STATE OF ALASKA
ALASKA CLEAN/DRINKING WATER FUND
GREEN PROJECT ASSESSMENT FORM

As applicable under the EPA annual capitalization grants provided to the Alaska Clean Water Fund (ACWF) and Alaska Drinking Water Fund (ADWF) loan programs, a portion of funds appropriated shall be for projects to address green infrastructure, water or energy efficiency improvements or other environmentally innovative activities." To meet this condition under the federal grant for administering these funds, this assessment form is provided to document this eligibility or what is termed a "Categorical" or "Business Case" justification, which will be reviewed by DEC for provisional compliance. For more information on green infrastructure development, please review the following EPA web site:

http://cfpub.epa.gov/npdes/home.cfm?program_id=298

For those projects requiring a "Business Case," Part 2 will require completion to qualify a "traditional project" as green; justification is broken down into two parts, technical and financial. The technical part should use information from a variety of sources such as maintenance or operation records, engineering studies, project plans or other applicable documentation to identify problems (including any data on water and/or energy inefficiencies) in the existing facility, and that clarifies the technical benefits from the project in water and/or energy efficiency terms. Financial justification needs to show estimated savings to a project based on the technical benefits, and demonstrate that the green component of the project provides a substantial savings and environmental benefit.

For more information and assistance in completing this assessment form, please contact the Municipal Matching Grants & Loans program in Anchorage at 907-269-7673, or in Juneau at 907-465-5300.

GENERAL INFORMATION

Name of Community Anchorage - Solid Waste Services

Address MOA SWS Disposal Utility 1111 East 56th Avenue Anchorage, AK 99518-1754

Contact Name Mark Madden Title Engineer Telephone (907) 343-6279

PROJECT INFORMATION

Project Name Anchorage Landfill Leachate Discharge Force Main Location Anchorage Regional Landfill

Project Type: X New Construction _____ Upgrades

_____ Stormwater Infrastructure X Energy Efficiency Project

_____ Water Efficiency Project _____ Innovative Environmental Project

Green Project Description: This project will design and construct new force main pipeline which will convey leachate from the Anchorage Regional Landfill collection ponds to the sanitary sewer on JBER military base; eliminating the need to truck leachate to the Turpin Street dump station for discharge. Pumping the leachate through the force main will be more energy efficient then trucking the leachate, and is a cost effective solution.

PART 1 – GREEN PROJECT CATEGORY & COSTS

Identify the most appropriate "Green" Clean Water or Drinking Water category project type. Note, any selection with (BC) at the end will require a Business Case demonstration.

ENERGY EFFICIENCY – the use of improved technologies and practices to reduce the energy consumption of water quality projects.

_____ Wastewater/water utility energy audits _____ Clean power for public owned facilities

_____ Leak detection equipment _____Retrofits/upgrades to pumps & treatment processes (BC)

_____ Replace/rehabilitation of distribution (BC) __X__ Other: Eliminate trucking of leachate (BC)

WATER EFFICIENCY – the use of improved technologies and practices to deliver equal or better services with less water.

_____ Water meters _____ Fixture Retrofit _____ Landscape/Irrigation

_____ Graywater or other water recycling _____ Replace/rehabilitation of distribution (BC)

_____ Leak detection equipment _____ OTHER: _____ (BC)

GREEN INFRASTRUCTURE – Practices that manage and treat stormwater and that maintain and restore natural hydrology by infiltrating, evapotranspiring and capturing and using stormwater.

_____ Green Streets _____ Water harvesting and reuse

_____ Porous pavement, bioretention, trees, green roofs, water gardens, constructed wetlands

_____ Hydromodification for riparian buffers, floodplains, and wetlands

_____ Downspout disconnection to remove stormwater from combined sewers and storm sewers

_____ OTHER: _____ (BC)

ENVIRONMENTALLY INNOVATIVE PROJECTS – Demonstrate new/innovative approaches to managing water resources in a more sustainable way. This may include projects that achieve pollution prevention or pollutant removal with reduced costs and projects that foster adaptation of water protection programs and practices to climate change.

_____ Wetland restoration _____ Decentralized wastewater treatment solutions

_____ Water reuse _____ Green stormwater infrastructure _____ Water balance approaches

_____ Adaptation to climate change _____ Integrated water resource management

_____ OTHER: _____ (BC)

PROJECT & GREEN COMPONENT COSTS

	TOTAL PROJECT COSTS	TOTAL "GREEN" COMPONENT COSTS
Administration	$ 75,000	$ 75,000
Legal	$ 75,000	$ 75,000
Preliminary Studies/Reports	$ 150,000	$ 150,000
Engineering Design	$ 175,000	$ 175,000
Inspection/Surveying/Construction Management	$ 165,000	$ 165,000
Construction	$ 1,800,000	$ 1,800,000
Equipment	$ 300,000	$ 300,000
Contingencies	$ 400,000	$ 400,000
Other _____	$	$
Total Costs	$ 3,140,000	$ 3,140,000

PART 2 – PROJECT "BUSINESS CASE" TECHNICAL/FINANCIAL ASSESSMENT

TECHNICAL ANALYSIS OF BENEFITS*

In addition to this form, a supporting technical and financial analysis is required to verify energy and water saving efficiencies for any green component of the project. For green infrastructure and innovative environmental type projects, the analysis should include any applicable efficiency and environmental benefits. For assisting MGL in evaluating "Business Case" assessments of water main, meter, and pump facility replacement type projects, the attached form titled "ADWF - Water/Energy Efficiency Determination - Water Main Replacement/Meter/Pump Facility" is required to be completed. Once the form is complete along with any supporting documentation, please submit documentation to the MGL program for review and concurrence. Note, only water/energy efficiencies that achieve a 20% or greater increase in efficiency will categorically qualify as a Green project.

CERTIFICATION STATEMENT:

I certify the above information is current and accurate.

Mark Madden — Name

Engineer — Title

_____ — Signature

_____ — Date

Submit Completed Form to:

Alaska Department of Environmental Conservation
Municipal Matching Grants & Loans
555 Cordova Street
Anchorage, AK 99501-2617

ACWF 130291 – Anchorage Landfill Leachate Discharge Force Main

Solid Waste Services – Municipality of Anchorage

Business Case:

This project will design and construct new force main pipeline which will convey leachate from the Anchorage Regional Landfill collection ponds to the sanitary sewer on JBER military base; eliminating the need to truck leachate to the Turpin Street dump station for discharge. Pumping the leachate through the force main will be more energy efficient then trucking the leachate, and is a cost effective solution.

Comparison of energy use:

Approximately 4,700,000 kWh per year is currently used for the leachate hauling. If the leachate force main is constructed, the estimated power consumption for the pumps is 42,000 kWh per year (Mark Madden). There would be a 99% reduction in energy use from this project.

Calculation for current energy use for hauling leachate:

12.7kWh/gal x 5 miles/gal x 73,818 miles/year =4,687,443 kWh/year

Assumptions:

Petroleum to electricity conversion of 12.7 kWh per gallon of petroleum from the US Energy Information Administration Independent Statistics & Analysis Frequently Asked Questions (http://www.eia.gov/tools/faqs/faq.cfm?id=667&t=6)

The leachate tanker trucks get an average of 5 mpg while hauling per Mark Madden.

Annual tractor miles is 73,818 miles/year (pg 18 Anchorage Regional Landfill Leachate Disposal Pipeline Study July 8, 2013)

ANCHORAGE REGIONAL LANDFILL
LEACHATE DISPOSAL PIPELINE STUDY

July 8, 2013

Municipality of Anchorage Solid Waste Services

Prepared By:

Bristol Engineering Services Corporation
111 W. 16th Avenue, Suite 301
Anchorage, Alaska 99501
Ph: 907-563-0013
in association with
Stephl Engineering LLC and BHC Consultants

MUNICIPALITY OF ANCHORAGE

Solid Waste Services Department

1111 E. 56th Avenue
Anchorage, Alaska 99518
Phone – (907) 343-6262 Fax – (907) 561-1357

Mayor Dan Sullivan

July 18, 2013

RE: Anchorage Regional Landfill
Leachate Disposal Improvement Project

Each year the Anchorage Regional Landfill produces in excess of 13 million gallons of contaminated water which has percolated through the landfill waste, commonly referred to as "leachate" Like most major landfills in the U.S., the Solid Waste Services Department (SWS) discharges this leachate to the local publicly owned wastewater treatment system. Currently, SWS hauls this liquid in 6,000-gallon tanker trucks to a discharge point at the Glenn Highway and Turpin Street; approximately 9 miles away. Due to the record snowfall in 2012, last year we made nearly 3,800 trips for this purpose, an average of over 10 trips per day.

SWS is currently considering an alternative which would allow us to discharge the leachate directly to the sanitary sewer system. Enclosed is a preliminary report describing the proposed project. The project would significantly reduce the annual costs incurred by the Department for leachate disposal, but would also protect public safety by eliminating the risk of a traffic incident-related spill.

At this time, we are soliciting input on the project to determine our final design parameters and to identify any requirements or concerns you might have as we move this project forward. Please contact Mark Madden, the SWS Manager of Engineering and Planning with your questions or comments on this project. He can be reached at (907) 343-6279 or maddenmg@muni.org.

Sincerely,
Solid Waste Services

Paul F. Alcantar
Director

Attachments: "Anchorage Regional Landfill Leachate Disposal Pipeline Study" June 19, 2013.

Distribution: Dan Gavora, Doyon Utilities
Bob Zacharski, Doyon Utilities
Brett Jokela, Anchorage Water and Wastewater Utility
Kurt Vause, Anchorage Water and Wastewater Utility
George Vakalis, Municipal Manager
Dave Glines, Joint Base Elmendorf – Richardson
Al Lucht, Joint Base Elmendorf – Richardson
Wes Layton, Joint Base Elmendorf - Richardson

CONTENTS

SECTION 1
INTRODUCTION

Solid Waste Services (SWS) commissioned Bristol Engineering Services Corporation (BESC) to evaluate the feasibility of constructing a pipeline to convey leachate from the Anchorage Regional Landfill (ARL) to the nearby sanitary sewer system at Joint Base Elmendorf Richardson (JBER). Leachate is currently hauled by tanker truck from ARL and discharged into the Turpin Street septage receiving station in the Municipality of Anchorage (MOA), Anchorage Water and Wastewater Utility (AWWU) sanitary sewer system. The Fort Richardson Army (FRA) portion of the JBER sewer system ultimately discharges into the AWWU sanitary sewer system above this point.

SECTION 2
BACKGROUND

Background

Landfill leachate at ARL is collected on the landfill liner and conveyed by pipe to two lined ponds located on the west side of the landfill site. The leachate treatment ponds are located approximately one mile from the northeastern end of the FRA sanitary sewer system. The northeastern end of the FRA sanitary sewer system serves the National Guard Armory Building and the Range Control facility on the east side of the Glenn Highway. The ARL and FRA properties are adjacent to each other. Figure No. 1 shows the ARL and JBER sites and the proposed route for a force main pipe to convey leachate from ARL.

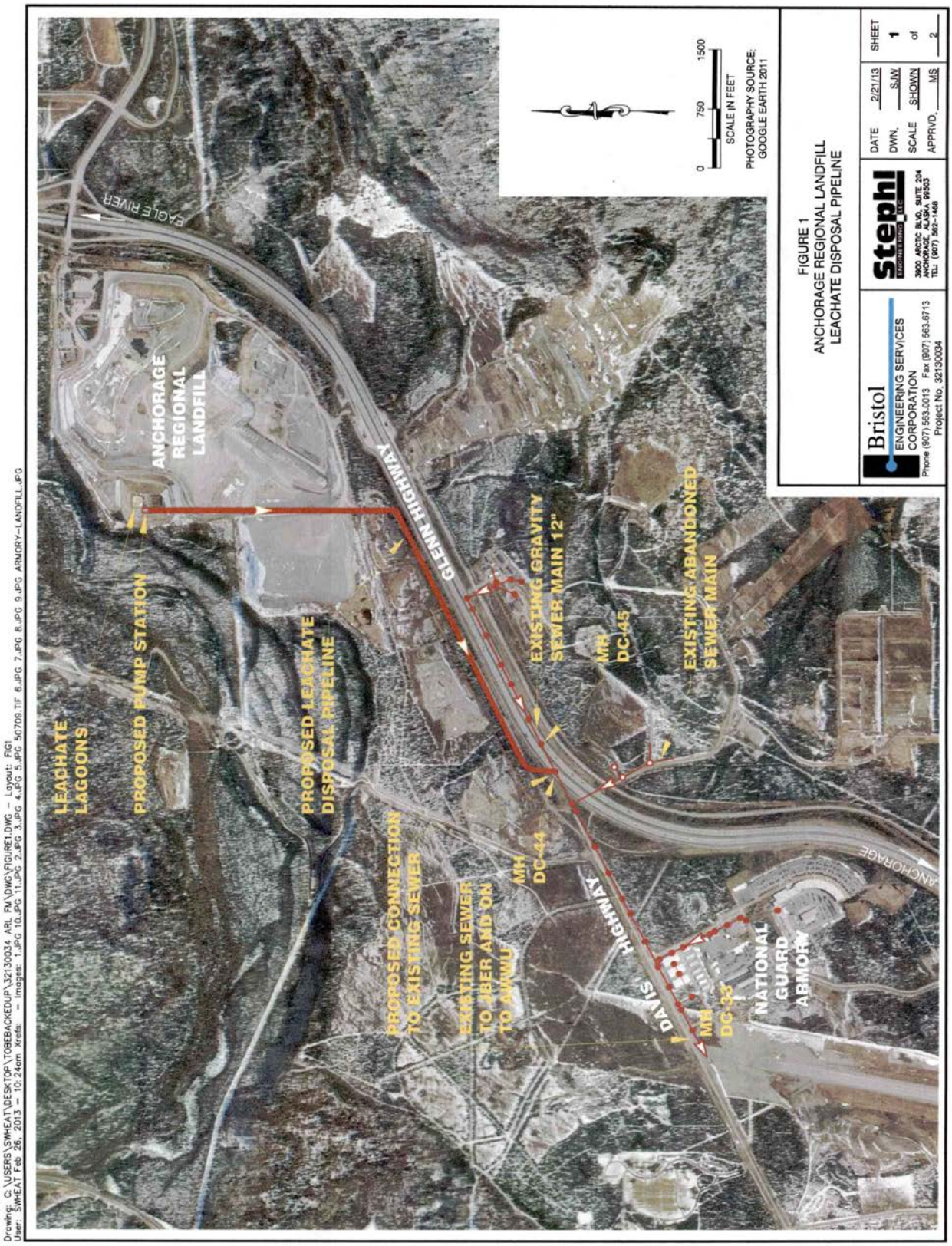
ARL Leachate Treatment

Leachate at ARL is treated by aeration and stabilization. There is no chemical addition in the treatment process. ARL has two lined lagoons. Lagoon No. 1 (1.0 million gallons) and Lagoon No. 2 (1.2 million gallons). Lagoon No. 1 is the primary lagoon and has a high rate course bubble aeration system that sits on the lagoon floor. It consists of a network of air pipe headers and 319 aeration nozzles. The system receives air from two blowers located in the adjacent blower building. The blowers have approximately 275 hp total and an output capacity of 5,600 scfm. Lagoon No. 2 is currently used to store excess leachate and does not have an aeration system.

ARL Leachate Truck Haul

SWS uses tractor-trailer tanker trucks to convey the treated leachate to the AWWU sanitary sewer disposal site at the septic haulers discharge station on Turpin Road. Each tanker has a maximum capacity of 6,000 gallons. The truck tanks are filled to the 5,500 gallon level to leave head space in the tanks for sloshing. SWS operates three tanker trucks. The trucks can haul leachate up to seven days a week and 10 hours per day. The frequency of haul and hours of operation are constantly being modified to accommodate the fluctuating incoming leachate flow rates and operation of the lagoons.

Truck tanks are filled via a truck loading station that sits adjacent to the treatment lagoons. Leachate to fill the trucks comes from aerated Lagoon No. 1. Full trucks travel via the Glenn Highway to the AWWU septage receiving station on Turpin Street, and discharge their tanks at this dump station via a drain hose in the tank. Each tanker truck is required to log into an automatic card reader at the Turpin dump station to maintain a tally of the leachate quantity that is discharged into the AWWU sanitary sewer



Drawing: C:\USERS\SWHEAT\DESKTOP\TOBEBACKEDUP\32130034 ARL FM\DWG\FIGURE1.DWG – Layout: FIG1
User: SWHEAT Feb 26, 2013 – 10:24am Xrefs: – Images: 1.JPG 10.JPG 11.JPG 2.JPG 3.JPG 4.JPG 5.JPG 50708.TIF 6.JPG 7.JPG 8.JPG 9.JPG ARMORY-LANDFILL.JPG

system. The trucks travel approximately nine miles to the dump station. Additionally, a scale ticket is generated by SWS documenting the weight of each load.

Under their Industrial Wastewater Discharge Permit, SWS is allowed to haul and discharge 50,000 gallons per day. During high flow periods, AWWU has granted waivers to the permit to allow up to 125,000 gallons per day. These occurrences have become more frequent in recent years. SWS has been under an almost continuous waiver since June, 2012.

JBER and FRA Sewer Collection System

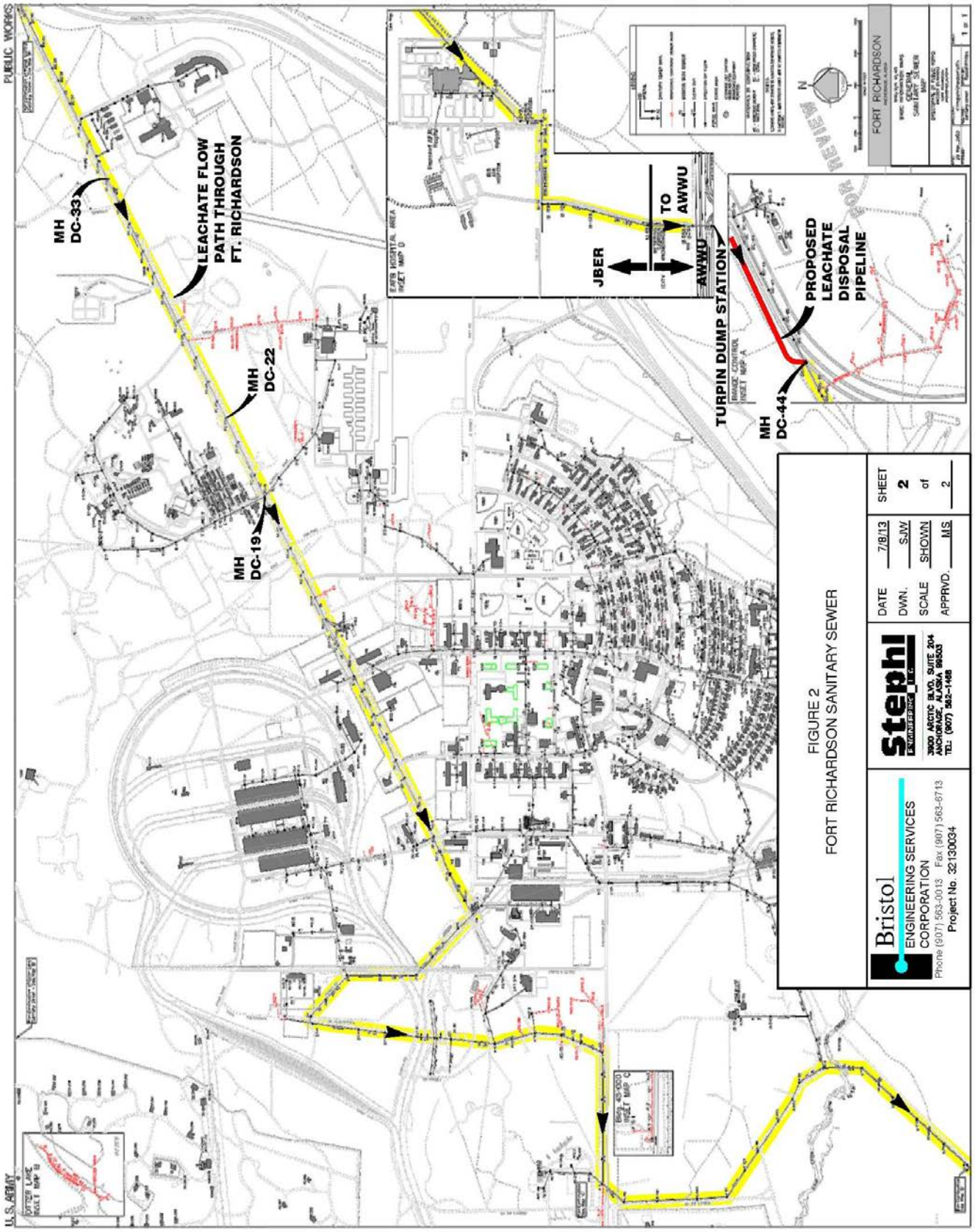
The Ft. Richardson (FRA) sewer system is now part of the overall JBER sewer system. JBER includes both Ft. Richardson and Elmendorf and these two collection systems meet at their downstream ends and discharge into AWWU at the one and same location.

Most of the sewage collection system on Fort Richardson was built in the 1950's. Figure No. 2 shows the route the leachate would travel through the military base from the proposed discharge point. A 2008 FRA Utility Characterization Study by PDC Inc. Engineers found that the FRA sewer collection system has adequate flow capacity and the pipes are not undersized for the sanitary flow rates. Based on visual observation of the existing sewer flows, the sewer pipes generally experience flow levels that are at or below the 25 percent full level (25% of the diameter).

SWS proposes to discharge leachate to the JBER system at manhole (MH) DC-44 located approximately 2000 feet upstream of the Amory. The leachate would travel an estimated 7.3 miles through the JBER sewers until it reached the connection to the AWWU sewer system at the Glenn Highway. There are no pump stations or lift stations along the entire 7.3 mile flow path. The sewers that the leachate will travel through are constructed with non-reinforced concrete pipe, asbestos cement pipe, cast iron pipe and reinforced concrete pipe.

The 2008 Utility Characterization Study of the FRA system stated that approximately 60,000 feet of the system has been inspected with a closed circuit television camera (CCTV). In 1996 and 1997, 55,000 feet of the sewer system was inspected and 4,600 feet of larger diameter sewer mains were inspected in 2008. Approximately 10,300 feet of the existing 1996 and 2008 video data was reviewed as part of the 2008 study to determine the general condition of the various pipes in the system. General characteristics of the entire FRA sewer system as observed in portion of the video data that was reviewed include:

- FRA pipes are overall generally in fair to good condition
- Grades and inverts are for the most part uniform
- Some root intrusion was observed
- Widespread debris, grease, soft plugs and tallow buildup were observed
- A few localized defects (not widespread) were observed in some of the older smaller diameter concrete pipes and they included: short sags, holes, cracking and minor collapsing of the pipe crown, mortar loss on the surface and exposed aggregate showing around the entire pipe circumference and longitudinal cracking at the 3:00 and 9:00 positions and a slight deformation of the pipe crown that indicates a pending structural failure.


MH DC-33
LEACHATE FLOW PATH THROUGH FT. RICHARDSON
MH DC-22
MH DC-19
JBER
TO AWWU
AWWU
TURPIN DUMP STATION
PROPOSED LEACHATE DISPOSAL PIPELINE
MH DC-44
FORT RICHARDSON
U.S. ARMY
PUBLIC WORKS
FIGURE 2
FORT RICHARDSON SANITARY SEWER
Bristol
ENGINEERING SERVICES CORPORATION
Phone (907) 563-0013 Fax (907) 563-6713
Project No. 32130034
Stephl
3909 ARCTIC BLVD, SUITE 204
ANCHORAGE, ALASKA 99503
TEL: (907) 562-1488
DATE 7/8/13
DWN. SJW
SCALE SHOWN
APPRVD. MS
SHEET 2 of 2

- In some cases, the CCTV camera inspection had to be terminated due to excessive debris in the invert or surcharged flow levels due to downstream debris backing up the sewage flows
- In the 10,300 feet of CCTV data that was reviewed, 16 service connections were identified

JBER Sewer Pipes Downstream of Proposed Leachate Discharge from MH DC-44 to MH DC-22
The existing JBER sewer pipes from MH DC-44 to MH DC-22 that are immediately downstream of the proposed leachate discharge manhole are constructed with non-reinforced concrete pipe with three-foot long pipe joint segments. The total length of sewer pipe from MH DC-44 to MH DC-22 is approximately 7,850 feet (1.5 miles) long. This section of sewer was inspected in 1996 with a closed circuit television (CCTV) camera. Part of the CCTV inspection data was reviewed during the sewer study work in 2008. All 7,850 feet of the 1996 CCTV data was not reviewed in 2008. The portion that was reviewed included 1,600 feet of video data or 20 percent of the 7,850 foot total length. The partial review of the 1996 CCTV information found the following about the sewers downstream of MH DC-44:

- The 12-inch concrete pipes in the CCTV data that was reviewed are in fair to good condition.
- No structural defects were identified in the CCTV data that was reviewed.
- Some signs of deterioration were observed that was described as "aggregate showing in the invert from 5:00 to 7:00 position." This type of condition in an older concrete pipe invert is normally attributed to erosion of the pipe wall and not corrosion.
- Sewage debris accumulation and high liquid levels were observed in three areas. This condition was due to root intrusion in the pipe joints. Low sewage flows, a lack of adequate flushing and a lack of periodic pipe cleaning maintenance are likely contributing to this condition.

JBER Sanitary Sewer Flow Volume
The existing sanitary sewer flow in MH DC-44 in the JBER sewer system at the location of the proposed leachate discharge pipe connection is estimated to be 20 gallons per minute (gpm). During a manhole inspection survey in May 2008, the sewer flow was measured at approximately one inch deep in the at sewer pipe at MH DC-44. Manhole inspection reports are attached. Sewer flows in the nearby adjacent manholes in the 12-inch sewer main were also measured as approximately one inch of flow depth.

Using the Manning equation and an assumed minimum pipe slope of 0.22 percent, the flow in the sewer pipe is estimated to be 20 gpm at MH DC-44. Other downstream estimated flows are shown below:

Manhole	Pipe Dia.	Flow Depth 2008	Estimated Sanitary Flow
DC-44	12"	1"	20 gpm
DC-33	12"	1"	20 gpm
DC-19	18"	3"	130 gpm

If this project is pursued further and proceeds into design, it is recommended that the existing sanitary flows be measured again to obtain more updated information.

AWWU Leachate Collection and Conveyance
Leachate is currently hauled and then enters the AWWU sanitary sewer system in a 24-inch concrete pipe at the Turpin Street septage dump station. It travels through an estimated 15 miles of sewer pipe before it reaches the Asplund Wastewater Treatment Plant located at Point Woronzof. The Turpin septage dump station is located just downstream of the point where the JBER sewage enters the AWWU sewer system. Wastewater leaving the JBER/AWWU connection on the north side of the Glenn Highway

travels approximately 1,050 feet through a 24-inch concrete sewer pipe before it goes past the Turpin dump station that is located on the south side of the Glenn Highway.

AWWU Leachate Tariff and Charges

AWWU charges a fee to SWS for the discharge of leachate into the AWWU sewer system. The current fee for disposal of leachate into the Turpin dump station is $21.66 per 1,000 gallons. This is the same fee that septage haulers pay to discharge sanitary sewage waste into the dump station.

High Strength Industrial Waste users are charged a rate of $6.73 per 1,000 gallons. This rate is charged to industrial facilities that discharge directly in to the AWWU sanitary pipe sewer system and do not discharge into the dump stations such as Turpin. A High Strength Industrial Waste user is classified by AWWU as an industrial facility that is discharging effluent that has a total suspended solids (TSS) that exceeds 450 mg/L. If ARL was discharging directly to the sewer system this is the category that best represents their discharge since their TSS is typically greater than 450 mg/l.

Under the current practice, each full tanker truck is weighed at the ARL scale. SWS converts the weight to gallons to track their haul volumes. At the Turpin Dump Station the truck swipes in at the card reader and connects to a metered discharge pipe. The meter has not been reliable. Therefore, SWS is currently charged by the truck load at 80 percent of the tanker rated capacity.

Fort Richardson Sewer Tariff

AWWU charges a fee to Fort Richardson for the discharge of sanitary sewer wastewater into the AWWU sewer system. The current fee for disposal of wastewater by FRA is $1.79 per 1,000 gallons.

SECTION 3
LEACHATE DESIGN FLOWS AND COMPOSITION

Historical Leachate Flow Rates

Leachate has been hauled by truck from ARL since 1989. The volume of leachate discharged from the landfill is measured by truck load and truck weight and then converted to gallons. The monthly truck loads and leachate volumes for the period 2002 to 2012 are shown in Table No. 1.

TABLE NO. 1

ARL LEACHATE HAUL HISTORY: 2002-2012

Month	2002		2003		2004		2005		2006		2007	
	Loads	Gallons	Loads	Gallons	Loads	Gallons	Loads	Gallons	Loads	Gallons	Loads	Gallons
JAN	88	496,400	176	750,524	117	453,925	343	1,911,058	89	489,771	114	630,632
FEB	29	160,558	219	1,177,496	93	495,353	68	382,919	214	1,191,307	155	863,140
MAR	95	540,880	154	738,886	124	699,607	164	921,409	113	725,510	127	707,307
APR	363	2,100,062	107	577,255	301	1,703,293	193	1,091,456	390	2,153,929	196	917,714
MAY	402	2,290,514	124	714,693	88	498,830	163	923,247	377	2,076,928	247	1,370,684
JUN	191	1,084,961	63	362,691	139	781,529	219	1,211,983	64	348,187	209	1,163,494
JUL	113	639,581	73	416,726	94	495,830	178	957,869	109	519,602	74	400,451
AUG	147	830,211	99	546,469	93	515,724	318	1,645,481	190	919,221	189	969,124
SEP	160	904,633	78	440,925	168	937,954	465	2,597,081	447	2,453,396	282	1,603,811
OCT	248	1,411,914	98	560,050	286	1,603,607	236	1,213,134	469	2,690,747	253	1,451,068
NOV	180	1,014,120	87	471,830	115	647,552	55	306,322	75	387,746	120	674,610
DEC	126	661,194	91	489,814	143	810,373	383	2,156,084	93	514,979	98	548,925
TOTAL	2,142	12,135,028	1,369	7,247,359	1,761	9,643,577	2,785	15,318,044	2,630	14,471,324	2,064	11,300,960

Month	2008		2009		2010		2011		2012		2013	
	Loads	Gallons	Loads	Gallons	Loads	Gallons	Loads	Gallons	Loads	Gallons	Loads	Gallons
JAN	113	612,812	107	599,329	92	615,339	97	514,646	73	404,976	452	2,445,536
FEB	189	1,032,766	172	929,167	87	468,386	183	956,005	116	625,617	477	2,580,603
MAR	149	851,355	79	434,217	109	549,249	72	396,827	145	782,454	255	1,436,697
APR	79	439,427	93	515,856	247	785,340	301	1,732,975	546	2,890,207	338	2,412,376
MAY	284	1,459,209	88	482,011	178	934,270	126	716,805	415	2,210,766	405	2,158,548
JUN	85	433,534	80	443,202	109	603,977	174	991,370	320	1,704,424		
JUL	106	509,335	36	200,580	231	1,190,272	39	223,092	189	1,002,310		
AUG	213	1,034,028	83	448,362	277	1,165,951	277	1,592,578	325	1,725,122		
SEP	130	733,172	139	763,164	158	893,311	174	995,291	394	2,099,838		
OCT	119	663,871	120	687,041	66	362,706	97	559,705	519	2,731,188		
NOV	88	492,115	59	336,209	46	254,483	126	718,490	401	2,102,253		
DEC	67	365,925	78	429,047	86	460,220	168	929,989	342	1,787,323		
TOTAL	1,622	8,627,549	1,134	6,268,185	1,686	8,283,504	1,834	10,327,773	3,785	20,066,478	1,927	11,033,760

Future Leachate Flow Rates

Leachate flow rates are directly affected by precipitation and the lined landfill footprint size. Table No. 2 shows the leachate generation for recent peak flow years. Precipitation values shown in Table No. 2 were obtained from historical data recorded at the Anchorage weather station number 500280.

TABLE NO. 2

Historic Leachate Generation Rates					
Peak Years	Annual Leachate Volume (gal)	Annual Precipitation (inches)	Landfill Footprint (acres)	Gallons leachate/ precip/acre (per year)	Gallons leachate/ acre/year
2002	12,135,028	18.8	82	7,872	147,988
2005	15,318,044	15.9	105	9,175	145,886
2006	14,471,324	20.3	105	6,789	137,822
2007	11,300,906	15.4	105	6,989	107,628
2012	20,066,478	21.0	113	8,456	177,579
	Average	18.3		7,856	143,381

At full build-out, when all the cells are developed, the landfill will have a footprint of 167 acres. The landfill will have the opportunity to reach its highest historical annual leachate flows during the first few years of operation after full build-out is achieved. This is the period before portions of the landfill will begin to be capped. A water proof cap over the landfill will prevent precipitation from entering the waste and eventually ending up in the lagoons.

For design purposes, a peak generation rate of 150,000 gallons of leachate per acre per year will be used. At full build-out of the landfill the leachate volumes are estimated to be as follows:

Landfill Full Build-Out Year Estimated Leachate Design Flows

Landfill size:	167 acres
Leachate generation rate:	150,000 gallons/acre/year
Annual leachate volume:	25,050,000 gallons/year
Average monthly flow:	2,088,000 gallons/month
Average daily flow:	68,600 gallons/day
Average instantaneous flow:	48 gallons/minute
Pump station design output flow:	60 gallons/minute

The pump station will not be designed for peak month or peak hour flows that are common factors in sanitary sewage pump station designs. The pump station will be designed to convey the average annual flow of a typical peak year leachate volume when the landfill is at its largest future size. Short-term peak flow periods will be controlled by operating the lagoons to dampen the peaks. The lagoons have a total volume of 2.2 million gallons and the volume of liquid stored in the lagoons can be adjusted. The lagoons will be managed to accept the incoming peak flows and produce a more uniform outgoing flow.

Leachate Composition

The composition of the treated leachate from ARL is tested on a periodic basis. Results of the periodic tests taken since 2009 are shown in the following table. In addition to the information below, ARL leachate data from 1999 to 2005 had measured sulfate concentrations ranging from 130 mg/l to 1700 mg/l. Typical concentrations were between 200 and 400 mg/l.

TABLE NO. 3

Municipality of Anchorage - Solid Waste Services

Anchorage Water & Wastewater Utility Industrial Pretreatment Program

7/2010 to 9/2012

Parameter	Arsenic	Beryllium	BOD	BOD Sol.	Cadmium	Chromium	Copper	Cyanide	Lead	Mercury	Nickel	O&G	pH	Silver	TAH	TSS	Zinc
Permit Limit[1]	3.7 mg/L	14.5 mg/L	NA	NA	0.69 mg/L	2.77 mg/L	3.38 mg/L	1.7 mg/L	0.69 mg/L	0.2 mg/L	3.88 mg/L	NA	5.0<x<12.5	2.5 mg/L	5.0 mg/L	NA	12 mg/L
Anchorage Regional Landfill (ARL202)																	
1/6/2009	0.0449	ND	11,200	11,500	ND	0.0684	0.0207	0.0092	ND	ND	0.551	48.4	8.87	ND	ND	360	0.739
2/3/2009	-	-	10,200	9,640	-	-	-	-	-	-	-	-	7.89	-	-	1,410	-
3/5/2009	-	-	10,300	11,100	-	-	-	-	-	-	-	-	7.83	-	-	2,150	-
4/10/2009	ND	ND	9,740	8,900	ND	0.0729	0.0214	0.0088	0.0231	ND	0.366	93.4	6.30	ND	ND	2,160	1.520
5/6/2009	-	-	7,060	5,650	-	-	-	-	-	-	-	-	8.24	-	-	2,780	-
6/4/2009	-	-	6,680	6,140	-	-	-	-	-	-	-	-	8.36	-	-	2,090	-
7/13/2009	ND	-	4,520	3,000	ND	0.0658	0.0176	ND	ND	ND	0.403	900	8.34	ND	0.0055	3,480	1.080
8/4/2009	-	-	1,420	906	-	-	-	-	-	-	-	-	8.50	-	-	6,020	-
9/10/2009	-	-	445	42.3	-	-	-	-	-	-	-	-	8.56	-	-	6,410	-
10/7/2009	0.0322	ND	2,600	2,060	ND	0.0518	0.0115	ND	0.00351	ND	0.263	39.8	8.48	ND	ND	1,740	1.190
11/3/2009	-	-	5,890	5,040	-	-	-	-	-	-	-	-	8.12	-	-	2,410	-
12/3/2009	-	-	6,590	7,070	-	-	-	-	-	-	-	-	8.21	-	-	2,060	-
1/5/2010	0.0527	ND	8,190	6,210	ND	0.0883	0.0138	0.0014	0.00339	ND	0.475	84.4	8.20	ND	ND	1,500	1.700
2/5/2010	-	-	6,010	5,890	-	-	-	-	-	-	-	-	8.24	-	-	1,430	-
3/2/2010	-	-	6,360	5,660	-	-	-	-	-	-	-	-	7.95	-	-	510	-
4/1/2010	0.0073	ND	6,270	4,920	ND	0.0073	0.0021	0.0100	0.0013	ND	0.0372	50.2	8.00	ND	0.0065	2,090	0.210
5/10/2010	-	-	4,750	4,120	-	-	-	-	-	-	-	-	8.17	-	-	1,470	-
6/7/2010	-	-	5,510	5,370	-	-	-	-	-	-	-	-	8.17	-	-	3,060	-
7/7/2010	ND	ND	1,700	1,550	ND	0.0743	0.0137	0.0100	0.0025	ND	0.3560	82.7	8.40	ND	ND	3,780	1.750
8/6/2010	-	-	1,220	704	-	-	-	-	-	-	-	-	8.34	-	-	2,610	-
9/14/2010	-	-	1,890	1,770	-	-	-	-	-	-	-	-	8.06	-	-	1,840	-
10/12/2010	ND	ND	4,940	3,450	ND	0.0520	0.0228	ND	0.00379	ND	0.337	35.7	8.20	ND	ND	2,320	2.500
11/24/2010	-	-	6,080	4,580	-	-	-	-	-	-	-	-	-	-	-	2,960	-
12/21/2010	-	-	6,040	4,900	-	-	-	-	-	-	-	-	8.24	-	-	890	-
1/25/2011	ND	ND	5,080	4,390	ND	0.0333	0.0679	ND	0.00278	ND	0.3670	28.1	8.10	ND	ND	380	0.742
2/28/2011	-	-	4,850	4,040	-	-	-	-	-	-	-	-	8.00	-	-	625	-
3/30/2011	-	-	2,750	2,270	-	-	-	-	-	-	-	-	7.90	-	-	2,290	-
4/26/2011	-	-	2,340	2,000	-	-	-	-	-	-	-	-	7.70	-	-	3,760	-
5/26/2011	-	-	1,910	1,410	-	-	-	-	-	-	-	-	8.10	-	-	8,850	-
6/8/2011	0.0438	-	928	1,120	ND	0.0588	0.0432	ND	0.00508	ND	0.334	19.3	8.43	ND	ND	2,860	1.820
7/28/2011	0.0469	ND	490	37.5	ND	0.0557	0.0308	ND	0.00461	ND	0.395	7.47	8.40	ND	ND	3,160	1.970
8/30/2011	-	-	648	51.2	-	-	-	-	-	-	-	-	8.00	-	-	4,000	-
9/28/2011	-	-	1,180	77.2	-	-	-	-	-	-	-	-	8.40	-	-	1,740	-
10/20/2011	0.0311	ND	1,730	216	ND	0.0434	0.0208	0.0083	0.00222	ND	0.384	ND	8.43	ND	0.00196	1,820	1.540
11/22/2011	-	-	3,070	2,490	-	-	-	-	-	-	-	-	7.37	-	-	755	-
12/7/2011	-	-	3,800	3,030	-	-	-	-	-	-	-	-	7.70	-	-	1,030	-
1/12/2012	0.0362	ND	1,840	1,810	ND	0.0382	0.0251	0.0058	0.00240	ND	0.337	11.30	8.17	ND	0.00422	320	0.692
2/8/2012	-	-	23,700	7,900	-	-	-	-	-	-	-	-	7.80	-	-	2,480	-
3/13/2012	-	-	6,150	6,760	-	-	-	-	-	-	-	-	7.90	-	-	2,660	-
4/2/2012	0.0662	ND	5,360	5,390	ND	0.0973	0.0489	0.0150	0.00550	ND	0.577	30.80	7.80	ND	0.02991	225	6.650
5/23/2012	-	-	5,400	6,000	-	-	-	-	-	-	-	-	7.40	-	-	2,930	-
6/14/2012	-	-	5,630	4,410	-	-	-	-	-	-	-	-	7.60	-	-	2,950	-
7/12/2012	0.0520	ND	5,070	4,500	ND	0.0785	0.0235	0.0066	0.00319	ND	0.528	55.70	8.00	ND	ND [0.044]	4,240	7.250
8/8/2012	-	-	5,940	2,690	-	-	-	-	-	-	-	-	8.10	-	-	1,270	-
9/7/2012	-	-	4,730	3,740	-	-	-	-	-	-	-	-	7.80	-	-	8,400	-

Abbreviations:

>	Greater than
<	Less than
-	Sample not analyzed for this parameter
mg/L	Milligrams per liter
NA	Not Applicable
ND	Not Detected
TAH	Total Aromatic Hydrocarbon (TAH) result is sum of benzene, toluene, ethylbenzene, & xylenes concentration results
TSS	Total Suspended Solids

Notes:

Industrial Wastewater Discharge Permit (October 1, 2009 to September 30, 2014)

Results prior to January 2011 available upon request.

SECTION 4
LEACHATE IMPACT ON JBER SEWERS

Potential Leachate Effects

The leachate concentration in the JBER sewer will be the highest at the location where the leachate is discharged into the sewer system. As the leachate combines with sanitary sewage flows downstream in the JBER system, the leachate concentration will be reduced by additional incoming sanitary sewage.

It is estimated that the liquid flowing out of MH DC-44 will consist of 20 gpm of sanitary sewage and 60 gpm of leachate. The estimated total flow of 80 gpm would be 75 percent leachate and 25 percent sanitary sewage. These flow values would be confirmed in greater detail if the project moves forward into the next phase.

There is a possibility that hydrogen sulfide (H2S) formation could occur in the JBER sewer mains and manholes at, or in, proximity of the leachate discharge point. How far the H2S in significant concentrations would travel down the sewer pipe depends on a number of factors, including turbulence in the pipe flow and the volume of incoming sanitary sewage.

EPA Document 832, *Detection, Control and Correction of Hydrogen Sulfide Corrosion in Existing Wastewater Systems*, recommends that target levels for dissolved sulfides be less than 0.1 to 0.3 mg/L and for hydrogen sulfide in the air the target level should be less than 3 to 5 ppm (in sanitary sewers). It is recommended that the levels be controlled to meet the EPA recommended concentrations or the sewers should be protected.

If this project moves ahead, a more thorough evaluation of the potential for H2S formation should be completed. This could include: 1) flow monitoring of the existing sewer flows, 2) measurement of the existing leachate sulfate concentrations, 3) measurement of H2S levels in the JBER sewers at the discharge point and downstream, 4) camera inspection (CCTV) of the existing nearby sewer pipes to confirm their condition, and 5) testing of potential H2S formation in the JBER sewers by discharging truck hauled leachate into a manhole and measuring the effects.

Protecting the JBER Sewers

If it is determined later that protection of the JBER sewer is needed, two options for accomplishing this may include; 1) chemical addition to the leachate to reduce the hydrogen sulfide concentration or, 2) installation of a protective coating on the inside of the manholes and upgrading of the sewer mains with a cured in place pipe (CIPP) liner. CIPP liners are a trenchless technology that can be installed in sewers via access through the manholes. Digging is not necessary. CIPP liners are resistant to H2S attack.

For the purpose of this analysis, it has been assumed that a liner would be installed and manholes would be protected for 1,420 feet in the JBER sewer system. The protection would start upstream at MH DC-45 (upstream of the MH DC-44 discharge) and would extend approximately 1,000 feet downstream to MH DC-41.

Other Considerations: Foaming, Odor, Maintenance

In our experience, foaming has not been a problem at locations where leachate is discharged to a sewer or WWTP. Foaming has been experienced at times at most leachate aeration facilities, but it has not been noted at the discharge to sewer collection system or WWTP.

Leachate does not create gas safety issues beyond what should be considered for any sanitary sewer. Having the leachate fully aerated before entering the pump station and force main will help control odors, but it would not be unusual for odor to be detected near the initial discharge manhole. If odor becomes a problem, several approaches to control the odor could be used, including bioxide or other oxidizing agent addition at the pump station or routing vent gasses through activated carbon.

Solids accumulation has not been reported as a problem at any of the sewer collection systems we have been involved with that receive leachate. Calcite formation has been observed at ARL and Cedar Hills where the leachate first leaves the landfill, but it has not been noted in the downstream facilities, and has not to our knowledge been an issue in the AWWU sewer system.

Experience at Other Locations with Similar Leachate Disposal Methods

Our experience with landfill leachate being pumped directly into a sewer system includes Cedar Hills Regional Landfill in King County Washington, Snohomish County Regional/Cathcart Landfill in Snohomish County Washington, and Unalaska Landfill in Dutch Harbor Alaska.

Leachate is trucked and discharged to a sewer collection system or directly to a WWTP at Vashon Island Landfill in King County Washington, Kenai Peninsula Borough in Kenai Alaska, Cedarville Landfill in Whatcom County Washington, Roseburg Landfill in Douglas County Oregon, and ARL. Currently, pump stations and force mains to discharge leachate to sewer collection systems are being evaluated for Roseburg and Reedsport Landfills in Douglas County Oregon. Each facility has unique conditions, both in leachate characteristics and sewer collection system, and will be evaluated independently.

SECTION 5
LEACHATE DISPOSAL PIPELINE PROJECT

Pipeline and Pump Station

In the proposed system, leachate would be conveyed with a pump station and a 5-inch HDPE force main pipe. The pump station would have two pumps and would be designed with one pump having the capacity to convey the design flow of an estimated 60 gpm. The second pump would provide redundancy.

A 5-inch SDR 11 HDPE pipe with a 150 psi pressure rating has an inside diameter of 4.5 inches is recommended at this time. A 4-inch SDR 11 HDPE pipe with an inside diameter of 3.6 inches is another option and should be evaluated in detail during the design phase to confirm if this smaller pipe is acceptable in regard to head loss, long-term maintenance and potential debris accumulation.

At a flow of 60 gpm, the 5-inch force main would have a liquid velocity of approximately 1.2 ft/second and have a total dynamic pressure loss of approximately 5 psi. These are reasonable study-level values for providing cleaning velocities and manageable head loss in the pipe. The new pipe would be buried below the frost depth and would have buried cleanouts spaced periodically along its length. The grade of the pipe should be designed to prevent trapped air or debris accumulation.

There is a possibility that the ground topography may slope downhill from north to south where the pipe is parallel to the Glenn Highway. Early in the design phase a design survey will be completed along

the proposed alignment. Converting the discharge pipe from a fully flowing force main to a partially flowing gravity pipe should be evaluated.

The pump station would include controls and equipment for measuring and totalizing the leachate flows. Equipment would also be included that would allow the operators to control the volume of leachate that is pumped to maintain the lagoon liquid levels and leachate aeration times as needed to fit the changes in the incoming leachate flows from the cells. The pump station would be designed to minimize corrosion from the leachate.

Right of Way

The pump station and approximately 3,000 feet of the force main pipe would be installed on Municipally owned ARL land. The remaining 4,200 feet of force main would be installed on Military land or State of Alaska Department of Transportation (AKDOT) right of way. Authorization from the Military and AKDOT will be required to install and maintain the pipe on their properties.

Permits

A detailed evaluation should be completed to identify all the project permits. There are no known protected habitat or wetlands along the alignment that would require extensive agency permits. Permits will be needed from the AKDOT to work near the travel lanes on the Glenn Highway and along or under the adjacent bike path. No excavation work would be done in the driving lanes and no temporary lane closures are proposed. The project should be designed to avoid this. Permits required for construction on JBER will be identified.

JBER Sewer System Upgrades

Although the impact of potential H2S gas has not been confirmed, funding will be included in the project at this time to protect JBER sewers, if it is determined later that the protection is needed. Protection could include installing a CIPP liner in approximately 1,420 feet of 12-inch concrete sewer pipe and applying protective coatings in five manholes.

Estimated Cost

The estimated costs for the leachate pump station and force main are shown in Table No. 4.

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	LIFE	ANNUAL DEPRECIATION
Duplex Pump Station	1	EA	$230,000.00	$230,000	40	$5,750
Pumps	1	EA	$60,000.00	$60,000	10	$6,000
5" HDPE Force Main	7200	LF	$200.00	$1,440,000	50	$28,800
12" CIPP Liner (or chemical addition)	1420	LF	$160.00	$227,200	50	$4,544
Manhole Coating	5	EA	$5,000.00	$25,000	50	$500
Surface restoration	1	LS	$180,000.00	$180,000	50	$3,600
Subtotal				$2,162,200		$49,194
Design & CM @ 20% of Capital Cost	20%			$432,440	50	$8,649
Subtotal				$2,594,640		
Contingency	20%			$518,928	50	$10,379
Total				$3,113,568		$68,221

SECTION 6
LEACHATE PUMPING VS. TRUCK HAUL

Table No. 4 above outlines the capital cost and life expectancy of the various improvements associated with transmitting the ARL leachate to AWWU via a force main. Table No. 5 below compares the annual operating costs of the force main versus continued haul of ARL leachate to the AWWU Turpin Discharge Station. The comparison is based upon an average of 20,000,000 gallon per year of leachate production. The Force Main project versus the current Direct Haul option results in an annual savings of $802,347.

Capital costs associated with the truck hauling include just the tractors (7-year life) and 6,000 gallon tankers (10-year life) and their operating and maintenance costs of $1.24/mile for the tractors and $0.27/mile for the tankers. Both alternatives have a labor component, but as seen in Table No. 5, the force main alternative requires 5,480 less labor hours per year. The largest cost variable in the comparison is the AWWU user fee. Even without this AWWU variable, SWS would still save ($583,324-$79,577) $503,747 annually.

See Appendix B for more detail and backup information in regard to the cost comparison of hauling versus pumping of leachate.

TABLE NO. 5

Force Main versus Truck Haul of ARL Leachate

20,000,000 gallons per year

	2014	Notes
Force Main Annual Operating:		
Labor & FB to maintain pumps	$5,356	Burdened labor at $44.63 and 120 hours/year.
Electric for pumps/year	$6,000	11 hp motor for force main pump
Capital Depreciation $	$68,221	See other text and Baseline Data Summary WB sheet.
AWWU User Fees	$134,600	20,000,000 gallons/year at $6.73/1,000 gallons.
Annual Total	**$214,177**	
Direct Haul Annual Operating:		
Direct Labor & Fringe Benefits	$384,833	5,600 Labor hrs at $44.63/hr. (Hauling 20,000,000 gallons/yr or 5,500 gal/load at 1.54 hr/load.)
Equipment Operating	$111,262	73,818 miles at, Tractor ($1.24) & Tanker ($0.267) O&M average cost/mile in 2012.
Capital Depreciation $	$87,230	Tractors: 3 each $98,999 with 7 year life and 3 Tankers at $149,338 each with 10 year life.
AWWU User Fees	$433,200	20,000,000 gallons at AWWU rate of $21.66/1000 gallons.
Annual Total	**$1,016,524**	

APPENDIX A
COST COMPARISON DATA

ARL Leachate Force Main vs Tanker Haul Cost Comparison Data Table..

Description				Notes
Labor:				
MOA/SWS Labor Rate for a RDU III		$/hr	$31.25	This is for a RDU III employee Range 18-D. Wage rate could go up to $35.31 for an employee with the 'Incentives". (See below Line 68)
Fringe Benefit Labor Rate		$/hr	$13.38	From SWS
Total Labor Rate		$/hr	**$44.63**	
Equipment:				
Tractor Capital Cost			**$98,999**	From SWS
Tractor Annual Depreciation Cost		**7 year**	**$14,143**	
Tractor Operating		$/mile	**$1.240**	Based on 2012 Averages shown below:
Tractor 54506	$33,298.64	29,364		
Tractor 54507	$29,774.85	22,540		
Tractor 55508	$32,983.19	25,542		
Totals	$96,056.68	77,446		
Tanker Capital Cost			**$149,338**	From SWS
Tanker Annual Depreciation		**10 year**	**$29,868**	
Tanker Operating		$/mile	**$0.267**	Based on 2012 Averages shown below:
Tanker 55109	$5,131.41	26,479		
Tanker 55811	$8,505.89	23,856		
Tanker 55108	$6,889.05	26,559		
Totals	$20,526.35	76,894		
AWWU Tarriff for ARL **Tanker Hauled** Leach		$/1000 gal	**$21.66**	AWWU Schedule NO.5 Septage Hauler as of Jan 1 , 2013. (Note rate currently charged to SWS)
AWWU Tarriff for ARL **Force Main** Leach		$/1000 gal	**$6.73**	AWWU Schedule NO.4 Metered Commercial Rate as of Jan 1, 2013.
Leachate Factors:				
Projected annual leachate flow/year. (Peak)		gallons/year	25,050,000	From M Stephl report: At full build out.
Daily leachate flow		gallons/day	68,630	From M Stephl report: At full build out and 365 days per year
Tanker Average gallon/haul/trip			**5,500**	Annual averages have ranged between 5,300 to 5,800 due to various factors like load limits and balancing weight on tanker/tractor axils. This value is an assumed average. Tanker capacity actually 6,000 gallons.
Tanker average hours/round trip per load			**1.54**	From 2012 SWS records: which show 3,785 loads hauled, taking 5,827.85 hours.
Round trip miles/load			20.3	From SWS 2012 Spreadsheet.
Assumed ave annual leachate for Cost Comparison			20,000,000	**Annual Leachate flow.**
Assumed average Daily flow for $ Comparison (365days/year)			54,795	Daily Flow (gallons) for force main at 365 days/year.
Assumed average Daily flow for $ Comparison (312days/year)			64,103	Daily Flow (gallons) for Truck Haul at 312 days/year.
Tanker trips per year at 5,500 gallons/load.		Loads/year	3,636	Used 5,500 gallons/load rather than SWS report 2012 report showing 5302 gallons.
Tanker trips per day. Using 312 operating days/yr		Loads/day	12	Rounded to highest whole number.
Labor hours/year @ 1.54 hrs/trip		hours	**5,600**	Rounded to 12 loads/day for 312 days per year and 1.54 hours per load which is SWS 2012 data.
Annual Tractor miles		miles/year	**73,818**	Tanker trips/year (3,636) times distance 20.3 miles /trip.
Force Main Pump Electrical			**$6,000**	From JV: 20 mg/y flow. 11 hp/ 42,000 kWh/yr. cost $6,000/year
Annual Labor to Maintain Force Main Pump/year		Hours/year	120	Assumed labor hours

ARL Leachate Force Main vs Tanker Haul Cost Comparison Data Table..

Force Main Capital	Cost	Life	Annual Depreciation
Pump Station	$230,000	40	$5,750
Pumps	$60,000	10	$6,000
5" HDPE Force Main	$1,440,000	50	$28,800
12" CIPP Liner	$227,200	50	$4,544
Manhole Coating	$25,000	50	$500
Surface Restoration	$180,000	50	$3,600
Subtotal	$2,162,200		$49,194
Design & CM at 20% of Capital	$432,440	50	$8,649
Subtotal	$2,594,640		
Contingency @ 20%	$518,928	50	$10,379
Total Annual Deprecition	$3,113,568		**$68,221**

Dierct Haul Capital	Cost	Life	Annual Depreciation
Tractors	**$98,999**	7	$14,143
Tankers	**$149,338**	10	$14,934
Total Annual Deprecition	$248,337		**$29,077**

For 1 unit: 3 needed.

Labor:

RDU III employee hauling leachate in 2013: From Ruth on 5/8

Salary (1) with Incentive Pay	$35.31	
Leave Accrual	$4.62	13.08%
Benefits	$7.75	21.95%
General Liability	$0.08	0.23%
Workers Comp	$2.67	7.56%
Total	$50.43	42.82%
Benefit Total	$15.12	

(1)	Salary Range for RDU III without "Incentive Pay:	$27.01	$28.36	$29.77	**$31.25**
	Fringe Benefits	$11.57	$12.14	$12.75	**$13.38**
		$38.58	$40.50	$42.52	**$44.63**

Annual labor to Haul 20 m gallons:		Gallons	20,000,000
Average gallons /trip	5750		
Trips			3,478
Hours/Trip			