City of Bethel
Public Works Committee
Regular Meeting - Wednesday, May 15, 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) 04-17-2019 Regular Meeting

VI. UNFINISHED BUSINESS
a) We are Still in - Paris Agreement Standing/Support (Sanders)
b) Feasibility Study for Gasification Incinerator (Municipal Solid Waste)
c) Review Memorandum of Understanding (MOU) between City of Bethel and Lower Kuskokwim School District draft
d) Reconciliation of Hauled Water/Sewer Services
e) Institutional Corridor Water Truck Fill Point

VII. NEW BUSINESS:
a) Review recommendation for the Community Transportation Program
b) Solid Waste/Dumpster Improvements

VIII. DIRECTOR'S REPORT

IX. COMMITTEE MEMBER COMMENTS

X. ADJOURNMENT

Posted May 9, 2019 at City Hall, AC Co., Swanson's, and the Post Office.

Charlie Dan, Public Works Assistant

City of Bethel, Alaska
Public Works Committee Meeting Minutes

April 17, 2019 Regular Meeting Bethel, Alaska

I. CALL TO ORDER:

A regular Public Works Committee meeting was held on April 17, 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, Carol Jung-Jordan, Juan Delgado
Also Present: Charlie Dan, Recorder
Unexcused Absence: Jeff Sanders, Ryan Butte

III. PEOPLE TO BE HEARD:-5 Minute Limit

IV. APPROVAL OF AGENDA:

MOVED BY:	Alyssa Gustafson	Motion to approve the agenda.
SECONDED BY:	Carol Jung-Jordan	
VOTE ON MOTION	Motion carried by unanimous vote.	

V. APPROVAL OF THE MINUTES:

MOVED BY:	Alyssa Gustafson	Motion to approve meeting minutes for 05-16-2018, 06-20-2018, 07-18-2018, 08-13-2018, and 03-20-2019.
SECONDED BY:	Carol Jung-Jordan	
VOTE ON MOTION	Motion carried by unanimous vote.	

VI. SPECIAL ORDER OF BUSINESS:

VII. UNFINISHED BUSINESS:

A. We Are Still In-Paris Agreement Standing/Support (Sanders)

MOVED BY:	Alyssa Gustafson	Motion to table Agenda item until next meeting.
SECONDED BY:	Carol Jung-Jordan	
VOTE ON MOTION	Motion carried by unanimous vote.	

B. Feasibility Study for Gasification Incinerator (Municipal Solid Waste)

MOVED BY:	Juan Delgado	Motion to table Agenda item until next meeting.
SECONDED BY:	Carol Jung-Jordan	
VOTE ON MOTION	Motion carried by unanimous vote.	

C. Review Memorandum of Understanding (MOU) between City of Bethel and Lower Kuskokwim School District

MOVED BY:	Alyssa Gustafson	Motion to table Agenda item until next meeting.
SECONDED BY:	Juan Delgado	
VOTE ON MOTION	Motion carried by unanimous vote.	

VIII. NEW BUSINESS:

A. Reconciliation of Hauled Water/Sewer Services

MOVED BY:	Alyssa Gustafson	Motion to table Agenda item.
SECONDED BY:	Juan Delgado	
VOTE ON MOTION	Motion carried by unanimous vote.	

B. Institutional Corridor Water Truck Fill Point

MOVED BY:	Alyssa Gustafson	Motion to table Agenda item.
SECONDED BY:	Juan Delgado	
VOTE ON MOTION	Motion carried by unanimous vote.	

IX. DIRECTORS REPORT:

X. COMMITTEE MEMBER'S COMENTS:

C.Trammell- Was very happy to see Murkowski's comments.
A.Gustafson- Thank you all for coming.
C.Jung-Jordan- Thank you all for coming, this meeting was well organized.
J.Delgado- TVSS Surge protection should be in all City-owned buildings.

XI. ADJOURNMENT

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

With no further business, meeting adjourned at 6:42 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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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.

City of Kotzebue
Biomass Energy Feasibility Study Report

SUBMITTED BY:

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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

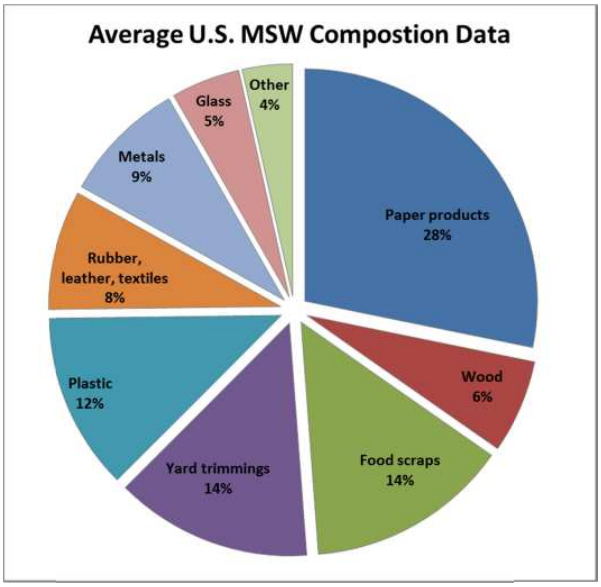
Feedstock supply is the single most important aspect of a biomass energy project. Consistent volumes of underutilized energy sources are critical to a project's operational and financial viability. In this task, Tetra Tech has analyzed the available and accessible volume of biomass supply in the Kotzebue, 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.

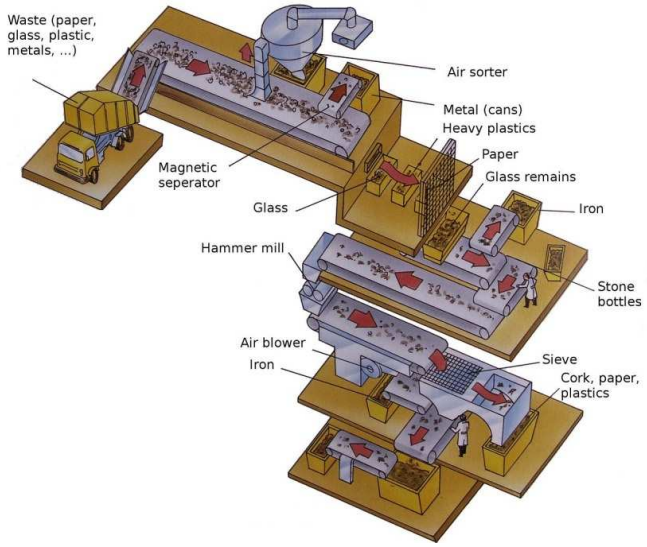
This program can also be implemented along with a recycling program in Kotzebue to divert additional materials from the local landfill. Aluminum and tin, which are easy to separate and are the most cost-effective materials to recycle, can be removed from the waste stream either in conjunction with a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

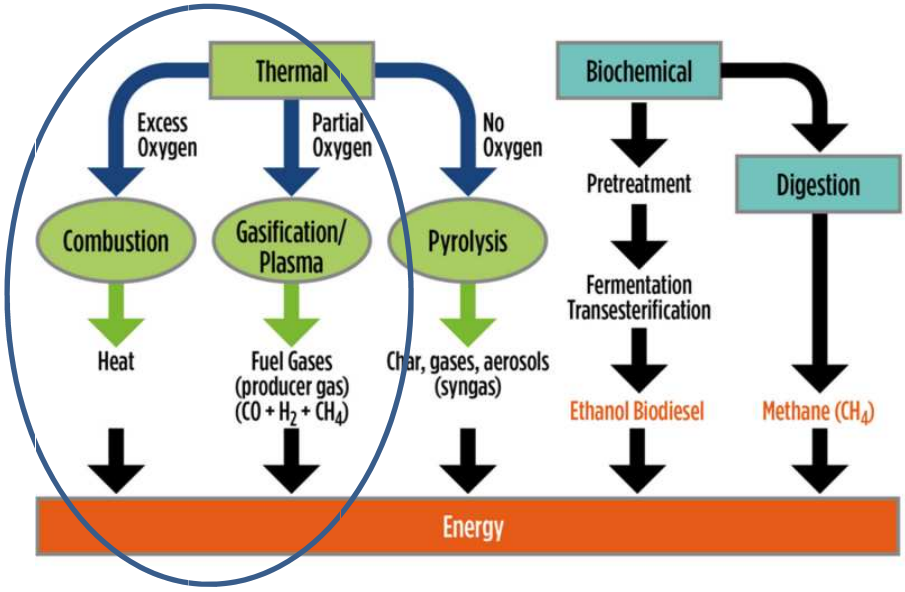
Tetra Tech reviewed major biomass energy generation technology options that are applicable to the general project conditions thus far determined. The following section identifies the most likely process technology for a biomass energy plant in Kotzebue.

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.

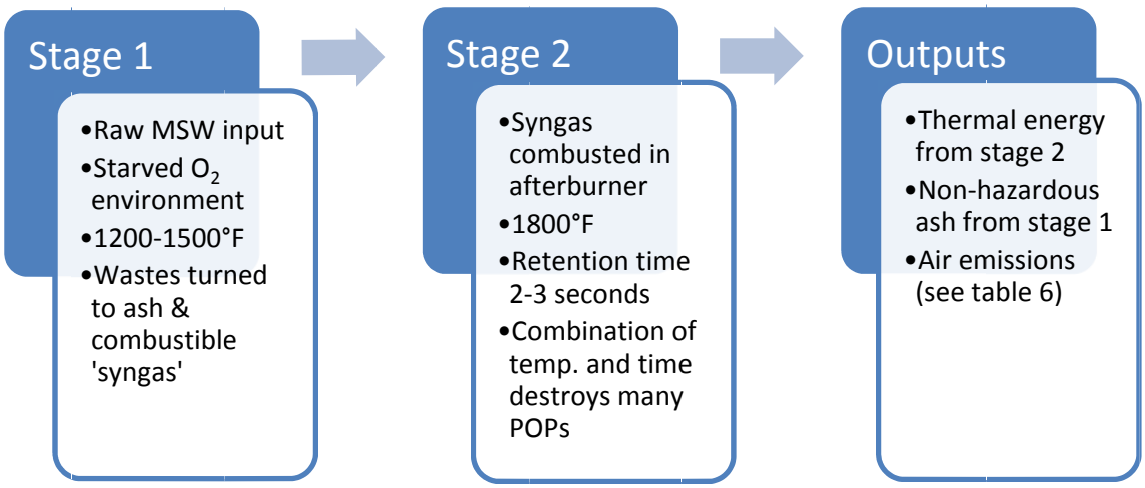
Stoker boilers are most commonly used in existing industrial operations due to their ease of use and maintenance. The stoker boiler process simply involves traditional combustion of feedstock in an oxygen enriched environment, with the thermal energy generated from the combustion used to generate steam.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

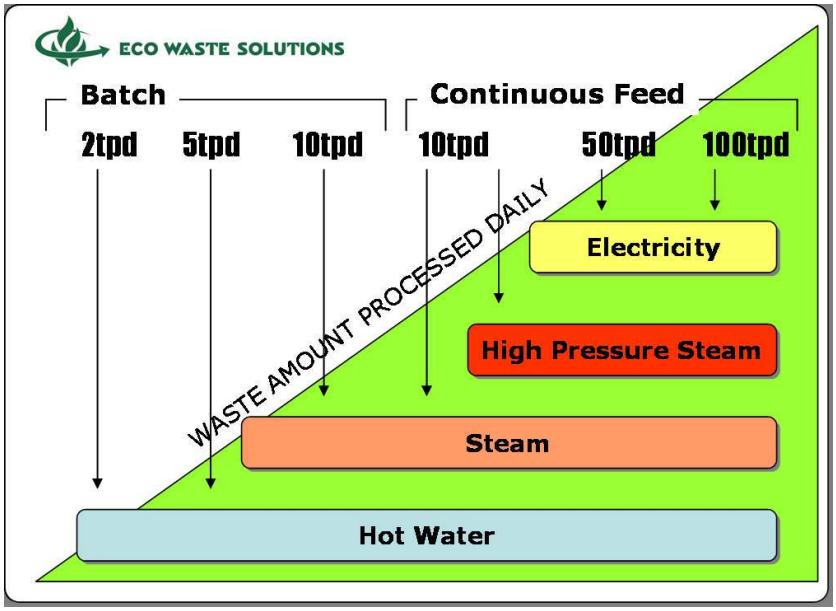
Previous gasification applications installed in Alaska (Barrow, Egegik, Skagway) have been almost entirely of the batch variety, due to these systems relative ease of operation and lessor infrastructure requirements. For the proposed systems involving energy production as well as waste destruction, a 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

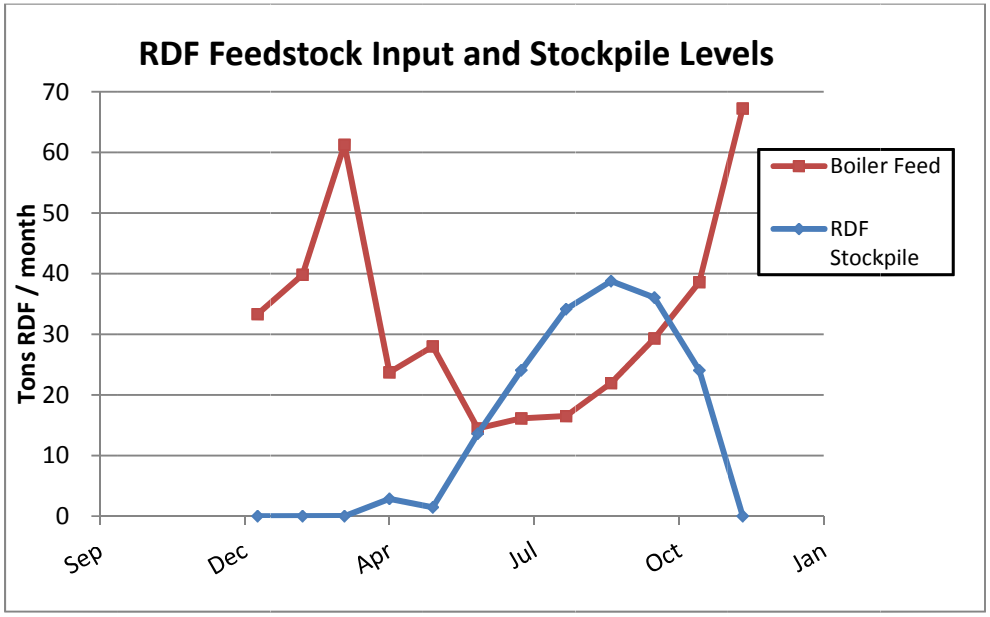
The boiler system in Scenario 1 is designed to be oversized to allow for additional feedstock input and energy users supplied. Primarily, this is because boilers are offered in a relatively standard 1.5 MM Btu size. The additional capacity allows turn-up and turn-down capability to accommodate fluctuations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

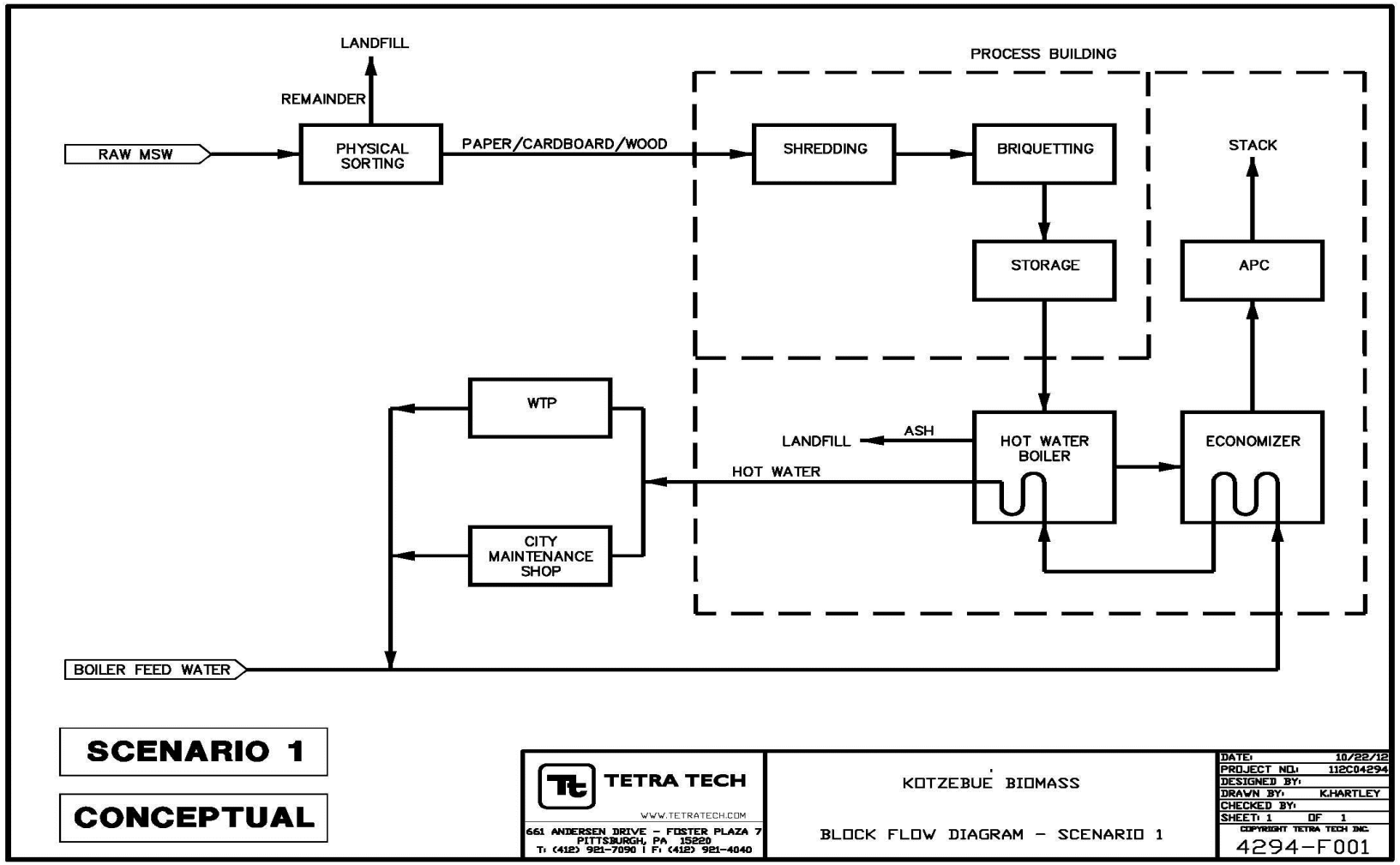
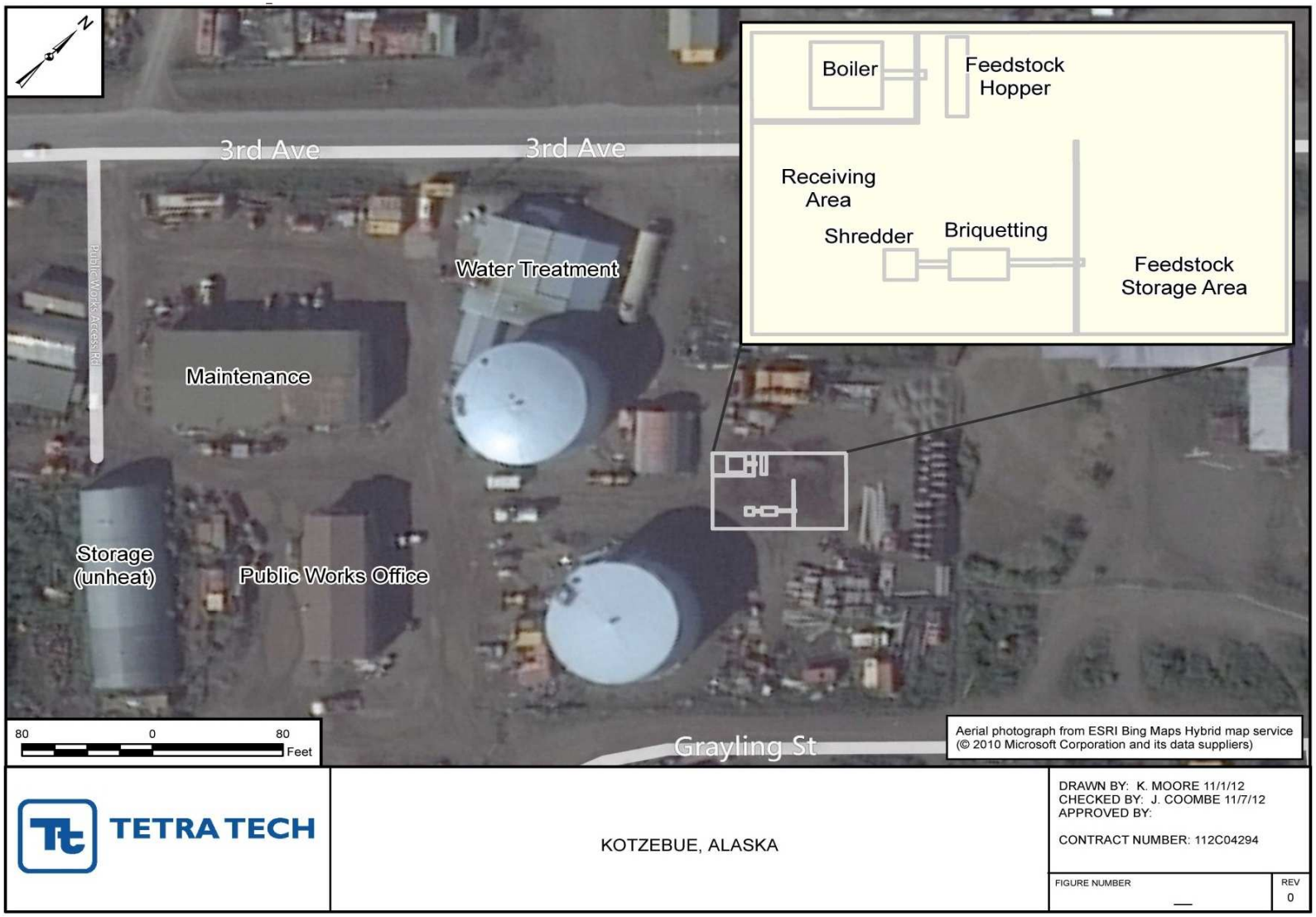


Figure 5-3: Kotzebue Biomass Power Plant Facility Configuration (In-Town RDF Plant)



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.

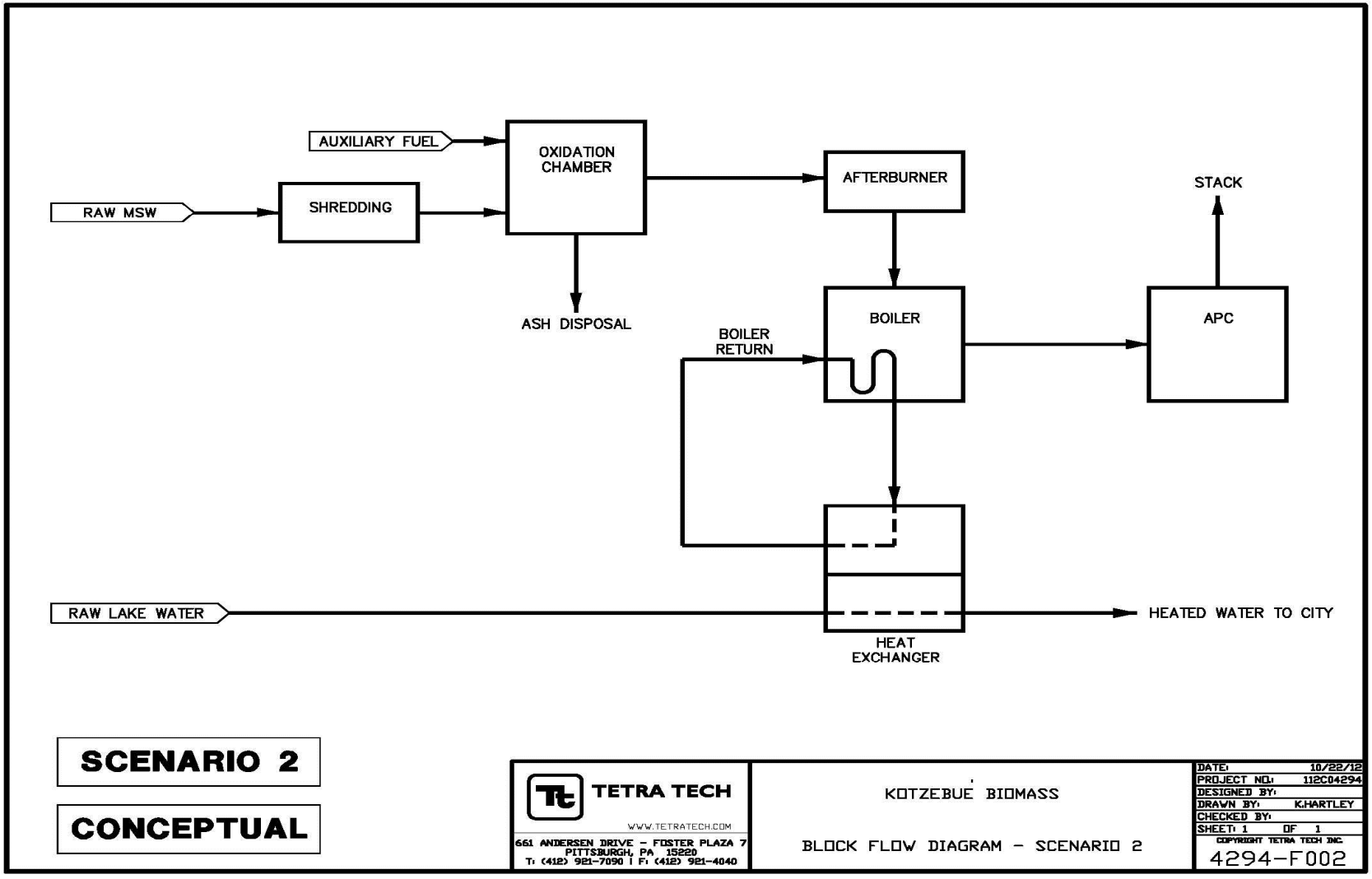
Combustion Byproduct Management

- 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 Bethel

Committees and Commissions

Recommendation to City Council

Committees and Commissions that wish to make a recommendation to City Council should turn this form in to the City Clerk or to the City Council representative on the committee or commission.

Committee/Commission: Public Works Committee	**Chair: Courtney Trammell**
Date Submitted: 05/15/2019	**Council Rep: Carol Jung-Jordan**

Issue: The City of Bethel has an opportunity to prepare and submit a Community Transportation Program application to the Alaska Department of Transportation and Public Facilities to nominate a project for funding in the FY 2020-2023 Statewide Transportation Improvement Plan. Engineer firm DOWL has been contracted to prepare and submit the application. The new deadline is September 15, 2019.

City Administration considered several projects before recommending that a significant road rehabilitation be completed for Akakeek Street, Ptarmigan Street from Lulu Heron to Delapp Drive, and all of Delapp Drive. The City believes that an engineer-designed and rebuilt road from the bottom to the surface will result in less injuries, deaths, and close calls on these roads, which carry pedestrians, bicyclists, pets, four-wheelers, snowmachines, automobiles, and heavy trucks and equipment.

Recommendation: The Public Works Committee recommends to City Council that the City pursue a Community Transportation Program grant application to request funds for the Akakeek, Ptarmigan, and Delapp Heavy Use Road Improvement Project and provide the cash match amount of $175,004 that was approved by City Council on April 9, 2019.

CITY OF BETHEL
Managers Office

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Celebrating 50 Years of Service

DATE: April 30, 2019

TO: Fred Watson, Mayor

FROM: Bill Howell, Acting Manager

SUBJECT: Manager's Report – Month of April, 26 through April 30, 2019

Current Events

- The scope of this report is limited to less than three days in position. City manager duties were assumed on April 26, 2019.
- A meeting was held with our local Union representatives Monday April 30, 2019 to discuss safety and employment conditions for employees. We plan to meet every Tuesday at 10 am to keep an ongoing dialog and to foster better communication.
- The Manager attended the Yuut Elitnurviat Executive Board meeting on April 29th at 1400 hrs. The meeting packet is attached to this report.

Departments

- A department head meeting was held on April 26th at 3 p.m. In the meeting the incoming acting manager was briefed on the status of various department projects

HR

- All department heads and Human resources have been directed to complete all past due evaluations by May 15th 2019
- HR was directed to complete all pay increase as required by the COBEA agreement. Several employees were without evaluations or the required pay increase guaranteed 30-days after their anniversary date.

Finance

- The Finance department is fully staffed. We are enjoying the new energy, experience and knowledge of our new Finance Director, Christine Blake. We warmly welcome Christine to the team and wish her success in her new position with the Cityo of Bethel.

- Finance is working diligently to complete the audit and also get the FY19 budget current.

Public Works

- Avenues water project - bond/loan financing negotiations are oncgoing with a reputable Alaskan firm.

- Public works is investigating the feasibility of credit card acceptors at the public fill points. We are also discussing the viability of a public fill at the City Sub treatment plant.

- Public works has been directed to cap the well at the Nicholson's water works lot that was recently leased to Jared Carr and Naim Shabani. The lessor has asked that the well be capped so they can begin improvements.

- Public works is researching "mile markers" for boardwalks in Pinkie's park. The idea is from recommendation received through the public safety commission.

PD

- The Chief of police has been on training. I will meet with him later this week to receive a briefing on current events in the Police Department.

Planning

- A review of the new proposed Tangik Subdivision preliminary Plat by the City's engineering firm Dowl has been approved and is expected to cost less than $4000.00.

IT/Purchasing agent

- The IT director has updated the City Manager's voice message to a generic City manager response.

- IT is conducting an audit of all City voicemails to ensure they are correct and land in the appropriate office.

- A sole source justification for sewer pump repairs is being prepared to include these services in our sole-source agreement with Alaska Pump and Supply.

Port

- I will be working with the Port on barge renewal.

Fire

- Fire department is in the Midst of completing a Fire Fighter one class and has successfully applied to the Fire Standards Council to hold our first ever Fire Fighter 2 class.

- The Acting Fire Chief is out through May 5 for a family funeral.

Budget / Financial

- Having only 2-1/2 days in the position I have not completed a full review of the FY 2019 Budget nor the budget for the manager's office.

Grants

- I received briefing from the grants manager on the status of all City grants.

- The Grants Manager sought my assistance in issuing the RFB for lift station controls. We are waiting for review by Public Works.

- I have assigned the Grant Manager to serve as the liaison for the City's Long Range Transportation Plan (LRTP). There is an open house for the public, in chambers, from 5:00-7:30 p.m. on May 29, 2019. Council members are invited. Snacks will be served.

PLANNING DEPARTMENT

Monthly Manager's Report April 2019

To: Acting City Manager Bill Howell
From: Planning Director, Betsy Jumper

The Planning Department has officially entered the development season. We have received 10 site plan permits for adding fill to properties, relocating houses on existing properties to abide by setback requirements, and the construction of single family dwellings.

We had a Planning Commission meeting on the 11th of April. Our action items included ONC's Ciullkulek Subdivision Development Agreement recommendation. Commissioners also approved land leases with GCI and BTP LLC.

If all goes well we will have AC Liquor Store's Conditional Use Permit (CUP) on the upcoming May agenda. We are also currently reviewing the Bethel Municipal Code on how to change and rewrite codes. We are also looking into commercial parking lots and the backing up onto the highway.

The 1st of April, administration purposed a new Planning budget that will be reviewed by City Council. The proposal is to defund the current administrative assistant position and change my position to assistant planner and a hire a new planner. I have attended three city council budget meetings but they have not gotten to the Planning budget yet.

KYUK's Reporter Anna Rose MacArthur stopped by the Planning Office for an interview with Pauline and I. We discussed the paper process about the removal of junk vehicles. We shared with her details of the process, and gave her a tour of the Public Works yard where the impounded vehicles get stored.

I also have been working with the subdivision developers. I am currently working with Tanqik and waiting to hear back from them so that we can get everything processed to go to the planning commission. Tanqik Subdivision Agreement is scheduled to be on the June's 2019 agenda.

In conclusion, we anticipate a busy summer, and look forward to what the season is going to bring.

CITY OF BETHEL
Fire Department

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Celebrating 50 Years of Service

DATE: April 29, 2019

TO: Bill Howell, Acting City Manager

FROM: Daron Solesbee, Acting Fire Chief

SUBJECT: Management Report, April 2019

Current Events

- Bethel Firefighters and Utilities personnel tested hydrants on the Institutional Corridor (IC) water system. Several of these hydrants demonstrated flows in excess of 1000 gallons per minute.
- The department is assisting in scheduling hearing testing for May 20-22, 2019.
- We are working with representatives of the Lower Kuskokwim School District to upgrade fire protection systems including a new water storage tank, address signage, hydrant plans, and fire access roads.
- The annual Cama'i Festival was a wonderful success this year. Our staff and volunteers performed safety inspections and alarm tests prior to the commencement. There were no significant EMS or fire incidents during the festival.

Community Planning/Preparedness

- During April, the department ordered 19 address plaques for the community. The department has ordered 769 address signs since inception of the program. For those needing assistance, the department has installed approximately 10% of these signs at the request by property owners. The department also oversees and facilitates ordering of commercial signs with an Anchorage vendor. We are reposting our PSA on social media to rekindle awareness.

- 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 04/02/19 at 7:00 p.m., an EMT Meeting was held at the fire station. Responders reviewed care and treatment for OB/GYN emergencies and practiced the procedure for emergency childbirth.

- On 04/11/19 at 7:00 p.m., a Fire Meeting was held at the fire station. Responders reviewed and conducted drills for vertical ventilation and ground ladders.

- On 04/16/19 at 7:00 p.m., an EMT Meeting was held at the fire station. Responders reviewed and practiced care and treatment procedures for pain management.

- On 04/25/19 at 7:00 p.m., the Fire Meeting was held at the fire station. Responders reviewed procedures and conducted drills for fire attacks.

- Five candidates are progressing through their Firefighter-1 training. Recent topics of instruction include Ventilation, Water Supply, Fire Attack and Foam, Hose Deployments, Fire Fighter Survival, Salvage and Overhaul, Fire Prevention and Public Education, and Fire Fighter Rehabilitation. The course will conclude on June 8, 2019 with State of Alaska Written and Practical Skills Examinations.

- The State of Alaska Bureau of Fire Accreditation, Standards, and Training (BFAST) and Fire Standards Council (AFSC) approved the department to instruct a Firefighter-2 course in June 2019. This course will deliver advanced training in the

Incident Command System, Foam Application, Coordinating a Fire Attack, and Vehicle Extrication.

- EMI-Alaska, Inc. instructed a 16-hour HAZWOPER course to complete the 40-hour HAZWOPER training for City of Bethel personnel on April 10-11, 2019. There is a 3-day OJT requirement for each person to complete in order to receive their 40-hr HAZWOPER certificate. The department contacted EMI-Alaska, Inc. with a request to assist and provide oversight to the City of Bethel in the clean-up of the hazardous materials site next to the Bethel Pool. This will meet the 3-day requirement.

- Captain Solesbee attended the 34th Annual Alaska Association of Fire and Arson Investigators Training Conference in Ketchikan from April 20-27. This training is essential to the department to ensure the proper investigation of fire and arson related incidents.

- The department is coordinating the delivery of a State of Alaska EMT-2 Initial Course from May 26 – June 1, 2019.

Responses

- Between 04/01/19 and 04/29/19 the Bethel Fire Department responded to 134 EMS and 20 Fire incidents.

- During this period, 53 EMS incidents (39.5%) were alcohol-related.

- On 03/05/19 at 6:27 p.m. firefighters responded to East Avenue for the report of a steam bath fire. Upon arrival, Firefighters observed a fully involved steam bath.

- On 04/02/19 at 9:21 p.m. medics responded to Rav'n Alaska for the report of a person who fractured their hip. The patient was assessed and transported to the hospital.

- On 04/02/19 at 11:08 p.m. firefighters responded to Joe Lomack Beach for the report of a bonfire. Firefighters informed the individuals that open burning on the ground is not allowed within City limits. The individuals were advised that they would be allowed to burn items without a burn permit inside a barrel that has a screen on top.

- On 04/04/19 at 10:30 p.m. firefighters responded to Joe Lomack Beach for the report of a fire with intoxicated people around it. On arrival, there was no one around the fire. Crew then put the fire out and returned to quarters.

- On 04/07/19 at 5:08 p.m. firefighters responded to Ptarmigan Road for the report of a grass fire. Firefighters arrived to find a grass fire that was no longer burning, deployed hose line, and checked the area to ensure there were no embers remaining. Firefighters cleared the scene and returned to quarters.

- On 04/12/19 at 6:00 p.m. firefighters responded to the Old Senior Center for the report of a grass fire. Firefighters deployed hose lines, extinguished the fire, and checked the area to ensure there were no embers remaining. Firefighters cleared the scene and returned to quarters.

- On 04/16/19 at 5:00 p.m. medics responded to the YKHC Prematernal Home for the report of a person in labor. Upon arrival, medics assessed the mother and performed emergency childbirth of a healthy baby. Medics transported both patients to the hospital.

Budget/Financial

- The department is operating within budget.
- The proposed FY 2020 budget was submitted to the manager for review.

Grants

- The Department was awarded funding through the Volunteer Fire Assistance program for $7,470, for three sets of firefighting turnouts. Due to Federal budget cuts to the VFA program, this award was cut in half.

- 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 has one open Firefighter/EMT position, which is being advertised on the State of Alaska ALEXS website and nation-wide on the IAFC's Daily Dispatch website.

- All employee evaluations are being completed.

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 System (CAFS) compressor. We are outfitting the new ladder truck with firefighting and rescue equipment.

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 parts on order.
Engine 3	Pumper	1986	*Being outfitted as a tender and water supply unit. 3000 feet of LDH.* (Poor overall condition needs replacement) Generator mounting parts ordered for installation
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

Memorandum

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

April 2019 Current Events

- **New Finance Director:**
  April saw the addition of a new Finance Director, Christine Blank, into the City of Bethel family. She has been added to the City network and has been orientating herself with the workings of the City machine this month.

- **Budget Review with Council:**
  Another highlight of the month was getting the chance to discuss the IT department's budget with the City Council and answer any questions they had over the costs of items, justifications, or places we could possibly cut. As the budget process moves forward, more things may need to be fine-tuned before the IT budget is finalized for FY20.

- **Finalized Policies and Procedures:**
  April saw, in collaboration with the legal department, the finalization of several policies and procedures that will be used to encompass all City employees as far as network usage and appropriate behavior. All employees will be made to sign these policies as read and acknowledged. The policies that were implemented were the following:
  - Computer Use Policy
  - Unique ID Policy
  - Antivirus Policy
  - Media Disposal Policy
  - Password Policy

- **New Access Points for Public Works:**
  Managed to procure the hardware needed in order to swap out the wireless access points at Public Works. The new access points will be the same model that are used throughout the rest of the city and will complete my endeavor for uniformity. The new models offer a lot more control and security than the currently used hardware and perform better overall as far as range and speed. I hope to have the access points set up and installed within the following month.

- **Video Upgrades for Chambers:**
  Managed to obtain and set up some hardware that will allow the City Clerk to more easily present information to both Council and other audiences within Council chambers. We are hoping to replace the projector with large LED televisions that will be easier to see when the room remains lit. Additionally, the Clerk will be able to share on multiple screens at once.

Memorandum

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

- **Caselle Update from 2018.11.204 to 2019.2.135:**
  Pushed a major Caselle update out to all workstations using it. This took the version from 2018.11.204 to 2019.2.135

- **Business-As-Usual:**
  Beyond the above-mentioned items, the month has been spent fixing or helping with run-of-the-mill trouble tickets such as email issues, printing/scanning, Caselle access, cellphone replacement, missing network drives, login problems, etc.

Future Plans

- **Budget Finalization and Projects:**
  Pending the finalization of the FY20 budget, I hope to start getting the ball rolling on whatever capital expenditure projects get approved by Council. In this I will obtain hard quotes for hardware and scopes of work and then, in the next few months, schedule purchases of hardware or services.

MEMORANDUM

DATE: 04.30.2019
TO: Bill Howell, Acting City Manager
FROM: Bill Arnold, Public Works Director
SUBJECT: Manager's Report –

Programs/Divisions

Public Works Director:

Hauled Utilities:

The Hauled Utilities Dept has been doing great this month besides having trouble with the trucks on maintenance. We'd have four to five trucks both for water and sewer routes running but still get the job done. Thanks to all the drivers that are helping out to keep the services running in the hauled utility department.

A few of the trucks are running slower than they usually are pumping and requires more time to finish the routes. A big thank you to all the drivers who are helping others to finish their route sheets on time.

We are looking forward to all the new trucks for the department that will greatly help save time and hopefully getting more drivers to cover the route sheets to finish on time without overtime.

We are getting by with the drivers that are currently working but still need more drivers to finish the work without too much overtime for some of the drivers that are covering for the other drivers on leave or have called in sick.

The Hauled Utility Dept has a very old company truck that I use for this department. The company truck needs a lot of maintenance done and worn out pretty much. The driver side door can't properly close and the door has to be lifted to properly close but still doesn't close properly. Seem like the door was pryed open when the keys were locked in. There is an inch or a half inch gap on the top of the driver door when closed.

The front wheels seem to be misaligned even after the whole drive line was maintained and upgraded. The truck wobbles when doing tight turns like the wheels would come off.

We could use the fuel tank on the truck but the tank is pretty rusted and the fuel filter shows a lot of rust in the tank. The fuel pump seems to be rusted and worn. We tried to get maintenance done on the fuel tank but V&E doesn't want to maintain the fuel tank.

The cab is too small for the CWS workers when I have three CWS workers on board.

The truck uses a lot of fuel even after both tanks are topped off each fuel up. Sometimes the fuel pumps on the two tanks don't work and shots off the engine to start back up with the other fuel tank.

Some of the drivers need safety gear and the high visible safety clothing with the rain gear for the summer seasons. A lot of the drivers need new boots and some are wearing torn up gear or their own personal clothing to work. The work gear doesn't last three months with all the work the drivers do and get pretty torn up by the fourth or fifth month of use. Especially, the high visibility work jackets used by the drivers and we don't have enough funds for the clothing.

Utility Maintenance:

- Lagoon discharge operations are shut-down until spring. Normal operation for winter is ongoing.
- 12 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 and parts have arrived. Repairs expected to take 1-2 weeks. Lift Station is running on 2 pumps for now.
- Clean up and organization of shops.
- 18 residential lift station repairs
- Line flushing and leveling activities on low-flow and plugged 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.
- FAA lift station is thawed out and operational.

Property Maintenance:

- PW Building
  - Boiler #1 completely removed. Boiler #2 is sole operation of building heating system.
  - Hot water system has been removed from PW building as part of the boiler/mechanical space remodel. PW building will not have hot water until the boiler project is complete.
  - Fire sprinkling system in PW still NON operational.
  - Used oil filtration and water separation system needed complete rebuild. Drained down, removed filtering, cleaned and replaced. Addition of plumbing to aid in water separation.
  - Water trapped under building causing drive and parking to wash out. Cut drainage path, de-iced culverts and began pumping water out from low spots under the building.
  - Foundation piling inspection has revealed sinking and heave of support posts and beams.
  - No smoking sign installed on building in appropriate locations.

- City Hall
  - Manually selecting operation of boiler as the temperatures are fluctuating greatly from day to night.
  - Rear entrance stairs are rotting. Two different expanded metal stairs plates had to be repaired. Project to replace the stairs in entirety as a summer project.
  - Wheel chair ramp section at front entrance is showing signs of degradation and will need to be rebuilt or replaced. Project this for summer. Materials quotes requested.
  - No smoking sign installed on building in appropriate locations.
  - Installed TV mount for Lori.
  - Investigated soft section in floor reported by Tamara.

- Court House
  - No smoking sign installed on building in appropriate locations.
  - OCS is moved out of leased space exit walkthrough
  - **Dry Sprinkler System:**
    - Dry system is back in NORMAL operation minus ONE isolated sprinkler head located on the outside of the building to the left of the front main entrance. Project to have contractor complete repair from break Spring/Summer of 2019. Contractor is in communication with city building maintenance and scheduling a time for the work to be completed.
    - The dry system has a small leak in the dry system piping just above court room 4. Leak is temporarily fixed and holding. Static air pressure is remaining constant with additional help from the fire system air compressor. A plan is being developed to have the dry system evaluated for replacement and repair Spring/Summer 2019 by a contracted service.

  - **Holding Cell Area Door:**
    - Door ordered from AHS, shipped and received. Prep work has begun to add the new wiring, relight vision, latching hardware and paint for install. Door removal and replacement will be coordinated with Alaska State Court System. The area where the door is a sensitive area as inmates are transferred through this area.

  - **Water leak damage remediation survey:**
    - Industrial Hygienist from Advanced Look Solutions in Anchorage completed an Environmental survey off all areas within the court system that was affected by the water leak. Sample have been sent to lab in Lower 48 for testing and results are expected to be returned in April.
    - A plan for remediation/remodel work will begin once results are returned and priority areas have been identified.
    - Reports returned. No hazards present in lab samples tested.

  - **Dirty sprinkler heads and escutcheon plates:**
    - All protruding sprinkler heads have been cleaned and inspected.

- Dog Pound
  - Replaced door latching hardware 3 times from vandalism.
  - Bethel Friends of Canines has transitioned and is using the building more often.
  - Area donated for BFK9 kennel relocation has been scraped clear of ice and debris.
  - Surveyed and staked off pad sight for sand pad prep.
  - BFK9 has been in close communication in the process of relocating their kennel to the property.

- Log Cabin
  - Boiler is consistently found tripped during building rounds. Building is temporary closed to resident use of the building due to a sewer line freeze and boiler reliability

issues. Boiler remains operational with daily rounds to ensure adequate warmth of the building. Water service has been isolated and lines drained to prevent freeze up.

- YKFC - Pool
  - Requests for assistance with the boiler are frequent. The department assists when able.
  - Meeting completed with Pool management staff to determine cause of repeated issues with the boiler system. The issues have primarily been pressure related and high temp limit related. Action plan to evaluate the system in its entirety for correct daily operation is in place.
  - Boiler #1 – complete shutdown and cleaning performed. Function checks completed after and boiler placed back online.
  - Water line failed in the pool chemical dispersing system. Line repaired and system put back in normal operation.

- Police Department
  - Periodic low fuel level alarm activation for the emergency power generator. The issue has been isolated to a set of terminals outside the building that get wet and short causing a false alarm. The alarm will short ad activate when the weather is rainy and windy.

- Billy's Water plant
  - Boiler #1 shut down and Boiler #2 fired. To even out boiler usage.
  - Boiler #1 also had a failed fuel pressure gauge. Gauge was replaced Boiler #1 is back in normal operation as needed.
  - No smoking sign installed on building in appropriate locations.

- Sean's Water Plant
  - Boilers monitored daily as they are the main source of heat for the City sub water utility lines.
  - No smoking sign installed on building in appropriate locations.

- Teen Center
  - Boilers are monitored daily as they are a "Boost" of temperatures supporting the heat loop that runs through the City Sub water utility lines.
  - No smoking sign installed on building in appropriate locations.

Parks and Recreation:

- Lions Club Park
  - Picked up trash from entire park location. Emptied ALL trash bins.

As spring is quickly approaches a list of projects for the summer are being developed within the department along with projected timelines.

- Projects so far, more to be considered.
  - Owl Park (projected dates May27th thru June 7th)
    - Install of new playground equipment and play ground material

- All play parks
  - General maintenance and grounds upkeep
- Pinky's Park
  - Softball field refurbish/re-sod/re-seed
  - Dugout repairs, repaint
- Soccer Sports Field
  - Hydro Seed
  - Maintenance contract options for field to be discussed
  - Install bleachers
  - Paint concrete blocks High Vis
  - Install soccer goal posts
  - Place Portable restroom facilities
  - Install bike rack
  - Place information bulletin stand
- Airport Cemetery
  - Ordering additional fencing
  - Installing additional fencing
  - Hydro seeding expanded sections
- Boardwalks
  - Trial Lighting pole project
  - General maintenance and upkeep
  - Vegetation trim back
  - Way finding signage
  - Location marking signage project.

Road Maintenance:

Streets and Roads, now that the city sand pit has been thawing out, we have been out at the pit pushing up sand with the D-8. This will be on-going for the next few weeks as it thaws to strip ground so that we can push up a landfill cover pile, road sand pile, and a road salt sand pile.

Streets and Roads has been hauling cover to the landfill from city sand pit for the last three weeks with one or two dump trucks. We will help as long as we have drivers or dump trucks, and not on other road projects.

Streets and Roads unloaded the four freezer vans of Calcium Chloride 52, 2500lb bags that was on the south side of the city shop. We will start laying this down on the roads when the rain stops and the roads starts drying out.

Streets and Roads is done with the steaming culverts this year, a total of 76, culverts, and in most years we would have to thaw over 150 culverts. The new steamer works great at 350 degrees and higher presser. It is 2-3 times faster, uses less water and fuel than the old steamer.

Vehicles and Equipment:

This month has been productive besides the fact that we have mechanics gone due to injury. We just had a temporary mechanic yesterday. This will help a lot. We did get a couple of the large projects done that were very time consuming. It is still a fight to try and keep up with other departments issues when 95% of out time is fighting to keep the water and sewer trucks on the road. It is going to be nice when the new sewer trucks arrive. On the other hand, the fact that we need to run these water trucks for another 14 months is quite scary. I know I have said it in the

past months but trying to find parts for these dinosaurs is ridiculous and sometimes impossible. It may come down to buying used parts just get us by, since nothing new is available. We have also done a lot of winter tire swapping and routine services. The V&E team has done a great job despite the lack of man power.

Transit System:

The Bethel Transit System and the City's Finance Department has submitted the monthly Budget Summary Billings, to DOT, for the months of July through March. Currently the State has reimbursed the City $138,214.12 from the Federal/State Transit System grant. Leaving $118,206.88 in the grant. As soon as the Finance Department closes April, I will be working on the April Budget Summaries. I need to work with the Finance Department and bring the billing for V & E overhead and parts up to date. So far, we have only claimed it for the months of July, August and September.

The ridership for the month of April has picked up. For the month of April there was 2738 rides. Elders/Seniors (64years old+) 274 rides, who paid the regular fare, 54 rides for youth (3-14 years old), 233 for Disabled and 2400 rides for the general public. General public rides include: 6-10 rides per day for those going to and from work, 25-30 rides per day for those seniors that have monthly and yearly passes, and the remainder are those that go to and from the hospital, post office, stores, and back home. The ridership has increased with ONC purchasing of monthly passes for seniors and caregivers. The revenue for the month of April is $5,200.00.

The Transit System is currently running one route, the Green Line runs Monday through Friday from 6:30am to 10:30am and 11:30am to 6:15pm and Saturday 9:30 -11:30 and 12:30 -2:30.

Bus 437 was purchased in 2008 and is down with a bad motor. The City Shop recommends not fixing it and if they do they'll have to replace the motor. A couple of years ago the City Shop replace the motor in Bus 436 and it cost between $12,000 and $15,000. It was down for over a year. Bus 436 was purchased in 2008 and has over 149,104.6 miles on it. Bus 438 was purchased in 2007 and has 123,865 miles. Our newer bus, Bus 439 purchased in 2014 and has over 145,000 miles. The State's guidelines for replacing cutaway buses was 5 years old and/or 100,000. The City Council and DOT has approved the purchase of a new bus, FY 2019 Grant, it is on order and should be on this summer barge.

Landfill / Recycle Center:

Between landfill personnel and the road crew there has been a lot of cover material that was brought in this month, covering the big stuff (C&D) and keeping the dumpster stuff covered more frequently than normal. Currently, we have two working faces as prescribed by DEC. We have built up a couple of pads with some asphalt that the road crew broke up last summer. Our new road has been properly named Bill's Hill Top Drive as it was his idea and has been a blessing. Nobody stuck this year during breakup.

Water Plant Operations: For the month of April, we continue to make our DMR report for the sewer lagoon. Also our monthly water logs to ADEC for BHWTP and CSWTP. Also our monthly Monitoring Summary test in the field and water plant to OEH and ADEC. ARWA in

process doing our CCRs for BHWTP and CSWTP according to our 2019 Monitoring Summary. Glycol heat for sewer systems at CSWTP in summer mode. Daily safety meeting here at CSWTP.

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. Valve was left partially closed during commissioning
- Fire hydrant static and flow testing was performed to accommodate requests from multiple customers working on sprinkler designs in their buildings.

Staffing Issues/Concerns/Training:

Streets and Roads daily log:

4/1/19
Graded Ptarmigan Road, Akakeek Street, and Ridgecrest Street.
Hauled gravel with the dump truck to Ptarmigan Road, and Akakeek Street.
The steamer was out steaming culverts on 4th Ave., 260 Alder Street, and Ptarmigan Road 8 hours.

4/2/19
Grader was out 9 hours grading roads throughout Bethel start with Ptarmigan Road and Akakeek Street and back to those roads at the end of the day.
Both steamers where out for 8.5 hours steaming culverts in Tundra Ridge, Ptarmigan Road, and Akakeek Street.

4/3/19
The grader was out for 7 hours grading throughout Bethel roads starting on Ptarmigan Road, and Akakeek Street.
Both steamers were out for 7 hours steaming culverts in Larson Sub, Delapp Street, Housing, and Ridgecrest Street.
We had a dump truck hauling cover to the landfill.

4/4/19
Grader was out for 6 hours grading throughout the Bethel roads starting with Ptarmigan Road and Akakeek Street.
The road maintenance crew was out for 4 hours helping the fire department clean up a fuel spill in trailer court with the 420D backhoe and 950 loader.

We dispersed some gravel on Ptarmigan Street to fill in potholes.

4/5/19
The grader was out 7 hours grading roads starting with Ptarmigan Road and Akakeek Road.
Hauled 4 loads of gravel to fill in pot holes at City Subdivision.
Helped building maintenance take down a wheel chair ramp at the old Kilbuck School and haul it to the piped water shop.
The road maintenance crew was out for 3 hours helping the fire department clean up a fuel spill in trailer court with the 420D backhoe and 950 loader.

4/5/19
Graded roads for 8 hours throughout Bethel roads.
Loosened up gravel on the gravel pile for 2 hours
Back blade gravel in the potholes with the 966F loader 5 hours.

4/6/19
Grade roads throughout Bethel for 4 hours.

4/7/19
Took the 966F out to the city sand pit and hauled 9 loads of road sand utilizing the dump truck to disperse sand onto Mission Lake Roads.

4/8/19
Both of the steamers were out steaming culverts in Blue Berry Sub., City Sub., Mission Lake Road, and the culverts at the city shop.
The grader was out grading Kasayuli Subdivision road, City sand pit road, and Standard Oil Road.

4/15/19
Took the loader out to the city sand pit to load dump trucks and hauled cover to the landfill.
Pushed sand out at the city sand pit with D-8 dozer 7 hours.

4/16/19
Took the loader out to the city sand pit to load dump trucks and hauled cover to the landfill with two dump trucks for 7 hours.

4/17/19
Took the loader out at the city sand pit to load dump trucks and hauled cover to the landfill utilizing two dump trucks for 7 hours.
Pushed at the city sand pit with the D-8 for 4 hours.

4/18/19
Drove the 950G loader out to the city sand pit to load dump trucks and hauled cover to the landfill utilizing two dump trucks for 7 hours.
Graded roads for 6 hours in City Subdivision, Ridgecrest Street, 4th Avenue, 6th Avenue.
Unloaded two freezer vans of calcium chloride, total 37, 2500lb bags

4/19/19
Took the 950G loader back out to the city sand pit to load dump trucks and hauled cover to the landfill utilizing two dump trucks for 7 hours.
Unloaded a freezer van of calcium chloride, total 15, 2500lb bags.
Graded Harrison road for 2 hours

4/22/19
Grease up the 950G loader.
Took the 950G loader to the city sand pit to load dump trucks and hauled cover to the landfill utilizing two dump trucks for 7 hours.

4/23/19
Grease up the 950G loader.
Took the 950G out to the city sand pit to load dump trucks and hauled cover to the landfill utilizing two dump trucks for 7 hours.
The sander truck was out 4 hours sanding roads for the school bus and for the public.
Pushed the pile of cover at the landfill with 966F

4/24/19
Greased up 950G loader and took it out to the City Sand Pit and hauled cover to the landfill utilizing two dump trucks for 7 hours.
Pushed up a pile of sand with the D-8 at the city sand pit 7 hours.

4/25/19
Took the 950G out to the city sand pit to load dump trucks and hauled cover to the landfill with the dump truck for 7 hours.
Pushed up a pile of sand with the D-8 at the city sand pit again for 6.5 hours.

4/26/19
Took the 950G out to the city sand pit to load dump trucks and hauled cover to the landfill for 7 hours.
Pushed up road sand and landfill cover at the city sand pit with D-8 for 7 hours.

4/29/19
Graded BIA Road, City Sand pit road, and H-Marker Lake road with grader
Watered down BIA road, Kasayuli Road with water truck.
Pushed at the city sand pit with D-8 for 7 hours

4/30/19
Pushed at the sand pit with the D-8 for 5 hours.
Hauled two cars to the landfill from 6th Ave.
The grader was out grading Ridgecrest Street, Akakeek Street, Kasayuli Sub. , and Ptarmigan Road

MEMORANDUM

DATE: May 7, 2019

TO: Peter Williams, City Manager

FROM: John Sargent, Grant Manager

SUBJECT: Grant Manager's Report – May 14, 2019 Bethel City Council Meeting

STIP Project Nomination

The City is working with DOWL to nominate the Akakeek, Ptarmigan, and Delapp Heavy Use Road Improvement Project to be included in the 2020-2023 Statewide Transportation Improvement Plan (STIP). A City Council resolution, Public Safety Commission Recommendation, and support letters will accompany the request. STIP applications are now due September 15, 2019.

Grant Projects

Lift Station E-Panels and "New" Bethel Main

The City is out to bid on the Lift Station Controls and Improvements project. The prospective contractor will construct and install electric panels for five lift stations and be prepared to construct two more e-panels for two additional lift stations, if the State comes through with the City's additional funding request. The contractor will also rebuild the Bethel Main Lift Station near AC Qucikstop.

Repeaters Purchased

The City prepared all appropriate documents to be able to purchase three public safety repeaters from a NASPO contracted vendor in the amount of $56,600. Funding is from one of the City's Homeland Security grants. The three repeaters will replace the City's three public safety repeaters in use now that are no longer supported by the manufacturer. The new repeaters will allow for the next anticipated narrowband configuration requirement.

APEI Safety Grant Received

The City of Bethel applied for and was awarded a $3,000 safety grant from APEI, the City's insurance company. These grant funds will be used to purchase traffic barricades to help direct traffic and keep City road workers safe, public safety uses, and for events like the Fourth of July celebration.

City of Bethel
Grant Summary
Fiscal Year 2019

Preparing

Sponsor	Name	Products/Services	City Depts. (Partners)	Date	$ Grant $ City Match
AK Dept. of Health and Social Services	CSP Program Grant	Operating costs associated with CSP Program	Police	5/23/19	$323,081 $32,308 in-kind
AK Dept. of Transportation & Public Facilities	STIP – Statewide Transportation Improvement Program	Transportation improvements in Bethel (e.g., roads/trails)	Public Works	5/15/19	$1,075,021 $175,004
United States Dept. of Agriculture-Rural Development	Water and wastewater grant/loan program	Piped water and sewer system in The Avenues subdivision	Public Works	Target 1/31/19	$13,321,000 $306,000

Submitted in Fiscal Year 2019

Most recent first

Sponsor	Name	Products/Services	City Depts.	Date	$ Grant $ Match
Village Safe Water Program, AK Dept. of Environmental Conservation	Sanitation Deficiency Database entries	Heat trace, two utility service trucks, lift station safety installs, Avenues proj. design	Public Works	4/1/19	$1,546,209 $0 expected
Alaska Division of Homeland Security and Emerg. Mgmt.	State Homeland Security Grant Program	Interoperable Comm. Plan, thermal imager, fencing for water tanks, foam extinguishers, Continuity of Op. Plan.	Fire, Public Works	1/31/18	$163,732 0
State of Alaska	Capital Budget Requests	Avenues water and sewer project, Bethel Heights Water Loop A, Dust Control, City Hall Roof	Public Works	12/18	$20,743,645
AK Dept. of Transportation & Public Facilities	Community Transportation Grant	Operate Bethel Transit System	Public Works, Transit Division	12/17/18	$316,832 $86,381

Approved in Fiscal Year 2019

Most recent first

Sponsor	Name	Products/Services	City Depts.	Date	$ Grant
Alaska Public Entity Insurance	Safety Grant	Traffic safety barricades	Public Works	5/7/19	$3,000
AK Dept. of Envior. Cons., Village Safe Water Program	Infrastructure Protection Funding	Heat trace from FAA lift station to Q2 lift station.	Public Works	2/8/19	$127,500 22,500
Alaska Dept. of Environmental Conservation	Alaska Village Safe Water Program	Preliminary Engineering Report & Environmental Report for Bethel Heights Sewer System	Public Works	11/27/18	$75,000

Not Approved in Fiscal Year 2019

Most recent first

Sponsor	Name	Products/Services	City Depts.	Date	$ Grant

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: 30 April 2019

Position	Number of Vacancies	Number of New Applications	Number Hired During Period	Number of Vacancies Remaining	Applicants in Review
City Manager	1	0	0	1	0
Driver Hauled	5	4	0	5	0
Bldg Maint Wkr	1	0	0	1	0
Util Maint Wkr	1	0	0	1	0
Police Officer III	1	2	1	1	0
Fire Fighter	1	0	0	1	0
TOTALS	**10**	**6**	**1**	**10**	**0**

Applications and Hiring:

Currently developing recruiting strategy and coordination with the City Clerk to announce the vacant City Manager position.

HR received a total of 6 **Applications** in April

From those 6 Applicants:

4 applicants were not selected due to failure to meet licensing requirements, pending current criminal charges, or performed poorly during the interview process.

1 applicant was hired as a police officer with a start date of 13 May 2019.

We currently have 6 job positions with a total of 10 openings, with 0 applications under review as follows:

City Manager: Coordinating outreach recruiting.

Driver Hauled Utility (5 positions): Currently announced.

Utility Maint Wkr: Announced.

Building Maint Wkr: Announced

Police Officer III: One hired, one failed background process.

1 firefighter position: Announced

BEACON Programs:

3 Random Beacon test were conducted during the month of April.
2 Post Accident Beacon Test were conducted.

Reports of Injury:

There were two reports of injury

Administrative Actions:

Currently closing out all overdue employee performance evaluations.

Multiple routine PAR actions were executed.

Multiple yearly performance evaluations were submitted and processed.

Employee related announcements:

There were no announcements during the month of April.

https://akpei.com/fmla-resources-for-employers/

Training, Conferences and Seminars:

No one currently scheduled

James P. Harris
Human Resources Manager

PORT OF BETHEL

Post Office Box 1388
Bethel, Alaska 99559
Voice: 907-543-2310
Fax: 907-543-2311

TO: Bill Howell, Acting City Manager

FROM: Allen Wold, Port Director

SUBJECT: April 2019 Managers Report

- **Small Boat Harbor**
  -2019 SBH permits came in.
  -Cleaning around the harbor using Loader and the Dump truck.
  -Repairing floats.

- **City Dock/Beach 1**
  -Customers are in and out of the Dock.
  -Crowley, Faulkner, and Vitus working on the tugs and barges.
  -Using a trash pump to drain ditches around the City Dock.
  -Hauling gravel to the Dock (5 loads)
  -Cleaning up the Dock and repairing the warehouse.

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

- **Admin**
  -Monthly Storage billing for customers.
  -Had a Port Commission on April 15th 2019 (no quorum).
  -Worked on FY 20 Budget.
  -Hired a temp City Dock Attendant with a class A CDL.

- **Seawall**
  -Consistent clean up.
  -Attached orange fencing along cable fencing across 1st National.
  -Tightened cable fence/welded new posts and strung cable fencing at the East Addition, 1st National and Lower Access.
  -Put gravel down on the Lower Access road on the trail.

- **Misc./Vehicles**
  -Safety checks along the seawall.
  -Safety Meetings.
  -V&E working on our trucks.
  -Helping Public Works haul dirt up to the Landfill.
  -Working on the Water truck and the Grader.

TO: **Bill Howell**

FROM: **Christine Blake, Finance Director**

SUBJECT: **April 2019 Managers Report**

My first month with the City of Bethel has been busy with meeting people and getting a sense of what the Finance Department needs to accomplish in the short and long term. I've developed a fluid list of goals which seems to change and grow daily.

Highest priority items I spent time on:

1. Status of the FY18 Audit- Facilitated the completion of the list of pending items requested by the auditors. The items are needed in order to issue our FY18 Audit Report. Most items needed have now been sent to the auditors. Financial statements are being compiled by the contractor and should be sent to the auditors in the next few weeks.

2. FY20 Budget was already drafted when I arrived. I've been working in the budget documents to become familiar with the numbers and to make revisions requested by Council.

3. Facilitated the update of the majority of our general ledger accounts through March, 2019.

4. Getting to know Finance staff, what they do, and what they need to succeed.

April, 2019 Monthly Report

Personnel:

Two conditional job offers were made to prospective patrol officer applicants. Unfortunately one applicant was not successful in the process. The other applicant was successful and starts on May 13th. One patrol sergeant announced his resignation effective 5/19/2019. An internal candidate has also signed a condition job offer and is continuing through the background process. If successful, he will be required to attend the Academy in Sitka starting in August. The investigator assigned to the AST WAANT unit is reportedly doing well. He is currently attending a narcotics investigator course for 2 weeks.

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

Operations:

There were approximately 1,602 calls for service the month of April, a rise of approximately 230 cases from March and down approximately 150 cases from the same period in 2018. The number of calls requiring investigative reports was at 88, down one from March but up 8 from 2018. There were 520 intoxicated pedestrian calls compared to 590 for the same period last year. The number of domestic violence investigations was 37 this month compared to 23 for the same period in 2018 and 26 in March. There were 9 DUI arrests compared to 3 for the same period last year and 1 arrest in March. There was one death investigation in April, compared to 4 for the same period last year.

BPD investigated an assault at The Long House Hotel that resulted in the victim being sent to Anchorage for treatment of his injuries. That case was forwarded to the District Attorney's Office for review. BPD also

investigated a death at the Sobering Center. No foul play is suspected in that case.

Chief Waldron was confirmed by the Alaska Legislature for his appointment to the Alaska Police Standards Council.

Animal Control:

There were 37 animal control calls for service for the month with no reported with one reported dog bite.