File No. 1802

CITY/BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY

Engineering Department

REQUEST FOR PROPOSALS

(C3) RFP E14-240

BIOSOLIDS TREATMENT AND DISPOSAL EVALUATION, PHASE II

Issued by: _____ **Date:** 3/19/14
Greg Smith, Contract Administrator

SCOPE OF SERVICES: The City and Borough of Juneau (CBJ) is requesting proposals from qualified consultants to provide services for the Biosolids Treatment and Disposal Evaluation, Phase II project.

PRE-PROPOSAL MEETING: A non-mandatory pre-proposal meeting will be held in the 3rd floor Engineering Department conference room, 230 South Franklin Street, Marine View Center, at **10:00 a.m., Alaska time on April 1, 2014.** Persons interested in submitting proposals are encouraged to attend. A conference call has been set up for the Pre-Proposal meeting. Proposers intending to participate via teleconference shall notify Janet Sanbei in the CBJ Engineering Contracts Division, at 907-586-0480, or email contracts@ci.juneau.ak.us by 4:30 p.m., on March 31, 2014.

QUESTIONS REGARDING THIS RFP: Greg Smith, Contract Administrator, phone 907-586-0873, fax 907-586-4530, greg_smith@ci.juneau.ak.us is the sole point of contact for all issues pertaining to this procurement.

DEADLINE FOR PROPOSALS: 7 copies of the proposal, in a ***sealed envelope***, must be received by the Purchasing Division prior to 2:00 p.m. Alaska Time on **April 10, 2014**, or such later time as the Contract Administrator may announce by addendum to planholders at any time prior to the submittal date. Proposals will be time-stamped by the Purchasing Division, which will establish the official time of receipt of proposals. Late proposals will not be accepted and will be returned unopened. Faxed or emailed proposals will not be accepted.

Note: Mailing/delivery times to Alaska may take longer than other areas of the U.S.

Proposal documents delivered in person or by courier services must be delivered to:

PHYSICAL LOCATION:
City and Borough of Juneau, Purchasing Division
105 Municipal Way, Room 300
Juneau, AK 99801

Proposal documents delivered by the U.S. Postal Service must be mailed to:

MAILING ADDRESS:
City and Borough of Juneau, Purchasing Division
155 South Seward Street
Juneau, AK 99801

The CBJ Purchasing Division's phone number is 907-586-5258, and fax number 907-586-4561.

Please affix the label below to the outer envelope in the lower left hand corner.

IMPORTANTNOTICE TO PROPOSER

To submit your proposal:

1. Print your company name and address on the upper left corner of your envelope.
2. **Complete this label and place it on the lower left corner of your envelope**

RFP NUMBER:
E14-240

SUBJECT:
Biosolids Treatment & Disposal Evaluation, Phase II

DATE OF OPENING AT 2:00 P.M. ALASKA TIME

SEALED PROPOSAL

Disadvantaged Business Enterprises are encouraged to respond.

TABLE OF CONTENTS

1.0 GENERAL INFORMATION

This Class 3 Request for Proposals (RFP) defines the scope of the project, explains the procedures for selecting a firm to provide the requested services, and defines the documents required to respond to the RFP.

1.1 Purpose

The purpose of this document is to solicit proposals from qualified consultants to provide analysis services for Biosolids Treatment and Disposal Evaluation, Phase II.

The Class 3 process is used for acquisition of professional service contracts estimated to be more than $50,000.

1.2 Scope of Services

The consultant shall analyze a minimum of three biosolid alternatives that were carried forward from the first study including:

1. Incineration
2. ATAD
3. Heat Drying

Additional alternatives may be analyzed if the consultant makes a recommendation to the CBJ and further research is approved.

A detailed evaluation of factors shall be performed for each alternative that includes:

- system and infrastructure
- additional infrastructure and land needs
- timeline for implementation
- location of the technology
- brief case studies of proposed technologies installed at other treatment plants
- logistics of transport
- public health and safety issues
- environmental and permitting issues
- additional process treatment requirements or optional processes to optimize the treatment
- end product disposal method
- detailed operational and capital cost estimates for each treatment and disposal technology and method
- energy consumption and sourcing

The analysis of energy use, consumption and sourcing shall be considered in light of CBJ's commitment to reducing greenhouse gas emissions and the use of fossil fuels. An evaluation of the energy use and carbon footprint in terms of treatment and disposal shall be included in the report. The consultant shall be familiar with the Juneau Climate Action & Implementation Plan, November 2009. This plan can be found online at: http://www.juneau.org/manager/documents/CAP_Final_Nov_14.pdf

A report shall be generated from this analysis identifying specific technologies and costs that are appropriate for the Juneau wastewater process. The conclusion of the report shall be a recommendation for the **treatment and disposal** method that is most appropriate for Juneau based on the evaluation of factors listed above.

This evaluation and recommendation shall be based on a thorough understanding of Juneau's wastewater treatment plants, operational challenges, existing technology, and the physical limitations of the environment and location of Juneau and the plants. The evaluation and recommendation shall be appropriate and customized for Juneau.

To perform this analysis, the consultant shall work closely with CBJ Public Works and Engineering staff. Draft submittals and interim presentations to staff shall be required. This report and evaluation shall provide the CBJ with enough information to begin design development for the implementation of the recommended system.

This contract may be amended to include design development and construction document preparation for the biosolids treatment and disposal solution.

1.3 Completion

Consultant shall present a draft report by July 15, 2014. The final report shall be due by August 30, 2014.

1.4 Background

Juneau is Alaska's Capital City. The CBJ municipal offices are located at 155 South Seward Street, Juneau, Alaska 99801. The Engineering Department is located on the 3rf Floor of the Marine View Center, 230 South Franklin Street, Juneau, Alaska.

The City and Borough of Juneau (CBJ) utilized a sludge incinerator from 1990 until 2009, when the incinerator was taken out of service due to numerous mechanical failures. After shutdown of the incinerator, the only immediate, viable sludge disposal option was landfilling, which required CBJ to ship the sludge in barge containers to certified landfills in the lower 48. Since that time, the CBJ has been considering a variety of options. The first option was to rehabilitate the incinerator, but in 2010 that option was considered too costly. The second option was composting, however despite some support and investigation for this option, this has not moved forward because of concern about the suitability for composting as a solution for a city as large as Juneau. The CBJ is still shipping its sludge down south.

The CBJ produces approximately 18.5 wet tons of solid waste per day. In 2012, CBJ shipped approximately 7,280 wet tons of dewatered sludge cake and grit at a disposal cost of approximately $721,200. The sludge is currently shipped to a landfill in Oregon and the cost rises each year as the cost of fuel rises. If secondary treatment can be added to the sludge processing to produce biosolids, the CBJ can realize a significant decrease in the product that must be disposed. Biosolids are a much more stable and environmentally safe material that may not require shipping south.

In 2013, the CBJ evaluated ten practical secondary treatment options to produce biosolids and viable long term disposal options for the product. See the attached report, Biosolid Management System Alternatives Study.

1.5 Questions

Questions regarding this proposal should be directed to:

Greg Smith, Contract Administrator
City and Borough of Juneau
ENGINEERING DEPARTMENT
Marine View Center – 3rd Floor
230 South Franklin Street
Juneau, Alaska 99801

email: greg_smith@ci.juneau.ak.us
Telephone: (907) 586-0873
Fax: (907) 586-4530

Office hours are 8:00 a.m. to 4:30 p.m. local time, Monday through Friday.

1.6 Standard Contract Language

Attached to this RFP is the CBJ's standard contract (Attachment 1) which should be carefully reviewed by proposers, as it is the form of agreement that the CBJ intends that the selected Consultant sign in the event of acceptance of its proposal.

2.0 Rules Governing Competition

2.1 Pre-Proposal

Proposers should carefully examine the entire RFP and any addenda thereto, and all related materials and data referenced in the RFP. Proposers should become fully aware of the nature of the services requested and the conditions likely to be encountered in performing the services.

2.2 Proposal Development

The content of proposals will be kept confidential until the selection of the Consultant is publicly announced. All materials submitted in response to this RFP will become the property of the CBJ. One copy shall be retained for the official files of the Engineering Department and will become public record after announcement of the successful Proposer. The CBJ will not return proposals to the Proposer. The CBJ reserves the right to reject any or all proposals. Proposals are to be prepared in such a way as to provide a straightforward, concise delineation of the Proposer's capabilities to satisfy the requirements of this RFP. Emphasis should be concentrated on conformance to the RFP instructions, responsiveness to the RFP requirements, and on completeness and clarity of content.

This solicitation does not commit CBJ to select any Consultant(s) for the requested services. All costs associated with the respondents' preparations, submission and oral presentations (if applicable) shall be the responsibility of the Proposer.

All proposals must be signed. Proposals must be received in the number of copies stated in the RFP no later than the date and time specified in the cover letter. All copies of the proposals must be under sealed cover and plainly

marked. Proposals not received by the date and time specified in the cover letter will not be considered.

2.3 Disclosure of Proposal Contents.

The City and Borough of Juneau, a municipal corporation and political subdivision of the State of Alaska, is subject to the Alaska Public Records Act codified at AS 40.25.100-220, and the public records provisions in the CBJ Charter, section 15.7. The contents of proposals submitted in response to this RFP will be kept confidential until the top ranked proposer is announced. Immediately following announcement, all proposals become public information. Trade secrets and other proprietary data contained in a proposal may be held confidential, to the extent allowed by law, by the Purchasing Officer, upon request in writing by a proposer. Material considered confidential by the proposer must be clearly identified and marked (page, section, etc) by the proposer, and the proposer must include a brief statement that sets out the reasons for confidentiality. Marking the entire proposal confidential is not acceptable and may be cause for the City to reject your proposal as non-responsive.

3.0 PROPOSAL CONTENT REQUIREMENTS

To achieve a uniform review process and obtain the maximum degree of comparability for the Selection Committee, proposals should be organized in the manner specified below and not be more than 20 pages in length, excluding resumes:

3.1 Title Page

Show the RFP subject, the name of the firm, address, telephone numbers, and name of contact person and date of submission.

3.2 Table of Contents

Clearly identify the materials by selection and page number.

3.3 Letter of Transmittal

Limit to one or two printed pages.

3.3.1 Briefly state the firm's understanding of the proposal requirements and summarize your capability to meet same.

3.3.2 Give names of the person(s) who will be authorized to represent the firm, their title(s), address(es) and telephone number(s).

3.3.3 The transmittal letter must be signed by a representative who has authority to bind the firm. Name and title of the individual signing the proposal must be printed below or adjacent to the signature.

3.3.4 ***Acknowledge receipt of all addenda.*** Failure to acknowledge addenda may result in the proposal being considered non-responsive and subject to rejection.

3.4 Scope of Services and Work Plan

3.4.1 Discuss the Scope of Services and how the firm will provide the desired services. Include a statement of approach and methodology for accomplishing the requested services.

3.4.2 Provide a work plan which includes a proposed project schedule. This schedule should identify major tasks and critical components of the project. If the Consultant's team anticipates delays or problems with the design schedule, describe these issues in detail.

3.4.3 Discuss the incorporation of this project into the firm's current workload and the ability of the Consultant's team to meet the project schedule. Provide a staff schedule, identifying primary personnel and subconsultants and how their proposed work schedule during different phases of the project. How much priority can/will this project be given?

3.5 History and Experience

3.5.1 Provide company names, individual contacts, and telephone numbers of references for at least two similar projects which are of the same general concept requested in this RFP.

3.5.2 Provide general background information on the firm including specialized experience, capabilities, and unique qualifications in the field. This should include information outlining the firm's experience in the specific professional services requested.

3.6 Proposer's organization and Personnel Qualifications

3.6.1 Describe the organizational structure of the Consultant team for this project with an organizational chart or other diagrammatic explanation. Describe how this project fits into the firm's over-all organization.

3.6.2 Specify the project manager and other personnel who will be directly providing services for the CBJ in various areas of the described project and state their position. The names, titles and resumes of listed personnel should be provided. Please indicate the experience of each member specifically as it applies to this type of project.

3.7 Firm's Hourly Rates

Evaluation will include the hourly rates of pay for personnel to be used on this project. Include a list of reimbursable expenses typical for this type of project. Hourly rates shall include all markups and multipliers. Hourly rates shall remain in effect for the life of the contract with no increases.

3.8 Licenses

Professional registration (Engineer/Architect/Land Surveyor/Landscape Architect) in the State of Alaska at the time of proposal submission is required (Alaska Statute 08-48-281).

If a corporate license is held, the professional licensed in the State of Alaska (in order to obtain a corporate license) must be in responsible charge of the project, as well as the professional stamping the work.

All survey work involving property or boundary surveys must be stamped by a Professional Land Surveyor licensed in the State of Alaska.

All reports prepared by a registered professional licensed in the State of Alaska must be stamped by the registered professional.

The proposal must include a statement indicating that all required corporate, all required professional occupational licenses and all other necessary licenses/certifications are currently held. License/certification numbers must be provided.

4.0 EVALUATION OF PROPOSALS

4.1 Criteria

Proposals will be evaluated and scored, using the criteria on the EVALUATION/RANKING page, found at the end of this document, in order to ascertain which proposal best meets the needs of the CBJ. The items to be considered during the evaluation and the associated point values are located on the EVALUATION/RANKING sheet at the end of this RFP.

4.2 Evaluation Data

The evaluation Data discussed below is the presented in an effort to delineate what criteria will be used to score proposals. Please do not include a separate section in your proposal for Evaluation Data. Much of the information discussed and requested below should be included in the proposal as part of the Proposal Content Requirements discussed in SECTION 3.0 of this RFP.

4.2.1 Proposed Method to Accomplish the Project

a. Work schedule and methodology will be evaluated according to budget sensitivity, efficiency, completeness and pertinence of the tasks submitted by the Proposer, as well as the creativity and logic of the overall approach. The proposal should show interest and insight about this project.

4.2.2 Organization, Capacity of Firm and Personnel Qualifications

a. Evaluation will be made of the Proposer's organization and the ability to perform the desired services within the established schedule.

b. Evaluation will be made based on proposed personnel, their relevant qualifications and experience, and their proposed scale of involvement.

4.2.3 Relevant Experience and Past Record of Performance

Evaluation will be made of the Proposer's experience with projects of similar scope and scale, as well as other projects with the CBJ, other government agencies and private industry.

4.2.4 Firm's Hourly Rates

Evaluation will be made on the proposed hourly rates of pay for personnel to be used on this project.

4.2.5 Quality of the Proposal

Is proposal clear and concise? Is proposal responsive to the needs of the project? Evaluation will include the clarity and professional quality of the document(s) submitted.

4.2.6 Juneau Proposer according to **SECTION 7.0**

Prime Consultant meets Juneau Proposer requirements as stipulated in Section 7.0 – Juneau Proposer Points.

4.3 Evaluation Process

Evaluation of the proposals will be performed by a committee selected by the City and Borough of Juneau. The intent of the CBJ is to make award based on written proposals.

5.0 SELECTION AND AWARD

An evaluation committee will review, evaluate, score and rank proposals, in accordance with criteria identified below and the Evaluation/Ranking sheet located at the end of this RFP. Clarification of submitted material may be requested during the evaluation process. Interviews by telephone with top ranked Proposers may also be conducted at the discretion of the evaluation committee. If necessary, in-person interviews will be conducted. Finalists will be notified and informed of interview requirements. In the event of a tie in the ranking totals, only the raw scores of the Proposers who are tied will be totaled to determine the appropriate ranking. The successful Proposer will be invited to enter into contract negotiations with CBJ. Upon conclusion of successful negotiations and compliance with any pre-award obligations, award will be made in the form of a contract and a purchase order, if appropriate, will be sent to the Consultant. If an agreement cannot be reached during the negotiation process, the City will notify the Proposer and terminate the negotiations. Negotiations may then be conducted with the next Proposer in the order of its respective ranking.

6.0 INSURANCE REQUIREMENTS

The insurance requirements for this project are specified in Attachment 1 – Sample Contract, under Appendix C.

7.0 JUNEAU PROPOSER POINTS

Juneau proposer points shall be awarded if the Proposer is determined to be a "Juneau proposer" meeting the criteria of CBJ's Purchasing Ordinance 53.50, Section 53.50.010. CBJ Ordinance 53.50 can be viewed electronically at the following internet address: www.juneau.org/law. ***Note:*** *The criteria for meeting Juneau Proposer requirements have changed. Please review the new requirements and contact the CBJ Engineering Department or Purchasing Division with any questions.*

A paper copy of the CBJ Purchasing Ordinance is available upon request from the CBJ Engineering Department or Purchasing Division.

8.0 PROTESTS

The protest period begins with the posting of a notice of apparent successful proposer, in the CBJ Purchasing Division.

Protests shall be executed in accordance with CBJ Ordinance 53.50.062 PROTESTS and 53.50.080 ADMINISTRATION OF PROTEST. Copies of the ordinances describing protest procedures are available from the CBJ Purchasing Division, 155 South Seward Street, Juneau, Alaska. Questions concerning protests or protest procedures should be directed to the CBJ Purchasing Officer at 907-586-5258. CBJ Ordinance 53.50 can be viewed electronically at the following internet address: www.juneau.org/law.

9.0 CONSULTANT'S GOOD STANDING WITH CBJ FINANCE DEPARTMENT

Consultants must be in good standing with the CBJ prior to award, and prior to any contract renewals, and in any event no later than ***seven business days*** following notification by the CBJ of intent to award. **Good standing** means: all amounts owed to the CBJ are current and the Consultant is not delinquent with respect to any taxes, fees, assessment, or other monies due and owed the CBJ, or a Confession of Judgment has been executed and the Consultant is in compliance with the terms of any stipulation associated with the Confession of Judgment, including being current as to any installment payments due; and Consultant is current in all CBJ reporting obligations (such as sales tax registration and reporting and business personal property declarations). Failure to meet these requirements may be cause for rejection of your proposal. To determine if your business is in good standing, or for further information, contact the CBJ Finance Department's Sales Tax Division at (907) 586-5265 for sales tax issues, Assessor's Office at (907)586-0930 for business personal property issues, or Collections Division at (907) 586-5268 for all other accounts.

Note: Juneau Proposer preference (7.0) has requirements regarding a firm's good standing with the City at the time a proposal is submitted. Please review the Purchasing Code cited.

CONSULTING FIRM: _____

SCORED BY: _____ **DATE:** _____

EVALUATION/RANKING

		POINTS AWARDED	
		Points Possible	**Score**
4.2.1	Proposed Method to Accomplish the Project	0 - 25	
4.2.2	Organization, Capacity of Firm and Personnel Qualifications		
	a. Organization and ability to perform services within desired schedule	0 – 20	
	b. Experience of proposed personnel and scale of involvement	0 – 20	
4.2.3	Relevant Experience and Past Record of Performance	0 – 20	
4.2.4	Proposed Hourly Rates	0 – 5	
4.2.5	Quality of Proposal	0 – 5	
		Subtotal	
The Engineering Contract Administrator will assign points for criterion 4.2.6 below			
4.2.6	Juneau Proposer (according to SECTION 7.0)	0 or 5	
	TOTAL POINTS	**100**	
	INDIVIDUAL RANKING		

ENGINEERING DEPARTMENT

ATTACHMENT 1

PROFESSIONAL SERVICES CONTRACT
Biosolids Treatment and Disposal, Phase II
Contract No. RFP E14-240

This Agreement is entered into by and between the City and Borough of Juneau, Alaska ("City"), and _____company name_____ whose address is _____phone and fax__ ("Consultant").

Witnesseth:

Whereas, the City desires to engage the Consultant for the purpose of rendering certain professional services, and

Whereas, the Consultant represents that it is in all respects licensed and qualified to perform such services;

Now, Therefore, the parties agree as follows:

1. CONTRACTUAL RELATIONSHIP. The parties intend that an independent Consultant/City relationship will be created by this Contract. City is interested only in the results to be achieved, and the conduct and control of the work will lie solely with the Consultant. Consultant is not considered to be an agent or employee of City for any purpose, and the employees of Consultant are not entitled to any benefits that City provides for City's employees. It is understood that the City does not agree to use the Consultant exclusively. It is further understood that the Consultant is free to contract for similar services to be performed for others while it is under contract with the City.

2. SCOPE OF SERVICE. The Consultant shall carry out in a professional and prudent manner all of the services required by the Contract. These services include all of the services described in Appendix A. Consultant will diligently proceed with the Scope of Services, and will provide such services in a timely manner.

3. PERSONNEL, EQUIPMENT, SUPPLIES, AND LICENSES.

(A) Except as noted in Appendix A, the Consultant represents that it has or will secure at its own expense all personnel, equipment, and supplies required in performing the services under this Contract.

(B) All of the services required hereunder will be performed by the Consultant or under its supervision.

(C) None of the work or services covered by this Contract shall be subcontracted without prior written approval of the Contract Administrator.

(D) Consultant warrants that it is fully licensed under all applicable local, state, and federal laws to perform the services to be provided hereunder.

4. TIME OF PERFORMANCE. The services of the Consultant are to commence after the execution of the Contract and issuance of Notice to Proceed and Purchase Order. All work shall be completed no later than the time specified in Appendix A. Amendment to this Contract may be made upon mutual, written agreement prior to the contract expiration date.

5. REPORTING. Except as authorized within Appendix A, the City's primary representative for this Contract shall be Michele Elfers. The City Manager shall be an alternate representative. The City shall not be liable for Consultant's expenses incurred in reliance on directions received from any other municipal officer or employee. The Consultant's representative shall be _____.

6. COMPENSATION. The City agrees to pay the Consultant according to the schedule attached as Appendix B. The Consultant's estimated fee schedule is attached to Appendix B.

7. TERMINATION OF CONTRACT FOR CAUSE. If, through any cause, except causes beyond the control of the Consultant, the Consultant shall fail to fulfill in a timely and proper manner its obligations under this Contract; or if the Consultant shall violate any of the covenants, agreements, or stipulations of this Contract, the City shall have the right to terminate this Contract by giving written notice to the Consultant of such termination and specifying the effective date thereof, at least ten days before the effective date of such termination. In that event, all finished or unfinished documents, or other data, in whatever form, prepared by the Consultant under this Contract shall, at the option of the City, become its property, and the Consultant shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents and materials, not to exceed the Contract amount.

8. TERMINATION FOR CONVENIENCE OF CITY. The City may terminate this Contract at any time by giving written notice to the Consultant of such termination and specifying the effective date thereof, at least thirty days before the effective day of such termination. In that event, all finished or unfinished documents and other materials as described in paragraph 7 above shall, at the option of the City become its property, and the Consultant will be paid an amount not to exceed the sum set forth in Appendix B for work satisfactorily completed on or before the date of termination, less payments of compensation previously made.

9. CONTRACT AGREEMENT. All parties mutually agreed to the terms of this Contract. The Contract should not be construed in favor of or against any party. This Contract contains the entire agreement between the parties; there are no other promises, terms, conditions, or obligations other than those contained herein; and this Contract shall supersede all previous communications, representations or agreements, either oral or written, between the parties.

10. CHANGES. The City may, from time to time, require changes in the scope of services to be performed under this Contract. Such changes, including any increase or decrease in the amount of the Consultant's compensation, must be mutually agreed upon in writing before they will be regarded as part of this Contract.

11. EQUAL EMPLOYMENT OPPORTUNITY. The Consultant will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

12. CONFLICTS OF INTEREST. Consultant agrees that no employee of the City who has exercised or will exercise any authority over the specifications, procurement, supervision or payment for this Contract, and no member of the employee's immediate family, has had or will have any direct or indirect financial interest in this Contract. If the Consultant learns of any such

interest, the Consultant shall without delay inform the City Attorney or one of the officers specified in Paragraph 5.

13. ETHICS. Consultant shall discharge its duties fairly, impartially and maintain a standard of conduct that competently serves the City and the interests of the City. Consultant shall at all times exercise unbiased judgment when performing its duties under this contract.

14. PUBLIC RELATIONS. Consultant shall issue press releases, respond to press inquiries, make public speeches, appear on broadcast media or otherwise engage in public relations regarding the project only with the specific approval of the CBJ Project Manager.

15. ELECTED OFFICIALS. The Consultant shall respond to project-related inquiries from elected officials by providing impartial, factual information, but shall not initiate contact or attempt to persuade an elected official to agree with any viewpoint or to take any official action. The Consultant will promptly notify the Project manager of any request by an elected official for project-related information.

16. ASSIGNABILITY. The Consultant shall not assign any interest in this Contract and shall not transfer any interest in the same without the prior written consent of the City; however, claims for money due or to become due to the Consultant from the City under this Contract may be assigned to a bank, trust company, or other financial institution without approval. Notice of any such assignment or transfer shall be furnished promptly to the City.

17. FINDINGS CONFIDENTIAL. Any information given to or prepared by the Consultant under this Contract which the City requests to be kept as confidential shall not be made available to any individual or organization by the Consultant without the prior written approval of the City.

18. IDENTIFICATION OF DOCUMENTS. All reports, maps, and other documents completed as a part of this Contract, other than documents exclusively for internal use within the City, shall carry a City notation or logo as directed by the City.

19. PUBLICATION, REPRODUCTION, AND USE OF MATERIALS. No services, information, computer program elements, reports or other deliverables which may have a potential patent or copyright value produced in whole or in part under this Contract shall be subject to copyright in the United States or any other country.

If a copyright applies by law to the work produced under this Contract, that copyright will either be signed over to the City or the City will be given unrestricted license to the copyright. The City shall have unrestricted license to publish, disclose, distribute, and otherwise use, in whole or in part, any reports, data, or other materials prepared under this Contract. If this Contract includes architectural and/or engineering design services, any use of the design features or details produced under this Contract on other City facilities will be at the City's risk.

20. RECORDS. During performance and after termination of this Contract, each party shall make available to the other party for inspection and copying, all records, whether external or internal, having any relevance to this Contract.

21. INSURANCE REQUIREMENTS. The Consultant has secured and shall maintain insurance for the risks and in the amounts specified in Appendix C. The Consultant and its insurance carrier waive subrogation against the City, except Workers Compensation and Professional Liability.

22. INDEMNIFICATION AND HOLD HARMLESS. The Consultant agrees to defend, indemnify, and hold harmless CBJ, its employees, and authorized representatives, with respect to any action, claim, or lawsuit arising out of or related to the Consultant's negligent performance of this contract without limitation as to the amount of fees, and without limitation as to any damages, cost or expense resulting from settlement, judgment, or verdict, and includes the award of any attorney's fees even if in excess of Alaska Civil Rule 82. This indemnification agreement applies to the fullest extent permitted by law, meaning that if there is a claim of, or liability for, a joint act, error, or omission of the consultant and the CBJ, the indemnification, defense, and hold harmless obligation of this provision shall be apportioned on a comparative fault basis. This agreement is in full force and effect whenever and wherever any action, claim, or lawsuit is initiated, filed, or otherwise brought against CBJ relating to this contract. The obligations of Consultant arise immediately upon actual or constructive notice of any action, claim, or lawsuit. CBJ shall notify Consultant in a timely manner of the need for indemnification, but such notice is not a condition precedent to Consultant's obligations and may be waived where the Consultant has actual notice.

23. CHOICE OF LAW; JURISDICTION. This Contract shall be governed by the laws of the State of Alaska. Jurisdiction shall be in the State of Alaska, First Judicial District.

24. SUCCESSORS. This Contract shall be binding upon the successors and assigns of the parties.

25. PRECEDENCE OF DOCUMENTS. In the event of a conflict between the provisions of this document and its appendices, the order of precedence shall be this document, Appendix A, Appendix B and Appendix C.

In Witness Whereof the parties have affixed their signatures the date first above set out:

CITY AND BOROUGH OF JUNEAU

_____

Kimberly A. Kiefer Date
City and Borough Manager

Company name

_____

Name Date
Rank [i.e. President]
email

Approved as to content:

_____

Greg Smith Date
Contract Administrator

CIP Coding: _____

APPENDIX A: SCOPE OF SERVICES
Biosolids Treatment and Disposal, Phase II
Contract No. RFP E14-240

See Scope of Services in RFP .

PERSONNEL: The Consultant's primary personnel for this work will be:

The completion date for this project is _____.

This contract expires on _____, unless an amendment changing this date is fully executed prior to _____.

APPENDIX B: COMPENSATION
Biosolids Treatment and Disposal, Phase II
Contract No. RFP E14-240

Amount of Payment

Lump Sum

Consultant shall be compensated a lump sum amount of $_____for satisfactory performance of all [or specific services] services described in this contract.

Time and Materials

Consultant shall be compensated based on time and materials, a not-to-exceed amount of $___ for satisfactory performance of _____ services described in this contract.

Hourly rates shall remain the same for the life of this contract including all amendments, unless the Consultant requests a rate increase. Hourly rate increases may be negotiated on a yearly basis and shall not exceed the percentage increase of the Anchorage Consumer Price Index.

The total Contract amount shall be $

Method of Payment

Monthly Payable within 30 days of receipt of an invoice approved by the project manager and progress report stating the amount of services completed.

Consultant Invoice Requirements

- Itemized invoices must be submitted that indicate the services performed.
- Invoices for this contract must be submitted separately from invoices for services performed under any other contract(s).
- Invoices must include the CBJ Contract Number and Purchase Order numbers.

Compensation Based on Time and Materials

If compensation is based on time and materials, the following shall apply:

Compensation shall be computed based on the hourly billing rates, approved by the CBJ Project Manager, times the actual number of hours spent in the performance of services. The hourly billing rate for each employee is the amount to be paid to the Consultant, and is full compensation for all salary, benefits, taxes, overhead and profit. There shall be no additional compensation for overtime, weekend, or holiday work.

Compensation for subconsultants shall be equal to the amounts actually paid to sub-consultants hereunder plus a negotiated mark-up percentage.

Compensation for expenses shall be an amount equal to reimbursable expenses approved in advance by the CBJ Project Manager, necessary and reasonably incurred and actually paid by

the Consultant in the performance of the services hereunder. No markup allowance is allowed. Reimbursable expenses are expenses that are unique to the performance of the services under the Contract and generally contemplate the purchase of outside ancillary services, such as mailing and delivery charges for submittal of drawings, specifications and reports, long distance telephone calls, rentals of equipment, travel and local transportation, meals and lodging on overnight trips.

Reimbursable expenses do not include expenses that are usually and customarily included as part of the Consultant's overhead. For the purposes of this Agreement reimbursable expenses do not include amounts for typing, utilization of computer systems, computer aided design and drafting (CADD), cameras, recording or measuring devices, flashlights and other small, portable equipment, safety supplies, phones, telephone calls, electronic messaging including FAX, Telex and telegrams, or expendable office supplies. Unless otherwise indicated, required insurance is not a reimbursable expense.

The Consultant shall obtain the CBJ Project Manager's written approval prior to making expenditures for reimbursable expenses in excess of $500 per specific expenditure and for all overnight trips which are reimbursable expenditures as set forth above. The Consultant shall substantiate all billings for reimbursable expenses in excess of $25 with receipted bills and provide said receipts with the appropriate billing.

The Consultant shall keep, and cause any sub-consultants to keep, daily records of the time spent in the performance of services hereunder by all persons whose billing rates will be the basis for compensation as well as records and receipts of reimbursable expenditures hereunder. Failure to do so shall be a conclusive waiver of any right to compensation for such services or expenses as are otherwise compensable hereunder.

The CBJ shall have the right to inspect all records of the Consultant, and of any sub-consultants, pertaining to this project. Records shall be maintained by the Consultant and sub-consultants for a period of three years after completion of services.

When travel is necessary as part of the professional services to be provided, the following shall be followed:

- Airline tickets should be purchased at the 14 day advanced purchase price. The CBJ will not pay for First Class travel. Any deviation shall be approved in writing in advance by the CBJ Project Manager.
- Per diem meal allowance shall be: $50.00 ($10.00 for breakfast, $15.00 for lunch and $25.00 for dinner).
- The Consultant shall stay at the hotel with a daily rate not to exceed $125.00.
- Travel agent fees, tips, alcohol or bar tabs shall not be paid by the CBJ.
- Car rental, parking, and taxi fees shall be reasonable and not excessive. This reimbursement is for services in Juneau only. Parking fees, etc. outside of Juneau will not be reimbursed.

APPENDIX C: INSURANCE REQUIREMENTS
Biosolids Treatment and Disposal, Phase II
Contract No. RFP E14-240

The Consultant must provide certification of proper insurance coverage or binder to the City and Borough of Juneau. The certificate of insurance supplied to the City shall state that the City is named as **"Additional Insured for any and all work performed for the City & Borough of Juneau."** The Additional Insured requirement does not apply to Professional Liability and Workers Compensation insurance. Should any of the above described policies be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions. The City no longer requires certificates of insurance referencing project names and contract numbers. Proof of the following insurance is required before award:

Commercial General Liability Insurance. The Consultant must maintain Commercial General Liability Insurance in an amount it deems reasonably sufficient to cover any suit that may be brought against the Consultant. This amount must be at least one million dollars ($1,000,000.00) per occurrence, and two million dollars ($2,000,000.00) aggregate.

Professional Liability Insurance. The Consultant must maintain Professional Liability Insurance in an amount not less than one million dollars ($1,000,000.00) aggregate to protect the Consultant from any claims or damages for any error, omission, or negligent act of the Consultant, the Consultant's firm and employees. This requirement applies to the Consultant's firm, the Consultant's subcontractors and assignees, and anyone directly or indirectly employed to perform work under this contract.

Workers Compensation Insurance. The Consultant must maintain Workers Compensation Insurance to protect the Consultant from any claims or damages for any personal injury or death which may arise from services performed under this contract. This requirement applies to the Consultant's firm, the Consultant's subcontractors and assignees, and anyone directly or indirectly employed to perform work under this contract. The Consultant must notify the City as well as the State Division of Workers Compensation immediately when changes in the Consultant's business operation affect the Consultant's insurance status. Statutory limits apply to Workers Compensation Insurance. The policy must include employer's liability coverage of one hundred thousand dollars ($100,000.00) per injury, and five hundred thousand dollars ($500,000.00) policy limits.

Comprehensive Automobile Liability Insurance. The coverage shall include all owned, hired, and non-owned vehicles to a one million dollar ($1,000,000.00) combined single limit coverage.

Each policy shall be endorsed to waive all rights of subrogation against the City by reason of any payment made for claims under the above coverage, except Workers Compensation and Professional Liability.

ATTACHMENT 2

BIOSOLIDS REPORT

APRIL 1, 2013

Biosolid Management System Alternatives Study

Wastewater Documentation Updates

This report identifies, describes and compares sewage sludge treatment technologies and disposal alternatives for the City and Borough of Juneau (CBJ). It was prepared collaboratively by Tetra Tech and CBJ staff.

I. BACKGROUND

CBJ owns and operates three wastewater treatment plants: Auke Bay (ABWTP), Mendenhall (MWTP); and Juneau Douglas (JDWTP). All of the plants provide secondary treatment using a biologically mediated process known as activated sludge. In order to maintain effectiveness and efficiency of the treatment process it is necessary to remove excess activated sludge from the treatment process. This sludge is known as waste activated sludge (WAS) and is composed of biological organisms, inert solids and residual wastewater. WAS from the ABWTP is aerobically digested and then trucked to the MWTP combined with the MWTP WAS and then dewatered with a belt filter press (BFP) to achieve a sludge cake containing approximately 15% solids and 85% water. WAS from the MWTP is not digested prior to dewatering. WAS generated by the JDWTP is aerobically digested and then dewatered to approximately 15% solids.

From 1990 to 2011, dewatered sludge cake from the MWTP was trucked to the JDWTP, combined with the dewatered sludge cake from the JDWTP, and incinerated in the fluidized bed furnace (FBF) located at the JDWTP. In 2011 the JDWTP FBF was decommissioned due to deterioration of the FBF, estimated repair cost of over $2 million and review of historical high cost of operation. CBJ responded by transporting the dewatered sludge cake for disposal at the local Capital Landfill and the

Arlington Landfill located in eastern Oregon; both landfills are operated by Waste Management Inc. (WM).

Approximately 18.5 wet tons per day of solid waste at 15% total solids are produced. This process annually requires electrical energy costing $20,000, the addition of dewatering polymers for costing $100,000, and approximately 3000 hrs of operating labor.

II. SLUDGE PRODUCTION RATES IN JUNEAU

In 2012 CBJ produced and disposed of approximately 7,280 wet tons of dewatered sludge cake and grit at a disposal cost of approximately $721,200. CBJ's records indicate that approximately 74% of the total dewatered sludge cake produced by CBJ's wastewater treatment plants was disposed of at the local Capital Landfill at a unit cost of approximately $88 per wet ton. The remaining 26% (1915 tons) of the dewatered sludge cake was not accepted by Waste Management (WM) for disposal at the Capital Landfill due to elevated concentrations of residual hydrocarbons contained in the sludge, so it was shipped to and disposed of in WM's Arlington Landfill at an average cost of $131 per wet ton (current cost is estimated to be $140/ton). On an annual basis, the MWTP and ABWTP together produce approximately 79% of the sludge while the JDWTP produces the remaining 21%.

Sludge production rates for year 2012 are presented in Table 1. Sludge production rates are significantly more variable from the JDWTP than from the combined MWTP and ABWTP. The peak week and monthly sludge production rates occurred July through mid-September, and is likely the consequence of peak tourist activity in Juneau, including cruise ships. Figures 1 and 2 provide a graphical illustration of the variability of the waste sludge production rates in 2012.

TABLE 1
Waste Sludge Production Rates for Year 2012

Time Period	MWTP+ABWTP	JDWTP	All CBJ Plants
Annual	14.6 (2.19)	3.9 (0.59)	18.5 (2.78)
Max. 30-day Average	24.0 (3.60)	9.7 (1.46)	27.4 (4.11)
Max. 7-day Average	24.5 (3.68)	14.3 (2.15)	32.8 (4.92)
Max. Day	41.6 (6.24)	25.1 (3.77)	56.6 (8.49)

Values without parentheses are in wet tons per day, based on 15% solids basis and 85% water.
Values within parentheses are tons per day, dry solids basis.

Sludge production rates in 2012 are greater than the annual production rates for years 1986-1988 as reported in the Sludge Treatment and Disposal Facility Plan Amendment dated June 1989. The annual average daily sludge production rate for the MWTP (including the ABWTP) was 1.22 ton per day, the JDWTP production was 0.725 tons per day and the total annual production was 1.95 tons/day, all dry solids basis. Overall this represents an annual increase of approximately 0.5% per year for the last 24 years. Sludge production by the MWTP has increased at a rate of about 2.5% per year while sludge production by the JDWTP decreased at an equivalent rate of 0.85% per year. The ratio of the sludge loads in the average day of the maximum month to the annual average day has not changed and remains to be about 1.5 to 1.

For this initial screening of biosolids management technologies, the sludge production rates shown in Table 1 were used to estimate capital and treatment costs. Appropriate allowances for growth should be defined before proceeding with cost budgeting and design.

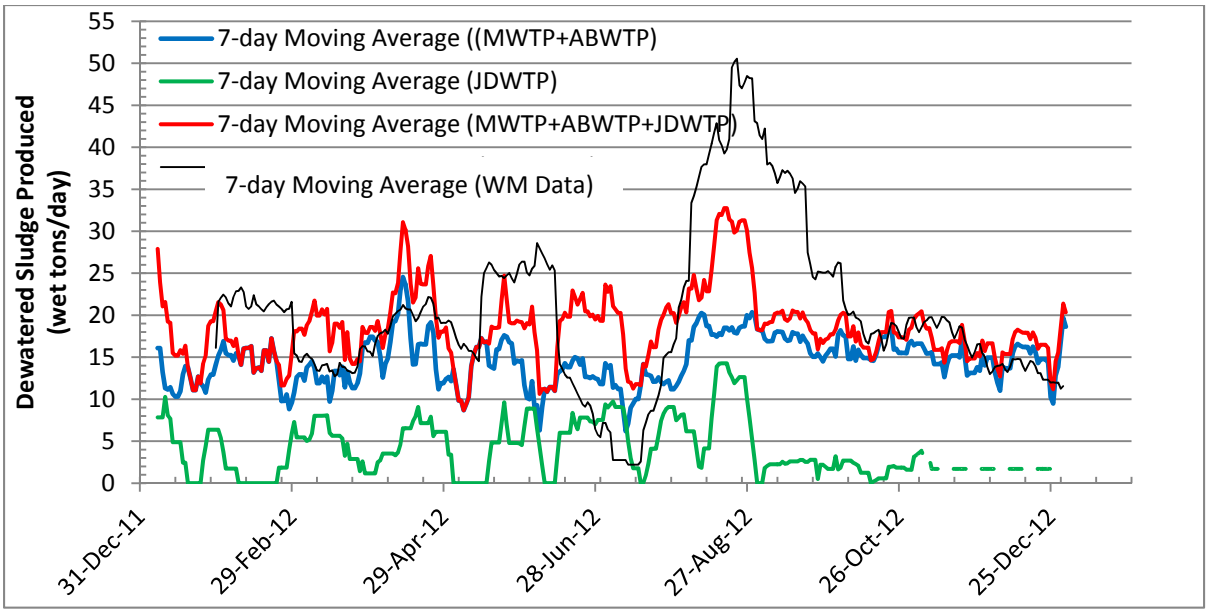

Figure 1. Weekly averages of daily sludge production by the JDWTP, MWTP+ABWTP, and the sum of all dewatered sludge produced by CBJ. WM data includes CBJ dewatered sludge transported to Capital Landfill and Arlington Landfill.

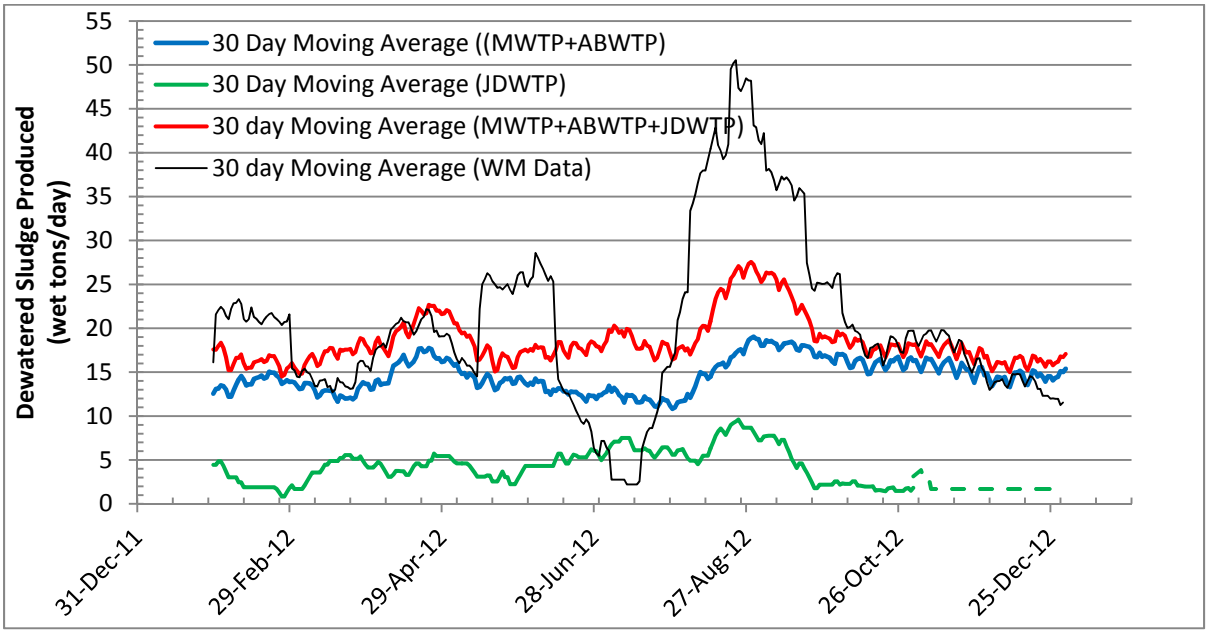

Figure 2. Monthly averages of daily sludge production by the JDWTP, MWTP+ABWTP, and the sum of all dewatered sludge produced by CBJ. WM Data includes CBJ dewatered sludge transported to Capital Landfill and Arlington Landfill.

III. IMPORTANT REGULATORY FACTS CONCERNING USE OR DISPOSAL OF BIOSOLIDS

As required by the Clean Water Act Amendments of 1987, the US EPA developed the Standards for the Use or Disposal of Sewage Sludge (40 CFR 503) to protect public health and the environment from any reasonable adverse effect of certain pollutants that might be present in sewage sludge biosolids. The regulations became effective March 22, 1993. The 503 regulations establish requirements for the final use or disposal of sewage sludge biosolids when the biosolids are:

- applied to land to condition the soil or fertilize crops or applied to the vegetation grown in soil,
- placed on a surface disposal site for final disposal, and
- fired in an incinerator

For each of the regulated uses or disposal practices identified above, the 503 regulations provide general requirements, toxic metals and pathogenic bacteria limits, management practices, operational standards and frequency of monitoring, record keeping and reporting.

The 503 regulations do not apply to sewage sludge that is placed in a municipal solid waste landfill, but such sludge must meet the provisions of 40 CFR 258 Design Criteria for Municipal Solids Waste Landfills. Sewage sludge that is to be landfilled must be dewatered or otherwise concentrated so that it meets the "paint filter test". Passing this test means that no liquid is released when the sewage sludge is placed in a paint filter (60-mesh) within a 5 minute test period.

For sewage sludge that is not placed in a municipal solid waste landfill or monofill, the EPA 503 regulations utilize two classificatons of biosolids defined by their pathogenic characteristics - Class A and Class B. Generally, Class A biosolids meet more stringent standards and are allowed to be discharged more widely in land application uses. Discharge of Class B biosolids generally requires buffers, limits on public access and crop harvest restrictions.

Class A biosolids must be treated by one of the six alternatives shown in Table 2 to reduce the density of pathogenic organisms at the time of final use or disposal. The specific requirements for pathogens in Class A biosolids are less than 1000 fecal coliform MPN per gram of total solids (dry with basis) and less than 3 *Salmonella* sp. MPN per 4 grams total solids (dry weight basis). When compared to Class B biosolids, more disposal options may exist for Class A biosolids due to the high treatment standards required for classification.

Class B biosolids must be treated by one of the methods shown in Table 3. Class B biosolids require less stringent standards for treatment and, once treated, contain small but compliant amounts of bacteria. Because of potential contamination concern, disposal options for Class B biosolids may be limited when compared to Class A biosolids.

EPA 503 regulations also classify biosolids using toxic metal standards. The two classifications used are Exceptional Quality (EQ) biosolids and Pollutant Concentration (PC) biosolids. The limits for each metal are the same for EQ biosolids and PC biosolids. The difference is that EQ biosolids must also meet Class A pathogen standards and PC biosolids need only meet Class B pathogen standards. If biosolids meet the EQ/PC limits, the land application site is not subject to cumulative pollutant tracking of annual loading. The EQ/PC limits are shown in Table 4.

Biosolids that are disposed of or reused on land and not placed in a municipal landfill must also meet the vector attraction reduction (VAR) requirement set for in the EPA 503 regulations. VAR is required because unstablized biosolids pose a disease risk when they come in to contact with humans or other susceptible hosts, both plant and animal. Flies, mosquitoes, fleas, rodents and birds can transmit pathogens to humans and other hosts through physical contact or biologically by playing a specific role in the life cycle of the pathogen. Reducing the attractiveness of the biosolids to vectors

reduces the potential for transmitting diseases from pathogens in biosolids. The 503 regulations recognize 12 options that can be used to demonstrate that treated biosolids meet the VAR requirements as indicated in Table 5. Option 12 applies only to treatment of domestic septage. Options 9-11 are not considered viable alternatives for Juneau due to seasonal climatic conditions that would require periodic accumulation and storage of biosolids (i.e. frozen ground conditions in the winter).

TABLE 2
Pathogen Reduction Requirements for Class A Biosolids

Alternative	Restrictions
1. Thermally Treated Biosolids	Use one of four time-temperature regimes
2. Biosolids Treated in a High pH and High Temperature Process	Specific pH, temperature, and air-drying requirements
3. For Biosolids Treated in Other Processes	Demonstrate that the process can reduce enteric viruses and viable helminth (parasitic intestinal worm) ova. Maintain operating conditions use in the demonstration
4. Biosolids Treated in Unknown Process	Demonstrate by testing that process is unnecessary to reliably achieve the density pathogenic organisms as measured by fecal coliform or *Salmonella species* bacteria to specific density requirements at the time of biosolids use or disposal or when prepare for sale or given away
5. Use of Process to Further Reduce Pathogens (PFRP)	a. **Composting** – in-vessel or aerated static pile method with biosolids maintained at 55^{o}C or higher for 3 days; or windrow method with biosolids maintained at 55^{o}C or higher for 15 days or longer and turned a minimum of five times while temperature of compost is 55^{o}C or higher. b. **Heat drying** – biosolids are dried by direct or indirect contact with hot gases to reduce moisture content of biosolids to 10% or less. Either temperature of biosolids particles exceeds 80^{o}C or the wet bulb temperature of the gas in contact with the biosolids as the biosolids leave the dryer exceeds 80^{o}C. c. **Heat Treatment** – liquid biosolids are heated to a temperature of 180^{o}C or higher for 30 minutes. d. **Thermophilic aerobic digestion** – liquid biosolids are agitated with air or oxygen to maintain aerobic conditions and mean cell residence time (MCRT) of solids is at least 10 days at 55^{o} to 60^{o}C e. **Beta Ray Irradiation** – biosolids are irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at about 20^{o}C. f. **Gamma Ray Irradiation** – biosolids are irradiated with gamma rays from certain isotopes such as cobalt 60 and cesium 137 at about 20^{o}C. g. **Pasteurization** – liquid biosolids are heated and maintained at 70^{o}C or higher for 30 minutes.
6. Use of a Process Equivalent to PFRP	Biosolids are treated in a process equivalent to one of the PFRPs as determined by the permitting authority.

TABLE 3
Pathogen Reduction Requirements for Class B Biosolids

Alternative	Restrictions
1. Monitoring of Indicator Organisms	Geometric mean of seven samples of biosolids tested for fecal shall be less than 2 million MPNs (most probable number) per gram total solids
2. Biosolids Treated in a Process to Significantly reduce Pathogens (PSRP)	a. **Aerobic Digestion** – Biosolids are mixed with air or oxygen to maintain aerobic conditions for a MCRT and temperature between 40 days at 20^{o}C and 60 days at 15^{o}C. b. **Air Drying** – Biosolids are dried on sand beds or paved or unpaved basins for a minimum of three months with two of the three months with ambient average daily temperature above 0^{o}C. c. **Anaerobic Digestion** – Biosolids are mixed in the absence of air or oxygen to maintain aerobic conditions for a MCRT and temperature between 15 days at 35^{o}C to 55 ^{o}C and 60 days at 20^{o}C. d. **Composting -** Biosolids are composted using in-vessel, static aerated pile, or windrow methods where the temperature of the biosolids is raised to and maintained at 40^{o}C or higher for 5 days. For 4- hours in the 5-day period the temperature of the compost must exceed 55^{o}C. e. **Lime Stabilization -** Sufficient lime is blended with the biosolids to raise the pH of the biosolids to 12 after 2 hours of contact.
3. Biosolids Treated in a Process equivalent to one of the PSRPs as determined by the permitting authority.	Biosolids must be treated in a process equivalent to one of the PSRPs as determined by the permitting authority

TABLE 4

COMPARISON OF ALLOWABLE TOXIC METALS LIMITS FOR BIOSOLIDS APPLIED TO LAND AND TOXIC METALS CONCENTRATIONS REPORTED FOR MWTP AND JDWTP BIOSOLIDS

Metal	**Ceiling** [mg/kg]	**EQ / PC** [mg/kg]	**JDWTP** [mg/kg]	**Meets EQ / PC**	**MWTP** [mg/kg]	**Meets EQ / PC**
Arsenic	75	41	<6.3 -- <89 (9)	?	< 10 -- <710 (12)	?
Beryllium	85	39	<0.097 -- <1.3 (9)	Y	<0.15 -- < 11 (12)	Y
Cadmium	3000	1200	<0.39 -- <4.7 (9)	Y	<0.62 -- <44 (12)	Y
Chromium	4300	1500	2 -- 36 (9)	Y	<1.5 -- <110 (12)	Y
Lead	840	300	3.5 -- 36 (9)	Y	<4.6 -- <330 (12)	?
Mercury	57	17	1.1 -- 4.6 (7)	Y	0.30 -- 0.75 (12)	Y
Molybdenum	75	----	NT (0)	?	NT (0)	?
Nickel	420	420	<1.0 -- < 22 (9)	Y	<14 -- <220 (12)	Y
Selenium	100	36	NT (0)	?	NT (0)	?
Zinc	7500	2800	<1.4 -- 3.65 (5)	Y	NT (0)	Y

Ceiling means ceiling concentration limit for biosolids applied to land as define in 40 CFR 503.13

EQ: Exceptional Quality. EQ biosolids also meet Class A biosolid pathogen standards. When the above limits are not exceeded, the biosolids are not required to meet cumulative pollutant or annual loading limits.

PC: Pollutant Concentration.. PC biosolids also meet Class B biosolid pathogen standards. When the above limits are not exceeded, the biosolids are not required to meet cumulative pollutant or annual loading limits.

?: Additional testing is needed either due to lack of data or existing test results were not reported to a degree of accuracy to make a determination.

NT: Not tested.

Values not in parentheses are pollutant concentration, mg/Kg.

Values in parentheses refer to number of samples.

TABLE 5

OPTIONS FOR ACHIEVING THE VECTOR ATTRACTION REDUCTION REQUIREMENTS

Option	Vector Attraction Reduction Requirements
1	Reduce mass of volatile solids by at least 38%.
2	Demonstrate vector attraction reduction with additional anaerobic digestion in a bench scale unit
3	Demonstrate vector attraction reduction with additional aerobic digestion in a bench scale unit
4	Meet specific oxygen uptake requirement (SOUR) of equal to or less than 1.5 mg O2 per gram of biosolids (dry weight basis) at 20 ^{o}C for aerobically treated biosolids.
5	Use aerobic process at greater than 40 ^{o}C and average temperature of 45 ^{o}C for 14 days or longer (e.g. biosolids compositing)
6	Add strong alkali to raise pH at least 12, measured at 25'C, and without the addition of more alkaline material, maintain a pH of at least 12 for 2 hours; and maintain a pH of at least 11.5 without addition of more alkaline material for an additional 22 hours.
7	Reduce moisture content of biosolids to at least 75% solids; biosolids must not contain unstabilized biosolids from primary treatment and must be have a solids concentration of at least 75% before the biosolids are mixed with other materials.
8	Reduce moisture content of biosolids which may include unstabilized solids to 90% solids.
9	Inject biosolids beneath the solids surface within a specified time depending on level of pathogen treatment.
10	Incorporate biosolids applied to or placed on the land surface within a specified time periods after application to or placement on the land surface
11	Cover biosolids placed on a surface disposal site with soil or other material at the end of each operating day.
12	Alkaline treatment of domestic septage to pH 12 or above for 30 minutes without adding more alkaline material.

IV. DESCRIPTION OF BIOSOLIDS MANAGEMENT ALTERNATIVES

Sludge is a byproduct of the wastewater liquid stream treatment process. The solids removed from the sedimentation tank following wastewater process liquid stream reactor are mostly returned to the liquid stream process tank to maintain the food-to-microorganism ratio within the activated sludge process. Solids must be removed from the activated sludge process to prevent process overload and to achieve process efficiency. The solids are contained in a dilute suspension consisting of 0.5 to 1 percent solids in water; this suspension of microorganism and inert material is called waste activated sludge (WAS). The solids contained in CBJ wastewater sludge consist of 83% organic matter and 17% inert material which is typical for the type of treatment process and wastewater from similar communities.

Only the organic fraction of the sludge can be reduced by digestion or incineration or other oxidative processes. The purpose of a biosolids handling process is to reduce the mass and volume, and if sewage sludge is to be applied to land or beneficially used, to stabilize the organic fraction of the WAS to meet US EPA Sewage Sludge Regulations 40 CFR 503.

A biosolids management system will be comprised of a disposal alternative and a treatment alternative or multiple combinations of each. Be aware that not all disposal options are feasible for all treatment methods. Also, some disposal options may only be realistic for limited amounts of biosolids. For this reason, a combination of alternatives may be necessary to manage all of CBJ's needs.

1. DISPOSAL ALTERNATIVES

A. Landfill – Waste Management Local and Out of Town

Description:

Disposal of biosolids at a permitted sanitary landfill generally only requires that the biosolids do not contain free water as determined by the result of the paint filter test previously discussed. No pathogen or vector attraction reduction process is required for disposal of raw biosolids in a permitted sanitary landfill so long as the moisture requirements are met.

For approximately the last two years CBJ has adopted this approach to disposing of its wastewater treatment plant biosolids. Dewatering of the sludge to at least 12 to 14% solids content is generally required to meet the paint filter test and performance data indicate that CBJ can reliably meet this requirement with its existing sludge dewatering equipment. Because tipping costs at landfills are based on the delivered weight of the waste, it is often cost-effective to reduce the moisture content of the dewatered biosolids to reduce both transportation and tipping costs.

WM has at times refused to accept CBJ biosolids at the Capital Landfill over the last year because of high residual concentrations of hydrocarbons contained in the dewatered biosolids. Residual hydrocarbon concentrations at the levels reported for CBJ's biosolids would not be a concern if WM Capital Landfill contained a liner and comprehensive leachate collection system. Although a specific hydrocarbon source has not been identified, the hydrocarbon concentrations could be caused by leaking underground storage tanks, or illicit dumping.

Cost:

- $88 per wet ton for transportation and tipping costs at Waste Management in Juneau
- $140 per wet ton for transportation and tipping costs at Waste Management Landfill in Arlington, Oregon

Advantages:

- Exempt from permitting and reporting requirements under the biosolids regulations 40 CFR 503 and 40 CFR 258. Design Criteria for Municipal Solids Waste Landfills governs the permitting, methods, and reporting requirements.
- All types of biosolids accepted, Class A, Class B and solid waste

Disadvantages:

- WM has refused biosolids due to high concentration of hydrocarbons
- Regulations may be changing in Washington and Oregon that may prevent biosolids from being accepted
- Perceived odor problem

B. Monofill

Description:

Sewage sludge monofills are sometimes the preferred method for managing wastewater biosolids because beneficial reuse options are not feasible or cost competitive. A biosolids monofill is a landfill that only accepts wastewater treatment plant biosolids.

Sewage sludge monofills are regulated by ADEC 18 AAC 60.470 as well as the Federal 503 regulations. The ADEC regulation stipulates that biosolids must be dewatered to contain at least 10 percent solids by weight. Experience indicates that 15 percent solids or more is needed for a sustainable operation. Sewage sludge monofills do not need to have a liner or leachate collection system if the conditions identified in Table 5 are achieved and are deposited at least 50 feet from the property line. Toxic metals contained in CBJ's biosolids would not likely require a liner or leachate collection system (see analysis, below).

In general, an active biosolids monofill may not be located within 200 feet of an active fault, in an unstable area or in a wetland. Gas monitoring is required in any building within 500 feet of where biosolids are deposited. Sewage sludge that is place in a monofill must meet the vector attraction reduction requirements (VAR) of the 40 CR 503.33(b) (1-11) to reduce potential for animals or insects to transmit diseases or meet the Class A or Class B pathogen reduction requirements (PFRP or PSRP). Therefore CBJs biosolids cannot be placed in a monofill unless additional treatment is implemented.

Based on CBJ's current annual production of sewage sludge of approximately 1,015 tons, dry weight basis, CBJ would be required to complete quarterly sampling and analysis of the sludge being deposited in the monofill to demonstrate:

- arsenic, chromium, and nickel concentrations do not exceed the values in Table 5,
- pathogen density requirements of 40 CFR 503.32 and vector attraction reduction requirements (VAR) in 40CFR (b) (1-8) are achieved.

TABLE 5 Maximum Allowable Pollutant Concentrations in Sewage Sludge Placed in a Monofill Without A Liner and Leachate Collection System			
Distance from Disposal Area to Property Line (feet)	Allowable Pollutant Concentration, mg/Kg		
	Arsenic	Chromium	Nickel
50 to <82	30	200	210
82 to <164	34	220	240
164 to <246	39	260	270
246 to <328	46	300	320
328 to <410	53	360	390
410 to < 492	62	450	420
>492	73	600	420

Cost:

- $25-50 per wet ton for operating cost (not including cost of additional treatment required for placement of biosolids in a monofill)
- Capital cost is 65 acres of land

Advantages:

- Low operational cost
- Class A and Class B biosolids accepted

Disadvantages:

- 65 acres of land required for a service life of 20 years
- Additional treatment required
- Public access to monofill restricted during use and for three years after facility has closed
- Potential objection from nearby property owners

C. Land Application Local

Description:

In other parts of the country, land application of biosolids is often a preferred biosolids management strategy because it has a low capital cost, it is relatively simple and reportedly makes maximum use of the biosolids recycle value. In agricultural areas of the United States, land applied sludge can be an excellent substitute for commercial fertilizers and soil amendments. Additionally, biosolids have been applied and provided benefits to: commercial timber and fiber production lands, federal and state forests, and reclamation or re-vegetation of disturbed or marginal lands such as those which have been disturbed by mining or mineral processing operations and sandy and other unproductive areas.

Biosolids that are land applied are required to be treated by a PSRP. During periods of the year when the soil is wet, frozen or snow covered, biosolids often cannot be applied. Because of the prevailing climate conditions in Juneau, finding a suitable application site within a reasonable distance to the wastewater treatment plants would be difficult. Also, a very large area of land would be required for land application. Finding an area this large, transporting the biosolids and accessing the land would be challenging.

Cost:

- Operating cost would be determined by proximity of the application site and difficulty of application
- Capital cost would be the land

Advantages:

- Low operating cost

Disadvantages:

- Difficult to find available land
- Additional treatment of biosolids required
- On a small scale, finding willing consumers may be difficult
- On a large scale, application on public land may be unacceptable to the community

2. TREATMENT ALTERNATIVES

A. Existing

Description:

This option is based on continuing the present operation at all three treatment plants. At the MWTP, waste activated sludge generated by the SBR process is dewatered to achieve a sludge cake having a solids content of approximately 15% using an existing 1-meter gravity belt thickener in conjunction with a belt filter press. Waste activated sludge generated by the JDWTP is aerated, but only partially digested, and then dewatered on a belt filter press to achieve a solids content of approximately 15%. In both cases polymer is added to the sludge to promote the flocculation of solid and the expulsion of water during the dewatering process. Currently an emulsion polymer is used at the MWTP and a dry polymer is used at the JDWTP.

Although the JDWTP has an operating aerobic digester, it does not necessarily produce Class B Biosolids. Monitoring is inconclusive regarding the ability of the existing digestion process to meet Class B standards. VSS reduction rarely meets the VAR reduction requirement of 38%, no other testing such as oxygen uptake has been performed and the destruction of fecal coliforms has not been demonstrated. In 2005, Carson Dorn recommended upgrading the digester aeration system to increase the oxygen transfer capacity and presumably meet Class B requirements.

Given the uncertainty of the JDWTP biosolids and its relatively low percentage of the total biosolids production, the biosolids produced with this option are considered as unclassified for any disposal other than solid waste.

Cost:

- Treatment per year Less than $50,000

Advantages:

- Current operation- no action alternative
- Simple and does not require additional labor, materials and energy..

Disadvantages:

- Produces a large amount of solid waste with limited disposal options: landfill
- Sometimes contains high amounts of hydrocarbons that are rejected by the local Waste Management landfill

- Solids are not stable and susceptible to generating significant odors during sludge dewatering process and during transport of material to the disposal site.

B. Aerobic Digestion

Description:

This method of digestion is the simplest of the digestion processes and produces Class B biosolids.. The aerobic digester operates on the same principles as the activated sludge process. As food is depleted from the dissolved phase of the wastewater, the microbes enter the endogenous phase where the organisms eat one another, ultimately oxidizing most of the cell tissue to CO2, H2O, NH3, NO2, and NO3. This process would require construction of aerobic digesters at the MWTP and upgrade of the existing digester at the JDWTP.

Up to 80 percent of the cell tissue may be oxidized in this manner; the remaining fraction contains inert and non-biodegradable materials. Factors to be considered during the design process are characteristics and origin of the sludge, hydraulic residence, true solids loading criteria, energy requirement for mixing, environmental conditions and process operation.

This process produces approximately 12.8 wet tons per day of Class B biosolids at 15% total solids. This process requires oxygen and has energy requirements of 3,350,000 kWh per year.

Cost:

- Treatment Cost per year is $500,000 to 700,000 due to high energy consumption and oxygen requirements
- Sludge dewatering costs including labor, materials and polymer would be approximately the same as the existing program.
- One-Time Capital $2-5 million

Advantages:

- ABWWTP and JDWWTP currently employ aerobic digestion
- Volatile Suspended Solids (VSS) are reduced to 38-45 percent, slightly less than the performance of anaerobic digestion but adequate to produce a Class B biosolids
- Produces a stable humus-like end product
- More basic fertilizer values are recovered than by anaerobic digestion or Autothermal Thermophilic Aerobic Digestion (ATAD) process
- Operation is relatively simple
- Cyclic aeration can reduce energy requirements
- Odor is minimal during digestion process and during dewatering and subsequent transport

Disadvantages:

- Higher operating cost associated with supplying oxygen and mixing energy to the digester
- No other useful by-product such as digester gas produced
- Aerobically digested sludge does not dewater as efficiently as anaerobically digested
- Produces a minimal recycle stream

- Decant thickening of digester and filtrate from dewatering can seed and promote sludge bulking in the activated sludge liquids process and may require pretreatment before being returned to the liquid stream processes of the plant.

C. Incineration

Description:

Incineration of biosolids results in near complete conversion of the organic fraction of the sewage solids to carbon dioxide and water but the inorganic fraction remains in a dehydrated form. The resulting product is ash or solid waste. The waste would have to be disposed of at a landfill or a monofill if the metals contained in the ash are not significantly leachable. The popularity of incineration as a treatment process has waned in recent years due to the energy costs and capital costs to meet new stringent air emission standards. In the past, combustion of wastewater solids was both practical and inexpensive. Solids were easily dewatered and the fuel required for combustion was cheap and plentiful and air emission standards were virtually non-existent.

In today's environment, wastewater solids are more complex and include sludges from secondary and advanced waste treatment processes. These sludges are more difficult to dewater and thereby increase fuel requirements for combustion.

Development of more efficient solids dewatering processes and advances in combustion technology have retained the interest in the use of high temperature processes for specific applications where land suitable for biosolids application is scarce or non-existent; destruction of toxic materials or environmentally disruptive substances contained in the biosolids is of concern; or the potential exists for recovery of energy, either with wastewater solids alone or combined with municipal refuse.

The water content of the sludge cake is a controlling factor in determining the amount of auxiliary fuel required to vaporize the water to maintain combustion. The cost of auxiliary fuel is a major operational cost. For example, if the moisture content of CBJs biosolids was reduced to 78% (22% solids), incineration of the biosolids would require only 27% of the auxiliary fuel required at the current moisture content of 85% (15% solids). Improving the dewatering process to this degree would result in an annual saving of approximately $300,000 per year based on a fuel price of $4 per gallon. A positive return on the investment for installation of a more efficient dewatering system would be in the range of 4 to 5 years at the existing biosolids production rate of 2.78 tons per day, dry solids basis.

Fluidized bed furnaces are the most common process used for incineration of sludge in the United States and Europe. In the case of CBJ, the existing incinerator building could be upgraded to house a new incinerator. The ash slurry would be dewatered and sent to a secure landfill.

Approximately 2.7 wet tons per day of solid waste at 35% total solids would be produced in this process. Incineration would require 100,000 gallons of diesel fuel per year plus electricity to handle Juneau’s biosolids.

Cost:

- Treatment per year is $1 to $1.2 million
- One-Time Capital is $10-$15 million

Advantages:

- Undigested sludges from wastewater treatment plants require only dewatering. Digestion is counterproductive because it destroys 30-50% or more of the fuel heating value of the sludge
- Reduces the volume and weight of wet sludge cake by approximately 95 percent, thereby reducing disposal requirements.
- Destroys or reduces toxins that may otherwise create adverse environmental impacts.

- Potentially recovers energy through the combustion of waste products, thereby reducing the overall expenditure of energy.

Disadvantages:

- High capital and operational costs
- High temperature operations create high maintenance requirements and can reduce equipment reliability
- Skilled and experienced operators are required
- Discharges to atmosphere (Carbon dioxide, particulates and other toxic or noxious emissions), surface waters (scrubbing water), and land (furnace residues) may require extensive treatment to assure protection of the environment.

D. Compost

Description:

Composting of wastewater treatment plant biosolids is an extension of the biological treatment process but without free water. The process is a controlled natural process that is mediated biologically under aerobic thermophilic conditions that stabilizes biosolids to meet the PSRP and VAR requirements of the EPA 503 regulations. The primary benefits of biosolids composting is the end product is similar to soil or mulch that can be beneficially used as a natural fertilizer to improve or restore soils for domestic and agricultural plant growth. The product can be a Class A or Class B product depending on the method of composting used and the temperatures achieved during the composting process. Production of a Class A compost requires achieving a temperature of at least 55^{o}C consistently for 3 to 15 days depending on the frequency of mixing or turning. Production of Class B compost only requires achieving a temperature of 55^{o}C consistently for approximately 4 hours.

Composting to Class B would not be significantly less expensive for capital or operational costs but would be more challenging to find application area. Class B material has significantly more restrictions regarding reuse and would not allow distribution to the public.

Composting is a natural process which generates heat as a result of the biological decomposition of the organic material in the biosolids. In addition to the incoming wastewater biosolids the process requires oxygen, nitrogen, and moisture in the proper proportions with some degree of physical control to help retain the heat given off by the process. This is an important factor for Juneau. Typically the wastewater solids contain too much moisture and not enough porosity for air carrying oxygen to penetrate into the dewatered wastewater treatment plant biosolids to keep it from becoming septic or anaerobic. To overcome this limitation, bulking and absorbent soils such as shredded tire chips, waste paper and cardboard can be blended with the incoming biosolids to achieve a moisture content of 50 – 65 percent and porosity sufficient to allow air/oxygen to penetrate completely into the bulk pile.

There are several composting processes that have been applied successfully to compost unstabilized municipal wastewater biosolids: windrow, aerated static pile and closed-vessel composting. Windrow composting systems are passively aerated, open-air systems. Aerated static pile composting systems are mechanically aerated in a pile, while closed vessel systems periodically mix or turn the biosolids and bulking agent mixture with aeration.

The entire process typically takes 5-8 weeks, but systems are frequently designed for up to 10 weeks solids retention. Some of the compost is recycled to serve as a biological seed and recover heat, and is mixed with the incoming un-composted biosolids and amendment. The portion of the compost that

is not recycled is placed in a maturation/curing storage pile and covered for at least 60 days. After the maturation storage period, the compost is mechanically screened to produce a relatively uniform product and to recover bulking material so that it can be recycled. Front end loaders are generally used for mixing and moving the compost around the site.

Control of odors and thermal protection during cold weather conditions are considered the most critical considerations for designing and operating a successful composting system. The controlled mechanical aeration systems used for the aerated static pile and closed vessel composting systems have a good performance record when the extracted off-gas is treated in a composting biofilter, chemical wet scrubber, activated carbon scrubber or thermal oxidizer either individually or in combination.

In 2009, Kodiak operated a pilot composting program with their sewage sludge. They produced Class A biosolids using wood chips as bulking material, forced aeration, aboveground piping and a wood chip filter for off gases. The results of the study found that they needed a ratio of 1:3.2 biosolids to woodchip. They also found that moisture control was very difficult as they needed wet weather in the summer and dry weather in the winter for screening. Odors were a problem during mixing and it took the pile longer than planned to reach the maximum temperature that was needed. Extrapolating from data on Kodiak's pilot program, to compost all of Juneau waste, a 1 acre facility would be needed and the facility cost would be approximately $5-$10 million. Operating costs would be approximately $500-$700,000 per year.

Approximately 9.2 wet tons per day of Class A compost at 32% total solids would be produced.

Cost:

- Treatment per year $500-$700,000
- One-Time Capital $5-10 million and cost of land

Advantages:

- Based on the metals content of Juneau wastewater treatment plant, biosolids would qualify as exceptional quality if composted to meet Class A standards
- Low treatment cost per year

Disadvantages:

- Finding a suitable location acceptable to the public for treatment would be difficult
- Additional treatment of off gas would be necessary to minimize odors
- Water management of the compost pile is difficult
- Large amounts of bulking or absorbent materials required and must be disposed of after use
- Product may not be acceptable by public for land application use

E. Anaerobic Digestion

Description:

Anaerobic sludge digestion is a biologically mediated process accomplished by anaerobic and facultative bacteria that convert 40 to 60 percent of the organic fraction contained in the biosolids feed to carbon dioxide and methane gas. The process is accomplished entirely without oxygen or addition of other substances. Anaerobic digesters must be continuously and thoroughly mixed either through mechanical mixing or digester gas recirculation sparging (mixing). Digesters are generally designed for a detention time of 15 to 25 days. Fifteen days at 35^{o}C is necessary to achieve PSRP requirements for production of Class B biosolids.

There are conventional and high-rate digesters; the conventional design uses a one or two stage process. In any of these systems, provisions are normally made for sludge heating. The one stage digestion systems are the most common.

Digester gas can be recovered, however it increases initial costs because of the necessity of providing explosion-proof equipment. Typically, digester gas has a lower heating value of about 600 BTU/CF, which is about 60 percent of natural gas and contains 25 to 30% carbon dioxide, small amounts of nitrogen, hydrogen sulfide and other gases. Anaerobic digester gas, however, can contain up to 1% hydrogen sulfide which generally needs to be removed to make beneficial use of the gas without detrimental effects on combustion equipment

This process produces approximately 8.9 wet tons per day of Class B biosolids at 18% total solids. The energy input to the system is electricity.

Cost:

- Treatment per year $150,000 to $250,000
- One-Time Capital $5-10 million

Advantages:

- Higher organic loading, i.e. rates of treatment not limited by oxygen transfer as in aerobic digestion
- Minimal need for biological nutrients (N and P) and further treatment
- Less electricity required than aerobic digestion
- Production of a useful by-product (methane) which has a low heat value compared to natural gas

Disadvantages:

- Digesters must be heated to about 30 to 38^{o}C for optimum operation
- Molecular oxygen is toxic to the system and must be excluded
- Higher skilled operation is required
- Anaerobic digesters are easily upset by unusual conditions and are slow to recover
- Mixing in large tanks is more difficult
- Additional safety precautions are needed due to the explosive nature of digester gas
- Recycled filtrate from dewatering of the sludge has a high concentration of ammonia and phosphorus and may need to be treated in a side stream treatment process to avoid shock loading upset of the wastewater treatment plant
- Periodic cleaning of an anaerobic digester is complicated because it is a closed vessel

F. Auto-thermal Thermophilic Aerobic Digestion (ATAD)

Description:

In the ATAD process, volatile solids in waste sludge are degraded in an aerobic, high temperature (55-65ºC) reactor. The reactor is covered and insulated. The high temperature inside is generated by heat released from biological activity in the sludge. The high temperature accelerates destruction of pathogens and organic material.

To achieve Class A standards for biosolids, a properly operating ATAD system would require about 12 days detention time at 55 to 60ºC. An ATAD process can achieve a greater organic destruction

and degree of pathogen reduction with a much smaller reactor as compared to that provided by a conventional aerobic digester. The ATAD system would require approximately one-sixth the volume of a conventional aerobic digester with a thickened sludge feed.

Prior to entering the ATAD reactor, the waste sludge should be thickened to 6 percent. This can be achieved with several mechanical thickeners. For this analysis, a gravity belt thickener was assumed.

Air is supplied with aspirating jet aerators, which provides the oxygen supply to keep the process aerobic and the mixing energy to disperse the oxygen supply homogeneously within the biosolids slurry. Exhaust gas from the ATAD is directed to a cyclic aeration nitrification-denitrification reactor that reduces the concentration of ammonia and soluble Chemical Oxygen Demand (COD) in the liquid phase of the digested sludge. Ultimately this process reduces the impact of the centrate/filtrate recycle stream that is generated when the final biosolids product is dewatered. The recycle stream is discharged to the plant liquids stream process, which is then treated.

Exhaust gas from the nitrification-denitrification process is treated in a wet scrubber to absorb ammonia odors from off gas stream and is then passed through a composting biofilter. The absorbed ammonia water stream from the wet scrubber is returned to the liquids treatment process of the plant.

This process would produce 6.8 wet tons per day of Class A biosolids at 20% total solids and requires 820,000 kWh per year to run.

Cost:

- Treatment per year: $600,000 to $800,000
- One-Time Capital: $5-10 million

Advantages:

- Class A product
- The coupled ATAD followed by the nitrification and denitrification process can collectively remove 60% of the mass of the dry solids content of the sludge entering the ATAD process and improves dewatering characteristics so that 26% solids can be reliably achieved. This process would reduce the annual biosolids production from 6765 wet tons/year at 15% solids to 1560 wet tons/year at 26%, an effective mass reduction of approximately 77%.
- Potential for waste heat recovery

Disadvantages:

- Operators must pay close attention to operating conditions and equipment maintenance.
- Typical operational problems with ATAD systems are poor oxygen transfer efficiency, poor mixing, excessive foam generation, odors and drop in process temperature
- High recycle stream
- High energy costs
- Product may not be acceptable by public for land application use

G. Super Critical Water Oxidation (SCWO)

Description:

SCWO is a high-efficiency thermal oxidation process capable of treating a wide variety of hazardous and non-hazardous wastes including wastewater treatment plant sludge. The process is sometimes referred to as the hydrothermal oxidation process. The SCWO process consists of elevating the temperature and pressure of the waste stream (in this case, the biosolids generated by all three

treatment plants) above the critical point of water, which is 3242 psi and 374^{o}C. Under these conditions water becomes a fluid with unique properties that can be used to completely oxidize organic substances contained in the wastewater stream to carbon dioxide and water if there is adequate oxygen available.

Typically an oxidizing agent such as hydrogen peroxide, oxygen, ozone or potassium permanganate must be added to the wastewater or sewage sludge to allow oxidation to occur since the amount of dissolved oxygen in the sludge is not adequate to support complete oxidation of the organic material contained in the biosolids. The supercritical water oxidation process harnesses most of the energy from oxidation to sustain the process in a looped counter-current tubular reactor.

To date, the SCWO process has been used by less than 10 petrochemical industries, the US Department of Defense for treatment of hazardous and extremely hazardous wastes, and one sewage sludge treatment system. The system used specifically for treating sewage sludge was reported to have been constructed in 2001. This system operated for four years before being decommissioned due to severe and unresolvable corrosion, salt precipitation and mineral scale deposition within the reactor, heat exchanger, piping and pumping systems. Another SCWO municipal sewage sludge system was constructed in the last few years in Orlando, Florida but the author has been unable to obtain any information about its function.

In addition to sewage sludge, the system would accept Household Hazardous Wastes (HHW) and Fats, Oils and Greases (FOGS). The system would produce 1 to 3 wet tons per day of solid waste at 35% total solids.

Cost:

- Treatment per year $500-$700,000
- One-Time Capital $10-$20 million

Advantages:

- Small amount of solid waste produced
- Potential waste heat recovery to fuel system, only energy for start-up required
- Accepts HHW and FOGS

Disadvantages:

- No known municipal sewage treatment systems currently functioning in the United States
- Problems with scale and mineral deposits when treating wastes contained in water with substantial dissolved mineral content, small diameter titanium tubes may help to overcome these problems as well as chemical attack and scour of silts and sands

H. Lime Stabilization

Description:

Class B sludge can be produced with lime stabilization without digestion or other processes. This is accomplished by blending lime with the dewatered sludge at the rate of 500 pounds of lime per dry ton of biosolids at 15 to 20%. Retention time in the mixer is generally one minute followed by 30 minutes retention in a curing vessel. The process removes 50 to 75% of the nitrogen in the biosolids by converting Total Kjeldahl Nitrogen (TKN) to ammonia gas. Capital costs for producing lime stabilized sludge are comparatively low as compared to other Class B alternatives.

Approximately19.2 wet tons per day of Class B biosolids at 18% total solids would be produced. Per year, 250 tons of lime and 40,000 kWh would be required to operate the system.

Cost:

- Treatment per year $200,000 to $300,000
- One-Time Capital $1-3 million

Advantages:

- Low Treatment Cost

Disadvantages:

- Highest amount of biosolids produced of all systems in this study
- Potential Odor
- Large amounts of lime can pose safety hazards for staff
- Land application may be difficult if product is not accepted by public

I. Lime + Heat Stabilization

Description:

Class A sludge can be produced with lime and heat. The sludge is heated by indirect application of steam generated by a diesel fired boiler. The process would require approximately 200 tons of lime. Several commercial systems have been developed to couple the lime stabilization process with the sludge dewatering process. FKC and RDP are two manufacturers that have a track record of performance with producing Class A lime stabilized biosolids in conjunction with dewatering.

Approximately 15.7 wet tons per day of Class A biosolids at 22% total solids would be produced. Annual fuel consumption would be 45,000 gallons of diesel fuel and 100,000 kWh of electricity.

Cost:

- Treatment per year $500,000 to $700,000
- One-Time Capital $4-8 million

Advantages:

- Less biosolids produced than with just lime stabilization
- Class A product

Disadvantages:

- Higher treatment cost than with just lime stabilization
- Potential Odor higher than with just lime stabilization
- Large amounts of lime can pose safety hazards for staff
- Land application may be difficult if product is not accepted by public

J. Heat Drying Without Digestion

Description:

Heat drying is accomplished from direct or indirect dryers used to evaporate water from the dewatered biosolids. Heat drying is one of several methods that are used to reduce the volume and improve the quality of biosolids. Heat drying is an ideal process for producing Class A Biosolids in which the product can be used beneficially.

Most new heat drying biosolids facilities use the direct rotary drying process. Heat dryers use large amounts of energy to evaporate the water from the biosolids. Typical heat drying systems require 1,400 to 1,700 BTU per pound of water evaporated. Wastewater treatment plants that have anaerobic

digesters have used the digester gas to fuel the heat drying units. Dryers are often located at plants in areas where landfilling, incineration and land application of Class B biosolids is prohibitively expensive or not feasible. Exhaust gas from dryers is very odorous and typically requires multiple stage treatment systems to prevent complaints from plant workers and residents in the vicinity of the drying plant. Dust generated by storage and transfer of dried sludge requires special attention during design because dusts can adversely affect human health and cause odors when the dried sludge comes in contact with moisture.

This process produces 3.1 wet tons per day of Class A biosolids at 90% total solids. It requires 100,000 gallons of diesel fuel per year and electricity to operate.

Cost:

- Treatment per year $600,000 to $800,000
- One-Time Capital $5-10 million

Advantages:

- Class A product
- Low amount of biosolids produced
- Potential waste heat recovery

Disadvantages:

- Large amount of fuel required to operate system
- Dust is a health hazard
- Severe odor

IV. LIST OF ABBREVIATIONS

ABWTP	Auke Bay Water Treatment Plant
ATAD	Autothermal Thermophilic Aerobic Digestion
BOD	Biological Oxygen Demand
BFP	Belt Filter Press
CBJ	City and Borough of Juneau
COD	Chemical Oxygen Demand
FBF	Fluidized Bed Furnace
JDWTP	Juneau Douglas Water Treatment Plant
MCRT	Mean Cell Residence Time
MPN	Most Probable Number
MWTP	Mendenhall Water Treatment Plant
PFRP	Process to Further Reduce Pathogens
PSRP	Process to Significantly Reduce Pathogens
SCWO	Supercritical Water Oxidation
TKN	Total Kjeldhal Nitrogen
VAR	Vector Attraction Reduction
VSS	Volatile Suspended Solids
WAS	Waste Activated Sludge
WM	Waste Management

VI. Biosolid Management System Alternatives Matrix

Each System is comprised of Disposal Alternatives and Treatment Alternatives

1. Disposal Alternatives

		Biosolid Product Accepted	Problems	Public Perception Issues	Infrastructure Needs	Operational Cost
A	**Landfill at Local Waste Management**	Class A and B, high hydrocarbon content rejected	May not accept indefinitely due to space limitations	Percieved odor problem	None	$88/wet ton + transportation
B	**Landfill at Out of Town Waste Management**	All Waste	Changing regulations in WA and OR may prevent biosolids from being accepted		Shipping Containers	$140/wet ton + transportation
C	**Monofill**	All Waste	65 acres required for 20 year life	Potential objection from nearby property owners	Land	$25-$50/wet ton + transportation
D	**Local Land Application**	Class A and Class B (more restrictive)	Huge amount of land required	Finding willing consumers difficult, acceptance of application on public land may be difficult	Land	transportation costs

2. Treatment Alternatives

		Biosolids Produced								COST	
		Quality	Approximate Quantity (average wet tons/day)	Disposal Options	Inputs to System - Energy and Other (annual)	Other Outputs	Waste Energy Recovery Possible	Implementation Time Period	Potential Problems	Annual Treatment*	One-Time Capital
A	**Existing**	solid waste	18.5 @ 15% TS	Landfill, Monofill	Electricity			Current Operation	High Energy Consumption for Transportation	Low	NA
B	**Aerobic Digestion**	Class B	12.8 @15% TS	Landfill, Monofill, Land Application	Electricity 3,350,000 kWh	Minimal recycle stream		1-3 years	High Energy Consumption	Medium	$2-5 million
C	**Incineration**	Ash, solid waste	2.7 @ 35% TS	Landfill, Monofill	Diesel - 100,000 Gal/yr Electricity	CO2	Potential waste heat recovery	3-5 years	High Operations Cost	High	$10-15 million
D	**Compost**	Class A	9.2 @ 32% TS	Landfill, Monofill, Land Application	Oxygen, Nitrogen, Water, Bulking Material (shredded tires, paper, cardboard)	Odor, potential leachate		1-3 years	Disposal of surplus material, potential odor, public acceptance and use of product	Medium	$5-10 million
E	**Anaerobic Digestion**	Class B	8.9 @ 18% TS	Landfill, Monofill, Land Application	Electrical Power	CO2, methane, ammonia and hydrogen sulfide if gas is not utilized, odor, higher recylce stream	Digester Gas for cogen and digester heating	1-3 years	Safety Issues for Public and Staff with Explosive Gas	Low	$5-10 million
F	**Autothermal Thermophilic Aerobic Digestion (ATAD)**	Class A	6.8 @ 20% TS	Landfill, Monofill, Land Application	Electricity - 820,000 kWhr polymer (prethickening)	Potential odor	Potential waste heat recovery	3-5 years	Odor a big problem with first generation processes; second generation improvements have much lower odor potential	Medium	$5-10 million
G	**Super Critical Water Oxidation (SCWO)**	solid waste	1 to 3 @ 35% TS	Landfill, Monofill, Land Application	Oxidizing Agent, Accepts HHW and FOGS also	No data	Energy recovered from system fuels treatment process	5-7 years	Process not known to have been successfully implemented in the US for municipal wastewater treatment	Medium	$10-20 million
H	**Lime Stabilization**	Class B	19.2 @ 18% TS	Landfill, Monofill, Land Application	Lime 250 tons Electricity 40,000 kWh/yr	Ammonia, potential odor		1-3 years	Staff safety with large amts of lime	Low	$1-3 million
I	**Lime + Heat Stabilization**	Class A	15.7 @22% TS	Landfill, Monofill, Land Application	Diesel - 45,000 Gal Electricity 100,000 kWh Lime 200 tons	Higher odor potential		3-5 years	Staff safety with large amts of lime	Medium	$4-8 million
J	**Heat Drying without Digestion**	Class A	3.1 @ 90% TS	Landfill, Monofill, Land Application	Diesel 100,000 gal Electricity	Dust, Severe Odor	Potential waste heat recovery	3-5 years	Product may be highly odorous	Medium	$5-10 million

***Does not include disposal costs. Low= <$500k/year, Medium=$500k - $1 million/year, High= $1 million+/year**

Notes:

1. Design Life Expectancy is 40 years for concrete and piping systems, 20 years for pumps and other equipment, and 7 years for shipping containers.
2. Higher potential for odor release during treatment process resulting in Class A biosolid than Class B.
3. Abbreviations: TS= Total Solids
4. Cost data are planning level estimates only prepared by Tetra Tech using CapDet modeling software, manufacturer information, and industry experience.