# SULTAN CITY COUNCIL

## AGENDA ITEM COVER SHEET

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|---|---|
| **ITEM NO:** | **Public Works Staff Report** |
| **DATE:** | October 23, 2008 |
| **SUBJECT:** | Sultan WWTP Solids Handling Project Background Decision and Schedule Memorandum |
| **CONTACT PERSON:** | Connie Dunn, Public Works CDunn |

**ISSUE:**
The purpose of this staff report is to update the City Council on the timeline of the new solids handling equipment.

**SUMMARY:**

The key issues associated with this solids handling project are funding, schedule, and Department of Ecology (DOE) approval as summarized below:

- Funding: $500,000 State line item allocation is dependent upon approval of the City's Comprehensive Plan. The City expects to have approval by December 6, 2008.
- Schedule: The preferred centrifuge vendor, Alfa-Laval, has indicated their centrifuge requires up to an 8-month lead time. This lead time will require proceeding with the design immediately to ensure the project is on-line and commissioned prior to October 15, 2009 (the typical time of year when the rainy season starts).
- DOE approval: DOE will need to approve this project. To that end, the 75 percent (substantially complete) drawings, design criteria and specs and the DOE Submittal Letter referencing approved Engineering Report sections will need to be submitted for review.

In order to meet the schedule requirements, the following project schedule is proposed:

- October 6, 2008 – Begin design and DOE Submittal Letter
- October 31, 2008 – Submit 75 percent design and DOE Letter
- November 17, 2008 – Bid advertisement
- December 6, 2008 – Expected Comp Plan approval (and consequently DOE approval)
- December 10, 2008 – Bid opening
- January 1, 2009 – NTP and Contractor to order centrifuge
- August 1, 2009 – Start project construction
- September 1, 2009 – Centrifuge delivered

- October 1, 2009 – Begin commissioning
- October 15, 2009 – Commissioning complete

This proposed schedule is somewhat tight. An alternative approach could be to break the bid packages into two packages: the procurement of the centrifuge, and the installation of the procured equipment. The two-package approach could save some time on the schedule, but is not as desirable as prepare one bid package since the City would have more risk as a result of furnishing the solids handling equipment (as opposed to the contractor assuming the risk of both securing and installing the equipment).

**BACKGROUND:**
The existing solids handling system limits the capacity of the Wastewater Treatment Plant (WWTP) since continuous operation is required to keep up with the waste activated sludge accumulation for the current wastewater flows conveyed to the WWTP. The existing solids handling system is not a true dewatering system, rather it is a thickening process that produces only about nine percent solids.

The Draft Technical Memorandum dated January 10, 2008 described a number of temporary solids handling alternatives. The alternatives in the January 2008 memorandum were to consider temporary as the WWTP design was on track for completion. April 2008 the City experienced a sharp downturn in housing development activity. In the course of reassessment, the City determined that the best approach would be to re-phase the project so that only those components of the project that was immediately necessary advanced at this time.

May 29, 2008 the City Council approved of the approach of installing solid handling equipment and reusing the selected equipment in the future when the plant is upgraded. Based on Council direction staff confirmed with Brown and Caldwell the City would like to proceed with the solids handling design given the lack of housing development interest at this time and the need for increasing dewatering capacity at the plant.

On August 28, 2008, Brown and Caldwell prepared a schedule to bid, procure, and install the solids handling equipment. City Council approved contract amendment #5 with Brown and Caldwell for Centrifuge design, Public Works Trust Fund (PWTF) Loan, and the 50% design deliverable of the WWTP.

The memorandum (Attachment A) is the project schedule to bid, procure and install the solids handling equipment with Department of Ecology approval.

**FISCAL IMPACT:**
The solids handling project is to be funded by the $500,000.00 from the Centennial Clean Water Program awarded the City by Special Legislative Proviso, Wastewater System Improvements, managed by the Department of Ecology.

**RECOMMENDED COUNCIL ACTION:**
No action is required at this time the memorandum is sharing of communication regarding the Solids Handling Project at the WWTP.

**ATTACHMENTS:**

**A -** Sultan WWTP Centrifuge Project Background, Decision and Schedule
**B –** Department of Ecology letter, April 23, 2008
**C-** January 10, 2008 DRAFT Solids Handling Technical Memorandum

One Convention Place
701 Pike Street, Suite 1200
Seattle, WA 98101
Tel: (206) 624-0100
Fax: (206) 749-2200

**Memorandum**

| | |
|---|---|
| Subject: | Sultan WWTP Centrifuge Project Background, Decisions and Schedule |
| Job #: | 131877.100.106 |
| Date: | October 6, 2008 |
| To: | Connie Dunn, City of Sultan |
| From: | Tadd Giesbrecht, Brown and Caldwell |
| Copy to: | Deborah Knight, City of Sultan<br>Steve Krugel, Brown and Caldwell |

The purpose of this memorandum is to briefly summarize the background surrounding the City's decision to proceed with the installation of a new centrifuge, and to provide a proposed project schedule.

As the January 10, 2008 DRAFT Technical Memorandum on Temporary Solids Handling Evaluation (Solids Handling TM) describes, a number of temporary solids handling alternatives were considered. These alternatives were considered to be temporary, since it was expected that the WWTP would be upgraded in the near future and would include permanent solids handling facilities.

Based on the assumptions listed in the Solids Handling TM, it was determined that from a life cycle cost basis, the least expensive alternative would be to continue hauling 10 percent waste activated sludge (WAS) to the La Conner composting facility. Key assumptions include in this analysis were that the La Conner tipping fee would continue to be $27/wet ton and that the new WWTP upgrade would be completed in about 30 months.

In April 2008, the overall WWTP upgrade design was advanced to about the 50 percent completion level. About this time, the City experienced a sharp downturn in housing development activity. Because the City's rate study relied on a significant portion of the project cost to be supported by developer connection charges, the viability of continuing with the full upgrade project was reassessed given the concern of the housing market. In the course of this reassessment, the City determined that the best approach would be to re-phase the project so that only those components of the project that were immediately necessary (regardless of additional developer connections) would be advanced at this time.

In September 2008 portions of the Solids Handling TM financial analysis were updated to reflect the decision to postpone the plant upgrade and to account for La Conner's tipping fee increase from $27 to $110/wet ton. This updated evaluation also considered the City's current disposal location, GroCo, where they are able to dispose at around $64/wet ton. After making assumptions and recognizing the risk associated with the different options (e.g., potential future increase in GroCo tipping fees etc.), it appears that the net present value of buying a new centrifuge in 2009 versus continuing to dispose at GroCo is about the same if the new plant upgrade is deferred about 4-5 years.

On May 29, 2008 the City Council approved of the approach of installing a centrifuge and reusing the centrifuge in the future when the plant is upgraded. On August 28, 2008, the City Council approved Amendment No. 5, which included the centrifuge design as well as binding the 50% design documents and making minor PWTF loan modifications. Based on Council's direction and a meeting with Connie Dunn and John Harris at the City on October 2, 2008, it was confirmed that the City would like to proceed with the centrifuge design given the lack of housing development interest at this time and the need for increasing dewatering capacity at the plant.

The key issues associated with this centrifuge project are funding, schedule, and Department of Ecology (DOE) approval as summarized below:

- Funding: $500,000 State line item allocation is dependent upon approval of the City's Comprehensive Plan. The City expects to have approval by December 6, 2008.
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TG:sjw

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APR 25 2008
BY:

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
*PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000*
*711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341*

April 23, 2008

The Honorable Carolyn Eslick, Mayor
City of Sultan
319 Main Street
Sultan, WA 98294-1199

**Re: Centennial Clean Water Program**
**Clean Water Act Section 319 Nonpoint Source Fund**
**Washington State Water Pollution Control Revolving Fund**
**FY 2009 Funding Cycle**
**Special Legislative Proviso, Wastewater System Improvements**

Dear Mayor Eslick:

I am pleased to inform you that an amount of $500,000 in grant funds from the Centennial Clean Water Program has been offered on the enclosed Fiscal Year 2009 (FY 2009) Water Quality Combined Final Offer and Applicant List for your above-referenced project. The funding for the City's project is identified in the 2008 Supplemental Capital Budget.

The FY 2009 Final Offer and Applicant List identifies funding for projects from three sources, the Centennial Clean Water Program (Centennial), the federal Clean Water Act Section 319 Nonpoint Source Fund (Section 319), and the Washington State Water Pollution Control Revolving Fund (Revolving Fund). A copy of the FY 2009 State Revolving Fund Final Intended Use Plan (IUP), which provides further information on the Revolving Fund loan program, is also included for your information.

Ecology is committed to negotiating and signing a funding agreement by October 31, 2008. To meet this timeline and ensure timely use of limited state and federal funds, it is essential that negotiations begin as soon as possible.

Ecology has assigned the following Grant and Loan Project Management Team for your project:

| | | | |
|---|---|---|---|
| Ken Ziebart | Northwest Regional Office | Project Manager | (425) 649-7164 |
| Tammie McClure | Headquarters Office, Lacey | Financial Project Manager | 360-407-6410 |

Ecology's Project Manager will contact you soon to schedule a negotiation date. If you are not contacted by May 27, 2008, please call your Project Manager directly.

Kzie46l@ecy.wa.gov
425 649-7164

Based on your application, the following conditions apply and will be addressed during your agreement negotiations. Other conditions may also be identified as applicable during project negotiations.

- Before Ecology can sign a financial assistance agreement for a water pollution control facilities project, the local jurisdiction applying for funding must be in compliance with requirements of the Growth Management Act (GMA), RCW 36.70A. The 1999 Washington State Legislature revised RCW 70.146.070, Water Pollution Control Facilities Financing to reinforce GMA compliance as a condition of receiving grant or loan funding. This statute now requires adoption of a comprehensive plan, including a capital facilities plan element, and adoption of development regulations as required by RCW 36.70A.040, before grant or loan funds can be received.

If you have any questions or concerns, please contact Jeff Nejedly at 360-407-6566 or jnej@ecy.wa.gov. For more information about this funding cycle and upcoming funding opportunities, please visit the Water Quality website:

http://www.ecy.wa.gov/programs/wq/funding/indexfunding.html

We appreciate your commitment to improving Washington's water quality and look forward to working with you to complete this high priority project.

Sincerely,

Kelly Susewind, P.E., P.G.
Interim Water Quality Program Manager

KS:JWN:smb

Enclosures

cc: Deborah Knight, City of Sultan
Ken Ziebart, Northwest Regional Office

BROWN AND CALDWELL

# DRAFT Technical Memorandum

**Project:** Sultan WWTP Update

**Project Number:** 131877.500.516

**Date:** January 10, 2009

**To:** Randy Oesch & Connie Dunn, City of Sultan

**From:** Bo Vestergaard-Hansen & Chris Muller, Brown and Caldwell

**Copy to:** Tadd Giesbrecht & Bill McCarthy, Brown and Caldwell

**Subject:** Temporary Solids Handling Evaluation

## BACKGROUND AND OBJECTIVE

The Sultan Wastewater Treatment Plant (WWTP) currently generates an average of approximately 455 lbs of solids per day, which is dewatered in a Somat press to produce a 9 to 10 percent solids dewatered cake. The plant is currently transporting the dewatered solids to La Conner, WA for composting. This composting facility has expressed some concern with the amount of bulking agent required for such low solids cake. The plant was planning to transport the solids to the Monroe, WA composting facility, which is expected to begin operation in the spring of 2008. However, the issue of low solids content would exist at this facility as well. Additionally, the Sultan WWTP staff spends a lot of money and time operating and keeping the Somat press in operation. For these reasons, the City of Sultan has asked Brown and Caldwell to evaluate temporary solids handling options that would be in service until the WWTP upgrade is complete at which time a new centrifuge dewatering system is planned to be online. The objective of this memorandum is to provide descriptions and cost analysis of available options: continue transport to La Conner for composting, two options for centrifuge dewatering, and various hauling options. All options are described in further detail below, followed by the results of the economic evaluation and non-economic considerations.

## TEMPORARY SOLIDS HANDLING OPTIONS

The following potential options were selected for evaluation and economic analysis.

- *Composting (La Conner)*
  Under this option, the Sultan WWTP would continue dewatering with the Somat press and transporting the cake to the La Conner compost operation. Additional costs for purchasing bulking agent at La Conner are not expected to be passed on to Sultan (based on their inter-local agreement) and savings when transporting to Monroe for composting have not been included in the analysis. This composting option serves as a base case for comparing other options.

- ***Buying a Centrifuge***
  Buying a centrifuge and installing it temporarily near the current solids handling building. It is assumed the existing feed pump to the Somat press and the polymer system can be reused for the centrifuge. The centrifuge installation would include a temporary concrete slab and a metal shed for weather protection. The installation would be above flood level. Demolishing the temporary facility has not been included in the economic analysis. Centrifuge delivery and construction time are estimated at 5 to 6 months, and the economic analysis includes continued Somat operation and trucking to La Conner during this time.

- ***Renting a Centrifuge***
  A few companies specialize in mobile, trailer-mounted dewatering centrifuge systems. The plant could rent this system, which would include a polymer system, waste activated sludge (WAS) pump, centrate pump, cake conveyor, and control system. A cost quote has not yet been provided, but based on experience, dewatering centrifuge system rental is in the range of $10,000 to $15,000 per month. Disposal is assumed to be at the La Conner compost operation.

- ***Hauling 4% sludge to the South Treatment Plant***
  The South Treatment Plant cannot receive non-pumped sludge at its septage receiving facility so the City's existing truck could not be used. Sultan Septic Services hauls septage to the South Treatment Plant in Renton on a regular basis and may be able to provide a 3,300-gallon tanker dedicated to the Sultan WWTP during temporary hauling. However, this truck cannot handle 10% cake because it must be pumpable from the truck, and haulers prefer a 4% sludge to facilitate pumping from the tanker trucks. This requirement means that the solids content would need to be reduced to about 4%, which would require experimentation with the Somat press to produce this lower solids cake/sludge before this option is viable. The South Treatment Plant's disposal rates are based on percent solids, but Sultan Septic Services' hauling fee includes this disposal fee. The hauling rates are:
    a. $0.36 per gallon for 0-2%
    b. $0.72 per gallon for 4%

  For this evaluation, we have assumed a 4% sludge can be produced by the Somat press (Randy has seen this unit used as a thickening device, supporting the assumption). We have also assumed that the polymer demand is reduced by 50%; the actual polymer consumption would be determined by experimenting with the Somat to get this lower percent solids. If this option is selected, the City should work with the hauler to experiment with higher solids content to reduce the hauling cost. Hauling costs for other percent solids are adjusted linearly based on the percent solids.

- ***Hauling 1% WAS to the South Treatment Plant***
  Sultan Septic can haul liquid WAS to the South Treatment Plant at $0.36 per gallon. For 1% WAS hauling, Sultan Septic Services would use an 8,000-gallon tanker truck dedicated to the Sultan WWTP for daily hauling. Based on the recent site visit, Sultan Septic Services did not see any issues with truck access or WAS pumping to the tanker truck.

- ***Hauling 1% WAS by Septage Receiver***
  Tenelco near Lake Stevens can haul 1% WAS to its own treatment site near Lake Stevens for septage treatment. The process includes screening, equalization basin, dewatering with screw press, and land application on Tenelco-owned farmland in Douglas County. Before committing to this option, Tenelco may want to experiment with the sludge first to determine any effects it would have on the company's treatment process and any interactions the WAS would have with general septage. According to Tenelco's permit, the company is allowed to treat municipal biosolids at its facility; nonetheless, Tenelco wants to involve Department of Ecology to ensure the agency would approve of this treatment. Evergreen Sanitation (a sister company of Tenelco) would haul the WAS in an 8,000-gallon tanker truck. If the City determines that this option warrants further consideration, it should have Tenelco haul a couple of loads for testing at the company's facility to ensure the feasibility of solids disposal there. Based on the recent site visit, Tenelco does not see any issues with truck access or WAS pumping to the tanker truck.

  Brown and Caldwell also discussed hauling of dewatered cake by Tenelco. However, Tenelco cannot accept dewatered cake if it is not Class B. If the biosolids can be guaranteed Class B, there may be opportunities for hauling dewatered cake to Tenelco's land application site in Douglas County. However, Tenelco is hesitant to do this because the company would have to store Sultan's dewatered cake on-site at its facility in Lake Stevens until a full truck load is available. Management of the dewatered cake is cumbersome because Tenelco would have to keep separate track of this material. In general, Tenelco would prefer not to undertake hauling of cake.

- ***Hauling 1% WAS to the Edmonds WWTP***
  Tenelco can haul liquid WAS in an 8,000-gallon tanker truck to the Edmonds Treatment Plant for $0.12 per gallon; Edmonds charges a tipping fee of $0.25 per dry-lb solids. Product delivered to the Edmonds Treatment Plant must be pumpable since it would be transferred to the facility's sludge storage tank for subsequent dewatering and incineration. Again, Tenelco does not see any issues with truck access or WAS pumping to the tanker truck.

- ***Hauling to Landfill***
  Cedar Hills Landfill, owned and operated by King County's Solids Waste Division (SWD), may be able to accept dewatered biosolids that pass the paint filter test. In general, King County requires the beneficial reuse of biosolids and typically does not accept municipal biosolids or any solids waste outside its jurisdiction. However, the SWD may accept the biosolids under certain circumstances, which may be subject to King County Department of Health and any conditional requiremens by the SWD. The acceptance and contract is set up with the Waste Clearance department and is subject to the approval by the King County Department of Health. Disposal at the landfill will require some work on the part of the City of Sultan in obtaining the right permits and establishing an interlocal agreement with King County, as well as any requirements through Snohomish County Department of Health and a permit to transport solids waste between jurisdictions.

## ECONOMIC ANALYSIS

The economic evaluation is based on temporary solids handling for 30 months, or 2.5 years, which is the estimated time until the WWTP upgrade is complete. The analysis does not include escalation or discount factors since the duration of the temporary solids handling options is short and solids production is not expected to increase significantly. A copy of the economic analysis is provided in Appendix A and includes the assumptions and data used in the analysis. Table 1 shows the results of the economic analysis for the selected temporary solids handling options.

Table 1: Economic Analysis of Temporary Solids Handling Options

| | Estimated Cost | | | Rank by Cost |
|---|---|---|---|---|
| | Capital | Operating | Total | |
| Composting at La Conner | $ - | $ 181,200 | $ 181,200 | 1 |
| Buying a Centrifuge [1] | $ 423,200 | $ 93,900 | $ 517,100 | 4 |
| Renting a Centrifuge [2] | $ - | $ 393,900 | $ 393,900 | 3 |
| Hauling 4% sludge to the South Plant | $ - | $ 967,200 | $ 967,200 | 7 |
| Hauling 1% WAS to the South Plant | $ - | $ 1,787,400 | $ 1,787,200 | 8 |
| Hauling 1% WAS by Septage Receiver | $ - | $ 600,900 | $ 600,900 | 5 |
| Hauling 1% WAS to Edmonds WWTP | $ - | $ 699,600 | $ 699,600 | 6 |
| Hauling to Landfill | $ - | $ 331,500 | $ 331,500 | 2 |

[1] Includes building and foundation

[2] Based on $10,000 per month. At $15,000 per month, the cost is approximately 38% higher ($543,900)

The least-cost option would be to continue dewatering with the Somat press and transporting the cake to the La Conner compost operation.

## NON-ECONOMIC CONSIDERATIONS

- ***Composting (La Conner)***

  There is some uncertainty about the La Conner operation, such as availability of the bulking agent for composting, which could result in the facility declining to accept cake. However, this option could get paired with the landfill option by using the landfill as a contingency plan. The plant has also been able to transport cake to GroCo and could retain this option as a backup plan. The inter-local agreement ensures continued disposal of dewatered cake at La Conner. However, the inter-local agreement is typically an annually agreement and is subject to change.

- ***Buying a Centrifuge***

  This option presents a number of issues, including the reuse of the temporary centrifuge. After approximately 2 years of operation, this centrifuge would no longer be under warranty and would not be performance tested or guaranteed in the new installation (the City may be able to purchase an optimization package from the vendor, but a performance guarantee may be diffucult to obtain). Buying and installing a centrifuge requires the longest implementation time, approximately 5 to 6 months, and is subject to centrifuge availability. This option would also require a separate construction contract. The plant staff has previously investigated this option and found it less attractive because of the long implementation time.

- ***Renting a Centrifuge***
  Renting a centrifuge could have the advantage of providing the staff with centrifuge experience for future centrifuge operation. However, rental cost, availability, and implementation time are unknown at this time.

- ***Hauling 4% Sludge to the South Treatment Plant***
  Hauling low solids sludge to the South Treatment Plant requires reducing solids content produced by the Somat press and does not eliminate the operation and maintenance issues associated with the press. Plant staff would have to experiment with Somat operation to determine if they could lower the solids content without compromising the dewatering operation. Plant staff would also be required to work closely with the hauler to determine optimum solids content that can be pumped. Lower solids content also means more frequent trucking and higher transportation cost, but some savings can be expected on reduced polymer usage.

- ***Hauling 1% WAS to the South Treatment Plant***
  Hauling 1% WAS to the South Treatment Plant requires very frequent truck hauls, averaging once per day.

- ***Hauling 1% WAS by Septage Receiver***
  Hauling 1% WAS to the septage receiver's facility requires very frequent truck hauls, averaging once per day.

- ***Hauling 1% WAS to the Edmonds WWTP***
  Hauling 1% WAS to the Edmonds WWTP requires very frequent truck hauls, averaging once per day. There may be some concerns with the capacity of the Edmonds WWTP and the plant's ability to accept the Sultan WAS on a consistent or continuous basis.

- ***Hauling to Landfill***
  Hauling to the Cedar Hills landfill presents a number of issues previously discussed, including permits and transportation of solids waste to another jurisdiction. Since the City of Sultan has been able to secure disposal at the composting site in La Conner through the inter-local agreement, it is recommended that the landfill option be used as a contingency plan only.

**RECOMMENDATION**

Based on this analysis, the least-cost option is continuation of the current operation and it is recommended that the City of Sultan continue dewatering with the Somat press and hauling the dewatered cake to La Conner for composting. The composting facility in Monroe is scheduled to be operational in early spring of 2008, and it is anticipated that the City of Sultan will begin transporting the dewatered cake to Monroe as soon as possible; the proximity of this location would reduce hauling costs.

Despite the high cost of disposal at GroCo, the plant has occasionally been bringing dewatered cake to GroCo and it is recommended to keep this option open as a second contingency plan. It is also recommended that the City establish a contingency plan with the Cedar Hills Landfill in case of issues at La Conner.

# APPENDIX A: ECONOMIC ANALYSIS

| | | Composting at La Conner | Buying a Centrifuge | Renting a Centrifuge | Hauling 4% sludge to the South TP | Hauling 1% WAS to the South TP | Hauling 1% WAS by Septage Receiver | Hauling 1% WAS to Edmonds | Hauling to Cedar Hills Landfill |
|---|---|---|---|---|---|---|---|---|---|
| **Solids Data and Equipment Sizing** | | | | | | | | | |
| WAS Percent solids | | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% |
| Cake Percent solids | | 10% | 20% | 20% | 4% | - | - | - | 10% |
| Solids generation rate (MM) | lb/d | 490 | 490 | 490 | 490 | 490 | 490 | 490 | 490 |
| Solids generation rate (ADWF) | lb/d | 420 | 420 | 420 | 420 | 420 | 420 | 420 | 420 |
| Solids generation rate (avg annual) | lb/d | 455 | 455 | 455 | 455 | 455 | 455 | 455 | 455 |
| | lb/wk | 3,185 | 3,185 | 3,185 | 3,185 | 3,185 | 3,185 | 3,185 | 3,185 |
| | WT/wk | 15.9 | 8.0 | 8.0 | 39.8 | - | - | - | 15.9 |
| | DT/year | 83.0 | 83.0 | 83.0 | 83.0 | 83.0 | 83.0 | 83.0 | 83.0 |
| | WT/year | 830.4 | 415.2 | 415.2 | 2075.9 | - | - | - | 830.4 |
| Density | lb/cf | 60.0 | 58.0 | 58.0 | 60.0 | 62.4 | 62.4 | 62.4 | 60.0 |
| | lb/gal | 8.34 | 8.34 | 8.34 | 8.34 | 8.34 | 8.34 | 8.34 | 8.34 |
| Volume of dewatered solids | cy/year | 1025 | 530 | 530 | 2563 | - | - | - | 1025 |
| | cy/wk | 19.7 | 10.2 | 10.2 | 49.2 | - | - | - | 19.7 |
| | gal/wk | - | - | - | 9,547 | - | - | - | - |
| Volume of WAS | gal/wk | 38,189 | 38,189 | 38,189 | 38,189 | 38,189 | 38,189 | 38,189 | 38,189 |
| Operating time for dewatering | hrs/week | 32 | 16 | 16 | 32 | - | - | - | 32 |
| Flow rate to dewatering | gpm | 21 | 43 | 43 | 21 | - | - | - | 21 |
| **Electric Power** | | | | | | | | | |
| Power demand | hp | 5 | 27 | 27 | 5 | - | - | - | 5 |
| Power cost | $/kWh | $0.070 | $0.070 | $0.070 | $0.070 | - | - | - | $0.070 |
| Annual power cost | $/year | $434 | $1,165 | $1,165 | $434 | $0 | $0 | $0 | $434 |
| Monthly power cost | $/month | $36 | $97 | $97 | $36 | $0 | $0 | $0 | $36 |
| **Polymer** | | | | | | | | | |
| Polymer requirement | lbs-active/DT | 9.9 | 20 | 20 | - | - | - | - | 9.9 |
| Polymer cost | $/lb-solution POL | $2.40 | $2.40 | $2.40 | - | - | - | - | $2.40 |
| Emulsion polymer % active | | 45% | 45% | 45% | - | - | - | - | 45% |
| Annual polymer cost | $/year | $4,400 | $8,850 | $8,850 | $2,200 | $0 | $0 | $0 | $4,400 |
| Monthly polymer cost | $/month | $367 | $738 | $738 | $183 | $0 | $0 | $0 | $367 |
| **Centrifuge** | | | | | | | | | |
| Rental | $/month | $0 | $0 | $10,000 | $0 | $0 | $0 | $0 | $0 |
| | $/year | $0 | $0 | $120,000 | $0 | $0 | $0 | $0 | $0 |
| Purchase | | - | $290,000 | - | - | - | - | - | - |
| Installation | | - | $133,220 | - | - | - | - | - | - |
| **Hauling** | | | | | | | | | |
| Max truck capacity (75% of 20 cy) | cy | 15 | 15 | 15 | - | - | - | - | 15 |
| Truck loading | cy or gal | 9.9 | 10.2 | 10.2 | 3300 | 8000 | 8000 | 8000 | 9.9 |
| Number of trips | trips/week | 2 | 1 | 1 | 2.9 | 4.8 | 4.8 | 4.8 | 2 |
| | trips/year | 104 | 52 | 52 | 150 | 248 | 248 | 248 | 104 |
| Diesel fuel cost | $/gal | $3.50 | $3.50 | $3.50 | - | - | - | - | $3.50 |
| Trip distance (roundtrip) | | | | | | | | | |
| La Conner | miles | 120 | 120 | 120 | - | - | - | - | - |
| Renton (90) | miles | - | - | - | - | - | - | - | - |
| Cedar Hills Landfill | miles | - | - | - | - | - | - | - | 100 |
| Tenelco | miles | - | - | - | - | - | 50 | - | - |
| Time (roundtrip) | | | | | | | | | |
| La Conner | hrs | 3.5 | 3.5 | 3.5 | - | - | - | - | - |
| Renton | hrs | - | - | - | - | - | - | - | - |
| Cedar Hills Landfill | hrs | - | - | - | - | - | - | - | 3.0 |
| Tenelco | hrs | - | - | - | - | - | 1.5 | - | - |
| Miles per gal | mpg | 8.0 | 8.0 | 8.0 | - | - | 4.0 | - | 8.0 |
| Fuel surcharge (cost above $3/gal) | $/gal | - | - | - | - | - | $0.65 | - | - |
| Haul rate | $/gal | - | - | - | $0.72 | $0.36 | $0.12 | $0.12 | - |
| Truck maintenance (estimate) | $/year | $1,000 | $750 | $750 | $0 | $0 | $0 | $0 | $1,000 |
| Annual hauling cost | $/year | $18,472 | $9,486 | $9,486 | $357,453 | $714,906 | $240,319 | $238,302 | $15,846 |
| Monthly hauling cost | $/month | $1,539 | $791 | $791 | $29,788 | $59,576 | $20,027 | $19,859 | $1,321 |
| *Does not include truck depreciation* | | | | | | | | | |
| **Tipping Fee** | | | | | | | | | |
| Tipping fee at La Conner | $/ton | $27 | $27 | $27 | - | - | - | - | - |
| Tipping fee at Cedar Hills Landfill | $/ton | - | - | - | - | - | - | - | $102.50 |
| Tipping fee at Edmonds WWTP | $/dry-lb | - | - | - | - | - | - | $0.25 | - |
| Annual tipping fee | $/year | $22,420 | $11,210 | $11,210 | $0 | $0 | $0 | $41,519 | $85,113 |
| Monthly tipping fee | $/month | $1,868 | $934 | $934 | $0 | $0 | $0 | $3,460 | $7,093 |
| **Operator** | | | | | | | | | |
| Salary | $/hr | $33 | $33 | $33 | $33 | - | - | - | $33 |
| Operator time | % of operation | 25% | 25% | 25% | 25% | - | - | - | 25% |
| Annual operator cost | $/year | $13,728 | $6,864 | $6,864 | $13,728 | $0 | $0 | $0 | $13,728 |
| Monthly operator cost | $/month | $1,144 | $572 | $572 | $1,144 | $0 | $0 | $0 | $1,144 |
| **Maintenance** | | | | | | | | | |
| Replacement parts (Somat) | $/year | $12,000 | $0 | $0 | $12,000 | - | - | - | $12,000 |
| Operator (Somat overhaul) | hrs/year | 32 | 0 | 0 | 32 | - | - | - | 32 |
| | $/year | $1,056 | $0 | $0 | $1,056 | - | - | - | $1,056 |
| Annual maintenance cost | $/year | $13,056 | $0 | $0 | $13,056 | $0 | $0 | $0 | $13,056 |
| Monthly maintenance cost | $/month | $1,088 | $0 | $0 | $1,088 | $0 | $0 | $0 | $1,088 |
| **Total** | | | | | | | | | |
| | $/year | $72,510 | $37,580 | $157,580 | $386,870 | $714,910 | $240,320 | $279,820 | $132,580 |
| | $/month | $6,040 | $3,130 | $13,130 | $32,240 | $59,580 | $20,030 | $23,320 | $11,050 |
| **Project Duration** | months | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| **Operating Cost** | $ | $181,200 | $93,900 | $393,900 | $967,200 | $1,787,400 | $600,900 | $699,600 | $331,500 |
| **Capital Cost** | $ | $0 | $423,220 | $0 | $0 | $0 | $0 | $0 | $0 |
| **Total** | $ | $181,200 | $517,100 | $393,900 | $967,200 | $1,787,400 | $600,900 | $699,600 | $331,500 |