6.3. GREEN PROJECT RESERVE

The proposed Project includes 2 components that are eligible for Green Project Reserve funds. Table 22 presents the Classification of each component in accordance with the four (4) categories listed in EPA's Attachment 2 (2010 Clean Water and Drinking Water State Revolving Fund 20% Green Project Reserve), and the Associated Costs of each component and the total project. The sections following present the required justifications for each component and the confirmations required for the Environmentally Innovative Project Components.

Table 22. Green Project Reserve Component Classification and Cost

CLASSIFICATION		COST	Justification
	Environmentally Innovative		
1	Biosolids Dewatering Screw Press	$ 239,000	Business Case
2	Influent Fine Screen	$ 126,000	Business Case
	Sub-total	$ 365,000	
	Green Project Reserve Total	$ 365,000	
	Facility Improvements Project Total	$ 365,000	

CLASSIFICATION: Environmentally Innovative
Definition: *"...projects that demonstrate new and/or innovative approaches to delivering services or managing water resources in a more sustainable way."*

The headworks fine screen and dewatering screw press are considered environmentally innovative which qualify for Green Project Reserve funds. The Green Project Reserve Guidance Document defines "environmentally innovative" as: ..."projects that demonstrate new and/or innovative approaches to delivering services or managing water resources in a more sustainable way." Both the fine screen and dewatering equipment will provide the District with the ability to manage water resources more sustainably as this equipment will allow biosolids to be composted in a regional composting facility. This equipment will also facilitate the treatment facility in producing a higher quality effluent discharged into the Fraser River.

The fine screen and screw press are not specifically listed under the categorical projects so a business case will be made for each to demonstrate they meet the Green Project Reserve requirements.

6.3.1. Item 1 – Screw Press

Description: Dewater biosolids to significantly reduce the volume of residuals allowing composting for conversion to beneficial product.

Justification: Business Case, matches cited example 4.5-5b in EPA Attachment 2

Reference: Environmentally Innovative Example 4.5-5b states "Treatment technologies that significantly reduce the volume of residuals..." in EPA Attachment 2.

Discussion: The screw press is proposed to both improve overall secondary treatment performance and decrease the annual volume of biosolids that are hauled offsite. The existing digester decanting method has negatively impacted the SBR process by limiting wasting frequency and volume. With the installation of a screw press, decanting will no longer be necessary and wasting can occur more frequently allowing more secondary treatment time in each SBR cycle. The result will be effluent with lower organic contaminants flowing into the Fraser River.

The screw press is a low power dewatering option with one installation in the state of Colorado at the time of writing this report. The screw press uses a fraction of the electricity the centrifuge uses which was also evaluated in this memo. During the onsite screw press pilot testing, the energy usage was monitored revealing excellent cake output results at very low power usage.

When compared with the current liquid biosolids hauling method, dewatering will significantly reduce the volume of biosolids that will be hauled offsite. Dewatering is considered a "green" component because it reduces the estimated annual biosolids hauling trips from 41 to 3 which is a 93% reduction in greenhouse gas emissions. The screw press will allow the District to operate more sustainably and efficiently in the future decreasing hauling costs and dependence on contract haulers.

The total screw press cost shown in Table 15 include the equipment, all necessary appurtenances for a properly functioning screw press, engineering, and construction.

6.3.2. Item 2 – Fine Screen

Description: Process required for Tabernash Meadows biosolids to be composted at regional facility.

Justification: Business Case, matches cited example 4.5-5b in EPA Attachment 2

Reference: Water Environment Federation Manual of Practice No. 11, page 32-10 as an example fine screen is necessary for composting.

Environmentally Innovative Example 4.5-5b(i) states "Includes composting, Class A and other sustainable biosolids management approaches." in EPA Attachment 2.

Discussion: The headworks fine screen is considered a "green" component because it provides the District the potential opportunity to compost biosolids either in the Granby Sanitation District composting facility 12 miles from Tabernash or the Climax composting facility 80 miles away. Unscreened or coarse screened biosolids are not accepted by either the Granby or Climax composting facilities and without a fine screen, the District would be forced to haul the biosolids to a landfill 100 miles or more from Tabernash. Locally composting dewatered biosolids will provide a positive benefit to the local community as well as cut hauling greenhouse gas emissions by 90% when compared to hauling to a landfill on the Front Range. Replacing an existing coarse screen with a fine screen will also allow the District to do their part in sustainably managing the Fraser River as the treatment facility effluent will be free of inert objects commonly seen in wastewater influent.

The total fine screen cost shown in Table 22 include the equipment, all necessary appurtenances for a properly functioning fine screen, engineering, and construction.

6.3.3. Cost Savings

The screw press and fine screen will provide the District with substantial annual savings by allowing solids hauling instead of liquid hauling. Table 23 summarizes both the direct savings to the District as well as the reduced number of hauling trips effectively reducing greenhouse gas emissions. These estimates are based on medium term biosolids production.

Table 23. Summary of Annual Hauling Cost Savings

Hauling Method	Annual Cost	Trips Per year
Liquid Biosolids	$92,600	41
Dewatered Solids to Compost Site[2]	$14,800	3
Difference (savings)	**$77,800**	**38**

(1) Medium term biosolids production assumed

(2) Worst case scenario - assume biosolids hauled to Climax composting facility.

The estimated loan payback time is just over 8.5 years assuming an interest rate of 2%.

Project No: Tabernash Meadows WSD Biosolids Improvements
Description: Dewatering Equipment Calculations

Date: September 17, 2010
Calculations By: NAW
Checked By

OBJECTIVE:

Calculate the solids production from the Tabernash facility and dewatering equipment required

GIVEN:

Projected Loads/ Flow		**Buildout**	
2010 Taps	277	Current	
2015 Taps	388	10 year projection	Assumes all inactive taps sold will become active
2025 Taps	714	20 year projection	

Projected flows (mgd)

	Year	Annual Average	Max Month	gal/tap/day	
	2010	0.037	0.075	134	A 1.96 MM:A, .
	2015	0.052	0.102		1.96 factor used to calculate MM
	2025	0.095	0.187		1.96 factor used to calculate MM
Match Plant Capacity			0.200		Calculated max flow similar to plant capacity

Parameter	Flow (MGD)	Influent Conc (mg/l)	Influent BOD (ppd)	Effluent Conc (mg/l)	Effluent BOD (ppd)
Ann. Avg. Loading (ppd)	0.095	170.0	135	6	5
Max. Month Loading (ppd)	0.200	170.0	283.6	6	10

Biosolids Yield	0.60	lb VSS/ lb BOD influent	
WAS Volatile Fraction	0.75	lb VSS/ lb TSS	
Total WAS Yield	0.80		
WAS Concentration	5,000 0.5%	mg/L	CASS calculations (5400 and Facility Data 5800)
TWAS Feed	5,000 0.5%	mg/L	

CALCULATIIONS:

1) **Calculate the volume of sludge wasted per day and the thickened volume fed to stabilization process**

Annual Avg. Load			
Total WAS Load Gen.	104	lb TSS/ day	*- (BOD in - BOD out) * Total WAS Yield*
Total Volatile Suspended Solids	78	lb VSS/day	
Total WAS Volume	2,503	gal WAS/ day	*Volume stored in WAS storage tank*
Total TWAS Feed Volume	2,503	gal/day	
Filtrate Side Stream	0	gal/day	

Max. Month Load			
Total WAS Load Gen.	219	lb TSS/ day	*- (BOD in - BOD out) * Total WAS Yield*
Total Volatile Suspended Solids	164	lb VSS/day	
Total WAS Volume	5,248	gal WAS/ day	*Volume stored in WAS storage tank*
Total TWAS Feed Volume	5,248	gal/day	
Filtrate Side Stream	0	gal/day	

Project No: Tabernash Meadows WSD Biosolids Improvements
Description: Dewatering Equipment Calculations

Date: September 17, 2010
Calculations By: NAW
Checked By

2) Calculate the required dewatering flow rate for assumed hours of operation

Aerobic Digestion Stabilization of Annual Average Solids Loading				
Percent Volatile Solids Destroyed	10%	lb VSS/ day	*decrease due to less SRT in digester*	
Total Solids	104	lb TSS/day	0.05 dry tons/day	
Volatile Solids	78	ppd		
Volatile Solids Destroyed	8	ppd		
Fixed Solids	26	ppd		
Total Solids Post Stabilization	97	ppd	0.05 dry tons/day	17.4 tons/year
Volume removed	2,503	gal/day	*Volume dewatered equal to feed volume*	
Final sludge concentration	0.50%		*Concentration after stabilization*	
Dewatered Solids Conc.	18.0%		*Average value based on manufacturers data*	
Volume of dewatered solids	64	gal/day		
Side stream	2,438	gal/day		
Days of dewatering operation	7	days/week	Slow rotating dewatering equipment can be run for longer periods of time unattended. 12 hour run days are acceptable for the max month flow and loading	
Hours of dewatering operation	18.0	hours/day		
Dewatering flow rate	2	gpm		
Dewateiring Solids Loading Rate	5	lbs/hour		
Total Solids Post Stabilization	536	ppd	*Wet pounds per day*	
Solids weight per volume	1,739	lbs/CY		
Volume of dry sludge	0.31	CY/day	*Sludge to be disposed*	

Aerobic Digestion Stabilization of Maximum Month Solids Loading			
Percent Volatile Solids Destroyed	10%	lb VSS/ day	
Total Solids	219	lb TSS/day	0.11 dry tons/day
Volatile Solids	164	ppd	
Volatile Solids Destroyed	16	ppd	
Fixed Solids	55	ppd	
Total Solids Post Stabilization	202	ppd	0.10 dry tons/day
Volume removed	5,248	gal/day	*Volume after decanting*
Final sludge concentration	0.5%		*Concentration after decanting*
Dewatered Solids Conc.	18.0%		
Volume of dewatered solids	135	gal/day	
Side stream	5,113	gal/day	
Days of dewatering operation	7	days/week	
Hours of dewatering operation	18	hours/day	
Dewatering flow rate	5	gpm	
Dewateiring Solids Loading Rate	11	lbs/hour	
Total Solids Post Stabilization	1,125	ppd	*Wet pounds per day*
Solids weight per volume	1,739	lbs/CY	
Volume of dry sludge	0.6	CY/day	*Sludge to be disposed*

Project No: Tabernash Meadows WSD Biosolids Improvements
Description: Dewatering Equipment Calculations

Date: September 17, 2010
Calculations By: NAW
Checked By

OBJECTIVE:

Calculate the solids production from the Tabernash facility and dewatering equipment required

GIVEN:

Projected Loads/ Flow		**Medium Term**
2010 Taps	277	Current
2015 Taps	388	10 year projection
2025 Taps	714	20 year projection

Projected flows (mgd)

	Year	Annual Average	Peak Day
	2010	0.037	0.075
	2015	0.052	0.102
	2025	0.095	0.187
Match Plant Capacity			0.200

Parameter	Flow (MGD)	Influent Conc (mg/l)	Influent BOD (ppd)	Effluent Conc (mg/l)	Effluent BOD (ppd)
Ann. Avg. Loading (ppd)	0.052	170.0	73	6	3
Max. Month Loading (ppd)	0.102	170.0	144.0	6	5

Biosolids Yield	0.60	lb VSS/ lb BOD influent	
WAS Volatile Fraction	0.75	lb VSS/ lb TSS	
Total WAS Yield	0.80		
WAS Concentration	5,000	mg/L	CASS calculations (5400 and Facility Data 5800)
	0.50%		
TWAS Feed	5,000	mg/L	
	0.50%		

CALCULATIIONS:

1) **Calculate the volume of sludge wasted per day and the thickened volume fed to stabilization process**

Annual Avg. Load

Total WAS Load Gen.	57	lb TSS/ day	*- (BOD in - BOD out) * Total WAS Yield*
Total Volatile Suspended Solids	43	lb VSS/day	
Total WAS Volume	1,360	gal WAS/ day	*Volume stored in WAS storage tank*
Total TWAS Feed Volume	1,360	gal/day	
Filtrate Side Stream	0	gal/day	

Max. Month Load

Total WAS Load Gen.	111	lb TSS/ day	*- (BOD in - BOD out) * Total WAS Yield*
Total Volatile Suspended Solids	83	lb VSS/day	
Total WAS Volume	2,665	gal WAS/ day	*Volume stored in WAS storage tank*
Total TWAS Feed Volume	2,665	gal/day	
Filtrate Side Stream	0	gal/day	

Project No: Tabernash Meadows WSD Biosolids Improvements
Description: Dewatering Equipment Calculations

Date: September 17, 2010
Calculations By: NAW
Checked By

2) Calculate the required dewatering flow rate for assumed hours of operation

Aerobic Digestion Stabilization of Annual Average Solids Loading

Percent Volatile Solids Destroyed	15%	lb VSS/ day	*decrease due to less SRT in digester*	
Total Solids	57	lb TSS/day	0.03 dry tons/day	
Volatile Solids	43	ppd		
Volatile Solids Destroyed	6	ppd		
Fixed Solids	14	ppd		
Total Solids Post Stabilization	50	ppd	0.025 dry tons/day	9.1 tons/year
Volume removed	1,360	gal/day	*Volume dewatered equal to feed volume*	
Final sludge concentration	0.50%		*Equal to the SBR WAS*	
Dewatered Solids Conc.	18.0%		*Average value based on manufacturers data*	
Volume of dewatered solids	34	gal/day		
Side stream	1,326	gal/day		
Days of dewatering operation	5	days/week	Slow rotating dewatering equipment can be run for longer periods of time unattended. 12 hour run days are acceptable for the max month flow and loading	
Hours of dewatering operation	8.0	hours/day		
Dewatering flow rate	4.0	gpm		
Dewateiring Solids Loading Rate	9	lbs/hr		
Total Solids Post Stabilization	280	ppd	*Wet pounds per day*	51 tons/year
Solids weight per volume	1,739	lbs/CY		
Volume of dry sludge	0.16	CY/day	*Sludge to be disposed*	

Aerobic Digestion Stabilization of Maximum Month Solids Loading

Percent Volatile Solids Destroyed	15%	lb VSS/ day	
Total Solids	111	lb TSS/day	0.06 dry tons/day
Volatile Solids	83	ppd	
Volatile Solids Destroyed	13	ppd	
Fixed Solids	28	ppd	
Total Solids Post Stabilization	99	ppd	0.05 dry tons/day
Volume removed	2,665	gal/day	*Volume after decanting*
Final sludge concentration	0.5%		*Concentration after decanting*
Dewatered Solids Conc.	18.0%		
Volume of dewatered solids	66	gal/day	
Side stream	2,600	gal/day	
Days of dewatering operation	5	days/week	
Hours of dewatering operation	12.0	hours/day	
Dewatering flow rate	5.2	gpm	
Dewateiring Solids Loading Rate	12	lbs/hour	
Total Solids Post Stabilization	548	ppd	*Wet pounds per day*
Solids weight per volume	1,739	lbs/CY	
Volume of dry sludge	0.32	CY/day	*Sludge to be disposed*

Project No: Tabernash Meadows WSD Biosolids Improvements
Description: Dewatering Equipment Calculations

Date: September 17, 2010
Calculations By: NAW
Checked By

OBJECTIVE:

Calculate the solids production from the Tabernash facility and dewatering equipment required

GIVEN:

Projected Loads/ Flow		**Current**
2010 Taps	277	Current
2015 Taps	388	10 year projection
2025 Taps	714	20 year projection

Projected flows (mgd)

	Year	Annual Average	Peak Day
	2010	0.037	0.075
	2015	0.052	0.102
	2025	0.095	0.187
Match Plant Capacity			0.200

Parameter	Flow (MGD)	Influent Conc (mg/l)	Influent BOD (ppd)	Effluent Conc (mg/l)	Effluent BOD (ppd)
Ann. Avg. Loading (ppd)	0.037	170.0	52	6	2
Max. Month Loading (ppd)	0.075	170.0	106.6	6	4

Biosolids Yield	0.60	lb VSS/ lb BOD influent	
WAS Volatile Fraction	0.75	lb VSS/ lb TSS	
Total WAS Yield	0.80		
WAS Concentration	5,000	mg/L	CASS calculations (5400 and Facility Data 5800)
	0.50%		
TWAS Feed	5,000	mg/L	
	0.50%		

CALCULATIIONS:

1) **Calculate the volume of sludge wasted per day and the thickened volume fed to stabilization process**

Annual Avg. Load			
Total WAS Load Gen.	40	lb TSS/ day	*- (BOD in - BOD out) * Total WAS Yield*
Total Volatile Suspended Solids	30	lb VSS/day	
Total WAS Volume	971	gal WAS/ day	*Volume stored in WAS storage tank*
Total TWAS Feed Volume	971	gal/day	
Filtrate Side Stream	0	gal/day	

Max. Month Load			
Total WAS Load Gen.	82	lb TSS/ day	*- (BOD in - BOD out) * Total WAS Yield*
Total Volatile Suspended Solids	62	lb VSS/day	
Total WAS Volume	1,973	gal WAS/ day	*Volume stored in WAS storage tank*
Total TWAS Feed Volume	1,973	gal/day	
Filtrate Side Stream	0	gal/day	

Project No: Tabernash Meadows WSD Biosolids Improvements
Description: Dewatering Equipment Calculations

Date: September 17, 2010
Calculations By: NAW
Checked By

2) Calculate the required dewatering flow rate for assumed hours of operation

Aerobic Digestion Stabilization of Annual Average Solids Loading

Percent Volatile Solids Destroyed	20%	lb VSS/ day	
Total Solids	40	lb TSS/day	0.02 dry tons/day
Volatile Solids	30	ppd	
Volatile Solids Destroyed	6	ppd	
Fixed Solids	10	ppd	
Total Solids Post Stabilization	34	ppd	0.017 dry tons/day 6.2 tons/year
Volume removed	971	gal/day	*Volume dewatered equal to feed volume*
Final sludge concentration	0.50%		*Equal to the SBR WAS*
Dewatered Solids Conc.	18.0%		*Average value based on manufacturers data*
Volume of dewatered solids	23	gal/day	
Side stream	948	gal/day	
Days of dewatering operation	5	days/week	Slow rotating dewatering equipment can be run for longer periods of time unattended. 12 hour run days are acceptable for the max month flow and loading
Hours of dewatering operation	5.0	hours/day	
Dewatering flow rate	4.53	gpm	
Dewateiring Solids Loading Rate	10	lbs/hr	
Total Solids Post Stabilization	191	ppd	*Wet pounds per day*
Solids weight per volume	1,739	lbs/CY	
Volume of dry sludge	0.11	CY/day	*Sludge to be disposed*

Aerobic Digestion Stabilization of Maximum Month Solids Loading

Percent Volatile Solids Destroyed	20%	lb VSS/ day	
Total Solids	82	lb TSS/day	0.04 dry tons/day
Volatile Solids	62	ppd	
Volatile Solids Destroyed	12	ppd	
Fixed Solids	21	ppd	
Total Solids Post Stabilization	70	ppd	0.035 dry tons/day
Volume removed	1,973	gal/day	*Volume after decanting*
Final sludge concentration	0.5%		*Concentration after decanting*
Dewatered Solids Conc.	18.0%		
Volume of dewatered solids	47	gal/day	
Side stream	1,927	gal/day	
Days of dewatering operation	5	days/week	
Hours of dewatering operation	9	hours/day	
Dewatering flow rate	5.1	gpm	
Dewateiring Solids Loading Rate	11	lbs/hour	
Total Solids Post Stabilization	389	ppd	*Wet pounds per day*
Solids weight per volume	1,739	lbs/CY	
Volume of dry sludge	0.22	CY/day	*Sludge to be disposed*

Project No: TMWSD WWTF - Biosolids Dewatering Improvements
Description: Capital Cost Calculations

Date: September 22, 2010
Calculations by: NAW
Checked by:

Preliminary Opinion of Probable Construction Costs

Alternative - Centrifuge -

Division	Description	Quantity	Units	Cost per Unit ($)	Installation Multiplier	Cost (nearest $100)
2	**CIVIL / SITEWORK**					**2,700**
	4" DI filtrate pipe to headworks lift station	35	LF	25	1.0	900
	Polymer feed line (insulated and heat traced)	50	LF	35	1.0	1,800
3	**CONCRETE**					**16,800**
	Concrete pad for biosolids storage	3	CY	300.00	1.0	800
	Concrete Deck over Tank	1	LS	15,000.00	1.0	15,000
	Jersey Barriers	4	LS	250.00	1.0	1,000
9	**FINISHES**					**15,000**
	Paint Aerobic Digester tank	1	LS	15,000	1.0	15,000
11	**EQUIPMENT**					**201,000**
	Polymer feed system	1	LS	20,000	1.0	20,000
	Centrifuge	1	LS	$ 130,000	1.1	143,000
	Dewatering feed pump	2	LS	$ 8,000	1.0	16,000
	Conveyor system	1	LS	$ 20,000	1.1	22,000
15	**MECHANICAL / HVAC**					**1,300**
	4" Drain line from concrete pad	15	LF	25	1.0	400
	3" Sludge Feed pipe	35	LF	25	1.0	900
16	**ELECTRICAL and INSTRUMENTATION & CONTROLS**					**20,000**
	Electrical/I&C Equipment and Install	12%	LS	20,000	1.0	20,000
					SUBTOTAL 1	**256,800**
	CONSTRUCTION PRORATES (See Note 1)	10.0%	of Subtotal 1	25,680	1.0	25,700
	CONTRACTOR'S OVERHEAD & PROFIT (See Note 2)	8.0%	of Div 16	1,600	1.0	1,600
	FEDERAL FUNDING COMPLIANCE PRORATES (See Note 3)	10.0%	of Div 16	2,000	1.0	2,000
					SUBTOTAL 4	**286,100**
	CONTINGENCY (See Note 4)	15.0%	of Subtotal 4	42,915	1.0	43,000
	ENGINEERING COSTS	18.0%	of Subtotal 4	51,498	1.0	51,500
					TOTAL	**381,000**

Project No: TMWSD WWTF - Biosolids Dewatering Improvements
Description: Capital Cost Calculations

Date: September 22, 2010
Calculations by: NAW
Checked by:

Notes

1	Construction Prorates [a] [b]	
(a)	General conditions includes cost associated with permits, licenses, insurance, environmental safe guards, sediment and drainage control, and special construction practices to maintain continued plant operations. Also includes misc construction materials needed for project not included above	10%
2	Contractor's Overhead & Profit [a]	
(a)	Contractor's overhead and profit include costs for mobilization/demobilization, administration, and contractor/subcontractor overhead costs and profits.	8.0%
3	Federal Funding Compliance Prorates	
(a)	Prorate applied to subtotal to account for Davis Bacon wage rates and additional documentation	10.0%
4	Design Contingency [a]	
(a)	The design continency is added to the subtotal based on the conceptual nature of information developed for this evaluation.	15.0%
5	Engineering Costs	
	Costs incurred during Final Design and Construction	18%

Date: September 29, 2010
Calculations by: NAW

OBJECTIVE: Calculate the operations and maintenance costs associated with a centrifuge

CALCULATIONS:

Annual O&M Costs

(1) Electrical Power Consumption

Description	Quantity		Motor Size		Brake HP Each	Total Wire Power	Motor Effec.	Run Time, hrs	Daily Energy Use	Annual Energy Use	Unit Cost	Annual Electricity Cost
	Installed	Operating	Motor Size	Total Installed								
			(HP)	(HP)	(BHP)	(kW)	(%)	(hr/day)	(kWh/day)	(kWh/yr)	($/kWh)	($/yr)
Drive Motor	1	1	10	10.0	7.0	5.82	90%	8	47	16,988	$0.13	$2,136
Scroll Motor	1	1	3	3.0	2.5	2.08	90%	8	17	6,067	$0.13	$763
							Daily Energy Use		63	2022 Annual Cost		$2,899

(2) Polymer

Polymer Usage	30	lbs active polymer/DT of sludge
Assumed % active content	43%	Value based on Polymer vendors (Jim Eloff 1-29-10)
Lbs of neat polymer required	69.8	lbs neat polymer/DT of sludge
Neat Polymer cost ($/lb)	$1.96	per pound neat polymer
Daily Polymer Cost	$3	per day
Meduim Term Annual Polymer Cost	$1,258	per year

(3) Maintenance Costs

Maintenance Costs	$650	per year	Assume 0.5% of capital costs for equipment
Medium Term Maintenance Costs	$916	per year	Future value based on real interest rate

(4) Operations Staff Requirements

Daily FTE requirement for process	0.2	FTE	Operator has to dump box every few days
Annual Cost of FTE	$ 59,892		
Medium Term Annual Operations Staff Cost	$ 11,978		

Medium Term Annual O&M Costs **$17,051**

CONCLUSION:

Present Worth Analysis

Years Considered in NPV	20
Interest Rate used for NPV	2.90%

Cost Type	Year	Total Cost	Discount Factor	Present Value
Capital Cost	0	$ 381,000	1.00	$ 381,000
Annual O&M Cost	1-20	$17,051	15.02	$ 257,000

Net Present Worth **$ 638,000**

Project No: TMWSD WWTF - Biosolids Dewatering Improvements
Description: Capital Cost Calculations

Date: September 29, 2010
Calculations by: NAW
Checked by:

Preliminary Opinion of Probable Construction Costs

Alternative - Screw Press

Division	Description	Quantity	Units	Cost per Unit ($)	Installation Multiplier	Cost (nearest $100)
2	**CIVIL / SITEWORK**					**900**
	4" DI filtrate pipe to headworks lift station	35	LF	25	1.0	900
3	**CONCRETE**					**1,800**
	Concrete Pad for Biosolids Roll Off	16	CY	300.00	1.0	4,700
	Concrete pad for biosolids storage	3	CY	300.00	1.0	800
	Jersey Barriers	4	LS	250.00	1.0	1,000
9	**FINISHES**					**15,000**
	Paint Digester (Concrete repair and coating)	1	LS	15,000	1.0	15,000
11	**EQUIPMENT**					**109,400**
	Screw Press and polymer feed system	1	LS	$ 91,400	1.0	91,400
	Progressing Cavity Feed Pumps	1	LS	$ 8,000	1.0	8,000
	Grinder	1	LS	$ 10,000	1.0	10,000
13	**SPECIAL CONSTRUCTION**					**11,900**
	FRP Grating and support for dewatering unit	140	SF	85	1.0	11,900
15	**MECHANICAL / HVAC**					**4,300**
	4" Drain line from concrete pad	15	LF	25	1.0	400
	3" Sludge Feed pipe	35	LF	25	1.0	900
	Heat trace pipe and insulation	1	LS	3,000	1.0	3,000
16	**ELECTRICAL and INSTRUMENTATION & CONTROLS**					**15,000**
	Electrical/I&C Equipment and Install		LS	15,000	1.0	15,000
					SUBTOTAL 1	**158,300**
	CONSTRUCTION PRORATES(See Note 1)	10.0%	of Subtotal 1	15,830	1.0	15,900
	CONTRACTOR'S OVERHEAD & PROFIT (See Note 2)	8.0%	of Div 16 and paint	2,400	1.0	2,400
	FEDERAL FUNDING COMPLIANCE PRORATES (See Note 3)	10.0%	of Div 16 and paint	3,000	1.0	3,000
					SUBTOTAL 4	**179,600**
	CONTINGENCY (See Note 4)	15.0%	of Subtotal 4	26,940	1.0	27,000
	ENGINEERING COSTS	18.0%	of Subtotal 4	32,328	1.0	32,400
					TOTAL	**239,000**

Project No: TMWSD WWTF - Biosolids Dewatering Improvements
Description: Capital Cost Calculations

Date: September 29, 2010
Calculations by: NAW
Checked by:

Notes

1	Construction Prorates [(a) (b)]	
(a)	General conditions includes cost associated with permits, licenses, insurance, environmental safe guards, sediment and drainage control, and special construction practices to maintain continued plant operations. Also includes misc construction materials needed for project not included above	10%
2	Contractor's Overhead & Profit [(a)]	
(a)	Contractor's overhead and profit include costs for mobilization/demobilization, administration, and contractor/subcontractor overhead costs and profits.	8.0%
3	Federal Funding Compliance Prorates	
(a)	Prorate applied to subtotal to account for Davis Bacon wage rates and additional documentation	10.0%
4	Design Contingency [(a)]	
(a)	The design continency is added to the subtotal based on the conceptual nature of information developed for this evaluation.	15.0%
5	Engineering Costs	
	Costs incurred during Final Design and Construction	18%

OBJECTIVE: Calculate the operations and maintenance costs associated with a screw press

CALCULATIONS:

Annual O&M Costs

(1) Electrical Power Consumption

Description	Quantity		Motor Size		Brake HP Each	Total Wire Power	Motor Effec.	Run Time, hrs	Daily Energy Use	Annual Energy Use	Unit Cost	Annual Electricity Cost
	Installed	Operating	Motor Size	Total Installed								
			(HP)	(HP)	(BHP)	(kW)	(%)	(hr/day)	(kWh/day)	(kWh/yr)	($/kWh)	($/yr)
Screw Press	1	1	2	2.0	0.8	0.63	90%	24	15	5,475	$0.13	$688
							Daily Energy Use		**15**	**2022 Annual Cost**		**$688**

(2) Polymer

Polymer Usage	25	lbs active polymer/DT of sludge
Assumed % active content	43%	Value based on Polymer vendors (Jim Eloff 1-29-10)
Lbs of neat polymer required	58.1	lbs neat polymer/DT of sludge
Neat Polymer cost ($/lb)	$1.96	per pound neat polymer
Daily Polymer Cost	$3	per day
Meduim Term Annual Polymer Cost	$1,049	per year

(3) Maintenance Costs

Maintenance Costs	$457	per year	Assume 0.5% of capital costs for equipment
Medium Term Maintenance Costs	$644	per year	Future value based on real interest rate

(4) Operations Staff Requirements

Daily FTE requirement for process	0.1	FTE	Operator needs to periodically check on equipment
Annual Cost of FTE	$ 59,892		
Medium Term Annual Operations Staff Cost	$ 5,989		

Medium Term Annual O&M Costs **$8,370**

CONCLUSION:

Present Worth Analysis

Years Considered in NPV	20
Interest Rate used for NPV	2.90%

Cost Type	Year	Total Cost	Discount Factor	Present Value
Capital Cost	0	$ 239,000	1.00	$ 239,000
Annual O&M Cost	1-20	$8,370	15.02	$ 126,000
Sludge Hauling Costs	1-20	$ -	$ 15	$ -

Net Present Worth **$ 365,000**

Project No: TMWSD WWTF - Biosolids Dewatering Improvements

Date: September 29,2010
Calculations by: NAW

OBJECTIVE: Calculate the operations and maintenance costs associated with continuing to haul liquid biosolids from the site

ASSUMPTIONS:

Assume the amount of decanting possible will continue to be less and less as time goes on.

Current Hauling Rate =	120000	gallons per year
Truckloads per year =	20	Trucks per year
Current Wasting Rate =	1200	gpd
Annual Wasting =	438000	gallons per year
Decant Decrease in Hauling =	27%	
Medium term Decant Decrease in Effic. =	40%	
Hauler Truck Capacity =	6000	gallons per load

Assume medium term is 10 years from construction

CALCULATIONS:

Biosolids Hauling

(5) Biosolids Hauling and Reuse

Annual WAS to be Hauled =	245,388	gal/yr
2020 Cost Of Hauling Liquid =	$ 0.38	per gal
Number of trips =	41	trips per year
Annual Cost of Hauling Liquid =	92,570	

CONCLUSION:

Present Worth Analysis

Years Considered in NPV	20
Interest Rate used for NPV	2.90%

Cost Type	Year	Total Cost	Discount Factor	Present Value
Capital Cost	0	$ -	1.00	$ -
Annual O&M Cost	1-20	$0	15.02	$ -
Sludge Hauling Costs	1-20	$ 92,570	$ 15	$ 1,391,000

Net Present Worth **$ 1,391,000**

Project No: TMWSD WWTF - Biosolids Dewatering Improvements
Page 1 of 1

Date: September 29,2010
Calculations by: NAW

OBJECTIVE: Calculate the operations and maintenance costs associated with contracting Parker AG to haul solids to Climax

ASSUMPTIONS:

Assume a dumpster is rented from McDonald farms and is filled onsite.

Assumed cake dryness before haul=	18%	
Density of Solids =	1777	lbs/CY @ 30% cake
Roll off Box options	15YD - 10 ton	
	25YD - 17 ton	
Max Volume in 25 YD box	19	CY
Max Volume in 15 YD box	11	CY

Assume medium term is 10 years from construction

CALCULATIONS:

Biosolids Hauling

(5) Biosolids Hauling and Reuse

Annual Solids To Haul	9	DT/year
Annual Solids To Haul	51	WT/year
Annual Trips with 25 YD Rolloff	3.01	
Annual Trips with 15 YD Rolloff	5.1	

25 Yard Roll Off

Trip Fee	3,855	Per trip
Solids Cost	3,084	$/WT
Monthly Rental Fee	6,436	per year
Lab Fee	1,431	per year
2020 Annual Hauling Cost	14,807	per year

15 Yard Roll Off

Trip Fee	6,554	Per trip
Solids Cost	3,084	$/WT
Monthly Rental Fee	6,436	per year
Lab Fee	1,431	per year
2020 Annual Hauling Cost	17,506	per year

CONCLUSION:

Present Worth Analysis

Years Considered in NPV	20
Interest Rate used for NPV	2.90%

Cost Type	Year	Total Cost	Discount Factor	Present Value
Capital Cost	0	$ -	1.00	$ -
Annual O&M Cost	1-20	$0	15.02	$ -
Sludge Hauling Costs	1-20	$ 14,807	$ 15	$ 223,000

Net Present Worth $ 223,000

Project No: TMWSD WWTF - Biosolids Dewatering Improvements
Description: Capital Cost Calculations

Date: September 22, 2010
Calculations by: NAW
Checked by:

Preliminary Opinion of Probable Construction Costs

Fine Screen

Division	Description	Quantity	Units	Cost per Unit ($)	Installation Multiplier	Cost (nearest $100)
11	**EQUIPMENT**					**67,000**
	Fine Screen	1	LS	66,000	1.0	66,000
	Plate for screenings bucket	1	LS	1,000	1.0	1,000
15	**MECHANICAL / HVAC**					**1,000**
	Wash Water/misc piping	1	LS	1,000	1.0	1,000
16	**ELECTRICAL and INSTRUMENTATION & CONTROLS**					**15,000**
	Electrical/I&C Equipment and Install		LS	15,000	1.0	15,000
					SUBTOTAL 1	**83,000**
	CONSTRUCTION PRORATES (See Note 1)	10.0%	of Subtotal 1	8,300	1.0	8,300
	CONTRACTOR'S OVERHEAD & PROFIT (See Note 2)	8.0%	of Div 16	1,200	1.0	1,200
	FEDERAL FUNDING COMPLAINCE (See Note 3)	10.0%	of Div 16	1,500	1.0	1,500
					SUBTOTAL 4	**94,000**
	CONTINGENCY (See Note 4)	15.0%	of Subtotal 4	14,100	1.0	14,100
	ENGINEERING COSTS	18.0%	of Subtotal 4	16,920	1.0	17,000
					TOTAL	**126,000**

Project No: TMWSD WWTF - Biosolids Dewatering Improvements
Description: Capital Cost Calculations

Date: September 22, 2010
Calculations by: NAW
Checked by:

Notes

1	Construction Prorates [a] [b]	10.0%
(a)	General conditions includes cost associated with permits, licenses, insurance, environmental safe guards, sediment and drainage control, and special construction practices to maintain continued plant operations. Also includes misc construction materials needed for project not included above	
2	Contractor's Overhead & Profit [a]	8.0%
(a)	Contractor's overhead and profit include costs for mobilization/demobilization, administration, and contractor/subcontractor overhead costs and profits.	
3	Federal Funding Compliance Prorates	10.0%
(a)	Prorate applied to subtotal to account for Davis Bacon wage rates and additional documentation	
4	Design Contingency [a]	15.0%
(a)	The design continency is added to the subtotal based on the conceptual nature of information developed for this evaluation.	
5	Engineering Costs	18%
	Costs incurred during Final Design and Construction	