City of Bethel
Public Works Committee
Regular Meeting - Wednesday, March 20, 2019 5:30 pm City Hall Council Chambers, 300 Chief Eddie Hoffman Highway

Courtney Trammell
Committee Chair
Term Expires 12/2020

Alyssa Gustafson
Committee Vice-Chair
Term Expires 12/2019

Carol Jung-Jordan
Council Representative
Term Expires 10/2020

Jeff Sanders
Committee Member
Term Expires 12/2020

Ryan Butte
Committee Member
Term Expires 12/2020

Juan Delgado
Committee Member
Term Expires 12/2021

Bill Arnold
Ex- Officio Member

Charlie Dan
Committee Recorder

I. CALL TO ORDER

II. ROLL CALL

III. PEOPLE TO BE HEARD – 5 minute limit

IV. APPROVAL OF AGENDA

V. APPROVAL OF MINUTES
a) 06-21-2017 Regular Meeting
b) 08-16-2017 Regular Meeting
c) 09-20-2017 Regular Meeting
d) 10-18-2017 Regular Meeting
e) 11-15-2017 Regular Meeting
f) 12-20-2017 Regular Meeting
g) 02-20-2019 Regular Meeting

VI. UNFINISHED BUSINESS
a) We are Still in - Paris Agreement Standing/Support (Sanders)
b) Institutional Corridor Water and Sewer Rates
c) Coordinating Road Maintenance to Prevent School Delays (Butte)

VII. NEW BUSINESS
a) Feasibility Study for Gasification Incinerator (Municipal Solid Waste)
b) Review Memorandum of Understanding (MOU) between City of Bethel and Lower Kuskokwim School District draft
c) Review recommendation for Amendment of Bethel Municipal Code Ordinance, Section 13.04.180 Holding Tank Service

VIII. DIRECTOR'S REPORT

IX. COMMITTEE MEMBER COMMENTS

X. ADJOURNMENT

Posted March 11, 2019 at City Hall, AC Co., Swanson's, and the Post Office.

Charlie Dan, Public Works Assistant

City of Bethel, Alaska
Public Works Committee Minutes

June 21, 2017 Regular Meeting Bethel, Alaska

I. CALL TO ORDER:

A regular Public Works Committee Meeting was held on June 21, 2017 at the council chambers of the City Hall, Bethel, Alaska. Joseph Klejka called the meeting to order at 6:34 pm.

II. ROLL CALL:

Comprising a quorum of the committee, the following were present: Joseph Klejka, Jennifer Dobson, Robert Champagne, and Naim Shabani.

Excused Absents: Public Works Director, Bill Arnold and Scott Guinn

Also Present:
Committee Recorder, Pauline Boratko

III. PEOPLE TO BE HEARD: none

IV. APPROVAL OF AGENDA:

MOVED BY:	Jennifer Dobson	Motion to approve the agenda.
SECONDED BY:	Robert Champagne	
VOTE ON MOTION	Motion carried by unanimous vote.	

V. APPROVAL OF MINUTES:

MOVED BY:	Jennifer Dobson	Motion to approve minutes for April 19, 2017 meeting.
SECONDED BY:	Robert Champagne	
VOTE ON MOTION	Motion carried by unanimous vote.	

MOVED BY:	Robert Champagne	Motion to approve minutes for May 17, 2017 meeting.
SECONDED BY:	Naim Shabani	
VOTE ON MOTION	Motion carried by unanimous vote.	

VI. SPECIAL ORDER OF BUSINESS:

VII. UNFINISHED BUSINESS:

A. Institutional Corridor Piped Water Supply Project: no new updates this month

B. Sewer Lagoon- PER (Preliminary Engineering Report) and ER (Environmental Report) for Truck Dump site and other options: No new updates this month

C. Leveling of the Bethel Heights Water Treatment Plant Building: The building is off by 14 inches. The plan is to measure it again at the end of the summer to determine what step needs to be taken.
D. Clarification of BMC Codes: no new updates this month
E. Ridgecrest Drive Road Update: The plan is to have the road project compleated in August of 2018.
F. Snow Removal from neighborhoods: no new updates this month
G. Landfill closure and new landfill site: no new updates this month

VIII. NEW BUSINESS:

IX. DIRECTOR'S REPORT: Director of Public Works, Bill Arnold was unavailable to give report.

X. MEMBER COMMENTS:
Robert Champagne- no comment
Jennifer Dobson- Thank you AVCP for hosting a disposal of electronics drive.
Joseph Klejka- Thank you
Naim Shabani- Thank you for your time you put into the committee.

XI. ADJOURNMENT:

MOVED BY:	Jennifer Dobson	Motion to adjourn.
SECONDED BY:	Niam Shabani	
VOTE ON MOTION	Motion carried by unanimous vote	

With no further business, meeting adjourned at 7:01 pm

APPROVED THIS _____ DAY OF _____, 2017.

_____
Pauline R. Boratko
Recorder of Minutes

_____
Joseph Klejka
Chair

City of Bethel, Alaska
Public Works Committee Minutes

August 16, 2017 Regular Meeting Bethel, Alaska

I. CALL TO ORDER:
Due to the lack of quorum there was no regular meeting held on August 16, 2017

II. ROLL CALL:
The following were present: Joseph Klejka, Jennifer Dobson, and Scott Guinn

Excused absence(s):Robert Champagne
Unexcused absent: Naim Shabani

Also Present:
Committee Recorder, Betsy Jumper

Meeting adjourned at 6:45 pm due to lack of quorum.

APPROVED THIS _____ DAY OF _____, 2017.

_____
Betsy Jumper
Recorder of Minutes

_____
Joseph Klejka
Chair

City of Bethel, Alaska
Public Works Committee Minutes

September 20, 2017 Regular Meeting Bethel, Alaska

I. CALL TO ORDER:

A regular Public Works Committee Meeting was held on September 20, 2017 at the council chambers of the City Hall, Bethel, Alaska. Joseph Klejka called the meeting to order at 6:32 pm.

II. ROLL CALL:

Comprising a quorum of the committee, the following were present: Joseph Klejka, Jennifer Dobson, Robert Champagne, and Scott Guinn

Unexcused Absent: Naim Shabani

Also Present:
Committee Recorder, Pauline Boratko
Public Works Director, Bill Arnold

III. PEOPLE TO BE HEARD: none

IV. APPROVAL OF AGENDA:

MOVED BY:	Jennifer Dobson	Motion to approve the agenda.
SECONDED BY:	Scott Guinn	
VOTE ON MOTION	Motion carried by unanimous vote.	

V. APPROVAL OF MINUTES:

MOVED BY:	Jennifer Dobson	Motion to approve minutes for June 21, 2017 meeting.
SECONDED BY:	Robert Champagne	
VOTE ON MOTION	Motion carried by unanimous vote.	

MOVED BY:	Jennifer Dobson	Motion to approve minutes for July 19, 2017 meeting.
SECONDED BY:	Scott Guinn	
VOTE ON MOTION	Motion carried by unanimous vote.	

MOVED BY:	Scott Guinn	Motion to approve minutes for August 16, 2017 meeting.
SECONDED BY:	Jennifer Dobson	
VOTE ON MOTION	Motion carried by unanimous vote.	

VI. SPECIAL ORDER OF BUSINESS:

VII. UNFINISHED BUSINESS:

- **A.** Institutional Corridor Piped Water Supply Project: The bid went out to the BSI Contractors and they will start the project in February of 2018 and should take about 5-6 months to complete.
- **B.** Sewer Lagoon- PER (Preliminary Engineering Report) and ER (Environmental Report) for Truck Dump site and other options: Dredging is in process and the dump site will be rebuilt.
- **C.** Leveling of the Bethel Heights Water Treatment Plant Building: The building has stopped moving and is currently staying at 14 inches.
- **D.** Clarification of BMC Codes: no new updates this month
- **E.** Ridgecrest Drive Road Update: The plan is to have the road project compleated in August of 2018.
- **F.** Snow Removal from neighborhoods: no new updates this month
- **G.** Landfill closure and new landfill site: The landfill was inspected and is recommended to install shallow wells to test water.

VIII. NEW BUSINESS:

IX. DIRECTOR'S REPORT: Director of Public Works, Bill Arnold reported that there will be a total of 15 new trucks replacing the hauled utilities fleet. For piping of the "avenues" a PER and ER has been submitted, and funds have already been applied for.

X. MEMBER COMMENTS:

Robert Champagne- no comment
Jennifer Dobson- City Elections October 3rd.
Joseph Klejka- I can't be here for the next meeting.
Scott Guinn- no comment

XI. ADJOURNMENT:

MOVED BY:	Jennifer Dobson	Motion to adjourn.
SECONDED BY:	Scott Guinn	
VOTE ON MOTION	Motion carried by unanimous vote	

With no further business, meeting adjourned at 7:31 pm

APPROVED THIS _____ DAY OF _____, 2017.

_____
Pauline R. Boratko
Recorder of Minutes

_____
Joseph Klejka
Chair

City of Bethel, Alaska
Public Works Committee Minutes

October 18, 2017 Regular Meeting Bethel, Alaska

I. CALL TO ORDER:
Due to the lack of quorum there was no regular meeting held on October 18, 2017

II. ROLL CALL:
The following were present: Jennifer Dobson, Robert Champagne, and Fred Watson

Excused absence(s): Joseph Klejka
Unexcused absent: Scott Guinn

Also Present:
Committee Recorder, Grant Kemp and Pauline Boratko

Meeting adjourned at 5:45 pm due to lack of quorum.

APPROVED THIS _____ DAY OF _____, 2017.

_____
Grant Kemp
Recorder of Minutes

_____
Jennifer Dobson
Vice-Chair

City of Bethel, Alaska
Public Works Committee Minutes

November 15, 2017 Regular Meeting Bethel, Alaska

I. CALL TO ORDER:
Due to the lack of quorum there was no regular meeting held on November 15, 2017

II. ROLL CALL:
The following were present: Joseph Klejka, Jennifer Dobson, and Robert Champagne

Excused absence(s): Scott Guinn

Also Present:
Ex-Officio Member, Bill Arnold
Committee Recorder, Grant Kemp

Meeting adjourned at 5:45 pm due to lack of quorum.

APPROVED THIS _____ DAY OF _____, 2017.

_____
Grant Kemp
Recorder of Minutes

_____
Joseph Klejka
Chair

City of Bethel, Alaska
Public Works Committee Minutes

December 20, 2017 Regular Meeting Bethel, Alaska

I. CALL TO ORDER:
Due to the lack of quorum there was no regular meeting held on December 20, 2017

II. ROLL CALL:
The following were present: Jennifer Dobson and Scott Guinn

Excused absence(s): Robert Champagne, Alyssa Gustafson, Bill Arnold
Unexcused absences(s): Joseph Klejka, Fred Watson

Also Present:
Committee Recorder, Grant Kemp

Meeting adjourned at 5:45 pm due to lack of quorum.

APPROVED THIS _____ DAY OF _____, 2017.

_____
Grant Kemp
Recorder of Minutes

_____
Jennifer Dobson
Vice-Chair

City of Bethel, Alaska
Public Works Committee Meeting Minutes

February 20, 2019 Regular Meeting Bethel, Alaska

I. CALL TO ORDER:

A regular Public Works Committee meeting was held on February 20, 2019 in the City Hall council chambers in Bethel, Alaska. Courtney Trammell called the meeting to order at 5:30 pm.

II. ROLL CALL:

Present: Courtney Trammell, Alyssa Gustafson, Jeff Sanders, Ryan Butte, Juan Delgado
Also Present: Bill Arnold, Charlie Dan and Pauline Boratko
Excused Absence: Carol Jung-Jordan

III. PEOPLE TO BE HEARD:-5 Minute Limit

IV. APPROVAL OF AGENDA:

MOVED BY:	Alyssa Gustafson	Motion to approve Agenda.
SECONDED BY:	Ryan Butte	
VOTE ON MOTION	Motion carried by unanimous vote.	

V. APPROVAL OF THE MINUTES:

MOVED BY:	Ryan Butte	Motion to approve meeting minutes for dates: 9/19/18, 10/17/18, 11/21/18, 12/9/18, and 1/16/19 meetings.
SECONDED BY:	Alyssa Gustafson	
VOTE ON MOTION	Motion carried by unanimous vote.	

VI. SPECIAL ORDER OF BUSINESS:

VII. UNFINISHED BUSINESS:

A. Institutional Corridor Piped Water Supply Project: Finished business in November.

B. Sewer Lagoon: Finished business.

C. Gasification Incinerator for Municipal Solid Waste (Sanders): Committee discussed refinement of item on the agenda: Feasibility study.

D. We Are Still In-Paris Agreement Standing/Support (Sanders): discussed carbon footprint per capita, also not qualified for agreement. Would like more info/research.

E. Institutional Corridor Water and Sewer Rates: Committee discussed the "endgame", also members would like more info/research from another committees.

F. Coordinating Road Maintenance to Prevent School Delays (Butte): Committee discussed writing up a MOU (Memorandum of Understanding) between the City of Bethel and the School District for road safety for the buses.

MOVED BY:	Ryan Butte	Motion to request for a MOU between the City of Bethel and the School District for the road conditions/safety.
SECONDED BY:	Alyssa Gustafson	
VOTE ON MOTION	Motion carried by unanimous vote.	

MOVED BY:	Ryan Butte	Motion to bend rules and discuss item E on Unfinished Business.
SECONDED BY:	Alyssa Gustafson	
VOTE ON MOTION	Motion carried by unanimous vote.	

G. Clarification of BMC Sections on ownership of Water/Sewer Facilities: Finished business

VIII. NEW BUSINESS:

A. Water Tank Size Ordinance: As discussed in previous meeting, requesting a change in wording for the Ordinance.

B. Water Plant Operator Certification (Gustafson): discussed the difficulty in certification.

C. Circuit Board Disposal in Rural Alaska: discussed ideas for a sustainable solution.

IX. DIRECTORS REPORT: Bill Arnold gave Report

X. COMMITTEE MEMBER'S COMENTS:

C.Trammell- Thank you all for coming, great discussion throughout meeting.

A.Gustafson- Thank you to the City employees who put the packet together.

J.Sanders- Ensure that appropriate amount of sand is dispersed when needed.

R.Butte- Thank you to the City employees who put the packet together.

J.Delgado- Thank you to the City employees who put the packet together.

XI. ADJOURNMENT

MOVED BY:	Ryan Butte	Motion to Adjourn.
SECONDED BY:	Alyssa Gustafson	
VOTE ON MOTION	Motion carried by unanimous vote.	

With no further business, meeting adjourned at 7:31 PM.

APPROVED THIS _____ DAY OF _____, 2019.

_____
Charlie Dan
Recorder of Minutes

_____
Courtney Trammell
Committee Chair

City of Kotzebue
Biomass Energy Feasibility Study Report

SUBMITTED BY:

Tetra Tech
310 K St., Ste. 200
Anchorage, Alaska 99501

CONTACT:

Mr. Keith Henn, PG
(412) 921-8398
keith.henn@tetratech.com

TETRA TECH

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ACRONYMS AND ABBREVIATIONS

24/7	24 Hours Per Day, 7 Days Per Week
APC	Air Pollution Control
AC	Alaska commercial company value center
AEA	Alaska Energy Authority
AK DEC	Alaska Dept. of Environmental Conservation
BTU	British Thermal Unit
C&D	construction and demolition
CHP	Combined Heat and Power
DOER	Massachusetts Department of Energy Resources
EPA	Environmental Protection Agency
EPC	Engineering, Procurement, and Construction
EPCRA	Emergency Planning and Community Right-to-know act
FIA	USFS Forest Inventory and Analysis National Program
HAPs	Hazardous air pollutants
IC	Interconnection Customers
IRR	Internal Rate of return
LHV	Lower Heating Value
MCF	Measured in cubic feet
MW	Megawatt
KEA	Kotzebue Electric Association
KIC	Kikiktagaruk Inupiat Corporation
KOTZEBUE	City of Kotzebue
MRF	materials recovery facility
MSW	Municipal Solid Waste

NWI	National Wetlands Inventory
PTE	Potential to Emit
RCRA	Resource Conservation Recovery Act
RDF	Refuse derived fuels
REC	Renewable Energy Credits
SBA	Small Business Administration
SPEED	Sustainably Priced Energy Development Program
SQA	Statement of qualification application
Syngas	Synthetic Gas Fuel
T&D	Transportation and Delivery
TCLP	Toxicity characteristic leading procedure
Tetra Tech	Tetra Tech Inc.
TPD	tons per day
UCF	University of Central Florida
WTP	water treatment plant

EXECUTIVE SUMMARY

PROJECT OVERVIEW

The City of Kotzebue (Kotzebue) is the regional hub of Northwest Alaska, located roughly 20 miles above the Arctic Circle on the Chukchi Sea. The city is currently reviewing an opportunity to generate energy from waste through construction of a biomass-fired energy generation plant. Kotzebue has many existing features that are advantageous for development of such a project. Fundamentally, the city is located in an isolated region, and would benefit from the ability to produce its own energy and reduce dependence on expensive energy imports. Furthermore, Kotzebue owns several government buildings and is responsible for treatment and heating of citizens' water supply, either or both of which could absorb the energy produced by such a plant and reduce the city's high energy costs. Kotzebue also has a readily available source of combustible biomass in the form of municipal solid waste (MSW) that is currently being disposed in the local landfill.

The Alaska Energy Authority (AEA) sponsored this analysis into the viability of a biomass-fired community energy project in Kotzebue. Engineering firm Tetra Tech, Inc. (Tetra Tech) and project partner DOWL HKM (DOWL) conducted the evaluation.

Kotzebue has pioneered renewable energy projects in the past in conjunction with the local energy utility Kotzebue Electric Association, including a 2.94 MW wind farm, solar thermal projects, and waste-heat capture, amongst other projects. Therefore, the desire for renewable energy projects fits well with the progressive government approach to locally produced energy.

Converting waste to energy, while new to the region, is a proven and commercialized technology field. There are over 100 MSW energy projects operating in the world, processing over 40 million metric tonnes of waste per year and producing over 26 million megawatt-hours (MWh) of electricity and 7.4 million MWh of thermal energy per year[1]. Versions of this technology have been in operation at large scale since the 1970's. Community-scale projects, such as those for remote towns, and military bases, have been developed in the last several decades in response to the rise in basic energy costs, and as process technologies have advanced to manage the material inputs and emission outputs associated with MSW.

The State of Alaska has unique intrinsic characteristics that provide opportunities for waste to energy applications. 90% of rural, remote Alaskan villages dispose of combustible waste in landfills that are often not compliant with EPA's Resource Conservation and Recovery Act (RCRA) standards[2]. Meanwhile, the villages

[1] http://wteplants.com/

[2] Colt, et al. "Sustainable Utilities in Rural Alaska; Effective Management, Maintenance and Operation of Electric, Water, Sewer, Bulk Fuel, Solid Waste. " University of Alaska Anchorage, 2003.

pay approximately $7 to $10 per gallon for heating fuel and diesel powered electric generation. These fuels are often barged or airlifted to the rural villages, a non-sustainable energy cycle. While many of these villages, such as Kotzebue, have seemingly viable conditions for a waste to energy system, it is required that logistical, technical, and organization issues are carefully evaluated to lay out a sound strategy and plan.

WASTE STREAM FEEDSTOCK

One of the primary goals of this study was to evaluate the biomass material available in Kotzebue that could be used as feedstock to generate energy. This study focused primarily on waste-based feedstocks. It was found that the energy content of Kotzebue's Municipal Solid Waste (MSW) stream is equivalent to nearly 120,000 gallons of fuel oil per year. In just the wood-based combustible materials (e.g., paper, cardboard, and wood-based materials), over eight billion Btu's of are thrown into the Kotzebue landfill annually, equivalent to over 62,000 gallons of fuel oil. Assuming that all commercial enterprises in Kotzebue separated their garbage before disposal (i.e., in a source-separation program), there is a potential to capture 250 tons per year of refuse derived fuels (RDF) feedstock. The wood-based materials (e.g., paper, cardboard, and wood) from the overall waste stream, referred to as RDF, would be the material of interest for a waste to energy project. Laboratory analysis of the city's waste stream is recommended to confirm these estimates prior to final engineering of a biomass energy plant to ensure anticipated values are consistent with the waste composition. Source separation of wastes is preferred over post-consumer separation of RDF materials. The City of Kotzebue recently implemented a waste can separation collection system for its residents. The program has already achieved success, and is a good sign for the implementation of a more formalized source-separation and/or recycling program in the city.

Wood pellets or briquettes are an additional supplementary biomass feedstock that can be purchased and imported to Kotzebue to supplement waste-derived feedstock supplies. On an energy value basis, bulk-purchase pellets are significantly less expensive than fuel oil, and complement RDF fuels in boiler systems by promoting a more efficient and complete combustion.

FEASIBILITY STUDY CONCLUSIONS AND RECOMMENDATIONS

Waste to energy technologies have advanced significantly in recent years and are currently available for commercial applications. Numerous technologies were investigated in this study; however two technologies including gasification of unsorted MSW and the combustion of sorted refuse derived fuels (RDF) were identified as options carried forward in detailed analysis. Gasification is a more sophisticated technology which can convert nearly the entire waste stream into energy extracting the maximum energy possible, while RDF combustion technologies offers a more commonly used technology and presents an opportunity to operate in conjunction with a city recycling program. These scenarios are referred to as MSW Gasification and RDF Boiler scenarios, respectively. The relatively small scale of both analyzed systems precludes electrical generation or combined heat and power. However, both systems clearly aim to turn Kotzebue's waste streams into valuable resources.

These attributes, as well as other logistical considerations, were evaluated in the feasibility study. Two (2) potential operational scenarios were developed. One system envisions combustion of a combination of RDF briquettes and wood pellets to produce building heat at the public works campus; the second evaluated gasifying all of Kotzebue's MSW at an off-site location to potentially pre-heat city raw water supplies. Conceptual designs of both biomass energy plant scenarios were created based on the evaluation, and financial viability of the project was evaluated.

The evaluation determined that both project scenarios are technically and financially viable prospects. Both technologies are commercially available from multiple vendors, and both are robust for harsh climate and remote locations such as Kotzebue. As analyzed, each scenario is able to repay project debt obligations within a reasonable timeframe, while covering operating costs, employee wages, maintenance and materials, and produce a small additional annual income for the city. Revenue for the projects is derived in the form of avoided fuel oil purchases. The RDF Boiler scenario can support one additional full-time licensed boiler operator position, while the MSW Gasifier scenario will require four (4) full-time staff positions. The RDF Boiler scenario is highly sensitive to project capital cost and throughput (i.e., RDF capture rate). It is likely that improvements can be made to the conservative capital expense estimate, which includes a nearly 200% remote Arctic construction cost factor increase, as well as the conservative capture rate of RDF (estimated to be 50%, but could be improved to 60% + through source-separation programs).

While both scenarios require additional city planning and detailed engineering steps typical for projects of this nature, Tetra Tech recommends pursuing either of the two scenarios. An RDF Boiler located on the Public Works campus is an immediately implementable project contingent only on securing financing for the project. The MSW Gasifier scenario is contingent on re-development of the city's water treatment system at an off-site location, likely a long-term project. Additionally, the reduced capital expense of the RDF Boiler in comparison makes it a more attractive near-term investment.

Tetra Tech also recommends laboratory analysis of representative samples of Kotzebue's waste stream. The scope of the study only allowed for empirical review of available information and estimation of Kotzebue's waste composition. Analysis of combustible materials from the city's waste stream will determine the actual energy content of the material, as well as contaminants and other values that will affect subsequent engineering. Analysis can also help to indicate expected product capture rate of RDF. Laboratory characterization of the feedstock source should be combined with test-burns in the selected conversion technology to solidify burn characteristics, emission profile, and required equipment for combustion (pre-processing, ash handling, etc).

Kotzebue's remote location is also a project driver. The difficulty of transporting materials to Kotzebue significantly increases capital cost, as noted in the project report. However, cost to import fuel must be borne throughout project lifespan, whereas a biomass energy system has locally-produced and reliable fuel source in the city's waste stream. A prospective deep-water port being planned to service Kotzebue from Cape Blossom would likely reduce material costs (steel, concrete, and equipment) to support capital projects, but

is unlikely to have much effect on fuel costs, which are tied to global increases in energy demand and expense.

The findings of this study should be considered applicable in corollary for the region, not only the City of Kotzebue. The smaller villages in the Northwest Arctic Borough have expressed interest in similar waste-to-energy solutions, scaled to fit the feedstock sources and heating needs of the respective villages. The difficulty and expense in sourcing fuel oil shared by all of these communities presents similar opportunity for biomass energy systems as Kotzebue's opportunity. The concept in theory has been shown to be viable, but each situation should be carefully evaluated for its technical and logistical viability, financial cost, and approval within the respective communities.

In conclusion, what can be determined from this study is that a significant amount of Kotzebue's trash is being unnecessarily landfilled, and could instead be used as a sustainable source of energy. The city could also avoid importing a significant amount of fuel oil with the development of a biomass energy plant. Total energy production of the RDF Boiler scenario would displace over 30,000 gallons of fuel oil each year, and divert over 300 tons of waste from the local landfill annually. This project exemplifies the type of sustainable energy project that can win support at the local, state, and national level for its ability to reduce fuel imports, increase community self-sufficiency, and improve waste management and disposal practices. This biomass energy project can be a model program for other Alaskan villages, continuing the tradition of Kotzebue in pioneering sustainable and renewable energy practices.

1 INTRODUCTION

1.1 PROJECT OVERVIEW

The City of Kotzebue (Kotzebue) is the regional hub of Northwest Alaska. The port city is located roughly 20 miles above the Arctic Circle on the Chukchi Sea. Kotzebue has engaged Tetra Tech, Inc. (Tetra Tech) and project partner DOWL HKM (DOWL) to review the feasibility of a biomass-fired community energy project, assisted through funding from the Alaska Energy Authority (AEA).

Kotzebue sees an opportunity to generate energy from waste through construction of a biomass-fired energy generation plant. The area has many existing features that are advantageous for development of such a project. Fundamentally, the city is located in an isolated region, and would benefit from the ability to produce its own energy and reduce dependence on expensive energy imports. Furthermore, Kotzebue owns several government buildings and is responsible for treatment and heating of citizens' water supply, any of which could absorb the energy produced by such a plant. Kotzebue also has a readily available source of combustible biomass in the form of municipal solid waste (MSW), which can be converted into energy.

1.2 STUDY AND REPORT ORGANIZATION

The City of Kotzebue project analysis and report is organized to address the five key aspects requested within the project RFP. These are:

1. Paper and Wood Stream Analysis for Kotzebue
2. Identification and Evaluation of Viable Technologies
3. Conceptual Design and ROM Cost Analysis
4. Permitting and Environmental Analysis
5. Economic and Financial Analysis

The report is formatted in such a way as to track the flow of materials utilized by and produced from the waste-to-energy plant, starting with a review of MSW supply. The report finishes with a review of permitting and environmental requirements and a financial analysis of the project.

The report contains the following sections:

An Executive Summary to summarize the findings of the study.

Section 1 includes this introduction to the project that provides the background and explains the scope and purpose of this study.

Section 2 provides an assessment of the MSW (feedstock) availability in the city. The analysis also addresses feedstock energy content and logistics associated with collecting and sorting MSW. This section also

introduces the potential use of supplementary feedstocks (wood pellets/briquettes) and estimates the cost for such feedstocks to be delivered for use at the project.

Section 3 reviews available technologies for conversion of MSW to thermal energy, and recommends two potential technologies for this application. Based upon the needs of these technologies, MSW handling and processing equipment sets were reviewed for use at the project site.

Section 4 reviews the current energy demand profiles of Kotzebue controlled facilities, and reviews potential project sites in light of available infrastructure and interconnection logistics. Three potential project sites are identified and further evaluated.

Section 5 provides process descriptions and conceptual engineering design of two project scenarios found to be technically viable for converting MSW to energy in Kotzebue. The facility process and engineering is carried out to a standard 10% design completion for both scenarios.

Section 6 reviews permitting requirements for all aspects of the reviewed technologies. Environmental concerns relating to air emissions from reviewed technologies are also addressed, and contact information is provided for various regulating agencies.

Section 7 includes an estimation of the capital and operational costs, energy savings and revenues for the most likely facility operational range. These estimates are included into a financial model for the site.

Section 8 discusses the final conclusions and recommendations of the study.

Tetra Tech extends our appreciation to the City of Kotzebue for the opportunity to work on this project.

2 BIOMASS FEEDSTOCK ASSESSMENT

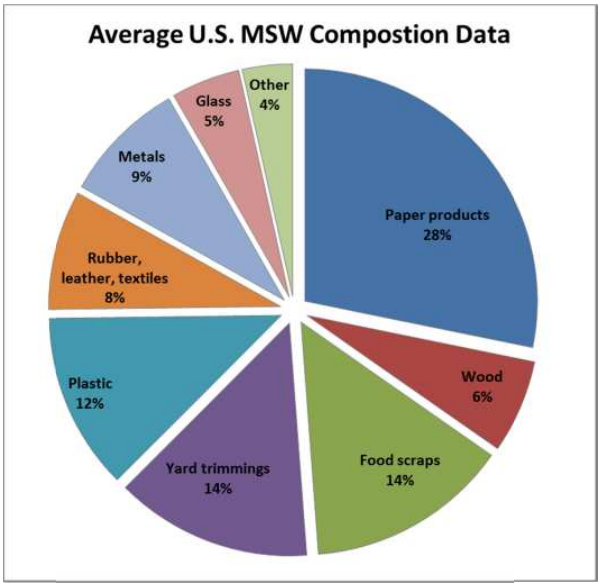
Feedstock supply is the single most important aspect of a biomass energy project. Consistent volumes of underutilized energy sources are critical to a project's operational and financial viability. In this task, Tetra Tech has analyzed the available and accessible volume of biomass supply in the Kotzebue, Alaska region. The following section quantifies the waste-derived biomass feedstock supply potential in and around Kotzebue, in terms of supply volume, consistency, and fuel quality.

2.1 MUNICIPAL SOLID WASTE (MSW) SUPPLY

Municipal Solid Waste (MSW) management is a more acute problem in Alaska than elsewhere in the world. Export of materials for disposal, or even recycling, is rarely cost-effective, and the vast majority of waste products end up in city landfills. In addition, 90% of rural Alaskan villages dispose of waste in open dumps not compliant with EPA's Resource Conservation and Recovery Act (RCRA) standards[3].

Below is the standard percentage composition of waste materials in the U.S., according to the Environmental Protection Agency (EPA)[4].

Figure 2-1: Average U.S. MSW Composition



Source: US EPA

[3] Colt, et al. "Sustainable Utilities in Rural Alaska; Effective Management, Maintenance and Operation of Electric, Water, Sewer, Bulk Fuel, Solid Waste. " University of Alaska Anchorage, 2003.

[4] http://www.epa.gov/epawaste/nonhaz/municipal/index.htm

Data concerning the composition of waste materials in Kotzebue was gathered through interviews with the city's Refuse Manager and empirical data regarding waste composition.

Kotzebue, with a population of 3,201 as of the 2010 US Census, is large by Alaskan village standards, and has a relatively sophisticated waste management system to process and dispose of its citizen's trash. Each year approximately 1,625 tons of raw MSW are disposed in the city's landfill. Kotzebue's landfill is currently classified as a 'Class II' landfill by RCRA and meets EPA operational guidelines.

Wastes are collected throughout the town and brought to a central processing point on the Public Works campus, known as the Bailer building. Hazardous materials are separated for processing, and the remainder of the refuse is compacted into approximately 1800 lb, 4 foot by 4 foot cubes to reduce landfill space and reduce waste dispersion in the landfill.

Figure 2-2: Kotzebue Refuse Baler

A breakdown of the distribution of materials (i.e., the percentage of paper vs. plastic. vs. cardboard, etc) in Kotzebue's waste was calculated based on US EPA aggregate data. Due to its remote location, Kotzebue's distribution values will likely differ from that of a standard US mainland city. The two expected major deviations from the norm are 1) lawn and yard biomass of which there is none produced, and 2) cardboard content. Cardboard content is expected to be approximately 20% higher than average due to packaging and shipping of consumer content to the city. These numbers present a conservative overview of the composition of Kotzebue's waste stream, specifically the divertible material (paper products and wood). Laboratory analysis of the city waste stream is recommended prior to final engineering of a waste-to-energy system to ensure expected values are consistent with the waste composition.

The resulting estimated MSW composition breakdown for Kotzebue is displayed in Table 2-1.

Table 2-1: Kotzebue Municipal Solid Waste (MSW) Composition

Material	Wet Weight (%)	Wet Weight (Lbs/day)	Avg. Moisture Content	Dry Weight (Lbs/day)	Dry Weight (tons/yr)
Cardboard	18.7%	1,665	5%	1,582	**290**
Food Waste	18.6%	1,656	70%	497	**90**
Paper	14.1%	1,255	6%	1,179	**220**
Plastics	12.3%	1,095	4%	1,047	**190**
Metal	8.6%	766	2%	752	**140**
Wood	6.5%	579	40%	347	**60**
Glass	4.8%	427	3%	417	**80**
Textiles	2.8%	246	10%	222	**40**
Rubber	2.8%	246	0%	246	**40**
Leather	2.8%	246	13%	216	**40**
Garden Trimmings	0.0%	-	60%	-	**-**
Other	8.1%	721	0%	721	**130**
Total	100.0%	8,900		7,200	**1,310**
Paper, Cardboard & Wood Fraction	39.3%	3,500		3,100	**570**

Source: EPA, Tetra Tech analysis

2.2 REFUSE-DERIVED FUEL

Refuse derived fuel (RDF) is a separated combustible portion of MSW. RDF is processed to be a consistent, homogenous fuel, free of contaminants, dirt, glass, metals, and other non-combustible materials. Large-scale RDF production and combustion systems, process non-recyclable plastics, food wastes, and other combustible materials. It is expected that an RDF system employed at Kotzebue will focus on wood-based materials, specifically lumber, paper, and cardboard. Careful attention must be paid tin the sorting process to avoid contaminants, such as plastic, painted or stained wood, or other materials that may foul an RDF boiler or produced unwanted air emissions from combustion.

RDF is often compressed in to pellets or briquettes after processing to further improve combustion characteristics and efficiencies. Densification and stabilization of RDF feedstock is discussed in more detail in Section 4.

2.2.1 SOURCE SEPARATION OF RDF FEEDSTOCK

The easiest way to avoid contamination of the cardboard-paper-wood fraction of Kotzebue's waste stream is to divert those products prior to entering the mass waste stream. Source-separation systems are likely to be employed at the only the largest RDF producers in the area. The two primary producers are Alaska Commercial Company Value Center (AC), and the Maniilaq Health Center. Secondary point-source producers of RDF materials are the school buildings, cafeterias, and maintenance buildings of the Northwest Arctic Borough School District, Nullagvik Hotel, Rotman's Store, and the various restaurants in town. Another source of wood (pallets) are the local air cargo firms that supply this regional trading hub, which include Alaska Airlines, Arctic Transportation Service, Lynden Air Cargo, Northern Air Cargo, and Village Aviation, Inc.

- *AC Value Center.* The Alaska Commercial Company Value Center produces the largest volume of cardboard waste of any single entity in Kotzebue, through the packaging of all of the products it sells. Cardboard is separated from the common waste stream and baled onsite. The AC produces between 9-12 bales per week, at 100-150 lbs per bale, the pre-sorted output of this facility is estimated at 25 to 50 tons per year. Paper and wood (pallets, etc) can be separated by employees in the same bin that baled cardboard is for pick-up. Including paper and wood, the AC may produce as much as 100 tons per year of source-separated RDF raw material. Figure 2-3 below shows a pile of pallets and baled cardboard, which constitute a ready supply of ideal RDF feedstock.

Figure 2-3: Photo of AC Cardboard Bales and Pallets

- *Maniilaq Health Center.* The local Health Center is one of the largest institutions in Kotzebue. Waste is an issue at the health Center; currently the space available for refuse containers is not sufficient for the volume of waste produced by the hospital. Figure 2-4 shows an overflowing roll-off at the hospital, and also clearly shows the large percentage of cardboard and paper materials in the waste stream.

  A container for cardboard, paper, and wood only can be placed in another location and reduce the congestion of waste at the Health Center. Specific volumes of RDF produced by the Health Center are unknown; it is expected that the cardboard volume, supplemented by significant paper waste, could rival the tonnage produced by the AC.

Figure 2-4: Photo of Maniilaq Health Center Waste Stream

Assuming all commercial enterprises in Kotzebue were incorporated into a source-separation project, there is the potential to capture 250 tons/year of ready RDF feedstock.

AC has the potential to provide up to 100 tons per year of primarily cardboard and pallets, and Maniilaq can potentially add an equal volume of cardboard and paper product. Source-separation at other installations may provide 5-10 tons/year each, or 30-50 tons/yr aggregate to supplement.

2.2.2 INCENTIVIZING SOURCE SEPARATION

An incentive program will be greatly improve the chances of success, at least initially, of Kotzebue's RDF sorting system. This will likely be required for several years, and then the system will become standard operational procedure for customers. Incentives can be applied through the rate system, whether it is reduced fees for companies participating in the program, or increased fees for other waste materials.

A model program that this can be based on is Sitka, a town roughly twice the size of Kotzebue but with a similar opportunity to reduce landfilled waste. Sitka's voluntary recycling program diverts over 1.4 million

pounds of material from landfills each year. According to the city recycling website, RecycleSITKA[5], in one month in 2011 over 50 tons of cardboard, newspaper, and mixed paper were brought to the city recycling center[6]. Adjusted for Kotzebue's size, that is equivalent to over 300 tons per year of feedstock diverted from the waste stream.

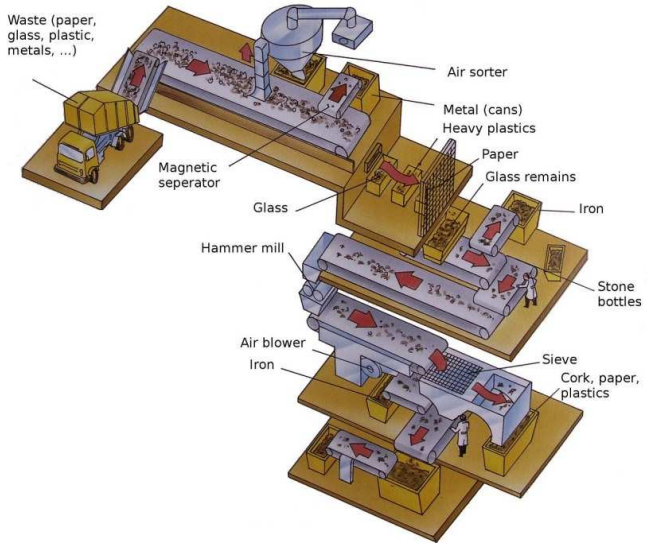
This program can also be implemented along with a recycling program in Kotzebue to divert additional materials from the local landfill. Aluminum and tin, which are easy to separate and are the most cost-effective materials to recycle, can be removed from the waste stream either in conjunction with a source-separation program, or as post-consumer sorting.

The City of Kotzebue recently implemented a can waste collection system for its residents. The program has already met with success, and is a good sign for the implementation of a source-separation and/or recycling program in the city.

2.2.3 POST-CONSUMER MATERIALS RECOVERY

RDF feedstocks not separated at the source need to be removed from the waste stream at the waste transfer point. This would likely occur at the Bailer building. Post-consumer refuse separation occurs in a materials recovery facility (MRF). MRF's are common only in large cities, where waste volumes warrant large-scale recycling efforts. Figure 2-5 is a stylized schematic of a mechanized RDF system in operation.

Figure 2-5: Schematic of Materials Recovery Facility



Source: Based on "Energie en grondstoffen in de toekomst" by Robbin Kerrod

[5] http://www.sitka.net/sitka/utilities.html

[6] http://www.cityofsitka.com/government/departments/publicworks/RecycleSitka.html

The majority of MRF's, even in large metropolitan areas, are mostly or entirely operated manually, with employees separating various contaminants and recyclable materials from the waste stream. Due to the relatively small volumes of material being processed, a mechanized system does not make financial sense. Manual processing into large rolling bins is the likely mode of RDF separation. It is assumed this will occur in the Bailer building, with the discard material continuing to be baled.

2.2.4 RDF SUMMARY

A RDF-based biomass energy system in Kotzebue is conservatively assumed to achieve 50% recovery of the desired cardboard-paper-wood fraction, due to the difficulties inherent with hand-sorting and emphasis on avoidance of contaminants in the RDF stream. Rather than sorting the contaminants out of the RDF stream, which leads to a certain amount passing unnoticed into the energy plant, this methodology will separate cardboard, paper and wood from the waste stream. Total capture is 320 tons per year of material. If the capture rate is increased to 60%, that number jumps to over 380 tons per year, an achievable rate with a well-organized source-separation system in place.

An RDF sorting system can also be combined with a recycling effort in the city, separating recyclable metals (tin, aluminum) and potentially glass form the Kotzebue waste stream. Even assuming a capture rate of 50% acquisition of RDF material, combined with recycling of aluminum and tin, can equal a reduction of almost 30% of material going into Kotzebue's landfill. If all combustible materials are captured, the amount going to the landfill is nearly halved.

2.3 MSW ENERGY CONTENT

Energy content of the materials in Kotzebue's waste stream was calculated based on generally-accepted vales for the materials' Btu content. A study of tested values for sorted MSW material Energy contents, conducted by UCF[7] was used as the basis of the analysis.

[7] Reinhart, Debora. *Estimation of Energy Content in MSW*. University of Central Florida. 2004. http://www.msw.cecs.ucf.edu/Thermochemical%20Conversion.ppt

Table 2-2: Kotzebue Municipal Solid Waste (MSW) Energy Content

Material	Heat Value (Btu/lb dry weight)	Heat Value (Btu/day)	Heat Value (MM Btu /year)
Cardboard	7,000	11,072,705	**4,041.5**
Food Waste	2,000	993,699	**362.7**
Paper	7,200	8,488,045	**3,098.1**
Plastics	14,000	14,658,230	**5,350.3**
Metal	-	-	**-**
Wood	8,000	2,778,082	**1,014.0**
Glass	-	-	**-**
Textiles	7,500	1,662,842	**606.9**
Rubber	10,000	2,463,470	**899.2**
Leather	7,500	1,616,652	**590.1**
Garden Trimmings	2,800	-	**-**
Other	-	-	**-**
Total		32,661,000	**11,921**
Paper, Cardboard & Wood Fraction		22,339,000	**8,154**

Source: University of Central Florida, Tetra Tech analysis

The theoretical limit energy content available from Kotzebue's waste stream is 11,921 MM Btu per year. The paper, wood and cardboard (RDF) fraction of waste, if 100% captured and utilized, contained a maximum of 8,154 MM Btu per year.

Tetra Tech recommends laboratory analysis of representative samples of the combustible material to determine actual energetic value of the material, as well as contaminants and other values. Collection of sample product can also help to indicate expected product capture rate. Laboratory characterization of the feedstock source should be combined with test-burns in the selected conversion technology to solidify burn characteristics, emission profile, and required equipment for combustion (pre-processing, ash handling, etc).

2.4 CONSTRUCTION AND DEMOLITION WASTE (C&D)

2.4.1 PRIMARY SOURCED

Pallets are a likely additional resource an RDF boiler system. A portion of the used pallet supply in Kotzebue is collected by city residents to be burned in home fireplaces. It is expected that the biomass energy plant will source the pallets not collected for this purpose. The total supply can be increased by requesting wood pallets for shipping instead of plastic pallets.

Construction and demolition wastes are also considered as additional feedstock. This category involves wood waste derived from byproducts of the construction industry, such as warped or otherwise unusable wood planks, and materials removed from buildings during remodeling or demolitions. This category only refers to non-contaminated wood products, and does not include wood with coatings or treatments, such as paints or stains, preservatives, etc. or wood with plaster or other construction materials imbedded or stuck to the

wood. Nails, staples, and other inert metals are safe for use in an RDF combustion system and will be removed with the bottom ash at the end of the combustion cycle.

2.4.2 LANDFILL 'MINING'

It is expected that landfill mining will be limited to choice picking of uncontaminated wood and cardboard from the city landfill. Transport of entire bales for deconstruction and harvesting of 'feedstock' is likely a net loss; it does not produce an equivalent amount of energy as that required for the harvesting process. The practice may also conflict with several state waste control regulations.

2.5 ALTERNATIVE FEEDSTOCK SOURCES

The project scope also called for evaluation of alternative feedstock sources. Tetra Tech found only one such alternative feedstock source for the proposed biomass energy system; wood pellets / briquettes imported into Kotzebue from elsewhere in Alaska or from abroad. Pellets and briquettes produced as byproducts from wood harvests or mill operations are a rapidly growing heating fuel source, with over 14 million tons produced worldwide as of 2010. If produced from timber industry byproducts, pellets and briquettes have been found to carry significant life-cycle emissions and other environmental benefits to fossil fuel use.

Superior Pellet Fuels of Fairbanks is the only Alaskan producer of volume, but Canada and the lower 48 are producing significant volumes available for export to Kotzebue. Prices are quoted in the range of $300 per delivered ton.

Pellets as a supplementary fuel carry several benefits. For one, vendors have noted that blending wood to a high cardboard-content material improves combustion characteristics in their RDF boilers. As well, purchased pellets can be used to increase the output of a system limited by locally-available feedstocks, better matching the demand needs of the end user of the produced energy. Particle size is the major difference between pellets and briquettes; either would be satisfactory additions to an RDF boiler.

Pellets are also much more cost-effective than heating fuel. At current heating fuel prices of $6.04/gallon, it would cost $45.00 for 1 MM Btu of heating value. That same 1 MM Btu of heating value in pellet would cost only $21.50, less than half the price of heating fuel. It therefore makes financial sense to purchase pellets or briquettes, in addition to the environmental benefits of the biomass fuel.

3 TECHNOLOGY EVALUATION

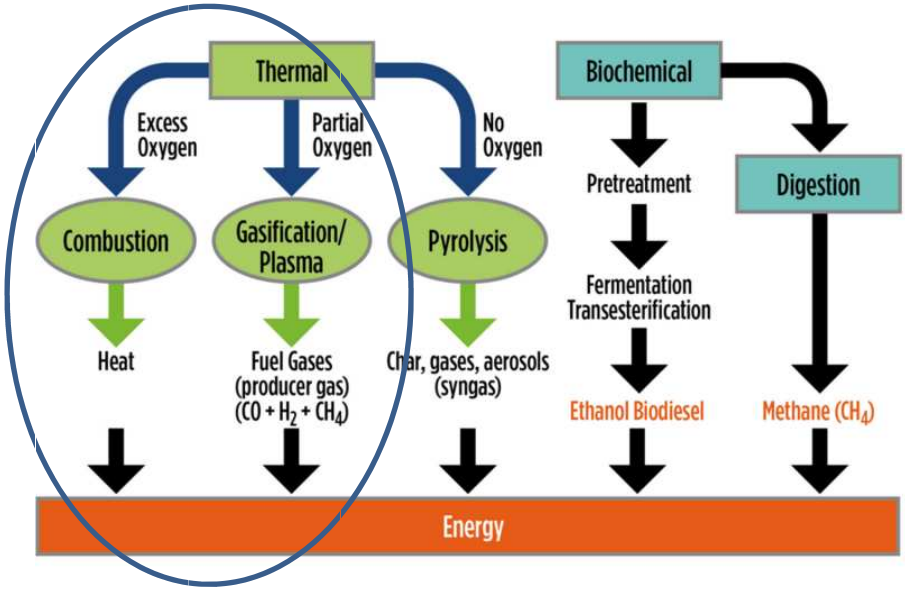
Tetra Tech reviewed major biomass energy generation technology options that are applicable to the general project conditions thus far determined. The following section identifies the most likely process technology for a biomass energy plant in Kotzebue.

3.1 ENERGY GENERATION TECHNOLOGIES

The options evaluated included standard combustion systems for the paper, cardboard and wood fraction of MSW and gasification systems for bulk unsorted MSW. Each of these technologies was evaluated to determine which technology platform can most cost-effectively utilize the available fuel source, is fairly easy to implement considering the site operations and location, has a history of success under similar operating conditions, and is commercially available for full scale operation. Evaluations are based on previous experience with comparable projects. Ultimate selection of technology may depend on the preferred vendor, as vendors may include specific proprietary improvements, modifications, and interpretations to each given technology.

Figure 3-1 illustrates the various pathways to produce energy from wastes. This project will focus on thermal conversion pathways of combustion and gasification, more applicable to the scale and feedstock available in Kotzebue than pyrolysis or biochemical conversion pathways.

Figure 3-1: Waste-to-Energy Conversion Pathways



Source: NREL

3.1.1 COMBUSTION

Combustion can be defined as the burning of fuel to produce power and heat. The combustion process is highly developed commercially and is available in numerous vendor specific designs. It has been used throughout the world for power generation and heating. Incineration technology is well-established and easy to use, and systems using this process have evolved to be robust and long-lasting investments. Combustion occurs with oxygen in slight stoichiometric excess to rapidly complete the thermal oxidation reaction. Waste products are an ash residue and an off gas made up of predominantly nitrogen (N_2), carbon dioxide (CO_2), and water vapor. The off gas must be treated to meet regulatory requirements for chemical pollutants and particulates. The emissions will vary considerably from one vendor to another. Most vendors prefer to select and design specific Air Pollution Control (APC) equipment for each project that addresses pollution and particulate emissions.

Combustion is a highly exothermic (net heat output) process; therefore, the technology lends itself to heat recovery in many applications. It is critical to maintain correct airflow and exposure of the fuel bed to ensure complete, clean, and efficient combustion. This is done by a combination of methods, including rotating kilns, fluidized bed reactors, and traveling grates. All of the systems work in conjunction with any number of controlled air flow systems including induced draft, forced air, and over fire/under fire systems.

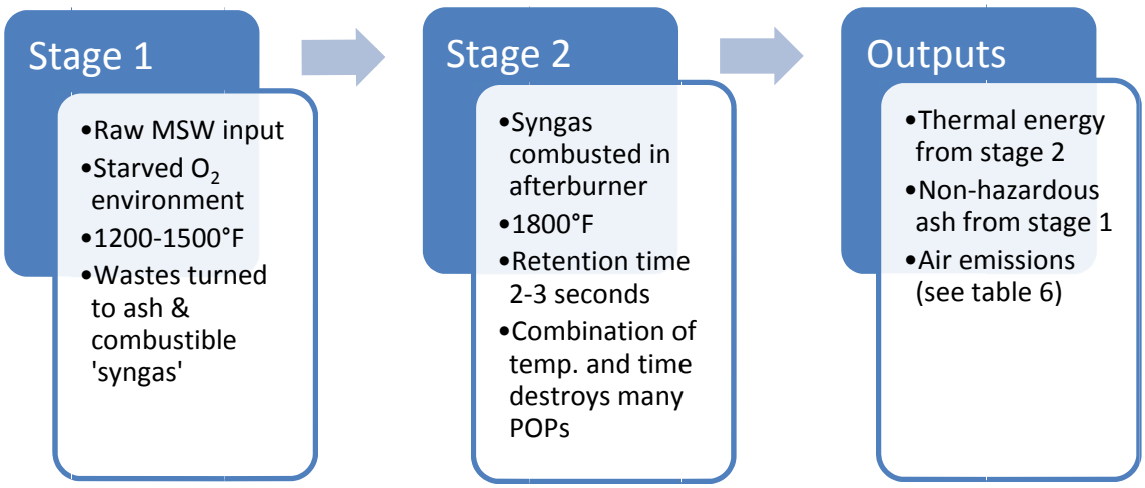
Stoker boilers are most commonly used in existing industrial operations due to their ease of use and maintenance. The stoker boiler process simply involves traditional combustion of feedstock in an oxygen enriched environment, with the thermal energy generated from the combustion used to generate steam. The system is robust and proven over many applications.

Boilers may either produce steam or hot water for use as a working fluid. More commonly, these are known as steam boilers or hydronic boilers. The working fluid is used as a medium to transport thermal energy produced by the boiler to the desired user. Steam is a more efficient medium for heat transfer, however it requires a greater rate of thermal input from the feedstock than hydronic boilers. Steam boilers are generally used for industrial applications, while hydronic boilers are more than sufficient to provide building heat. Hydronic boilers recommended of Kotzebue have a working fluid operating at approximately 230°F and 58 psi.

3.1.2 GASIFICATION

Gasifier boilers increase efficiency as compared to stoker boilers by separating the combustion process into 2 phases. In these processes, a 'synthesis gas fuel' (syngas), also called 'producer gas' is created from the MSW in an oxygen starved pre-burn chamber. The syngas is immediately burned in a second combustion chamber or used as a fuel in an attached combustion device. Figure 3-2 provides an outlined illustration of this process.

Figure 3-2: Advanced Combustion 2-Stage Process Description



This second destruction stage results in a higher efficiency of conversion for the fuel, and improved environmental and energy performance. The key to this improved performance is the conversion of the fuel source from a solid to a gas in the stage 1 primary chamber. This is because gaseous fuels can be combusted at higher temperatures and pressures than solid fuel. Combustion at higher temperatures and pressures increases the maximum operational efficiency of any system according to Carnot's rule of thermodynamics. These higher temperatures and pressures also allow for easier removal of sulfur and nitrous oxides (SO_X, and NO_X), and trace contaminants such as mercury, arsenic, selenium, cadmium, etc.[8] Environmental improvements provided by increased temperatures also allow for the environmentally responsible use of other MSW combustibles such as non-recyclable plastics within the fuel source.

Gasifier systems offer the benefit of being able to accommodate a wide range of feedstocks, thus limiting the need for preprocessing and sorting of the MSW feedstock in question. This added feedstock flexibility would improve overall system efficiency by: decreasing the man-hours needed to separate wastes, significantly reducing the need for pre-processing of waste material, increasing the system's energy generation potential, and increasing reliability by diversifying the project feedstock portfolio. Feedstocks that can be accommodated by this technology include: untreated/unsorted MSW, construction and demolition waste, tires, fish and animal remains, waste wood, and others. Inert materials such as glass and metals that may be mixed in with MSW can more easily be separated from the ash after the reaction is complete and later recycled (if desired).

[8] National Renewable Energy Laboratory. *Advantages of Gasification*. http://www.netl.doe.gov/technologies/coalpower/gasification/gasifipedia/7-advantages/index.html

Gasifiers are offered in one of two feedstock delivery configurations, batch or continuous. Batch gasification systems operate by loading large quantities of feedstock into the primary reaction chamber, where the feedstock is heated in a starved oxygen environment to generate syngas. This primary reaction is allowed to continue to completion, and then the system is shut down to remove ash before re-loading. Conversely, continuously fed systems introduce feedstock to the gasifier at a constant rate, and are shut down only to perform maintenance.

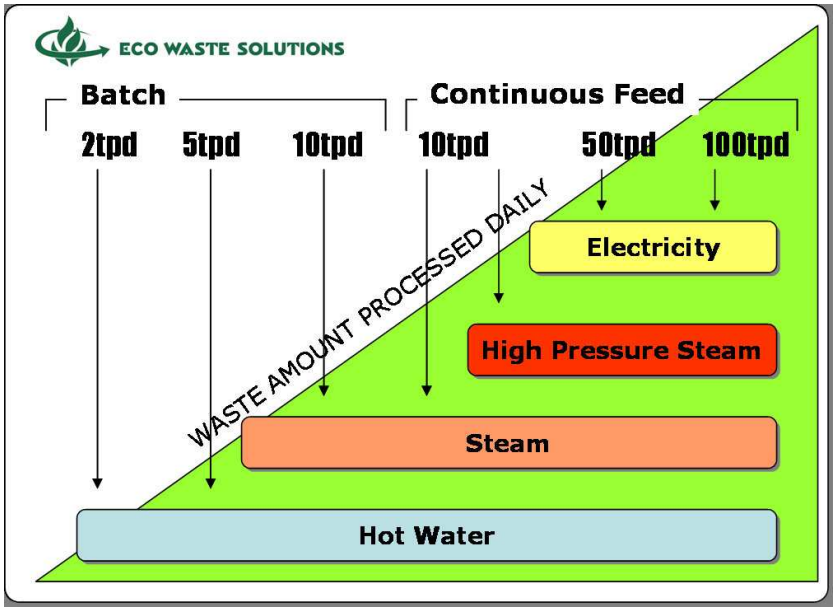
Previous gasification applications installed in Alaska (Barrow, Egegik, Skagway) have been almost entirely of the batch variety, due to these systems relative ease of operation and lessor infrastructure requirements. For the proposed systems involving energy production as well as waste destruction, a continuous-feed system is recommended. A drawbacks of batch systems is that, due to their long periods of down-time (10-12 hours per day), are unable to provide a steady source of thermal energy for heat recovery activities. Furthermore, the need to constantly re-start the batch system from a cooled stage greatly increases the need for fuel oil which initiates the primary reaction. Information for the vendors indicated that fuel oil requirements for a batch system would be nearly equal to the fuel oil displaced by gasifying MSW. A continuously fed system will come at a higher initial price, but will solve the issues presented by collecting heat from a batch system. This system is expected to require only 2.5 gallons of fuel oil per hour to supplement the MSW feedstock. Waste oils can be used for this requirement.

3.2 ELECTRICITY PRODUCTION

Biomass-fired stoker boilers and gasifiers can be coupled with turbines to produce electricity. In this process, water is heated to generate high pressure steam by the boiler. The pressurized steam is expanded to lower pressure in a multistage turbine as it expands energy to rotate the turbine and generator. The steam is then either condensed or, more often in biomass-based combined heat and power (CHP) installations, sent as low pressure stream or hot water to process heat, space heating, or other applications. Steam turbine technology is well understood and steam turbines enjoy the benefit of a relatively long lifespan.

However, it is the working experience of Tetra Tech and its network of preferred technology vendors that electricity production via CHP or direct electricity production is not financially feasible for projects of the scale available in Kotzebue. As well, producing electricity requires high-pressure steam production, driving up boiler costs and operational expenditures. A generalized decision chart for waste to energy systems based on TPD feedstock input is shown in the Figure below. For reference, all Kotzebue MSW (both combustibles and non-combustibles) totals approximately 3.5 TPD.

Figure 3-3: Generalized Decision Chart for MSW Based Energy Systems



Source: Eco Waste Solutions

Additionally, a simple scenario analysis was performed to evaluate electricity production in Kotzebue. The analysis assumed best-case scenarios; 100% of all wastes could be used to generate a steady year-round source of electricity and steam, and electrical efficiency was set at 30%, at the high- end of what is achievable for a turbine of this scale. Using these aggressive numbers, generator capacity would be extremely low for both scenarios (80 kW for a combustion boiler, 160 kW for a gasifier). Table 3-1 displays the parameters in the analysis.

Table 3-1: CHP Generation - Best Case Scenario Analysis

Parameter	Combustion	Gasification
Feedstock MM BTU/day	22.3	43.7
Feedstock MM BTU/hr	0.93	1.82
Electrical Efficiency*	30%	30%
Output Capacity (kW)	80	160
* Electrical Efficiency = net electricity generate/total fuel into system; A measure of the amount of fuel converted into electricity		

Tetra Tech's experience with related projects suggests that the capital costs associated with generator construction, increased costs for boiler upgrades and electrical interconnection equipment, and hiring skilled labor to manage the electrical system, outweigh any financial savings realized by electricity production at this scale.

3.3 PRE-PROCESSING AND STORAGE

Due to the seasonal variations in heating requirements, Kotzebue will find it necessary to store collected feedstocks in seasons of low heat demand to supplement heat production later in the year. Storage of biomass over prolonged periods of time presents a number of important but manageable challenges that will need to be addressed by this system. These issues include feedstock homogenization, space management, and moisture management.

- *Feedstock Homogenization.* In order to ensure a clean and even burn, boilers are designed to operate optimally within a somewhat narrow range of feedstock energy values. Because MSW is a combination of several types of feedstocks, and because these feedstocks can vary in Btu values from source to source, shredding and/or densifying raw MSW fuel helps to maintain a consistent Btu flow.

- *Space Management.* The combustible portion of MSW feedstocks available in Kotzebue consists primarily of wood wastes, cardboard, and paper products. When loosely stored, the shape and structure of these biomass sources will inherently generate a very porous storage pile. Practically speaking, this means that if the biomass is left unprocessed, long term storage could require a significant geographical footprint in Kotzebue. A maximum storage need (if used to supplement Add-Heat) is 6 months' supply. Table 3-2 shows the benefit of densification in feedstock storage, reducing storage building space from 6,321 cu yd to just 584 cu yd. Densification also stabilizes the material and inhibits microbial and rodent attacks on the feedstock supply.

Table 3-2: RDF Storage Pile Volume Comparing Storage Scenarios

RDF summer storage	
Months of storage	6
Separated lbs /day	3,500
Total RDF mass for storage (tons)	319.20
Storage - loose (cu.yd)	**6,321**
Storage - densified (cu.yd)	**584**

- *Moisture Management.* Regardless of what method of biomass storage is used for the proposed system, moisture management will be critical to reduce and eliminate rotting and other biological activity that can lower the overall Btu value of the feedstock. Moisture management can involve both preliminary drying (where necessary), and storage in a low moisture environment.

3.3.1 SHREDDING

The first step in many systems that address the issues of feedstock homogenization and storage space management is mechanical shredding of the material. Shredding is recommended for both RDF and bulk MSW systems. Shredders are widely used, robust pieces of machinery which can be provided by a number of different vendors. Shredding advantages include:

- Improved handling material qualities
- Improved homogenization capabilities
- Improved fuel density
- Readies material for further processing

Figures 3-4 and 3-5 below depict generic shredders similar to those that may be employed in Kotzebue.

Figure 3-4: MSW Shredder (Photo Courtesy of UNTHA)

Figure 3-5: Wood Shredder (Photo courtesy of UNTHA)

3.3.2 PELLETIZATION & BRIQUETTING

After the shredding phase, one way to further improve the storing and handling characteristics and process efficiencies of the MSW is through densification. This is accomplished through one of two processes; pelletization or briquetting. In pelletization, shredded MSW would be fed into a hammer mill reducing it to sawdust sized particles. This material would then be mixed with a binding agent (such as waste oil), and passed through a mechanical extrusion pelletizer. Briquetting also mechanically compacts shredded MSW, though without the additional step of hammer milling. Despite the different processes, both methods accomplish similar goals. These include:

- **Densification** – Storage space can be reduced by up to 50% over material that is only shredded.
- **Transportability** – The increased energy density of the pelletized/briquetted feedstock improves transport efficiencies several orders of magnitude. Because of this pellets/briquettes could be imported to supplement shortfalls, or increase anticipated system size.
- **Homogenization** - Wood, cardboard, paper, and (maybe) binder waste oil can be combined into a single fuel source with a consistent density, BTU value, and thus consistent combustion properties.

Table 3-3 illustrates some of the key operating differences between pellets and briquettes and Figures 3-6 and 3-7 display the physical appearance of these feedstocks. As can be seen, both have their advantages. Pellets are the more dense, durable, and commonly used option. They also hold an advantage in transportability. However briquettes require less pre-treatment, are cheaper to produce, and the equipment used is considered to be more robust. For these reasons, briquetting will likely be more a more attractive option for the proposed plant.

Table 3-3: Product Parameters Concerning Densification Technologies

Parameter	Pelleting	Briquetting
Needs Binder	No (But helpful)	No
Pre-Conditioning	Shredding Hammer Milling Drying (If MC> 15%)[(a)]	Shredding Drying (If MC> 20%)[(a)]
Moisture Resistant	Yes	Yes
Final Bulk Density (lb/ft^3)	34 – 41	28 – 33
Product Durability	Good	Fair
Estimated Production Cost ($/ton)	$30 - $40[(b)]	$8 - $14[(c)]
Estimated Cost of Purchasing Additional Feedstock ($/ton delivered)	$300	$300
Additional Feedstock Availability	Very Good	Fair

(a) Kaliyan, N., Morey, R.V. (2009). *Factors affecting strength and durability of densified biomass products*. Biomass Bioenergy 33 (3), 337–359.
(b) Based on conversations with CPM & FFS Pelleting companies
(c) Based on performance claims from Reinbold Briquetters & Nielson Briquetters (http://www.briquettingsystems.com/lease/costs.htm#nielsen23)
(b)&(c) Electricity costs set to $0.15 per kWh

Figure 3-6: Biomass Pellets
(Source www.cleantechloops.com)

Figure 3-7: MSW Briquettes
(Source www.bhsenergy.com)

3.4 TECHNOLOGY RECOMMENDATION

As can be seen, there are a number of factors that affect the ultimate technology selection and as many different system arrangements for consideration. Table 3-4 below summarizes some of the critical project parameters discussed in the preceding sections. This table also shows the two scenarios that will be carried forward in the subsequent sections of this report.

Table 3-4: Summary of Technology Parameters

Parameter	Scenario 1: RDF Boiler	Scenario 2: MSW Gasifier
Feedstock Use	Paper Cardboard Wood	All MSW Combustibles
Feedstock Processing	Sorted Material Shredding Densification	Unsorted MSW Shredding
Feedstock TPD Produced	1.56	3.59
Feedstock BTU/Day Potential	22.3 MM	32.7 MM
Combustion Stages	1	2
Electricity Generation	Not economical	Not economical
Air Emissions	May not require permit	Within regulatory limits
Ash/Residuals	Non-hazardous	Non-hazardous
Ability to import additional feedstock	Yes	No
Operational Concerns	Sorting process must eliminate contaminants	Potential for emissions within city limits

Technically speaking and as shown in the above table, gasification holds an edge in the availability of feedstock volume and pre-processing demands. As such, offers Kotzebue the greatest energy potential. However, concerns over system footprint and the cost of storing MSW on site could de-rail the project. RDF, on the other hand, has the advantage of being a better understood platform that can be supported by imported feedstock thus increasing project stability.

Both technology platforms will be evaluated further in the study, to determine potential site locations (Section 4), conceptual design of the processes (Section 5), permitting and environmental issues of each (Section 6), and financial feasibility of the options (Section 7).

4 LOCAL ENERGY DEMAND AND FACILITY SITING

The following section describes the energy consumption in the project region, and identifies and quantifies energy loads that can potentially be satisfied by a biomass-fired energy generator plant. Recommendations for potential plant sites follow in the second portion of the section. This takes into consideration that biomass plant siting must be in close proximity to the user groups of the energy produced.

4.1 LOCAL FACILITIES AND ENERGY DEMAND

Tetra Tech conducted a biomass energy use audit in the City of Kotzebue. Several facilities were identified as beneficial users of thermal energy (heating) produced by the prospective biomass energy plant. The analysis also evaluated interconnection of the energy customer facilities to the prospective plant.

4.1.1 DISTRICT ENERGY MULTI-BUILDING HEATING AT KOTZEBUE CITY-OWNED BUILDINGS

Space heating was indicated at the project outset as a focus area for use of the energy produced by a biomass energy plant. Kotzebue heats most of its public buildings with diesel-fired boilers, supplemented by electric heat, at a rapidly rising energy cost to the city.

Below are listed some of the city-owned facilities that were found to be viable options to use the energy produced by a biomass energy plant. Bailer Building data was unavailable for the study and was estimated based on Maintenance Building. Information displayed was gathered by the city of Kotzebue as part of an EPA Energy Star energy use accounting program.

- Public Works Campus
- Water Treatment Facility
- City Maintenance Shop
- Refuse Bailer Building
- City Public Works Offices
- Kotzebue City Hall
- Kotzebue Recreation Center
- Kotzebue Fire Hall
- Kotzebue Police Station
- Kotzebue Corrections Facility

Table 4-1: Kotzebue Government Building Heating Demands

		Water Treatment Facility	Kotzebue City Maintenance Shop	Kotzebue City Bailer Building (est.)	Kotzebue Public Works	Kotzebue Recreation Center	Kotzebue Fire Hall	Kotzebue Police Station	Kotzebue Corrections Facility	Kotzebue City Hall
Average Daily Load (BTUs/day)	January	7,864,266	4,314,803	257,810	106,620	6,561,515	3,353,003	288,097	3,789,581	664,839
	February	7,871,092	6,404,768	508,889	154,006	7,963,897	6,402,358	0	7,510,959	1,062,078
	March	12,117,572	9,789,307	693,722	252,836	7,777,948	6,912,993	528,547	7,167,405	913,045
	April	5,168,530	3,299,432	267,167	96,689	6,498,402	5,292,877	1,461,478	5,211,353	1,110,650
	May	6,643,068	3,739,939	297,454	84,952	4,609,327	2,036,844	169,977	2,135,462	309,593
	June	2,748,000	2,561,136	144,626	47,785	2,005,582	2,501,825	175,643	2,410,866	0
	July	3,369,181	2,603,952	147,717	46,243	2,217,902	2,339,789	0	0	0
	August	3,545,806	2,660,241	147,791	34,522	1,440,484	290,313	0	3,235,548	733,539
	Sept	6,551,461	2,061,229	127,248	50,940	1,717,500	870,200	0	836,766	0
	October	7,558,995	3,213,609	184,702	86,183	3,590,129	2,730,049	266,822	2,171,806	1,149,063
	November	8,129,500	4,465,500	254,444	279,889	7,497,918	6,812,292	427,314	11,965,479	905,924
	December	14,032,529	10,362,619	831,295	230,724	10,291,703	8,333,088	731,766	6,544,229	588,161
Annual Data	Average Daily Load (BTUs/day)	7,133,333	4,623,045	321,905	122,616	5,181,026	3,989,636	337,470	4,414,955	619,741
	Average Annual Load (BTUs/year)	2,611,324,785	1,691,373,390	117,495,469	611,718,540	1,889,712,351	1,452,661,500	123,474,510	1,603,161,216	225,871,860
	Maximum Oberved Load (BTUs/day)	17,427,639	14,963,303	831,295	5,038,000	12,472,374	9,751,854	2,464,040	18,015,888	1,826,090

The total thermal energy demand of these buildings is 26.74 MM Btu/day, or 10,327 MM Btu/year. Currently, over 94,000 gallons of fuel oil is purchased by the City of Kotzebue per year to heat this collection of buildings. This is considered the primary opportunity for const savings through biomass energy use in Kotzebue.

4.1.2 PRIMARY BUILDING HEATING SCENARIO

Total thermal demand of the city's public buildings is roughly equal to the total energy content in Kotzebue's waste stream on a Btu basis. Once the inherent efficiency losses of a waste to energy conversion system are factored, the heating demand in the city's public buildings is greater than the ability of a waste to energy system to serve that need. A top-down selection process was employed to determine the most cost effective buildings and energy systems to convert to biomass heat.

Of the Kotzebue public buildings, the top energy consumers are the Water Treatment Plant (WTP) and the Maintenance Building. Upon further review, these buildings present as the logical choice for district energy location. Their current heating plants are both diesel boilers, and are some of the oldest on the Public Works campus. As well, the energy demand of these facilities closely matches available energy production from biomass energy plant. These plants were factored into the conceptual design as the energy consumers of an RDF plant in Scenario 1, discussed in Section 5.

Table 4-2: Scenario 1 Energy Uses

	Kotzebue City Water Treatment Facility	Kotzebue City Maintenance Shop	Scenario 1 District Energy System Total
January	7,864,266	4,314,803	13,759,170
February	7,871,092	6,404,768	16,438,102
March	12,117,572	9,789,307	25,290,465
April	5,168,530	3,299,432	9,798,452
May	6,643,068	3,739,939	11,563,761
June	2,748,000	2,561,136	5,968,656
July	3,369,181	2,603,952	6,655,700
August	3,545,806	2,660,241	6,827,450
Sept	6,551,461	2,061,229	9,071,148
October	7,558,995	3,213,609	12,102,281
November	8,129,500	4,465,500	15,938,400
December	14,032,529	10,362,619	27,757,016
Average Daily Load (BTUs/day)	7,133,333	4,623,045	**11,756,378**
Average Annual Load (BTUs/year)	2,611,324,785	1,691,373,390	**4,302,698,175**
Maximum Oberved Load (BTUs/day)	17,427,639	14,963,303	**32,390,942**

Additional energy demand centers, such as the school district complex, Maniilaq Hospital, and others were not polled for their interest level or logistical feasibility of converting to biomass-supplied energy. Metering and sale of energy to third-party consumers adds a difficult, and as shown here, unnecessary, management layer to a biomass energy plant's business plan. Recovery of capital expenditure through fuel savings and avoided disposal costs is the simplest pathway form a business and logistics standpoint.

4.1.3 'ADD-HEAT' FOR CITY WATER SYSTEM

Another potential use for biomass-produced thermal energy is the Kotzebue 'Add-Heat' city water heating system. The Add-Heat system currently heats treated water prior to distribution in the city water loops to prevent freezes. Kotzebue Electric Association (KEA) provides waste heat from its diesel-electric generators into the return portion of the lagoon Loop water line to serve this heating need, on a contract with the City. The heated water is blended the rest of the city water supply. The water is heated to an average of 60 deg F, at an average flow (return) of 193 gpm, resulting in an average heat input of 982,600 Btu/hr, or over 23.5 MMBtu/day. Additional diesel-fired heating is available at the WTP itself, but is reportedly rarely used. Thermal energy is sold to the city based on Btu content, at approximately 87.5% of the price of heating fuel (nearly $40/MM Btu going into the 2012/2013 heating season). Kotzebue requires an average of 171 heating days to ensure steady water supply to its residents. Table 4-3 below shows the five-year historical Add-Heat operating parameters.

Table 4-3: Kotzebue / KEA Add-Heat System Parameters

		Supply		Return		
Date	Operating Days	Flow (gpm)	Temp. (deg. F)	Flow (gpm)	Temp. (deg. F)	BTU/hr*
Nov07-May08	173	239	53	199	63	995,000
Oct08-Apr09	182	227	51	187	63	1,122,000
Nov09-Apr10	157	229	48	188	58	940,000
Nov10-Apr11	147	239	47	200	58	1,100,000
Nov11-May12	196	224	47	189	55	756,000
Average	171	232	49	193	59	982,600
					Daily Load	23,582,400

* Calculated using "Advantage Engineering BTU Calculator"
http://www.advantageengineering.com/fyi/288/advantageFYI288.php

KEA is currently in the process of overhauling its energy generation portfolio, focusing on increasing reliance on renewable energy with more turbines at the local wind farm and testing and potential rollout of solar panels. As well, KEA is scheduled to replace several if its diesel –electric gensets with newer, more efficient units that produce less waste heat. KEA has indicated that it can continue to provide as much Add-Heat from its waste heat production as the city needs, but that issue will have to be revisited in future years as the new equipment is installed. A biomass energy plant heating the WTP and Maintenance building, as described above, can supplement the Add-Heat system if a shortfall arises. Considering the finite amount of biomass feedstocks available, it is recommended that the city only supplement the Add-Heat system with biomass energy, rather than replacing the system outright. The Btu's produced are better used to directly displace fuel oil use elsewhere within Kotzebue.

4.1.4 PREHEATING 'ADD-HEAT' FOR CITY WATER SYSTEM

Alternately, Add-Heat energy can be injected into the front end of the water treatment to assist in the treatment process, in addition to avoiding freeze-ups in the distribution pipes. The present treatment system is expected to benefit somewhat from higher-temperature water, but this option becomes much more viable if the proposed redesign of the WTP goes forward. The advanced water treatment technologies, including micro- and nano-filtration, operate at an optimal water temperature of 45°F. The WTP may be re-designed at the existing location at the Public Works campus, or it may be re-located to the Hillside area town, along the raw water distribution line from Vortak Lake. This is therefore considered a long-term option, contingent upon the construction of a new WTP. Ambient inlet water temperature at the WTP is a relatively steady average of 34°F, based on monitoring conducted by WH Pacific, at a flow rate averaging 220 gpm. Heating 220 gpm from 34°F to 45°F is expected to consume 1,610,000 Btu/hr, or 38.68 MM Btu/day. This is greater than the demand for heating all of the public buildings in Kotzebue, as calculated in Section 4.1.1..

After accounting for production and heat transfer inefficiencies, it is expected that output of the proposed MSW gasifier system very closely matches the demand curve of an Add-Heat preheater for a re-designed WTP. The RDF boiler scenario, as proposed, will supply approximately 25% of the needed energy.

4.2 PROJECT SITING ASSESSMENT

The selection of a proper site encompasses many issues, such as transportation (i.e., road access for feedstock delivery trucks) and utility availability (i.e., electrical and substation access), but also should take into account issues such as the environmental impact, the status of current and future production technology, the ability to expand production as required, and more. Tetra Tech conducted a project siting analysis with assistance from project partner DOWL HKM.

The drivers for siting of the biomass energy facility include (ranked in relative order of importance):

1. **Proximity to energy user (load)**
2. **Land owned or controlled by project stakeholders**
3. **Compliance with city Zoning Code**
4. **Accepted by neighboring landowners**
5. **Compliance with County, State, and Federal regulations**
6. **Access to feedstock delivery and storage**

Steam piping and hot water piping are predominantly the limiting factor in project siting, and a distance of over 1,000' between source and use is not recommended due to piping cost and energy loss over the pipe run. In this project as in most, proximity to the end users of the energy produced is the single largest determining factor in facility siting.

The city of Kotzebue has no zoning laws, thus zoning is less important, but land ownership and potential impacts to neighbors of the biomass plant are both critical siting factors. While the environmental impact of a biomass power plant is minimal, there still remains a need to ensure that such a facility does not negatively impact the community. The plant will also need to be designed with appropriate setbacks and safety features to comply with applicable safety regulations.

At present it does not appear that the land and space requirements for either of the proposed plant scenarios will be a limiting factor in site selection. Bulk feedstock storage appears to be minimal, and plant processing equipment indicates the process building will be within the range of existing industrial buildings in Kotzebue. Process building and storage requirements for the biomass energy plant are described in greater detail in Section 5.

In and around Kotzebue are many areas with preliminary wetland designation in the Kotzebue National Wetlands Inventory (NWI). Sites 2 and 3 are designated as 'freshwater emergent wetlands'. Site 1 does not have a designation, but standing water was noted in one of the areas identified as suitable for plant siting. These designations are for planning purposes only, and it is likely the sites will qualify for development under a national Wide permit with the designations. An onsite delineation survey is recommended prior to final site selection.

A map of Kotzebue identifying the prospective sites follows the discussion (Figure 4-2), and includes overlays of the preliminary wetland delineations in the city.

4.2.1 SITE 1: PUBLIC WORKS FACILITY

Several available locations at the Kotzebue Public Works campus are suitable for construction of a biomass energy plant, including to the west of the Bailer building and vehicle storage Quonset hut, and to the northeast of the WTP and water tanks.

Siting at the Public Works campus carries a number of project benefits, including proximity (both to feedstock source and energy users) and land ownership and control. Regarding distance to potential energy users, producing renewable energy to serve either space heating at city-owned buildings or the city Add-Heat system is logistically feasible at this prospective site. Hot water distribution piping is minimal in either plant configuration. As well, Kotzebue already owns and controls access to this land, which will speed permitting and reduce safety requirements at the site.

There are also potential drawbacks to these sites. For one, the available space is limited. Not only is available unused land at a premium in the city, the site is bordered closely by facilities on all sides, and residential property to the southeast. This is more of a challenge to a large-scale MSW gasification system than a smaller-scale RDF boiler, which is expected to have greater noise, odor, and air emissions than a facility processing pre-sorted feedstock. This location is the most sensitive of the sites identified to potential noise, visual, emissions, or other impacts.

An additional consideration is that there is currently standing water in the area to the west of the bailer Building. The city has considered filling the standing water area with dredged material from the upcoming Swan Lake Boat Harbor upgrades project, thus creating a location for the facility.

4.2.2 SITE 2: HILLSIDE

The Hillside area to the southeast of Kotzebue is also under consideration as a potential biomass energy plant site. The city of Kotzebue has plans to develop areas of the hillside for residential use, and proposed in the 2009 Sanitation Master Plan to locate a new water treatment plant on the east side of the Hillside area. The area has been platted and lots subdivided, with the city of Kotzebue owning the majority of lots in this area. Kikiktagaruk Inupiat Corporation (KIC) owns the surrounding land. Figure 4-1 is a picture of Hillside area and approximate site location, from the city looking east.

Figure 4-1: Photo of Hillside Area and Site 2

The hillside siting offers the advantage that a proposed biomass facility could be located near the proposed water treatment plant, making an "add heat" system logistically simple. Once again though, if the biomass is insufficient in providing all the required "add heat", a separate "add heat" system would also be required.

Since this area is not fully developed, the facility size is not as important. Lots could be combined or a new lot, altogether, could be developed for this facility. Large storage facilities could easily be located here. This location has several advantages, including city ownership, and ample space available for siting and configuration of any size facility.

The infrastructure on the hillside is underdeveloped. Site grading and connection to utility infrastructure would be required for development of the site. Also, plans exist for developing this area, but it may be a few years before construction begins.

Thermal energy produced by a facility at this location can only be used for heating city water, as a supplement or a replacement to the current Add-Heat system. A redesigned Add-Heat system could absorb the entire production of with an RDF Boiler or an MSW Gasifier system at this location. Outlets for any additional produced energy would be limited to building heat for the redesigned WTP.

4.2.3 SITE 3: CITY INDUSTRIAL SECTOR NEAR KEA POWER PLANT

A third alternate plant site could be located near the KEA Power plant, in the industrial part of Kotzebue. This location would allow smoke stack emissions to be concentrated in one area, instead of spreading them out over the city. The lots directly south of the power plant are an option. These are owned by NANA Regional Corporation, and it is likely that a transfer of ownership could be arranged for plant siting. While

relations between the city and NANA are strong, land conveyance processes are slow, however, and this could present significant additional cost to the project.

The city of Kotzebue has plans to construct a designated Add-Heat line from the KEA power plant to the city's water treatment and distribution center. Currently heated water is added to one of the city's distribution loops. If the biomass were used for heating water in an Add-Heat system for the city's water system, this location would be advantageous, because it could take advantage of planned infrastructure. However, if the biomass energy potential is insufficient to provide all of the city's Add-Heat requirements the city would still have to purchase Add-Heat from KEA, which it currently does on a fixed fee basis, and a new Add-Heat water main would be required anyway. If the biomass is insufficient in providing all the required Add-Heat, alternative facility types should be considered.

Figure 4-2: Biomass Energy Plant Sites

5 CONCEPTUAL ENGINEERING DESIGN

Tetra Tech reviewed major heating and power options that are applicable to the general project conditions thus far determined for the prospective plant. The following section identifies the most likely process technology for the biomass power plant and describes the conceptual plant design.

5.1 FACILITY DESCRIPTIONS

Tetra Tech evaluated the viability of two energy generation configurations at Kotzebue:

Scenario 1 will combust densified refuse-derive waste (RDF) in a commercial-scale boiler. Scenario 1 will rely on source-separation and on-site sorting of Kotzebue's waste stream to produce a homogenous RDF waste stream. This waste stream will be combusted in a single-chamber ambient-air boiler of less capital and operating expense. Thermal energy produced would be used for heating Public Works campus buildings, but could also be used to supplement the city water Add-Heat system.

Scenario 2 is gasification-based system processing the entire city's MSW waste stream, and producing year-round thermal energy for pre-heating a redesigned version of the city water supply treatment and Add-Heat system.

5.2 SCENARIO 1 – RDF BOILER SYSTEM

Tetra Tech developed the following conceptual process design of a RDF boiler system for Scenario 1. The plant design is engineered and tailored to conditions specific to the site, at a level corresponding to standard engineering practices of 10% system design. The system process flow is described in sequence in the following section and a corresponding process flow diagram is supplied below as Figure 5-1. In the description below, the process has been broken down into its three critical components: feedstock management, energy generation/distribution, and combustion byproduct management.

Feedstock Management & Logistics

- Feedstock for this system will consist of sorted and separated cardboard, newspaper, mixed paper, and wood materials from the city of Kotzebue waste stream. The city's waste management equipment will be used to collect materials, either as source-separated material from the producers or mixed with the city's MSW waste stream. RDF fuel will be separated from the waste stream in the Bailer building, possibly in conjunction with an aluminum and tin recycling program.

- Once sorted, the RDF fuel material is transported to the fuel storage room of the energy plant building, adjacent to the Bailer Building on the Kotzebue Public Works campus. Here, raw RDF is blended to achieve the standard cardboard/paper/wood ratio, then sent through a shredder and briquette unit. A pelletizing unit may be substituted for briquetting in this stage, but would require the addition of a

hammer mill and possibly other equipment at an additional cost. The feedstock storage area is designed to store a 60-day supply of feedstock, sufficient for this configuration. This will allow for onsite drying, blending of various grades of feedstock materials, and summer storage. The lower heat value of the feedstock fuel processed at the facility is expected to be approximately 6520 Btu/lb, and the moisture content as received is expected to be approximately 10-30 percent. Any material received outs of that specification can be either dried or blended with in-spec material to reach the desired blend ratio. Operational experience is critical in this stage; in order to produce consistent feed material understanding the seasonal variations inherent in the Arctic.

- Several 4-6 yard rolling bins will be included in the project capital costs for feedstock management. It is assumed these bins can be moved from the sorting location within the Bailer building to the process building using existing city equipment (e.g., front-end loaders, skid-steer, etc).

Energy Generation & Distribution

- Sorted, mixed, dried, and densified RDF fuel will likely be manually loaded to a 1-2 day surge hopper. Alternatively, a mechanized 'walking floor' system can transition stored fuels into the combustion cycle. Walking floor systems add significant additional cost, and were not deemed necessary for the volume of material needing transport. The surge hopper marks the beginning of the combustion cycle. From here, twin screw augers homogenize and break up densified fuel, metering into the stoker – boiler unit.

- The stoker – boiler system will utilize a 3-pass, hydronic hot-water based boiler system, reducing the cost and hazard associated with high-pressure steam. In addition to hot water, the boiler generates ash and exhaust gasses. The solid material remaining is the ash waste product which is mechanically removed from the bottom of the boiler.

- The working fluid (here, water) is heated at low pressure (15-30 psi) to desired temperature (180 deg C). The water will be metered as needed to the Water Treatment Plant (WTP) and the Maintenance Shop via underground piping, which will enter each building at its boiler room and tie into existing heating distribution systems. Existing diesel boilers are expected to be retained for backup or on-call peak heating needs.

- Feed control and plant operations are managed automatically via control panel and programmable logic controller (PLC) systems.

Combustion Byproduct Management

- Ash is produced by the combustion process and is collected as noted in the energy generation section. The amount of ash produced will likely range from 2 to 10 percent of the original feedstock, but is dependent on the feedstock, moisture content and the transformational process noted above. Ash produced by the system is expected to be baled with residual MSW and disposed of in the city landfill.

- Air Pollution Control (APC) is the final treatment of the gas stream prior to release into the atmosphere and is denoted as "gas cleanup" in Figure 5-1. This gas cleanup step will ensure that NOx, SOx, and other contaminates are removed from the combustion gasses. Air emissions will be required to meet regulations determined by the Federal EPA and State environmental regulatory agency. APC equipment will be selected further into the design process, but would likely include one or more standard technologies, including cyclone dust collectors, baghouses, and electrostatic precipitators. The less-costly cyclonic dry systems are expected to be sufficient for this configuration, and are factored into the capital expenditure as such.

5.2.1 SCENARIO 1 SYSTEM SCALE FLEXIBILITY

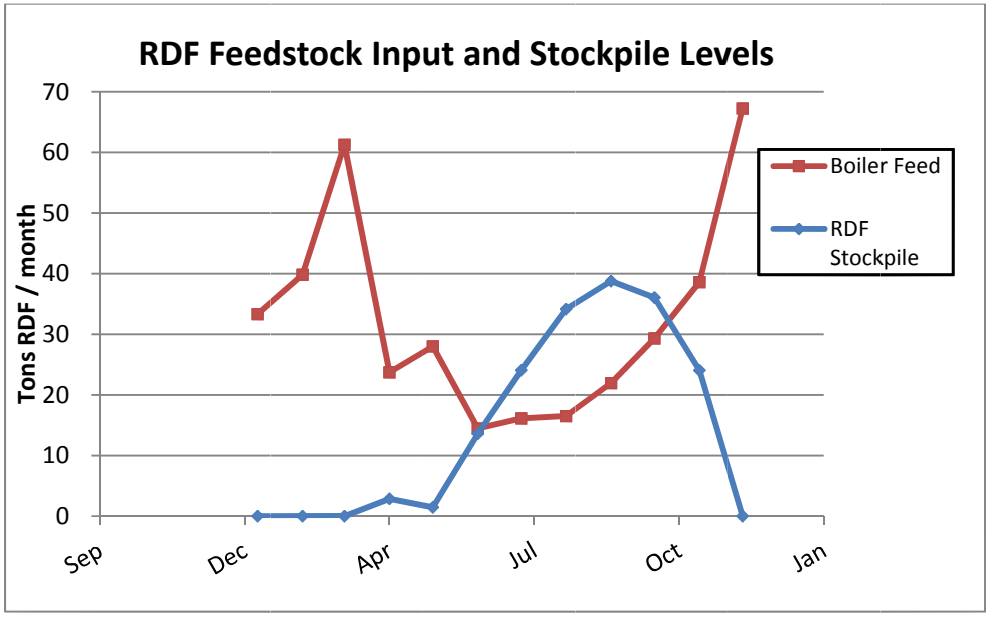
The boiler system in Scenario 1 is designed to be oversized to allow for additional feedstock input and energy users supplied. Primarily, this is because boilers are offered in a relatively standard 1.5 MM Btu size. The additional capacity allows turn-up and turn-down capability to accommodate fluctuations in seasonal demand for thermal energy, demonstrated in Table 5-1.

Table 5-1: Scenario 1 Seasonal Variability

Seasonal Variability		Scenario 1
Peak Season Analysis	Feedstock Demand (TPD)	2.21
	Hot Water (MM BTU/hr)	0.93
Low Season Analysis	Feedstock Demand (TPD)	0.48
	Hot Water (MM BTU/hr)	0.39

Additionally, an RDF system in Kotzebue has significant ability for expansion in feedstock input through several sources. Increased production and/or capture of cardboard, paper, and wood materials can immediately translate to more buildings heated by the system. 60% + capture rate of RDF is achievable, and results in an increase of 60 tons per year of feedstock material. Pellet purchase can also be increased as needed to heat more city buildings.

Figure 5-1: Feedstock Storage Schedule



RDF feedstock will be stockpiled through summer months and drawn down in the winter months. RDF briquettes will be stored in the plant building storage area in the offseason. Maximum storage is expected at approximately 40 tons at a 50% RDF capture rate, and 70 tons at a 60% RDF capture rate. Maximum supply occurs in September, as the heating season is beginning to ramp up. Figure 5-1 shows the seasonal variation in boiler operations and RDF briquette storage.

Figure 5-2: Scenario 1 – RDF Boiler Block Flow Diagram

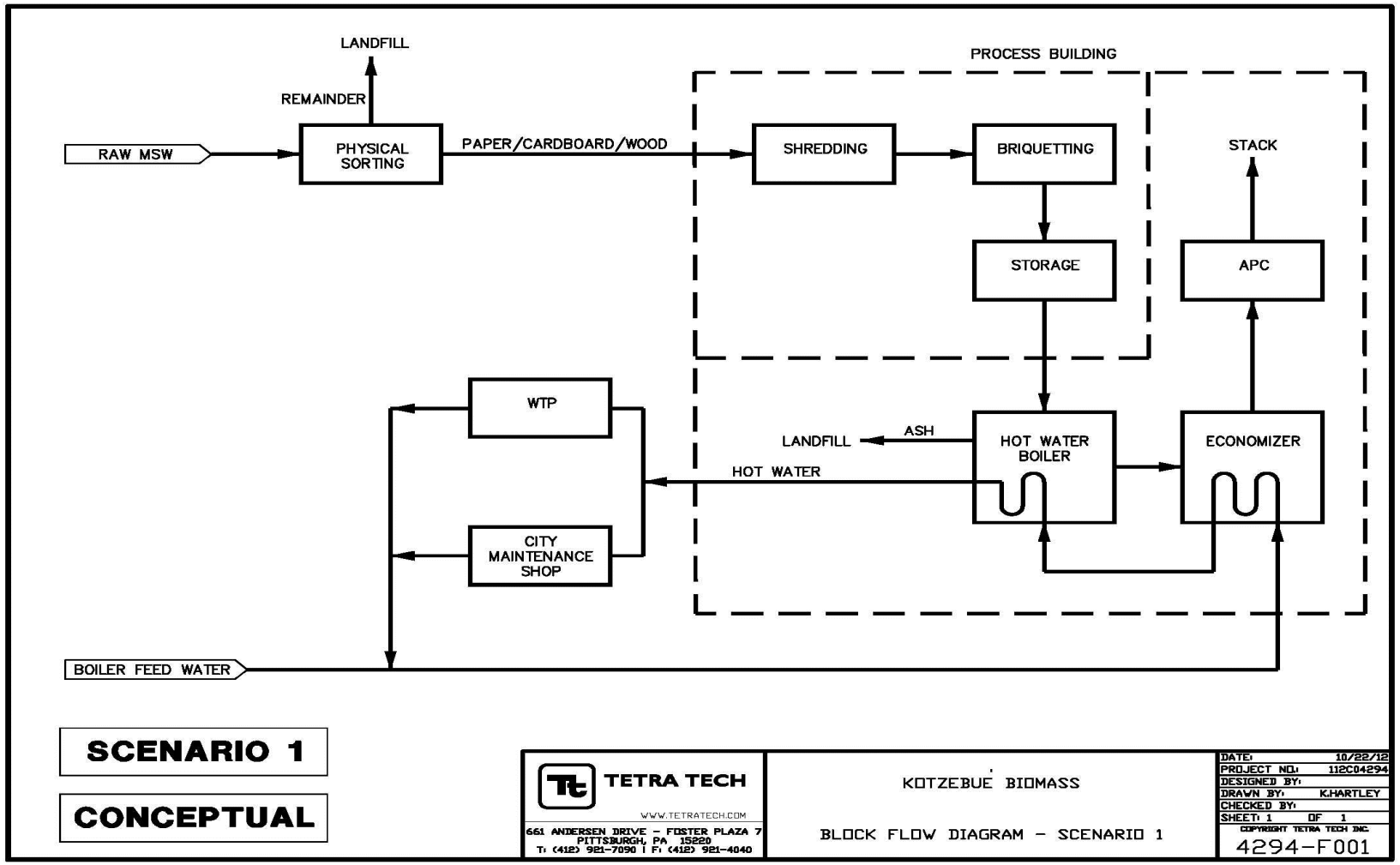
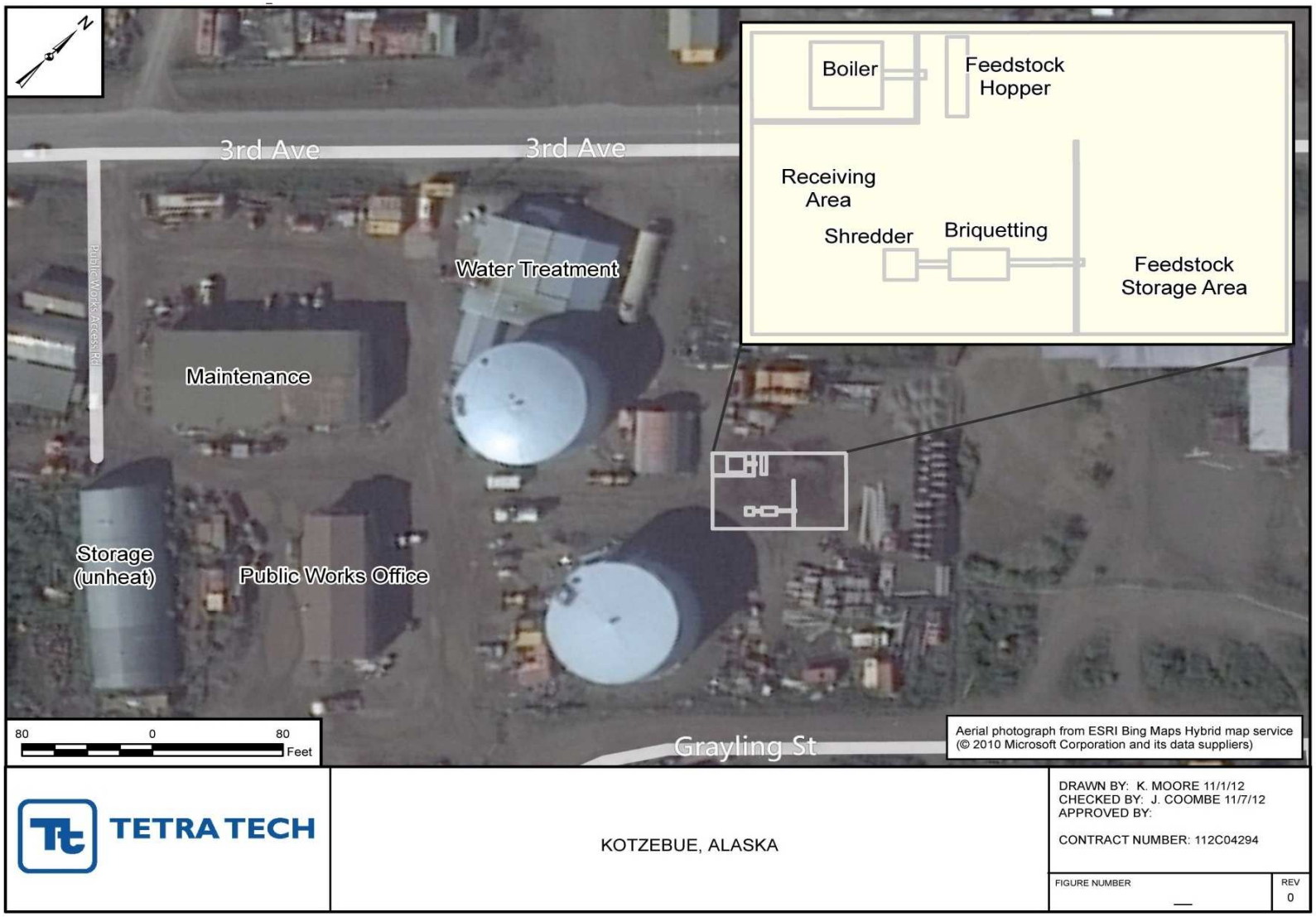


Figure 5-3: Kotzebue Biomass Power Plant Facility Configuration (In-Town RDF Plant)



5.3 SCENARIO 2 – MSW GASIFIER

Tetra Tech also developed a conceptual process design of a 2-stage gasification system fuel by unsorted MSW, corresponding to Scenario 2. As with the RDF boiler conceptual design, this plant design is engineered and tailored to conditions specific to the site, at a level corresponding to standard engineering practices of 10% system design. The system process flow is described in sequence in the following section and a corresponding process flow diagram is supplied below as Figure 5-3.

Feedstock Management & Logistics

- Feedstock for this system will consist of essentially unsorted municipal solid waste. Visual inspection of the waste stream to remove potentially explosive items (canisters, etc) or hazardous materials such as large batteries is all that is required prior to being fed into the gasifier.

- Once at the project site, the bales will be passed through an MSW shredder. This will serve to reduce particle size, blend the feedstock, and make it more amenable to use within the gasification system.

Energy Generation & Distribution

- Feedstock material will be introduced to the combustion system via auger, which will continuously load the primary combustion chamber. An operator will be required onsite 24/7 to assure material flow is not interrupted. Supplemental fuel is estimated at 2.5 gallons/hr of diesel/fuel oil required to ensure complete oxidation is achieved in the primary chamber.

- The system will utilize a 2-stage gasification system described above. The first stage operates with limited and carefully-controlled oxygen (air) input and gasifies the material. Gasses are fully combusted with air in the second stage, producing steam in a boiler. The system generates ash and exhaust gasses. The solid material remaining is the ash waste product which is mechanically removed from the bottom of the boiler.

- The working fluid (here, water) is heated to produce medium pressure steam (50-150 psi). Energy from the steam will be transferred to Kotzebue's incoming raw water flow via jacketing or hot plate heat exchangers.

- Feed control and plant operations are managed automatically via control panel and programmable logic controller (PLC) systems.

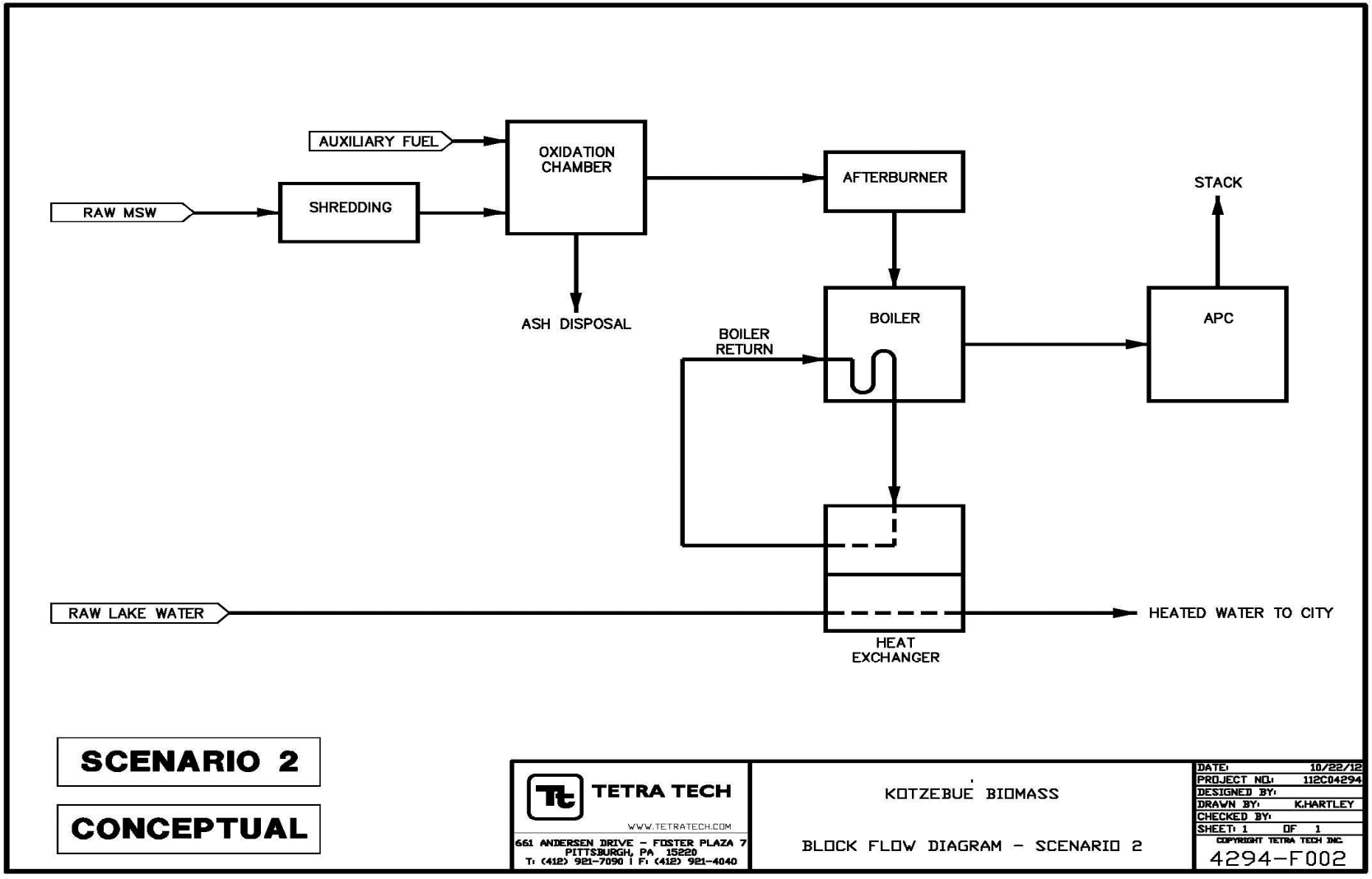
Combustion Byproduct Management

- Ash is produced by the combustion process and is collected as noted in the energy generation section. The amount of ash produced will likely range from 10-15 percent of the original feedstock, but is dependent on the feedstock, moisture content and the transformational process noted above. Ash produced by the system is expected to be disposed of in the city landfill.

- Air Pollution Control (APC) is the final treatment of the gas stream prior to release into the atmosphere and is denoted as “gas cleanup” in Figure 5-3. This gas cleanup step will ensure that NOx, SOx, and other contaminates are removed from the combustion gasses.

- Air emissions will be required to meet regulations determined by the Federal EPA and State environmental regulatory agency. APC equipment will be selected further into the design process, but would likely include one or more standard technologies, including cyclone dust collectors, baghouses, and electrostatic precipitators. APCs can be categorized into two types: wet or dry. Both types use chemical addition, adsorbents and absorbents, and filters to bind the chemical pollutants, and then trap the particulate emissions through the use of bag house filters. The wet systems have a 'blow-down' stream and a 'make-up' stream that will need to be considered. The blow-down stream is dried, discharged to outfall, or reused in the manufacturing process. A dry system will have filters that collect particles. In this the particles can be dislodged from the filters and disposed of, and the filters reused.

Figure 5-4: Scenario 2 – MSW Gasifier Block Flow Diagram



5.4 BIOMASS POWER PLANT OPERATIONAL CONSIDERATIONS

Scenario 1 is expected to be in operation during normal business hours, or whenever buildings need to be heated. Scenario 2 designed to operate 24 hours per day, 7 days per week (24/7). The system will be automated to maintain the feed and monitor the operations, but will require regular shifts of operators.

Scenario 1 requires only a boiler operator to oversee operations. It is expected that current refuse system employees will be available to assist in sorting and transport of feedstock to the process building on an as-needed basis. This is contingent on the plant being built on the Public Works campus. The system takes advantage of feedstock hoppers and the project PLC to assist with overnight and weekend operations.

For scenario 2, four employees are required for 24/7/365 operations. One shift team leader is expected to oversee day to day operations, environmental monitoring, management of truck traffic in and out, and scheduling of repairs and down time. Two (2) shift employees cover the majority of operational shifts, and a boiler operator will also be required.

Scheduled maintenance will need to be conducted on the system at periodic intervals. The biomass power plant is assumed to have 95% uptime, corresponding to approximately 350 days per year of consistent operation.

It is noted that the operation of the prospective biomass power plant will require regulatory oversight. A facility such as this comes under oversight by many authorities including: US EPA, OSHA, Alaska Department of Environmental Conservation (AK DEC), Alaska Department of Labor and Workforce Development, and others. Operating the proposed facility to the highest level of regulatory compliance should be a primary goal of the City of Kotzebue.

The major variables for facility operation, as well as modeling the project's financial performance, include product yields, product and raw material pricing, labor costs, energy consumption and pricing, capital costs including engineering, procurement and construction of the plants and all supporting facilities and systems, project development costs, financing costs, start-up costs, working capital and inventory costs. Major operational facility parameters for both plant configurations are shown in Table 5-2. Capital and operational expenditures for both scenarios are described in Section 7.

Table 5-2: Biomass Energy Plant Operating Parameters

Facility Logistics	Scenario 1	Scenario 2
Landfill Diversion (ton/yr)	314	1,245
Fuel Oil Replaced (gal/yr)	31,300	100,200
Operators Needed	1	4
Throughput rate of Feedstock (TPD)	0.94	4.45
Storage (cu.yds)	195	21
Ash disposal (ton/year)	29	162

Table 5-3: Biomass Energy Plant Inputs and Outputs

Plant Inputs		Scenario 1	Scenario 2
Feedstock	Type	RDF	All MSW
	Feedstock Demand (TPD)	0.94	4.45
	Auxiliary Fuel (gal heating fuel/day)	-	60
	Feedstock Shortfall (MM BTU/yr)	294	-
	Supplementary Feedstock Type	Wood Pellets	-
	Supplementary Feedstock (TPY)	40.9	-
Electrical Inputs	Parasitic Load (kWh/ raw ton)	2.50	2.71
Plant Outputs		**Scenario 1**	**Scenario 2**
System Parameters	Output Type	Thermal - Boiler	Thermal - Boiler
	System Capacity (MM BTU)	1.5	2.0
	Combustion Efficiency*	77%	69%
	System Efficiency**		
System Outputs (Average)	Hot Water (MM BTU/hr)	0.39	1.26
	Hot Water (MM BTU/yr)	3,135	12,205
	Ash (lbs/day)	160	770
	Other Inert Material (lbs/day)	-	1,190

6 PERMITTING AND ENVIRONMENTAL ANALYSIS

Based on the proposed sites under consideration, developing a biomass energy plant in the vicinity of Kotzebue, Alaska, would require coordination with tribal, federal, state, and county personnel. Permitting can be one of the biggest obstacles to the development of any industrial plant. As in the case of any industrial facility, construction and operation must be preceded by the acquisition of a broad range of regulatory permits and approvals.

6.1 PERMITTING REQUIREMENTS FOR A BIOMASS ENERGY PLANT

Based on past project experience, Tetra Tech assumes that the project will likely trigger several environmental permits. These permits may include various federal, state and local environmental, construction and land use permits. Examples of permitting concerns may include issues related to air quality, solid and hazardous waste, water quality, water use, wastewater disposal, tank registration as well as various other local permits, such as local building, transportation and other special use permits. Below are outlined a few of the primary permits that may be required for a biomass energy plant in Kotzebue, Alaska. This list is not exhaustive and may change based on the technology and site selected for the final project. Tetra Tech recommends contracting for the services of a permitting firm with experience in Alaska to navigate the permitting process.

- *Clean Air Act - Non-Title V Operating Permit – Part 70*. 40 CFR 49.139 establishes an operating permit program for owners and operators of air pollution sources who want to request federally-enforceable limits on the source's actual emissions or potential to emit (PTE). A facility's PTE is based on the maximum annual operational (production, throughput, etc.) rate of the facility taking into consideration the capacity and configuration of the equipment and operations.

  The primary reason for requesting federally-enforceable limitations is to reduce a facility's PTE to below major source thresholds, therefore avoiding certain federal Clean Air Act requirements. The major source threshold for any "air pollutant" is 100 tons/year and major source thresholds for "hazardous air pollutants" (HAP) are 10 tons/year for a single HAP or 25 tons/year for any combination of HAP. The analyzed biomass energy plant scenarios, and associated emission profiles, are expected to be below this threshold and therefore will be subject to Non-Title V Operating Permit procedures.

- *State of Alaska DEC Air Permitting*. AK DEC's Division of Air Quality has the authority to permit and regulate air emissions within the state. Alaska Air Quality Regulations 18-AAC-50 stipulates that facilities producing over 40 tons per year of nitrogen oxides (NO_x) and/or sulfur oxides (SO_x), and/or 15 tons per year of particulate matter, must apply for an air emissions permit, complete with dispersion modeling, monitoring and reporting. Facilities that produce less than these limits are not required to obtain a state permit, but are expected to comply with federal emissions regulations. Laboratory testing will be

required to determine whether the proposed biomass energy plant scenarios will be exempt from state permitting obligations. Contact information:

Alaska Department of Environmental Conservation
Division of Air Quality
410 Willoughby Ave., Suite 303
Juneau, AK 99811-1800
(907) 465-5100
Program Manager: John Kuterbach

- *Emergency Planning and Community Right-to-Know Act (EPCRA) Section 313: Toxics Release Inventory.* Facilities must complete and submit a Toxic Chemical Release Inventory Form annually for each of the more than 600 Toxic Release Inventory (TRI) chemicals that are manufactured or otherwise used above the applicable threshold quantities. It is not expected that hazardous waste will be produced directly by the process based on the expected composition of material input. Maintenance operations could produce hazardous waste, however, and the following waste streams should be considered as potential sources.
    - Residual fly ash
    - Residual bottom ash

  A Toxicity Characteristic Leaching Procedure (TCLP) test may need to be conducted on the ash residuals to characterize the waste as hazardous or non-hazardous. Non-hazardous waste should be properly disposed of at approved municipal solid waste landfills. Hazardous wastes need to be disposed of in permitted hazardous waste facilities, and may need to be transported out of Kotzebue for disposal, but that appears unlikely. A similar system in Barrow, AK, has passed every TCLP test taken on its ash material.

- *State of Alaska DEC Solid Waste Regulations*. AK DEC's Solid Waste Program will be involved with the acceptance of wastes to local landfills, including ash residuals. As well, the Solid Waste program requires an application for any facility treating municipal solid waste. Exemptions are allowed for facilities treating less than five (5) tons per day, or ten (10) tons per batch. Both proposed project scenarios should be below that permit threshold and exempt, but contact with state representatives is encouraged. Contact information:

  Alaska Department of Environmental Conservation
  Division of Environmental Health
  Solid Waste Program
  610 University Avenue
  Fairbanks, AK 99709
  (907) 451-2134
  Project Contact: Ken Spires

- *EPA Construction General Permit.* Construction activities in Alaska are covered by a general permit for stormwater discharges from construction sites. The NPDES stormwater program requires construction site operators engaged in clearing, grading, and excavating activities that disturb 1 acre or more, including smaller sites in a larger common plan of development or sale, to obtain coverage under an NPDES permit for their stormwater discharges.

- *Boiler Permitting and Boiler Operators*. Dependent on size, boilers of various types require certified and trained operators for safe operation. Alaska's Department of Labor and Workforce Development oversees boiler operator and permitting in the state. The boilers proposed for this project produce low pressure steam or hot water, and thus fall to the low end of the spectrum in terms of regulatory oversight.

  Alaska Statutes, Sec. 18.60.210 (a) (9) states that to be exempt from boiler inspections, operator certification, and licensing requirements, the system must have a heat input of less than 200,000 Btu/hr, which is lower than the average heat input of both proposed heating systems. The systems are therefore not exempt.

  Alaska Statutes, Sec. 18.60.395 (b) (2) requires a third-class boiler operator's license for systems up to 3.5 MM Btu/hr, or well within the range of the proposed units. A third-class operator's license is the least restrictive class of boiler operator license to obtain.

6.2 EMISSIONS CONCERNS FROM COMBUSTION AND GASIFICATION OF WASTES

Combustion (and vis-à-vis gasification) of waste products has always been a contentious issue, with many concerns raised over the makeup of the material being combusted and the emissions produced by the system. Careful air emission and air dispersion modeling prior to construction, and monitoring once operations begin, of the system's emissions profiles are critical to ensuring the system meets applicable emissions regulations and preserves local health and safety standards.

It is important to note that many waste-to-energy system vendors certify, as a contact term, that their system will meet applicable air emissions control regulations. As mentioned previously, specific configuration of air pollution controls equipment (APC) is often specified and installed as a partnership between the boiler supplier and APC supplier. This ensures that their technologies are compatible and achieve promised emissions profiles. Tetra Tech recommends that this stipulation be included in any EPC contract for construction of a biomass energy plant.

6.2.1.1 Hazardous Air Pollutants (HAPs) from MSW Gasification

Dioxins and Furans are produced from the combustion of plastics and other chemical compounds found in municipal MSW, and pose the largest hazardous air pollutant (HAP) risk of MSW gasification. Thermal decomposition of these components occurs in the final combustion phase of the gasification operation.

Here, temperatures reach in excess of 1000 deg C. This is well above the thermal degradation point of dioxins and furans, (700 deg C)[9]. Table 6-1 is a sample performance claim for a gasification system offered by Eco Waste Solutions. Tests were conducted to conform to the Canadian Environmental Technology Verification program, which is recognized and reciprocal with US EPA.

Table 6-1: Sample Performance Claim for Batch Gasification of MSW Application.

Parameter	Stack Emission Maximum	Unit
Particulate	12	mg/Rm^3
Pb + Mn + Cr + Cu	1	mg/Rm^3
As + Ni	0.02	mg/Rm^3
Cd + Hg	0.1	mg/Rm^3
Dioxin/Furan*	0.09	$ng\ ITEQ/Rm^3$
SO_2**	39	mg/Rm^3
NO_x	136	mg/Rm^3
CO	1.3	mg/Rm^3
*I-TEQ refers to international toxicity equivalent factor (2,3,7,8-TCDD) ** Emissions exclude diesel fuel auxiliary burner SO_2 and NO_x contributions R Indicates the reference measurement conditions for emissions which are : temperature = 25°C, pressure = 101.3kPa, and O_2 content = 11% dry		

Source: Eco Waste Solutions Inc.

Tetra Tech is confident, based on the analysis conducted for this and other projects, that the proposed biomass energy systems will meet all applicable air permits and regulations, and may be below state permitting requirements (and therefore not require a state air emissions permit). However, that cannot be confirmed until samples of the specific feedstock input have undergone analytical testing and the technology configuration (including APC) is selected. As such, Tetra Tech recommends analytical testing of feedstock samples as one of the most immediate proceeding steps in the development of this project.

[9] EPA Doc 600280197 “Dioxins”, 1980

7 PROJECT FINANCIAL AND ECONOMIC ANALYSIS

Tetra Tech prepared two financial modeling and economic performance projections of the prospective biomass energy plant, using proprietary economic modeling software. The models evaluate the project conditions evaluated in the study. When possible, Tetra Tech solicited cost and operational parameters from equipment providers, and supplemented that information with internal engineering analysis. Facility parameters incorporated for a 1.5 MM Btu RDF Boiler and a 1.5 MM Btu MSW Gasifier include:

- Product yields
- Product and raw material pricing
- Labor costs
- Energy consumption and pricing
- Capital costs including engineering, procurement and construction of the plants
- Financing costs
- Project development costs, including start-up costs, working capital and inventory

These parameters are further evaluated in the section below. A pro forma analysis was prepared corresponding to the base case project assumptions, and additional analysis is provided to examine the primary factors affecting the financial viability of the project scenarios.

7.1 FACILITY CAPITAL COSTS

Tetra Tech developed capital costs for the proposed facility configurations based on a number of communications with equipment vendors, publicly-available information, and internal databases, as well as costs and operational parameters derived from engineering investigation of the proposed facility. The capital cost below is therefore not representative of any single bid or vendor's equipment profile. Tetra Tech recommends that Kotzebue solicit final construction bids from prospective vendors to confirm final project capital costs.

Table 22 shows the estimated capital cost breakdown for process equipment, building costs, development costs, startup, and contingency for both scenarios. The capital cost supplied is a budgetary estimate, corresponding to the level of engineering detail that has been conducted at this stage of the project. Budgetary quotes are defined by engineering's governing body, AACE International, as 10-15% design completion of the facility, and as such can only be held to a +30% to -15% accuracy level. Adhering to this international standard, the RDF Boiler plant all-in capital cost is projected to fall in the range of **$1.9 MM – $2.9 MM**. The MSW Gasifier plant is projected to cost in the range of **$4.2 MM – $6.4 MM**.

Table 7-1: Biomass Power Plant Capital Cost Estimate

Capital Expenditure	Scenario 1 RDF Boiler	Scenario 2 MSW Gasifier
Process Equipment		
Energy System & Controls	$250,000	$2,434,000
Feedstock Handling and Rolling Stock	$133,000	$190,000
District Energy Distribution Piping	$185,000	$0
Process Equipment Total	**$568,000**	**$2,624,000**
Building and Development Costs		
Site Preparation	$37,000	$190,000
Process Building	$388,000	$351,000
Utility Connections and Controls	$98,000	$157,000
Delivery and Installation	$624,000	$624,000
Engineering, Permitting, and Indirect Costs	$150,000	$162,000
Total	**$1,865,000**	**$4,108,000**
Contingency (20%)	**$373,000**	**$822,000**
Grand Total	**$2,238,000**	**$4,930,000**

Note that a 20% contingency factor is also applied to the capital cost to account for additional cost overruns. Actual costs will vary depending on the technology provider and general contractor chosen for the project, material costs, and other factors in further facility engineering and procurement stages.

7.1.1 CAPITAL COST FACTORS

A number of assumptions are made regarding capital costs for projects that are in early developmental stages. The primary factors affecting the Kotzebue biomass energy system are described below.

- *Process Equipment Scale and Cost.* It was discovered that RDF boilers priced for Scenario 1 do not cost significantly more than smaller-scale installations, As noted in the cost estimate above, a 1.5 MM Btu RDF boiler by itself is approximately $250,000, while a 500k – 1 MM Btu boiler saves only $30-50k. 1.5 MM Btu is a standard size for this equipment, and is available through more outlets. Therefore it was determined to specify an oversized boiler for Scenario 1, able to accommodate additional feedstock supply either through improved RDF collection efforts or increased purchase of wood pellets.

  Scenario 2 is scaled to match the volume of incoming feedstock; it is not oversized as there are no anticipated additional feedstock sources for this type of system.

- *Materials and Labor Factor for Kotzebue*. All materials and labor sourced from the Kotzebue area, and delivery of materials from outside vendors, were subject to an 185% cost surplus factor. This estimate is

based on past experience with remote capital projects as well as geographic cost differentials calculated by the McDowell Group for the Alaska Department of Labor and Workforce[10].

7.2 FINANCIAL MODELING INPUTS AND CONDITIONAL ASSUMPTIONS

Tetra Tech prepared two financial models for the project, corresponding to the two plant scale conceptual designs. The financial model is an estimate of potential project returns, based upon the most accurate information available at present. To maintain project transparency, and to facilitate adjustments to project goals as the project moves further in the development phase, an explanation of the inputs used in the financial forecasts that have the greatest impact on the project risk and return follows.

The project inputs that have the greatest impact on project operations and financial returns are:

- *Feedstock Input.* For the RDF Boiler scenario (Scenario 1), feedstock input is assumed to be 320 tons per year of sorted cardboard, paper, and wood product, supplemented by 40.9 tons per year of purchased wood pellets to meet the WTP and Maintenance Building heating needs. Daily input rate varies with heat demand between 0.51 tons/day and 2.35 tons/day.

  For the MSW Gasifier scenario, feedstock input is assumed to be the entire volume of Kotzebue's waste stream, 1,625 tons per year at ~20% moisture which is approximately the current moisture content in the feedstock available. Daily input rate is steady per the volume of material incoming.

- *Feedstock Input Cost.* MSW feedstock was not assumed to carry any cost or tipping fee. RDF sorting costs are included as manpower and operational costs. Supplemental pellets are assumed to cost $300/ton, delivered to Kotzebue.

- *Avoided Waste Disposal Cost.* A factor was included to account for avoidance of landfilling the wastes associated with each scenario, and was included as a revenue or savings in the financial modeling. Disposal cost avoidance was based on research conducted by the Alaska Chapter of the Solid Waste Association of North America, which calculated an average disposal cost of $68-112/ton in 1995 dollars for an Alaska township the size of Kotzebue[11]. Costs for the smaller rural areas were much higher per ton. Converted to 2012 dollars, the range is $102-168/ton. $102/ton avoidance cost was conservatively assumed for financial costing of the project, after accounting for ash waste that will need to be landfilled.

[10] Fried, Neal. "The Cost of Living in Alaska." Alaska Economic Trends, July 2011.

[11] "Alaska Solid Waste Regionalization Report." The Alaska Chapter of the Solid Waste Association of North America, May 1999.

- *Thermal Energy Production.* All thermal energy produced by the biomass energy plant scenarios is assumed to be used by the city of Kotzebue to offset heating fuel purchases. For Scenario 1, space heating of city buildings is assumed as the use, for Scenario 2, water heating in replacement of the KEA Add-Heat system.

- *Thermal Energy Sale Value.* The average price of heating fuel in Kotzebue for the winter of 2012/2013 is $6.037/gallon. The value of the thermal energy produced in Scenario 1 is based on the local price of #1 heating fuel, determined on Btu:Btu basis taking into account the relative efficiency of the diesel boilers serving the buildings. Efficiency of those boilers is set at 80%. The value of thermal energy in Scenario 1 is $45.05/MM Btu.

  Scenario 2 replaces the KEA Add-Heat system, and the value of thermal energy is set according to the KEA Add-Heat contract. The contract states that the charge is equal to the quantity of heating fuel avoided (times) the price of heating fuel (times) 70%. The quantity of fuel avoided includes a factor for the efficiency of the City's boilers, set at 80%. Thus, the value of thermal energy in Scenario 2 is $39.42/MM Btu.

- *Project Investment.* Financing of the project is expected to be accomplished primarily through raising of a bond, supplemented by capital investment from the city. The projects expected interest rate is set at the Treasury Department's posted 20-yr Bond interest rate, 2.5% as of November 2012.

- *Grant Funding.* Support of $500,000 in general economic development grants is assumed for each project scenario.

- *Project Construction and Facility Operational Year.* The facility was assumed to be constructed and operational in the year 2014. The construction period is expected to consume 13 months following project financial close, then ramp up to full operations in months 14 and 15.

- *Depreciation and Amortization.* 20-year straight line depreciation is used to depreciate the installed cost of the biomass energy plant's major equipment, and 30-yr straight line depreciation for process buildings. Process equipment depreciation is based on the minimum lifespan of the equipment as reported by the respective equipment vendors, and takes into account maintenance and overhaul costs.

- *10-year Return on Investment (ROI) calculation.* Return on Investment calculation is based on 10 years of facility operation, on a pre-tax income basis.

- *20-year Internal Rate of Return (IRR) calculation.* Internal Rate of Return calculation is based on a 20-year run of the financial model (10 years of the base model plus 10 years of additional end-of-year cash flow).

- *Project Operating and Maintenance.* Maintenance and materials expenditures for each project scenario is assumed to be 1.5% of the equipment capital costs, annually.

7.3 PRO FORMA FINANCIAL MODELING AND PROJECTED RETURNS

Tetra Tech conducted the financial analysis to determine if a biomass energy plant is economically feasible for the city of Kotzebue to pursue, and to identify key project parameters that most affect the viability of the project. The Tetra Tech Life Cycle Cost Model produces ten-year operating forecasts for the projects including a balance sheet, income statement, and cash flow statement. Complete 11-year pro forma (one year of construction and ten years of operation) for the scenario is included in the appendixes. The Life Cycle Cost Model also produces 20-year project return calculations. The impacts of critical project variables have been determined and the viability of the projects with regard to each has been evaluated.

As before, the financial pro forma analysis considered for two project scenarios; Scenario 1 is a 1.5 MM Btu RDF boiler system, Scenario 2 is a 1.5 MM Btu MSW gasifier system.

7.3.1 PROJECT FINANCIAL ANALYSIS RESULTS

Based on the inputs included in the financial model, both the RDF boiler and the MSW gasifier are positive financial ventures. The RDF boiler produces a slim annual average net income of nearly $40,000, and project lifespan Internal Rate of Return (IRR) of 1.8%. The MSW gasifier produces an annual average income of nearly $213,000, and a lifespan IRR of 4.7%. Table 7-2 displays the summary financial metrics of each scenario.

Table 7-2: Summary Financial Metrics

City of Kotzebue 112C04294 Financial Projections Summary	Scenario 1: RDF Boiler	Scenario 2: MSW Gasifier
10-year Average Annual ROI	2.6%	4.8%
20-year Internal Rate of Return (IRR)	1.8%	4.7%
Simple Payback in Years	17.66	11.93
Average Annual Income	$39,749	$212,916
Total Project Investment	**$2,053,100**	**$4,930,100**

However, average income and IRR do not tell the full story. Both facilities produce positive EBITDA (earnings before interest, taxes, depreciation, and amortization), the cash flow from operations for a tax-exempt entity. Thus, on an ongoing operations basis, the facilities are self-sustaining, saving more in fuel costs (approximately $150,000 and $500,000 annually, for Scenarios 1 and 2, respectively) than their operational costs, maintenance, and employee pay (totaling approximately $55,000 and $230,000, each). Scenario 1 only produces enough cash flow to support a single employee, however, and required the $500,000 grant funding to reduce the cost of capital equipment repayment.

Table 7-3 shows a summary pro forma Income Statement for the two baseline production scenarios. The summaries display projected financial metrics in Year 2 of facility operation, assumed to be the first year of stable facility operations.

Table 7-3: Results of Baseline Scenario Financial Analysis

City of Kotzebue 112C04294 Pro forma Income Statement for Year 2	Scenario 1: RDF Boiler	Scenario 2: MSW Gasifier
Net Revenue	**$/Year**	**$/Year**
Avoided Disposal Cost	$29,905	$152,159
Heat	$154,715	$493,136
Power	$0	$0
Total Revenue	**$184,620**	**$645,295**
Production & Operating Expenses		
Feedstocks	$12,300	$0
Electricity	$221	$1,078
Total Production Costs	**$12,521**	**$1,078**
Gross Profit	**$172,099**	**$644,217**
Env. Commodities / Incentives	$0	$0
Administrative & Operating Expenses		
Maintenance Materials & Services	$5,329	$39,341
Salaries, Wages & Benefits	$50,490	$191,760
Total Administrative & Operating Expenses	**$55,819**	**$231,101**
EBITDA	**$116,281**	**$413,115**
Less:		
Interest - Senior Debt	$24,859	$71,632
Depreciation & Amortization	$65,085	$168,113
Current Income Taxes	$0	$0
Year 2 Net Earnings	**$26,337**	**$173,370**
10-Year Average Annual Income	**$39,749**	**$212,916**
10-Year Average Annual ROI	**2.6%**	**4.8%**
20-Year Internal Rate of Return (IRR)	**1.8%**	**4.7%**

Appendices A and B display complete financial pro formas for the scenarios.

7.3.2 OPTIONS TO IMPROVE CASH FLOW

While both project scenarios achieve positive cash flow and are on the plus side of all major financial metrics, they have medium-term payback periods near to the lifespan expectancy of the equipment, and are closer to break-even than many banks and private investors would prefer. Key project variables can be improved from the conservative feasibility study assumptions to improve the financial outlook. Below are listed some of those critical variables and the effect changing these variables.

- *Option 1: Increase RDF collection Rate to 60%.* Increasing the sorting and capture rate of RDF feedstock to 60% of the available material, from the estimated 50%, provides a substantial increase in energy produced, fuel oil gallons displaced, and as a result, projected financial performance. With this increased product capture, throughput increases by over 60 tons/year to 383.25 tons/year.

  If this capture rate is achieved, net income of the RDF boiler scenario more than doubles, to nearly $60,000, and IRR increases to 6.1%. This is an achievable goal that can have a significant impact on the project.

- *Option 2: Reduce CapEx.* Project equity and debt requirements can be eased through grant assistance, primarily, or also secondarily by combining capital improvement projects. For instance, paralleling the design and project management of the biomass energy plant with the proposed redesign of the WTP, and incorporating the biomass plant within the WTP building envelope, can substantially reduce construction costs as well as project 'soft costs', the oversight and management costs of a project.

  Incorporating the RDF boiler scenario into the WTP reduces capital expenditure by approximately $700,000, and improves average annual income by $30,000 per year. IRR rises to investment-grade 9.7% solely through the improvement in capital expenditure.

- *Option 3: Loan Assistance.* Low-interest or zero-interest capital improvement loans can help to improve cash flow by reducing the debt interest payment required. If the RDF boiler scenario is capitalized through a zero-interest loan, it improves ROI and IRR to 4.0% each, and annual net income by $22,000. The MSW gasifier scenario improves as well, to 5.6% IRR and plus $81,000 in net income.

8 CONCLUSIONS AND RECOMMENDATIONS

Based on the information available at this time and the analysis conducted in this study, Tetra Tech recommends that the city of Kotzebue proceed with further development of a biomass energy plant in Kotzebue. The project, built at either project scale, appears to be a technically and financially sound decision for a public entity to undertake. Benefits to the community include jobs and economic development, as well as renewable and self-reliant energy generation, reduced waste disposal in the local landfill, and reduced imports of fuel oil burned for heat.

Evaluated options for the proposed biomass facility include two configurations (Scenario 1RDF boiler and Scenario 2 MSW gasifier), at several project locations (on the Public Works campus, at the Hillside site, or near KEA's electricity generation plant), and providing thermal energy for several potential users (Public Works campus building heat, supplemental Add-Heat, and/or Add-Heat preheating for a redesigned Water Treatment Plant).

The optimal project scale and configuration remains indeterminate at this time, and is based on a number of factors outside of the scope of this study. Several configurations of the biomass energy plant are contingent on the redevelopment of the WTP, which has been proposed but not yet finalized. Whether the new WTP is built near its current location on the Public Works campus or on the Hillside area closer to the city water source at Vortak Lake helps to determine both the scale and the location of the biomass energy plant.

Tetra Tech also recommends laboratory analysis of representative samples of Kotzebue's waste stream. The scope of the study only allowed for empirical review of available information and estimation of Kotzebue's waste composition. Collection of sample combustible material product will determine the actual energy content of the material, as well as contaminants and other values. Sampling can also help to indicate expected product capture rate of RDF. Laboratory characterization of the feedstock source should be combined with test-burns in the selected conversion technology to solidify burn characteristics, emission profile, and required equipment for combustion (pre-processing, ash handling, etc).

In conclusion, what can be determined from this study is that a significant amount of Kotzebue's trash is being unnecessarily landfilled, and a significant amount of fuel oil could be displaced, with the development of a biomass energy plant. Total energy production of the RDF Boiler scenario would displace over 30,000 gallons of fuel oil each year, and could keep over 300 tons of waste out of the local landfill annually. Reduction of waste is a primary driver for the project, not to be forgotten with the benefits of energy production. A model program that this can be based on is Sitka, a town roughly twice the size of Kotzebue but with a similar opportunity to reduce landfilled waste. Sitka's voluntary recycling program diverts over 1.4 million pounds of material from landfills each year. A biomass energy plant combined with a recycling program would make Kotzebue a model community in its own right.

APPENDIX A – LIFE CYCLE COST MODEL PROFORMA

RDF Boiler Scenario Financial Projection

City of Kotzebue - RDF Boiler
Financial Assumptions

Nameplate Plant Scale	1.5 MM Btu
Operating Days Per Year	350

USE OF FUNDS:	
Project Engineering & Construction Costs	
EPC Contract	$350,000
Delivery and Installation	$624,000
Rail	$0
Barge Unloading	$0
Additional Feedstock Storage	$0
Contingency	$373,000
Total Engineering and Construction Cost	$1,347,000
Development and Start-up Costs	
Inventory - Feedstock	$0
Inventory - Chemicals	$0
Inventory - Spare Parts	$0
Start-up Costs	$100
Land	$0
Site Development	$218,000
Building & Office Equipment	$388,000
Insurance & Performance Bond	$0
Rolling Stock & Shop Equipment	$0
Organizational Costs & Permits	$100,000
Capitalized Interest & Financing Costs	$0
Working Capital/Risk Management	$0
Total Development Costs	$706,100
TOTAL USES	**$2,053,100**

SOURCE OF FUNDS:			
Senior Debt			
Principal	$1,026,550		50.00%
Interest Rate	2.50%	fixed	
Lender and Misc. Fees	$0		0.000%
Placement Fees	$0		0.000%
Amortization Period	30	years	
Cash Sweep	0.000%		
Subordinate Debt			
Principal	$0		0.00%
Interest Rate	0.00%		interest only
Lender Fees	$0		0.000%
Placement Fees	$0		0.000%
Amortization Period	10	years	
Equity Investment			
Total Equity Amount	$526,550		25.65%
Placement Fees	$0		0.000%
Common Equity	$526,550		100.000%
Preferred Equity	$0		0.000%
Grants			
Amount	$500,000		24.35%
TOTAL SOURCES	**$2,053,100**		

Investment Activities	
Income Tax Rate	0.00%
Investment Interest	0.00%
Operating Line Interest	0.00%
State Producer Payment	
Producer payment	$0
Env. Commodity $/kWh	$0.000
Incentive duration, years	0

Other Incentive Payments		Expires
Small Producer Tax Credit	0	n/a
ITC / PTC Tax Credit	$0.00	n/a

Plant Operating Rate

Month	% Nameplate
13	50.0%
14	50.0%
15	100.0%
16	100.0%
17	100.0%
18	100.0%
19	100.0%
20	100.0%
21	100.0%
22	100.0%
23	100.0%
24	100.0%

Accounts Payable, Receivable & Inventories	Receivable (# Days)	Payable (# Days)	Inventories (# Days)
Finished Products	14		0
Chemicals		0	0
Feedstock		10	30
Utilities		15	

City of Kotzebue - RDF Boiler

Production Assumptions

	1st Year Operations	2nd Year Operations	3rd Year Operations	4th Year Operations	5th Year Operations	6th Year Operations	7th Year Operations	8th Year Operations	9th Year Operations	10th Year Operations	Annual Escalation
Year:	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Feedstock Inputs											
MSW Input (raw ton/year)	293	319	319	319	319	319	319	319	319	319	
Secpondary Feedstock Input (tons/yr)	0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	
Feedstock Moisture Content (%)	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	
Blended Feedstock LHV (btu/lb)	6,580	6,580	6,580	6,580	6,580	6,580	6,580	6,580	6,580	6,580	
Total Feedstock Usage (ton/yr)	293	360	360	360	360	360	360	360	360	360	
Feedstock Price / Tipping Fee ($/ton)	$0.00	$34.13	$34.81	$35.51	$36.22	$36.94	$37.68	$38.44	$39.21	$39.99	2.00%
Production Outputs											
Avoided Disposal Cost											
Avoided disposal Yield (tons/ton waste)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Avoided Waste total (ton/year)	263	287	287	287	287	287	287	287	287	287	
Cost of Disposal ($/ton)	102.00	104.04	106.12	108.24	110.41	112.62	114.87	117.17	119.51	121.90	2.00%
Heat & Power											
Co-generation Efficiency (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Heat Recovery (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Total Raw Feedstock Energy Content (MMBTU/yr)	3,852	4,742	4,742	4,742	4,742	4,742	4,742	4,742	4,742	4,742	
Electricity Production (kWh/yr)	0	0	0	0	0	0	0	0	0	0	
Electricity Available for Sale (kWh/yr)	0	0	0	0	0	0	0	0	0	0	
Electricity Sale Price ($/kWh)	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	2.00%
Thermal Energy Production (MM Btu/yr)	3,071	3,351	3,351	3,351	3,351	3,351	3,351	3,351	3,351	3,351	
Thermal Energy Available for Sale (MM Btu/yr)	3,071	3,351	3,351	3,351	3,351	3,351	3,351	3,351	3,351	3,351	
Thermal Energy Sale Price ($/MM Btu)	$45.0500	$46.1763	$47.3307	$48.5139	$49.7268	$50.9699	$52.2442	$53.5503	$54.8891	$56.2613	2.50%
Utility Usage											
Thermal Energy Required (BTU/raw ton feedstock)	0	0	0	0	0	0	0	0	0	0	
Thermal Energy Generated (BTU/raw ton)	0	0	0	0	0	0	0	0	0	0	
Makeup Energy Needed (BTU/raw ton)	0	0	0	0	0	0	0	0	0	0	
Thermal Energy Price ($/MMBTU)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Annual Thermal Energy Use (MMBTU/yr)	0	0	0	0	0	0	0	0	0	0	
Electricity Required (kWh/raw ton feedstock)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
Electricity Generated (kWh/raw ton)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Makeup Electricity Needed (kWh/raw ton)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
Electricity Price ($/kWh)	0.2400	0.2448	0.2497	0.2547	0.2598	0.2650	0.2703	0.2757	0.2812	0.2868	2.00%
Annual Electricity Use (kWh/year)	732	901	901	901	901	901	901	901	901	901	
Electricity Demand (MW)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Number of Employees	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Average Salary	$49,500	$50,490	$51,500	$52,530	$53,580	$54,652	$55,745	$56,860	$57,997	$59,157	2.00%
Maintenance Materials & Services (% of Capital Equip	1.500%	1.523%	1.545%	1.569%	1.592%	1.616%	1.640%	1.665%	1.690%	1.715%	1.50%
Property Tax & Insurance (% of Depreciated Property,	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	3.00%
Inflation for all other Administrative Expense Categories											2.00%

City of Kotzebue - RDF Boiler
Proforma Balance Sheet

	Construction (Year 0)	1st Year Operations	2nd Year Operations	3rd Year Operations	4th Year Operations	5th Year Operations	6th Year Operations	7th Year Operations	8th Year Operations	9th Year Operations	10th Year Operations
ASSETS	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Current Assets:											
Cash & Cash Equivalents	0	69,014	135,650	206,276	280,110	357,236	437,739	521,710	609,239	700,420	795,348
Inventories											
Feedstock	0	0	1,054	1,075	1,097	1,119	1,141	1,164	1,187	1,211	1,235
Finished Product Inventory	0	0	0	0	0	0	0	0	0	0	0
Spare Parts	0	0	0	0	0	0	0	0	0	0	0
Total Inventories	0	0	1,054	1,075	1,097	1,119	1,141	1,164	1,187	1,211	1,235
Prepaid Expenses	0	0	0	0	0	0	0	0	0	0	0
Other Current Assets	0	0	0	0	0	0	0	0	0	0	0
Total Current Assets	0	70,048	137,900	208,572	282,452	359,624	440,175	524,195	611,774	703,005	797,985
Land	0	0	0	0	0	0	0	0	0	0	0
Property, Plant & Equipment											
Property, Plant & Equipment, at cost	1,757,700	1,953,000	1,953,000	1,953,000	1,953,000	1,953,000	1,953,000	1,953,000	1,953,000	1,953,000	1,953,000
Less Accumulated Depreciation & Amortization	0	65,085	128,713	192,341	255,970	319,598	383,226	446,854	510,482	574,110	637,738
Net Property, Plant & Equipment	1,757,700	1,887,915	1,824,287	1,760,659	1,697,030	1,633,402	1,569,774	1,506,146	1,442,518	1,378,890	1,315,262
Capitalized Fees & Interest	9,439	14,569	13,112	11,655	10,199	8,742	7,285	5,828	4,371	2,914	1,457
Total Assets	1,767,139	1,972,532	1,975,299	1,980,886	1,989,681	2,001,768	2,017,234	2,036,169	2,058,662	2,084,809	2,114,704
LIABILITIES & EQUITIES											
Current Liabilities:											
Accounts Payable	0	8	321	327	334	341	347	354	361	369	376
Notes Payable	0	0	0	0	0	0	0	0	0	0	0
Current Maturities of Senior Debt (incl. sweeps)	0	23,883	24,485	25,103	25,737	26,386	27,052	27,735	28,435	29,152	0
Current Maturities of Working Capital	0	0	0	0	0	0	0	0	0	0	0
Total Current Liabilities	0	23,891	24,806	25,431	26,071	26,727	27,399	28,089	28,796	29,521	376
Senior Debt (excluding current maturities)	815,589	979,372	954,887	929,784	904,047	877,661	850,609	822,874	794,439	765,287	765,287
Working Capital (excluding current maturities)	0	0	0	0	0	0	0	0	0	0	0
Deferred Income Taxes	0	0	0	0	0	0	0	0	0	0	0
Total Liabilities	815,589	1,003,263	979,693	955,214	930,118	904,388	878,008	850,963	823,235	794,808	765,663
Capital Units & Equities											
Common Equity	526,550	526,550	526,550	526,550	526,550	526,550	526,550	526,550	526,550	526,550	526,550
Preferred Equity	0	0	0	0	0	0	0	0	0	0	0
Grants	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Distribution to Shareholders	0	0	0	0	0	0	0	0	0	0	0
Retained Earnings	(75,000)	(57,281)	(30,944)	(879)	33,013	70,830	112,676	158,656	208,877	263,451	322,490
Total Capital Shares & Equities	951,550	969,269	995,606	1,025,671	1,059,563	1,097,380	1,139,226	1,185,206	1,235,427	1,290,001	1,349,040
Total Liabilities & Equities	1,767,139	1,972,532	1,975,299	1,980,886	1,989,681	2,001,768	2,017,234	2,036,169	2,058,662	2,084,809	2,114,704

City of Kotzebue - RDF Boiler
Proforma Income Statement

	Construction (Year 0)	1st Year Operations	2nd Year Operations	3rd Year Operations	4th Year Operations	5th Year Operations	6th Year Operations	7th Year Operations	8th Year Operations	9th Year Operations	10th Year Operations
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Revenue											
Avoided Disposal Cost	0	24,376	29,905	30,503	31,113	31,735	32,370	33,018	33,678	34,351	35,038
Heat	0	138,363	154,715	158,583	162,547	166,611	170,776	175,046	179,422	183,907	188,505
Power	0	0	0	0	0	0	0	0	0	0	0
Environmental Commodities / Incentives	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	0	162,739	184,620	189,086	193,661	198,346	203,146	208,063	213,100	218,259	223,544
Production & Operating Expenses											
Feedstocks	0	0	12,300	12,546	12,797	13,053	13,314	13,580	13,852	14,129	14,411
Chemicals	0	0	0	0	0	0	0	0	0	0	0
Natural Gas	0	0	0	0	0	0	0	0	0	0	0
Electricity	0	176	221	225	229	234	239	244	248	253	258
Makeup Water	0	0	0	0	0	0	0	0	0	0	0
Wastewater Disposal	0	0	0	0	0	0	0	0	0	0	0
Direct Labor & Benefits	0	0	0	0	0	0	0	0	0	0	0
Total Production Costs	0	176	12,521	12,771	13,026	13,287	13,553	13,824	14,100	14,382	14,670
Gross Profit	0	162,563	172,099	176,315	180,634	185,060	189,594	194,240	199,000	203,877	208,874
Administrative & Operating Expenses											
Maintenance Materials & Services	0	4,813	5,329	5,409	5,490	5,572	5,656	5,741	5,827	5,914	6,003
Repairs & Maintenance - Wages & Benefits	0	0	0	0	0	0	0	0	0	0	0
Consulting, Management and Bank Fees	0	0	0	0	0	0	0	0	0	0	0
Property Taxes & Insurance	0	0	0	0	0	0	0	0	0	0	0
Salaries, Wages & Benefits	0	49,500	50,490	51,500	52,530	53,580	54,652	55,745	56,860	57,997	59,157
Engineering and Organizational Costs	75,000	0	0	0	0	0	0	0	0	0	0
Office/Lab Supplies & Expenses	0	0	0	0	0	0	0	0	0	0	0
Travel, Training & Miscellaneous	0	0	0	0	0	0	0	0	0	0	0
Total Administrative & Operating Expenses	75,000	54,313	55,819	56,908	58,020	59,153	60,308	61,486	62,687	63,911	65,160
EBITDA	(75,000)	108,251	116,281	119,406	122,615	125,907	129,286	132,754	136,313	139,965	143,714
Less:											
Interest - Operating Line of Credit	0	0	0	0	0	0	0	0	0	0	0
Interest - Senior Debt	0	25,446	24,859	24,256	23,638	23,005	22,355	21,689	21,007	20,307	19,589
Interest - Working Capital	0	0	0	0	0	0	0	0	0	0	0
Depreciation & Amortization	0	65,085	65,085	65,085	65,085	65,085	65,085	65,085	65,085	65,085	65,085
Pre-Tax Income	(75,000)	17,719	26,337	30,065	33,891	37,817	41,846	45,980	50,221	54,574	59,040
Current Income Taxes	0	0	0	0	0	0	0	0	0	0	0
Net Earnings (Loss) for the Year	(75,000)	17,719	26,337	30,065	33,891	37,817	41,846	45,980	50,221	54,574	59,040
Pre-Tax Return on Investment	-4.8%	1.1%	1.7%	1.9%	2.2%	2.4%	2.7%	3.0%	3.2%	3.5%	3.8%
10-Year Average Annual Pre-Tax ROI	2.6%										

City of Kotzebue - RDF Boiler
Proforma Statements of Cash Flows

Cash provided by (used in)	Construction (Year 0) 2014	1st Year Operations 2015	2nd Year Operations 2016	3rd Year Operations 2017	4th Year Operations 2018	5th Year Operations 2019	6th Year Operations 2020	7th Year Operations 2021	8th Year Operations 2022	9th Year Operations 2023	10th Year Operations 2024
Operating Activities											
Net Earnings (loss)	(75,000)	17,719	26,337	30,065	33,891	37,817	41,846	45,980	50,221	54,574	59,040
Non cash charges to operations											
Depreciation & Amortization	0	65,085	65,085	65,085	65,085	65,085	65,085	65,085	65,085	65,085	65,085
Total cash provided by (used in)	(75,000)	82,804	91,422	95,150	98,976	102,902	106,931	111,065	115,306	119,659	124,125
Changes in non-cash working capital balances											
Accounts Receivable	0	1,034	162	24	24	25	25	26	26	27	27
Inventories	0	0	1,054	21	22	22	22	23	23	24	24
Prepaid Expenses	0	0	0	0	0	0	0	0	0	0	0
Accounts Payable	0	(8)	(313)	(6)	(7)	(7)	(7)	(7)	(7)	(7)	(7)
Total changes in capital balances	0	1,026	903	39	39	40	41	42	43	43	44
Investing Activities											
Land Purchase	0	0	0	0	0	0	0	0	0	0	0
Fixed Asset Purchases	1,757,700	195,300	0	0	0	0	0	0	0	0	0
Capitalized Fees & Interest	9,439	5,130	0	0	0	0	0	0	0	0	0
Total Investing activities	1,767,139	200,430	0	0	0	0	0	0	0	0	0
Financing Activities											
Senior Debt Advances	815,589	210,961	0	0	0	0	0	0	0	0	0
Repayment of Senior Debt	0	(23,295)	(23,883)	(24,485)	(25,103)	(25,737)	(26,386)	(27,052)	(27,735)	(28,435)	(29,152)
Working Capital Advances	0	0	0	0	0	0	0	0	0	0	0
Repayment of Subordinate Debt	0	0	0	0	0	0	0	0	0	0	0
Equity Investment	526,550	0	0	0	0	0	0	0	0	0	0
Grants	500,000	0	0	0	0	0	0	0	0	0	0
Cash Sweep for Debt Service	0	0	0	0	0	0	0	0	0	0	0
Distributions to Shareholders	0	0	0	0	0	0	0	0	0	0	0
Net Increase (Decrease) in Cash	0	69,014	66,636	70,627	73,834	77,126	80,504	83,971	87,529	91,181	94,928
Cash (Indebtedness), Beginning of Year	0	0	69,014	135,650	206,276	280,110	357,236	437,739	521,710	609,239	700,420
Cash (Bank Indebtedness), End of Year	0	69,014	135,650	206,276	280,110	357,236	437,739	521,710	609,239	700,420	795,348
20-Year IRR	1.8%										

City of Kotzebue - RDF Boiler

Debt Coverage Ratio

	1st Year Operations	2nd Year Operations	3rd Year Operations	4th Year Operations	5th Year Operations	6th Year Operations	7th Year Operations	8th Year Operations	9th Year Operations	10th Year Operations
EBITDA	108,251	116,281	119,406	122,615	125,907	129,286	132,754	136,313	139,965	143,714
Taxes Paid	0	0	0	0	0	0	0	0	0	0
Distributions to Shareholders	0	0	0	0	0	0	0	0	0	0
Changes in non-cash working capital balances	(1,026)	(903)	(39)	(39)	(40)	(41)	(42)	(43)	(43)	(44)
Investing Activities (Capital Expenditures)	(200,430)	0	0	0	0	0	0	0	0	0
Senior Debt Advances	210,961	0	0	0	0	0	0	0	0	0
Working Capital Advances	0	0	0	0	0	0	0	0	0	0
Cash Available for Debt Service	117,755	115,377	119,368	122,575	125,867	129,245	132,712	136,270	139,922	143,670
Senior Debt P&I Payment	48,741	48,741	48,741	48,741	48,741	48,741	48,741	48,741	48,741	48,741
Suboridinate Debt P&I Payment	0	0	0	0	0	0	0	0	0	0
Debt Coverage Ratio (senior + subdebt)	2.42	2.37	2.45	2.51	2.58	2.65	2.72	2.80	2.87	2.95

10-year Average Debt Coverage Ratio **2.63**

Note: the '1st Year Operations' consists of 0 months of construction and startup, plus 12 months of commercial operation

Depreciation Schedules

	Depreciation Method (note1)	1st Year Operations	2nd Year Operations	3rd Year Operations	4th Year Operations	5th Year Operations	6th Year Operations	7th Year Operations	8th Year Operations	9th Year Operations	10th Year Operations
Major Process equipment	20 year SLN	37,247	37,247	37,247	37,247	37,247	37,247	37,247	37,247	37,247	37,247
Minor Process Equipment	20 year SLN	18,780	18,780	18,780	18,780	18,780	18,780	18,780	18,780	18,780	18,780
Aux.	30 year SLN	0	0	0	0	0	0	0	0	0	0
Vehicles	10 year SLN	0	0	0	0	0	0	0	0	0	0
Building	30 year SLN	9,053	9,053	9,053	9,053	9,053	9,053	9,053	9,053	9,053	9,053
Office equipment	5 year SLN	0	0	0	0	0	0	0	0	0	0
Start-up cost	20 year SLN	5	5	5	5	5	5	5	5	5	5
Annual capital expenditures (starting in year 2)	10 year SLN	0	0	0	0	0	0	0	0	0	0
Total Depreciation		65,085	65,085	65,085	65,085	65,085	65,085	65,085	65,085	65,085	65,085

Note 1: Depreciation Method = DDB (Double Declining Balance) or SLN (Straight Line)

APPENDIX B – LIFE CYCLE COST MODEL PROFORMA

MSW Gaifier Scenario Financial Projection

City of Kotzebue - MSW Gasifier
Financial Assumptions

Nameplate Plant Scale	1.5 MM Btu
Operating Days Per Year	350

USE OF FUNDS:	
Project Engineering & Construction Costs	
EPC Contract	$2,584,000
Delivery and Installation	$624,000
Rail	$0
Barge Unloading	$0
Additional Feedstock Storage	$0
Contingency	$822,000
Total Engineering and Construction Cost	$4,030,000
Development and Start-up Costs	
Inventory - Feedstock	$0
Inventory - Chemicals	$0
Inventory - Spare Parts	$0
Start-up Costs	$100
Land	$0
Site Development	$437,000
Building & Office Equipment	$351,000
Insurance & Performance Bond	$0
Rolling Stock & Shop Equipment	$0
Organizational Costs & Permits	$112,000
Capitalized Interest & Financing Costs	$0
Working Capital/Risk Management	$0
Total Development Costs	$900,100
TOTAL USES	**$4,930,100**

SOURCE OF FUNDS:			
Senior Debt			
Principal	$3,697,575		75.00%
Interest Rate	2.50%	fixed	
Lender and Misc. Fees	$0		0.000%
Placement Fees	$0		0.000%
Amortization Period	30	years	
Cash Sweep	0.000%		
Subordinate Debt			
Principal	$0		0.00%
Interest Rate	0.00%		interest only
Lender Fees	$0		0.000%
Placement Fees	$0		0.000%
Amortization Period	10	years	
Equity Investment			
Total Equity Amount	$732,525		14.86%
Placement Fees	$0		0.000%
Common Equity	$732,525		100.000%
Preferred Equity	$0		0.000%
Grants			
Amount	$500,000		10.14%
TOTAL SOURCES	**$4,930,100**		

Investment Activities	
Income Tax Rate	0.00%
Investment Interest	0.00%
Operating Line Interest	0.00%
State Producer Payment	
Producer payment	$0
Env. Commodity $/kWh	$0.000
Incentive duration, years	0

Other Incentive Payments		Expires
Small Producer Tax Credit	0	n/a
ITC / PTC Tax Credit	$0.00	n/a

Plant Operating Rate

Month	% Nameplate
13	50.0%
14	50.0%
15	100.0%
16	100.0%
17	100.0%
18	100.0%
19	100.0%
20	100.0%
21	100.0%
22	100.0%
23	100.0%
24	100.0%

Accounts Payable, Receivable & Inventories	Receivable (# Days)	Payable (# Days)	Inventories (# Days)
Finished Products	14		0
Chemicals		15	0
Feedstock		10	30
Utilities		15	

City of Kotzebue - MSW Gasifier

Production Assumptions

	1st Year Operations	2nd Year Operations	3rd Year Operations	4th Year Operations	5th Year Operations	6th Year Operations	7th Year Operations	8th Year Operations	9th Year Operations	10th Year Operations	Annual Escalation
Year:	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Feedstock Inputs											
MSW Input (raw ton/year)	1,490	1,625	1,625	1,625	1,625	1,625	1,625	1,625	1,625	1,625	
Secpondary Feedstock Input (tons/yr)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Feedstock Moisture Content (%)	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	
Blended Feedstock LHV (btu/lb)	4,912	4,912	4,912	4,912	4,912	4,912	4,912	4,912	4,912	4,912	
Total Feedstock Usage (ton/yr)	1,490	1,625	1,625	1,625	1,625	1,625	1,625	1,625	1,625	1,625	
Feedstock Price / Tipping Fee ($/ton)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	2.00%
Production Outputs											
Avoided Disposal Cost											
Avoided disposal Yield (tons/ton waste)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Avoided Waste total (ton/year)	1,341	1,463	1,463	1,463	1,463	1,463	1,463	1,463	1,463	1,463	
Cost of Disposal ($/ton)	102.00	104.04	106.12	108.24	110.41	112.62	114.87	117.17	119.51	121.90	2.00%
Heat & Power											
Co-generation Efficiency (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Heat Recovery (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Total Raw Feedstock Energy Content (MMBTU/yr)	14,634	15,964	15,964	15,964	15,964	15,964	15,964	15,964	15,964	15,964	
Electricity Production (kWh/yr)	0	0	0	0	0	0	0	0	0	0	
Electricity Available for Sale (kWh/yr)	0	0	0	0	0	0	0	0	0	0	
Electricity Sale Price ($/kWh)	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	2.00%
Thermal Energy Production (MM Btu/yr)	11,188	12,205	12,205	12,205	12,205	12,205	12,205	12,205	12,205	12,205	
Thermal Energy Available for Sale (MM Btu/yr)	11,188	12,205	12,205	12,205	12,205	12,205	12,205	12,205	12,205	12,205	
Thermal Energy Sale Price ($/MM Btu)	$39.4200	$40.4055	$41.4156	$42.4510	$43.5123	$44.6001	$45.7151	$46.8580	$48.0294	$49.2302	2.50%
Utility Usage											
Thermal Energy Required (BTU/raw ton feedstock)	3	3	3	3	3	3	3	3	3	3	
Thermal Energy Generated (BTU/raw ton)	0	0	0	0	0	0	0	0	0	0	
Makeup Energy Needed (BTU/raw ton)	3	3	3	3	3	3	3	3	3	3	
Thermal Energy Price ($/MMBTU)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Annual Thermal Energy Use (MMBTU/yr)	0	0	0	0	0	0	0	0	0	0	
Electricity Required (kWh/raw ton feedstock)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	
Electricity Generated (kWh/raw ton)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Makeup Electricity Needed (kWh/raw ton)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	
Electricity Price ($/kWh)	0.2400	0.2448	0.2497	0.2547	0.2598	0.2650	0.2703	0.2757	0.2812	0.2868	2.00%
Annual Electricity Use (kWh/year)	4,037	4,404	4,404	4,404	4,404	4,404	4,404	4,404	4,404	4,404	
Electricity Demand (MW)	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	
Number of Employees	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
Average Salary	$47,000	$47,940	$48,899	$49,877	$50,874	$51,892	$52,930	$53,988	$55,068	$56,169	2.00%
Maintenance Materials & Services (% of Capital Equip	1.500%	1.523%	1.545%	1.569%	1.592%	1.616%	1.640%	1.665%	1.690%	1.715%	1.50%
Property Tax & Insurance (% of Depreciated Property,	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	3.00%
Inflation for all other Administrative Expense Categories											2.00%

City of Kotzebue - MSW Gasifier
Proforma Balance Sheet

	Construction (Year 0)	1st Year Operations	2nd Year Operations	3rd Year Operations	4th Year Operations	5th Year Operations	6th Year Operations	7th Year Operations	8th Year Operations	9th Year Operations	10th Year Operations
ASSETS	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Current Assets:											
Cash & Cash Equivalents	0	123,658	359,766	608,122	867,683	1,138,739	1,421,589	1,716,538	2,023,899	2,343,992	2,677,148
Inventories											
Feedstock	0	0	0	0	0	0	0	0	0	0	0
Finished Product Inventory	0	0	0	0	0	0	0	0	0	0	0
Spare Parts	0	0	0	0	0	0	0	0	0	0	0
Total Inventories	0	0	0	0	0	0	0	0	0	0	0
Prepaid Expenses	0	0	0	0	0	0	0	0	0	0	0
Other Current Assets	0	0	0	0	0	0	0	0	0	0	0
Total Current Assets	0	128,299	365,852	614,330	874,015	1,145,198	1,428,177	1,723,258	2,030,753	2,350,983	2,684,279
Land	0	0	0	0	0	0	0	0	0	0	0
Property, Plant & Equipment											
Property, Plant & Equipment, at cost	4,336,200	4,818,000	4,818,000	4,818,000	4,818,000	4,818,000	4,818,000	4,818,000	4,818,000	4,818,000	4,818,000
Less Accumulated Depreciation & Amortization	0	168,113	332,616	497,118	661,620	826,122	990,625	1,155,127	1,319,629	1,484,131	1,648,634
Net Property, Plant & Equipment	4,336,200	4,649,887	4,485,384	4,320,882	4,156,380	3,991,878	3,827,375	3,662,873	3,498,371	3,333,869	3,169,366
Capitalized Fees & Interest	23,358	36,111	32,500	28,889	25,278	21,667	18,055	14,444	10,833	7,222	3,611
Total Assets	4,359,558	4,814,296	4,883,737	4,964,101	5,055,672	5,158,742	5,273,608	5,400,575	5,539,957	5,692,074	5,857,256
LIABILITIES & EQUITIES											
Current Liabilities:											
Accounts Payable	0	44	46	47	48	49	50	51	52	53	54
Notes Payable	0	0	0	0	0	0	0	0	0	0	0
Current Maturities of Senior Debt (incl. sweeps)	0	86,024	88,195	90,421	92,702	95,042	97,440	99,899	102,420	105,005	0
Current Maturities of Working Capital	0	0	0	0	0	0	0	0	0	0	0
Total Current Liabilities	0	86,068	88,241	90,468	92,750	95,091	97,490	99,950	102,472	105,058	54
Senior Debt (excluding current maturities)	3,225,116	3,527,644	3,439,449	3,349,029	3,256,327	3,161,285	3,063,845	2,963,946	2,861,526	2,756,521	2,756,521
Working Capital (excluding current maturities)	0	0	0	0	0	0	0	0	0	0	0
Deferred Income Taxes	0	0	0	0	0	0	0	0	0	0	0
Total Liabilities	3,225,116	3,613,712	3,527,691	3,439,497	3,349,077	3,256,376	3,161,335	3,063,896	2,963,998	2,861,579	2,756,575
Capital Units & Equities											
Common Equity	732,525	732,525	732,525	732,525	732,525	732,525	732,525	732,525	732,525	732,525	732,525
Preferred Equity	0	0	0	0	0	0	0	0	0	0	0
Grants	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Distribution to Shareholders	0	0	0	0	0	0	0	0	0	0	0
Retained Earnings	(98,083)	(31,941)	123,521	292,079	474,071	669,842	879,748	1,104,155	1,343,434	1,597,970	1,868,156
Total Capital Shares & Equities	1,134,442	1,200,584	1,356,046	1,524,604	1,706,596	1,902,367	2,112,273	2,336,680	2,575,959	2,830,495	3,100,681
Total Liabilities & Equities	4,359,558	4,814,296	4,883,737	4,964,101	5,055,672	5,158,742	5,273,608	5,400,575	5,539,957	5,692,074	5,857,256

City of Kotzebue - MSW Gasifier
Proforma Income Statement

	Construction (Year 0)	1st Year Operations	2nd Year Operations	3rd Year Operations	4th Year Operations	5th Year Operations	6th Year Operations	7th Year Operations	8th Year Operations	9th Year Operations	10th Year Operations
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Revenue											
Avoided Disposal Cost	0	109,395	152,159	155,202	158,306	161,472	164,701	167,995	171,355	174,782	178,278
Heat	0	441,016	493,136	505,465	518,101	531,054	544,330	557,938	571,887	586,184	600,839
Power	0	0	0	0	0	0	0	0	0	0	0
Environmental Commodities / Incentives	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	0	550,411	645,295	660,666	676,407	692,526	709,031	725,934	743,242	760,966	779,116
Production & Operating Expenses											
Feedstocks	0	0	0	0	0	0	0	0	0	0	0
Chemicals	0	0	0	0	0	0	0	0	0	0	0
Natural Gas	0	0	0	0	0	0	0	0	0	0	0
Electricity	0	969	1,078	1,100	1,122	1,144	1,167	1,190	1,214	1,238	1,263
Makeup Water	0	0	0	0	0	0	0	0	0	0	0
Wastewater Disposal	0	0	0	0	0	0	0	0	0	0	0
Direct Labor & Benefits	0	0	0	0	0	0	0	0	0	0	0
Total Production Costs	0	969	1,078	1,100	1,122	1,144	1,167	1,190	1,214	1,238	1,263
Gross Profit	0	549,442	644,217	659,567	675,285	691,381	707,864	724,743	742,028	759,728	777,853
Administrative & Operating Expenses											
Maintenance Materials & Services	0	35,530	39,341	39,932	40,530	41,138	41,756	42,382	43,018	43,663	44,318
Repairs & Maintenance - Wages & Benefits	0	0	0	0	0	0	0	0	0	0	0
Consulting, Management and Bank Fees	0	0	0	0	0	0	0	0	0	0	0
Property Taxes & Insurance	0	0	0	0	0	0	0	0	0	0	0
Salaries, Wages & Benefits	23,083	188,000	191,760	195,595	199,507	203,497	207,567	211,719	215,953	220,272	224,677
Engineering and Organizational Costs	75,000	0	0	0	0	0	0	0	0	0	0
Office/Lab Supplies & Expenses	0	0	0	0	0	0	0	0	0	0	0
Travel, Training & Miscellaneous	0	0	0	0	0	0	0	0	0	0	0
Total Administrative & Operating Expenses	98,083	223,530	231,101	235,527	240,038	244,636	249,323	254,100	258,970	263,935	268,995
EBITDA	(98,083)	325,912	413,115	424,040	435,248	446,746	458,542	470,643	483,057	495,793	508,858
Less:											
Interest - Operating Line of Credit	0	0	0	0	0	0	0	0	0	0	0
Interest - Senior Debt	0	91,657	89,539	87,369	85,143	82,861	80,522	78,123	75,664	73,143	70,559
Interest - Working Capital	0	0	0	0	0	0	0	0	0	0	0
Depreciation & Amortization	0	168,113	168,113	168,113	168,113	168,113	168,113	168,113	168,113	168,113	168,113
Pre-Tax Income	(98,083)	66,142	155,462	168,558	181,991	195,771	209,907	224,406	239,280	254,536	270,186
Current Income Taxes	0	0	0	0	0	0	0	0	0	0	0
Net Earnings (Loss) for the Year	(98,083)	66,142	155,462	168,558	181,991	195,771	209,907	224,406	239,280	254,536	270,186
Pre-Tax Return on Investment	-2.2%	1.5%	3.5%	3.8%	4.1%	4.4%	4.7%	5.1%	5.4%	5.7%	6.1%
10-Year Average Annual Pre-Tax ROI	4.4%										

City of Kotzebue - MSW Gasifier
Proforma Statements of Cash Flows

Cash provided by (used in)	Construction (Year 0) 2014	1st Year Operations 2015	2nd Year Operations 2016	3rd Year Operations 2017	4th Year Operations 2018	5th Year Operations 2019	6th Year Operations 2020	7th Year Operations 2021	8th Year Operations 2022	9th Year Operations 2023	10th Year Operations 2024
Operating Activities											
Net Earnings (loss)	(98,083)	66,142	155,462	168,558	181,991	195,771	209,907	224,406	239,280	254,536	270,186
Non cash charges to operations											
Depreciation & Amortization	0	168,113	168,113	168,113	168,113	168,113	168,113	168,113	168,113	168,113	168,113
Total cash provided by (used in)	(98,083)	234,255	323,576	336,671	350,105	363,885	378,020	392,520	407,393	422,650	438,299
Changes in non-cash working capital balances											
Accounts Receivable	0	4,641	1,445	122	124	127	129	132	134	137	140
Inventories	0	0	0	0	0	0	0	0	0	0	0
Prepaid Expenses	0	0	0	0	0	0	0	0	0	0	0
Accounts Payable	0	(44)	(2)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Total changes in capital balances	0	4,597	1,443	121	123	126	128	131	133	136	139
Investing Activities											
Land Purchase	0	0	0	0	0	0	0	0	0	0	0
Fixed Asset Purchases	4,336,200	481,800	0	0	0	0	0	0	0	0	0
Capitalized Fees & Interest	23,358	12,753	0	0	0	0	0	0	0	0	0
Total Investing activities	4,359,558	494,553	0	0	0	0	0	0	0	0	0
Financing Activities											
Senior Debt Advances	3,225,116	472,459	0	0	0	0	0	0	0	0	0
Repayment of Senior Debt	0	(83,907)	(86,024)	(88,195)	(90,421)	(92,702)	(95,042)	(97,440)	(99,899)	(102,420)	(105,005)
Working Capital Advances	0	0	0	0	0	0	0	0	0	0	0
Repayment of Subordinate Debt	0	0	0	0	0	0	0	0	0	0	0
Equity Investment	732,525	0	0	0	0	0	0	0	0	0	0
Grants	500,000	0	0	0	0	0	0	0	0	0	0
Cash Sweep for Debt Service	0	0	0	0	0	0	0	0	0	0	0
Distributions to Shareholders	0	0	0	0	0	0	0	0	0	0	0
Net Increase (Decrease) in Cash	0	123,658	236,109	248,356	259,561	271,057	282,850	294,949	307,361	320,094	333,156
Cash (Indebtedness), Beginning of Year	0	0	123,658	359,766	608,122	867,683	1,138,739	1,421,589	1,716,538	2,023,899	2,343,992
Cash (Bank Indebtedness), End of Year	0	123,658	359,766	608,122	867,683	1,138,739	1,421,589	1,716,538	2,023,899	2,343,992	2,677,148
20-Year IRR	3.3%										

City of Kotzebue - MSW Gasifier

Debt Coverage Ratio

	1st Year Operations	2nd Year Operations	3rd Year Operations	4th Year Operations	5th Year Operations	6th Year Operations	7th Year Operations	8th Year Operations	9th Year Operations	10th Year Operations
EBITDA	325,912	413,115	424,040	435,248	446,746	458,542	470,643	483,057	495,793	508,858
Taxes Paid	0	0	0	0	0	0	0	0	0	0
Distributions to Shareholders	0	0	0	0	0	0	0	0	0	0
Changes in non-cash working capital balances	(4,597)	(1,443)	(121)	(123)	(126)	(128)	(131)	(133)	(136)	(139)
Investing Activities (Capital Expenditures)	(494,553)	0	0	0	0	0	0	0	0	0
Senior Debt Advances	472,459	0	0	0	0	0	0	0	0	0
Working Capital Advances	0	0	0	0	0	0	0	0	0	0
Cash Available for Debt Service	299,221	411,672	423,919	435,124	446,620	458,413	470,512	482,924	495,657	508,719
Senior Debt P&I Payment	175,563	175,563	175,563	175,563	175,563	175,563	175,563	175,563	175,563	175,563
Suboridinate Debt P&I Payment	0	0	0	0	0	0	0	0	0	0
Debt Coverage Ratio (senior + subdebt)	1.70	2.34	2.41	2.48	2.54	2.61	2.68	2.75	2.82	2.90
10-year Average Debt Coverage Ratio **2.52**										

Note: the '1st Year Operations' consists of 0 months of construction and startup, plus 12 months of commercial operation

Depreciation Schedules

	Depreciation Method (note1)	1st Year Operations	2nd Year Operations	3rd Year Operations	4th Year Operations	5th Year Operations	6th Year Operations	7th Year Operations	8th Year Operations	9th Year Operations	10th Year Operations
Major Process equipment	20 year SLN	106,315	106,315	106,315	106,315	106,315	106,315	106,315	106,315	106,315	106,315
Minor Process Equipment	20 year SLN	53,604	53,604	53,604	53,604	53,604	53,604	53,604	53,604	53,604	53,604
Aux.	30 year SLN	0	0	0	0	0	0	0	0	0	0
Vehicles	10 year SLN	0	0	0	0	0	0	0	0	0	0
Building	30 year SLN	8,190	8,190	8,190	8,190	8,190	8,190	8,190	8,190	8,190	8,190
Office equipment	5 year SLN	0	0	0	0	0	0	0	0	0	0
Start-up cost	20 year SLN	5	5	5	5	5	5	5	5	5	5
Annual capital expenditures (starting in year 2)	10 year SLN	0	0	0	0	0	0	0	0	0	0
Total Depreciation		168,113	168,113	168,113	168,113	168,113	168,113	168,113	168,113	168,113	168,113

Note 1: Depreciation Method = DDB (Double Declining Balance) or SLN (Straight Line)

City of Kotzebue
Biomass Energy Feasibility Study Report

SUBMITTED BY:

Tetra Tech
310 K St., Ste. 200
Anchorage, Alaska 99501

CONTACT:

Mr. Keith Henn, PG
(412) 921-8398
keith.henn@tetratech.com

TETRA TECH

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ACRONYMS AND ABBREVIATIONS

24/7	24 Hours Per Day, 7 Days Per Week
APC	Air Pollution Control
AC	Alaska commercial company value center
AEA	Alaska Energy Authority
AK DEC	Alaska Dept. of Environmental Conservation
BTU	British Thermal Unit
C&D	construction and demolition
CHP	Combined Heat and Power
DOER	Massachusetts Department of Energy Resources
EPA	Environmental Protection Agency
EPC	Engineering, Procurement, and Construction
EPCRA	Emergency Planning and Community Right-to-know act
FIA	USFS Forest Inventory and Analysis National Program
HAPs	Hazardous air pollutants
IC	Interconnection Customers
IRR	Internal Rate of return
LHV	Lower Heating Value
MCF	Measured in cubic feet
MW	Megawatt
KEA	Kotzebue Electric Association
KIC	Kikiktagaruk Inupiat Corporation
KOTZEBUE	City of Kotzebue
MRF	materials recovery facility
MSW	Municipal Solid Waste

NWI	National Wetlands Inventory
PTE	Potential to Emit
RCRA	Resource Conservation Recovery Act
RDF	Refuse derived fuels
REC	Renewable Energy Credits
SBA	Small Business Administration
SPEED	Sustainably Priced Energy Development Program
SQA	Statement of qualification application
Syngas	Synthetic Gas Fuel
T&D	Transportation and Delivery
TCLP	Toxicity characteristic leading procedure
Tetra Tech	Tetra Tech Inc.
TPD	tons per day
UCF	University of Central Florida
WTP	water treatment plant

EXECUTIVE SUMMARY

PROJECT OVERVIEW

The City of Kotzebue (Kotzebue) is the regional hub of Northwest Alaska, located roughly 20 miles above the Arctic Circle on the Chukchi Sea. The city is currently reviewing an opportunity to generate energy from waste through construction of a biomass-fired energy generation plant. Kotzebue has many existing features that are advantageous for development of such a project. Fundamentally, the city is located in an isolated region, and would benefit from the ability to produce its own energy and reduce dependence on expensive energy imports. Furthermore, Kotzebue owns several government buildings and is responsible for treatment and heating of citizens' water supply, either or both of which could absorb the energy produced by such a plant and reduce the city's high energy costs. Kotzebue also has a readily available source of combustible biomass in the form of municipal solid waste (MSW) that is currently being disposed in the local landfill.

The Alaska Energy Authority (AEA) sponsored this analysis into the viability of a biomass-fired community energy project in Kotzebue. Engineering firm Tetra Tech, Inc. (Tetra Tech) and project partner DOWL HKM (DOWL) conducted the evaluation.

Kotzebue has pioneered renewable energy projects in the past in conjunction with the local energy utility Kotzebue Electric Association, including a 2.94 MW wind farm, solar thermal projects, and waste-heat capture, amongst other projects. Therefore, the desire for renewable energy projects fits well with the progressive government approach to locally produced energy.

Converting waste to energy, while new to the region, is a proven and commercialized technology field. There are over 100 MSW energy projects operating in the world, processing over 40 million metric tonnes of waste per year and producing over 26 million megawatt-hours (MWh) of electricity and 7.4 million MWh of thermal energy per year[1]. Versions of this technology have been in operation at large scale since the 1970's. Community-scale projects, such as those for remote towns, and military bases, have been developed in the last several decades in response to the rise in basic energy costs, and as process technologies have advanced to manage the material inputs and emission outputs associated with MSW.

The State of Alaska has unique intrinsic characteristics that provide opportunities for waste to energy applications. 90% of rural, remote Alaskan villages dispose of combustible waste in landfills that are often not compliant with EPA's Resource Conservation and Recovery Act (RCRA) standards[2]. Meanwhile, the villages

[1] http://wteplants.com/

[2] Colt, et al. "Sustainable Utilities in Rural Alaska; Effective Management, Maintenance and Operation of Electric, Water, Sewer, Bulk Fuel, Solid Waste. " University of Alaska Anchorage, 2003.

pay approximately $7 to $10 per gallon for heating fuel and diesel powered electric generation. These fuels are often barged or airlifted to the rural villages, a non-sustainable energy cycle. While many of these villages, such as Kotzebue, have seemingly viable conditions for a waste to energy system, it is required that logistical, technical, and organization issues are carefully evaluated to lay out a sound strategy and plan.

WASTE STREAM FEEDSTOCK

One of the primary goals of this study was to evaluate the biomass material available in Kotzebue that could be used as feedstock to generate energy. This study focused primarily on waste-based feedstocks. It was found that the energy content of Kotzebue's Municipal Solid Waste (MSW) stream is equivalent to nearly 120,000 gallons of fuel oil per year. In just the wood-based combustible materials (e.g., paper, cardboard, and wood-based materials), over eight billion Btu's of are thrown into the Kotzebue landfill annually, equivalent to over 62,000 gallons of fuel oil. Assuming that all commercial enterprises in Kotzebue separated their garbage before disposal (i.e., in a source-separation program), there is a potential to capture 250 tons per year of refuse derived fuels (RDF) feedstock. The wood-based materials (e.g., paper, cardboard, and wood) from the overall waste stream, referred to as RDF, would be the material of interest for a waste to energy project. Laboratory analysis of the city's waste stream is recommended to confirm these estimates prior to final engineering of a biomass energy plant to ensure anticipated values are consistent with the waste composition. Source separation of wastes is preferred over post-consumer separation of RDF materials. The City of Kotzebue recently implemented a waste can separation collection system for its residents. The program has already achieved success, and is a good sign for the implementation of a more formalized source-separation and/or recycling program in the city.

Wood pellets or briquettes are an additional supplementary biomass feedstock that can be purchased and imported to Kotzebue to supplement waste-derived feedstock supplies. On an energy value basis, bulk-purchase pellets are significantly less expensive than fuel oil, and complement RDF fuels in boiler systems by promoting a more efficient and complete combustion.

FEASIBILITY STUDY CONCLUSIONS AND RECOMMENDATIONS

Waste to energy technologies have advanced significantly in recent years and are currently available for commercial applications. Numerous technologies were investigated in this study; however two technologies including gasification of unsorted MSW and the combustion of sorted refuse derived fuels (RDF) were identified as options carried forward in detailed analysis. Gasification is a more sophisticated technology which can convert nearly the entire waste stream into energy extracting the maximum energy possible, while RDF combustion technologies offers a more commonly used technology and presents an opportunity to operate in conjunction with a city recycling program. These scenarios are referred to as MSW Gasification and RDF Boiler scenarios, respectively. The relatively small scale of both analyzed systems precludes electrical generation or combined heat and power. However, both systems clearly aim to turn Kotzebue's waste streams into valuable resources.

These attributes, as well as other logistical considerations, were evaluated in the feasibility study. Two (2) potential operational scenarios were developed. One system envisions combustion of a combination of RDF briquettes and wood pellets to produce building heat at the public works campus; the second evaluated gasifying all of Kotzebue's MSW at an off-site location to potentially pre-heat city raw water supplies. Conceptual designs of both biomass energy plant scenarios were created based on the evaluation, and financial viability of the project was evaluated.

The evaluation determined that both project scenarios are technically and financially viable prospects. Both technologies are commercially available from multiple vendors, and both are robust for harsh climate and remote locations such as Kotzebue. As analyzed, each scenario is able to repay project debt obligations within a reasonable timeframe, while covering operating costs, employee wages, maintenance and materials, and produce a small additional annual income for the city. Revenue for the projects is derived in the form of avoided fuel oil purchases. The RDF Boiler scenario can support one additional full-time licensed boiler operator position, while the MSW Gasifier scenario will require four (4) full-time staff positions. The RDF Boiler scenario is highly sensitive to project capital cost and throughput (i.e., RDF capture rate). It is likely that improvements can be made to the conservative capital expense estimate, which includes a nearly 200% remote Arctic construction cost factor increase, as well as the conservative capture rate of RDF (estimated to be 50%, but could be improved to 60% + through source-separation programs).

While both scenarios require additional city planning and detailed engineering steps typical for projects of this nature, Tetra Tech recommends pursuing either of the two scenarios. An RDF Boiler located on the Public Works campus is an immediately implementable project contingent only on securing financing for the project. The MSW Gasifier scenario is contingent on re-development of the city's water treatment system at an off-site location, likely a long-term project. Additionally, the reduced capital expense of the RDF Boiler in comparison makes it a more attractive near-term investment.

Tetra Tech also recommends laboratory analysis of representative samples of Kotzebue's waste stream. The scope of the study only allowed for empirical review of available information and estimation of Kotzebue's waste composition. Analysis of combustible materials from the city's waste stream will determine the actual energy content of the material, as well as contaminants and other values that will affect subsequent engineering. Analysis can also help to indicate expected product capture rate of RDF. Laboratory characterization of the feedstock source should be combined with test-burns in the selected conversion technology to solidify burn characteristics, emission profile, and required equipment for combustion (pre-processing, ash handling, etc).

Kotzebue's remote location is also a project driver. The difficulty of transporting materials to Kotzebue significantly increases capital cost, as noted in the project report. However, cost to import fuel must be borne throughout project lifespan, whereas a biomass energy system has locally-produced and reliable fuel source in the city's waste stream. A prospective deep-water port being planned to service Kotzebue from Cape Blossom would likely reduce material costs (steel, concrete, and equipment) to support capital projects, but

is unlikely to have much effect on fuel costs, which are tied to global increases in energy demand and expense.

The findings of this study should be considered applicable in corollary for the region, not only the City of Kotzebue. The smaller villages in the Northwest Arctic Borough have expressed interest in similar waste-to-energy solutions, scaled to fit the feedstock sources and heating needs of the respective villages. The difficulty and expense in sourcing fuel oil shared by all of these communities presents similar opportunity for biomass energy systems as Kotzebue's opportunity. The concept in theory has been shown to be viable, but each situation should be carefully evaluated for its technical and logistical viability, financial cost, and approval within the respective communities.

In conclusion, what can be determined from this study is that a significant amount of Kotzebue's trash is being unnecessarily landfilled, and could instead be used as a sustainable source of energy. The city could also avoid importing a significant amount of fuel oil with the development of a biomass energy plant. Total energy production of the RDF Boiler scenario would displace over 30,000 gallons of fuel oil each year, and divert over 300 tons of waste from the local landfill annually. This project exemplifies the type of sustainable energy project that can win support at the local, state, and national level for its ability to reduce fuel imports, increase community self-sufficiency, and improve waste management and disposal practices. This biomass energy project can be a model program for other Alaskan villages, continuing the tradition of Kotzebue in pioneering sustainable and renewable energy practices.

Memorandum of Understanding

Between

City of Bethel, Public Works Department

And

Lower Kuskokwim School District

This Memorandum of Understanding (MOU) sets for the terms and understanding between City of Bethel Public Works Department and Lower Kuskokwim School District to maintain safe road conditions for the bus routes.

This MOU will ensure the students of the Lower Kuskokwim School District have a successful route of transportation.

The above goal will be accomplished by undertaking the following activities:

- The Streets and Roads Department make the school bus routes a priority to prepare the roads for the upcoming weather by dispersing sand, scarification and/or plowing the roads.
- Streets and Roads Department does keep up with weather prediction to determine whether or not the employees have to come in early to prepare the roads.
- There is also communication between the School District and Streets and Roads Department for which roads need extra attention.

Should such responsibilities fail to follow through, (who shall be appointed responsibility for effectiveness of this MOU?).

This MOU is strictly an understanding and there will be no obligation for transfer of funds per diem.

This MOU is at-will and may be modified by mutual consent of authorized officials from City of Bethel Public Works Department and Lower Kuskokwim School District. This MOU shall become effective upon signature by the authorized officials from the City of Bethel Public Works Department and Lower Kuskokwim Health Corporation and will remain in effect until modified or terminated by any one of the partners by mutual consent.

Contact Information

City of Bethel Public Works Department

William (Bill) Arnold

Public Works Director

1155 Ridgecrest Dr, PO Box 1388 Bethel, AK 99559

PN: 907-543-3110

FN: 907-543-2046

warnold@cityofbethel.net

Lower Kuskokwim School District

Ryan Butte?

Capital Projects Manager

1004 Ron Edwards Memorial Dr. Bethel, AK 99559

PN: 907-543-4903

FN:

ryan_butte@lksd.org

(Are you the primary contact for this MOU?)

_____ Date:

Bill Arnold, City of Bethel, Public Works Director

_____ Date:

Ryan Butte, Capital Projects Manager, Lower Kuskokwim School District

Introduced by: Public Works Committee
Date: March 12, 2019
Public Hearing: March 26, 2019
Action:
Vote:

CITY OF BETHEL, ALASKA

Ordinance #19-03

AN ORDINANCE BY THE BETHEL CITY COUNCIL AMENDING CHAPTER 13.04.180 OF THE BETHEL MUNICIPAL CODE, HOLDING TANK SERVICE

WHEREAS, The City of Bethel ("City") operates water and sewer utilities to provide water and sewer in Bethel;

WHEREAS, Provision of such services to Bethel is in the best interest of the public;

WHEREAS, The current charges for delivery of water and sewer evacuation reflect the higher cost per gallon for smaller tank sizes;

WHEREAS, Hauled Services are set up to delivery to each neighborhood in Bethel two times a week;

WHEREAS, A primary concern for tank sizing is for the tank to be of adequate size so that the needs of the customer can be provide by no more than 2 deliveries per week;

WHEREAS, Many of the strategies for reducing water and sewer costs in Bethel are based on conservation;

WHEREAS, The current code requires tank sizes that are larger than a residence might use in one month;

THEREFORE BE IT ORDAINED by the City Council of Bethel, Alaska, that the Bethel Municipal Code shall be amended and revised as follows:

SECTION 1. Classification. This ordinance is permanent and general in nature and shall be placed in the Bethel Municipal Code

SECTION 2. Amendment The Bethel Municipal Code Section 13.04.180, is amended as follows (new language is underlined and ~~old language is stricken out~~):

Customers to whom a water main is not available may have water delivered to their properties for discharge into holding tanks; provided, that the location, type of holding tank and access thereto is approved by the department. Quantity and frequency of delivery shall be determined by regulations or orders of the department and approved by the council, and the rate charged for such delivery shall be determined by the council by ordinance. ~~In new home construction,~~ In new home dwelling completed after January 1, 2019, the minimum water holding tank size shall be determined by the chart below

Introduced by: Public Works Committee
Date: March 12, 2019
Public Hearing: March 26, 2019
Action:
Vote:

Number of Bedrooms	Water Tank Size
One to two bedrooms	800 gallons
Three bedrooms	1,000 gallons
Four bedrooms	1,200 gallons

New home construction is defined as all new homes where the site permit is approved after September 1, 2014.

SECTION 3. Effective Date. This ordinance shall become effective upon passage by the Bethel City Council.

ENACTED THIS __ DAY OF March 2019, BY A VOTE OF __ IN FAVOR AND ___ OPPOSED.

ATTEST:

_____
Fred Watson, Vice-Mayor

_____
Lori Strickler, City Clerk

13.04.180 Holding tank service.

A. Customers to whom a water main is not available may have water delivered to their properties for discharge into holding tanks; provided, that the location, type of holding tank and access thereto is approved by the department. Quantity and frequency of delivery shall be determined by regulations or orders of the department and approved by the council, and the rate charged for such delivery shall be determined by the council by ordinance. In new home construction, the minimum water holding tank size shall be determined by the chart below:

Number of Bedrooms	Minimum Water Tank Size
Studio, Efficiency or One bedroom	600 gallons
~~One to~~ two bedrooms	~~800~~ 900 gallons
Three to Four bedrooms	~~1,000~~ 1,200 gallons
~~Four~~ Five – Six bedrooms	~~1,200~~ 1,500 gallons
Six+	Per Public Works Department

B. The overflow bung/port/porthole for the water tank shall be installed a minimum distance of twelve (12") inches from the top of the water tank.

"New home construction" is defined as all new homes where the site permit is approved after ~~September 1, 2014~~ April 1, 2019.

13.04.185 Holding Tank Inspection

Holding tanks will be inspected by the Department under the following circumstances:

1. Whenever a customer applies for hauled water service with the City;
2. Whenever there is a tank replacement or a change in total water volume at a residence located in a hauled zone;
3. On all new construction or a remodel where water volume at the residence is affected;
4. Upon the request of the customer or homeowner; or
5. Upon notification by the City of Bethel.

Holding tanks will also be inspected randomly by the Department to ensure compliance with the BMC. The City will provide the customer with a minimum of 24 hours advance notice of the inspection. It is the customer's responsibility to provide access to the Department for the inspection. Failure to allow City personnel to complete the inspection may result in services being denied.

CITY OF BETHEL
P.O. Box 388
Bethel, Alaska 99559
Ph. (907) 543-4150
Fax (907) 543-3817

MEMORANDUM

DATE: Feb 19- March 5

TO: City Council

FROM: Peter Williams, City Manager

RE: Managers' Report

Finance Dept.- I'm still concerned about the decision not to provide funds for an interim Finance Director and staff support. The personnel in the finance department needs someone with a level of expertise to ensure that their work is completed correctly. Without this oversight, the current general ledger entries are being entered with proper supervision and approval. I suspect that when the FY-19 audit is begun, in November of 2019, the first work that will have to be completed will be to reconcile the general ledger and the fund balances. The odds are that the finance department will not be able to achieve this task on there own. In the past, the auditors or contracted CPA's performed this task at a significant expense.

– All the depts have submitted there budgets and the finance dept. will start creating the FY20 Budget.

- Will interview a candidate for the Finance Directors position on March 7th
- The FY 18 audit is underway.
- Ambulance fees are being collected and forwarded to us. Claim Pay of Alaska collected about $105,000 from billings due to us for a while.
- Amazon .com remitted an estimated $13,500 from on-line sales tax.

PROJECTS

Institutional Corridor – There are still a few customers that need to be hooked up to the system. There is about $170,000 left for contingencies. For all practical purposes, this project at the moment will not need the funds. We still are waiting for the Final Drawings. The final walk around will be performed when the snow is gone and the water has drained off of the low spots.

Jetty/Sewer Lagoon-The sewer trucks will be the last item to be completed for this project. They should arrive on the first barge in the springtime.

Long Range Transportation Plan 2020- Next meeting is on March 8th.
The State Transportation Improvement Plan for 2020-23

The Avenues- Discussed the loan needed for this project with our Bond Counsel and at the moment we are leaning towards First National Bank of Alaska to provide the bridge loan needed for this project.

Bethel Heights Water and Sewer System- Engineers are exploring alternative methods to resolve the water services in Bethel Heights. The alternates are too replace the Water Main, Main and Service Replacement.Another method is slip lining water and sewer mains and installing a heat trace between the slip line and the existing pipe.

Tundra Ridge Road Realignment- Tried to get an update but was told nothing had changed since January.

PW Building Boilers- Materials to install the boilers should be on the first barge. PW has installed the beam needed to support the floor in the boiler room at the shop.

Police Console- Pro-Com still needs to forward to us the Service Agreement for review and approval.

Geographic Information System (GIS) – DOWL has one more trip to Bethel to double check there work.

Asbestos Abatement- assessment for the old police annex and laundry mat is scheduled for March 18th and 19th.

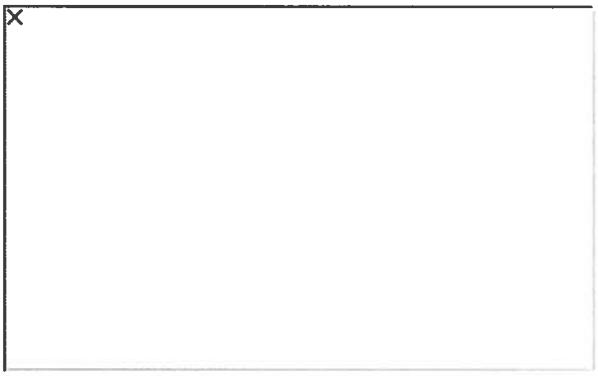
Please review the department's managers reports.

Peter Williams
Bethel City Manager

2018-2021 Alaska Statewide Transportation Improvement Program
Amendment 2; Approved January 30, 2019

Need ID: 31489
Title: Tundra Ridge Road Realignment
Region: Central
Place Name: Bethel
Highway: N/A

Project Description:
Construct Tundra Ridge Road on new alignment that provides a public road connection.



Phase	Funding	FFY19	FFY20	FFY21	After 2021
Design	SM	49,665	36,120	0	
Design	STP	500,335	363,880	0	
Right of Way	SM	0	0	9,030	
Right of Way	STP	0	0	90,970	
	Totals:	**550,000**	**400,000**	**100,000**	**8,300,000**

Program:	Alaska Highway System	**Sponsor:**	
Primary Work:	New Construction	**PEB Score:**	
2012 Election District:		**Criteria:**	
Borough/Census Area:	Bethel	**Functional Class:**	MINOR COLLECTOR
Municipal Planning Org. (MPO):	non-MPO		
Performance Measures:	Travel Time		

Memorandum

Date: February 25, 2019
To: Pete Williams, City Manager
From: Bo Foley, IT Director
Subject: IT Director's Report

February 2019 Current Events

- **Jury Duty:**
  For the month of February 2019, I have been on Jury Duty so a portion of the month's time was spent at the courthouse.

- **Janitorial Services ITB:**
  Early this month, the janitorial services ITB ended with two companies having submitted bid proposals. One company was disqualified as their proposal was lacking in information that was explicitly requested in the ITB.

- **Policies and Procedures:**
  Recently the Police Dept. went through an FBI Criminal Justice Information System (CJIS) audit and was found wanting in documentation for certain areas including IT. While we've been implementing best practices, to be compliant with the FBI CJIS Security Policy, there needs to be documentation that can be produced upon request. Chief Burke has been working to recreate these documents (as for some reason copies of the documents were missing, both electronically and physically). He has been collaborating with legal to make sure the new documents make sense and can be legally enforced and any of these policies and procedures that deal with the network have been forwarded to me for review. We should be in full compliance with the security policy very soon. Additionally, some of the policies and procedures may be adopted on a city-wide scale.

- **Preliminary Budget Prep:**
  During the month of February, I came up with my preliminary budget numbers for the city manager. He and I met to discuss various items especially in regards to any capital expenditure projects coming up to which there are several. We may be moving these projects to a different fund which will result in the operational costs of my department remaining more or less the same from last year.

- **Police Dept. File Recovery:**
  The new evidence custodian contacted me during the month to inform of missing files on the Police Dept. server. Upon looking into the matter, I found that the files were definitely gone instead of moved or misplaced (possibly deleted). Thanks to our nightly backup system, I was able to retrieve the missing files and restore them. This lends credence to how powerful a tool our backup system can be. All file servers controlled by the City are under this same backup protection for peace-of-mind.

Memorandum

Date: February 25, 2019
To: Pete Williams, City Manager
From: Bo Foley, IT Director
Subject: IT Director's Report

- **Business-As-Usual:**
  Beyond the above-mentioned items, the short month has been spent fixing or helping with run-of-the-mill trouble tickets such as email issues, printing/scanning, Caselle access, and login problems to name a few.

Future Plans

- **FY20 Budget Prep:**
  I will continue working with my vendors and with the other departments to fine tune my budget preparation as we get closer to the end of FY19.

- **Security+ Certification Training:**
  Though it is down the road, our grant manager has secured funding to send me out to a technical class dealing with cyber security. This class, CompTIA's Security+ course, will give me a further in-depth look at places where networks might be vulnerable and how to implement equipment and practices to help shore those vulnerabilities up. The grant funding should take care of all expenses associated with the training. It will last about a week and will fall at the end of April unless the date is changed by the company (if the class doesn't have enough students slated to attend).

Memorandum

DATE: March 4, 2019

TO: Pete Williams, City Manager

FROM: Cynthia Sharp-Assistant Finance Director

SUBJECT: Manager's Report – February 2019

Finance Committee

The Finance Committee met on Monday, February 25, 2019 but did not achieve a quorum. Its next regularly scheduled meeting is set for Monday, March 25th at 6:30 pm.

Staffing Issues/Concerns/Training

The Finance Department currently has three vacancies including the Finance Director position, Accounting Clerk and Accounting Specialist. The positions have been posted and recruitment is underway. The General ledger position is literally the one that produces the journal entries, reconciles all bank accounts makes adjustments to account balances, reconciles employee utility accounts, etc. I have been trying to keep this as up to date as possible as well as all the other duties where needed. The General Ledger position has been filled and training is currently underway by Carmen Jackson staff. The shortage of qualified staff continues to be a problem. If any of the staff need the day off it creates hardship on the rest of the staff.

Project Updates

- FY18 Audit
  Work is continuing on the Audit pending list.

- FY 2020 Annual Budget Preparation
  We are busy preparing the upcoming FY 2020 Proposed Annual Budget. The budget will be submitted to City Council by no later than April 1, 2019.

- Ambulance billing is current and is finally producing revenue for the city.

MEMORANDUM

DATE: 02.28.2019
TO: Peter Williams, City Manager
FROM: Bill Arnold, Public Works Director
SUBJECT: Manager's Report –

Programs/Divisions

Public Works Director: is on vacation and Andy Wakeman is Acting PW Director till he returns in March.

Hauled Utilities: The Hauled Utility Dept hasn't had a great month this February 2019. We had three water trucks on the road at times until we got the trucks back from maintenance. We are still having a shortage of water trucks pending maintenance.
We have one driver planning on retiring and we had a few that we lost. We do need more drivers for our Dept.
The Hauled Utility needs a new truck since the foreman truck is old and uses a lot of fuel. When the truck is on the road for inspections or incidents a few times, it needs more fuel in just a week or two.
The drivers are working on their licenses for renewal and some already had them changed. So they are being updated before the dead line for renewal notice.
I have been trying to get clothing for our new drivers that they still never get. Our supply is getting low without the proper sizes for the driver. Some of the drivers are using what they bought personally and they also need rain gear for the summer season. I have turned in a few purchase requisitions for clothing that we still never head of since. We need to know if the drivers are required to buy their own clothing.
The files are slowly catching up from the driving I had to do for the shortage of drivers and we still get by without a driver when they are not here for duty. The drivers are doing a great job providing services as needed but still need more drivers.

Utility Maintenance:

- Lagoon discharge operations are shut-down until spring. Normal operation for winter is ongoing.
- Additional Fire hydrant valves en route for inventory and use if needed.

- 18 alarms on residential lift stations were responded to. Multiple issues with grinder pumps, heat trace, and float systems.
- Monthly meter reading and service connections were completed
- Main Lift Station pump work –Pump #1 still in Anchorage for major repair. Pump will be in Anchorage 12-16 weeks (minimum) for repairs before we receive it back. Lift Station is running on 2 pumps for now.
- Multiple service line freeze up calls on customers lines.
- Clean up and organization of shops.
- 18 residential lift station repairs
- Line flushing and leveling activities on low-flow and frozen sewer lines. Non-compliance reports were filled out per DEC requirements.
- Daily safety meeting.
- All 3 Utility Maint. Trucks are having issues that require repairs. Several of these are major safety issues. Continue to work with V&E to repair them, but some issues are arising due to 2 of the vehicles are more than 10 years old.
- Utility Maint. Crew is assisting BHWTP with repairs from sanitary survey as per DEC requirements. Awaiting Electricians to complete action item list for sanitary survey.
- Issues with FAA lift station freezing up. Heat trace is on and thawing line out slowly.

Property Maintenance:

- City Hall
    - All building Boiler and pressure vessel inspections completed
    - Roof Replace/Rebuild
        - Plans to replace the failing rubber lined roof of the City Hall building has begun. COB's engineering firm DOWL has completed ad submitted the "As built" and "current condition" survey. Recommendations have been made for a permanent fix to rebuild a metal flashed, sloped rook versus replacing the existing style roof with same/same build.
- Court House
    - All building Boiler and pressure vessel inspections completed
    - **Dry Sprinkler System:**
        - System Status is same as last report. However action is being made to produce a solution to survey and replace weak, failed or near failure portions of the system. COB will be utilizing a contractor for this scope work.
    - **Holding Cell Area Door:**
        - Issue still remains as reported on previous report, however, the current door has been fixed with a temporary solution until the ordered door arrives and

can be installed. The temporary fix has allowed the door to operate in a normal condition as before. Instructions to use the door carefully have been provided to the court house staff.

- **Bathroom water line near Court Room #4:**
  - Company "Advance Look" is scheduled to send an Industrial Hygienist to Bethel for a deep look into water intrusion and hidden damages from the water leak. The hygienist is expected to arrive March 7th and complete a water damage survey of the building by March 9th.

- **Cracks in Dry Wall near holding cell entry door:**
  - Update to previous report. COB building maintenance staff made an evaluation of the damage and have completed repairing and painting the areas inside the holding cell area. Cracks are still present near the entry door area, where the door will be replaced upon arrival.

- **Dusty sprinkler heads and escutcheon plates:**
  - **Current Status:** Dusty, dirty in various locations
  - **Summary of Issue:** We have made note of this discrepancy and truthfully it simply is a task that fails to get done. I am not confident that this duty is assigned to a Janitor. I would rather have my staff deal with the issue than an untrained janitorial service.
  - **Solution to Issue:** I can assign the work to be completed this coming week. Plain and simple, I hold ourselves accountable for this issue. It needs to get done and we will see how it goes.

- Public Works Building
  - All building Boiler and pressure vessel inspections completed
  - The Replacement of the structural support laminate beam underneath the building boiler room is approaching fast. Preparations to remove the beam and replace with the engineered steel I-beam is in the works. This will be a project completed by the COB building maintenance staff. Expect to complete removal and install by mid-March.
  - South Side
    - Pioneer Door inspected the cause of the door intermittent failure. It was determined the spring tension clamp was slipping and would need to be replaced. As a solution a shaft has been installed through the spring/shaft coupler. Anticipate completing a door spring shaft rebuild during the summer months. All safety stops and limiting switches are now in normal operation. Door operates normally for now.
    - Fire sprinkler system deep look, awaiting contact with engineering firm DOWL for further data needed ad direction.

- Dog Pound
  - All building Boiler and pressure vessel inspections completed
  - Bethel Friends of Canines have transitioned into the dog pound building. Minor

issues with building maintaining heat have been discovered. Newly installed boiler needed minor adjustment to allow for continued operation.
    - BFK9 is planning to relocate their current kennel building from Tundra Ridge area to the Dog pound lot. Site pad work will be happening soon. COB building maintenance will assist in ensuring site is prepped correctly and building is placed with in staked region.

- Log Cabin
    - All building Boiler and pressure vessel inspections completed
    - Temporarily closed.

- YKFC - Pool
    - All building Boiler and pressure vessel inspections completed
    - Boiler #1 over pressure relief pop off valve started showing signs of fatigue. Boiler #1 shut down and a full service and flush conducted. Parts ordered to replace pressure relief valve.
    - Water leaks near the windows in the pool deck area were discovered again. This will be addressed again to determine problem and new solution.

- Fire Department
    - Boiler and pressure vessel inspection by State of Alaska complete.

- Police Department
    - All building Boiler and pressure vessel inspections completed
    - Low fuel alarms on the onsite power generator have occurred several times. Each time a full inspection of the Onsite generator fuel system is completed and no issues have been found. Each time the low fuel alarm has activated, the actual fuel levels have been above 75% capacity.

- Bethel Heights Water Treatment Plant
    - All building Boiler and pressure vessel inspections completed
    - Inline circulating fan that provides air to the piping room is repaired and operational.

- City Subdivision Water Treatment Plant
    - All building Boiler and pressure vessel inspections completed
    - Boiler pump line A has been showing signs of declining pressure. Glycol is occasionally added and pressure returns to normal for several days. Leak inspection throughout entire line has been conducted with no leaks found. Suspect air trapped in line as it is part of the new corridor.

- Teen Center
    - All building Boiler and pressure vessel inspections completed
    - Vandalism and theft was reported by program director. Back door latching

mechanism was not latching perfectly due to building shift. Alteration to the door alignment was made to prevent intruders from entering the building again.

Parks and Recreation:

No tasks at this time.
Outlook and preparation for upcoming Summer projects have begun. PRAHSC committee is involved with communication. Proposals for field ad parks grass and sod maintenance has been provided by Codman services.
Images of the damaged floor at the fitness center have been reviewed by the committee and options are being weighed whether to refinish or refurbish the existing floor.

Road Maintenance:

Streets and Roads put in a culvert with the 324E excavator that crosses Akakeek Street at 136 Akakeek. We had to put it in, due to the big thaw, and all the water on the upper side of Akakeek Street flooding at the driveways. It took over two days to get the steamer working due to the steamer being over 36 years old.

Streets and Roads did spend the next three days during the thaw steaming culverts, until it froze back up. We thaw out culverts in City subdivision, Akakeet Street, Ptarmigan Street, Larson Subdivision and in Tundra Ridge.

Streets and Roads did lay gravel down on the roads during the thaw being the frost on the roads were thawed out it turn to mud and would not hold up to grading. We lay gravel in Boat Harbor Road, Avernus, City Sub, BIA Road, Akakeek Street, Ridgecrest Drive, Ptarmigan Street, and Tundra Ridge.

Streets and Roads had to fix some small wash out all culverts crosses due to the thaw, by back blading some gravel in those areas with the loader. Those culverts were in City Sub., Akakeek Street, Ptarmigan Street, H-Marker Road, and Tundra Ridge.

Vehicles and Equipment: February was a very productive month. The team has done an excellent job. We got 3 large jobs completed along with over 50 work orders. We had the 160M grader, D8 dozer, and the 324 Excavator all down and in the shop at once. Everything is out the door and back up and running. Again water trucks are our biggest challenge. We finally just got parts in last night 2/27. We should have 2 more water trucks up and running by days end.

Transit System: The month of February continued to be a busy month. This past week the full time driver was on leave and it kept us busy filling in. It made for longer days but it was important to keep the bus schedule running to serve our passengers. We sold eight adult monthly passes, 2 senior monthly passes and 2 youth monthly passes. ONC purchase, through the Community Action Grant, 42 senior monthly passes. The total ridership was 1985; 358 seniors, who paid the trip fare, 67 youth, 1560 general, and within that number, there were 179 Disabled Handicapped.

The February weather seems warmer than usual. Which has turned the roads into mud and potholes. Streets and Roads has been busy trying to keep them pass able, however that is almost impossible. The drivers have had a difficult time keeping the time schedule. In addition, do so has taken a toll on the buses.

The condition of our buses are maxing out, the State DOT, recommends that buses be phased out when they are five years old and/or 100,000 miles. Our newest bus was purchased in October of 2014, three years old, but has 146,500+ miles, Bus 438 our oldest and smallest bus was purchased in 2008, nine years old, and has 130,000+ miles. Bus 436, the diesel, was purchased in 2008, nine years old, and has 146,000+ miles. Bus 437, diesel, was purchased in 2008, and has a bad motor and is not being used.

The July, August, September, November and December Budget Summaries have been submitted, accepted and paid by the State. We are working on the January one and as soon as the Finance Department closes out January, we will be able to finish it.

Last spring the State, DOT, was here and did a Compliance and Review we worked on the findings and submitted them last fall. They, DOT, is now review what we have submitted and helping us to meet their requirements. The State Compliance and Review "team" will be coming back out later this spring and going over what was recommended last spring and making "more" recommendations for us to work on.

Landfill / Recycle Center:

The Landfill has been trying to suck up as much water as possible while we have this warm weather to keep the mud down and attempt to make the DEC happy so that the water is not in contact with the trash. We have spent a lot of time working on the budget and attempting to get ready for spring time and all the problems that

time of year brings. Our new road up on top should take care of a lot of problems.

Water Plant Operations:
For the month of February both water plants are in normal operation for winter mode. Monthly water logs to ADEC from BHWTP and CSWTP. Sewage Lagoon DMR report for December. We also hold a safety meeting at CSWTP daily.

Institutional Corridor Update:

- Line construction has been completed.
- DEC has issued a letter (11/20/18) with Interim Approval to Operate the line. This is valid until February 22, 2019. Request for final approval must be submitted prior to expiration.
- U.S. Fish & Wildlife was the first customer to apply for and receive services following the receipt of approval to operate.
- To date (2/28/19) only 5 service connections have been turned on. U.S. Fish & Wildlife, Bethel Youth Facility, Correctional Facility and YKHC (hospital and housing units).
- Still waiting on other customers to complete work and apply for services soon.
- Issues with circulation pumps and high demand pump alarms and tripping has been resolved.

Staffing Issues/Concerns/Training:

- HazWoper training is scheduled for April.
- There are six driver positions open in the Hauled Water and Sewer dept.

CITY OF BETHEL
Fire Department

William F. Howell III, Fire Chief
P.O. Box 1388, Bethel, Alaska 99559
Phone: (907)-543-2131
Fax: (907)-543-2702
bhowell@cityofbethel.net

Celebrating 50 Years of Service

DATE: March 05, 2019

TO: Pete Williams, City Manager

FROM: Bill Howell, Fire Chief

SUBJECT: Management Report, February 2019

Current Events

- During February a total of 123 address plaques were ordered for residents and businesses. The department has ordered 690 address signs since inception of the program. For those needing assistance, the department has installed approximately 55 of these signs at the request of the property owners. Overall, reaction to the updated ordinance has been overwhelmingly positive.
- The department's December 13th address order was lost in transit and had to be reordered.
- Initial budget preparation discussions with administration were conducted for the FY 20 budget. The department is preparing it's 2020 budget.
- The Fire Chief was unable to attend the Annual leadership summit due to multiple flight cancellations. Both weather and mechanical issues precipitated the cancellation.

Community Planning/Preparedness

- The Department is working with the administration to update the City of Bethel Emergency operations plan.
- The Department is assisting administration with the cleanup and disposal of a release of Muriatic Acid inside a storage container at the pool. The storage container was secured by BFD personnel with a Knox padlock until City personnel receive the proper training to neutralize and dispose of the materials.
- Bethel Fire Department has been selected as a test site for the new Medicaid supplemental reimbursement program (GEMT). Being part of this pilot will allow

Bethel to shape the program to meet Bethel's needs. GEMT legislation (HB 176) was signed into law in June of this year. This law allows municipal ambulance services to receive reimbursement of 50% or more of the uncompensated cost (UCC) of providing ambulance service.

Bethel's ambulance service costs the City around $1500 per transport. The City receives about $400 from Medicaid per transport. The City would be able to receive reimbursement for at least half of the UCC, $1100. Current estimates suggest as much as 150K-200K in revenue from this program. These funds must be used for EMS purposes. The Department is waiting for further information on steps needed to participate

Training

- On 02/05/19, at 7:00 p.m. EMT Meeeting was held at the fire station. Responders conducted several skill drill in various Vehicle Extrication scenarios..
- On 02/14/19 at 7:00 p.m. a Fire Meeting was held at the fire station. Responders practiced C.A.F.S/Foam Training. Responders deployed hose lines, and took turns in operating the C.A.F.S/Foam System at the pump panel.
- On 02/16/19 at 8:00 a.m. Fire Fighter 1 class begin cadets conducted the Fire Department Physical Agility Test. All cadets passed their physical agility test.
- The department is in the process of scheduling an EMT 2 class and HAZWOPR 40 hour.

Responses

- Between 01/30/19 and 02/28/19 the Bethel Fire Department responded to 99 EMS and 10 Fire incidents.
- On 2/1/19 at 7:44 p.m. medics responded to Ptarmigan for the report of an unresponsive person. Patient was assessed and transported to the hospital.
- On 2/3/19 at 12:46 p.m. medics responded to Schwalbe Street for the report of a person who had fainted. Patient was assessed and transported to the hospital.
- On 2/3/19 at 2:02 p.m. Firefighters responded to the area of Chief Eddie Hoffman Hwy. and Alex Hatley for the report of a snow machine fire. Upon Arrival firefighters found no snow machine or fire.
- On 2/4/2019 at 12:21 p.m. medics responded to 6th and willow for the report of an motor vehicle accident. The patient was assessed and transported to the hospital
- On 2/13/19 at 2:32 p.m. Firefighters responded to 9228 Tundra Ridge Sub division for the report of smoke plum coming from the building. Firefighters observed no smoke or fire when on scene. Firefighters determined the cause of the smoke was from an unmaintained boiler

- On 2/13/19 at 6:25 p.m. Medics/Firefighters responded behind AC Quick for the report of children falling into the ice. Both children were assessed and released to their parents.

- 2/14/19 at 3:30 p.m. Medics responded to the playground for a report of a person who fell off the play set. Patient was treated and transported to YKER.

- On 2/15/19 at 8:32 p.m. Firefighters responded to BNC apartments for the report of smoke that was smelt on the second floor of the apartments. Firefighters observed initially no smoke or flames and fire alarms were sounding with some residents outside. When firefighters entered the second floor they noticed an excessive about of marijuana smoke. Firefighters determined that the smoke alarms were set off due to the marijuana smoke. Firefighters reset fire alarms and went back into service.

- On 2/16/19 at 11 a.m. medics responded to Akakeek for a person that took painkillers. Patient assessed and transported to the hospital.

- On 2/18/19 at 3:56 p.m. firefighters responded to Quivik Sub for a baby that was locked inside alone. Firefighters opened the door and returned to the station.

- On 2/19/19 at 3:14 a.m. firefighters responded to behind the Liquor store for a vehicle on fire. On arrival, firefighters found a vehicle fully involved in flames. Firefighters extinguished the fire

- On 2/26219 at 11:16 p.m. medics responded to second Road Housing for a kid that fell and not breathing. On arrival patient was breathing and transported to the hospital.

Budget/Financial

- The department is operating within budget.

Grants

- The Department received funding through the Volunteer Fire Assistance program for $7,470, for three sets of firefighting turnouts. This grant has a 10% match. The project total is $8,300. This project is completed and we are closing out the grant.

- The Department applied for and passed the first round of approval the Phase 18 Code blue Grant for $45,000 for the remount of Medic-5 to a new chassis. Funds have been awarded and will be reimbursed once expenditures are made.

- The Department was awarded $7,500 in Code Blue grant funding for a new power stretcher for Medic-6. The YKHC EMS Department administers this grant and BVESA has committed matching funds. The stretcher is in service in the new ambulance. We are waiting for invoice to make final payment and close the grant.

Staffing/recruitment

- The Department is fully staffed effective November 1, 2018.
- All past due employee evaluations are complete.

Vehicles & Equipment

- A bill of sale and title was provided to administration to dispose of E-28. Once signed the surplus fire vehicle will be property of the Native village of Napaimute.
- The new ladder truck is receiving warranty repair for a problem with the nozzle-nesting feature and repairs to the Compressed Air Foam (CAFS) compressor. We are outfitting the new ladder truck with firefighting and rescue equipment.
- The Code Blue committee has approved $45,000 to remount our 2003 Ford ambulance M-5.

FIRE DEPARTMENT VEHICLE STATUS			
Vehicle	**Type**	**Year**	**Status**
Medic 4	Ambulance	1999	*(Backup ambulance)In service, Airbags repaired.*
Medic 5	Ambulance	2003	In service. Frequent no starts/dead batteries. (Plan to remount to new Dodge chassis in 2018/2019)
Medic 6	Ambulance	2017	*(Frontline Ambulance) In service.*
Engine 4	Pumper	2013	*(Frontline pumper)* In service, Seat belt sensor silenced but still needing repair by V&E. DEF tank heater malfunction.
Engine 3	Pumper	1986	*Being outfitted as a tender and water supply unit. 3000 feet of LDH.* (Poor overall condition needs replacement)
Truck 1	Ladder Truck	2017	Outfitting, in service
Com 1	Pickup	2014	In service
Com 2	Pickup	2004	In service.
Tanker 1	Tanker (1500 gallon)	1980	Out of Service
Truck 1	Ladder Truck	1980	Out of Service

Streets and Roads daily dialog

1/30/19
We scarified roads and graded roads starting at 5:30 AM in the morning for 9 hours.
A sander truck been out all day sanding roads for 6 hours.
Dug out the ice at the water pump house in City Sub. , with the 420D backhoe and hauled away with loader.

1/31/19
The grader has been scarifying and grading the Bethel roads 6 hours.
We took the 420D backhoe out to the graveyard at the airport to dig out the left over sand pile from the last grave and level it off.
We took the dump truck with trailer and loader with forks out to Kasayuli Subdivision to load up the old SUV that was, left on the road, to bring back to the shop.

2/1/19
The grader has been scarifying roads throughout Bethel for 6 hours.
The sander has also been out sanding Bethel roads for 7 hours.
We and parked the dump truck of snow with oil in it in the city shop to thaw out into the loader bucket so we could put it in drums.

2/4/19
The grader was out at 6:30 AM scarifying and grading roads for 7 hours
The loader was out pushing the snow berm left Saturday for 5 hours.
The sander been sanding roads for 5 hours.

2/5/19
The grader was out at 5:00 AM scarifying and grading roads for 8 hours.
Both sander was out at 6:00 AM sanding roads for 7 hours.
The Hitachi excavator has been losing up gravel for the roads that we will need being that we will have rain for the next two days.

2/6/19
The grader was out scarifying and grading roads for 8 hours.
Both sander been out sanding roads for 8 hours each.
4 water pumps, pumped water across Akakeek Street due to flooding 12 hours each.

2/7/19
Four water pumps, pumped water across Akakeek Street due to flooding 14 hours each.
A sander was out sanding roads for 4 hours.
The grader was out grading roads for 9 hours.

2/8/19
Dug and added a culvert across Akakeek Street due to flooding 4 hours.
Haul gravel to fix Akakeek Street Ptarmigan Street and Ridgecrest Drive 5 hours.
The grader was out graded roads for 6 hours.
The sander did some sanding on slippery roads.
The steamer was fix and it was steaming culverts for 10 hours.

2/ 9/10
The grader been out grading roads for 7 hours.
The sander was out sanding roads for 7hours.
The steamer been out steaming culverts for 10 hours.

2/10/10
When it started to thaw, the grader was out grading for 6 hours.
When it started to thaw, the steamer was out for 7 hours.

2/11/19
We had to go to training for 2 to 3 hours.
The grader was out start at 5:30 am in the morning grading roads for 6 hours.
Sander was out sanding roads for 6 hours.

2/12/19
The grader was out grading at 5:30 in the morning grading and scarifying roads for 8 hours.
The sander out sanding has been sanding roads for 7 hours.
Hauled 5 dump trucks load of gravel to fill in pot holes with grader on Ptarmigan Street and Akakeek Street.

1/22/19
Both graders been out grading and scarifying roads in Bethel Roads 7 hours each.
Sander was out all day sanding roads 8 hours.
Pull out a water truck in Blue Berry Sub. at 240 Black Berry Street.

2/23/19
Saturday
Grader was out all day grading and scarifying roads 8 hours.
The sander was out sanding roads throughout Bethel 8 hours.

2/24/19
Sunday to grader was out grading for 3 hours on Ridgecrest Street, Akakeek Road, and Ptarmigan Street.

2/25/19
The grader was out at 5AM, grader Ridgecrest Drive, Akakeeke Street and Ptarmigan Street before the school buses run.
The steamer was out steaming culverts in H-Marker Lake Road, Ptarmigan Street, and Mallard Line.
Pull out a water truck on 4th Ave…

2/26/19
Grader was out grading roads at 5AM starting on Ridgecrest Drive, Akakeek Street, and Ptarmigan Street
In addition, Hauled in 8 dump truck loads of gravel to pot holes on Akakeek Street, Ptarmigan Street and the grader, graded it.
Steamer been out seaming culverts in City Sub. 6 hours.

2/27/19
The grader was out grading roads 12 AM for 3hours during the freezes on Akakeek Street, Ridgecrest Drive, and Ptarmigan Street, so the roads would be smooth for the school buses.
The grader is out today grading and spreading gravel on BIA Road, Akiak Drive, Akakeek Street, and Ptarmigan Street.
The dump truck hauled 8 load for the grader.
The steamer is out in Larson Sub., and Ptarmigan Street steaming culverts.

2/28/19
Grader has out grading at 5 am on Akakeek Road, Ridgecrest Drive, and Ptarmigan Street.
Hauled gravel to Akakeek Street, and Ptarmigan spread it out with loader.
The steamer was out steaming culvert on Ptarmigan Street, Owl Street, Mission Lake road, and Main Street.

3/1/19
Grader was out, 6 am grading Akakeek Street, Ridgecrest Drive, and Ptarmigan.
The other was out grading roads throughout bethel roads, 7 hours.
The steamer was out steaming culverts in Ptarmigan street, and over the YE center.
We took the D-8 out to the city sand pit so we can start pushing up sand for the landfill.

3/2/19
Saturday
Grader was out for 7 hours grading roads throughout Bethel roads.
The D-8 dozer was out pushing up a pile of sand out at the city sand pit for 8 hours.

3/3/19
Sunday
The grader was out for 3 hours after it started to thaw on Ptarmigan Street, Ridgecrest Drive, and Akakeek Street.

3/4/19
The grader was out for 7 hours grading Akakeek Street, Ptarmigan Street, Ridgecrest Drive, and Tundra Ridgecrest.
We laid gravel on the potholes on Akakeek Street, Ptarmigan Street, and some in Blue Berry Subdivision.

3/5/19
Grader was out, 6 am grading Akakeek Street, Ptarmigan Street, and Ridgecrest Drive, BIA Road, and Tundra Ridgecrest. These roads were graded two to three times today, 9 hours, and when it start freezes at 8 PM tonight, the grader will go out to grade those roads again so it freezes up smoother.
Took the 950G out to the city sand pit to load dump trucks for the landfill, 8 hours
Push the loads that was hauled to the landfill, with D-5, for 8 hours

City of Bethel
Street and Roads Foreman
James Flemings

CITY OF BETHEL

Post Office Box 1388
Bethel, Alaska 99559
Phone: 907-543-2047

TO: City Manager
FROM: Human Resources
SUBJECT: February Managers Report

DATE: 28 February 2019

Position	Number of Vacancies	Number of New Applications	Number Hired During Period	Number of Vacancies Remaining	Applicants in Review
Finance Director	1	1	0	1	1
Driver Hauled	5	1	0	5	1
Account Clerk	1	5	0	1	2
Account Spec I	1	0	0	1	0
Util Maint Wkr	1	1	0	1	1
Police Officer III	2	0	0	2	0
TOTALS	**11**	**8**	**0**	**11**	**5**

Applications and Hiring:

Interview panel being assembled to interview one candidate for the position of Finance Director. Date TBD.

In the interim, the vacancy announcement has been placed to the following:

Indeed.com (https://www.indeed.com/viewjob?t=finance+director&jk=b73f8e3f1d6d4dc4&_ga=2.184662569.101396549.1551461086-950838049.1550081478)

Alaska Municipal League http://www.akml.org/wp-content/uploads/2019/02/Bethel-Finance-Director-2.5.2019.pdf.

Government Finance Officers Association (GFOA, a national organization)

http://www.gfoa.org/employment-ad/34676.

The following cities/municipalities have been provided the vacancy announcement:

Anchorage
Cordova
Fairbanks
Galena
Homer
Juneau
Kodiak
Kotzebue
Nome
Palmer
Soldotna
Seward
Valdez
Wrangell
Wasilla

Points of Contact within the State of Alaska Human Resources workforce have also been provided the vacancy announcement.

HR received a total of 11 **Applications** in February

From those 11 Applicants:

One General Ledger Accountant was hired, start date 2 February 2019

One Internal lateral was hired from Hauled Utility to Landfill Technician 15 February

Interview panels were conducted to fill the Accounting Clerk on 22 Feb 2019. Three applicants were interviewed and determined to be non-select. Two more candidates. Two more applications were received 27/28 February and are under review for interview.

One application for hauled utility driver was received 28 Feb and is under review for hire.

One application for Util Maint Wkr was received 27 February and is pending interview for 1 March.

We currently have 6 job positions with a total of 11 openings, with 5 applications under review as follows:

Finance Director: Applicant pending interview by panel for week of 11-15 Feb 2019. This applicant was determined to be unqualified prior to interview. A new applicant is currently pending interview panel.

Driver Hauled Utility (5 positions): Currently announced

Utility Maint Wkr: Pending 1 March interview

Account Clerk: Interviews pending on 2 applicants

Account Spec I: Currently Announced

Police Officer III: Currently announced

Firefighter positions remain as open-continuous regardless of percentage of fill.

BEACON Programs:

2 Post-accident Non-DOT test were conducted due to accidents involving city vehicles.

Results were returned as "Negative."

Reports of Injury:

2 reports of falling

Administrative Actions:

Multiple terminations and resignations occurred simultaneously in both Hauled Utility and Water/Sewer creating an abundance of vacancies in conjunction to already existing vacancies.

Multiple routine PAR actions were executed.

Multiple yearly performance evaluations were submitted and processed.

Employee related announcements:

Premera:

Starting January 1, 2019 as fully insured and OptiFlex groups renew or start a new medical plan. Available as a buy-up option for self-funded groups.

We've added new features to our Medical Transportation Benefits program to help make healthcare more affordable and accessible for our Blue Cross Blue Shield of Alaska members in Alaska. This program covers certain travel expenses employees with a Premera medical plan may incur in these instances:

- When they are facing a serious medical condition that can't be treated locally.
- If they need to travel to the lower 48 to get elective, non-emergent care at lower prices than they'll find in Alaska. Travel for emergency related conditions are covered according to plan benefits.

Training, Conferences and Seminars:

AEPI instructed the workforce on Prevention of Sexual Harassment and Equal Employment Opportunity practices 11-12 February. All workforce members with the exception of a small handful of emergency services personnel were trained. Emergency service personnel will receive training from HR tentively scheduled for 18 Feb 2019.

James P. Harris
Human Resources Manager

To: Pete Williams, City Manager
From: Betsy Jumper, Planner
Subject: Jan. Manager's Report
Date: February 28, 2019

- Research City of Bethel properties-- citywide, on-going.
- Answer public's questions on miscellaneous planning topics/items.
- Removal of junk/abandoned cars in conjunction with Streets and Roads on City rights of way—on-going.
- Had a Planning Commission meeting Feb. 14th.
- Staff attended a sexual harassment training.
- Had a meeting with LSKD Staff and City Staff regarding the Ayuprun School project.
- Begin planning budget cycle for FY' 20.
-

: BETHEL

}ox 1388
Bethel, Alaska 99559
Voice: 907-543-2310
Fax: 907-543-2311

TO: Peter Williams, City Manager

FROM: Allen Wold, Port Director

SUBJECT: February 2019 Managers Report

- **Small Boat Harbor**
  -Sanded around SBH and the East Addition.
  -Plowed around the Harbor using loader.

- **City Dock/Beach 1**
  -Customers are still in and out of the Dock.
  -Plowing access for the customer's containers.
  -AML in and out of the Dock

- **Port Office**
  -Property Maintenance checking on building daily.
  -Ordered office furniture.
  -Working on surveillance system.
  -TC Construction sent out a subcontractor to check on the air conditioner.

- **Admin**
  -Monthly Storage billing for customers.
  -No quorum for the Port Commission meeting.
  -Worked on FY 20 Budget

- **Seawall**
  -Consistent clean up.
  -Sanded along the seawall.
  -Tightened cable fence.
  -Repairing damaged fencing.
  -Using loader to vehicles stuck in the overflow

- **Misc./Vehicles**
  -Safety checks along the seawall.
  -Safety Meetings.
  -V&E working on our trucks.
  -2 of us are working on our Class A CDL.
  -Getting a quote on a work truck.

RFPs and RFBs in Process

Updated February 19, 2019

Step 1 – Before RRP Written

Step 2 – Approved to Write

- Electrician (#1 priority)
- Controls-building technologies
- Audit services for yearly audits
- Audit services for City sales taxes
- Monitor fire alarms/lift stations
- Calcium Chloride/Sodium Chloride/Chemicals

Step 2 – Sent for Feedback

- Surveying City Property

Step 2 – Sent to Legal

- Surveying City Property

Step 3 – RFP/RFBs Issued	**Issued**	**Due**
• RFB-Vacant Land (Between Sammy's & Longhouse)	1/28/19	3/5/19
Step 4 – Scoring Proposals/Bids Received	**Date**	**# Received**
• RFB-Janitorial Services-Courthouse (AK Court System)	2/1/19	2
Step 5 – Council Approval	**Date**	**Status**

Contract or RFP/RFB List	**Notes**	**Expiration**
Bulk Fuel (Delta Western)		6/30/20
Gravel (KNIK)		6/30/24
Engineer Services (DOWL)		6/30/22
Barge Transportation (AML)	2/1 renewal notice due	10/31/20
Calcium Chloride & Sodium Chloride (Span Alaska)	Annual	
Water Treatment Plant Chemicals (Span Alaska)	Annual	
Auditing Services (Altman Rogers)		3/31/20
Accounting Services (Carmen Jackson, CPA)		6/30/20
Computer/IT Services		6/30/19
YK Fitness Center Mgmt.	Contract renewable	6/30/20
Website Hosting (GovOffice)		4/17/20
Background Checks (Accusource)	Annual – no contract now	
Dog Pound Operation (Bethel Friends of Canines)		12/31/20
Insurance Broker-Gen. Liability (Coombs Ins.)		6/30/22
Insurance Broker-Health (Wilson Agency)	3 yr. renewal option notice due July-not given 2018.	6/30/21
Custodian-City Hall & DMV (Midnight Sun)		6/30/19
Custodian-Dept. of Law (Midnight Sun)		6/30/22
Custodian-Courthouse (Kagista)	Monthly after expiration	
Dumpsters	Annual-check budget	
Bus Barn Repairs		
Senior Center Repairs		
Pinky's Park Lighting Project	DOWL doing design now.	
Public Works Building Assessment	DOWL to do?	

PD Dispatch Center Console	ProComm Alaska, LLC	
City Hall Roof	Architects Alaska did assessment	
Courthouse remove water tank ($290,000 est.)		

City of Bethel
Police Department

February, 2019 Monthly Report

Personnel:

BPD and the City Manager has signed the Letter of Agreement to facilitate the assignment of a BPD officer to the WAANT unit. The agreement is in the process of being signed at DPS.

Currently all Patrol Officer positions are filled but both the major crimes investigator and the WAANT Unit investigator positions are vacant. An officer has been chosen to fill the WAANT Unit position once the LOA is signed. We are currently in the background investigation process with two applicants to fill the patrol position that will be vacated by the WAANT investigator. One applicant is currently a CSP and the other applicant is a VPSO in a nearby Kuskokwim village. There is no one currently in patrol interested in filling the major crimes investigator position.

All Dispatch, administrative, CSP and CSO positions remain fully staffed.

Operations:

There were approximately 1,372 calls for service the month of February, a rise of 50 cases from January and down approximately 30 cases from the same period in 2018. The number of calls requiring investigative reports was up one from January to 76 but down 19 from February, 2018. The number of intoxicated pedestrian calls went down 120 from the same period last year and was 10 higher than last month. The number of domestic violence investigations was 31 this month compared to 28 for the same period in 2018 and 19 in January. There were 6 DUI arrests compared to 15 for the same period last year and 3 arrests in December. There were no unattended deaths in February compared to two in January and two in February, 2018.

There remains a missing person case that has been open since December. That individual has not been seen by friends or family since early November. The victim from a domestic assault case in January was released from the hospital and the perpetrator, the victim's son, was indicted for First Degree Assault and other lesser included offenses. The perpetrator remains incarcerated.

Chief Waldron has appeared telephonically at Committee hearings for APSC confirmation but is still awaiting his final confirmation.

Animal Control:

There were 45 animal control calls for service for the month with two reported dog bites.