Committee of the Whole

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Committee of the Whole

to be held at
City of Penticton, Council Chambers
171 Main Street, Penticton, B.C.

Tuesday, August 20, 2019
Recessed from the Regular Council Meeting at 1:00 p.m.

1. **Call Committee of the Whole to Order**

2. **Adoption of Agenda**

3. **Delegations and Staff Presentations:**

   3.1 **Celebrating 110 years of Penticton Boy Scouts** 1-9
   Gerry Lamb, Irwin Hobden, Jan Hanna, Randy Manuel and Dennis Oomen

   3.2 **Animal Lifeline Emergency Response Team** 10
   Deborah McBride

   3.3 **Penticton Wastewater Solids Review Project** 11-41
   David Lycon, Senior Wastewater Process Engineer, Water, AECOM
   and Len Robson, Public Works Manager

4. **Adjourn to Regular Meeting of Council**

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Request to Appear as a Delegation

Preferred Council Meeting Date: August 20, 2019

Second choice(s): ______

Subject matter: Celebrating 110 years of Penticton Boy Scouts

Name of person(s) making presentation:

Gerry Lamb, Irwin Hobden, Randy Manuel, Dennis Oomen and Jan Hanna

Address:

Phone:

Email:

Please provide details of your presentation or request of Council here: (or provide a detailed attachment)

We have two objectives. First is to continue building on our nearly 9 years of working with our public Museums to preserve and document Scouting history on a local basis. Publicity is helpful in encouraging people to look twice at old items and papers before relegating them to the dumpster. Second is to finally celebrate this rich heritage, and what better excuse than the 110th Anniversary of Scouting in Penticton,,,,,,in 2020.
This package contains background on how the project has evolved over the years, with a sample year of data which is verified by archived items in the Museum, and with a sample of where we are going with regard to documenting something as simple as a 35 Boy Scout shirt before it gets donated to the Museum. We have achieved significant success at archiving how Pentictonites guided the youth of the community. The time has come to celebrate this in a public manner.

Please note:

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- Please submit this completed form at your earliest convenience. Written Requests to Appear are to be received by the Corporate Officer, no later than noon Monday, one week prior to the Council meeting. Please include a copy of all materials that will be discussed.
- If you'd like to share a PowerPoint with Council, email it to the Corporate Officer by 9:30 a.m. Wednesday prior to the Council meeting to be included with the Agenda.
- We recommend you bring backup PowerPoint files with you on a memory stick.
- Delegations are limited to 5 minutes.

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110 in 2020 !!!!

The Boy Scout movement came to Penticton in 1910 under the guidance of Harry Pitman Scoutmaster and the Rev Ferguson Miller Assistant Scoutmaster.

Why? In that first Scout Troop was a young man named Frank Oscar McDonald, who became one of the earliest King's Scouts in Canada, and certainly the first in the South Okanagan, in 1912. After service in the Royal Flying Corps in the First World War, Mr McDonald returned to his home and proceeded to engage in a lifetime of community service, including periods as a Rotarian, civic politician, active contributions at the Okanagan Historical Society, community bands and other music organizations, the Peach Festival and the Square Dance Jamboree. And many others.

While he was doing all of the above, and while working for a living, and while helping to raise a family, he found the time and energy to dedicate 50 years of his adult life as a volunteer in the Boy Scout movement. Who does this sort of thing?

Who are we? Our group of loosely affiliated former Scouts and adult Scouters from the Penticton area has been researching stories like this for nearly nine years, and working closely with our civic Museum and Archive organizations to ensure that historic documents and artifacts are preserved for future generations. We call ourselves DYB DYB South Okanagan Historical Group, with Gerry Lamb as Interim Chair and Irwin Hobden as Honorary Chair. Input and item donations have come from all over the South Okanagan District, including notable Pentictonites such as Don Gray, Allan Dawkins, Sandy Ross, Brad Houston, Randy Manuel, Jan Hanna, Richard Tallon, Phil Williams and Tim Gladish.

What have we preserved? When we look at people who volunteered for 25 to 50 years in the Boy Scout movement in our area, we discover a lengthy list. Some names are familiar, but many have been forgotten. People such as Ruth Naish, Bert Swift, Avery King, Jim Laidlaw, Harley Hatfield, June Cuming, Jack Stocks, Mrs Tidball, Doug Southworth, Irwin Hobden, Bob Winter, Jack Scrivener, Jack Vass, Gwyn Russell, Allan Dawkins, Richard Tallon, Edgar Dewdney, Harry Boyle, George Layer, Brad Houston, Bob Osbourne, and David Mitchell. These were just the standouts from Penticton, There were many more when the rest of the District is included. And if we include those who served 15 to 20 years, the list is expanded substantially.

When we talk about the history of the Boy Scout movement, we are really talking about the people who made it happen. While Scouting depended heavily on parents and other community adults, these people depended on the "super volunteers of Scouting" to train and guide them. While many stories are told about their lives and community activities, Scouting is generally reserved to a line or two in their histories. It is time to tell those stories.

The next step. Let's have a party next year to celebrate 110 years of Scouting in Penticton. Let's put our artifacts and documents on display in our museums. Let's write the Scouting history of our community adults who made it all possible. And let's invite current and former Scouting youths and adults to "come home" next year to celebrate.

Gerry Lamb, Interim Chair

DYB DYB South Okanagan Historical Group

Our Proposal

The Museums. Over the past nearly nine years the public Museums of the South Okanagan have acquired a substantial collection of documents and artifacts relating to the history of the Boy Scout movement in each of their towns. The collection in each Museum is different since the focus is on the achievements and activities of people (both youths and adults) in each community. The Penticton Museum and Archives has also become the storehouse of the District-level documents.

Several of our Museums have expressed interest in using their seasonal display space in the summer and early autumn of 2020 to celebrate the rich history of the Scouting movement in their community. We are encouraging them to build their displays around the adult "super volunteers" who made Scouting such a success. We understand that the Museums can take care of their own requirements in this regard.

Reunions are good for tourism. We feel there is an opportunity for tourism next year. Call it a "reunion" if you wish, a weekend to celebrate all that was and is good about the Boy Scout movement. Since the Museum displays are static, this would have to occur off-site. Looking at the success many years ago of the 100 year celebration of Pen High, the Shatford Centre is an ideal option. The facility is available for three days on September 20-22, 2020.

The weekend will expand beyond what the Museums can display. **Activities and events under consideration** are an area where Jamboree materials can be displayed (only those events attended by local youths and adult volunteers). Central to this display would be the B.C./Yukon Jamboree which happened on the West Bench in July of 1966. Other ideas include a "badge trader and swap meet", always popular at Scouting events, demonstrations of Scouting skills such as ropes and lashings (what can we build over the weekend?), demonstrations of opening and closing ceremonies from all age groups, and of course a campfire with all of its traditional songs and skits. Other activities will be considered as we get further into the planning process. It could include field trips to the Scout Camps at Camp Boyle (Summerland) and Camp Secrest (Oliver).

We believe that with good promotion, starting in late September, 2019, we can attract a significant number of former Scouters back to Penticton for three days of memories. As a bonus, there is a belief that the weekend will prompt further donations of photos and documents to fill in some of the gaps in the Museum collections.

This is an example of what we have been able to piece together for just one of the years from 1909 to 2000. Depth of detail varies from year to year. All data is substantiated by documents and/or artifacts in our local Museums.

1955

Lady Baden-Powell visited Penticton on October 9.1955. Ceremonies were held at King's Park

1st Summerland Group
1st Summerland Cubs, Isabel McCargar Cubmaster, Allan McCargar ACM
1st Summerland Scouts, D.M. Munn Scoutmaster replaced by Rob Read mid-year, Eric Brinton ASM, Bill Clark ASM
Group Chair Dr. D.L. McIntosh
Sponsored by Branch 22, Royal Canadian Legion
Scouts Harold Oxley and Ted Hannah attended World Jamboree at Niagara on the Lake, Ontario

2nd Summerland Group
2nd Summerland Cubs, Mrs A McCargar Akela
2nd Summerland Scouts, Doug Campbell Scoutmaster, replaced by Woolliams, then Allan McCargar
McGibbon Group Chair
Sponsored by United Church

1st Penticton Group
1st Penticton Cubs, Leaders Mrs C S Conley Akela, Mrs White ACM, Mrs Thomas ACM
1st Penticton Scouts, Jack Stocks Scoutmaster, Ron Bradshaw ASM
1st Penticton Rovers, Don Jones Advisor
Scouts Murray Dean, Alastair Bennie, Bob Meyers, Pat Shipton, Ken Laidlaw, Bruce Dalrymple, Barry Abbott and Jack Boulding attended World Jamboree at Niagara on the Lake, Ontario. Jack Stocks attended as Scouter.
Scouts Philip Paslawski, Leslie Trabert, Jack Boulding, Bruce Dalrymple and Bernie Bermbach achieve Queen's Scout status
Frank McDonald Group Chair, replaced by Len Hill

2nd Penticton Group
2nd Penticton Cubs, Mrs Baulkham Akela
2nd Penticton Scouts, Ron Jensen ASM, Mr Gilmour ASM
Mr Bartlett Group Chair

3rd Penticton Group
3rd Penticton Cubs
3rd Penticton Scouts, Irwin Hobden Scoutmaster
Sponsored by Anglican Church

5th Penticton Group
5th Penticton Scouts, Mr Gordon SM, Steve Stogre ASM, Larry Adamson ASM
Mrs Richter Group Chair

6th Penticton Group
6th Penticton Cubs
Sponsored by United Church, Penticton

1st Naramata Group
1st Naramata Scouts, Gwyn Russell SM, Mr Tennant ASM

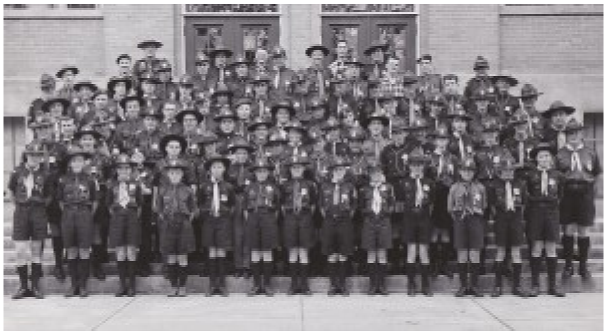
1st Hedley Group
1st Hedley Scouts, Fred Brent Scoutmaster
Scout Robert Calderoni attends World Jamboree at Niagara-on-the-Lake, Ontario, courtesy of Bank of Nova Scotia contest.
Scouts Danny Collins, Bob Graham and Paul McInnis attend World Jamboree in Niagara-on-the-Lake

1st Oliver Group
1st Oliver Scouts
Scout Roy Hayter achieves Queen's Scout status
Scout R B Hayter attends World Jamboree at Niagara-on-the-Lake, Ontario

2nd Oliver Group
2nd Oliver Scouts, Les Smith Scoutmaster, Jim Smith ASM, R Malcolm ASM
Founded in July, 1955, as "Oliver United Church Scout Troop"
Group President Hec Scott
Group Chair (Acting) Frank McDonald.
Adopted navy and red neckerchief.

1st Osoyoos Group
1st Osoyoos Cubs "A" Pack, Geoffrey King Akela, Mrs Barton ACM, Michael Mepham ACM
1st Osoyoos Cubs "B" Pack, Roy Degenstein Akela, Mrs McHugh ACM, Georger Sutton ACM
1st Osoyoos Scouts, Harold King Scoutmaster, E Albrecht ASM

District Commissioner, J.B. (Jim) Laidlaw (South OK)
Isobel McCargar DCM (OK South)
District Commissioner Jim Mitchell (Okanagan Boundary)
J D Southworth retires as Commissioner for South Okanagan
Dr T H Anstey President South Okanagan District Council (A A Swift continues on Council)
Field Executive Jack Scrivener receives 5-year Bar added to long service medal (total 15 years)/em>
Carleton McNaughton appointed to Provincial Training Team



1955 Patrol Leader Conference. Scouters Irwin Hobden and Jack Stocks are in back row on the left, Jim Laidlaw, Bob Winter and Vic Wilson on far left. Gwyn Russell on right.

World Jamboree at Niagara-on-the-Lake, Niagara, Ontario, in August, 1955. *Approximately 11,000 Scouts attended**.** Local attendees were Scouts Harold Oxley and Ted Hannah from 1st Summerland, Scouts Murray Dean, Alastair Bennie, Bob Meyers, Pat Shipton, Ken Laidlaw, Bruce Dalrymple, Barry Abbott and Jack Boulding from 1st Penticton, Scouts Danny Collins, Bob Graham and Paul McInnis from 1st Hedley, and Scout R B Hayter from 1st Oliver.Assistant Scoutmaster Jim Cade (1st Hedley) attended as part of the "B.C. Scout Staff in Sub-Camp Pacific". J.D. Southworth, District Commissioner, was in charge of Okanagan Troop #11 (Ogopogo Troop). Jack Stocks, Scoutmaster 1st Penticton, worked in one of the Trading Posts. Jack Scrivener, Scouts Canada Field Executive, was a Quartermaster. Ron Jensen, 2nd Penticton ASM, was attached to the Pacific HQ Cooking Staff. 429 people attended from British Columbia.*

This is a sample of how we are trying to archive items in our municipal museums.

Chris Ploner Uniform

Chris Ploner was a member of the 1st Penticton Scouting Group in the 1970s and early 1980s. He currently lives and works in Penticton. His Father, Erwin Ploner, was an Assistant Scoutmaster for a number of years. The tan shirt is representative of the “second generation” of Venturer uniform for the older Scouts (age 14 and up). The design replaced the original tan Venturer uniform which is in the Penticton Museum. The badge on the left pocket was first used in 1968 (after the Venturer program was officially adopted), and continued in use until 1991. The same applies to the Venturer shoulder epaulettes. The loden green beret was changed in 1968 to a lighter material from the original felt. In 1982 a loden green baseball style hat was introduced as optional official headgear. In addition to achieving the Chief Scout’s Award, Chris had the rare privilege of being able to attend two large Jamborees. Samples of ephemera from these Jamborees are in the archives of Penticton Museum and Archives.


Proficiency badges and special achievement awards underwent a major overhaul prior to the introduction of the new Venturer uniform and program in 1968. Some of these changes are listed below.

Canoeing badge discontinued 1982

Citizen achievement badge new in 1968, 3 layers, silver border is 2nd.

Collector new in 1968

Entertainer 68-98

Exploring Achievement new in 1968. Multi level, gold is top

Family Care new in 68

First Aid Achievement Badge redesigned 1968. 3 levels, silver is 2nd

Literary Arts new in 68

Modeler new in 68

Music new in 68

Safety Achievement Badge redesigned 1968, 3 layers, gold is top

Sailing new in 68

Sportsman new in 68

Swimming Achievement redesigned in 68, 3 levels, silver is 2nd

Team Sportsman new in 68

Winter Sportsman redesigned 68

Challenge Award Chain introduced in 68 til 98. Replaces the older cords. Bronze, silver, gold, only highest is worn

Gerry Lamb

March 25, 2019

110 in 2020

HOW CAN YOU HELP?

Celebrate with us! Honour the rich, 110 year heritage of the Boy Scout movement in Penticton.

The Penticton Museum and Archives will soon confirm a seasonal display of local Scouting history for 2020, and with potential exhibits at Summerland, Oliver and Naramata Museums. Let's encourage "Scouting tourism" through channels at Tourism Penticton.

Support a "Weekend of Memories", September 20-22 in 2020, at the Shatford Centre and other locations. This will feature Camporees and Jamborees attended by local youths and adults, other special Scouting events that occurred in Penticton, displays of Scouting skills, Scouting ceremonies through the decades, perhaps visits to Camp Boyle and Camp Secrest including a stop at the ghostly "Gone Home" wall at Camp Boyle.

OUTCOMES

Create expanded awareness of the need to preserve our history before it is lost forever. Significant documents and items still lie buried in basements, attics and garages, waiting to be discovered.

Offer an opportunity for area Scouting Groups to create interest in their activities.

Remind the community that Scouting was, and still is, about community service, learning lifelong skills, leadership and fun.

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Request to Appear as a Delegation

Preferred Council Meeting Date: August 6, 2019

Second choice(s): August 20, 2019

Subject matter: Animal Lifeline Emergency Response Team

Name of person(s) making presentation:

Deborah McBride

Address: Box 208, 113 - 437 Martin Street
Penticton, BC V2A 5L1

Phone: 250.809.7152

Email: info@alertcanada.org

Please provide details of your presentation or request of Council here: (or provide a detailed attachment)

Since 2017, the Animal Lifeline Emergency Response Team (ALERT) has been using the old Pound facility at 2330 Dartmouth Drive as an Animal Intake Facility for animals evacuated during a declared emergency/disaster.

In 2017, this permission was granted from the previous contracted Poundkeeper and with knowledge from the CAO, Peter Weber. In 2018 we started to make some improvements to the building and in 2019, the ALERT Volunteers had the entire inside professionally cleaned and painted.

This building has been invaluable to our team and we would like to make an MOU with the City to make it official with permission from Council. We are insured under BMS Canada and have the location "additionally insured under our policy".

ALERT supports the Penticton and RDOS ESS teams and in 2017 when Penticton agreed to support the Province by receiving evacuees from Williams Lake, this facility proved invaluable for their animals. We housed animals from the Highland Motel fire in Penticton. Additionally, during the floods in Oliver, Cawston, Chopaka, Keremeos, Okanagan Falls, etc. we had animals from the end of March through to July of 2018. We would like to present a powerpoint and seek permission from Council to continue occupying this building.

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The City of Penticton

Summary Report

Wastewater Solids Management Review

Prepared by:

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Prepared for:

The City of Penticton
171 Main Street
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Date: August, 2019

Project #: 60580404

Distribution List

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Revision History

Rev #	Date	Revised By:	Revision Description
0	July 23, 2019	D. Lycon	Issued For Review
1	August 12, 2019	D. Lycon	Issued For Final Report

AECOM Imagine it. Delivered.

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August 12, 2019

Len Robson
Public Works Manager
City of Penticton
171 Main Street
Penticton, BC V2A 5A9

Dear Len,

Please find attached our summary report for the City of Penticton Wastewater Solids Management Review project. The detailed technical memoranda that support this summary report have been included as appendices.

We appreciate the opportunity to have worked with the City on this important project and look forward to assisting in the future with the development of a solution for the management of the wastewater solids generated at the Advanced Wastewater Treatment Plant.

Sincerely,
AECOM Canada Ltd.

David Lycon, P.Eng.
Project Manager
david.lycon@aecom.com

Encl:
DSL:yp

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- represents AECOM's professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to AECOM which has not been independently verified;
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context;
- was prepared for the specific purposes described in the Report and the Agreement; and
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AECOM: 2015-04-13

Authors

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Process Engineer

Report Reviewed By:

David Lycon, P.Eng.
Project Manager & Senior Process Engineer

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Appendices

1. Project Summary

1.1 Project Objectives

The City of Penticton commissioned a Wastewater Solids Management Review to identify a sustainable solution to the growing production of waste solids from its Advanced Wastewater Treatment Plant (AWWTP).

The project was developed using five technical memoranda (TMs), which are located as appendices to this summary report. The purpose of these five preceding (TMs is to identify a sustainable solution for the management of waste solids from Penticton's Advanced Wastewater Treatment Plant (AWWTP). The five TMs describe the existing facilities and regulations, predict future wastewater solids production for the City of Penticton, develop a long list of wastewater solids management processes, propose a decision-making methodology, and evaluate different technological solutions.

This project summary provides an overview of the information provided in the five TMs as well as a recommendation on how the City of Penticton should proceed with the management of their wastewater solids.

1.2 Background Data Review

1.2.1 Biosolids Characteristics

Technical Memorandum 1 (TM1) estimates the future loadings and solids production. Historical data from the past 5 years was used to estimate the average per capita solids production as well as the peaking factors associated with solids production. A population estimate for the Penticton area over a 20-year design horizon of the project is used in conjunction with the average per capita solids production to estimate the amount of solids production that can be expected over the design horizon. Peaking factors were then applied to the average 20-year solid production to account for seasonal and operational fluctuations. The expected biosolids production can be found in in Table 1.1.

Table 1.1: Expected Biosolids Production

Date (Year)	Population	Yearly Solid Production (kg-dry/year)	Average Per Capita Solids Production (kg-dry/capita-day)
2013	33,401[1]	1,075,932	0.088
2014	34,070[1]	1,104,090	0.089
2015	34,492[1]	1,187,879	0.094
2016	32,847[1]	1,100,327	0.092
2017	34,935[1]	1,263,745	0.099
2038	40,027[3]	1,351,676	0.092[2]

Notes:

1: British Columbia Annual Population Estimate for the City of Penticton

2: Future 2038 Solids Production Taken as Average 2013 – 2017 Solids Production

3: 0.65% Medium Growth Rate, Population Projections and Housing Needs Review, Urbanics Consultants Ltd., March 2018

1.2.2 Other Source Contributions

The AWWTP accepts biosolids from both the Okanagan Falls WWTP and the Penticton WTP. Although there are plans to divert solids streams from both the Okanagan Falls WWTP and the Penticton WTP they are not yet in place and therefore AECOM recommends accounting for these streams during the planning phase.

Biosolids produced at the Okanagan Falls WWTP are trucked to the AWWTP as fermented primary sludge (FPS) and thickened waste activated sludge (TWAS). The FPS is released at the headworks of the AWWTP via septage receiving and is fully treated at the AWWTP. TWAS from the Okanagan Falls WWTP is transported directly to TWAS storage tank at the AWWTP. Biosolids from the Okanagan Falls WWTP represent 5.8% of the total mass of biosolids that need to be dewatered at the AWWTP before further solids processing occurs. At this time plans are being made for a dewatering facility at the Okanagan Falls WWTP. When this facility is built the AWWTP would no longer need to receive biosolids from Okanagan Falls at the AWWTP.

Solids are collected at the Penticton WTP from the dissolved air flotation and filter backwash processes and delivered to the AWWTP through the sanitary sewer. Although the Penticton WTP has a centrifuge that allows these solids to be dewatered on site and then trucked to the landfill, the facility does not currently utilize this process. Solids produced at the Penticton WTP contain a high concentration of aluminium. The aluminum aids in the reduction of the phosphorus found in the sewage but it also significantly increases the amount of inert solids entering the AWWTP. On average, solids from the Penticton WTP make up 11% of the solids that need to be dewatered. There has been discussion on bringing the centrifuge into service which would eliminate the solids being diverted from the WTP to the AWWTP.

1.3 Regulatory Review and Summary

The Canadian Council of Ministers of the Environment (CCME) developed and approved a Canada-wide approach for the management of wastewater solids which encourages the following principles:

1. Municipal biosolids, municipal sludge and treated septage contain valuable nutrients and organic matter that can be recycled or recovered as energy
2. Adequate source reduction and treatment of municipal sludge and septage should effectively reduce pathogens, trace metals, vector attraction, odours and other substances of concern
3. The beneficial use of municipal biosolids, municipal sludge and treated septage should minimize the net greenhouse gas emissions
4. Beneficial uses and sound management practices of municipal biosolids, municipal sludge and treated septage must adhere to all applicable safety, quality and management standards requirements and guidelines

In Canada, wastewater solids are regulated by provincial governments and the Province of British Columbia has done so considering CCME principles. In BC composting of organic matter is regulated by the Organic Matter Recycling Regulation (OMRR). However, if compost is applied to the land as fertilizer it is regulated federally by the Safety Guidelines for Fertilizers and Supplements.

Organic matter suitable for composting is described in Schedule 12 of the OMRR. In March 2017, the Ministry of Environment and Climate Change Strategy affirmed that undigested or raw sludge from domestic wastewater will not be included in Schedule 12. However, recently the Ministry has reversed this line of thinking and is proposing to include undigested wastewater sludge in Schedule 12.

At a recent Compost Council of Canada Conference held in Vancouver on February 28, 2019, staff members from the Ministry of Environment and Climate Change Strategy outlined the forthcoming changes to the OMRR. The notable changes to the OMRR are summarized below:

1. Composting facility planning requirements would be set based on annual mass of wet solids received. Facilities receiving over 15,000 tonnes per year will be required to obtain an operational certificate from the Ministry. This is a change from past regulations which required permits if the facility's annual production of compost was greater than 5,000 tonnes.
2. Composting facilities will be required to complete an odour management plan as part of their Facility Environmental Management Plan (FEMP).
3. Un-stabilized domestic wastewater treatment solids will be an allowable feedstock at composting facilities; either in the production of Class B or Class A compost.

Given the proposed changes to the OMRR it can be expected that the AWWTP would be able to stabilize its raw dewatered solids through composting. The current operating certificate for the AWWTP requires biosolids handling method to comply with the OMRR. The new proposed OMRR regulations are outlined in Table 1.2.

Table 1.2: Summary of the Future Organic Matter Recycling Regulations

Description	Current Authorization Process	Proposed Authorization Process	Requirement for Penticton Compost Facility
Facilities receiving 15,000 tonnes (wet weight) or greater of feedstock	Permit, Approval, Operational Certificate	No change	
All other facilities	Notification	Registration	X
Land application of Class A or B biosolids and Class B compost	Notification	Registration	
Land application of Class A compost	Comply with OMRR	No change	X

The Ministry is proposing that all composting facilities that receive less than 15,000 tonnes of feedstock per year be required to register with the Ministry. Currently, facilities the size of the Penticton Compost Facility are required to notify the Ministry by submitting a notice in writing to the appropriate director, and the Land Reserve Commission about the facility location and design, the contact person and type of waste received. However, the Ministry wishes to create a more transparent system in partnership with First Nations by requiring registration prior to operation instead of notification of operation in the future. In order to register with the Ministry of Environment a compost facility would have to submit plans, reports and specifications to the Ministry, First Nations, local regional districts and the Provincial Agricultural Land Commission. Given the expected size of the City of Penticton Compost Facility the city would be required to register with the Ministry of Environment and provided the associated documentation discussed above. It is likely that the Province will require an annual registration fee for each facility. The 2018 OMRR Intentions Paper outlined these fees to be a $400 registration fee and then an additional $200 per calendar year.

Currently, Class A compost can be applied to the land with no restrictions on the volume applied to the land. Class A compost must be analyzed for the presence of pathogens and heavy metals at least every 1,000 tonnes of dry weight produced or once per year. The facility must record temperature and retention time as well as the results of the analysis. Under the proposed OMRR changes compost facilities producing Class A compost would have to continue to meet the previously discussed regulations, but no further actions would need to be taken. The City of Penticton Compost Facility will produce Class A compost and therefore it will not have to register to apply the compost to the land. However, the facility would still need to be compliant with the OMRR regulations.

The OMRR outlines the quality of the compost through defining the concentration of heavy metals and fecal coliforms present. The maximum acceptable contaminant concentrations are outlined in Table 1.3. The average concentration, as well as the range in concentrations in contaminants measured between 2015 and 2018 at the Penticton facility, is also presented in Table 1.3. The current facility meets the existing OMRR regulations most of the time. One of fourteen samples taken in 2017 failed to meet the fecal coliform limit and one sample in 2018 failed to meet the zinc limit for Class A compost.

Table 1.3: Summary of the Organic Matter Recycling Regulations on allowable concentrations of pathogens and heavy metals

Constituent	Unit	Class A Compost	Biosolids Growing Medium	Class B Compost	Penticton Compost Facility
Fecal Coliforms	(MPN/g-dry solids)	< 1,000	< 1,000	< 2,000,000[2]	124 (3-1900)
Arsenic	(µg/g-dry)	13	13	75	6.6 (5.84-8.15)
Cadmium	(µg/g-dry)	3	1.5	20	0.7 (0.613-0.78)
Chromium	(µg/g-dry)	100	100	1060	19.2 (17.5-21.5)
Cobalt	(µg/g-dry)	34	34	150	2.9 (2.67-3.1)
Copper	(µg/g-dry)	400	150	2200	240 (220-265)
Lead	(µg/g-dry)	150	150	500	35 (27-42.2)
Mercury	(µg/g-dry)	2	0.8	15	0.3 (0.226-0.358)
Molybdenum	(µg/g-dry)	5	5	20	3.6 (2.95-4.2)
Nickel	(µg/g-dry)	62	62	180	8.5 (7.84-9.7)
Selenium	(µg/g-dry)	2	2	14	1.5 (1.34-1.66)
Zinc	(µg/g-dry)	500	150	1850	420 (320-801)
Foreign Matter	(%)	< 1[3]	< 1[3]	< 1[3]	Not Measured

If the compost will be land applied as fertilizer, it is regulated by the current Federal Fertilizers Regulations. These regulations require that the fertilizer product cannot contain any substance in quantities likely to be detrimental or injurious to vegetation, animals, public health, or the environment. The amount of metals that can be found in the fertilizer is determined by the fertilizer application rate on the land in question and the maximum acceptable cumulative metal addition to the soil over 45 years. The maximum amount of metal that can be applied to a hectare of land of 45 years is outlined in Table 1.4.

Table 1.4: Summary of the Safety Guidelines for Fertilizers and Supplements for heavy metals

Constituent	Unit	Maximum Acceptable Cumulative Constituent Additions to Soil over 45 Years
Arsenic	(kg-metal/ha)	15
Cadmium	(kg-metal/ha)	4
Chromium	(kg-metal/ha)	210
Cobalt	(kg-metal/ha)	30
Copper	(kg-metal/ha)	150
Mercury	(kg-metal/ha)	1
Molybdenum	(kg-metal/ha)	4
Nickel	(kg-metal/ha)	36
Lead	(kg-metal/ha)	100
Selenium	(kg-metal/ha)	2.8
Thallium	(kg-metal/ha)	1
Vanadium	(kg-metal/ha)	130
Zinc	(kg-metal/ha)	370
PCDD/Fs[1]	(mg-TEQ/ha)	5.355

2. Technology Long List Summary

A long list of wastewater solids management technologies were developed in TM2 for evaluation in an effort to further develop a manageable short list for detailed evaluation. The technologies fall under one of three major classifications, as defined below. The advantages and disadvantages as well as the state of maturity of each technology is summarized in Table 2.1.

1. Biological Stabilization Processes

Biological stabilization utilizes microbes to provide volatile solids and pathogen reduction, and a degree of odour reduction. All biological processes are dependent on time, pH, temperature and mixing. Common biological processes include anaerobic and aerobic digestion, and composting.

2. Drying and Thermal Processes

Drying and thermal technologies rely on the input of thermal energy in order to stabilize wastewater solids and reduce the volume of material to be hauled away for re-use or disposal. Drying and thermal processes are not popular in Canada but their frequency in use is increasing due to ability of these processes to greatly reduce the volume of solids that needs to be disposed of.

3. Final Re-use and Disposal

After wastewater solids are stabilized through a biological process they need to be disposed of. The resulting solids can be applied to the land, landfilled or used as landfill cover. As detailed in Section 1.3 land application of biosolids in British Columbia is regulated by OMRR. Biosolids have been used in mine and gravel pit reclamation as well as rangeland, hayfield and forest fertilization and landscaping soil products.

Treated biosolids can be used as bio-cover for landfills to reduce the amount of methane a landfill emits. The biosolids layer helps to oxidize methane produced in the landfill preventing it from entering the atmosphere. This has been trialed by the Regional District of Okanagan-Similkameen and its applicability to the City of Penticton is outlined in TM5.

Table 1.1: Technologies Available for the Management of Wastewater Solids – Long List

Process	State of Maturity	Advantages	Disadvantages
Biological Stabilization			
Anaerobic Digestion	• Established: mesophilic and thermophilic digestion have many instillations across the industry. • Advanced anaerobic digestion is well established • Anaerobic digestion pre-treatment technologies range from well established to emerging	• Stabilizes volatile solids and inactivates pathogens so product can be applied to the land • Potential for heat recovery and biogas production • Low odour potential • Low operating cost	• High capital cost • Difficult to clean • High capital cost • High ammonia and phosphorus concentration in centrate may be difficult to treat • Potential for struvite formation
Aerobic Digestion	• Established: hundreds of installations and extensive industry experience • ATAD is also an established technology. There are many operations in Europe and several in BC	• High pathogen inactivation: Class B for conventional, Class A for ATAD • Simple to operate • Low odour potential if operated properly • ATAD has lower energy	• Large footprint • High operating costs due to electricity consumed for aeration • ATAD product needs to be cooled to prevent odours from off-gassing • ATAD has high chemical

Process	State of Maturity	Advantages	Disadvantages
		requirements than the conventional process	requirements during dewatering
Composting	• Established: many installations worldwide, several installations in Western Canada. The City of Penticton currently uses composting to stabilize biosolids produced at the AWWTP	• Produces a Class A product • Simple process that is easy to operate and maintain	• Potential for odours • Product must be stored if it cannot be distributed • Product quality (heavy metal concentration, pathogen destruction) is variable • Large footprint
Geotube Dewatering/ Stabilization	• Several installations in Western Canada have been operating for 10 years	• Simple process	• Large footprint • Degree of stabilization may not be adequate for many end uses • Not well proven in larger facilities
Alkaline Stabilization	• Established: numerous instillations worldwide	• Lime stabilized biosolids are a good fertilizer for cropland • Small footprint • Simple technology, easy to operate	• Increases volume of biosolids, increasing expense of downstream transport/ disposal costs • Potential for odour and dust production
Drying and Thermal Technologies			
Thermal Dryer	• Established: numerous instillations worldwide	• Small footprint • Volume reduction • No chemical additives • Produces Class A biosolids, good pathogen destruction	• High capital cost • Large fuel requirement • Fire and explosion risk • Odour and dust potential
Solar Dryer	• Established: numerous installations worldwide	• Simple system • Low energy consumption	• Large footprint • Odour issues • Class B biosolids
Cambi Solid Stream Process	• One plant in operation in Germany	• Low thermal energy consumption • Gas production • Pressure feed- no pumping between steps	• Not proven • Two dewatering steps required • Complicated process
Incineration	• Established • Multiple hearth: outdated, due to low efficiency • Fluidized bed: established	• Significant solids volume reduction • Inert by-product • Complete pathogen reduction • Potential for energy recovery • Small footprint	• High capital cost • High O&M cost • Complicated process • High potential for public opposition
Combustion of Dried sludge	• Several operating systems worldwide	• No fossil fuel requirements • Stabilization of wastewater solids is not required • Complete pathogen destruction • Small to medium sized plants	• Limited commercial scale experience • Air quality permits may be difficult to acquire
Gasification and Pyrolysis	• Gasification is established in other industries. Gasification of wastewater solids is considered innovative • Pyrolysis is established is	• Potential for lower emissions than incineration technologies • Potential for energy production • Stabilization is not	• Limited commercial scale experience for wastewater solids • High capital cost • High temperature process • Air quality permits may be

Process	State of Maturity	Advantages	Disadvantages
	other industries. Pyrolysis of wastewater solids is considered innovative	required • Complete destruction of pathogens and organic portion of the feed • Minimizes hauling and amount of final end product	difficult to acquire • Complicated • Dry feed material required
Wet Air Oxidation Athos/ Zimpro	• Established technology but few installations are still operating due to issues with operation and odour	• Small footprint • Inert and reusable solid residue • Simplified flue gas treatment	• Limited commercial scale experience for wastewater solids • High pressure and temperature • Requires specialized operators • Requires purified oxygen
Supercritical Wet Air Oxidation	• One operational pilot in Ireland	• Complete destruction of organic material • Heat recovery and utilization • Potential to generate renewable energy • No emissions • Small footprint • Low odour potential	• Limited experience at commercial scale • High pressure and temperature • Requires liquid oxygen • Requires specialized operating staff • Risk of explosion
Final Re-Use/ Ultimate Disposal			
Land Application	• Well established in North America	• Can provide nutrients that have been depleted in the soil • Can be used as a part of the land reclamation process	• Soil product may be difficult to market • Sufficient land application area may not be available • Hauling costs may be high if land application locations are not within close proximity to the wastewater treatment plant
Landfilling	• Not common practise in Canada	• Can aid in the breakdown of municipal organic waste that has also been landfilled	• May contain pathogens depending on level of treatment • Requires rapid covering to mitigate odours • May increase leachate production
Compost Bio-covers for Landfill Gas Capture	• Bio-cover has been used in several landfill closures around BC but not specifically for methane capture	• Bio-covers can be used to reduce surface methane emissions on landfills that do not have landfill gas collection systems • Alternative to beneficial re-use • Less expensive than constructing and landfill gas collection system	• Performance of compost-based on temperature, pH, moisture content, organic content, nutrient content and age of compost. These properties are difficult to control and therefore bio-cover performance is inconsistent

3. Development of Wastewater Solids Management Technology Shortlist

3.1 Technology Screening Summary

Early in this project as part of TM1, critical success factors were developed in consultation with City of Penticton project staff These were to be used to evaluate the longlist of technology presented in TM2 and to establish a shortlist of technologies that could be evaluated in detail. The critical success factors for management of wastewater solids are as follows:

1. Provision for long-term process redundancy and reliability (25+ years)
2. Maximizing beneficial end use and marketing potential for any products
3. Ensuring end product can be produced predictably and consistently over the project's life
4. Compliance with existing and potential future regulatory limits
5. Minimizing impacts to local residents through odour, dust, noise, visual and traffic mitigation
6. Sustainability through lower greenhouse gas emissions and maximization of energy efficiency
7. Provision of good value to the City by minimizing capital and operating costs, and adopting innovative solutions

The 23 technologies outlined in TM2 were evaluated based on these critical success factors. The results are presented in Table 3.1. Each technology was assigned a pass or fail grade for each of the critical success factors. All options that achieved a minimum of 4 out of 7 pass grades were shortlisted and carried forward for detailed analysis.

Table 3.1: Evaluation of Wastewater Solids Management Technology Long List

OPTION / TECHNOLOGY	CRITICAL SUCCESS FACTOR						
	CSF 1	CSF 2	CSF 3	CSF 4	CSF 5	CSF 6	CSF 7
Anaerobic Digestion	Pass	Fail	Pass	Fail	Pass	Pass	Fail
Advanced Anaerobic Digestion	Pass	Pass	Pass	Fail	Pass	Pass	Pass
Anaerobic Digestion Pretreatment	Fail	Fail	Fail	Fail	Pass	Pass	Pass
Aerobic Digestion	Pass	Fail	Pass	Fail	Pass	Fail	Fail
Autothermal Thermophilic Aerobic Digestion	Pass	Pass	Pass	Fail	Fail	Fail	Fail
Composting	Pass	Pass	Pass	Pass	Fail	Fail	Fail
Geotube Dewatering / Stabilization	Fail	Fail	Fail	Fail	Pass	Fail	Fail
Alkaline Stabilization	Pass	Pass	Pass	Fail	Fail	Fail	Fail
Thermal Drying	Pass	Pass	Pass	Fail	Pass	Fail	Fail
Solar Drying	Pass	Fail	Fail	Fail	Fail	Pass	Fail
Cambi Solid Stream Process	Fail	Fail	Fail	Fail	Pass	Fail	Pass
Incineration	Pass	Fail	Pass	Pass	Fail	Fail	Fail

OPTION / TECHNOLOGY	CRITICAL SUCCESS FACTOR						
	CSF 1	CSF 2	CSF 3	CSF 4	CSF 5	CSF 6	CSF 7
Combustion of Dried Sludge	Fail	Fail	Pass	Pass	Fail	Fail	Fail
Plasma Assisted Sludge Oxidation	Fail	Fail	Fail	Pass	Fail	Fail	Pass
Gasification and Pyrolysis	Fail	Fail	Fail	Pass	Fail	Pass	Pass
Vitrification	Fail	Fail	Fail	Pass	Fail	Fail	Pass
Wet Air Oxidation Athos/Zimpro	Fail	Fail	Fail	Pass	Fail	Fail	Pass
Supercritical Wet Air Oxidation	Fail	Fail	Fail	Pass	Fail	Fail	Pass
Hydrothermal Carbonization	Fail	Fail	Fail	Pass	Fail	Fail	Pass
Combined Dewatering Drying Systems	Fail	Fail	Fail	Fail	Fail	Fail	Fail
Land Application	Pass	Pass	Pass	Pass	Fail	Fail	Fail
Landfilling	Pass	Fail	Pass	Fail	Pass	Fail	Fail
Compost Biocover for LG Capture	Fail	Pass	Fail	Fail	Pass	Pass	Pass

Based on this high level analysis of the critical success factors the following technologies were shortlisted for further consideration:

- Mesophilic Anaerobic digestion
- Thermophilic anaerobic digestion
- Thermal hydrolysis
- Composting
- Thermal drying
- Gasification/ Pyrolysis
- Land Application
- Compost biocover for landfill gas capture

4. Decision Making Approach

4.1 Multiple Bottom Line Methodology

Multiple bottom line analysis is a tool used make decisions by considering multiple factors that impact a project. This provides a method by which potentially competing core interests: economic, environmental, social and technical/ operational factors can be analysed in an objective manner.

The level to which each technology meets these criteria is gauged through the development of further criteria that contribute to meeting the overall project objectives. Both the objectives and criteria are weighted for importance and the technology is then ranked on a scale of how well it meets each criteria. Using the weight and rank of each criteria, an overall score can be calculated that quantifies how well each technology meets the goals of the project. Details of the approach used for this project is outlined in detail in TM3.

4.2 Evaluation Criteria

In order to carry out a multiple bottom line analysis, metrics by which each objective can be measured were developed. The evaluation criteria for each important outcome are summarized below; these metrics are based on the seven critical success factors described in Section 3:

1. Economic
    a. Capital cost
    b. Operating cost
    c. Expandability
2. Environmental
    a. Compliance with current and future regulations
    b. Energy efficient processing
    c. Maximizing resource recovery
3. Social
    a. Maximizing beneficial end use
    b. Minimizing odours, noise, traffic, dust and pests
    c. Public acceptance
4. Technical/ Operational
    a. Provision of redundancy
    b. Reliable production of end product
    c. Ease of operation

4.3 Criteria Weighting

The importance of the overall objectives and each individual criterion were weighted based on a pair-to-pair survey conducted AECOM. The survey was sent to the City of Penticton and Regional District of Okanagan-Similkameen staff and was responded to by 16 participants. It was found that economic and environmental factors were most important, followed by social factors. Technical and operational factors were found to be the least important of the core interests. The combined weight of each criteria was calculated by multiplying the weight of criteria by the weigh of its respective objective. The weighting of the criteria as determined by the survey is summarized in Table 4.1.

Table 4.1: Criterion Overall Combined Weighting

Core Objective	Criteria	Overall Combined Weighting
Economic	Capital Cost	11%
	Operating Cost	12%
	Expandability	7%
Environmental	Compliance with Current and Future Regulations	18%
	Energy Efficient Processing	9%
	Maximizing Resource Recovery	5%
Social	Maximizing Beneficial End Use	6%
	Minimizing Odours, Noise, Traffic, Dust and Pests	9%
	Public Acceptance	6%
Technical/ Operational	Provision of Redundancy	7%
	Reliable Production of End Product	6%
	Ease of Operation	5%

Capital and operating costs were established through high-level cost estimates. The ten remaining criteria were scored qualitatively on a scale of 1 to 5. A high score indicated the technology meets the criteria well while a low score indicates the technology is unable or does a poor job at meeting the criteria. This technical evaluation was conducted by 8 AECOM staff members: 5 senior wastewater engineers, 2 EITs and 1 wastewater solids practise leader.

4.4 Public Consultation

In a parallel exercise to this study the City of Penticton chose to consult the community as part of the wastewater solids management review to ensure residents were aware of the work, and that their views were understood and considered in the recommendation.

The public consultation was designed to occur in three phases. Phase 1 raised awareness of the need for the review and the opportunities to get involved. Activities in this phase included the creation of a website, media materials and a video that received 6,700 views. Phase 2 shared the outcome of the technology review (Sections 2 and 3 of this summary report) and gathered feedback on what was important to residents in making the decision. Activities in this phase included releasing the review's findings and discussing the options at an open house attended by 180 citizens. Through this phase, the City learned the following from the participants:

- Most describe their awareness of the process for handling the solids as good or fair although found the material fairly technical.
- They felt the list of 23 processes that were considered in the review was complete and they did not have any additional processes to suggest.
- They agreed with the criteria that were being used to evaluate the options. Of the four categories, they ranked the *Environment* as the most important followed by *Economic*, *Technical / Operational* and *Social* criteria.
- Within the categories, the five most important criteria to the participants included; *maximizing energy efficiency*, *accommodating growth / expansion*, *compliance with future regulations*, *maximizing reliability*, and *minimizing odor, noise, traffic and dust*.
- A small number of participants did express interest in having more information about the health risks of the processes, the cost effectiveness of the options and recommendation, and further involvement.

With the completion of this summary report, the project is entering Phase 3 which will review the recommendation with Council and assess the need for further engagement.

4.5 Analysis Outcome

The multiple bottom line analysis established overall rankings of the short-listed technology:

1. Mesophilic Anaerobic Digestion
2. Thermophilic Anaerobic Digestion
3. Thermal Hydrolysis
4. Composting
5. Compost Biocover for Landfill Gas Capture
6. Land Application
7. Thermal Drying
8. Gasification/ Pyrolysis

The technologies that best met the needs of the project were those that stabilized the wastewater solids using either digestion or composting. However, the best options identified by the multiple bottom line analysis may not function well as stand alone solutions. With this in mind, AECOM proposed studying three trains that treat biosolids based on the high performing technologies determined by the multiple bottom line analysis.

The three process configuration options that were developed further in TM4 are as follows:

1. Mesophilic Anaerobic Digestion → Composting → Landfill Biocover
2. Thermophilic Anaerobic Digestion → Unrestricted Land Application
3. Thermal Hydrolysis → Mesophilic Anaerobic Digestion → Unrestricted Land Application

4.6 Gasification Proposal Review

Gasification was carried as one of the eight shortlisted technologies based primarily on the interests of a local Penticton group who have been promoting gasification technology in the region. A consortium consisting of StruthersTech and Air Technic/Expander conducted a presentation on February 22, 2019 for the City of Penticton, Regional District of Okanagan-Similkameen and District of Summerland. AECOM staff also attended as a technical advisor to the City. The presentation outlined the technology and discussed potential wastewater solids management options that the consortium could provide for the City. Options ranged from the supply of a turnkey system that the City would operate to a consortium-run facility that would provide service based on City paid tipping fees. AECOM's primary concern with this technology is the lack of references where it has been successfully used on a large scale for wastewater solids.

At the end of the presentation, the City indicated that they would provide wastewater solids loading values to the consortium with direction for them to provide rough costs and overall feasibility in the context of the City. On May 19, 2019, the consortium responded to the City indicating that the use of wastewater solids in their process would require a significant supply of high quality wood chips to be blended with the wastewater solids prior to processing. Their research indicated that there was not a large enough supply of this material available in the local area. The costly import of the wood chips would not allow for favourable economics for this project. They also provided an indication that co-generated power from the process would not have a viable local market. The consortium also examined the possibility of drying the wastewater solids to 90% (dry solids) prior to gasification. However, this option would add significant capital and operating costs to the project.

Based on this, the consortium offered two options to the City for consideration:

1. The consortium would take all of the City's dewatered wastewater solids for a tipping fee of approximately $250/tonne and process and dispose of the material privately. Based on an annual projected wet solids load

of 8,000 tonnes per year, this would amount to a tipping fee of $2 Million a year. This is nearly ten times the amount that the City currently spends on operating their composting facility.

2. The City could invest in the drying equipment to produce pelletized wastewater solids that would be processed by the consortium at no cost. However, the installed cost of this process equipment would range between $10 Million and $20 Million and could add up to $350,000 to the AWWTP's annual operating costs.

Neither of these two options is attractive relative to other technologies options that are proven and can be achieved at lower capital and operating costs. For this reason, it was recommended that gasification of the City's wastewater solids not be considered further.

5. Process Configuration Evaluation

5.1 Description of Each Configuration

Option 1: For this option the mesophilic anaerobic digestion process would occur at the AWWTP and Class B biosolids would be produced. After mesophilic anaerobic digestion the biosolids would be dewatered by centrifuge and then trucked to the Regional District of Okanagan-Similkameen (RDOS) Regional Landfill and composted. The phosphorus-rich return stream from the dewatering process would be managed with a struvite recovery process to prevent the build-up of struvite on equipment within the AWWTP. The current Penticton Compost Facility is operated at the RDOS landfill facility. It is expected that if Option 1 were developed a new compost facility would be constructed in the same location. As Class B biosolids would be used as a compost feedstock, the current issues associated with odours at the compost facility would be greatly reduced. The composting process would produce Class A compost which can be applied on the land without restriction.

Option 2: If Option 2 were developed the thermophilic anaerobic digestion process would occur at the AWWTP and Class A biosolids would be produced. Similar to Option 1 biosolids would need to be dewatered prior to thermophilic anaerobic digestion and the phosphorus-rich return stream also must undergo a struvite recovery to prevent struvite fouling within the AWWTP. Class A biosolids can then be used for beneficial reuse in accordance with OMRR regulations.

Option 3: For this option, the wastewater water solids would undergo thermal hydrolysis prior to mesophilic digestion as a means of reducing the volume of solids to be removed from the site. These combined processes would create a product that can be land applied in an unrestricted manner. The mesophilic digestion process is added to this configuration in order to generate biogas that could be burned to help heat the thermal hydrolysis process.

5.2 Costs

The capital and operating costs were determined for the three proposed process configurations. The capital cost estimate was based on basic unit costs for commodities, budgetary pricing received for major pieces of equipment and recent construction costs. Operating cost estimates include operating costs associated with the new processes that will be added to the AWWTP's existing solids management operation. The operating costs include labour associated with management, laboratory, operations and maintenance, energy, chemicals, equipment maintenance, fertilizer production and hauling. Using the capital and operating costs the net present value (NPV) was estimated. The project life cycle was assumed to be 20 years and the rate of inflation 2.5%. The costs associated with the project are outlined in Table 5.1. A detailed cost analysis of each of the options can be found in Technical Memorandum 4 (TM4).

Table 5.1: Cost Summary

Option	Process Configuration	Capital Cost	Operating Cost	NPV
1	P-release Process, Mesophilic Digestion, Side Stream Treatment, and Composting	$19,740,000	$734,902	$31,196,507
2	P-release Process, Thermophilic Digestion, and Side Stream Treatment	$17,720,000	$741,331	$29,276,729
3	P-release Process, Intermediate Dewatering, THP, Mesophilic Digestion, and Side Stream Treatment	$26,070,000	$926,756	$40,517,350

5.3 Advantages and Disadvantages

The three proposed process configurations will be able to reliably produce either Class A biosolids or Class A compost. All three will also be capable of reducing the quantity of material that is trucked from the AWWTP by 40 to 50%. However, all three options require side stream treatment to manage the higher nutrient loads in the dewatering return stream. The advantages and disadvantages of each process configuration are summarized in Table 5.2.

Table 5.2: Process Configuration Advantages and Disadvantages

Option	Advantages	Disadvantages
1 (P-release Process, Mesophilic Digestion, Side Stream Treatment, and Composting)	• Two treatment technologies used: flexibility and reliability should one process not be available • Predicted to produce 2,200GJ/year of biogas, if co-generation is implemented excess gas can be sold to local gas utility • Familiar process to some plant staff. mesophilic anaerobic digestion was discontinued at the AWWTP 7 years ago • Compost products have higher market value than Class A biosolids alone • 2 treatment technologies allow for project phasing- spreading out capital cost	• Increased capital cost due to use of mesophilic anaerobic digestion which only creates a Class B product. A second process is required for a Class A product to be produced • Composting has issues with public acceptance due to truck traffic, noise, dust and odours. Mesophilic anaerobic digestion will only mitigate odours. Other issues important to the public will remain unresolved • Composting requires amendment, increasing the volume of final product that will need to be disposed of
2 (P-release Process, Thermophilic Digestion, and Side Stream Treatment)	• Lowest capital cost • Higher volatile solids reduction making solids easier to dewater, production of drier cake means less solids will have to be trucked offsite • Relies on single process to create Class A biosolids thus increasing potential points of failure	• Additional heating requirements due to high temperature at which thermophilic digestion operates • No redundancy, if an additional train were added the capital cost would increase significantly (~$2.8 million) • Land disposal of Class A biosolids has not been well investigated and may change the economics of the process. Public acceptance of land application may be problematic
3 (P-release Process, Intermediate Dewatering, THP, Mesophilic Digestion, and Side Stream Treatment)	• Predicted to produce 3,900GJ/year of biogas, if co-generation is implemented excess gas can be sold to local gas utility • High volatile solids production leading to less final product being trucked offsite	• High capital and operating cost • High energy requirements

5.4 Interim Recommendations

The three treatment configurations detailed in this section are all highly effective for wastewater solids management. Option 3 is significantly more expensive than Options 1 and 2 and therefore was not considered as a final treatment option. Based on this, either Option 1 or Option 2 was considered to be viable candidates for the City's requirements.

However, upon review both Option1 and Option 2 were considered to be outside of the City of Penticton's planning budget. As a result of this analysis and a recent proposed change to the composting regulation, City staff requested that AECOM re-visit a composting option using a purpose built and appropriately engineered compost facility. Development of this option is outlined in TM5.

6. Composting

6.1 Technology Description

The composting process occurs over several distinct steps: solids delivery, receiving and unloading at the compost facility, feedstock preparation, compost stabilization, compost curing and compost screening and storage. Both primary and secondary waste solids are processed and dewatered at the AWWTP. Primary sludge is first fermented to extract volatile fatty acids which enhance biological nutrient removal. At this point the fermented primary sludge (FPS) can potentially undergo mesophilic anaerobic digestion which serves to reduce odours and the quantity of solids requiring transport to the landfill. Secondary waste solids are collected and thickened using dissolved air flotation to form thickened waste activated sludge (TWAS). These resulting solids are then dewatered with the FPS (either raw or mesophilically digested) and transferred to the City of Penticton Compost Facility by truck.

If the FPS were to undergo mesophilic anaerobic digestion, the existing digester structure would need to be upgraded. A new gas and sludge piping system, waste gas flare, hot water boiler, heat exchanger and mixing system would need to be installed. The roof and the gas containment system would also need to be improved.

The composting process is optimized by adjusting the environmental conditions within the compost pile. It is important to control the porosity, microbial diversity, nutrient balance, moisture content and pH. The addition of wood chips and amendment increases the porosity of the pile leading to improved aeration and preventing pockets within the pile from going anaerobic as well as increasing the percentage of carbon in the pile providing the ideal ratio of nutrients needed for microbes to grow. The amendment, which is recycled compost, helps to improve microbial diversity. Once the correct ratio of waste solids, wood chips and amendment are added to the mixer and combined they are loaded into the compost tunnels using a front-end loader.

The stabilization process converts raw or partially digested wastewater solids to compost through biological degradation and pathogen destruction. Microbes are used to decompose the waste compost thereby creating heat which destroys any pathogens present. The stabilization process lasts approximately 21 days and it is important that the temperature of the compost is above 55°C for at least 3 days in order for sufficient pathogen destruction to occur.

After the stabilization process has been completed compost is removed from the compost tunnels for the curing phase. During the curing phase more complex substances are slowly decomposed. Curing the compost prevents continuing biological activity from causing odours and plant growth problems when the finished product is utilized. Currently, the OMRR does not clearly define the length of time necessary to cure, mature and finish the compost. However, it is the intention of the Ministry of Environment to clarify these requirements when OMRR is updated. As mentioned in Section 2.3 it is important that the compost is allowed to mature if it is being used as landfill bio-cover with the intent of capturing methane. Once the compost has been cured it can be screened. The screening will remove woodchips so that the woodchips can be recycled and mixed with new incoming raw dewatered solids.

6.2 Capital Cost

A capital cost estimate was prepared for the two proposed composting process configurations (raw solids and partially digested solids) based on basic unit costs for commodities, and recent construction costs (equipment and installation costs). The cost estimates are summarized in Table 6.1.

Table 6.1: Capital Cost Estimates - Compost Facility

Composting Option	Capital Cost
Raw dewatered wastewater solids composting	$8,230,000
FPS digested by mesophilic anaerobic digestion followed by dewatered wastewater solids composting	$11,140,000

7. Conclusions and Recommendation

The main goal of this project has been to examine all technologies and determine which one or combination best suits the needs of the City of Penticton. The City of Penticton has identified compliance with current and future regulations, capital and operating cost, minimizing odours, energy efficiency, minimizing noise and traffic and provisions of redundancy as important factors in the design of new wastewater solids management system. Part of this exercise has also been to understand which needs are absolute and which are aspirational. Utilizing the methodical approach of technology review and multiple bottom line decision making, the City is able to develop informed opinions on the best means of managing their wastewater solids. Unfortunately, the challenges associated with this are complex and there is no easy answer. This is a common issue throughout the Okanagan Valley and the rest of British Columbia.

The project's pathway has led the City from list of 23 technologies ranging from traditional and well-proven, to embryonic and leading edge. Paring this down to a more manageable list of 8 allowed for a detailed evaluation that included City and other stakeholder input. This evaluation further led to 3 viable configurations that are unfortunately significantly beyond the planned capital budget for this project. It was this main aspect that lead to the re-examination of a new biosolids compost facility.

Given the upcoming changes in OMRR composting facilities will be able to accept raw dewatered wastewater solids as a feedstock, thus allowing the City to maintain its current practice of trucking dewatered raw solids from the AWWTP. The proposed engineered, enclosed composting system would be capable of reliably producing a Class A biosolids product as defined in the Regulation while mitigating issues that have plagued the current operation over the years (primarily odours).

Despite the concerns surrounding end use of the compost, the construction of a new composting facility represents a significantly lower capital cost than the technology options reviewed in TM 4 [Wastewater Solids Management Process Configurations]. Composting can produce a high-quality Class A biosolids with multiple land application uses for a low capital cost. If the capital cost of the project is within the City's budget it is good option for the management of wastewater solids from the AWWTP in the future. The proposed facility includes enclosed compost tunnels as well as an odour control system. These technologies are capable of preventing offensive odours from entering the surrounding community which is of particular importance as the population density of the area increases. However, the odours associated with hauling the raw dewatered solids from the AWWTP to the compost facility can only be adequately addressed by undertaking mesophilic anaerobic digestion of the fermented primary sludge as a means to reduce the odourous volatile portion of the solids. The City will have to weigh this added capital cost against the public's acceptance of the occasion odours associated with hauling the raw solids to the compost facility.

Currently it is difficult to find facilities that are willing to take the compost produced from dewatered solids at the City of Penticton Compost Facility. It is expected that it would continue to be difficult to market the composted sludge as fertilizer. Another use that has been discussed is using the compost as landfill biocover. The percentage of compost produced annually that can be used as landfill cover is small. The City of Penticton can expect anywhere between 1 and 18% of the compost being used in a single year as landfill cover. At this time the end use of the compost is unknown and as such could present a challenge the City of Penticton. However, this will be a challenge regardless of the solids management option to be selected.
In summary, the proposed composting facility will meet regulations, has a significantly lower cost than other technologies studied in TM 4 and will help to minimize odours entering the surrounding community. It is therefore recommended that the City consider the development of an enclosed compost facility complete with an engineered odour control system.

Appendix A

Technical Memorandum 1

Appendix B

Technical Memorandum 2

Appendix C

Technical Memorandum 3

Appendix D

Technical Memorandum 4

Appendix E

Technical Memorandum 5

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