, q<sub>S3</sub></b>	2.45	gpm	3526.2	gallons/day									
125	Total Suspended Solids, TSS <sub>S3</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
126	Total Sump#3 Flow Rate, q <sub>S3</sub>	2.45	gpm	3526	gallons/day									
127	Flow Rate of Solids in Sump#3 Flow, q <sub>s-S3</sub>	0.000179	gpm	0.26	gallons/day	0	ft <sup>3</sup> /day							
128	Flow Rate of Water in Sump#3 Flow, q <sub>w-S3</sub>	2.45	gpm	3526.22	gallons/day									
129	Weight of Dry Solids in Sump#3 Flow, W <sub>TSS-S3</sub>	0.001854	kg/min	5.89	lbs/day									
130	Weight of Water in Sump#3 Flow, W <sub>w-S3</sub>	29,428	lbs/day											
131														
132	<b>Runoff from WTP Area (Sump#4)</b>													
133	<b>WTP Area</b>	236,949	ft <sup>2</sup>											
134	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
135	<b>Runoff Flowrate, q<sub>S4</sub></b>	15.39	gpm	22156.3	gallons/day									
136	Total Suspended Solids, TSS <sub>S4</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
137	Total Sump#4 Flow Rate, q <sub>S4</sub>	15.39	gpm	22158	gallons/day									
138	Flow Rate of Solids in Sump#4 Flow, q <sub>s-S4</sub>	0.001123	gpm	1.62	gallons/day	0	ft <sup>3</sup> /day							
139	Flow Rate of Water in Sump#4 Flow, q <sub>w-S4</sub>	15.39	gpm	22156.27	gallons/day									
140	Weight of Dry Solids in Sump#4 Flow, W <sub>TSS-S4</sub>	0.011649	kg/min	36.98	lbs/day									
141	Weight of Water in Sump#4 Flow, W <sub>w-S4</sub>	184,903	lbs/day											
142														
143	<b>Polymer and Makeup Water</b>													
144	Percent Fines in Slurry Solids, P <sub>fine</sub>	54.2%												
145	Fine Solids Weight	3948093.21	lbs/day											
146	Polymer Dosage Rate (lbs of dry polymer per dry ton of solids), DOS <sub>polymer</sub>	1.59	lbs/ton											
147	Dry Polymer Density, DEN <sub>polymer</sub>	0.70	g/cm <sup>3</sup>											
148	Daily Dry Polymer Needed, W <sub>drypolymer</sub>	3138.73	lbs/day	2.180	lbs/min									
149	Dry Polymer Volume, q <sub>drypolymer</sub>	0.3731	gpm	537	gallons/day	72	ft <sup>3</sup> /day							
150	Polymer Makeup Water Volume, q <sub>makeupwater</sub>	130.59	gpm	188,052	gallons/day	25,139	ft <sup>3</sup> /day							
151	Polymer Makeup water Weight, W <sub>makeupwater</sub>	1,569,367	lbs/day											

Based on P-GDT draft report.  
Ashland 2520 MSDS

Based on P-GDT draft report 0.2% dilution



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
152														
153	<b>Coagulant (Emulsion)</b>													
154	Coagulant Dosage Rate lbs of emulsion per dry ton of solids, $DOS_{coag}$	Not Applicable												
155	Coagulant Density, $DEN_{coag}$													
156	Coagulant Flow Rate, $q_{coag}$													
157	Coagulant Weight, $W_{coag}$													
158														
159	<b>RA-A Primary Screens and Polymer Injection</b>													
160	<b>Initial Dewatering in Geotextile Tubes (i.e., the first 24 hrs in the tubes)</b>													
161	Daily Weight of Water in Influent to Tubes	81,019,809 lbs/day												
162	Daily Volume of Water in Influent to Tubes	9,708,314 gallons/day	1297812.845 ft <sup>3</sup> /day											
163	Solids Content by Weight after Initial Dewatering in Tubes, $P_{s2}$	38%												
164	Daily Weight of Dry Solids Retained in Tubes, $W_{s-ret2}$	6,165,046 lbs/day												
165	Daily Volume of Solids Retained in Tubes, $q_{s-ret2}$	270,011 gallons/day	36.095 ft <sup>3</sup> /day											
166	Daily Weight of Water Retained in Tubes after Initial Dewatering, $W_{ret2}$	10,058,759 lbs/day												
167	Daily Volume of Water Retained in Tubes after Initial Dewatering, $q_{ret2}$	1,205,305 gallons/day	161125.8687 ft <sup>3</sup> /day											
168	Daily Weight of Water in Initial Filtrate Weight, $W_{if}$	71,248,330 lbs/day												
169	Daily Volume of Water in Initial Filtrate, $q_{if}$	8,537,432 gallons/day	1141288.764 ft <sup>3</sup> /day											
170	<b>Consolidation Dewatering in Geotextile Tubes</b>													
171	Solids Content by Weight after Consolidation Dewatering, $P_{s3}$	50%												
172	Peak Daily Weight of Retained Water in Tubes after Consolidation Dewatering, $W_{ret3}$	6,165,046 lbs/day												
173	Peak Daily Volume of Retained Water in Tubes after Consolidation Dewatering, $q_{ret3}$	738,735 gallons/day	98,755 ft <sup>3</sup> /day											
174	Peak Daily Weight of Water in Consolidation Dewatering Filtrate, $W_{cf}$	3,893,713 lbs/day												
175	Peak Daily Volume of Water in Consolidation Dewatering Filtrate, $q_{cf}$	466,570 gallons/day	62,371 ft <sup>3</sup> /day											
176	Consolidation Dewatering Duration, $t_c$	60 days												
177	Average Water Volume from Consolidation Dewatering of One Day Filling, $q_{dcf}$	7,776 gallons/day	1,040 ft <sup>3</sup> /day											
178														
179	Peak Volume of Water in Geotextile Tube Filtrate, $q_{tube-filtrate}$	9,004,002 gallons/day	1,203,660 ft <sup>3</sup> /day											
180	Daily Water Retained in Geotextile Tube, $q_{w-retained}$	738,735 gallons/day	98,755 ft <sup>3</sup> /day											
181														
182	<b>Total Suspended Solids in Geotextile Tube Filtrate</b>													
183	Total Suspended Solids, $TSS_{tube-filtrate}$	200 mg/L	757.1 mg/gallon	0.0001 gallon/gallon										
184	Total Geotextile Tube Filtrate Flow Rate, $q_{tube-filtrate}$	6253.2 gpm	9,004,659 gallons/day											
185	Flow Rate of Solids in Geotextile Tube Filtrate, $q_{s-tube-filtrate}$	0.46 gpm	657 gallons/day											
186	Flow Rate of Water in Geotextile Tube Filtrate, $q_{w-tube-filtrate}$	6252.8 gpm	9,004,002 gallons/day											
187	Weight of Dry Solids in Geotextile Tube Filtrate, $W_{TSS-tube-filtrate}$	4.73 kg/min	15,030 lbs/day											
188														
189	<b>Precipitation in SCA and SCA Basins</b>													
190	Daily Precipitation, $PRE_{daily}$ (inch)	Open Area, $A_{SCA}$ (acres)	Flow Rate, $q_{PRE}$ (gpd)	Flow Rate, $q_{PRE}$ (gpm)										
191	0.15	71.25	290,211	201.5										
192														
193	<b>pH Adjust Tank Influent (OBG line number 11)</b>													
194	Total Suspended Solids, $TSS_{influent}$	200.5 mg/L	758.98 mg/gallon	7.31752E-05 gallon/gallon										
195	Total Flow Rate, $MAX_{influent}$	5,663 gpm	8,154,720 gallons/day											
196	Flow Rate of Solids in Influent, $q_{TSS-influent}$	0.414 gpm	597 gallons/day											
197	Flow Rate of Water in Influent, $q_{w-influent}$	5662.59 gpm	8,154,123 gallons/day											
198	Weight of Dry Solids in Influent, $W_{TSS-influent}$	4.30 kg/min	568.5 lbs/hr	13644.9 lbs/day										
199														
200	<b>Effluent Tank Discharge (OBG line number 23)</b>													
201	Total Suspended Solids, $TSS_{discharge}$	4.5 mg/L	17.03 mg/gallon	1.64234E-06 gallon/gallon										
202	Total Flow Rate, $MAX_{discharge}$	4,514 gpm	6,500,000 gallons/day											
203	Flow Rate of Solids in Discharge, $q_{TSS-dis}$	0.007 gpm	11 gallons/day											
204	Flow Rate of Water in Discharge, $q_{w-dis}$	4513.88 gpm	6,499,989 gallons/day											
205	Weight of Dry Solids in Discharge, $W_{TSS-dis}$	0.08 kg/min	10.2 lbs/hr	244.1 lbs/day										

Notes

Based on P-GDT draft report.

Assumed value

Notes  
WTP BOD

On-site met data.

Maximum

WTP DP#3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
206	<b>Mass Balance Tables</b>													
207	<b>RA-C</b>													
208	<b>Incremental</b>													
209	<b>Accumulative</b>													
210		Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number	Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number	<b>Notes</b>		
211	Dredge Slurry	5500	5279	221	5058.5	1	5,500	5,279	221	5058.5				
212	Booster Pumps Seal Water	0	0	0	0.0	2	5,500	5,279	221	5058.5	3			
213	Primary Screen Wash Water	307	307	0	0.0	4	5,807	5,585	221	5058.5				
214	Gravel-Sized Removed from Primary Screen	(58.2)	(23.6)	(34.5)	(789.1)	5	5,749	5,562	187	4269.4	6			
215	Geotextile Tube Feed Pumps Seal Water from WTP	24	24	0	0.0	7	5,773	5,586	187	4269.4	8			
216	Secondary Screen and Hydrocyclone Screen Wash Water from WTP	0	0	0	0.0									
217	Gravel Removed from Secondary Screen	0.0	0.0	0.0	0.0		5,773	5,586	187	4269.4				
218	Sand Removed from Hydrocyclone	0.0	0.0	0.0	0.0		5,773	5,586	187	4269.4				
219	Clarifier Underflow and Filter Backwash from WTP	992	992	0.4	9.6	9	6,765	6,578	187	4279.0				
220	Filtrate from Screened Material Stockpile	9.5	9.5	0.00069	0.0	10								
221	Runoff to Stockpile Sump (Sump#1)	2.6	2.6	0.00019	0.0	10a								
222	Runoff to Screen Area Sump (Sump#2)	3.5	3.5	0.00025	0.0	10b								
223	Runoff to Polymer/Decon Area Sump (Sump#3)	2.4	2.4	0.00018	0.0	10c								
224	Runoff to WTP Area Sump (Sump#4)	15.4	15.4	0.00112	0.0	10d								
225	Coagulant Emulsion and Makeup Water from WTP	0	0	0.000	0.0									
226	Polymer and Makeup Water from WTP	131	131	0.4	2.2	11	6,929	6,742	188	4281.3	12			
227	Geotextile Tube Retention	(700.1)	(513.0)	(187.1)	(4270.8)	13	6229.2	6228.8	0.5	10.4				
228	Precipitation in SCA and Basins	202	202	0	0.0	14	6430.8	6430.3	0.5	10.4	15			
229	Primary Screen Wash Water	(307)	(307)	0	0.0	16	6124.1	6123.6	0.5	10.4	available			
230		(463.2)	(463.1)	(0.03)	(0.8)		5660.9	5660.5	0.4	9.7				
231	Net Flow to SCA Basins	(463.2)	(463.1)	(0.03)	(0.8)	17	5660.9	5660.5	0.4	9.7	18			
232	Clarifier Underflow and Filter Backwash	(992)	(992)	(0.4)	(9.6)		5,660.88	5,660.45	0.429		allowable			
233	Primary Screen Wash Water from WTP	0	0	0.0										
234	Geotextile Tube Feed Pumps Seal Water from WTP	(24)	(24)	0.0										
235	Polymer Makeup Water	(131)	(131)	0			4,668.48	4,668.47	0.007		Flow from WTP			
236	Net Flow to Holding Basin (Downstream Storage)	0	0	0										
237	Maximum Discharge to Metro						4,513.89	4,513.88	0.007		Maximum Discharge to Metro (6.5 MGD)			

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	<b>PARSONS</b>	Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date:1/11/2011	Rev:0	Preparer:	Date:						
2														
3		Project Name: Sediment Management Design	Calculation Title: Mass Balance	Reviewer: MTO	Date: 1/14/2011	Reviewer:	Date:							
4														
5														
6	<b>Incoming Slurry</b>													
7		Slurry Flow Rate, $q$	5,500	gpm										
8		Working Hours, $t$	24	hr/day										
9		Daily Slurry Volume, $q_T$	7,920,000	gallons/day	1,058,750	ft <sup>3</sup> /day								
10		Solids Content by Weight of Incoming Slurry, $P_s$	12.0%											
11		Specific Gravity of Solids, $G_s$	2.52											
12		Unit Weight of Water, $\gamma_w$	62.4279606	pcf										
13		Slurry Water Content, $WC$	733%											
14		Water Flow Rate, $q_w$	5218	gpm										
15		Dry Solids Flow Rate, $q_s$	282	gpm										
16		Daily Water Volume, $q_w$	7,513,429	gallons/day	1,004,399	ft <sup>3</sup> /day								
17		Daily Water Weight, $W_w$	62,702,608	lbs/day										
18		Daily Dry Solids Volume, $q_s$	406,571	gallons/day	54,351	ft <sup>3</sup> /day								
19		Daily Dry Solids Weight, $W_s$	8,550,356	lbs/day										
20		Slurry Concentration, $C_{s1}$	1.08	lbs/gallon	8.1	lb/ft <sup>3</sup>								
21		% Water in Slurry (by Volume)	95%											
22														
23														
24	<b>Booster Pump Seal Water</b>													
25		Booster Pump Seal Water (each), $q_{booster}$	0	gpm										
26		Number of Booster Pumps, $N_{booster}$	4											
27		Daily Volume of Booster Pump Seal Water	0	gallons/day	0	ft <sup>3</sup> /day								
28		Daily Weight of Booster Seal Water	0	lbs/day										
29														
30	<b>Primary Screen Wash Water</b>													
31		Primary Screen Wash Water (each), $q_{screen-wash}$	51.1	gpm										
32		Number of Screens, $N_{screen}$	6											
33		Daily Volume of Screen Wash Water	441,677	gallons/day	59,044	ft <sup>3</sup> /day								
34		Daily Weight of Screen Wash Water	3,685,972	lbs/day										
35														
36	<b>Geotextile Tube Feed Pump Seal Water</b>													
37		Geotextile Tube Feed Pump Seal Water (each), $q_{tube-pump}$	12	gpm										
38		Number of Geotextile Tube Feed Pumps, $N_{tube-pump}$	2											
39		Daily Volume of Tube Feed Pump Seal Water	34,560	gallons/day	4,620	ft <sup>3</sup> /day								
40		Daily Weight of Tube Feed Pump Seal Water	288,417	lbs/day										
41														
42	<b>Primary Screens (Gravel-Sized Particle Removal, &gt;1/4-inch)</b>													
43		Average Percentage of Gravel-Sized Particles, $P_{gravel-sized}$	0.50%											
44		Daily Dry Weight of Removed Gravel-Sized Particle, $W_{gravel-sized}$	42,752	lbs/day										
45		Daily Volume of Removed Gravel-Sized Particle, $q_{gravel-sized}$	2,033	gallons/day	272	ft <sup>3</sup> /day								
46		Initial Water Content of Removed Gravel-Sized Particles in Stockpile, $WC_{istock}$	25%											
47		Daily Weight of Water Removed with Gravel-Sized Particles, $W_{w-gravel-sized}$	10,688	lbs/day										
48		Daily Volume of Water Removed with Gravel-Sized Particles, $q_{w-gravel-sized}$	1,281	gallons/day	171	ft <sup>3</sup> /day								
49		Remaining Daily Dry Solids Weight in Slurry, $W_{sr1}$	8,507,604	lbs/day										
50		Remaining Daily Water Weight Slurry, $W_{wr1}$	66,666,309	lbs/day										
51		Remaining Daily Solids Volume Slurry, $q_{sr1}$	404,538	gallons/day	54,079	ft <sup>3</sup> /day								
52		Remaining Daily Water Volume Slurry, $q_{wr1}$	7,988,385	gallons/day	1,067,892	ft <sup>3</sup> /day								

**Notes**  
 Maximum flow  
  
 Tab "Properties", based on weighted average production rate.  
 Tab "Properties", volume and dry density-weighted average value.

Booster pumps use slurry as seal water

Vendor's data

Tab "Properties"

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
53														
54	<b>SCA WTP</b>													
55	I.P Clarifier Sludge (OBG line number 18)													
56	Total Suspended Solids, TSS <sub>clarifier</sub>	1571 mg/L		5946.9 mg/gallon		0.001 gallon/gallon								
57	Clarifier Sludge Flow Rate, q <sub>clarifier</sub>	708.4 gpm												
58	Flow Rate of Solids in Clarifier Sludge, q <sub>TSS-clarifier</sub>	0.44 gpm												
59	Flow Rate of Water in Clarifier Sludge, q <sub>w-clarifier</sub>	708.0 gpm												
60	Weight of Dry Solids in Clarifier Sludge, W <sub>TSS-clarifier</sub>	4.21 kg/min		557.3 lbs/hr		13,374 lbs/day								
61	Spent MMF Backwash (OBG line number 24)													
62	Total Suspended Solids, TSS <sub>MMF</sub>	159.2 mg/L		602.6 mg/gallon		0.0001 gallon/gallon								
63	MMF Backwash Flow Rate, q <sub>MMF</sub>	166.3 gpm												
64	Flow Rate of Solids in MMF Backwash, q <sub>TSS-MMF</sub>	0.01 gpm												
65	Flow Rate of Water in MMF Backwash, q <sub>w-MMF</sub>	166.3 gpm												
66	Weight of Dry Solids in MMF Backwash, W <sub>TSS-MMF</sub>	0.10 kg/min		13.3 lbs/hr		318 lbs/day								
67	Spent GAC Backwash (OBG line number 25)													
68	Total Suspended Solids, TSS <sub>GAC</sub>	128.4 mg/L		486.0 mg/gallon		0.00005 gallon/gallon								
69	GAC Backwash Flow Rate, q <sub>GAC</sub>	117.7 gpm												
70	Flow Rate of Solids in GAC Backwash, q <sub>TSS-GAC</sub>	0.006 gpm												
71	Flow Rate of Water in GAC Backwash, q <sub>w-GAC</sub>	117.7 gpm												
72	Weight of Dry Solids in GAC Backwash, W <sub>TSS-GAC</sub>	0.06 kg/min		7.6 lbs/hr		182 lbs/day								
73	<b>SCA WTP Total</b>													
74	Total Flow Rate, q <sub>WTP</sub>	992.4 gpm		1,429,056 gallons/day		191,037 ft <sup>3</sup> /day								
75	Solid Flow Rate, q <sub>WTP-TSS</sub>	0.5 gpm		660 gallons/day		88 ft <sup>3</sup> /day								
76	Water Flow Rate, q <sub>w-WTP</sub>	991.9 gpm		1,428,396 gallons/day		190,949 ft <sup>3</sup> /day								
77	Water Weight, W <sub>w-WTP</sub>	11,920,545 lbs/day												
78	Solids Weight, W <sub>WTP-TSS</sub>	13,874 lbs/day												
79														
80	<b>Water from Screened Material Stockpile (&gt;1/4 in)</b>													
81	Typical Solids Content of Sand from Hydrocyclone Shaker (TotalClean) (75-85%)	80%												
82	Sand Water Content	25%												
83	Assumed Initial Water Content of Screened Material Stockpile, WC <sub>istock</sub>	25%												
84	Assumed Final Water Content of Screened Material Stockpile, WC <sub>fstock</sub>	15%												
85														
86	Weight of Water Removed from Stockpile (Water Content from 25% to 15%), W <sub>w-stock</sub>	4,275 lbs/day												
87	Volume of Water Removed from Stockpile (Water Content from 25% to 15%), q <sub>w-stock</sub>	512 gallons/day		68 ft <sup>3</sup> /day										
88	Weight of Water Remained in Stockpile, W <sub>wr-stock</sub>	6,413 lbs/day												
89	Volume of Water Remained in Stockpile, q <sub>wr-stock</sub>	768 gallons/day		103 ft <sup>3</sup> /day										
90														
91	<b>Total Suspended Solids in Stockpile Filtrate</b>													
92	Total Suspended Solids, TSS <sub>stock-filtrate</sub>	200 mg/L		757.1 mg/gallon		0.0001 gallon/gallon								
93	Total Stockpile Filtrate Flow Rate, q <sub>stock-filtrate</sub>	0.4 gpm		512 gallons/day										
94	Flow Rate of Solids in Stockpile Filtrate, q <sub>s-stock-filtrate</sub>	2.82363E-05 gpm		0.04 gallons/day		0 ft <sup>3</sup> /day								
95	Flow Rate of Water in Stockpile Filtrate, q <sub>w-stock-filtrate</sub>	0.36 gpm		512.28 gallons/day										
96	Weight of Dry Solids in Stockpile Filtrate, W <sub>TSS-stock-filtrate</sub>	0.000269 kg/min		0.86 lbs/day										
97	Weight of Water in Stockpile Filtrate, W <sub>w-stock-filtrate</sub>	4,275 lbs/day												
98														

**Notes**  
WTP DP#3. Under normal operation condition, WTP sludge and backwash water will be sent to a dedicated geotextile tube directly, without polymer addition.

DeTank TCW-3000

Under normal operation condition, stockpile filtrate and runoff collected by the area sumps (Sump#1 through 4) will be sent to a dedicated geotextile tube directly, without polymer addition.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
99	<b>Runoff from Stockpile Area (Sump#1)</b>													
100	<b>Stockpile Area</b>	40,000	ft <sup>2</sup>											
101	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
102	<b>Runoff Flowrate, q<sub>S1</sub></b>	2.60	gpm	3740.3	gallons/day									
103	Total Suspended Solids, TSS <sub>S1</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
104	Total Sump#1 Flow Rate, q <sub>S1</sub>	2.60	gpm	3741	gallons/day									
105	Flow Rate of Solids in Sump#1 Flow, q <sub>s-S1</sub>	0.000206	gpm	0.297	gallons/day	0	ft <sup>3</sup> /day							
106	Flow Rate of Water in Sump#1 Flow, q <sub>w-S1</sub>	2.60	gpm	3740.26	gallons/day									
107	Weight of Dry Solids in Sump#1 Flow, W <sub>TSS-S1</sub>	0.001967	kg/min	6.24	lbs/day									
108	Weight of Water in Sump#1 Flow, W <sub>w-S1</sub>	31,214	lbs/day											
109														
110	<b>Runoff from Screen Area (Sump#2)</b>													
111	<b>Screen Area</b>	53,483	ft <sup>2</sup>											
112	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
113	<b>Runoff Flowrate, q<sub>S2</sub></b>	3.47	gpm	5001.0	gallons/day									
114	Total Suspended Solids, TSS <sub>S2</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
115	Total Sump#2 Flow Rate, q <sub>S2</sub>	3.47	gpm	5001	gallons/day									
116	Flow Rate of Solids in Sump#2 Flow, q <sub>s-S2</sub>	0.000276	gpm	0.40	gallons/day	0	ft <sup>3</sup> /day							
117	Flow Rate of Water in Sump#2 Flow, q <sub>w-S2</sub>	3.47	gpm	5001.01	gallons/day									
118	Weight of Dry Solids in Sump#2 Flow, W <sub>TSS-S2</sub>	0.002629	kg/min	8.35	lbs/day									
119	Weight of Water in Sump#2 Flow, W <sub>w-S2</sub>	41,735	lbs/day											
120														
121	<b>Runoff from Polymer and Decon Area (Sump#3)</b>													
122	<b>Polymer and Decon Area</b>	37,711	ft <sup>2</sup>											
123	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
124	<b>Runoff Flowrate, q<sub>S3</sub></b>	2.45	gpm	3526.2	gallons/day									
125	Total Suspended Solids, TSS <sub>S3</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
126	Total Sump#3 Flow Rate, q <sub>S3</sub>	2.45	gpm	3527	gallons/day									
127	Flow Rate of Solids in Sump#3 Flow, q <sub>s-S3</sub>	0.000194	gpm	0.28	gallons/day	0	ft <sup>3</sup> /day							
128	Flow Rate of Water in Sump#3 Flow, q <sub>w-S3</sub>	2.45	gpm	3526.22	gallons/day									
129	Weight of Dry Solids in Sump#3 Flow, W <sub>TSS-S3</sub>	0.001854	kg/min	5.89	lbs/day									
130	Weight of Water in Sump#3 Flow, W <sub>w-S3</sub>	29,428	lbs/day											
131														
132	<b>Runoff from WTP Area (Sump#4)</b>													
133	<b>WTP Area</b>	236,949	ft <sup>2</sup>											
134	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
135	<b>Runoff Flowrate, q<sub>S4</sub></b>	15.39	gpm	22156.3	gallons/day									
136	Total Suspended Solids, TSS <sub>S4</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
137	Total Sump#4 Flow Rate, q <sub>S4</sub>	15.39	gpm	22158	gallons/day									
138	Flow Rate of Solids in Sump#4 Flow, q <sub>s-S4</sub>	0.001221	gpm	1.76	gallons/day	0	ft <sup>3</sup> /day							
139	Flow Rate of Water in Sump#4 Flow, q <sub>w-S4</sub>	15.39	gpm	22156.27	gallons/day									
140	Weight of Dry Solids in Sump#4 Flow, W <sub>TSS-S4</sub>	0.011649	kg/min	36.98	lbs/day									
141	Weight of Water in Sump#4 Flow, W <sub>w-S4</sub>	184,903	lbs/day											
142														
143	<b>Polymer and Makeup Water</b>													
144	Percent Fines in Slurry Solids, P <sub>fine</sub>	90.0%												
145	Fine Solids Weight	7695320.12	lbs/day											
146	Polymer Dosage Rate (lbs of dry polymer per dry ton of solids), DOS <sub>polymer</sub>	1.59	lbs/ton											
147	Dry Polymer Density, DEN <sub>polymer</sub>	0.70	g/cm <sup>3</sup>											
148	Daily Dry Polymer Needed, W <sub>drypolymer</sub>	6117.78	lbs/day	4.248	lbs/min									
149	Dry Polymer Volume, q <sub>drypolymer</sub>	0.7273	gpm	1047	gallons/day	140	ft <sup>3</sup> /day							
150	Polymer Makeup Water Volume, q <sub>makeupwater</sub>	254.54	gpm	366,536	gallons/day	48,999	ft <sup>3</sup> /day							
151	Polymer Makeup water Weight, W <sub>makeupwater</sub>	3,058,890	lbs/day											

Based on P-GDT draft report.  
Ashland 2520 MSDS

Based on P-GDT draft report 0.2% dilution

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
152														
153	<b>Coagulant (Emulsion)</b>													
154	Coagulant Dosage Rate lbs of emulsion per dry ton of solids, $DOS_{coag}$	Not Applicable												
155	Coagulant Density, $DEN_{coag}$													
156	Coagulant Flow Rate, $q_{coag}$													
157	Coagulant Weight, $W_{coag}$													
158														
159	<b>RA-A Primary Screens and Polymer Injection</b>													
160	<b>Initial Dewatering in Geotextile Tubes (i.e., the first 24 hrs in the tubes)</b>													
161	Daily Weight of Water in Influent to Tubes	81,938,437 lbs/day												
162	Daily Volume of Water in Influent to Tubes	9,818,390 gallons/day	1312527.85 ft <sup>3</sup> /day											
163	Solids Content by Weight after Initial Dewatering in Tubes, $P_{s2}$	38%												
164	Daily Weight of Dry Solids Retained in Tubes, $W_{s-ret2}$	8,527,654 lbs/day												
165	Daily Volume of Solids Retained in Tubes, $q_{s-ret2}$	406,248 gallons/day	54,307 ft <sup>3</sup> /day											
166	Daily Weight of Water Retained in Tubes after Initial Dewatering, $W_{ret2}$	13,913,541 lbs/day												
167	Daily Volume of Water Retained in Tubes after Initial Dewatering, $q_{ret2}$	1,667,210 gallons/day	222873.5394 ft <sup>3</sup> /day											
168	Daily Weight of Water in Initial Filtrate Weight, $W_{if}$	68,312,177 lbs/day												
169	Daily Volume of Water in Initial Filtrate, $q_{if}$	8,185,604 gallons/day	1094256.098 ft <sup>3</sup> /day											
170	<b>Consolidation Dewatering in Geotextile Tubes</b>													
171	Solids Content by Weight after Consolidation Dewatering, $P_{s3}$	50%												
172	Peak Daily Weight of Retained Water in Tubes after Consolidation Dewatering, $W_{ret3}$	8,527,654 lbs/day												
173	Peak Daily Volume of Retained Water in Tubes after Consolidation Dewatering, $q_{ret3}$	1,021,838 gallons/day	136,600 ft <sup>3</sup> /day											
174	Peak Daily Weight of Water in Consolidation Dewatering Filtrate, $W_{cf}$	5,385,887 lbs/day												
175	Peak Daily Volume of Water in Consolidation Dewatering Filtrate, $q_{cf}$	645,372 gallons/day	86,274 ft <sup>3</sup> /day											
176	Consolidation Dewatering Duration, $t_c$	60 days												
177	Average Water Volume from Consolidation Dewatering of One Day Filling, $q_{dcf}$	10,756 gallons/day	1,438 ft <sup>3</sup> /day											
178														
179	Peak Volume of Water in Geotextile Tube Filtrate, $q_{tube-filtrate}$	8,830,975 gallons/day	1,180,530 ft <sup>3</sup> /day											
180	Daily Water Retained in Geotextile Tube, $q_{w-retained}$	1,021,838 gallons/day	136,600 ft <sup>3</sup> /day											
181														
182	<b>Total Suspended Solids in Geotextile Tube Filtrate</b>													
183	Total Suspended Solids, $TSS_{tube-filtrate}$	200 mg/L	757.1 mg/gallon	0.0001 gallon/gallon										
184	Total Geotextile Tube Filtrate Flow Rate, $q_{tube-filtrate}$	6133.1 gpm	8,831,676 gallons/day											
185	Flow Rate of Solids in Geotextile Tube Filtrate, $q_{s-tube-filtrate}$	0.49 gpm	701 gallons/day											
186	Flow Rate of Water in Geotextile Tube Filtrate, $q_{w-tube-filtrate}$	6132.6 gpm	8,830,975 gallons/day											
187	Weight of Dry Solids in Geotextile Tube Filtrate, $W_{TSS-tube-filtrate}$	4.64 kg/min	14,741 lbs/day											
188														
189	<b>Precipitation in SCA and SCA Basins</b>													
190	Daily Precipitation, $PRE_{daily}$ (inch)	Open Area, $A_{SCA}$ (acres)	Flow Rate, $q_{PRE}$ (gpd)	Flow Rate, $q_{PRE}$ (gpm)										
191	0.15	71.25	290,211	201.5										
192														
193	<b>pH Adjust Tank Influent (OBG line number 11)</b>													
194	Total Suspended Solids, $TSS_{influent}$	200.5 mg/L	758.98 mg/gallon	7.95635E-05 gallon/gallon										
195	Total Flow Rate, $MAX_{influent}$	5,663 gpm	8,154,720 gallons/day											
196	Flow Rate of Solids in Influent, $q_{TSS-influent}$	0.451 gpm	649 gallons/day											
197	Flow Rate of Water in Influent, $q_{w-influent}$	5662.55 gpm	8,154,071 gallons/day											
198	Weight of Dry Solids in Influent, $W_{TSS-influent}$	4.30 kg/min	568.5 lbs/hr	13644.9 lbs/day										
199														
200	<b>Effluent Tank Discharge (OBG line number 23)</b>													
201	Total Suspended Solids, $TSS_{discharge}$	4.5 mg/L	17.03 mg/gallon	1.78571E-06 gallon/gallon										
202	Total Flow Rate, $MAX_{discharge}$	4,514 gpm	6,500,000 gallons/day											
203	Flow Rate of Solids in Discharge, $q_{TSS-dis}$	0.008 gpm	12 gallons/day											
204	Flow Rate of Water in Discharge, $q_{w-dis}$	4513.88 gpm	6,499,988 gallons/day											
205	Weight of Dry Solids in Discharge, $W_{TSS-dis}$	0.08 kg/min	10.2 lbs/hr	244.1 lbs/day										

Notes

Based on P-GDT draft report.

Assumed value

Notes  
WTP BOD

On-site met data.

Maximum

WTP DP#3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
206	<b>Mass Balance Tables</b>													
207	<b>RA-D</b>													
208	<b>Incremental</b>													
209	<b>Accumulative</b>													
210		Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number	Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number	<b>Notes</b>		
211	Dredge Slurry	5500	5218	282	5937.7	1	5,500	5,218	282	5937.7				
212	Booster Pumps Seal Water	0	0	0	0.0	2	5,500	5,218	282	5937.7	3			
213	Primary Screen Wash Water	307	307	0	0.0	4	5,807	5,524	282	5937.7				
214	Gravel-Sized Removed from Primary Screen	(2.3)	(0.9)	(1.4)	(29.7)	5	5,804	5,523	281	5908.1	6			
215	Geotextile Tube Feed Pumps Seal Water from WTP	24	24	0	0.0	7	5,828	5,547	281	5908.1	8			
216	Secondary Screen and Hydrocyclone Screen Wash Water from WTP	0	0	0	0.0									
217	Gravel Removed from Secondary Screen	0.0	0.0	0.0	0.0		5,828	5,547	281	5908.1				
218	Sand Removed from Hydrocyclone	0.0	0.0	0.0	0.0		5,828	5,547	281	5908.1				
219	Clarifier Underflow and Filter Backwash from WTP	992	992	0.5	9.6	9	6,821	6,539	281	5917.7				
220	Filtrate from Screened Material Stockpile	0.4	0.4	0.00003	0.0	10								
221	Runoff to Stockpile Sump (Sump#1)	2.6	2.6	0.00021	0.0	10a								
222	Runoff to Screen Area Sump (Sump#2)	3.5	3.5	0.00028	0.0	10b								
223	Runoff to Polymer/Decon Area Sump (Sump#3)	2.4	2.4	0.00019	0.0	10c								
224	Runoff to WTP Area Sump (Sump#4)	15.4	15.4	0.00122	0.0	10d								
225	Coagulant Emulsion and Makeup Water from WTP	0	0	0.000	0.0									
226	Polymer and Makeup Water from WTP	255	255	0.7	4.2	11	7,100	6,818	282	5922.0	12			
227	Geotextile Tube Retention	(991.2)	(709.6)	(281.6)	(5911.7)	13	6109.1	6108.6	0.5	10.2				
228	Precipitation in SCA and Basins	202	202	0	0.0	14	6310.6	6310.2	0.5	10.2	15			
229	Primary Screen Wash Water	(307)	(307)	0	0.0	16	6003.9	6003.4	0.5	10.2	available			
230		(219.1)	(219.1)	(0.02)	(0.4)		5784.8	5784.4	0.5	9.9				
231	Net Flow to SCA Basins	(340.9)	(340.9)	(0.04)	(0.8)	17	5663.0	5662.5	0.5	9.5	18			
232	Clarifier Underflow and Filter Backwash	(992)	(992)	(0.5)	(9.6)		5,784.83	5,784.36	0.466		allowable			
233	Primary Screen Wash Water from WTP	0	0	0.0										
234	Geotextile Tube Feed Pumps Seal Water from WTP	(24)	(24)	0.0										
235	Polymer Makeup Water	(255)	(255)	0			4,792.43	4,792.42	0.008		Flow from WTP			
236	Net Flow to Holding Basin (Downstream Storage)	0	0	0										
237	Maximum Discharge to Metro						4,513.89	4,513.88	0.008		Maximum Discharge to Metro (6.5 MGD)			

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	<b>PARSONS</b>	Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date:1/11/2011	Rev:0	Preparer:	Date:						
2		Project Name: Sediment Management Design	Calculation Title: Mass Balance	Reviewer: MTO	Date: 1/14/2011	Reviewer:	Date:							
3														
4														
5														
6	<b>Incoming Slurry</b>													
7	Slurry Flow Rate, $q$	5,500	gpm											
8	Working Hours, $t$	24	hr/day											
9	Daily Slurry Volume, $q_T$	7,920,000	gallons/day	1,058,750	ft <sup>3</sup> /day									
10	Solids Content by Weight of Incoming Slurry, $P_s$	16.2%												
11	Specific Gravity of Solids, $G_s$	2.68												
12	Unit Weight of Water, $\gamma_w$	62.4279606	pcf											
13	Slurry Water Content, $WC$	517%												
14	Water Flow Rate, $q_w$	5130	gpm											
15	Dry Solids Flow Rate, $q_s$	370	gpm											
16	Daily Water Volume, $q_w$	7,387,141	gallons/day	987,517	ft <sup>3</sup> /day									
17	Daily Water Weight, $W_w$	61,648,680	lbs/day											
18	Daily Dry Solids Volume, $q_s$	532,859	gallons/day	71,233	ft <sup>3</sup> /day									
19	Daily Dry Solids Weight, $W_s$	11,917,764	lbs/day											
20	Slurry Concentration, $C_{s1}$	1.50	lbs/gallon	11.3	lb/ft <sup>3</sup>									
21	% Water in Slurry (by Volume)	93%												
22														
23														
24	<b>Booster Pump Seal Water</b>													
25	Booster Pump Seal Water (each), $q_{booster}$	0	gpm											
26	Number of Booster Pumps, $N_{booster}$	4												
27	Daily Volume of Booster Pump Seal Water	0	gallons/day	0	ft <sup>3</sup> /day									
28	Daily Weight of Booster Seal Water	0	lbs/day											
29														
30	<b>Primary Screen Wash Water</b>													
31	Primary Screen Wash Water (each), $q_{screen-wash}$	51.1	gpm											
32	Number of Screens, $N_{screen}$	6												
33	Daily Volume of Screen Wash Water	441,677	gallons/day	59,044	ft <sup>3</sup> /day									
34	Daily Weight of Screen Wash Water	3,685,972	lbs/day											
35														
36	<b>Geotextile Tube Feed Pump Seal Water</b>													
37	Geotextile Tube Feed Pump Seal Water (each), $q_{tube-pump}$	12	gpm											
38	Number of Geotextile Tube Feed Pumps, $N_{tube-pump}$	2												
39	Daily Volume of Tube Feed Pump Seal Water	34,560	gallons/day	4,620	ft <sup>3</sup> /day									
40	Daily Weight of Tube Feed Pump Seal Water	288,417	lbs/day											
41														
42	<b>Primary Screens (Gravel-Sized Particle Removal, &gt;1/4-inch)</b>													
43	Average Percentage of Gravel-Sized Particles, $P_{gravel-sized}$	0.30%												
44	Daily Dry Weight of Removed Gravel-Sized Particle, $W_{gravel-sized}$	35,753	lbs/day											
45	Daily Volume of Removed Gravel-Sized Particle, $q_{gravel-sized}$	1,599	gallons/day	214	ft <sup>3</sup> /day									
46	Initial Water Content of Removed Gravel-Sized Particles in Stockpile, $WC_{istock}$	25%												
47	Daily Weight of Water Removed with Gravel-Sized Particles, $W_{w-gravel-sized}$	8,938	lbs/day											
48	Daily Volume of Water Removed with Gravel-Sized Particles, $q_{w-gravel-sized}$	1,071	gallons/day	143	ft <sup>3</sup> /day									
49	Remaining Daily Dry Solids Weight in Slurry, $W_{sr1}$	11,882,011	lbs/day											
50	Remaining Daily Water Weight Slurry, $W_{wr1}$	65,614,130	lbs/day											
51	Remaining Daily Solids Volume Slurry, $q_{sr1}$	531,261	gallons/day	71,019	ft <sup>3</sup> /day									
52	Remaining Daily Water Volume Slurry, $q_{wr1}$	7,862,306	gallons/day	1,051,038	ft <sup>3</sup> /day									

**Notes**  
 Maximum flow  
 Tab "Properties", based on weighted average production rate.  
 Tab "Properties", volume and dry density-weighted average value.

Booster pumps use slurry as seal water

Vendor's data

Tab "Properties"



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
53														
54	<b>SCA WTP</b>													
55	I.P Clarifier Sludge (OBG line number 18)													
56	Total Suspended Solids, TSS <sub>clarifier</sub>	1571 mg/L		5946.9 mg/gallon		0.001 gallon/gallon								
57	Clarifier Sludge Flow Rate, q <sub>clarifier</sub>	708.4 gpm												
58	Flow Rate of Solids in Clarifier Sludge, q <sub>TSS-clarifier</sub>	0.42 gpm												
59	Flow Rate of Water in Clarifier Sludge, q <sub>w-clarifier</sub>	708.0 gpm												
60	Weight of Dry Solids in Clarifier Sludge, W <sub>TSS-clarifier</sub>	4.21 kg/min		557.3 lbs/hr		13,374 lbs/day								
61	Spent MMF Backwash (OBG line number 24)													
62	Total Suspended Solids, TSS <sub>MMF</sub>	159.2 mg/L		602.6 mg/gallon		0.0001 gallon/gallon								
63	MMF Backwash Flow Rate, q <sub>MMF</sub>	166.3 gpm												
64	Flow Rate of Solids in MMF Backwash, q <sub>TSS-MMF</sub>	0.01 gpm												
65	Flow Rate of Water in MMF Backwash, q <sub>w-MMF</sub>	166.3 gpm												
66	Weight of Dry Solids in MMF Backwash, W <sub>TSS-MMF</sub>	0.10 kg/min		13.3 lbs/hr		318 lbs/day								
67	Spent GAC Backwash (OBG line number 25)													
68	Total Suspended Solids, TSS <sub>GAC</sub>	128.4 mg/L		486.0 mg/gallon		0.00005 gallon/gallon								
69	GAC Backwash Flow Rate, q <sub>GAC</sub>	117.7 gpm												
70	Flow Rate of Solids in GAC Backwash, q <sub>TSS-GAC</sub>	0.006 gpm												
71	Flow Rate of Water in GAC Backwash, q <sub>w-GAC</sub>	117.7 gpm												
72	Weight of Dry Solids in GAC Backwash, W <sub>TSS-GAC</sub>	0.06 kg/min		7.6 lbs/hr		182 lbs/day								
73	<b>SCA WTP Total</b>													
74	Total Flow Rate, q <sub>WTP</sub>	992.4 gpm		1,429,056 gallons/day		191,037 ft <sup>3</sup> /day								
75	Solid Flow Rate, q <sub>WTP-TSS</sub>	0.4 gpm		620 gallons/day		83 ft <sup>3</sup> /day								
76	Water Flow Rate, q <sub>w-WTP</sub>	992.0 gpm		1,428,436 gallons/day		190,954 ft <sup>3</sup> /day								
77	Water Weight, W <sub>w-WTP</sub>	11,920,874 lbs/day												
78	Solids Weight, W <sub>WTP-TSS</sub>	13,874 lbs/day												
79														
80	<b>Water from Screened Material Stockpile (&gt;1/4 in)</b>													
81	Typical Solids Content of Sand from Hydrocyclone Shaker (TotalClean) (75-85%)	80%												
82	Sand Water Content	25%												
83	Assumed Initial Water Content of Screened Material Stockpile, WC <sub>istock</sub>	25%												
84	Assumed Final Water Content of Screened Material Stockpile, WC <sub>fstock</sub>	15%												
85														
86	Weight of Water Removed from Stockpile (Water Content from 25% to 15%), W <sub>w-stock</sub>	3,575 lbs/day												
87	Volume of Water Removed from Stockpile (Water Content from 25% to 15%), q <sub>w-stock</sub>	428 gallons/day		57 ft <sup>3</sup> /day										
88	Weight of Water Remained in Stockpile, W <sub>wr-stock</sub>	5,363 lbs/day												
89	Volume of Water Remained in Stockpile, q <sub>wr-stock</sub>	643 gallons/day		86 ft <sup>3</sup> /day										
90														
91	<b>Total Suspended Solids in Stockpile Filtrate</b>													
92	Total Suspended Solids, TSS <sub>stock-filtrate</sub>	200 mg/L		757.1 mg/gallon		0.0001 gallon/gallon								
93	Total Stockpile Filtrate Flow Rate, q <sub>stock-filtrate</sub>	0.3 gpm		428 gallons/day										
94	Flow Rate of Solids in Stockpile Filtrate, q <sub>s-stock-filtrate</sub>	2.22041E-05 gpm		0.03 gallons/day		0 ft <sup>3</sup> /day								
95	Flow Rate of Water in Stockpile Filtrate, q <sub>w-stock-filtrate</sub>	0.30 gpm		428.42 gallons/day										
96	Weight of Dry Solids in Stockpile Filtrate, W <sub>TSS-stock-filtrate</sub>	0.000225 kg/min		0.72 lbs/day										
97	Weight of Water in Stockpile Filtrate, W <sub>w-stock-filtrate</sub>	3,575 lbs/day												
98														

**Notes**  
WTP DP#3. Under normal operation condition, WTP sludge and backwash water will be sent to a dedicated geotextile tube directly, without polymer addition.

DeITank TCW-3000

Under normal operation condition, stockpile filtrate and runoff collected by the area sumps (Sump#1 through 4) will be sent to a dedicated geotextile tube directly, without polymer addition.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
99	<b>Runoff from Stockpile Area (Sump#1)</b>													
100	<b>Stockpile Area</b>	40,000	ft <sup>2</sup>											
101	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
102	<b>Runoff Flowrate, q<sub>S1</sub></b>	2.60	gpm	3740.3	gallons/day									
103	Total Suspended Solids, TSS <sub>S1</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
104	Total Sump#1 Flow Rate, q <sub>S1</sub>	2.60	gpm	3741	gallons/day									
105	Flow Rate of Solids in Sump#1 Flow, q <sub>s-S1</sub>	0.000194	gpm	0.279	gallons/day	0	ft <sup>3</sup> /day							
106	Flow Rate of Water in Sump#1 Flow, q <sub>w-S1</sub>	2.60	gpm	3740.26	gallons/day									
107	Weight of Dry Solids in Sump#1 Flow, W <sub>TSS-S1</sub>	0.001967	kg/min	6.24	lbs/day									
108	Weight of Water in Sump#1 Flow, W <sub>w-S1</sub>	31,214	lbs/day											
109														
110	<b>Runoff from Screen Area (Sump#2)</b>													
111	<b>Screen Area</b>	53,483	ft <sup>2</sup>											
112	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
113	<b>Runoff Flowrate, q<sub>S2</sub></b>	3.47	gpm	5001.0	gallons/day									
114	Total Suspended Solids, TSS <sub>S2</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
115	Total Sump#2 Flow Rate, q <sub>S2</sub>	3.47	gpm	5001	gallons/day									
116	Flow Rate of Solids in Sump#2 Flow, q <sub>s-S2</sub>	0.000259	gpm	0.37	gallons/day	0	ft <sup>3</sup> /day							
117	Flow Rate of Water in Sump#2 Flow, q <sub>w-S2</sub>	3.47	gpm	5001.01	gallons/day									
118	Weight of Dry Solids in Sump#2 Flow, W <sub>TSS-S2</sub>	0.002629	kg/min	8.35	lbs/day									
119	Weight of Water in Sump#2 Flow, W <sub>w-S2</sub>	41,735	lbs/day											
120														
121	<b>Runoff from Polymer and Decon Area (Sump#3)</b>													
122	<b>Polymer and Decon Area</b>	37,711	ft <sup>2</sup>											
123	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
124	<b>Runoff Flowrate, q<sub>S3</sub></b>	2.45	gpm	3526.2	gallons/day									
125	Total Suspended Solids, TSS <sub>S3</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
126	Total Sump#3 Flow Rate, q <sub>S3</sub>	2.45	gpm	3526	gallons/day									
127	Flow Rate of Solids in Sump#3 Flow, q <sub>s-S3</sub>	0.000183	gpm	0.26	gallons/day	0	ft <sup>3</sup> /day							
128	Flow Rate of Water in Sump#3 Flow, q <sub>w-S3</sub>	2.45	gpm	3526.22	gallons/day									
129	Weight of Dry Solids in Sump#3 Flow, W <sub>TSS-S3</sub>	0.001854	kg/min	5.89	lbs/day									
130	Weight of Water in Sump#3 Flow, W <sub>w-S3</sub>	29,428	lbs/day											
131														
132	<b>Runoff from WTP Area (Sump#4)</b>													
133	<b>WTP Area</b>	236,949	ft <sup>2</sup>											
134	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
135	<b>Runoff Flowrate, q<sub>S4</sub></b>	15.39	gpm	22156.3	gallons/day									
136	Total Suspended Solids, TSS <sub>S4</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
137	Total Sump#4 Flow Rate, q <sub>S4</sub>	15.39	gpm	22158	gallons/day									
138	Flow Rate of Solids in Sump#4 Flow, q <sub>s-S4</sub>	0.001148	gpm	1.65	gallons/day	0	ft <sup>3</sup> /day							
139	Flow Rate of Water in Sump#4 Flow, q <sub>w-S4</sub>	15.39	gpm	22156.27	gallons/day									
140	Weight of Dry Solids in Sump#4 Flow, W <sub>TSS-S4</sub>	0.011649	kg/min	36.98	lbs/day									
141	Weight of Water in Sump#4 Flow, W <sub>w-S4</sub>	184,903	lbs/day											
142														
143	<b>Polymer and Makeup Water</b>													
144	Percent Fines in Slurry Solids, P <sub>fine</sub>	76.7%												
145	Fine Solids Weight	9140924.90	lbs/day											
146	Polymer Dosage Rate (lbs of dry polymer per dry ton of solids), DOS <sub>polymer</sub>	1.59	lbs/ton											
147	Dry Polymer Density, DEN <sub>polymer</sub>	0.70	g/cm <sup>3</sup>											
148	Daily Dry Polymer Needed, W <sub>drypolymer</sub>	7267.04	lbs/day	5.047	lbs/min									
149	Dry Polymer Volume, q <sub>drypolymer</sub>	0.8639	gpm	1244	gallons/day	166	ft <sup>3</sup> /day							
150	Polymer Makeup Water Volume, q <sub>makeupwater</sub>	302.36	gpm	435,391	gallons/day	58,203	ft <sup>3</sup> /day							
151	Polymer Makeup water Weight, W <sub>makeupwater</sub>	3,633,518	lbs/day											

Based on P-GDT draft report.  
Ashland 2520 MSDS

Based on P-GDT draft report 0.2% dilution

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
152														
153	<b>Coagulant (Emulsion)</b>													
154	Coagulant Dosage Rate (lbs of emulsion per dry ton of solids), $DOS_{coag}$	5.71 lbs/ton												
155	Coagulant Emulsion Density, $DEN_{coag}$	1.03 g/cm <sup>3</sup>	64.300799 pcf											
156	Coagulant Emulsion Flow Rate, $q_{coag}$	2.11 gpm	3036 gallons/day	406 ft <sup>3</sup> /day										
157	Coagulant Emulsion Weight, $W_{coag}$	18.1 lbs/min	26,097 lbs/day											
158	Weight of Coagulant Makeup Water, $W_{coagwater}$	1812.3 lbs/min	2,609,734 lbs/day											
159	Volume of Coagulant Makeup Water, $q_{coagwater}$	217.2 gpm	312715 gallons/day											
160														
161	<b>RA-A Primary Screens and Polymer Injection</b>													
162	<b>Initial Dewatering in Geotextile Tubes (i.e., the first 24 hrs in the tubes)</b>													
163	Daily Weight of Water in Influent to Tubes	81,460,515 lbs/day												
164	Daily Volume of Water in Influent to Tubes	9,761,122 gallons/day	1304872.271 ft <sup>3</sup> /day											
165	Solids Content by Weight after Initial Dewatering in Tubes, $P_{s2}$	38%												
166	Daily Weight of Dry Solids Retained in Tubes, $W_{s-ret2}$	11,929,307 lbs/day												
167	Daily Volume of Solids Retained in Tubes, $q_{s-ret2}$	536,164 gallons/day	71,675 ft <sup>3</sup> /day											
168	Daily Weight of Water Retained in Tubes after Initial Dewatering, $W_{ret2}$	19,463,606 lbs/day												
169	Daily Volume of Water Retained in Tubes after Initial Dewatering, $q_{ret2}$	2,332,254 gallons/day	311777.0627 ft <sup>3</sup> /day											
170	Daily Weight of Water in Initial Filtrate Weight, $W_{if}$	64,893,923 lbs/day												
171	Daily Volume of Water in Initial Filtrate, $q_{if}$	7,776,007 gallons/day	1039500.925 ft <sup>3</sup> /day											
172	<b>Consolidation Dewatering in Geotextile Tubes</b>													
173	Solids Content by Weight after Consolidation Dewatering, $P_{s3}$	50%												
174	Peak Daily Weight of Retained Water in Tubes after Consolidation Dewatering, $W_{ret3}$	11,929,307 lbs/day												
175	Peak Daily Volume of Retained Water in Tubes after Consolidation Dewatering, $q_{ret3}$	1,429,446 gallons/day	191,089 ft <sup>3</sup> /day											
176	Peak Daily Weight of Water in Consolidation Dewatering Filtrate, $W_{cf}$	7,534,299 lbs/day												
177	Peak Daily Volume of Water in Consolidation Dewatering Filtrate, $q_{cf}$	902,808 gallons/day	120,688 ft <sup>3</sup> /day											
178	Consolidation Dewatering Duration, $t_c$	60 days												
179	Average Water Volume from Consolidation Dewatering of One Day Filling, $q_{dcf}$	15,047 gallons/day	2,011 ft <sup>3</sup> /day											
180														
181	Peak Volume of Water in Geotextile Tube Filtrate, $q_{tube-filtrate}$	8,678,815 gallons/day	1,160,189 ft <sup>3</sup> /day											
182	Daily Water Retained in Geotextile Tube, $q_{w-retained}$	1,429,446 gallons/day	191,089 ft <sup>3</sup> /day											
183														
184	<b>Total Suspended Solids in Geotextile Tube Filtrate</b>													
185	Total Suspended Solids, $TSS_{tube-filtrate}$	200 mg/L	757.1 mg/gallon	0.0001 gallon/gallon										
186	Total Geotextile Tube Filtrate Flow Rate, $q_{tube-filtrate}$	6027.4 gpm	8,679,462 gallons/day											
187	Flow Rate of Solids in Geotextile Tube Filtrate, $q_{s-tube-filtrate}$	0.45 gpm	648 gallons/day											
188	Flow Rate of Water in Geotextile Tube Filtrate, $q_{w-tube-filtrate}$	6027.0 gpm	8,678,815 gallons/day											
189	Weight of Dry Solids in Geotextile Tube Filtrate, $W_{TSS-tube-filtrate}$	4.56 kg/min	14,487 lbs/day											
190														
191	<b>Precipitation in SCA and SCA Basins</b>													
192	Daily Precipitation, $PRE_{daily}$ (inch)	Open Area, $A_{SCA}$ (acres)	Flow Rate, $q_{PRE}$ (gpd)	Flow Rate, $q_{PRE}$ (gpm)										
193	0.15	71.25	290,211	201.5										
194														
195	<b>pH Adjust Tank Influent (OBG line number 11)</b>													
196	Total Suspended Solids, $TSS_{influent}$	200.5 mg/L	758.98 mg/gallon	7.48134E-05 gallon/gallon										
197	Total Flow Rate, $MAX_{influent}$	5,663 gpm	8,154,720 gallons/day											
198	Flow Rate of Solids in Influent, $q_{TSS-influent}$	0.424 gpm	610 gallons/day											
199	Flow Rate of Water in Influent, $q_{w-influent}$	5662.58 gpm	8,154,110 gallons/day											
200	Weight of Dry Solids in Influent, $W_{TSS-influent}$	4.30 kg/min	568.5 lbs/hr	13644.9 lbs/day										
201														
202	<b>Effluent Tank Discharge (OBG line number 23)</b>													
203	Total Suspended Solids, $TSS_{discharge}$	4.5 mg/L	17.03 mg/gallon	1.6791E-06 gallon/gallon										
204	Total Flow Rate, $MAX_{discharge}$	4,514 gpm	6,500,000 gallons/day											
205	Flow Rate of Solids in Discharge, $q_{TSS-dis}$	0.008 gpm	11 gallons/day											
206	Flow Rate of Water in Discharge, $q_{w-dis}$	4513.88 gpm	6,499,989 gallons/day											
207	Weight of Dry Solids in Discharge, $W_{TSS-dis}$	0.08 kg/min	10.2 lbs/hr	244.1 lbs/day										

Based on P-GDT draft report.  
Based on Ashland 492 MSDS

Notes

Based on P-GDT draft report.

Assumed value

Notes  
WTP BOD

On-site met data.

Maximum

WTP DP#3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
208	<b>Mass Balance Tables</b>														
209	<b>RA-A</b>														
210	<b>RA-A</b>														
211		Incremental					Accumulative					<b>Notes</b>			
212		Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number	Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number				
213	Dredge Slurry	5500	5130	370	8276.2	1	5,500	5,130	370	8276.2					
214	Booster Pumps Seal Water	0	0	0	0.0	2	5,500	5,130	370	8276.2	3				
215	Primary Screen Wash Water	307	307	0	0.0	4	5,807	5,437	370	8276.2					
216	Gravel-Sized Removed from Primary Screen	(1.9)	(0.7)	(1.1)	(24.8)	5	5,805	5,436	369	8251.4	6				
217	Geotextile Tube Feed Pumps Seal Water from WTP	24	24	0	0.0	7	5,829	5,460	369	8251.4	8				
218	Secondary Screen and Hydrocyclone Screen Wash Water from WTP	0	0	0	0.0										
219	Gravel Removed from Secondary Screen	0.0	0.0	0.0	0.0		5,829	5,460	369	8251.4					
220	Sand Removed from Hydrocyclone	0.0	0.0	0.0	0.0		5,829	5,460	369	8251.4					
221	Clarifier Underflow and Filter Backwash from WTP	992	992	0.4	9.6	9	6,821	6,452	369	8261.0					
222	Filtrate from Screened Material Stockpile	0.3	0.3	0.00002	0.0	10									
223	Runoff to Stockpile Sump (Sump#1)	2.6	2.6	0.00019	0.0	10a									
224	Runoff to Screen Area Sump (Sump#2)	3.5	3.5	0.00026	0.0	10b									
225	Runoff to Polymer/Decon Area Sump (Sump#3)	2.4	2.4	0.00018	0.0	10c									
226	Runoff to WTP Area Sump (Sump#4)	15.4	15.4	0.00115	0.0	10d									
227	Coagulant, Polymer, and Makeup Water from WTP	522	520	3.0	23.2	11	7,368	6,996	372	8284.2	12				
228	Geotextile Tube Retention	(1364.6)	(992.7)	(371.9)	(8274.2)	13	6003.4	6003.0	0.4	10.1					
229	Precipitation in SCA and Basins	202	202	0	0.0	14	6204.9	6204.5	0.4	10.1	15				
230	Primary Screen Wash Water	(307)	(307)	0	0.0	16	5898.2	5897.8	0.4	10.1	available				
231		0.0	0.0	0.00	0.0		5898.2	5897.8	0.4	10.1					
232	Net Flow to SCA Basins	(235.2)	(235.2)	(0.03)	(0.6)	17	5663.0	5662.6	0.4	9.5	18				
233	Clarifier Underflow and Filter Backwash	(992)	(992)	(0.4)	(9.6)		6,049.81	6,049.37	0.438		allowable			Maximum Flow from EQ Basin to WTP	
234	Primary Screen Wash Water from WTP	0	0	0.0											
235	Geotextile Tube Feed Pumps Seal Water from WTP	(24)	(24)	0.0											
236	Polymer Makeup Water	(520)	(520)	0			5,057.41	5,057.40	0.008					Flow from WTP	
237	Net Flow to Holding Basin (Downstream Storage)	0	0	0											
238	Maximum Discharge to Metro						4,513.89	4,513.88	0.008					Maximum Discharge to Metro (6.5 MGD)	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	<b>PARSONS</b>	Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date:1/11/2011	Rev:0	Preparer:	Date:						
2		Project Name: Sediment Management Design	Calculation Title: Mass Balance	Reviewer: MTO	Date: 1/14/2011	Reviewer:	Date:							
3														
4														
5														
6	<b>Incoming Slurry</b>													
7	Slurry Flow Rate, $q$	5,500	gpm											
8	Working Hours, $t$	24	hr/day											
9	Daily Slurry Volume, $q_T$	7,920,000	gallons/day	1,058,750	ft <sup>3</sup> /day									
10	Solids Content by Weight of Incoming Slurry, $P_s$	18.5%												
11	Specific Gravity of Solids, $G_s$	2.58												
12	Unit Weight of Water, $\gamma_w$	62.4279606	pcf											
13	Slurry Water Content, $WC$	441%												
14	Water Flow Rate, $q_w$	5055	gpm											
15	Dry Solids Flow Rate, $q_s$	445	gpm											
16	Daily Water Volume, $q_w$	7,279,531	gallons/day	973,132	ft <sup>3</sup> /day									
17	Daily Water Weight, $W_w$	60,750,637	lbs/day											
18	Daily Dry Solids Volume, $q_s$	640,469	gallons/day	85,618	ft <sup>3</sup> /day									
19	Daily Dry Solids Weight, $W_s$	13,790,022	lbs/day											
20	Slurry Concentration, $C_{s1}$	1.74	lbs/gallon	13.0	lb/ft <sup>3</sup>									
21	% Water in Slurry (by Volume)	92%												
22														
23														
24	<b>Booster Pump Seal Water</b>													
25	Booster Pump Seal Water (each), $q_{booster}$	0	gpm											
26	Number of Booster Pumps, $N_{booster}$	4												
27	Daily Volume of Booster Pump Seal Water	0	gallons/day	0	ft <sup>3</sup> /day									
28	Daily Weight of Booster Seal Water	0	lbs/day											
29														
30	<b>Primary Screen Wash Water</b>													
31	Primary Screen Wash Water (each), $q_{screen-wash}$	51.1	gpm											
32	Number of Screens, $N_{screen}$	6												
33	Daily Volume of Screen Wash Water	441,677	gallons/day	59,044	ft <sup>3</sup> /day									
34	Daily Weight of Screen Wash Water	3,685,972	lbs/day											
35														
36	<b>Geotextile Tube Feed Pump Seal Water</b>													
37	Geotextile Tube Feed Pump Seal Water (each), $q_{tube-pump}$	12	gpm											
38	Number of Geotextile Tube Feed Pumps, $N_{tube-pump}$	2												
39	Daily Volume of Tube Feed Pump Seal Water	34,560	gallons/day	4,620	ft <sup>3</sup> /day									
40	Daily Weight of Tube Feed Pump Seal Water	288,417	lbs/day											
41														
42	<b>Primary Screens (Gravel-Sized Particle Removal, &gt;1/4-inch)</b>													
43	Average Percentage of Gravel-Sized Particles, $P_{gravel-sized}$	0.40%												
44	Daily Dry Weight of Removed Gravel-Sized Particle, $W_{gravel-sized}$	55,160	lbs/day											
45	Daily Volume of Removed Gravel-Sized Particle, $q_{gravel-sized}$	2,562	gallons/day	342	ft <sup>3</sup> /day									
46	Initial Water Content of Removed Gravel-Sized Particles in Stockpile, $WC_{istock}$	25%												
47	Daily Weight of Water Removed with Gravel-Sized Particles, $W_{w-gravel-sized}$	13,790	lbs/day											
48	Daily Volume of Water Removed with Gravel-Sized Particles, $q_{w-gravel-sized}$	1,652	gallons/day	221	ft <sup>3</sup> /day									
49	Remaining Daily Dry Solids Weight in Slurry, $W_{sr1}$	13,734,862	lbs/day											
50	Remaining Daily Water Weight Slurry, $W_{wr1}$	64,711,236	lbs/day						0					
51	Remaining Daily Solids Volume Slurry, $q_{sr1}$	637,907	gallons/day	85,276	ft <sup>3</sup> /day									
52	Remaining Daily Water Volume Slurry, $q_{wr1}$	7,754,116	gallons/day	1,036,575	ft <sup>3</sup> /day				0					

**Notes**  
 Maximum flow  
 Tab "Properties", based on weighted average production rate.  
 Tab "Properties", volume and dry density-weighted average value.

Booster pumps use slurry as seal water

Vendor's data

Tab "Properties"

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
53														
54	<b>SCA WTP</b>													
55	I.P Clarifier Sludge (OBG line number 18)													
56	Total Suspended Solids, TSS <sub>clarifier</sub>	1571 mg/L		5946.9 mg/gallon		0.001 gallon/gallon								
57	Clarifier Sludge Flow Rate, q <sub>clarifier</sub>	708.4 gpm												
58	Flow Rate of Solids in Clarifier Sludge, q <sub>TSS-clarifier</sub>	0.43 gpm												
59	Flow Rate of Water in Clarifier Sludge, q <sub>w-clarifier</sub>	708.0 gpm												
60	Weight of Dry Solids in Clarifier Sludge, W <sub>TSS-clarifier</sub>	4.21 kg/min		557.3 lbs/hr		13,374 lbs/day								
61	Spent MMF Backwash (OBG line number 24)													
62	Total Suspended Solids, TSS <sub>MMF</sub>	159.2 mg/L		602.6 mg/gallon		0.0001 gallon/gallon								
63	MMF Backwash Flow Rate, q <sub>MMF</sub>	166.3 gpm												
64	Flow Rate of Solids in MMF Backwash, q <sub>TSS-MMF</sub>	0.01 gpm												
65	Flow Rate of Water in MMF Backwash, q <sub>w-MMF</sub>	166.3 gpm												
66	Weight of Dry Solids in MMF Backwash, W <sub>TSS-MMF</sub>	0.10 kg/min		13.3 lbs/hr		318 lbs/day								
67	Spent GAC Backwash (OBG line number 25)													
68	Total Suspended Solids, TSS <sub>GAC</sub>	128.4 mg/L		486.0 mg/gallon		0.00005 gallon/gallon								
69	GAC Backwash Flow Rate, q <sub>GAC</sub>	117.7 gpm												
70	Flow Rate of Solids in GAC Backwash, q <sub>TSS-GAC</sub>	0.006 gpm												
71	Flow Rate of Water in GAC Backwash, q <sub>w-GAC</sub>	117.7 gpm												
72	Weight of Dry Solids in GAC Backwash, W <sub>TSS-GAC</sub>	0.06 kg/min		7.6 lbs/hr		182 lbs/day								
73	<b>SCA WTP Total</b>													
74	Total Flow Rate, q <sub>WTP</sub>	992.4 gpm		1,429,056 gallons/day		191,037 ft <sup>3</sup> /day								
75	Solid Flow Rate, q <sub>WTP-TSS</sub>	0.4 gpm		644 gallons/day		86 ft <sup>3</sup> /day								
76	Water Flow Rate, q <sub>w-WTP</sub>	992.0 gpm		1,428,412 gallons/day		190,951 ft <sup>3</sup> /day								
77	Water Weight, W <sub>w-WTP</sub>	11,920,673 lbs/day												
78	Solids Weight, W <sub>WTP-TSS</sub>	13,874 lbs/day												
79														
80	<b>Water from Screened Material Stockpile (&gt;1/4 in)</b>													
81	Typical Solids Content of Sand from Hydrocyclone Shaker (TotalClean) (75-85%)	80%												
82	Sand Water Content	25%												
83	Assumed Initial Water Content of Screened Material Stockpile, WC <sub>istock</sub>	25%												
84	Assumed Final Water Content of Screened Material Stockpile, WC <sub>fstock</sub>	15%												
85														
86	Weight of Water Removed from Stockpile (Water Content from 25% to 15%), W <sub>w-stock</sub>	5,516 lbs/day												
87	Volume of Water Removed from Stockpile (Water Content from 25% to 15%), q <sub>w-stock</sub>	661 gallons/day		88 ft <sup>3</sup> /day										
88	Weight of Water Remained in Stockpile, W <sub>wr-stock</sub>	8,274 lbs/day												
89	Volume of Water Remained in Stockpile, q <sub>wr-stock</sub>	991 gallons/day		133 ft <sup>3</sup> /day										
90														
91	<b>Total Suspended Solids in Stockpile Filtrate</b>													
92	Total Suspended Solids, TSS <sub>stock-filtrate</sub>	200 mg/L		757.1 mg/gallon		0.0001 gallon/gallon								
93	Total Stockpile Filtrate Flow Rate, q <sub>stock-filtrate</sub>	0.5 gpm		661 gallons/day										
94	Flow Rate of Solids in Stockpile Filtrate, q <sub>s-stock-filtrate</sub>	3.55843E-05 gpm		0.05 gallons/day		0 ft <sup>3</sup> /day								
95	Flow Rate of Water in Stockpile Filtrate, q <sub>w-stock-filtrate</sub>	0.46 gpm		660.96 gallons/day										
96	Weight of Dry Solids in Stockpile Filtrate, W <sub>TSS-stock-filtrate</sub>	0.000348 kg/min		1.10 lbs/day										
97	Weight of Water in Stockpile Filtrate, W <sub>w-stock-filtrate</sub>	5,516 lbs/day												
98														

**Notes**  
WTP DP#3. Under normal operation condition, WTP sludge and backwash water will be sent to a dedicated geotextile tube directly, without polymer addition.

DeITank TCW-3000

Under normal operation condition, stockpile filtrate and runoff collected by the area sumps (Sump#1 through 4) will be sent to a dedicated geotextile tube directly, without polymer addition.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
99	<b>Runoff from Stockpile Area (Sump#1)</b>													
100	<b>Stockpile Area</b>	40,000	ft <sup>2</sup>											
101	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
102	<b>Runoff Flowrate, q<sub>S1</sub></b>	2.60	gpm	3740.3	gallons/day									
103	Total Suspended Solids, TSS <sub>S1</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
104	Total Sump#1 Flow Rate, q <sub>S1</sub>	2.60	gpm	3741	gallons/day									
105	Flow Rate of Solids in Sump#1 Flow, q <sub>s-S1</sub>	0.000201	gpm	0.290	gallons/day	0	ft <sup>3</sup> /day							
106	Flow Rate of Water in Sump#1 Flow, q <sub>w-S1</sub>	2.60	gpm	3740.26	gallons/day									
107	Weight of Dry Solids in Sump#1 Flow, W <sub>TSS-S1</sub>	0.001967	kg/min	6.24	lbs/day									
108	Weight of Water in Sump#1 Flow, W <sub>w-S1</sub>	31,214	lbs/day											
109														
110	<b>Runoff from Screen Area (Sump#2)</b>													
111	<b>Screen Area</b>	53,483	ft <sup>2</sup>											
112	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
113	<b>Runoff Flowrate, q<sub>S2</sub></b>	3.47	gpm	5001.0	gallons/day									
114	Total Suspended Solids, TSS <sub>S2</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
115	Total Sump#2 Flow Rate, q <sub>S2</sub>	3.47	gpm	5001	gallons/day									
116	Flow Rate of Solids in Sump#2 Flow, q <sub>s-S2</sub>	0.000269	gpm	0.39	gallons/day	0	ft <sup>3</sup> /day							
117	Flow Rate of Water in Sump#2 Flow, q <sub>w-S2</sub>	3.47	gpm	5001.01	gallons/day									
118	Weight of Dry Solids in Sump#2 Flow, W <sub>TSS-S2</sub>	0.002629	kg/min	8.35	lbs/day									
119	Weight of Water in Sump#2 Flow, W <sub>w-S2</sub>	41,735	lbs/day											
120														
121	<b>Runoff from Polymer and Decon Area (Sump#3)</b>													
122	<b>Polymer and Decon Area</b>	37,711	ft <sup>2</sup>											
123	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
124	<b>Runoff Flowrate, q<sub>S3</sub></b>	2.45	gpm	3526.2	gallons/day									
125	Total Suspended Solids, TSS <sub>S3</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
126	Total Sump#3 Flow Rate, q <sub>S3</sub>	2.45	gpm	3526	gallons/day									
127	Flow Rate of Solids in Sump#3 Flow, q <sub>s-S3</sub>	0.000190	gpm	0.27	gallons/day	0	ft <sup>3</sup> /day							
128	Flow Rate of Water in Sump#3 Flow, q <sub>w-S3</sub>	2.45	gpm	3526.22	gallons/day									
129	Weight of Dry Solids in Sump#3 Flow, W <sub>TSS-S3</sub>	0.001854	kg/min	5.89	lbs/day									
130	Weight of Water in Sump#3 Flow, W <sub>w-S3</sub>	29,428	lbs/day											
131														
132	<b>Runoff from WTP Area (Sump#4)</b>													
133	<b>WTP Area</b>	236,949	ft <sup>2</sup>											
134	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
135	<b>Runoff Flowrate, q<sub>S4</sub></b>	15.39	gpm	22156.3	gallons/day									
136	Total Suspended Solids, TSS <sub>S4</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
137	Total Sump#4 Flow Rate, q <sub>S4</sub>	15.39	gpm	22158	gallons/day									
138	Flow Rate of Solids in Sump#4 Flow, q <sub>s-S4</sub>	0.001193	gpm	1.72	gallons/day	0	ft <sup>3</sup> /day							
139	Flow Rate of Water in Sump#4 Flow, q <sub>w-S4</sub>	15.39	gpm	22156.27	gallons/day									
140	Weight of Dry Solids in Sump#4 Flow, W <sub>TSS-S4</sub>	0.011649	kg/min	36.98	lbs/day									
141	Weight of Water in Sump#4 Flow, W <sub>w-S4</sub>	184,903	lbs/day											
142														
143	<b>Polymer and Makeup Water</b>													
144	Percent Fines in Slurry Solids, P <sub>fine</sub>	43.3%												
145	Fine Solids Weight	5971079.47	lbs/day											
146	Polymer Dosage Rate (lbs of dry polymer per dry ton of solids), DOS <sub>polymer</sub>	1.59	lbs/ton											
147	Dry Polymer Density, DEN <sub>polymer</sub>	0.70	g/cm <sup>3</sup>											
148	Daily Dry Polymer Needed, W <sub>drypolymer</sub>	4747.01	lbs/day	3.297	lbs/min									
149	Dry Polymer Volume, q <sub>drypolymer</sub>	0.5643	gpm	813	gallons/day	109	ft <sup>3</sup> /day							
150	Polymer Makeup Water Volume, q <sub>makeupwater</sub>	197.51	gpm	284,409	gallons/day	38,020	ft <sup>3</sup> /day							
151	Polymer Makeup water Weight, W <sub>makeupwater</sub>	2,373,504	lbs/day											

Based on P-GDT draft report.  
Ashland 2520 MSDS

Based on P-GDT draft report 0.2% dilution

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
152														
153	<b>Coagulant (Emulsion)</b>													
154	Coagulant Dosage Rate (lbs of emulsion per dry ton of solids), $DOS_{coag}$	5.71 lbs/ton												
155	Coagulant Emulsion Density, $DEN_{coag}$	1.03 g/cm <sup>3</sup>	64.300799 pcf											
156	Coagulant Emulsion Flow Rate, $q_{coag}$	1.38 gpm	1983 gallons/day	265 ft <sup>3</sup> /day										
157	Coagulant Emulsion Weight, $W_{coag}$	11.8 lbs/min	17,047 lbs/day											
158	Weight of Coagulant Makeup Water, $W_{coagwater}$	1183.8 lbs/min	1,704,743 lbs/day											
159	Volume of Coagulant Makeup Water, $q_{coagwater}$	141.9 gpm	204273 gallons/day											
160														
161	<b>RA-A Primary Screens and Polymer Injection</b>													
162	<b>Initial Dewatering in Geotextile Tubes (i.e., the first 24 hrs in the tubes)</b>													
163	Daily Weight of Water in Influent to Tubes	79,299,347 lbs/day												
164	Daily Volume of Water in Influent to Tubes	9,502,157 gallons/day	1270253.679 ft <sup>3</sup> /day											
165	Solids Content by Weight after Initial Dewatering in Tubes, $P_{s2}$	38%												
166	Daily Weight of Dry Solids Retained in Tubes, $W_{s-ret2}$	13,770,589 lbs/day												
167	Daily Volume of Solids Retained in Tubes, $q_{s-ret2}$	641,350 gallons/day	85,736 ft <sup>3</sup> /day											
168	Daily Weight of Water Retained in Tubes after Initial Dewatering, $W_{ret2}$	22,467,803 lbs/day												
169	Daily Volume of Water Retained in Tubes after Initial Dewatering, $q_{ret2}$	2,692,236 gallons/day	359899.6724 ft <sup>3</sup> /day											
170	Daily Weight of Water in Initial Filtrate Weight, $W_{if}$	58,823,567 lbs/day												
171	Daily Volume of Water in Initial Filtrate, $q_{if}$	7,048,618 gallons/day	942263.1599 ft <sup>3</sup> /day											
172	<b>Consolidation Dewatering in Geotextile Tubes</b>													
173	Solids Content by Weight after Consolidation Dewatering, $P_{s3}$	50%												
174	Peak Daily Weight of Retained Water in Tubes after Consolidation Dewatering, $W_{ret3}$	13,770,589 lbs/day												
175	Peak Daily Volume of Retained Water in Tubes after Consolidation Dewatering, $q_{ret3}$	1,650,080 gallons/day	220,584 ft <sup>3</sup> /day											
176	Peak Daily Weight of Water in Consolidation Dewatering Filtrate, $W_{cf}$	8,697,214 lbs/day												
177	Peak Daily Volume of Water in Consolidation Dewatering Filtrate, $q_{cf}$	1,042,156 gallons/day	139,316 ft <sup>3</sup> /day											
178	Consolidation Dewatering Duration, $t_c$	60 days												
179	Average Water Volume from Consolidation Dewatering of One Day Filling, $q_{dcf}$	17,369 gallons/day	2,322 ft <sup>3</sup> /day											
180														
181	Peak Volume of Water in Geotextile Tube Filtrate, $q_{tube-filtrate}$	8,090,774 gallons/day	1,081,579 ft <sup>3</sup> /day											
182	Daily Water Retained in Geotextile Tube, $q_{w-retained}$	1,650,080 gallons/day	220,584 ft <sup>3</sup> /day											
183														
184	<b>Total Suspended Solids in Geotextile Tube Filtrate</b>													
185	Total Suspended Solids, $TSS_{tube-filtrate}$	200 mg/L	757.1 mg/gallon	0.0001 gallon/gallon										
186	Total Geotextile Tube Filtrate Flow Rate, $q_{tube-filtrate}$	5619.0 gpm	8,091,401 gallons/day											
187	Flow Rate of Solids in Geotextile Tube Filtrate, $q_{s-tube-filtrate}$	0.44 gpm	627 gallons/day											
188	Flow Rate of Water in Geotextile Tube Filtrate, $q_{w-tube-filtrate}$	5618.6 gpm	8,090,774 gallons/day											
189	Weight of Dry Solids in Geotextile Tube Filtrate, $W_{TSS-tube-filtrate}$	4.25 kg/min	13,505 lbs/day											
190														
191	<b>Precipitation in SCA and SCA Basins</b>													
192	Daily Precipitation, $PRE_{daily}$ (inch)	Open Area, $A_{SCA}$ (acres)	Flow Rate, $q_{PRE}$ (gpd)	Flow Rate, $q_{PRE}$ (gpm)										
193	0.15	71.25	290,211	201.5										
194														
195	<b>pH Adjust Tank Influent (OBG line number 11)</b>													
196	Total Suspended Solids, $TSS_{influent}$	200.5 mg/L	758.98 mg/gallon	7.77132E-05 gallon/gallon										
197	Total Flow Rate, $MAX_{influent}$	5,663 gpm	8,154,720 gallons/day											
198	Flow Rate of Solids in Influent, $q_{TSS-influent}$	0.440 gpm	634 gallons/day											
199	Flow Rate of Water in Influent, $q_{w-influent}$	5662.56 gpm	8,154,086 gallons/day											
200	Weight of Dry Solids in Influent, $W_{TSS-influent}$	4.30 kg/min	568.5 lbs/hr	13644.9 lbs/day										
201														
202	<b>Effluent Tank Discharge (OBG line number 23)</b>													
203	Total Suspended Solids, $TSS_{discharge}$	4.5 mg/L	17.03 mg/gallon	1.74419E-06 gallon/gallon										
204	Total Flow Rate, $MAX_{discharge}$	4,514 gpm	6,500,000 gallons/day											
205	Flow Rate of Solids in Discharge, $q_{TSS-dis}$	0.008 gpm	11 gallons/day											
206	Flow Rate of Water in Discharge, $q_{w-dis}$	4513.88 gpm	6,499,989 gallons/day											
207	Weight of Dry Solids in Discharge, $W_{TSS-dis}$	0.08 kg/min	10.2 lbs/hr	244.1 lbs/day										

Based on P-GDT draft report.  
Based on Ashland 492 MSDS

**Notes**

Based on P-GDT draft report.

Assumed value

**Notes**  
WTP BOD

On-site met data.

**Maximum**

WTP DP#3



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
208	<b>Mass Balance Tables</b>													
209	<b>RA-E</b>													
210	<b>RA-E</b>													
211		Incremental					Accumulative					Notes		
212		Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number	Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number			
213	Dredge Slurry	5500	5055	445	9576.4	1	5,500	5,055	445	9576.4				
214	Booster Pumps Seal Water	0	0	0	0.0	2	5,500	5,055	445	9576.4	3			
215	Primary Screen Wash Water	307	307	0	0.0	4	5,807	5,362	445	9576.4				
216	Gravel-Sized Removed from Primary Screen	(2.9)	(1.1)	(1.8)	(38.3)	5	5,804	5,361	443	9538.1	6			
217	Geotextile Tube Feed Pumps Seal Water from WTP	24	24	0	0.0	7	5,828	5,385	443	9538.1	8			
218	Secondary Screen and Hydrocyclone Screen Wash Water from WTP	0	0	0	0.0									
219	Gravel Removed from Secondary Screen	0.0	0.0	0.0	0.0		5,828	5,385	443	9538.1				
220	Sand Removed from Hydrocyclone	0.0	0.0	0.0	0.0		5,828	5,385	443	9538.1				
221	Clarifier Underflow and Filter Backwash from WTP	992	992	0.4	9.6	9	6,820	6,377	443	9547.7				
222	Filtrate from Screened Material Stockpile	0.5	0.5	0.00004	0.0	10								
223	Runoff to Stockpile Sump (Sump#1)	2.6	2.6	0.00020	0.0	10a								
224	Runoff to Screen Area Sump (Sump#2)	3.5	3.5	0.00027	0.0	10b								
225	Runoff to Polymer/Decon Area Sump (Sump#3)	2.4	2.4	0.00019	0.0	10c								
226	Runoff to WTP Area Sump (Sump#4)	15.4	15.4	0.00119	0.0	10d								
227	Coagulant, Polymer, and Makeup Water from WTP	341	339	1.9	15.1	11	7,186	6,740	445	9562.9	12			
228	Geotextile Tube Retention	(1590.8)	(1145.9)	(444.9)	(9553.5)	13	5595.0	5594.6	0.4	9.4				
229	Precipitation in SCA and Basins	202	202	0	0.0	14	5796.6	5796.1	0.4	9.4	15			
230	Primary Screen Wash Water	(307)	(307)	0	0.0	16	5489.8	5489.4	0.4	9.4	available			
231		0.0	0.0	0.00	0.0		5489.8	5489.4	0.4	9.4				
232	Net Flow to SCA Basins	0.0	0.0	0.00	0.0	17	5489.8	5489.4	0.4	9.4	18	Maximum Flow from EQ Basin to WTP		
233	Clarifier Underflow and Filter Backwash	(992)	(992)	(0.4)	(9.6)		5,869.65	5,869.20	0.455		allowable			
234	Primary Screen Wash Water from WTP	0	0	0.0										
235	Geotextile Tube Feed Pumps Seal Water from WTP	(24)	(24)	0.0										
236	Polymer Makeup Water	(339)	(339)	0			4,877.25	4,877.24	0.008			Flow from WTP		
237	Net Flow to Holding Basin (Downstream Storage)	0	0	0										
238	Maximum Discharge to Metro						4,513.89	4,513.88	0.008			Maximum Discharge to Metro (6.5 MGD)		

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	<b>PARSONS</b>	Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date:1/11/2011	Rev:0	Preparer:	Date:						
2		Project Name: Sediment Management Design	Calculation Title: Mass Balance	Reviewer: MTO	Date: 1/14/2011		Reviewer:	Date:						
3														
4														
5														
6	<b>Incoming Slurry</b>													
7	Slurry Flow Rate, $q$	3,850	gpm											
8	Working Hours, $t$	24	hr/day											
9	Daily Slurry Volume, $q_T$	5,544,000	gallons/day	741,125	ft <sup>3</sup> /day									
10	Solids Content by Weight of Incoming Slurry, $P_s$	9.9%												
11	Specific Gravity of Solids, $G_s$	2.74												
12	Unit Weight of Water, $\gamma_w$	62.4279606	pcf											
13	Slurry Water Content, $WC$	910%												
14	Water Flow Rate, $q_w$	3702	gpm											
15	Dry Solids Flow Rate, $q_s$	148	gpm											
16	Daily Water Volume, $q_w$	5,330,249	gallons/day	712,551	ft <sup>3</sup> /day									
17	Daily Water Weight, $W_w$	44,483,089	lbs/day											
18	Daily Dry Solids Volume, $q_s$	213,751	gallons/day	28,574	ft <sup>3</sup> /day									
19	Daily Dry Solids Weight, $W_s$	4,887,709	lbs/day											
20	Slurry Concentration, $C_{s1}$	0.88	lbs/gallon	6.6	lb/ft <sup>3</sup>									
21	% Water in Slurry (by Volume)	96%												
22														
23														
24	<b>Booster Pump Seal Water</b>													
25	Booster Pump Seal Water (each), $q_{booster}$	0	gpm											
26	Number of Booster Pumps, $N_{booster}$	4												
27	Daily Volume of Booster Pump Seal Water	0	gallons/day	0	ft <sup>3</sup> /day									
28	Daily Weight of Booster Seal Water	0	lbs/day											
29														
30	<b>Primary Screen Wash Water</b>													
31	Primary Screen Wash Water (each), $q_{screen-wash}$	35.8	gpm											
32	Number of Screens, $N_{screen}$	6												
33	Daily Volume of Screen Wash Water	309,174	gallons/day	41,331	ft <sup>3</sup> /day									
34	Daily Weight of Screen Wash Water	2,580,180	lbs/day											
35														
36	<b>Geotextile Tube Feed Pump Seal Water</b>													
37	Geotextile Tube Feed Pump Seal Water (each), $q_{tube-pump}$	8.4	gpm											
38	Number of Geotextile Tube Feed Pumps, $N_{tube-pump}$	2												
39	Daily Volume of Tube Feed Pump Seal Water	24,192	gallons/day	3,234	ft <sup>3</sup> /day									
40	Daily Weight of Tube Feed Pump Seal Water	201,892	lbs/day											
41														
42	<b>Primary Screens (Gravel-Sized Particle Removal, &gt;1/4-inch)</b>													
43	Average Percentage of Gravel-Sized Particles, $P_{gravel-sized}$	15.60%												
44	Daily Dry Weight of Removed Gravel-Sized Particle, $W_{gravel-sized}$	762,483	lbs/day											
45	Daily Volume of Removed Gravel-Sized Particle, $q_{gravel-sized}$	33,345	gallons/day	4,458	ft <sup>3</sup> /day									
46	Initial Water Content of Removed Gravel-Sized Particles in Stockpile, $WC_{istock}$	25%												
47	Daily Weight of Water Removed with Gravel-Sized Particles, $W_{w-gravel-sized}$	190,621	lbs/day											
48	Daily Volume of Water Removed with Gravel-Sized Particles, $q_{w-gravel-sized}$	22,841	gallons/day	3,053	ft <sup>3</sup> /day									
49	Remaining Daily Dry Solids Weight in Slurry, $W_{sr1}$	4,125,226	lbs/day											
50	Remaining Daily Water Weight Slurry, $W_{wr1}$	47,074,541	lbs/day											
51	Remaining Daily Solids Volume Slurry, $q_{sr1}$	180,406	gallons/day	24,117	ft <sup>3</sup> /day									
52	Remaining Daily Water Volume Slurry, $q_{wr1}$	5,640,774	gallons/day	754,062	ft <sup>3</sup> /day									

**Notes**  
Average flow (70% of maximum flow)  
  
Tab "Properties", based on weighted average production rate.  
Tab "Properties", volume and dry density-weighted average value.

Booster pumps use slurry as seal water

Vendor's data

Tab "Properties"

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
53														
54	<b>SCA WTP</b>													
55	I.P Clarifier Sludge (OBG line number 18)													
56	Total Suspended Solids, TSS <sub>clarifier</sub>	1571	mg/L	5946.9	mg/gallon	0.001	gallon/gallon							
57	Clarifier Sludge Flow Rate, q <sub>clarifier</sub>	708.4	gpm											
58	Flow Rate of Solids in Clarifier Sludge, q <sub>TSS-clarifier</sub>	0.41	gpm											
59	Flow Rate of Water in Clarifier Sludge, q <sub>w-clarifier</sub>	708.0	gpm											
60	Weight of Dry Solids in Clarifier Sludge, W <sub>TSS-clarifier</sub>	4.21	kg/min	557.3	lbs/hr	13,374	lbs/day							
61	Spent MMF Backwash (OBG line number 24)													
62	Total Suspended Solids, TSS <sub>MMF</sub>	159.2	mg/L	602.6	mg/gallon	0.0001	gallon/gallon							
63	MMF Backwash Flow Rate, q <sub>MMF</sub>	166.3	gpm											
64	Flow Rate of Solids in MMF Backwash, q <sub>TSS-MMF</sub>	0.01	gpm											
65	Flow Rate of Water in MMF Backwash, q <sub>w-MMF</sub>	166.3	gpm											
66	Weight of Dry Solids in MMF Backwash, W <sub>TSS-MMF</sub>	0.10	kg/min	13.3	lbs/hr	318	lbs/day							
67	Spent GAC Backwash (OBG line number 25)													
68	Total Suspended Solids, TSS <sub>GAC</sub>	128.4	mg/L	486.0	mg/gallon	0.00005	gallon/gallon							
69	GAC Backwash Flow Rate, q <sub>GAC</sub>	117.7	gpm											
70	Flow Rate of Solids in GAC Backwash, q <sub>TSS-GAC</sub>	0.006	gpm											
71	Flow Rate of Water in GAC Backwash, q <sub>w-GAC</sub>	117.7	gpm											
72	Weight of Dry Solids in GAC Backwash, W <sub>TSS-GAC</sub>	0.06	kg/min	7.6	lbs/hr	182	lbs/day							
73	<b>SCA WTP Total</b>													
74	Total Flow Rate, q <sub>WTP</sub>	992.4	gpm	1,429,056	gallons/day	191,037	ft <sup>3</sup> /day							
75	Solid Flow Rate, q <sub>WTP-TSS</sub>	0.4	gpm	607	gallons/day	81	ft <sup>3</sup> /day							
76	Water Flow Rate, q <sub>w-WTP</sub>	992.0	gpm	1,428,449	gallons/day	190,956	ft <sup>3</sup> /day							
77	Water Weight, W <sub>w-WTP</sub>	11,920,987	lbs/day											
78	Solids Weight, W <sub>WTP-TSS</sub>	13,874	lbs/day											
79														
80	<b>Water from Screened Material Stockpile (&gt;1/4 in)</b>													
81	Typical Solids Content of Sand from Hydrocyclone Shaker (TotalClean) (75-85%)	80%												
82	Sand Water Content	25%												
83	Assumed Initial Water Content of Screened Material Stockpile, WC <sub>istock</sub>	25%												
84	Assumed Final Water Content of Screened Material Stockpile, WC <sub>fstock</sub>	15%												
85														
86	Weight of Water Removed from Stockpile (Water Content from 25% to 15%), W <sub>w-stock</sub>	76,248	lbs/day											
87	Volume of Water Removed from Stockpile (Water Content from 25% to 15%), q <sub>w-stock</sub>	9,137	gallons/day	1,221	ft <sup>3</sup> /day									
88	Weight of Water Remained in Stockpile, W <sub>wr-stock</sub>	114,372	lbs/day											
89	Volume of Water Remained in Stockpile, q <sub>wr-stock</sub>	13,705	gallons/day	1,832	ft <sup>3</sup> /day									
90														
91	<b>Total Suspended Solids in Stockpile Filtrate</b>													
92	Total Suspended Solids, TSS <sub>stock-filtrate</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
93	Total Stockpile Filtrate Flow Rate, q <sub>stock-filtrate</sub>	6.3	gpm	9137	gallons/day									
94	Flow Rate of Solids in Stockpile Filtrate, q <sub>s-stock-filtrate</sub>	0.00046316	gpm	0.67	gallons/day	0	ft <sup>3</sup> /day							
95	Flow Rate of Water in Stockpile Filtrate, q <sub>w-stock-filtrate</sub>	6.34	gpm	9136.56	gallons/day									
96	Weight of Dry Solids in Stockpile Filtrate, W <sub>TSS-stock-filtrate</sub>	0.004804	kg/min	15.25	lbs/day									
97	Weight of Water in Stockpile Filtrate, W <sub>w-stock-filtrate</sub>	76,248	lbs/day											
98														

**Notes**  
WTP DP#3. Under normal operation condition, WTP sludge and backwash water will be sent to a dedicated geotextile tube directly, without polymer addition.

DeITank TCW-3000

Under normal operation condition, stockpile filtrate and runoff collected by the area sumps (Sump#1 through 4) will be sent to a dedicated geotextile tube directly, without polymer addition.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
99	<b>Runoff from Stockpile Area (Sump#1)</b>													
100	<b>Stockpile Area</b>	40,000	ft <sup>2</sup>											
101	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
102	<b>Runoff Flowrate, q<sub>S1</sub></b>	2.60	gpm	3740.3	gallons/day									
103	Total Suspended Solids, TSS <sub>S1</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
104	Total Sump#1 Flow Rate, q <sub>S1</sub>	2.60	gpm	3741	gallons/day									
105	Flow Rate of Solids in Sump#1 Flow, q <sub>s-S1</sub>	0.000190	gpm	0.273	gallons/day	0	ft <sup>3</sup> /day							
106	Flow Rate of Water in Sump#1 Flow, q <sub>w-S1</sub>	2.60	gpm	3740.26	gallons/day									
107	Weight of Dry Solids in Sump#1 Flow, W <sub>TSS-S1</sub>	0.001967	kg/min	6.24	lbs/day									
108	Weight of Water in Sump#1 Flow, W <sub>w-S1</sub>	31,214	lbs/day											
109														
110	<b>Runoff from Screen Area (Sump#2)</b>													
111	<b>Screen Area</b>	53,483	ft <sup>2</sup>											
112	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
113	<b>Runoff Flowrate, q<sub>S2</sub></b>	3.47	gpm	5001.0	gallons/day									
114	Total Suspended Solids, TSS <sub>S2</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
115	Total Sump#2 Flow Rate, q <sub>S2</sub>	3.47	gpm	5001	gallons/day									
116	Flow Rate of Solids in Sump#2 Flow, q <sub>s-S2</sub>	0.000254	gpm	0.37	gallons/day	0	ft <sup>3</sup> /day							
117	Flow Rate of Water in Sump#2 Flow, q <sub>w-S2</sub>	3.47	gpm	5001.01	gallons/day									
118	Weight of Dry Solids in Sump#2 Flow, W <sub>TSS-S2</sub>	0.002629	kg/min	8.35	lbs/day									
119	Weight of Water in Sump#2 Flow, W <sub>w-S2</sub>	41,735	lbs/day											
120														
121	<b>Runoff from Polymer and Decon Area (Sump#3)</b>													
122	<b>Polymer and Decon Area</b>	37,711	ft <sup>2</sup>											
123	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
124	<b>Runoff Flowrate, q<sub>S3</sub></b>	2.45	gpm	3526.2	gallons/day									
125	Total Suspended Solids, TSS <sub>S3</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
126	Total Sump#3 Flow Rate, q <sub>S3</sub>	2.45	gpm	3526	gallons/day									
127	Flow Rate of Solids in Sump#3 Flow, q <sub>s-S3</sub>	0.000179	gpm	0.26	gallons/day	0	ft <sup>3</sup> /day							
128	Flow Rate of Water in Sump#3 Flow, q <sub>w-S3</sub>	2.45	gpm	3526.22	gallons/day									
129	Weight of Dry Solids in Sump#3 Flow, W <sub>TSS-S3</sub>	0.001854	kg/min	5.89	lbs/day									
130	Weight of Water in Sump#3 Flow, W <sub>w-S3</sub>	29,428	lbs/day											
131														
132	<b>Runoff from WTP Area (Sump#4)</b>													
133	<b>WTP Area</b>	236,949	ft <sup>2</sup>											
134	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
135	<b>Runoff Flowrate, q<sub>S4</sub></b>	15.39	gpm	22156.3	gallons/day									
136	Total Suspended Solids, TSS <sub>S4</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
137	Total Sump#4 Flow Rate, q <sub>S4</sub>	15.39	gpm	22158	gallons/day									
138	Flow Rate of Solids in Sump#4 Flow, q <sub>s-S4</sub>	0.001123	gpm	1.62	gallons/day	0	ft <sup>3</sup> /day							
139	Flow Rate of Water in Sump#4 Flow, q <sub>w-S4</sub>	15.39	gpm	22156.27	gallons/day									
140	Weight of Dry Solids in Sump#4 Flow, W <sub>TSS-S4</sub>	0.011649	kg/min	36.98	lbs/day									
141	Weight of Water in Sump#4 Flow, W <sub>w-S4</sub>	184,903	lbs/day											
142														
143	<b>Polymer and Makeup Water</b>													
144	Percent Fines in Slurry Solids, P <sub>fine</sub>	54.2%												
145	Fine Solids Weight	2649138.29	lbs/day											
146	Polymer Dosage Rate (lbs of dry polymer per dry ton of solids), DOS <sub>polymer</sub>	1.59	lbs/ton											
147	Dry Polymer Density, DEN <sub>polymer</sub>	0.70	g/cm <sup>3</sup>											
148	Daily Dry Polymer Needed, W <sub>drypolymer</sub>	2106.06	lbs/day	1.463	lbs/min									
149	Dry Polymer Volume, q <sub>drypolymer</sub>	0.2504	gpm	361	gallons/day	48	ft <sup>3</sup> /day							
150	Polymer Makeup Water Volume, q <sub>makeupwater</sub>	87.63	gpm	126,181	gallons/day	16,868	ft <sup>3</sup> /day							
151	Polymer Makeup water Weight, W <sub>makeupwater</sub>	1,053,032	lbs/day											

Based on P-GDT draft report.  
Ashland 2520 MSDS

Based on P-GDT draft report 0.2% dilution

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
152														
153	<b>Coagulant (Emulsion)</b>													
154	Coagulant Dosage Rate lbs of emulsion per dry ton of solids, $DOS_{coag}$	Not Applicable												
155	Coagulant Density, $DEN_{coag}$													
156	Coagulant Flow Rate, $q_{coag}$													
157	Coagulant Weight, $W_{coag}$													
158														
159	<b>RA-A Primary Screens and Polymer Injection</b>													
160	<b>Initial Dewatering in Geotextile Tubes (i.e., the first 24 hrs in the tubes)</b>													
161	Daily Weight of Water in Influent to Tubes	60,326,701 lbs/day												
162	Daily Volume of Water in Influent to Tubes	7,228,733 gallons/day	966341.0515 ft <sup>3</sup> /day											
163	Solids Content by Weight after Initial Dewatering in Tubes, $P_{s2}$	38%												
164	Daily Weight of Dry Solids Retained in Tubes, $W_{s-ret2}$	4,141,279 lbs/day												
165	Daily Volume of Solids Retained in Tubes, $q_{s-ret2}$	181,376 gallons/day	24,246 ft <sup>3</sup> /day											
166	Daily Weight of Water Retained in Tubes after Initial Dewatering, $W_{ret2}$	6,756,824 lbs/day												
167	Daily Volume of Water Retained in Tubes after Initial Dewatering, $q_{ret2}$	809,646 gallons/day	108233.9337 ft <sup>3</sup> /day											
168	Daily Weight of Water in Initial Filtrate Weight, $W_{if}$	53,857,158 lbs/day												
169	Daily Volume of Water in Initial Filtrate, $q_{if}$	6,453,510 gallons/day	862708.9052 ft <sup>3</sup> /day											
170	<b>Consolidation Dewatering in Geotextile Tubes</b>													
171	Solids Content by Weight after Consolidation Dewatering, $P_{s3}$	50%												
172	Peak Daily Weight of Retained Water in Tubes after Consolidation Dewatering, $W_{ret3}$	4,141,279 lbs/day												
173	Peak Daily Volume of Retained Water in Tubes after Consolidation Dewatering, $q_{ret3}$	496,235 gallons/day	66,337 ft <sup>3</sup> /day											
174	Peak Daily Weight of Water in Consolidation Dewatering Filtrate, $W_{cf}$	2,615,545 lbs/day												
175	Peak Daily Volume of Water in Consolidation Dewatering Filtrate, $q_{cf}$	313,411 gallons/day	41,897 ft <sup>3</sup> /day											
176	Consolidation Dewatering Duration, $t_c$	60 days												
177	Average Water Volume from Consolidation Dewatering of One Day Filling, $q_{dcf}$	5,224 gallons/day	698 ft <sup>3</sup> /day											
178														
179	Peak Volume of Water in Geotextile Tube Filtrate, $q_{tube-filtrate}$	6,766,922 gallons/day	904,606 ft <sup>3</sup> /day											
180	Daily Water Retained in Geotextile Tube, $q_{w-retained}$	496,235 gallons/day	66,337 ft <sup>3</sup> /day											
181														
182	<b>Total Suspended Solids in Geotextile Tube Filtrate</b>													
183	Total Suspended Solids, $TSS_{tube-filtrate}$	200 mg/L	757.1 mg/gallon	0.0001 gallon/gallon										
184	Total Geotextile Tube Filtrate Flow Rate, $q_{tube-filtrate}$	4699.6 gpm	6,767,416 gallons/day											
185	Flow Rate of Solids in Geotextile Tube Filtrate, $q_{s-tube-filtrate}$	0.34 gpm	494 gallons/day											
186	Flow Rate of Water in Geotextile Tube Filtrate, $q_{w-tube-filtrate}$	4699.3 gpm	6,766,922 gallons/day											
187	Weight of Dry Solids in Geotextile Tube Filtrate, $W_{TSS-tube-filtrate}$	3.56 kg/min	11,295 lbs/day											
188														
189	<b>Precipitation in SCA and SCA Basins</b>													
190	Daily Precipitation, $PRE_{daily}$ (inch)	Open Area, $A_{SCA}$ (acres)	Flow Rate, $q_{PRE}$ (gpd)	Flow Rate, $q_{PRE}$ (gpm)										
191	0.15	71.25	290,211	201.5										
192														
193	<b>pH Adjust Tank Influent (OBG line number 11)</b>													
194	Total Suspended Solids, $TSS_{influent}$	200.5 mg/L	758.98 mg/gallon	7.31752E-05 gallon/gallon										
195	Total Flow Rate, $MAX_{influent}$	5,663 gpm	8,154,720 gallons/day											
196	Flow Rate of Solids in Influent, $q_{TSS-influent}$	0.414 gpm	597 gallons/day											
197	Flow Rate of Water in Influent, $q_{w-influent}$	5662.59 gpm	8,154,123 gallons/day											
198	Weight of Dry Solids in Influent, $W_{TSS-influent}$	4.30 kg/min	568.5 lbs/hr	13644.9 lbs/day										
199														
200	<b>Effluent Tank Discharge (OBG line number 23)</b>													
201	Total Suspended Solids, $TSS_{discharge}$	4.5 mg/L	17.03 mg/gallon	1.64234E-06 gallon/gallon										
202	Total Flow Rate, $MAX_{discharge}$	4,514 gpm	6,500,000 gallons/day											
203	Flow Rate of Solids in Discharge, $q_{TSS-dis}$	0.007 gpm	11 gallons/day											
204	Flow Rate of Water in Discharge, $q_{w-dis}$	4513.88 gpm	6,499,989 gallons/day											
205	Weight of Dry Solids in Discharge, $W_{TSS-dis}$	0.08 kg/min	10.2 lbs/hr	244.1 lbs/day										

Notes  
Based on P-GDT draft report.

Assumed value

Notes  
WTP BOD

On-site met data.

Maximum

WTP DP#3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
206	<b>Mass Balance Tables</b>													
207	<b>RA-C</b>													
208	<b>RA-C</b>													
209		Incremental					Accumulative					<b>Notes</b>		
210		Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number	Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number			
211	Dredge Slurry	3850	3702	148	3394.2	1	3,850	3,702	148	3394.2				
212	Booster Pumps Seal Water	0	0	0	0.0	2	3,850	3,702	148	3394.2	3			
213	Primary Screen Wash Water	215	215	0	0.0	4	4,065	3,916	148	3394.2				
214	Gravel-Sized Removed from Primary Screen	(39.0)	(15.9)	(23.2)	(529.5)	5	4,026	3,900	125	2864.7	6			
215	Geotextile Tube Feed Pumps Seal Water from WTP	17	17	0	0.0	7	4,042	3,917	125	2864.7	8			
216	Secondary Screen and Hydrocyclone Screen Wash Water from WTP	0	0	0	0.0									
217	Gravel Removed from Secondary Screen	0.0	0.0	0.0	0.0		4,042	3,917	125	2864.7				
218	Sand Removed from Hydrocyclone	0.0	0.0	0.0	0.0		4,042	3,917	125	2864.7				
219	Clarifier Underflow and Filter Backwash from WTP	992	992	0.4	9.6	9	5,035	4,909	126	2874.4				
220	Filtrate from Screened Material Stockpile	6.3	6.3	0.00046	0.0	10								
221	Runoff to Stockpile Sump (Sump#1)	2.6	2.6	0.00019	0.0	10a								
222	Runoff to Screen Area Sump (Sump#2)	3.5	3.5	0.00025	0.0	10b								
223	Runoff to Polymer/Decon Area Sump (Sump#3)	2.4	2.4	0.00018	0.0	10c								
224	Runoff to WTP Area Sump (Sump#4)	15.4	15.4	0.00112	0.0	10d								
225	Coagulant Emulsion and Makeup Water from WTP	0	0	0.000	0.0									
226	Polymer and Makeup Water from WTP	88	88	0.3	1.5	11	5,153	5,027	126	2875.9	12			
227	Geotextile Tube Retention	(470.2)	(344.6)	(125.6)	(2868.0)	13	4682.8	4682.5	0.3	7.8				
228	Precipitation in SCA and Basins	202	202	0	0.0	14	4884.3	4884.0	0.3	7.8	15			
229	Primary Screen Wash Water	(215)	(215)	0	0.0	16	4669.6	4669.3	0.3	7.8	available			
230		0.0	0.0	0.00	0.0		4669.6	4669.3	0.3	7.8				
231	Net Flow to SCA Basins	0.0	0.0	0.00	0.0	17	4669.6	4669.3	0.3	7.8	18			
232	Clarifier Underflow and Filter Backwash	(992)	(992)	(0.4)	(9.6)		5,610.71	5,610.29	0.429		allowable			
233	Primary Screen Wash Water from WTP	0	0	0.0										
234	Geotextile Tube Feed Pumps Seal Water from WTP	(17)	(17)	0.0										
235	Polymer Makeup Water	(88)	(88)	0			4,618.31	4,618.31	0.007		Flow from WTP			
236	Net Flow to Holding Basin (Downstream Storage)	0	0	0										
237	Maximum Discharge to Metro						4,513.89	4,513.88	0.007		Maximum Discharge to Metro (6.5 MGD)			

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	<b>PARSONS</b>	Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date:1/11/2011	Rev:0	Preparer:	Date:						
2		Project Name: Sediment Management Design	Calculation Title: Mass Balance	Reviewer: MTO	Date: 1/14/2011	Reviewer:	Date:							
3														
4														
5														
6	<b>Incoming Slurry</b>													
7	Slurry Flow Rate, $q$	3,850	gpm											
8	Working Hours, $t$	24	hr/day											
9	Daily Slurry Volume, $q_T$	5,544,000	gallons/day	741,125	ft <sup>3</sup> /day									
10	Solids Content by Weight of Incoming Slurry, $P_s$	11.2%												
11	Specific Gravity of Solids, $G_s$	2.52												
12	Unit Weight of Water, $\gamma_w$	62.4279606	pcf											
13	Slurry Water Content, $WC$	793%												
14	Water Flow Rate, $q_w$	3666	gpm											
15	Dry Solids Flow Rate, $q_s$	184	gpm											
16	Daily Water Volume, $q_w$	5,279,748	gallons/day	705,800	ft <sup>3</sup> /day									
17	Daily Water Weight, $W_w$	44,061,637	lbs/day											
18	Daily Dry Solids Volume, $q_s$	264,252	gallons/day	35,325	ft <sup>3</sup> /day									
19	Daily Dry Solids Weight, $W_s$	5,557,324	lbs/day											
20	Slurry Concentration, $C_{s1}$	1.00	lbs/gallon	7.5	lb/ft <sup>3</sup>									
21	% Water in Slurry (by Volume)	95%												
22														
23														
24	<b>Booster Pump Seal Water</b>													
25	Booster Pump Seal Water (each), $q_{booster}$	0	gpm											
26	Number of Booster Pumps, $N_{booster}$	4												
27	Daily Volume of Booster Pump Seal Water	0	gallons/day	0	ft <sup>3</sup> /day									
28	Daily Weight of Booster Seal Water	0	lbs/day											
29														
30	<b>Primary Screen Wash Water</b>													
31	Primary Screen Wash Water (each), $q_{screen-wash}$	35.8	gpm											
32	Number of Screens, $N_{screen}$	6												
33	Daily Volume of Screen Wash Water	309,174	gallons/day	41,331	ft <sup>3</sup> /day									
34	Daily Weight of Screen Wash Water	2,580,180	lbs/day											
35														
36	<b>Geotextile Tube Feed Pump Seal Water</b>													
37	Geotextile Tube Feed Pump Seal Water (each), $q_{tube-pump}$	8.4	gpm											
38	Number of Geotextile Tube Feed Pumps, $N_{tube-pump}$	2												
39	Daily Volume of Tube Feed Pump Seal Water	24,192	gallons/day	3,234	ft <sup>3</sup> /day									
40	Daily Weight of Tube Feed Pump Seal Water	201,892	lbs/day											
41														
42	<b>Primary Screens (Gravel-Sized Particle Removal, &gt;1/4-inch)</b>													
43	Average Percentage of Gravel-Sized Particles, $P_{gravel-sized}$	0.50%												
44	Daily Dry Weight of Removed Gravel-Sized Particle, $W_{gravel-sized}$	27,787	lbs/day											
45	Daily Volume of Removed Gravel-Sized Particle, $q_{gravel-sized}$	1,321	gallons/day	177	ft <sup>3</sup> /day									
46	Initial Water Content of Removed Gravel-Sized Particles in Stockpile, $WC_{istock}$	25%												
47	Daily Weight of Water Removed with Gravel-Sized Particles, $W_{w-gravel-sized}$	6,947	lbs/day											
48	Daily Volume of Water Removed with Gravel-Sized Particles, $q_{w-gravel-sized}$	832	gallons/day	111	ft <sup>3</sup> /day									
49	Remaining Daily Dry Solids Weight in Slurry, $W_{sr1}$	5,529,537	lbs/day											
50	Remaining Daily Water Weight Slurry, $W_{wr1}$	46,836,763	lbs/day											
51	Remaining Daily Solids Volume Slurry, $q_{sr1}$	262,930	gallons/day	35,149	ft <sup>3</sup> /day									
52	Remaining Daily Water Volume Slurry, $q_{wr1}$	5,612,282	gallons/day	750,253	ft <sup>3</sup> /day									

**Notes**  
 Average flow (70% of maximum flow)  
  
 Tab "Properties", based on weighted average production rate.  
 Tab "Properties", volume and dry density-weighted average value.

Booster pumps use slurry as seal water

Vendor's data

Tab "Properties"

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
53														
54	<b>SCA WTP</b>													
55	I.P Clarifier Sludge (OBG line number 18)													
56	Total Suspended Solids, TSS <sub>clarifier</sub>	1571 mg/L		5946.9 mg/gallon		0.001 gallon/gallon								
57	Clarifier Sludge Flow Rate, q <sub>clarifier</sub>	708.4 gpm												
58	Flow Rate of Solids in Clarifier Sludge, q <sub>TSS-clarifier</sub>	0.44 gpm												
59	Flow Rate of Water in Clarifier Sludge, q <sub>w-clarifier</sub>	708.0 gpm												
60	Weight of Dry Solids in Clarifier Sludge, W <sub>TSS-clarifier</sub>	4.21 kg/min		557.3 lbs/hr		13,374 lbs/day								
61	Spent MMF Backwash (OBG line number 24)													
62	Total Suspended Solids, TSS <sub>MMF</sub>	159.2 mg/L		602.6 mg/gallon		0.0001 gallon/gallon								
63	MMF Backwash Flow Rate, q <sub>MMF</sub>	166.3 gpm												
64	Flow Rate of Solids in MMF Backwash, q <sub>TSS-MMF</sub>	0.01 gpm												
65	Flow Rate of Water in MMF Backwash, q <sub>w-MMF</sub>	166.3 gpm												
66	Weight of Dry Solids in MMF Backwash, W <sub>TSS-MMF</sub>	0.10 kg/min		13.3 lbs/hr		318 lbs/day								
67	Spent GAC Backwash (OBG line number 25)													
68	Total Suspended Solids, TSS <sub>GAC</sub>	128.4 mg/L		486.0 mg/gallon		0.00005 gallon/gallon								
69	GAC Backwash Flow Rate, q <sub>GAC</sub>	117.7 gpm												
70	Flow Rate of Solids in GAC Backwash, q <sub>TSS-GAC</sub>	0.006 gpm												
71	Flow Rate of Water in GAC Backwash, q <sub>w-GAC</sub>	117.7 gpm												
72	Weight of Dry Solids in GAC Backwash, W <sub>TSS-GAC</sub>	0.06 kg/min		7.6 lbs/hr		182 lbs/day								
73	<b>SCA WTP Total</b>													
74	Total Flow Rate, q <sub>WTP</sub>	992.4 gpm		1,429,056 gallons/day		191,037 ft <sup>3</sup> /day								
75	Solid Flow Rate, q <sub>WTP-TSS</sub>	0.5 gpm		660 gallons/day		88 ft <sup>3</sup> /day								
76	Water Flow Rate, q <sub>w-WTP</sub>	991.9 gpm		1,428,396 gallons/day		190,949 ft <sup>3</sup> /day								
77	Water Weight, W <sub>w-WTP</sub>	11,920,545 lbs/day												
78	Solids Weight, W <sub>WTP-TSS</sub>	13,874 lbs/day												
79														
80	<b>Water from Screened Material Stockpile (&gt;1/4 in)</b>													
81	Typical Solids Content of Sand from Hydrocyclone Shaker (TotalClean) (75-85%)	80%												
82	Sand Water Content	25%												
83	Assumed Initial Water Content of Screened Material Stockpile, WC <sub>istock</sub>	25%												
84	Assumed Final Water Content of Screened Material Stockpile, WC <sub>fstock</sub>	15%												
85														
86	Weight of Water Removed from Stockpile (Water Content from 25% to 15%), W <sub>w-stock</sub>	2,779 lbs/day												
87	Volume of Water Removed from Stockpile (Water Content from 25% to 15%), q <sub>w-stock</sub>	333 gallons/day		45 ft <sup>3</sup> /day										
88	Weight of Water Remained in Stockpile, W <sub>wr-stock</sub>	4,168 lbs/day												
89	Volume of Water Remained in Stockpile, q <sub>wr-stock</sub>	499 gallons/day		67 ft <sup>3</sup> /day										
90														
91	<b>Total Suspended Solids in Stockpile Filtrate</b>													
92	Total Suspended Solids, TSS <sub>stock-filtrate</sub>	200 mg/L		757.1 mg/gallon		0.0001 gallon/gallon								
93	Total Stockpile Filtrate Flow Rate, q <sub>stock-filtrate</sub>	0.2 gpm		333 gallons/day										
94	Flow Rate of Solids in Stockpile Filtrate, q <sub>s-stock-filtrate</sub>	1.83523E-05 gpm		0.03 gallons/day		0 ft <sup>3</sup> /day								
95	Flow Rate of Water in Stockpile Filtrate, q <sub>w-stock-filtrate</sub>	0.23 gpm		332.96 gallons/day										
96	Weight of Dry Solids in Stockpile Filtrate, W <sub>TSS-stock-filtrate</sub>	0.000175 kg/min		0.56 lbs/day										
97	Weight of Water in Stockpile Filtrate, W <sub>w-stock-filtrate</sub>	2,779 lbs/day												
98														

**Notes**  
WTP DP#3. Under normal operation condition, WTP sludge and backwash water will be sent to a dedicated geotextile tube directly, without polymer addition.

DeTank TCW-3000

Under normal operation condition, stockpile filtrate and runoff collected by the area sumps (Sump#1 through 4) will be sent to a dedicated geotextile tube directly, without polymer addition.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
99	<b>Runoff from Stockpile Area (Sump#1)</b>													
100	<b>Stockpile Area</b>	40,000	ft <sup>2</sup>											
101	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
102	<b>Runoff Flowrate, q<sub>S1</sub></b>	2.60	gpm	3740.3	gallons/day									
103	Total Suspended Solids, TSS <sub>S1</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
104	Total Sump#1 Flow Rate, q <sub>S1</sub>	2.60	gpm	3741	gallons/day									
105	Flow Rate of Solids in Sump#1 Flow, q <sub>s-S1</sub>	0.000206	gpm	0.297	gallons/day	0	ft <sup>3</sup> /day							
106	Flow Rate of Water in Sump#1 Flow, q <sub>w-S1</sub>	2.60	gpm	3740.26	gallons/day									
107	Weight of Dry Solids in Sump#1 Flow, W <sub>TSS-S1</sub>	0.001967	kg/min	6.24	lbs/day									
108	Weight of Water in Sump#1 Flow, W <sub>w-S1</sub>	31,214	lbs/day											
109														
110	<b>Runoff from Screen Area (Sump#2)</b>													
111	<b>Screen Area</b>	53,483	ft <sup>2</sup>											
112	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
113	<b>Runoff Flowrate, q<sub>S2</sub></b>	3.47	gpm	5001.0	gallons/day									
114	Total Suspended Solids, TSS <sub>S2</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
115	Total Sump#2 Flow Rate, q <sub>S2</sub>	3.47	gpm	5001	gallons/day									
116	Flow Rate of Solids in Sump#2 Flow, q <sub>s-S2</sub>	0.000276	gpm	0.40	gallons/day	0	ft <sup>3</sup> /day							
117	Flow Rate of Water in Sump#2 Flow, q <sub>w-S2</sub>	3.47	gpm	5001.01	gallons/day									
118	Weight of Dry Solids in Sump#2 Flow, W <sub>TSS-S2</sub>	0.002629	kg/min	8.35	lbs/day									
119	Weight of Water in Sump#2 Flow, W <sub>w-S2</sub>	41,735	lbs/day											
120														
121	<b>Runoff from Polymer and Decon Area (Sump#3)</b>													
122	<b>Polymer and Decon Area</b>	37,711	ft <sup>2</sup>											
123	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
124	<b>Runoff Flowrate, q<sub>S3</sub></b>	2.45	gpm	3526.2	gallons/day									
125	Total Suspended Solids, TSS <sub>S3</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
126	Total Sump#3 Flow Rate, q <sub>S3</sub>	2.45	gpm	3527	gallons/day									
127	Flow Rate of Solids in Sump#3 Flow, q <sub>s-S3</sub>	0.000194	gpm	0.28	gallons/day	0	ft <sup>3</sup> /day							
128	Flow Rate of Water in Sump#3 Flow, q <sub>w-S3</sub>	2.45	gpm	3526.22	gallons/day									
129	Weight of Dry Solids in Sump#3 Flow, W <sub>TSS-S3</sub>	0.001854	kg/min	5.89	lbs/day									
130	Weight of Water in Sump#3 Flow, W <sub>w-S3</sub>	29,428	lbs/day											
131														
132	<b>Runoff from WTP Area (Sump#4)</b>													
133	<b>WTP Area</b>	236,949	ft <sup>2</sup>											
134	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
135	<b>Runoff Flowrate, q<sub>S4</sub></b>	15.39	gpm	22156.3	gallons/day									
136	Total Suspended Solids, TSS <sub>S4</sub>	200	mg/L	757.1	mg/gallon	0.0001	gallon/gallon							
137	Total Sump#4 Flow Rate, q <sub>S4</sub>	15.39	gpm	22158	gallons/day									
138	Flow Rate of Solids in Sump#4 Flow, q <sub>s-S4</sub>	0.001221	gpm	1.76	gallons/day	0	ft <sup>3</sup> /day							
139	Flow Rate of Water in Sump#4 Flow, q <sub>w-S4</sub>	15.39	gpm	22156.27	gallons/day									
140	Weight of Dry Solids in Sump#4 Flow, W <sub>TSS-S4</sub>	0.011649	kg/min	36.98	lbs/day									
141	Weight of Water in Sump#4 Flow, W <sub>w-S4</sub>	184,903	lbs/day											
142														
143	<b>Polymer and Makeup Water</b>													
144	Percent Fines in Slurry Solids, P <sub>fine</sub>	90.0%												
145	Fine Solids Weight	5001591.28	lbs/day											
146	Polymer Dosage Rate (lbs of dry polymer per dry ton of solids), DOS <sub>polymer</sub>	1.59	lbs/ton											
147	Dry Polymer Density, DEN <sub>polymer</sub>	0.70	g/cm <sup>3</sup>											
148	Daily Dry Polymer Needed, W <sub>drypolymer</sub>	3976.27	lbs/day	2.761	lbs/min									
149	Dry Polymer Volume, q <sub>drypolymer</sub>	0.4727	gpm	681	gallons/day	91	ft <sup>3</sup> /day							
150	Polymer Makeup Water Volume, q <sub>makeupwater</sub>	165.44	gpm	238,231	gallons/day	31,847	ft <sup>3</sup> /day							
151	Polymer Makeup water Weight, W <sub>makeupwater</sub>	1,988,133	lbs/day											

Based on P-GDT draft report.  
Ashland 2520 MSDS

Based on P-GDT draft report 0.2% dilution

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
152														
153	<b>Coagulant (Emulsion)</b>													
154	Coagulant Dosage Rate lbs of emulsion per dry ton of solids, $DOS_{coag}$	Not Applicable												
155	Coagulant Density, $DEN_{coag}$													
156	Coagulant Flow Rate, $q_{coag}$													
157	Coagulant Weight, $W_{coag}$													
158														
159	<b>RA-A Primary Screens and Polymer Injection</b>													
160	<b>Initial Dewatering in Geotextile Tubes (i.e., the first 24 hrs in the tubes)</b>													
161	Daily Weight of Water in Influent to Tubes	60,950,112 lbs/day												
162	Daily Volume of Water in Influent to Tubes	7,303,434 gallons/day	976327.1324 ft <sup>3</sup> /day											
163	Solids Content by Weight after Initial Dewatering in Tubes, $P_{s2}$	38%												
164	Daily Weight of Dry Solids Retained in Tubes, $W_{s-ret2}$	5,547,445 lbs/day												
165	Daily Volume of Solids Retained in Tubes, $q_{s-ret2}$	264,274 gallons/day	35,328 ft <sup>3</sup> /day											
166	Daily Weight of Water Retained in Tubes after Initial Dewatering, $W_{ret2}$	9,051,095 lbs/day												
167	Daily Volume of Water Retained in Tubes after Initial Dewatering, $q_{ret2}$	1,084,560 gallons/day	144984.6302 ft <sup>3</sup> /day											
168	Daily Weight of Water in Initial Filtrate Weight, $W_{if}$	52,186,297 lbs/day												
169	Daily Volume of Water in Initial Filtrate, $q_{if}$	6,253,297 gallons/day	835944.2897 ft <sup>3</sup> /day											
170	<b>Consolidation Dewatering in Geotextile Tubes</b>													
171	Solids Content by Weight after Consolidation Dewatering, $P_{s3}$	50%												
172	Peak Daily Weight of Retained Water in Tubes after Consolidation Dewatering, $W_{ret3}$	5,547,445 lbs/day												
173	Peak Daily Volume of Retained Water in Tubes after Consolidation Dewatering, $q_{ret3}$	664,731 gallons/day	88,862 ft <sup>3</sup> /day											
174	Peak Daily Weight of Water in Consolidation Dewatering Filtrate, $W_{cf}$	3,503,650 lbs/day												
175	Peak Daily Volume of Water in Consolidation Dewatering Filtrate, $q_{cf}$	419,830 gallons/day	56,123 ft <sup>3</sup> /day											
176	Consolidation Dewatering Duration, $t_c$	60 days												
177	Average Water Volume from Consolidation Dewatering of One Day Filling, $q_{dcf}$	6,997 gallons/day	935 ft <sup>3</sup> /day											
178														
179	Peak Volume of Water in Geotextile Tube Filtrate, $q_{tube-filtrate}$	6,673,127 gallons/day	892,067 ft <sup>3</sup> /day											
180	Daily Water Retained in Geotextile Tube, $q_{w-retained}$	664,731 gallons/day	88,862 ft <sup>3</sup> /day											
181														
182	<b>Total Suspended Solids in Geotextile Tube Filtrate</b>													
183	Total Suspended Solids, $TSS_{tube-filtrate}$	200 mg/L	757.1 mg/gallon	0.0001 gallon/gallon										
184	Total Geotextile Tube Filtrate Flow Rate, $q_{tube-filtrate}$	4634.5 gpm	6,673,657 gallons/day											
185	Flow Rate of Solids in Geotextile Tube Filtrate, $q_{s-tube-filtrate}$	0.37 gpm	530 gallons/day											
186	Flow Rate of Water in Geotextile Tube Filtrate, $q_{w-tube-filtrate}$	4634.1 gpm	6,673,127 gallons/day											
187	Weight of Dry Solids in Geotextile Tube Filtrate, $W_{TSS-tube-filtrate}$	3.51 kg/min	11,139 lbs/day											
188														
189	<b>Precipitation in SCA and SCA Basins</b>													
190	Daily Precipitation, $PRE_{daily}$ (inch)	Open Area, $A_{SCA}$ (acres)	Flow Rate, $q_{PRE}$ (gpd)	Flow Rate, $q_{PRE}$ (gpm)										
191	0.15	71.25	290,211	201.5										
192														
193	<b>pH Adjust Tank Influent (OBG line number 11)</b>													
194	Total Suspended Solids, $TSS_{influent}$	200.5 mg/L	758.98 mg/gallon	7.95635E-05 gallon/gallon										
195	Total Flow Rate, $MAX_{influent}$	5,663 gpm	8,154,720 gallons/day											
196	Flow Rate of Solids in Influent, $q_{TSS-influent}$	0.451 gpm	649 gallons/day											
197	Flow Rate of Water in Influent, $q_{w-influent}$	5662.55 gpm	8,154,071 gallons/day											
198	Weight of Dry Solids in Influent, $W_{TSS-influent}$	4.30 kg/min	568.5 lbs/hr	13644.9 lbs/day										
199														
200	<b>Effluent Tank Discharge (OBG line number 23)</b>													
201	Total Suspended Solids, $TSS_{discharge}$	4.5 mg/L	17.03 mg/gallon	1.78571E-06 gallon/gallon										
202	Total Flow Rate, $MAX_{discharge}$	4,514 gpm	6,500,000 gallons/day											
203	Flow Rate of Solids in Discharge, $q_{TSS-dis}$	0.008 gpm	12 gallons/day											
204	Flow Rate of Water in Discharge, $q_{w-dis}$	4513.88 gpm	6,499,988 gallons/day											
205	Weight of Dry Solids in Discharge, $W_{TSS-dis}$	0.08 kg/min	10.2 lbs/hr	244.1 lbs/day										

Notes  
Based on P-GDT draft report.

Assumed value

Notes  
WTP BOD

On-site met data.

Maximum

WTP DP#3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
206	<b>Mass Balance Tables</b>													
207	<b>RA-D</b>													
208	<b>RA-D</b>													
209		Incremental					Accumulative					Notes		
210		Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number	Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number			
211	Dredge Slurry	3850	3666	184	3859.3	1	3,850	3,666	184	3859.3				
212	Booster Pumps Seal Water	0	0	0	0.0	2	3,850	3,666	184	3859.3	3			
213	Primary Screen Wash Water	215	215	0	0.0	4	4,065	3,881	184	3859.3				
214	Gravel-Sized Removed from Primary Screen	(1.5)	(0.6)	(0.9)	(19.3)	5	4,063	3,881	183	3840.0	6			
215	Geotextile Tube Feed Pumps Seal Water from WTP	17	17	0	0.0	7	4,080	3,897	183	3840.0	8			
216	Secondary Screen and Hydrocyclone Screen Wash Water from WTP	0	0	0	0.0									
217	Gravel Removed from Secondary Screen	0.0	0.0	0.0	0.0		4,080	3,897	183	3840.0				
218	Sand Removed from Hydrocyclone	0.0	0.0	0.0	0.0		4,080	3,897	183	3840.0				
219	Clarifier Underflow and Filter Backwash from WTP	992	992	0.5	9.6	9	5,072	4,889	183	3849.6				
220	Filtrate from Screened Material Stockpile	0.2	0.2	0.00002	0.0	10								
221	Runoff to Stockpile Sump (Sump#1)	2.6	2.6	0.00021	0.0	10a								
222	Runoff to Screen Area Sump (Sump#2)	3.5	3.5	0.00028	0.0	10b								
223	Runoff to Polymer/Decon Area Sump (Sump#3)	2.4	2.4	0.00019	0.0	10c								
224	Runoff to WTP Area Sump (Sump#4)	15.4	15.4	0.00122	0.0	10d								
225	Coagulant Emulsion and Makeup Water from WTP	0	0	0.000	0.0									
226	Polymer and Makeup Water from WTP	166	165	0.5	2.8	11	5,262	5,079	184	3852.4	12			
227	Geotextile Tube Retention	(644.8)	(461.6)	(183.2)	(3844.7)	13	4617.7	4617.3	0.4	7.7				
228	Precipitation in SCA and Basins	202	202	0	0.0	14	4819.2	4818.9	0.4	7.7	15			
229	Primary Screen Wash Water	(215)	(215)	0	0.0	16	4604.5	4604.1	0.4	7.7	available			
230		0.0	0.0	0.00	0.0		4604.5	4604.1	0.4	7.7				
231	Net Flow to SCA Basins	0.0	0.0	0.00	0.0	17	4604.5	4604.1	0.4	7.7	18	Maximum Flow from EQ Basin to WTP		
232	Clarifier Underflow and Filter Backwash	(992)	(992)	(0.5)	(9.6)		5,688.53	5,688.06	0.466		allowable			
233	Primary Screen Wash Water from WTP	0	0	0.0										
234	Geotextile Tube Feed Pumps Seal Water from WTP	(17)	(17)	0.0										
235	Polymer Makeup Water	(165)	(165)	0			4,696.13	4,696.12	0.008			Flow from WTP		
236	Net Flow to Holding Basin (Downstream Storage)	0	0	0										
237	Maximum Discharge to Metro						4,513.89	4,513.88	0.008			Maximum Discharge to Metro (6.5 MGD)		

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	<b>PARSONS</b>	Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date:1/11/2011	Rev:0	Preparer:	Date:						
2		Project Name: Sediment Management Design	Calculation Title: Mass Balance	Reviewer: MTO	Date: 1/14/2011		Reviewer:	Date:						
3														
4														
5														
6	<b>Incoming Slurry</b>													
7	Slurry Flow Rate, $q$	3,850	gpm											
8	Working Hours, $t$	24	hr/day											
9	Daily Slurry Volume, $q_T$	5,544,000	gallons/day	741,125	ft <sup>3</sup> /day									
10	Solids Content by Weight of Incoming Slurry, $P_s$	11.7%												
11	Specific Gravity of Solids, $G_s$	2.68												
12	Unit Weight of Water, $\gamma_w$	62.4279606	pcf											
13	Slurry Water Content, $WC$	755%												
14	Water Flow Rate, $q_w$	3669	gpm											
15	Dry Solids Flow Rate, $q_s$	181	gpm											
16	Daily Water Volume, $q_w$	5,282,811	gallons/day	706,209	ft <sup>3</sup> /day									
17	Daily Water Weight, $W_w$	44,087,194	lbs/day											
18	Daily Dry Solids Volume, $q_s$	261,189	gallons/day	34,916	ft <sup>3</sup> /day									
19	Daily Dry Solids Weight, $W_s$	5,841,678	lbs/day											
20	Slurry Concentration, $C_{s1}$	1.05	lbs/gallon	7.9	lb/ft <sup>3</sup>									
21	% Water in Slurry (by Volume)	95%												
22														
23														
24	<b>Booster Pump Seal Water</b>													
25	Booster Pump Seal Water (each), $q_{booster}$	0	gpm											
26	Number of Booster Pumps, $N_{booster}$	4												
27	Daily Volume of Booster Pump Seal Water	0	gallons/day	0	ft <sup>3</sup> /day									
28	Daily Weight of Booster Seal Water	0	lbs/day											
29														
30	<b>Primary Screen Wash Water</b>													
31	Primary Screen Wash Water (each), $q_{screen-wash}$	35.8	gpm											
32	Number of Screens, $N_{screen}$	6												
33	Daily Volume of Screen Wash Water	309,174	gallons/day	41,331	ft <sup>3</sup> /day									
34	Daily Weight of Screen Wash Water	2,580,180	lbs/day											
35														
36	<b>Geotextile Tube Feed Pump Seal Water</b>													
37	Geotextile Tube Feed Pump Seal Water (each), $q_{tube-pump}$	8.4	gpm											
38	Number of Geotextile Tube Feed Pumps, $N_{tube-pump}$	2												
39	Daily Volume of Tube Feed Pump Seal Water	24,192	gallons/day	3,234	ft <sup>3</sup> /day									
40	Daily Weight of Tube Feed Pump Seal Water	201,892	lbs/day											
41														
42	<b>Primary Screens (Gravel-Sized Particle Removal, &gt;1/4-inch)</b>													
43	Average Percentage of Gravel-Sized Particles, $P_{gravel-sized}$	0.30%												
44	Daily Dry Weight of Removed Gravel-Sized Particle, $W_{gravel-sized}$	17,525	lbs/day											
45	Daily Volume of Removed Gravel-Sized Particle, $q_{gravel-sized}$	784	gallons/day	105	ft <sup>3</sup> /day									
46	Initial Water Content of Removed Gravel-Sized Particles in Stockpile, $WC_{istock}$	25%												
47	Daily Weight of Water Removed with Gravel-Sized Particles, $W_{w-gravel-sized}$	4,381	lbs/day											
48	Daily Volume of Water Removed with Gravel-Sized Particles, $q_{w-gravel-sized}$	525	gallons/day	70	ft <sup>3</sup> /day									
49	Remaining Daily Dry Solids Weight in Slurry, $W_{sr1}$	5,824,153	lbs/day											
50	Remaining Daily Water Weight Slurry, $W_{wr1}$	46,864,885	lbs/day											
51	Remaining Daily Solids Volume Slurry, $q_{sr1}$	260,406	gallons/day	34,811	ft <sup>3</sup> /day									
52	Remaining Daily Water Volume Slurry, $q_{wr1}$	5,615,651	gallons/day	750,703	ft <sup>3</sup> /day									

**Notes**  
Average flow (70% of maximum flow)  
  
Tab "Properties", based on weighted average production rate.  
Tab "Properties", volume and dry density-weighted average value.

Booster pumps use slurry as seal water

Vendor's data

Tab "Properties"

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
53														
54	<b>SCA WTP</b>													
55	I.P Clarifier Sludge (OBG line number 18)													
56	Total Suspended Solids, TSS <sub>clarifier</sub>	1571 mg/L		5946.9 mg/gallon		0.001 gallon/gallon								
57	Clarifier Sludge Flow Rate, q <sub>clarifier</sub>	708.4 gpm												
58	Flow Rate of Solids in Clarifier Sludge, q <sub>TSS-clarifier</sub>	0.42 gpm												
59	Flow Rate of Water in Clarifier Sludge, q <sub>w-clarifier</sub>	708.0 gpm												
60	Weight of Dry Solids in Clarifier Sludge, W <sub>TSS-clarifier</sub>	4.21 kg/min		557.3 lbs/hr		13,374 lbs/day								
61	Spent MMF Backwash (OBG line number 24)													
62	Total Suspended Solids, TSS <sub>MMF</sub>	159.2 mg/L		602.6 mg/gallon		0.0001 gallon/gallon								
63	MMF Backwash Flow Rate, q <sub>MMF</sub>	166.3 gpm												
64	Flow Rate of Solids in MMF Backwash, q <sub>TSS-MMF</sub>	0.01 gpm												
65	Flow Rate of Water in MMF Backwash, q <sub>w-MMF</sub>	166.3 gpm												
66	Weight of Dry Solids in MMF Backwash, W <sub>TSS-MMF</sub>	0.10 kg/min		13.3 lbs/hr		318 lbs/day								
67	Spent GAC Backwash (OBG line number 25)													
68	Total Suspended Solids, TSS <sub>GAC</sub>	128.4 mg/L		486.0 mg/gallon		0.00005 gallon/gallon								
69	GAC Backwash Flow Rate, q <sub>GAC</sub>	117.7 gpm												
70	Flow Rate of Solids in GAC Backwash, q <sub>TSS-GAC</sub>	0.006 gpm												
71	Flow Rate of Water in GAC Backwash, q <sub>w-GAC</sub>	117.7 gpm												
72	Weight of Dry Solids in GAC Backwash, W <sub>TSS-GAC</sub>	0.06 kg/min		7.6 lbs/hr		182 lbs/day								
73	<b>SCA WTP Total</b>													
74	Total Flow Rate, q <sub>WTP</sub>	992.4 gpm		1,429,056 gallons/day		191,037 ft <sup>3</sup> /day								
75	Solid Flow Rate, q <sub>WTP-TSS</sub>	0.4 gpm		620 gallons/day		83 ft <sup>3</sup> /day								
76	Water Flow Rate, q <sub>w-WTP</sub>	992.0 gpm		1,428,436 gallons/day		190,954 ft <sup>3</sup> /day								
77	Water Weight, W <sub>w-WTP</sub>	11,920,874 lbs/day												
78	Solids Weight, W <sub>WTP-TSS</sub>	13,874 lbs/day												
79														
80	<b>Water from Screened Material Stockpile (&gt;1/4 in)</b>													
81	Typical Solids Content of Sand from Hydrocyclone Shaker (TotalClean) (75-85%)	80%												
82	Sand Water Content	25%												
83	Assumed Initial Water Content of Screened Material Stockpile, WC <sub>istock</sub>	25%												
84	Assumed Final Water Content of Screened Material Stockpile, WC <sub>fstock</sub>	15%												
85														
86	Weight of Water Removed from Stockpile (Water Content from 25% to 15%), W <sub>w-stock</sub>	1,753 lbs/day												
87	Volume of Water Removed from Stockpile (Water Content from 25% to 15%), q <sub>w-stock</sub>	210 gallons/day		28 ft <sup>3</sup> /day										
88	Weight of Water Remained in Stockpile, W <sub>wr-stock</sub>	2,629 lbs/day												
89	Volume of Water Remained in Stockpile, q <sub>wr-stock</sub>	315 gallons/day		42 ft <sup>3</sup> /day										
90														
91	<b>Total Suspended Solids in Stockpile Filtrate</b>													
92	Total Suspended Solids, TSS <sub>stock-filtrate</sub>	200 mg/L		757.1 mg/gallon		0.0001 gallon/gallon								
93	Total Stockpile Filtrate Flow Rate, q <sub>stock-filtrate</sub>	0.1 gpm		210 gallons/day										
94	Flow Rate of Solids in Stockpile Filtrate, q <sub>s-stock-filtrate</sub>	1.08837E-05 gpm		0.02 gallons/day		0 ft <sup>3</sup> /day								
95	Flow Rate of Water in Stockpile Filtrate, q <sub>w-stock-filtrate</sub>	0.15 gpm		210.00 gallons/day										
96	Weight of Dry Solids in Stockpile Filtrate, W <sub>TSS-stock-filtrate</sub>	0.000110 kg/min		0.35 lbs/day										
97	Weight of Water in Stockpile Filtrate, W <sub>w-stock-filtrate</sub>	1,753 lbs/day												
98														

**Notes**  
WTP DP#3. Under normal operation condition, WTP sludge and backwash water will be sent to a dedicated geotextile tube directly, without polymer addition.

DeTank TCW-3000

Under normal operation condition, stockpile filtrate and runoff collected by the area sumps (Sump#1 through 4) will be sent to a dedicated geotextile tube directly, without polymer addition.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
99	<b>Runoff from Stockpile Area (Sump#1)</b>													
100	<b>Stockpile Area</b>	40,000	ft <sup>2</sup>											
101	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
102	<b>Runoff Flowrate, q<sub>S1</sub></b>	2.60	gpm			3740.3	gallons/day							
103	Total Suspended Solids, TSS <sub>S1</sub>	200	mg/L			757.1	mg/gallon			0.0001	gallon/gallon			
104	Total Sump#1 Flow Rate, q <sub>S1</sub>	2.60	gpm			3741	gallons/day							
105	Flow Rate of Solids in Sump#1 Flow, q <sub>s-S1</sub>	0.000194	gpm			0.279	gallons/day			0	ft <sup>3</sup> /day			
106	Flow Rate of Water in Sump#1 Flow, q <sub>w-S1</sub>	2.60	gpm			3740.26	gallons/day							
107	Weight of Dry Solids in Sump#1 Flow, W <sub>TSS-S1</sub>	0.001967	kg/min			6.24	lbs/day							
108	Weight of Water in Sump#1 Flow, W <sub>w-S1</sub>	31,214	lbs/day											
109														
110	<b>Runoff from Screen Area (Sump#2)</b>													
111	<b>Screen Area</b>	53,483	ft <sup>2</sup>											
112	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
113	<b>Runoff Flowrate, q<sub>S2</sub></b>	3.47	gpm			5001.0	gallons/day							
114	Total Suspended Solids, TSS <sub>S2</sub>	200	mg/L			757.1	mg/gallon			0.0001	gallon/gallon			
115	Total Sump#2 Flow Rate, q <sub>S2</sub>	3.47	gpm			5001	gallons/day							
116	Flow Rate of Solids in Sump#2 Flow, q <sub>s-S2</sub>	0.000259	gpm			0.37	gallons/day			0	ft <sup>3</sup> /day			
117	Flow Rate of Water in Sump#2 Flow, q <sub>w-S2</sub>	3.47	gpm			5001.01	gallons/day							
118	Weight of Dry Solids in Sump#2 Flow, W <sub>TSS-S2</sub>	0.002629	kg/min			8.35	lbs/day							
119	Weight of Water in Sump#2 Flow, W <sub>w-S2</sub>	41,735	lbs/day											
120														
121	<b>Runoff from Polymer and Decon Area (Sump#3)</b>													
122	<b>Polymer and Decon Area</b>	37,711	ft <sup>2</sup>											
123	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
124	<b>Runoff Flowrate, q<sub>S3</sub></b>	2.45	gpm			3526.2	gallons/day							
125	Total Suspended Solids, TSS <sub>S3</sub>	200	mg/L			757.1	mg/gallon			0.0001	gallon/gallon			
126	Total Sump#3 Flow Rate, q <sub>S3</sub>	2.45	gpm			3526	gallons/day							
127	Flow Rate of Solids in Sump#3 Flow, q <sub>s-S3</sub>	0.000183	gpm			0.26	gallons/day			0	ft <sup>3</sup> /day			
128	Flow Rate of Water in Sump#3 Flow, q <sub>w-S3</sub>	2.45	gpm			3526.22	gallons/day							
129	Weight of Dry Solids in Sump#3 Flow, W <sub>TSS-S3</sub>	0.001854	kg/min			5.89	lbs/day							
130	Weight of Water in Sump#3 Flow, W <sub>w-S3</sub>	29,428	lbs/day											
131														
132	<b>Runoff from WTP Area (Sump#4)</b>													
133	<b>WTP Area</b>	236,949	ft <sup>2</sup>											
134	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
135	<b>Runoff Flowrate, q<sub>S4</sub></b>	15.39	gpm			22156.3	gallons/day							
136	Total Suspended Solids, TSS <sub>S4</sub>	200	mg/L			757.1	mg/gallon			0.0001	gallon/gallon			
137	Total Sump#4 Flow Rate, q <sub>S4</sub>	15.39	gpm			22158	gallons/day							
138	Flow Rate of Solids in Sump#4 Flow, q <sub>s-S4</sub>	0.001148	gpm			1.65	gallons/day			0	ft <sup>3</sup> /day			
139	Flow Rate of Water in Sump#4 Flow, q <sub>w-S4</sub>	15.39	gpm			22156.27	gallons/day							
140	Weight of Dry Solids in Sump#4 Flow, W <sub>TSS-S4</sub>	0.011649	kg/min			36.98	lbs/day							
141	Weight of Water in Sump#4 Flow, W <sub>w-S4</sub>	184,903	lbs/day											
142														
143	<b>Polymer and Makeup Water</b>													
144	Percent Fines in Slurry Solids, P <sub>fine</sub>	76.7%												
145	Fine Solids Weight	4480567.05	lbs/day											
146	Polymer Dosage Rate (lbs of dry polymer per dry ton of solids), DOS <sub>polymer</sub>	1.59	lbs/ton											
147	Dry Polymer Density, DEN <sub>polymer</sub>	0.70	g/cm <sup>3</sup>											
148	Daily Dry Polymer Needed, W <sub>drypolymer</sub>	3562.05	lbs/day			2.474	lbs/min							
149	Dry Polymer Volume, q <sub>drypolymer</sub>	0.4234	gpm			610	gallons/day			82	ft <sup>3</sup> /day			
150	Polymer Makeup Water Volume, q <sub>makeupwater</sub>	148.20	gpm			213,414	gallons/day			28,529	ft <sup>3</sup> /day			
151	Polymer Makeup water Weight, W <sub>makeupwater</sub>	1,781,025	lbs/day											

Based on P-GDT draft report.  
Ashland 2520 MSDS

Based on P-GDT draft report 0.2% dilution

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
152														
153	<b>Coagulant (Emulsion)</b>													
154	Coagulant Dosage Rate (lbs of emulsion per dry ton of solids), $DOS_{coag}$		5.71 lbs/ton											
155	Coagulant Emulsion Density, $DEN_{coag}$		1.03 g/cm <sup>3</sup>	64.300799 pcf										
156	Coagulant Emulsion Flow Rate, $q_{coag}$		1.03 gpm	1488 gallons/day	199 ft <sup>3</sup> /day									
157	Coagulant Emulsion Weight, $W_{coag}$		8.9 lbs/min	12,792 lbs/day										
158	Weight of Coagulant Makeup Water, $W_{coagwater}$		888.3 lbs/min	1,279,202 lbs/day										
159	Volume of Coagulant Makeup Water, $q_{coagwater}$		106.4 gpm	153282 gallons/day										
160														
161	<b>RA-A Primary Screens and Polymer Injection</b>													
162	<b>Initial Dewatering in Geotextile Tubes (i.e., the first 24 hrs in the tubes)</b>													
163	Daily Weight of Water in Influent to Tubes		60,770,429 lbs/day											
164	Daily Volume of Water in Influent to Tubes		7,281,903 gallons/day	973448.8924 ft <sup>3</sup> /day										
165	Solids Content by Weight after Initial Dewatering in Tubes, $P_{s2}$		38%											
166	Daily Weight of Dry Solids Retained in Tubes, $W_{s-ret2}$		5,854,439 lbs/day											
167	Daily Volume of Solids Retained in Tubes, $q_{s-ret2}$		263,127 gallons/day	35,175 ft <sup>3</sup> /day										
168	Daily Weight of Water Retained in Tubes after Initial Dewatering, $W_{ret2}$		9,551,979 lbs/day											
169	Daily Volume of Water Retained in Tubes after Initial Dewatering, $q_{ret2}$		1,144,579 gallons/day	153008.0261 ft <sup>3</sup> /day										
170	Daily Weight of Water in Initial Filtrate Weight, $W_{if}$		52,784,932 lbs/day											
171	Daily Volume of Water in Initial Filtrate, $q_{if}$		6,325,030 gallons/day	845533.5025 ft <sup>3</sup> /day										
172	<b>Consolidation Dewatering in Geotextile Tubes</b>													
173	Solids Content by Weight after Consolidation Dewatering, $P_{s3}$		50%											
174	Peak Daily Weight of Retained Water in Tubes after Consolidation Dewatering, $W_{ret3}$		5,854,439 lbs/day											
175	Peak Daily Volume of Retained Water in Tubes after Consolidation Dewatering, $q_{ret3}$		701,516 gallons/day	93,779 ft <sup>3</sup> /day										
176	Peak Daily Weight of Water in Consolidation Dewatering Filtrate, $W_{cf}$		3,697,540 lbs/day											
177	Peak Daily Volume of Water in Consolidation Dewatering Filtrate, $q_{cf}$		443,063 gallons/day	59,229 ft <sup>3</sup> /day										
178	Consolidation Dewatering Duration, $t_c$		60 days											
179	Average Water Volume from Consolidation Dewatering of One Day Filling, $q_{dcf}$		7,384 gallons/day	987 ft <sup>3</sup> /day										
180														
181	Peak Volume of Water in Geotextile Tube Filtrate, $q_{tube-filtrate}$		6,768,093 gallons/day	904,762 ft <sup>3</sup> /day										
182	Daily Water Retained in Geotextile Tube, $q_{w-retained}$		701,516 gallons/day	93,779 ft <sup>3</sup> /day										
183														
184	<b>Total Suspended Solids in Geotextile Tube Filtrate</b>													
185	Total Suspended Solids, $TSS_{tube-filtrate}$		200 mg/L	757.1 mg/gallon	0.0001 gallon/gallon									
186	Total Geotextile Tube Filtrate Flow Rate, $q_{tube-filtrate}$		4700.4 gpm	6,768,598 gallons/day										
187	Flow Rate of Solids in Geotextile Tube Filtrate, $q_{s-tube-filtrate}$		0.35 gpm	505 gallons/day										
188	Flow Rate of Water in Geotextile Tube Filtrate, $q_{w-tube-filtrate}$		4700.1 gpm	6,768,093 gallons/day										
189	Weight of Dry Solids in Geotextile Tube Filtrate, $W_{TSS-tube-filtrate}$		3.56 kg/min	11,297 lbs/day										
190														
191	<b>Precipitation in SCA and SCA Basins</b>													
192	Daily Precipitation, $PRE_{daily}$ (inch)	Open Area, $A_{SCA}$ (acres)	Flow Rate, $q_{PRE}$ (gpd)	Flow Rate, $q_{PRE}$ (gpm)										
193	0.15	71.25	290,211	201.5										
194														
195	<b>pH Adjust Tank Influent (OBG line number 11)</b>													
196	Total Suspended Solids, $TSS_{influent}$		200.5 mg/L	758.98 mg/gallon	7.48134E-05 gallon/gallon									
197	Total Flow Rate, $MAX_{influent}$		5,663 gpm	8,154,720 gallons/day										
198	Flow Rate of Solids in Influent, $q_{TSS-influent}$		0.424 gpm	610 gallons/day										
199	Flow Rate of Water in Influent, $q_{w-influent}$		5662.58 gpm	8,154,110 gallons/day										
200	Weight of Dry Solids in Influent, $W_{TSS-influent}$		4.30 kg/min	568.5 lbs/hr	13644.9 lbs/day									
201														
202	<b>Effluent Tank Discharge (OBG line number 23)</b>													
203	Total Suspended Solids, $TSS_{discharge}$		4.5 mg/L	17.03 mg/gallon	1.6791E-06 gallon/gallon									
204	Total Flow Rate, $MAX_{discharge}$		4,514 gpm	6,500,000 gallons/day										
205	Flow Rate of Solids in Discharge, $q_{TSS-dis}$		0.008 gpm	11 gallons/day										
206	Flow Rate of Water in Discharge, $q_{w-dis}$		4513.88 gpm	6,499,989 gallons/day										
207	Weight of Dry Solids in Discharge, $W_{TSS-dis}$		0.08 kg/min	10.2 lbs/hr	244.1 lbs/day									

Based on P-GDT draft report.  
Based on Ashland 492 MSDS

**Notes**

Based on P-GDT draft report.

Assumed value

**Notes**  
WTP BOD

On-site met data.

**Maximum**

WTP DP#3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
208	<b>Mass Balance Tables</b>													
209	<b>RA-A</b>													
210	<b>RA-A</b>													
211		Incremental					Accumulative					Notes		
212		Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number	Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number			
213	Dredge Slurry	3850	3669	181	4056.7	1	3,850	3,669	181	4056.7				
214	Booster Pumps Seal Water	0	0	0	0.0	2	3,850	3,669	181	4056.7	3			
215	Primary Screen Wash Water	215	215	0	0.0	4	4,065	3,883	181	4056.7				
216	Gravel-Sized Removed from Primary Screen	(0.9)	(0.4)	(0.5)	(12.2)	5	4,064	3,883	181	4044.6	6			
217	Geotextile Tube Feed Pumps Seal Water from WTP	17	17	0	0.0	7	4,081	3,900	181	4044.6	8			
218	Secondary Screen and Hydrocyclone Screen Wash Water from WTP	0	0	0	0.0									
219	Gravel Removed from Secondary Screen	0.0	0.0	0.0	0.0		4,081	3,900	181	4044.6				
220	Sand Removed from Hydrocyclone	0.0	0.0	0.0	0.0		4,081	3,900	181	4044.6				
221	Clarifier Underflow and Filter Backwash from WTP	992	992	0.4	9.6	9	5,073	4,892	181	4054.2				
222	Filtrate from Screened Material Stockpile	0.1	0.1	0.00001	0.0	10								
223	Runoff to Stockpile Sump (Sump#1)	2.6	2.6	0.00019	0.0	10a								
224	Runoff to Screen Area Sump (Sump#2)	3.5	3.5	0.00026	0.0	10b								
225	Runoff to Polymer/Decon Area Sump (Sump#3)	2.4	2.4	0.00018	0.0	10c								
226	Runoff to WTP Area Sump (Sump#4)	15.4	15.4	0.00115	0.0	10d								
227	Coagulant, Polymer, and Makeup Water from WTP	256	255	1.5	11.4	11	5,353	5,170	183	4065.6	12			
228	Geotextile Tube Retention	(669.5)	(487.2)	(182.4)	(4057.7)	13	4683.6	4683.3	0.4	7.8				
229	Precipitation in SCA and Basins	202	202	0	0.0	14	4885.2	4884.8	0.4	7.8	15			
230	Primary Screen Wash Water	(215)	(215)	0	0.0	16	4670.4	4670.1	0.4	7.8	available			
231		0.0	0.0	0.00	0.0		4670.4	4670.1	0.4	7.8				
232	Net Flow to SCA Basins	0.0	0.0	0.00	0.0	17	4670.4	4670.1	0.4	7.8	18	Maximum Flow from EQ Basin to WTP		
233	Clarifier Underflow and Filter Backwash	(992)	(992)	(0.4)	(9.6)		5,777.74	5,777.30	0.438		allowable			
234	Primary Screen Wash Water from WTP	0	0	0.0										
235	Geotextile Tube Feed Pumps Seal Water from WTP	(17)	(17)	0.0										
236	Polymer Makeup Water	(255)	(255)	0			4,785.34	4,785.33	0.008			Flow from WTP		
237	Net Flow to Holding Basin (Downstream Storage)	0	0	0										
238	Maximum Discharge to Metro						4,513.89	4,513.88	0.008			Maximum Discharge to Metro (6.5 MGD)		



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	<b>PARSONS</b>	Project Number: 444853	Calc.No. from index: 3	Preparer: XDH	Date:1/11/2011	Rev:0	Preparer:	Date:						
2		Project Name: Sediment Management Design	Calculation Title: Mass Balance	Reviewer: MTO	Date: 1/14/2011		Reviewer:	Date:						
3														
4														
5														
6	<b>Incoming Slurry</b>													
7	Slurry Flow Rate, $q$	3,850	gpm											
8	Working Hours, $t$	24	hr/day											
9	Daily Slurry Volume, $q_T$	5,544,000	gallons/day	741,125	ft <sup>3</sup> /day									
10	Solids Content by Weight of Incoming Slurry, $P_s$	14.9%												
11	Specific Gravity of Solids, $G_s$	2.58												
12	Unit Weight of Water, $\gamma_w$	62.4279606	pcf											
13	Slurry Water Content, $WC$	571%												
14	Water Flow Rate, $q_w$	3605	gpm											
15	Dry Solids Flow Rate, $q_s$	245	gpm											
16	Daily Water Volume, $q_w$	5,191,674	gallons/day	694,026	ft <sup>3</sup> /day									
17	Daily Water Weight, $W_w$	43,326,623	lbs/day											
18	Daily Dry Solids Volume, $q_s$	352,326	gallons/day	47,099	ft <sup>3</sup> /day									
19	Daily Dry Solids Weight, $W_s$	7,585,978	lbs/day											
20	Slurry Concentration, $C_{s1}$	1.37	lbs/gallon	10.2	lb/ft <sup>3</sup>									
21	% Water in Slurry (by Volume)	94%												
22														
23														
24	<b>Booster Pump Seal Water</b>													
25	Booster Pump Seal Water (each), $q_{booster}$	0	gpm											
26	Number of Booster Pumps, $N_{booster}$	4												
27	Daily Volume of Booster Pump Seal Water	0	gallons/day	0	ft <sup>3</sup> /day									
28	Daily Weight of Booster Seal Water	0	lbs/day											
29														
30	<b>Primary Screen Wash Water</b>													
31	Primary Screen Wash Water (each), $q_{screen-wash}$	35.8	gpm											
32	Number of Screens, $N_{screen}$	6												
33	Daily Volume of Screen Wash Water	309,174	gallons/day	41,331	ft <sup>3</sup> /day									
34	Daily Weight of Screen Wash Water	2,580,180	lbs/day											
35														
36	<b>Geotextile Tube Feed Pump Seal Water</b>													
37	Geotextile Tube Feed Pump Seal Water (each), $q_{tube-pump}$	8.4	gpm											
38	Number of Geotextile Tube Feed Pumps, $N_{tube-pump}$	2												
39	Daily Volume of Tube Feed Pump Seal Water	24,192	gallons/day	3,234	ft <sup>3</sup> /day									
40	Daily Weight of Tube Feed Pump Seal Water	201,892	lbs/day											
41														
42	<b>Primary Screens (Gravel-Sized Particle Removal, &gt;1/4-inch)</b>													
43	Average Percentage of Gravel-Sized Particles, $P_{gravel-sized}$	0.40%												
44	Daily Dry Weight of Removed Gravel-Sized Particle, $W_{gravel-sized}$	30,344	lbs/day											
45	Daily Volume of Removed Gravel-Sized Particle, $q_{gravel-sized}$	1,409	gallons/day	188	ft <sup>3</sup> /day									
46	Initial Water Content of Removed Gravel-Sized Particles in Stockpile, $WC_{istock}$	25%												
47	Daily Weight of Water Removed with Gravel-Sized Particles, $W_{w-gravel-sized}$	7,586	lbs/day											
48	Daily Volume of Water Removed with Gravel-Sized Particles, $q_{w-gravel-sized}$	909	gallons/day	122	ft <sup>3</sup> /day									
49	Remaining Daily Dry Solids Weight in Slurry, $W_{sr1}$	7,555,634	lbs/day											
50	Remaining Daily Water Weight Slurry, $W_{wr1}$	46,101,110	lbs/day											
51	Remaining Daily Solids Volume Slurry, $q_{sr1}$	350,916	gallons/day	46,911	ft <sup>3</sup> /day									
52	Remaining Daily Water Volume Slurry, $q_{wr1}$	5,524,131	gallons/day	738,469	ft <sup>3</sup> /day									

**Notes**  
Average flow (70% of maximum flow)  
  
Tab "Properties", based on weighted average production rate.  
Tab "Properties", volume and dry density-weighted average value.

Booster pumps use slurry as seal water

Vendor's data

Tab "Properties"

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
53														
54	<b>SCA WTP</b>													
55	I.P Clarifier Sludge (OBG line number 18)													
56	Total Suspended Solids, TSS <sub>clarifier</sub>	1571 mg/L		5946.9 mg/gallon		0.001 gallon/gallon								
57	Clarifier Sludge Flow Rate, q <sub>clarifier</sub>	708.4 gpm												
58	Flow Rate of Solids in Clarifier Sludge, q <sub>TSS-clarifier</sub>	0.43 gpm												
59	Flow Rate of Water in Clarifier Sludge, q <sub>w-clarifier</sub>	708.0 gpm												
60	Weight of Dry Solids in Clarifier Sludge, W <sub>TSS-clarifier</sub>	4.21 kg/min		557.3 lbs/hr		13,374 lbs/day								
61	Spent MMF Backwash (OBG line number 24)													
62	Total Suspended Solids, TSS <sub>MMF</sub>	159.2 mg/L		602.6 mg/gallon		0.0001 gallon/gallon								
63	MMF Backwash Flow Rate, q <sub>MMF</sub>	166.3 gpm												
64	Flow Rate of Solids in MMF Backwash, q <sub>TSS-MMF</sub>	0.01 gpm												
65	Flow Rate of Water in MMF Backwash, q <sub>w-MMF</sub>	166.3 gpm												
66	Weight of Dry Solids in MMF Backwash, W <sub>TSS-MMF</sub>	0.10 kg/min		13.3 lbs/hr		318 lbs/day								
67	Spent GAC Backwash (OBG line number 25)													
68	Total Suspended Solids, TSS <sub>GAC</sub>	128.4 mg/L		486.0 mg/gallon		0.00005 gallon/gallon								
69	GAC Backwash Flow Rate, q <sub>GAC</sub>	117.7 gpm												
70	Flow Rate of Solids in GAC Backwash, q <sub>TSS-GAC</sub>	0.006 gpm												
71	Flow Rate of Water in GAC Backwash, q <sub>w-GAC</sub>	117.7 gpm												
72	Weight of Dry Solids in GAC Backwash, W <sub>TSS-GAC</sub>	0.06 kg/min		7.6 lbs/hr		182 lbs/day								
73	<b>SCA WTP Total</b>													
74	Total Flow Rate, q <sub>WTP</sub>	992.4 gpm		1,429,056 gallons/day		191,037 ft <sup>3</sup> /day								
75	Solid Flow Rate, q <sub>WTP-TSS</sub>	0.4 gpm		644 gallons/day		86 ft <sup>3</sup> /day								
76	Water Flow Rate, q <sub>w-WTP</sub>	992.0 gpm		1,428,412 gallons/day		190,951 ft <sup>3</sup> /day								
77	Water Weight, W <sub>w-WTP</sub>	11,920,673 lbs/day												
78	Solids Weight, W <sub>WTP-TSS</sub>	13,874 lbs/day												
79														
80	<b>Water from Screened Material Stockpile (&gt;1/4 in)</b>													
81	Typical Solids Content of Sand from Hydrocyclone Shaker (TotalClean) (75-85%)	80%												
82	Sand Water Content	25%												
83	Assumed Initial Water Content of Screened Material Stockpile, WC <sub>istock</sub>	25%												
84	Assumed Final Water Content of Screened Material Stockpile, WC <sub>fstock</sub>	15%												
85														
86	Weight of Water Removed from Stockpile (Water Content from 25% to 15%), W <sub>w-stock</sub>	3,034 lbs/day												
87	Volume of Water Removed from Stockpile (Water Content from 25% to 15%), q <sub>w-stock</sub>	364 gallons/day		49 ft <sup>3</sup> /day										
88	Weight of Water Remained in Stockpile, W <sub>wr-stock</sub>	4,552 lbs/day												
89	Volume of Water Remained in Stockpile, q <sub>wr-stock</sub>	545 gallons/day		73 ft <sup>3</sup> /day										
90														
91	<b>Total Suspended Solids in Stockpile Filtrate</b>													
92	Total Suspended Solids, TSS <sub>stock-filtrate</sub>	200 mg/L		757.1 mg/gallon		0.0001 gallon/gallon								
93	Total Stockpile Filtrate Flow Rate, q <sub>stock-filtrate</sub>	0.3 gpm		364 gallons/day										
94	Flow Rate of Solids in Stockpile Filtrate, q <sub>s-stock-filtrate</sub>	1.95752E-05 gpm		0.03 gallons/day		0 ft <sup>3</sup> /day								
95	Flow Rate of Water in Stockpile Filtrate, q <sub>w-stock-filtrate</sub>	0.25 gpm		363.60 gallons/day										
96	Weight of Dry Solids in Stockpile Filtrate, W <sub>TSS-stock-filtrate</sub>	0.000191 kg/min		0.61 lbs/day										
97	Weight of Water in Stockpile Filtrate, W <sub>w-stock-filtrate</sub>	3,034 lbs/day												
98														

**Notes**  
WTP DP#3. Under normal operation condition, WTP sludge and backwash water will be sent to a dedicated geotextile tube directly, without polymer addition.

DeTank TCW-3000

Under normal operation condition, stockpile filtrate and runoff collected by the area sumps (Sump#1 through 4) will be sent to a dedicated geotextile tube directly, without polymer addition.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
99	<b>Runoff from Stockpile Area (Sump#1)</b>													
100	<b>Stockpile Area</b>	40,000	ft <sup>2</sup>											
101	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
102	<b>Runoff Flowrate, q<sub>S1</sub></b>	2.60	gpm			3740.3	gallons/day							
103	Total Suspended Solids, TSS <sub>S1</sub>	200	mg/L			757.1	mg/gallon			0.0001	gallon/gallon			
104	Total Sump#1 Flow Rate, q <sub>S1</sub>	2.60	gpm			3741	gallons/day							
105	Flow Rate of Solids in Sump#1 Flow, q <sub>s-S1</sub>	0.000201	gpm			0.290	gallons/day			0	ft <sup>3</sup> /day			
106	Flow Rate of Water in Sump#1 Flow, q <sub>w-S1</sub>	2.60	gpm			3740.26	gallons/day							
107	Weight of Dry Solids in Sump#1 Flow, W <sub>TSS-S1</sub>	0.001967	kg/min			6.24	lbs/day							
108	Weight of Water in Sump#1 Flow, W <sub>w-S1</sub>	31,214	lbs/day											
109														
110	<b>Runoff from Screen Area (Sump#2)</b>													
111	<b>Screen Area</b>	53,483	ft <sup>2</sup>											
112	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
113	<b>Runoff Flowrate, q<sub>S2</sub></b>	3.47	gpm			5001.0	gallons/day							
114	Total Suspended Solids, TSS <sub>S2</sub>	200	mg/L			757.1	mg/gallon			0.0001	gallon/gallon			
115	Total Sump#2 Flow Rate, q <sub>S2</sub>	3.47	gpm			5001	gallons/day							
116	Flow Rate of Solids in Sump#2 Flow, q <sub>s-S2</sub>	0.000269	gpm			0.39	gallons/day			0	ft <sup>3</sup> /day			
117	Flow Rate of Water in Sump#2 Flow, q <sub>w-S2</sub>	3.47	gpm			5001.01	gallons/day							
118	Weight of Dry Solids in Sump#2 Flow, W <sub>TSS-S2</sub>	0.002629	kg/min			8.35	lbs/day							
119	Weight of Water in Sump#2 Flow, W <sub>w-S2</sub>	41,735	lbs/day											
120														
121	<b>Runoff from Polymer and Decon Area (Sump#3)</b>													
122	<b>Polymer and Decon Area</b>	37,711	ft <sup>2</sup>											
123	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
124	<b>Runoff Flowrate, q<sub>S3</sub></b>	2.45	gpm			3526.2	gallons/day							
125	Total Suspended Solids, TSS <sub>S3</sub>	200	mg/L			757.1	mg/gallon			0.0001	gallon/gallon			
126	Total Sump#3 Flow Rate, q <sub>S3</sub>	2.45	gpm			3526	gallons/day							
127	Flow Rate of Solids in Sump#3 Flow, q <sub>s-S3</sub>	0.000190	gpm			0.27	gallons/day			0	ft <sup>3</sup> /day			
128	Flow Rate of Water in Sump#3 Flow, q <sub>w-S3</sub>	2.45	gpm			3526.22	gallons/day							
129	Weight of Dry Solids in Sump#3 Flow, W <sub>TSS-S3</sub>	0.001854	kg/min			5.89	lbs/day							
130	Weight of Water in Sump#3 Flow, W <sub>w-S3</sub>	29,428	lbs/day											
131														
132	<b>Runoff from WTP Area (Sump#4)</b>													
133	<b>WTP Area</b>	236,949	ft <sup>2</sup>											
134	<b>Daily Precipitation, PRE<sub>daily</sub></b>	0.15	inch/day											
135	<b>Runoff Flowrate, q<sub>S4</sub></b>	15.39	gpm			22156.3	gallons/day							
136	Total Suspended Solids, TSS <sub>S4</sub>	200	mg/L			757.1	mg/gallon			0.0001	gallon/gallon			
137	Total Sump#4 Flow Rate, q <sub>S4</sub>	15.39	gpm			22158	gallons/day							
138	Flow Rate of Solids in Sump#4 Flow, q <sub>s-S4</sub>	0.001193	gpm			1.72	gallons/day			0	ft <sup>3</sup> /day			
139	Flow Rate of Water in Sump#4 Flow, q <sub>w-S4</sub>	15.39	gpm			22156.27	gallons/day							
140	Weight of Dry Solids in Sump#4 Flow, W <sub>TSS-S4</sub>	0.011649	kg/min			36.98	lbs/day							
141	Weight of Water in Sump#4 Flow, W <sub>w-S4</sub>	184,903	lbs/day											
142														
143	<b>Polymer and Makeup Water</b>													
144	Percent Fines in Slurry Solids, P <sub>fine</sub>	43.3%												
145	Fine Solids Weight	3284728.27	lbs/day											
146	Polymer Dosage Rate (lbs of dry polymer per dry ton of solids), DOS <sub>polymer</sub>	1.59	lbs/ton											
147	Dry Polymer Density, DEN <sub>polymer</sub>	0.70	g/cm <sup>3</sup>											
148	Daily Dry Polymer Needed, W <sub>drypolymer</sub>	2611.36	lbs/day			1.813	lbs/min							
149	Dry Polymer Volume, q <sub>drypolymer</sub>	0.3104	gpm			447	gallons/day			60	ft <sup>3</sup> /day			
150	Polymer Makeup Water Volume, q <sub>makeupwater</sub>	108.65	gpm			156,455	gallons/day			20,915	ft <sup>3</sup> /day			
151	Polymer Makeup water Weight, W <sub>makeupwater</sub>	1,305,679	lbs/day											

Based on P-GDT draft report.  
Ashland 2520 MSDS

Based on P-GDT draft report 0.2% dilution

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
152														
153	<b>Coagulant (Emulsion)</b>													
154	Coagulant Dosage Rate (lbs of emulsion per dry ton of solids), $DOS_{coag}$		5.71 lbs/ton											
155	Coagulant Emulsion Density, $DEN_{coag}$		1.03 g/cm <sup>3</sup>	64.300799 pcf										
156	Coagulant Emulsion Flow Rate, $q_{coag}$		0.76 gpm	1091 gallons/day	146 ft <sup>3</sup> /day									
157	Coagulant Emulsion Weight, $W_{coag}$		6.5 lbs/min	9,378 lbs/day										
158	Weight of Coagulant Makeup Water, $W_{coagwater}$		651.2 lbs/min	937,790 lbs/day										
159	Volume of Coagulant Makeup Water, $q_{coagwater}$		78.0 gpm	112372 gallons/day										
160														
161	<b>RA-A Primary Screens and Polymer Injection</b>													
162	<b>Initial Dewatering in Geotextile Tubes (i.e., the first 24 hrs in the tubes)</b>													
163	Daily Weight of Water in Influent to Tubes		59,532,389 lbs/day											
164	Daily Volume of Water in Influent to Tubes		7,133,553 gallons/day	953617.3915 ft <sup>3</sup> /day										
165	Solids Content by Weight after Initial Dewatering in Tubes, $P_{s2}$		38%											
166	Daily Weight of Dry Solids Retained in Tubes, $W_{s-ret2}$		7,581,555 lbs/day											
167	Daily Volume of Solids Retained in Tubes, $q_{s-ret2}$		353,102 gallons/day	47,203 ft <sup>3</sup> /day										
168	Daily Weight of Water Retained in Tubes after Initial Dewatering, $W_{ret2}$		12,369,905 lbs/day											
169	Daily Volume of Water Retained in Tubes after Initial Dewatering, $q_{ret2}$		1,482,241 gallons/day	198146.8736 ft <sup>3</sup> /day										
170	Daily Weight of Water in Initial Filtrate Weight, $W_{if}$		48,387,554 lbs/day											
171	Daily Volume of Water in Initial Filtrate, $q_{if}$		5,798,107 gallons/day	775094.2588 ft <sup>3</sup> /day										
172	<b>Consolidation Dewatering in Geotextile Tubes</b>													
173	Solids Content by Weight after Consolidation Dewatering, $P_{s3}$		50%											
174	Peak Daily Weight of Retained Water in Tubes after Consolidation Dewatering, $W_{ret3}$		7,581,555 lbs/day											
175	Peak Daily Volume of Retained Water in Tubes after Consolidation Dewatering, $q_{ret3}$		908,471 gallons/day	121,445 ft <sup>3</sup> /day										
176	Peak Daily Weight of Water in Consolidation Dewatering Filtrate, $W_{cf}$		4,788,350 lbs/day											
177	Peak Daily Volume of Water in Consolidation Dewatering Filtrate, $q_{cf}$		573,771 gallons/day	76,702 ft <sup>3</sup> /day										
178	Consolidation Dewatering Duration, $t_c$		60 days											
179	Average Water Volume from Consolidation Dewatering of One Day Filling, $q_{dcf}$		9,563 gallons/day	1,278 ft <sup>3</sup> /day										
180														
181	Peak Volume of Water in Geotextile Tube Filtrate, $q_{tube-filtrate}$		6,371,878 gallons/day	851,796 ft <sup>3</sup> /day										
182	Daily Water Retained in Geotextile Tube, $q_{w-retained}$		908,471 gallons/day	121,445 ft <sup>3</sup> /day										
183														
184	<b>Total Suspended Solids in Geotextile Tube Filtrate</b>													
185	Total Suspended Solids, $TSS_{tube-filtrate}$		200 mg/L	757.1 mg/gallon	0.0001 gallon/gallon									
186	Total Geotextile Tube Filtrate Flow Rate, $q_{tube-filtrate}$		4425.3 gpm	6,372,372 gallons/day										
187	Flow Rate of Solids in Geotextile Tube Filtrate, $q_{s-tube-filtrate}$		0.34 gpm	494 gallons/day										
188	Flow Rate of Water in Geotextile Tube Filtrate, $q_{w-tube-filtrate}$		4424.9 gpm	6,371,878 gallons/day										
189	Weight of Dry Solids in Geotextile Tube Filtrate, $W_{TSS-tube-filtrate}$		3.35 kg/min	10,636 lbs/day										
190														
191	<b>Precipitation in SCA and SCA Basins</b>													
192	Daily Precipitation, $PRE_{daily}$ (inch)	Open Area, $A_{SCA}$ (acres)	Flow Rate, $q_{PRE}$ (gpd)	Flow Rate, $q_{PRE}$ (gpm)										
193	0.15	71.25	290,211	201.5										
194														
195	<b>pH Adjust Tank Influent (OBG line number 11)</b>													
196	Total Suspended Solids, $TSS_{influent}$		200.5 mg/L	758.98 mg/gallon	7.77132E-05 gallon/gallon									
197	Total Flow Rate, $MAX_{influent}$		5,663 gpm	8,154,720 gallons/day										
198	Flow Rate of Solids in Influent, $q_{TSS-influent}$		0.440 gpm	634 gallons/day										
199	Flow Rate of Water in Influent, $q_{w-influent}$		5662.56 gpm	8,154,086 gallons/day										
200	Weight of Dry Solids in Influent, $W_{TSS-influent}$		4.30 kg/min	568.5 lbs/hr	13644.9 lbs/day									
201														
202	<b>Effluent Tank Discharge (OBG line number 23)</b>													
203	Total Suspended Solids, $TSS_{discharge}$		4.5 mg/L	17.03 mg/gallon	1.74419E-06 gallon/gallon									
204	Total Flow Rate, $MAX_{discharge}$		4,514 gpm	6,500,000 gallons/day										
205	Flow Rate of Solids in Discharge, $q_{TSS-dis}$		0.008 gpm	11 gallons/day										
206	Flow Rate of Water in Discharge, $q_{w-dis}$		4513.88 gpm	6,499,989 gallons/day										
207	Weight of Dry Solids in Discharge, $W_{TSS-dis}$		0.08 kg/min	10.2 lbs/hr	244.1 lbs/day									

Based on P-GDT draft report.  
Based on Ashland 492 MSDS

**Notes**

Based on P-GDT draft report.

Assumed value

**Notes**  
WTP BOD

On-site met data.

**Maximum**

WTP DP#3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
208	<b>Mass Balance Tables</b>													
209	<b>RA-E</b>													
210	<b>RA-E</b>													
211		Incremental					Accumulative					Notes		
212		Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number	Total (gpm)	Water (gpm)	Solids (gpm)	Solids (lbs/min)	Stream Number			
213	Dredge Slurry	3850	3605	245	5268.0	1	3,850	3,605	245	5268.0				
214	Booster Pumps Seal Water	0	0	0	0.0	2	3,850	3,605	245	5268.0	3			
215	Primary Screen Wash Water	215	215	0	0.0	4	4,065	3,820	245	5268.0				
216	Gravel-Sized Removed from Primary Screen	(1.6)	(0.6)	(1.0)	(21.1)	5	4,063	3,819	244	5247.0	6			
217	Geotextile Tube Feed Pumps Seal Water from WTP	17	17	0	0.0	7	4,080	3,836	244	5247.0	8			
218	Secondary Screen and Hydrocyclone Screen Wash Water from WTP	0	0	0	0.0									
219	Gravel Removed from Secondary Screen	0.0	0.0	0.0	0.0		4,080	3,836	244	5247.0				
220	Sand Removed from Hydrocyclone	0.0	0.0	0.0	0.0		4,080	3,836	244	5247.0				
221	Clarifier Underflow and Filter Backwash from WTP	992	992	0.4	9.6	9	5,072	4,828	244	5256.6				
222	Filtrate from Screened Material Stockpile	0.3	0.3	0.00002	0.0	10								
223	Runoff to Stockpile Sump (Sump#1)	2.6	2.6	0.00020	0.0	10a								
224	Runoff to Screen Area Sump (Sump#2)	3.5	3.5	0.00027	0.0	10b								
225	Runoff to Polymer/Decon Area Sump (Sump#3)	2.4	2.4	0.00019	0.0	10c								
226	Runoff to WTP Area Sump (Sump#4)	15.4	15.4	0.00119	0.0	10d								
227	Coagulant, Polymer, and Makeup Water from WTP	188	187	1.1	8.3	11	5,284	5,039	245	5265.0	12			
228	Geotextile Tube Retention	(875.7)	(630.9)	(244.9)	(5257.6)	13	4408.5	4408.1	0.3	7.4				
229	Precipitation in SCA and Basins	202	202	0	0.0	14	4610.0	4609.7	0.3	7.4	15			
230	Primary Screen Wash Water	(215)	(215)	0	0.0	16	4395.3	4394.9	0.3	7.4	available			
231		0.0	0.0	0.00	0.0		4395.3	4394.9	0.3	7.4				
232	Net Flow to SCA Basins	0.0	0.0	0.00	0.0	17	4395.3	4394.9	0.3	7.4	18	Maximum Flow from EQ Basin to WTP		
233	Clarifier Underflow and Filter Backwash	(992)	(992)	(0.4)	(9.6)		5,709.77	5,709.32	0.455		allowable			
234	Primary Screen Wash Water from WTP	0	0	0.0										
235	Geotextile Tube Feed Pumps Seal Water from WTP	(17)	(17)	0.0										
236	Polymer Makeup Water	(187)	(187)	0			4,717.37	4,717.37	0.008			Flow from WTP		
237	Net Flow to Holding Basin (Downstream Storage)	0	0	0										
238	Maximum Discharge to Metro						4,513.89	4,513.88	0.008			Maximum Discharge to Metro (6.5 MGD)		