CITY OF HAMILTON

PUBLIC WORKS DEPARTMENT
Environment and Sustainable Infrastructure Division

and

CORPORATE SERVICES DEPARTMENT
Financial Planning and Policy Division

TO: Mayor and Members General Issues Committee	**WARD(S) AFFECTED:** CITY WIDE
COMMITTEE DATE: May 11, 2012	
SUBJECT/REPORT NO: Biosolids Management Project - P3 Canada Funding Business Plan Approval (PW11098a/FCS11112a) - (City Wide)	
SUBMITTED BY: Gerry Davis, CMA General Manager Public Works Department Roberto Rossini General Manager Finance & Corporate Services Department	**PREPARED BY:** Dan McKinnon (905) 546-2424, Extension 5941 Dan Chauvin (905) 546-2424, Extension 5988
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RECOMMENDATION

(a) That the General Manager, Public Works be authorized and directed to submit the Business Case attached as Appendix "A" to Report PW11098a/FCS11112a to Public-Private Partnerships Canada ('P3 Canada') requesting funding approval for either the Enhanced Treatment and/or Thermal Reduction alternatives for the City's long-term Biosolids Management Solution;

(b) That staff report back to Council with an update subsequent to receiving a response from P3 Canada, and prior to proceeding with Phase 2 of the approved Workplan, attached as Appendix "B".

EXECUTIVE SUMMARY

The purpose of Report PW11098a/FCS11112a is to seek Council approval to submit the attached Business Case to P3 Canada for funding approval by their deadline of June 15, 2012 for the City's Biosolids Management Project.

This Report presents the results from Phase 1 of the Biosolids Management Project Workplan (Appendix "B") as approved by Council in the December 12, 2011 Report "Biosolids Management Project - P3 Canada Funding Approval Workplan - PW11098/FCS11112".

The Phase 1 Workplan (attached as Appendix "B" to report PW11098a/FCS11112a) developed the Business Case to seek approval for the 25% funding from P3 Canada and evaluated all options available to the City for a long-term solution for the disposal of biosolids generated from the Woodward Avenue Wastewater Treatment Plant. The Business Case followed P3 Canada's guidelines and was developed by a dedicated Project Team consisting of staff from Public Works and Finance with the assistance of Financial and Engineering Consultants.

The key tasks included as part of the business plan were a Value for Money Analysis, a Triple Bottom Line Evaluation, and the development of a procurement strategy should P3 Canada and Council approve the next step of the process. A Request for Information (RFI) was also issued to assist the City in identifying a range of potential technologies. A market sounding consultation process was also undertaken with some of the respondents to gain further insight into existing market conditions.

The conclusions of the Business Case which is summarized in the Triple Bottom Line Evaluation and measures the Environmental, Social, and Economic benefits demonstrated that Enhanced Treatment and Thermal Reduction best meet the City's environmental, social, and economic objectives. With P3 Canada funding and a robust procurement process, these two alternatives can be competitive especially in a Design-Build-Finance-Operate-Maintain (DBFOM) project Delivery Model where most of the risk to the City can be transferred to the successful proponent. The Business Case also notes that respondents to an RFP may identify further opportunities for innovation and synergies at the Woodward Wastewater Treatment Plant (WWTP) in the areas of energy management and operating efficiencies. In addition, the RFI process clearly indicated that there is interest by a number of respondents on bidding on both of these two alternatives. This was further supported by the Market Sounding Consultation process. Finally, these two alternatives of Enhanced Treatment and Thermal Reduction best meet the P3 Canada criteria and the City's Triple Bottom line and as such are recommended as the two alternatives to carry forward through the P3 application process.

Alternatives for Consideration - See Page 11

FINANCIAL / STAFFING / LEGAL IMPLICATIONS

Financial: Although the Business Case has identified that land application has the lowest cost alternative, the Triple Bottom Line Evaluation has demonstrated that Enhanced Treatment and Thermal Reduction best meet the City's environmental, social, and economic objectives. With P3 Canada funding and a robust procurement process, these two alternatives can be competitive especially in a Design-Build-Finance-Operate-Maintain (DBFOM) project Delivery Model where most of the risk to the City can be transferred to the successful proponent. The Business Case also noted that respondents may identify further opportunities for innovation and synergies at the Woodward WWTP in the areas of energy management and operating efficiencies which has the potential to reduce the overall cost making other alternatives competitive with the City's current practice of land application.

Should Council support the recommendations of this Report, staff will report back to Council once PPP Canada responds to the City's funding application. Assuming a favourable response, staff will outline the costs required to proceed to the next steps for Council's approval prior to entering into the next phase of the project.

Staffing: Should Council support the recommendations of this Report, staff will report back to Council once PPP Canada responds to the City's funding application. Assuming a favourable response, staff will outline the staffing and resources required to proceed to the next steps for Council's approval prior to entering into the next phase of the project.

Legal: Should Council support the recommendations of this Report, staff will report back to Council once PPP Canada responds to the City's funding application. Assuming a favourable response, staff will outline any legal exposure the City may have in proceeding to the next steps for Council's approval prior to entering into the next phase of the project.

HISTORICAL BACKGROUND

The recommendations contained within this Report have City Wide implications.

The Report titled Biosolids Management Project - P3 Canada Funding Approval Workplan - PW11098/FCS11112 was presented to the General Issues Committee on December 12, 2011. The Council recommendations were as follows:

(a) That the General Manager, Public Works be authorized and directed to proceed with Phase 1 of the P3 Canada Funding Approval Workplan for the City's Biosolids Management Project as summarized in Appendix B, at a cost estimate of $300,000 to be funded from Project 5160966910 WWTP - Biosolids MP Implementation;

(b) That after completion of Phase 1 staff report back to Council prior to proceeding to Phase 2.

Subsequent to the December Report, staff retained the services of Financial and Engineering Consultants and formed a dedicated Project Team that developed and executed Phase 1 of the Council approved Workplan. In addition to the specific task specified by Council, the Project Team ensured that the various tasks required to meet P3 Canada's Business Case requirements were met. Attached to this Report is the final Business Case which is being submitted to P3 Canada for approval at its Board meeting on June 15, 2012.

POLICY IMPLICATIONS

The Public Works Business Plan, Innovate Now - The recommendations from this Report will assist in meeting the Public Works key goal *to be recognized as the centre of environmental and innovative excellence in Canada*. In addition, implementing the recommendations will also assist Public Works in building on Strategic Vision Drivers as follows:

- **Communities (Services our communities connect with and trust) -**

Proceeding with the Recommendations allows the City to undertake a selection process for a long-term sustainable biosolids management strategy that services the community for a period of at least 30 years.

- **People (Skilled teams, ready for any situation) -**

Proceeding with the Recommendations allows staff to be exposed to the process of analyzing complex business decisions in consultation with external government funding agencies thereby positioning the City to secure the existing application as well as pursue future funding opportunities.

- **Process (Smart processes to match our needs) -**

Proceeding with the Recommendations allows the City to select a sustainable long-term biosolids management option through an innovative process that promotes open and transparent technology selection and a procurement strategy which allows all key decision variables to be considered simultaneously.

- **Finances (Sound finance management for the long haul) -**

Proceeding with the Recommendations allows the City to select a long-term biosolids management strategy through an open market procurement process that accounts for a more holistic life cycle costing strategy over that of a lowest capital price which may have higher long-term operating and maintenance costs.

RELEVANT CONSULTATION

Corporate Services Department - Staff from the Corporate Services Department are part of the Project Team and assisted in developing the Business Case presented in Appendix "A".

ANALYSIS / RATIONALE FOR RECOMMENDATION

Since the December 2011 Council approval, the Project Team has been working to meet the established P3 Canada timelines of June 2012 and to develop a Business Case to address the City's long-term Biosolids Management Plan.

As directed by Council, the Project Team considered and analyzed all viable alternatives for municipal biosolids management. To facilitate this process staff elected to develop categories of alternatives. For the purpose of this Business Case, the existing practice of biosolids management practices in the City is referred to as Land Application (LA), the second category of alternatives in the marketplace is Enhanced Treatment (ET), and the third category is Thermal Reduction (TR). Each alternative is detailed as follows:

Land Application

Land Application is the current practice the City uses for biosolids management and the City has done so since 1996. This includes a process whereby sludge from the wastewater treatment process is stabilized to reduce pathogen content through what is referred to as digestion. Digestion means heating and mixing the sludge in an anaerobic environment for 15 days at 35 degrees Celsius. After digestion the sludge is then referred to as biosolids and is then dewatered to approximately 25% solids and hauled off-site where it is land applied onto agricultural fields for beneficial reuse of nutrients such as phosphorus and where it serves as an overall soil enhancement. Biosolids stabilized to this level are referred to as a "Class B" and the program is regulated under the Nutrient Management Act (NMA) through the Ministry of Environment (MOE) and the Ministry of Agriculture, Food and Rural Affairs (OMAFRA).

Prior to 2002, the application of biosolids to agricultural land was regulated under the Environmental Protection Act (EPA) and Ontario Regulation 347. The MOE regulated land application through issuance of Certificates of Approval (CofA) and enforcement of conditions in the CofA. Conditions generally were based on Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Lands. In 2002, the OMAFRA developed the Nutrient Management Act, followed by Ontario Regulation 267 in 2003, to address several aspects relating to the land application of nutrient products in Ontario, including biosolids. The new regulation contained many of the requirements of the Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Lands and in addition had a requirement for municipalities to provide 240 days of storage and prepare nutrient management strategies. Biosolids were referred to as non-agricultural source materials (NASM) under both the EPA and the NMA. This new regulatory structure regulated NASM under two Acts. In addition to still requiring CofAs for land application, municipalities had to prepare nutrient management strategies and invest significant capital in storage facilities to provide 240 days of storage. The industry believed that this regulatory framework could result in a decline in land application in Ontario.

In recognition of the confusion caused by the duplication of regulations, the MOE and OMAFRA proposed amendments to the EPA and Ontario Regulation 267 in 2009.

NASM would be regulated under the NMA and not under the EPA. The objectives were:

- Ensure that environmental protection is maintained.
- Manage material as nutrients, not wastes.
- Reduce regulatory duplication.
- Establish standards based on the quality of the material.
- Ensure consistency of standards across the Province.
- Ensure clear requirements are outlined.

The proposed changes in Ontario Regulation 267 included eliminating the requirement for 240 days of storage, a definition of three categories of NASM, two sub-categories of criteria for pathogens (equivalent to U.S. EPA Class A and Class B), two sub-categories of criteria for metals and three sub-categories of criteria for odours. With these categories, application rates, setbacks from environmentally sensitive features and adjacent properties were well defined. Municipalities would be responsible for source sampling biosolids and farmers responsible for soil sampling and preparing NASM plans, which would replace CofAs. The Ministry's NMAN nutrient model was also refined to determine allowable application rates with respect to nitrogen and phosphorus (macro-nutrients) and metals (micro-nutrients). The amendments were implemented in two phases in 2010 and 2011. With the new NASM regulatory framework in place, application of biosolids to agricultural land is well defined and well understood by the industry, demonstrating the Province's support for land application as being a sustainable alternative for biosolids management.

Although the risk of regulatory sustainability is being address by the Province, the logistical risk of land application remains a true concern for the City as it pertains to the number of certified contractors that can service the City program, storage during periods when land application cannot be undertaken (winter and wet weather), and uncertainty on escalating costs.

Enhanced Treatment

Enhanced Treatment is an emerging sector of biosolids management and includes a number of technologies that treat biosolids to a higher standard by further reducing the pathogenic and odour content of the biosolids to a much lower and safer level. This is achieved through processes such as chemical addition or heat treatment to produce a product that may be classified as a fertilizer or soil amendment regulated under the Canadian Food Inspection Agency (CFIA). Biosolids under this alternative have a much broader marketing potential including sod farms, nurseries, Brownfield remediation, or as a fuel source for cement kilns, each of which can generate revenue and off-set the overall program costs.

Thermal Reduction

Thermal Reduction is a category of alternatives that includes technologies whereby the application of high temperatures is essentially used to reduce biosolids to ash. This category of technologies includes fluidized bed incineration, gasification, pyrolysis, and others. This category of technology is regulated by the MOE for its air emissions. Heat

may be recovered in the form of steam and used to produce electricity and ash is typically hauled to landfill.

Business Case Development

In developing the Business Case, specific P3 Canada guidelines were followed and include undertaking a Market Sounding consultation process, a review of case studies, a Value for Money (VFM) Analysis, Triple Bottom Line Analysis (TBL) Evaluation, and the development of a procurement strategy. While a TBL analysis is not a requirement of P3 Canada, the Project Team elected to include it to ensure that the final Business Case was representative of the City's corporate values and evaluated in addition to the economic impact, and the environmental and social benefits as well. The following is an outline of each of the key components of the Business Case:

Request For Information and Market Sounding Consultation

In January 2012 the City released a Request for Information (RFI) to elicit feedback from the biosolids industry to better understand the market from companies that offer the service of municipal biosolids management, options and technologies that are available, and to determine what overall interest may exist for responding to a proposal call from Hamilton. A market sounding consultation was conducted with a number of respondents to gain additional feedback and the RFI also served to fulfill the market sounding requirement in the development of the Business Case for P3 Canada.

Eighteen (18) RFI responses were received from a range of firms which can be classified as follows: **Developers** who are primarily interested in investing equity and taking a project management role; **Integrated Developers** who indicated that they would provide a technology for biosolids management, as well as investing equity and taking on a project management role, and **Technology Providers** who indicated that they would provide a technology for biosolids management.

In summary, the RFI process clearly indicated that there is interest from a number of respondents on bidding on both enhanced treatment and thermal reduction. This was further supported by the Market Sounding consultation undertaken as part of the development of the Business Case.

Value for Money and Risk Analysis

Value for Money (VFM) is the comparison of the estimated net present value of the life cycle operating and capital costs, in this case over a 30-year period, between the P3 project Delivery Model and the traditional public sector approach. The analysis also quantifies the various risks that are associated with all three alternatives.

VFM is conducted to determine if the P3 procurement Delivery Model supported by P3 Canada for large capital projects would provide the City with greater value than the traditional municipal project Delivery Model most commonly referred to as Design-Bid-Build (DBB). P3 Canada's preferred Delivery Model is Design-Build-Finance-Operate-Maintain (DBFOM). Generally the DBFOM model provides the greatest risk transference to the private sector and as a result provides the most certainty for

successful delivery and operation of large scale capital projects for owners over a longer timeframe such as 25 to 30 years.

The P3 Canada Business Case requires the City to carry out a Value for Money (VFM) analysis. This analysis compares the total lifecycle cost of a project under two approaches: (1) the DBFOM model, and (2) the traditional municipal delivery approach. The analysis includes adjustments for City risk to reflect the fact that under the DBFOM model there can be significant risk transferred away from the City to the private sector. The VFM analysis is summarized by comparing the total risk adjusted cost of the two approaches and assessing whether there are expected savings from using the DBFOM model.

Table 1 summarizes the results of the VFM analysis for each Alternative. A positive result indicates expected savings (benefit) to the City from using a DBFOM model. A negative result indicates that the DBFOM model does not provide benefits.

Table 1: Summary of Value for Money Analysis

	VFM Summary
	(Estimated % savings of DBFOM model vs. Traditional model)
Land Application	-4% to -6%
Enhanced Treatment	8% to 15%
Thermal Reduction	7% to 16%

These results simply mean that the Land Application costs including risk are expected to be higher by 4% to 6% under the DBFOM model in comparison to a Traditional approach, so there is no expected benefit to the City of using DBFOM for this Alternative. However, there are expected to be risk-adjusted savings to the City using the DBFOM model for both Enhanced Treatment (8% to 15% savings) and Thermal Reduction (7% to 16%) approach. Therefore, a DBFOM model is expected to provide the City with overall benefit for these Alternatives.

The VFM includes all costs and risks associated with each alternative but does not include P3 Canada funding, which can be up to 25% of eligible capital costs. P3 Canada funding is a separate and additional benefit to be considered in relation to the DBFOM model. Generally speaking, P3 Canada will consider funding projects which demonstrate robust Value for Money savings (such as Enhanced Treatment and Thermal Reduction) and will not consider funding projects which do not demonstrate Value for Money (such as Land Application).

The VFM results were incorporated in the Triple Bottom Line which evaluates the economic, social, and environmental benefits. Since Enhanced Treatment and Thermal Reduction are best delivered as a DBFOM and are eligible for P3 Canada funding, the Triple Bottom Line analysis has assumed that these Alternatives include significant risk transference to the private sector as well as 25% P3 Canada funding.

Triple Bottom Line

The following table summarizes the 30-year life cycle costs (operating and capital) discounted on a net present value basis which were incorporated in the economic category of the Triple Bottom Line (TBL):

Table 2: Summary of Life Cycle Costs Discounted on an NPV Basis

Alternative	Traditional Delivery Model (NPV in Millions)	P3 Delivery Model (NPV in Millions)
Land Application	97	N/A
Enhanced Treatment (low cost)	102	116
Enhanced Treatment (high cost)	141	155
Thermal Reduction	176	191

The Triple Bottom Line (TBL) Evaluation Methodology used in the Business Case is similar to the one used in the 2007 Biosolids Master Plan and Class Environmental Study Report which evaluated various alternatives for the disposal of biosolids. TBL seeks to measure the environmental, social, and economic benefits by quantifying the strengths, weakness, opportunities, and threats for each alternative.

The following highlights the relative TBL weighting of categories used in both reports:

Table 3: Comparison of Triple Bottom Line Weightings

Impacts	EA Study	Business Case
Environmental	40%	40%
Social	25%	30%
Economic	35%	30%
Total	100%	100.0%

The following table summarizes the results of the evaluation for each option:

Table 4: Summary of Triple Bottom Line Analysis

Impact	Land Application	Enhanced Treatment	Thermal Reduction
Environmental	28.6	30.0	34.3
Social	18.8	22.5	26.3
Economic	16.5	22.5	16.5
Total	63.8	75.0	77.9

The results of this most recent TBL were very similar to the 2007 exercise whereby both Thermal Reduction and Enhanced Treatment scored very similarly while the existing practice of Land Application of a Class “B” product ranked with the lowest TBL. It must be noted that Enhanced Treatment did rank higher in this current evaluation than it did in 2007 as the quality of the City’s biosolids, and in particular specific metals, at the time were such that it prevented the full marketing potential to be achieved. Therefore

considering the quality of biosolids and lack of maturity in the overall market, Enhanced Treatment was screened out. Today, as a result of the implementation of a more effective Sewer Use Control Program, those metals of concern are well within regulatory limits thus improving the marketing potential of any resulting biosolids product, reducing its risk and improving the TBL for the Enhanced Treatment alternative.

Although Land Application had the lowest short-term costs, it scored the lowest due to Social and Environmental aspects such as highest truck traffic and diesel emissions, a limited market which creates a higher risk in the long term and produces a Class "B" product.

Enhanced Treatment and Thermal Reductions essentially scored the same. Enhanced Treatment produces a Class "A" product, low emissions and risks can be mitigated through a DBFOM model. It can be cheaper or more expensive than Land Application depending on the ability to successfully market the end product.

Thermal Reduction scored high due to a non-hazardous end product (ash), low truck traffic (the Business Case assumes the plant is located at the Woodward Avenue site) and controlled emissions. It's the highest cost alternative but has the lowest social and environmental risk through a DBFOM Delivery Model.

In summary, the Triple Bottom Line Evaluation ranked Enhanced Treatment and Thermal Reduction essentially the same. TBL has demonstrated that Enhanced Treatment and Thermal Reduction best meet the City's environmental, social, and economic objectives. Both are capital intensive with a risk profile which the City can mitigate through a DBFOM project Delivery Model and therefore are very good candidates for P3 Canada project and funding approval. On the other hand, land application is not capital intensive and has a risk profile not conducive to risk transfer and therefore would likely not qualify for P3 Canada funding.

With P3 Canada funding and a robust procurement process, these two alternatives can be competitive especially in a Design-Build-Finance-Operate-Maintain (DBFOM) project Delivery Model where most of the risk to the City can be mitigated by transferring risk to a qualified successful proponent.

Procurement Strategy

P3 Canada's mandate is to "improve the delivery of public infrastructure by achieving better value, timeliness, and accountability to taxpayers through P3s". P3 delivery models involve a specialized procurement process that seeks to transfer construction, operating, and maintenance risks over a long-term contract, generally in the range of 20 to 30 years, to the private sector. The key mechanism for analyzing if a project is suitable for PPP Canada funding is undertaking a Value for Money (VFM) exercise. The VFM analysis completed on the various categories of alternatives using information from the RFI responses revealed that the current practice of land application was not an eligible candidate for a P3 procurement approach. Low capital cost and the fact that the private sector currently bears much of the contractual risk associated with the program are cited as key reasons for this.

VFM analysis completed for both Enhanced Treatment and Thermal Reduction revealed that both of these categories of alternatives are good candidates for P3 procurement delivery and as a result are included in the attached Business Case. Moving forward, and contingent upon P3 Canada Board approval of the attached Business Case and subsequent approval from City Council, staff will develop a Request for Qualification (RFQ) followed by a Request for Proposal (RFP) process to bring to market in the fall of 2012 as outlined in Phase 2 of the Workplan as outlined in Appendix "B" of this Report. The procurement strategy will incorporate an output based process that sets a clearly defined performance specification and lets the bidders determine which technology best meets the City's performance specifications and evaluation criteria.

Affordability Threshold

Once a satisfactory funding agreement and a procurement strategy has been reached with P3 Canada, staff is proposing to incorporate a financial safeguard in the procurement process by developing and including an affordability threshold in the Request for Qualifications (RFQ) document. This safeguard will ensure that the project will be within the City's budgetary and financial constraints and it also provides greater certainty to P3 Canada since this threshold will establish a funding limit.

This approach is also a great benefit to the bidders. They will know in advance if the alternative that they are proposing is affordable and therefore do not have to invest a significant amount of resources on alternatives which are not economically viable to the City.

The affordability limit is intended to add structure and certainty to both the City and the bidders. It also seeks out low-cost technical solutions which meet the output specifications. The precise parameters of the affordability threshold will be developed once the City knows the level of funding which will be provided by P3 Canada and submitted to Council prior to proceeding to the next phase.

Further detail on procurement strategies will be brought forward in subsequent reports once staff are advised of P3 Canada's acceptance of the Business Case as per the Workplan as attached in Appendix "B".

ALTERNATIVES FOR CONSIDERATION

Council does have the alternative to not proceed with submitting the Business Case to P3 Canada which would negate the City's ability to pursue the available funding. In this case, Council would then need to provide staff direction on their desire to continue with the recommendation of the Biosolids Master Plan whereby the City constructs and operates its own thermal reduction unit, or to complete the due diligence phase on the Liberty Energy proposal which had been put on hold until this P3 Canada funding option was explored.

CORPORATE STRATEGIC PLAN

Focus Areas: 1. Skilled, Innovative and Respectful Organization, 2. Financial Sustainability, 3. Intergovernmental Relationships, 4. Growing Our Economy, 5. Social Development, 6. Environmental Stewardship, 7. Healthy Community

Skilled, Innovative and Respectful Organization

- More innovation, greater teamwork, better client focus.
- Undertaking a P3 Canada approach to infrastructure procurement allows the City to achieve innovation in selecting appropriate technology.

Financial Sustainability

- Delivery of municipal services and management capital assets/liabilities in a sustainable, innovative, and cost-effective manner.
- Undertaking a P3 Canada approach to infrastructure procurement allows the City to achieve innovation in selecting appropriate technology.

APPENDICES / SCHEDULES

Appendix “A”: Biosolids Management Project Business Case - City of Hamilton
Appendix “B”: PPP Canada Biosolids Management Project Workplan

Deloitte.

Business Case Submission to PPP Canada

Hamilton Biosolids Management Project

April 30, 2012

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Section 1: Executive summary

The City of Hamilton is seeking to procure a private sector partner who will provide biosolids management services based on a long-term Design-Build-Finance-Operate-Maintain (DBFOM) contract. A DBFOM contract is a form of public-private partnership that will allow the City to capitalize on the potential for PPP Canada to fund up to 25% of eligible Project costs.

This Project involves the development of biosolids management infrastructure, as part of the City of Hamilton's wastewater treatment process. The City currently utilizes a Land Application process for management and disposal of biosolids. However, Land Application faces a variety of challenges which require the City to carefully consider whether a different approach to biosolids management will be more sustainable for the long-term. Accordingly, Council has directed City staff to examine all biosolids management options, with a view to potentially developing new infrastructure for a long-term approach to biosolids management. The Project Team understands that Council wants to allow the market to dictate, to the extent possible, the optimal biosolids management approach.

Through a Request for Information (RFI) process, market sounding interviews, and a comprehensive jurisdictional scan of biosolids management in other Canadian municipalities, the Project Team has examined all options and determined that three broad categories of technical approaches ("Alternatives") are available: Land Application, Enhanced Treatment, and Thermal Reduction.

- **Land Application** is the City's current practice, and involves a contractor applying processed "Class B" biosolids to agricultural land at no cost to the farmer.
- **Enhanced Treatment** involves further processing of biosolids to produce a higher quality "Class A" end product which can be sold for use as fertilizer or fuel.
- **Thermal Reduction** involves thermal treatment of biosolids and disposal of ash by-product in landfill.

The Project Team carried out a Triple Bottom Line analysis on each of these Alternatives, to determine which Alternative(s) best meet the City's environmental, social, and economic objectives. The analysis demonstrates that Enhanced Treatment and Thermal Reduction Alternatives were rated highest.

- Enhanced Treatment produces a Class A end product, has low emissions (reduced truck traffic compared to Land Application), and can result in low risk to the City if procured via a DBFOM model. Depending on the market for the end product, Enhanced Treatment can be relatively cost-competitive with Land Application or can be up to 30% more expensive. Although previous studies carried out by the City have identified risk factors with Enhanced Treatment, improvements in the quality of the City's biosolids (lower metals concentration), the ability to transfer marketing risks under the DBFOM model, and the maturing market for Enhanced Treatment products have significantly mitigated these risks.

- Thermal Reduction produces a non-hazardous end product (ash) and has the lowest truck traffic of all the Alternatives. Thermal Reduction involves controlled emissions. It is the highest cost Alternative, but can result in low risk to the City if procured via a DBFOM model.

The Land Application Alternative was rated the lowest among the Alternatives based on the City's Triple Bottom Line evaluation criteria. Land Application involves the most truck traffic of the Alternatives (diesel emissions). There are also logistical concerns relating to the limited market of land application service providers as well as limited storage sites, over the long term (30 years). This Alternative is not suited to a DBFOM model (see next paragraph) and is expected to result in the most risk to the City. Land

Application may be the lowest cost Alternative, but under some scenarios Enhanced Treatment could be relatively close in cost to Land Application (on a Net Present Value basis).

The Project Team also carried out a preliminary Value for Money (VFM) analysis, in order to determine which Alternatives were suitable for procurement as a DBFOM contract. The analysis demonstrates that Projects based on either Thermal Reduction or Enhanced Treatment technology are well suited to the DBFOM model. Projects based on these Alternatives are expected to provide overall savings to the City over the term of the Project, by transferring risk to the private sector and anchoring the risk transfer by requiring investment of private capital over the long term (30 years). The preliminary VFM analysis also clearly indicates that a Project based on a Land Application approach would not be suitable for a DBFOM model, since Land Application is not expected to involve significant amounts of private capital to secure the risk. There are no expected savings to the City using the DBFOM model to procure a Land Application service provider.

Taking the Triple Bottom Line and VFM analysis into account, the Project Team is recommending an output based procurement approach that attracts competition between Enhanced Treatment and Thermal Reduction solutions. The procurement should be based on a DBFOM contract structure that provides an opportunity to attract P3 Canada funding.

The City will "allow the market to decide" by providing an output specification that requires biosolids to be treated to a certain standard ("Class A") or thermally treated. Private sector providers will be free to propose any form of technology that they believe is most suitable to achieve this output specification, subject to a Request for Qualifications process that screens in only proven technologies. It is expected that Enhanced Treatment and Thermal Reduction technologies will be able to achieve the output specification and will be considered by the market in responding to the RFP. Proposals will be evaluated based on a combination of financial (price) and non-financial evaluation criteria. The Project Team believes that an output based procurement approach will best meet the City's objectives and will satisfy Council's desire to "let the market decide".

This approach has been tested through consultations with potential biosolids service providers and financiers. The consultations indicated that an output based procurement process would likely attract significant interest from the market, provided that the process appropriately considers the increased time and investment required by the private sector to participate.

Therefore, the Business Case recommends that:

- The procurement process proceeds with an output based process that sets a clearly defined performance specification and lets the bidders determine which technology best meets the performance specifications and evaluation criteria.
- The procurement process should be a two-stage process: (1) a Request for Qualifications which screens in bidders with the best track record and experience, and ensures that only proven technologies are brought forward; and (2) a Request for Proposals process which identifies a preferred bidder based on technical and financial criteria.
- The Output Specifications should be set so that they can be met by Enhanced Treatment and Thermal Reduction Alternatives, i.e. minimum Class A.
- The Output Specifications should be set so that they cannot be met by Land Application.
- The procurement should be based on a 30-year operating term, DBFOM contract which provides the opportunity to obtain P3 Canada funding.

Project Summary Sheet

The table below provides a high-level overview of key features of the Project. The subsequent chapters of the Business Case provide additional details.

Table 1 – Project Summary

Item	Outline Terms
Procuring authority	• City of Hamilton.
Type of infrastructure	• Biosolids management facilities. • Precise type of infrastructure will depend on form of technology selected to meet Output Specifications. • Forms of technology that are expected to meet the Output Specifications include: Thermal Reduction, Enhanced Treatment.
Term	• Construction period plus 30 year operating term
Capital Costs	• Will depend on type of technology put forward by Project Co. • Thermal Reduction Facility - $50 - $100M • Enhanced Treatment Facility - $25-$50M
Technology selection	• Left to Proponents as part of procurement process, subject to an RFQ process which screens in only proven technologies. • Any technology which meets Output Specifications.
Status of approvals	• Council to approve submission of business case to P3 Canada in May 2012. • Council to approve procurement plan and initiation of process summer/fall 2012, following P3 Canada investment decision.
Site	• Proponents to be provided a site at the City's Woodward Wastewater treatment plant facility. • Proponents may also, at their risk and cost, provide their own site at an alternative location.
Delivery Model	• Design-Build-Finance-Operate-Maintain.
Proposed Capital Structure	• 25% Substantial Completion Payment (funded by PPP Canada). • 75% Long-term financing.
Payment Mechanism	• Availability based. • Per-tonne fee for biosolids above forecast production.
Commercial Risks	• Electricity: − Woodward site - City to utilize any surplus electrical energy produced and credit Project Co for savings. • Risks associated with marketing of any other end products assigned to Project Co. City to consider developing a revenue share mechanism above certain threshold.
Preliminary Value for Money	• Enhanced Treatment: Between 9 and 15% estimated savings • Thermal Reduction: Between 7 and 16% estimated savings
Procurement Process	• Two staged – RFQ and RFP. • Adaptations to address market concerns over output based procurement – see Section 12.
Precedent Projects	• Barwan Biosolids Management Facility (Australia, DBFOM). • Philadelphia Biosolids Management Facility (US, DBFO). • Sudbury Biosolids Management Project (Ontario, proposed DBFOM, in procurement).
Affordability	• Affordability cap to be prescribed as part of procurement process.
Innovation	• The City envisions providing Proponents with the option to bring forward innovation proposals for the City's biosolids digesters, as part of the procurement.

Section 2: Glossary

Table 2 - Glossary

Term	Definition
Alternative	For the purposes of this Business Case, the term "Alternative" is used to refer to a general approach to biosolids management which could be carried out using several different Technologies and is not proprietary to any one vendor. An example of an Alternative is Thermal Reduction. Thermal Reduction of biosolids can be accomplished via a number of different Technologies, including Pyrofluid and others.
Biosolids	Biosolids are a product of wastewater treatment, after digestion and dewatering.
Biosolids Master Plan or BMP	The master plan completed by the City and approved in 2007 and as discussed further in Section 4.
Business Case	Means this document.
City	The City of Hamilton.
Class A	Generally refers to biosolids which have undergone a more thorough treatment process than Class B biosolids and contain minute levels of pathogens. Class A biosolids can be used as commercial fertilizer or fuel pellets, without any pathogen-related restrictions.
Class B	Generally refers to biosolids which have undergone less treatment and contain higher levels of pathogens than Class A. Class B biosolids can be land applied to agricultural sites, and their application is controlled by provincial regulations (Nutrient Management Act) which protect public health and the environment.
Council	Refers to Hamilton City Council.
Design-Bid-Build or DBB	Means a Project Delivery Model where the public sector procures a design through consulting engineers, and tenders that design for construction via general contractor. The contractor is paid via progress payments and no private financing is needed for construction of the infrastructure. Following completion the public sector assumes responsibility for operations and maintenance of the infrastructure, either through its own staff or via short-term O&M contracts with private firms. For the purposes of this Business Case, a DBB is assumed to be constructed under terms similar to a CCDC II construction contract.
Design-Build-Finance-Operate-Maintain or DBFOM	Means a Project Delivery Model where a private sector partner is selected to take responsibility for the design, construction, operations, and maintenance of infrastructure, typically for a term of 25-35 years. During construction, a significant portion of payment is held back, requiring the private sector partner to obtain financing for construction. Following completion, the held back funds are then paid to the private sector over the term of the contract as part of an annual service fee.
EA	Means the Ontario Environmental Assessment Act and any related processes and approvals.
ECA	Means an Environmental Compliance Approval issued by the Province of Ontario.
Enhanced Treatment	Refers to a range of approaches to biosolids management which involve treating biosolids in order to produce a higher quality end product, typically fertilizer or fuel pellets. The end product may be "wet" or "dry".
EPC	Means all engineering, procurement and construction procedures and processes during the design-build phase of a project.
FiT	Refers to a power-purchase agreement issued by the Ontario Power Authority under the Green Energy and Economy Act.
IO	Infrastructure Ontario.
Land Application	An approach to biosolids management which involves treatment of biosolids sludge to reduce pathogen content followed by application to agricultural or other land as a soil amendment or soil additive.

Term	Definition
MOE	Means the Provincial Ministry of the Environment
NMA	Refers to the Ontario Nutrient Management Act and its regulations.
NPV	Means Net Present Value.
O&M	Means the annual operating and maintenance obligations and the periodic major lifecycle refurbishments that occur during the operating period.
PPP Canada	The federal agency that provides funding to eligible PPP Projects.
Preferred Alternative(s)	Means the Alternative or Alternatives which, based on the Triple Bottom Line analysis, best meet environmental, social, and economic objectives and are recommended to be brought forward for P3 Canada funding approval and as the basis for a competitive procurement process.
Project	Means the City of Hamilton Biosolids Management Project.
Project Co.	Generic term used to refer to the City's private sector partner under any type of PPP structure.
Project Delivery Model	Means a particular allocation of roles, responsibilities, and risks between the public sector and the private sector, in relation to an infrastructure Project. Examples of Project Delivery Models include Design-Bid-Build (DBB) and Design-Build-Finance-Operate-Maintain (DBFOM).
Project Team	Refers to City Staff assisted by its advisors retained for the purposes of the developing the Business Case, including Deloitte, CH2M Hill, and Joseph Rinaldo.
Proponent	Means a private sector firm or consortium that is bidding on the Project.
PSC or Public Sector Comparator	The traditional Project Delivery Model used as the basis to compare the costs and benefits of a PPP in a VFM analysis.
Public-Private Partnership, PPP or P3	Refers generally to an approach for procurement of public infrastructure where the private sector assumes a significant share of the responsibility for the delivery and the performance of the infrastructure, typically characterized by performance based payment, a long-term duration, and a requirement for private financing of at least a portion of the capital costs. The DBF, DBOM, and DBFOM Project Delivery Models are commonly considered as types of PPP.
RFI	Refers to the Request for Expression of Interest process undertaken by the City and as outlined in Section 5.
RFP	Refers to a Request for Proposals typically issued to solicit binding proposals under a PPP procurement approach.
RFQ	Refers to a Request for Qualifications typically issued to pre-qualify a short-list of bidders under a PPP procurement approach.
Substantial Completion Payment	Means a lump sum payment provided to Project Co. upon certification of substantial completion of the Project, typically between 25% and 50% of the overall capital cost of the Project.
Technology	For the purposes of this Business Case, the term "Technology" is used to refer to a specific, proprietary process or method for biosolids management that is normally unique to one vendor. Examples of Technologies include Veolia Water's Pyrofluid fluidized bed thermal treatment technology, or Lystek's cell lysing technology.
Thermal Reduction	An approach to biosolids management which destroys organic matter through application of high heat, resulting in an ash by-product that must be disposed.
Value for Money or VFM	Refers to the risk-adjusted cost-benefit analysis as further defined in Section 9.
Woodward or Woodward WWTP	Refers to the City's water and wastewater treatment facilities located at its Woodward site, as further described in Section 4.

Section 3: Project Description and Need

3.1. Overview

This Project involves the development of biosolids management infrastructure, as part of the City's wastewater treatment process. The City currently utilizes a Land Application process for management and disposal of biosolids. However, Land Application faces a variety of challenges which require the City to carefully consider whether a different approach to biosolids management will be more sustainable for the long-term. Accordingly, Council has directed City staff to examine all biosolids management options, with a view to potentially developing new infrastructure for a long-term approach to biosolids management.

The infrastructure will accept partially digested biosolids from the City's wastewater treatment facilities, and will carry out further processing and/or final disposal of the biosolids. This may occur through thermal treatment, further treatment, or other methods that meet the City's output specifications. Initial estimates indicate that capital costs for solutions based on Enhanced Treatment or Thermal Reduction approaches could range from $25M to $100M, depending on type of technology selected. The City's procurement process will incentivize the lowest cost solutions that meet the City's technical requirements.

The Project is expected to proceed as soon as possible following the conclusion of the procurement process. Current timelines envision the commencement of construction in early 2014, with a construction period expected to be no longer than 2 years. Timelines will be adjusted as necessary to coincide with the City's window to terminate the existing land application contract.

3.2. Strategic Alignment and Priority

The need for the Project is being driven by a number of strategic factors:

- **Managing risk** – There are commercial, environmental and reputational risks associated with continued Land Application of biosolids;
- **Technological** – Newer methods of biosolids management (e.g. Enhanced Treatment approaches) have emerged and developed over the past 10-15 years and may be more appropriate for the City's needs;
- **Social** – The Project must address biosolids management within the context of growth over the next 30 years and the possibility of decreased land area on which to land apply biosolids;
- **Environmental** – A long-term approach to biosolids management should ensure that environmental impacts are appropriately considered; and
- **Consideration of the PPP** – The characteristics of the Project may suit a PPP structure which would qualify for funding from PPP Canada.

The City has clearly identified the need for a long-term biosolids management solution. This need was primarily articulated by the development of a biosolids Master Plan for Hamilton, dated August 2007.

3.3. Objectives

The Project Team as well as senior management at the City has developed a set of objectives for the Project. These objectives are similar to those set out in the City's Biosolids Master Plan developed in 2007, and have been selected to ensure that the Technology solution will:

- Provide the City with a long-term contractual solution in the range of 20-30 years in duration;
- Be environmentally sustainable over the long term;
- Be reliable over the long term;
- Provide a long term cost-effective Technology that will ensure cost and performance certainty that will fit within affordability constraints identified by the City; and
- Minimize long-term risks to the City and transfer or share these risks with the private sector as commercially appropriate.

Section 4: Project Background

This section provides an overview of the current status of biosolids management in Hamilton as well as future challenges. This section also summarizes the City's efforts to date on development of a long-term biosolids management strategy, including drafting a biosolids Master Plan, due diligence review of unsolicited proposals from the private sector for biosolids management solutions, and obtaining EA approvals.

4.1. Current Status of Biosolids Management in Hamilton

The City has previously used thermal treatment as a final step in the biosolids treatment process, based on multiple hearth technology. However, in 1996 the City determined that necessary upgrades to the incinerator infrastructure were not cost-effective, in comparison with Land Application. Since 1996, the City has used Land Application, by contracting with a private service provider.

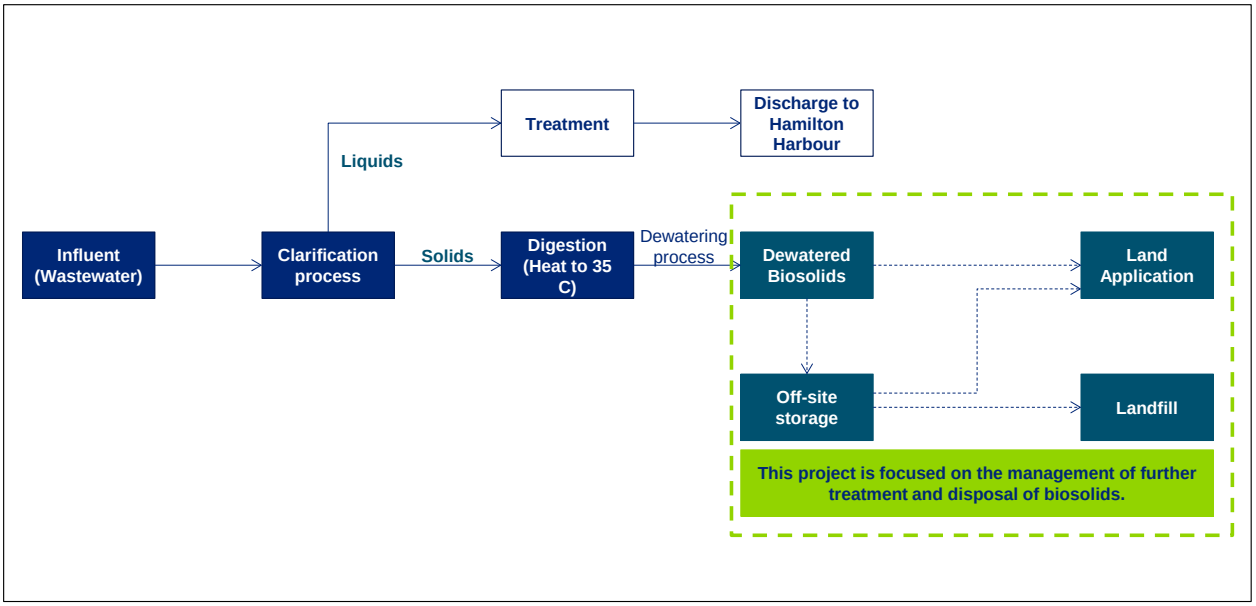
Biosolids processing at Woodward WWTP

Biosolids sludge originates at the City's wastewater treatment plants, as a product of the wastewater treatment process. The City has two wastewater treatment plants: Dundas, and Woodward. Woodward WWTP is the largest of these sites, and biosolids sludge is trucked from Dundas to Woodward. The Woodward WWTP is the main central site for the City's biosolids management program.

The Woodward WWTP has an average day rated capacity of 409,000 m^3/d of wastewater influent with ability to treat peak flows to 614,000 m^3/d. The Woodward WWTP takes wastewater influent, separates liquids from solids through a process known as biological treatment and clarification whereby the liquid is treated and discharged to Hamilton Harbour via Red Hill Creek. The solids are then further processed using anaerobic digestion which product is referred to as biosolids. The biosolids are then trucked off-site for application onto agriculture lands as a soil additive. During the off-season winter months (December through March) or during wet weather periods when land application is prohibited by the *Nutrient Management Act* regulations, biosolids are stored in an approved facility. If storage is not available, as a contingency, biosolids may be sent to a registered landfill.

This Project is focused on the end-point of the biosolids process – that is, processing the partially digested biosolids and treating them further with the goal of disposal or beneficial use.

Figure 1: Biosolids Process



Trends in production

The City is currently producing approximately 40,000 wet tonnes of biosolids per year. The City's future projections for growth in biosolids production are forecast to be in line with anticipated population growth of 1% per year, to reach over 57,460 wet tonnes per year by 2041.

Challenges associated with Land Application

There are a variety of risks associated with Land Application that cast doubt on the ability of this technology to be sustainable as the City's biosolids management strategy, and to meet its objectives.

There are critical market competitiveness and capacity concerns regarding Land Application and associated storage. The City's recent experience in procuring Land Application service providers indicates a very limited market of service providers in Ontario with the capacity to handle the volume of biosolids produced by Hamilton and the capacity to secure the associated agriculture land on an annual basis. In addition, the City has historically transferred the requirement of biosolids storage onto the contract service provider. Storage volumes are typically sized to meet the volumes produced over the winter months which translate into significant storage needs for the City biosolids program. It is understood that the storage facility for City's existing service provider is leased and siting a new biosolids storage facility within the Province may be challenging for this or other service providers. Overall, market capacity is considered to be a risk factor for the future, and the exit of any qualified firm from the market in the future would exacerbate this problem.

A second risk factor is the continued availability of land for application. Land application requires a customer base of agricultural land owners who have secured necessary approvals and who are located within a reasonable transportation radius.[1] The supply of available land is limited by setback requirements, loading restrictions[2], as well as health and environmental concerns from the community which can also cause farmers to decline to accept biosolids being applied to their land. There is also competition from alternative fertilizer sources such as manure. Taken together all of these factors point to some risk of static or declining supply of available land, as biosolids production levels continue to rise.

[1] Land application is regulated under Ontario Reg. 267/03, as amended by O.Reg. 338/09 which sets out quality criteria for biosolids to be land applied. Land applicators (volunteer farmers) must file a Non-Agricultural Source Materials (NASM) Plan, which must be completed by a certified developer and requires soil testing.
[2] The new regulations require, for example, setback and separation requirements, waiting periods, and a maximum application rate of 22 tonnes/hectare/5 years, or as restricted by metals, sodium, or other parameters.

The City's Biosolids Management Plan (discussed in greater detail within Section 4.2) analyzed the area of land within Hamilton that could potentially accept biosolids for land application. The BMP concluded that less than 7,000 hectares of land within Hamilton are available for biosolids application, in the sense that the land is agricultural in nature and would meet regulatory requirements. To meet the present biosolids spreading requirements, at least 18% of this land would be required, rising to 32% in 2035 and necessitating a considerable volunteer base requirement. Even if the potential area were expanded to include a 50km radius, by 2035 Hamilton would require 14% of all potentially available land in order to satisfy its land application needs. Therefore, the BMP concluded that:

> *"overall sustainability of this management approach, especially over the medium to long term, is uncertain."*

However, the recent amendments to the Nutrient Management Act have provided increased clarity around the regulatory regime for Land Application. These amendments may, in some cases, allow for increases in the rate of application of biosolids to agricultural land. These amendments have removed regulatory uncertainty surrounding this Alternative and greatly reduced the associated risks of regulatory change over the short-term (long-term sustainability concerns continue to exist). However, the logistical concerns related to market capacity and storage siting, remain.

The table below summarizes key challenges and risk factors associated with Land Application. These challenges and risk factors are, in part, driving the need for this proposed infrastructure Project to support a long-term biosolids management plan for the City.

Table 3: Risks Associated with Land Application

Challenge	Description
Regulatory risks	• The Nutrient Management Act heavily regulates land application of biosolids. However, regulations have been overhauled and are clear for the foreseeable future long-term sustainability concerns continue to exist).
Storage	• Application can only be carried out in-season (8 months of the year) and in suitable weather, so storage is required. Concerns over siting and availability of storage.
Availability of land	• Competition from other municipalities and from other sources of nutrients (manure). • Limited base of volunteer farmers. • As available land becomes more scarce, land application becomes more costly since trucking costs will increase. • Regulatory requirements restrict total available land (setback requirements, nutrient loading).
Environmental and Social impact	• Odour concerns. • Generally speaking, community does not support land application in their vicinity.
Sensitive to fuel prices	• Cost of land application is highly sensitive to fuel prices (trucking to application site) and this factor goes hand-in-hand with availability of nearby land.
Market capacity	• Limited supply of qualified service providers.

4.2. Biosolids Master Plan

Given the challenges associated with the current Land Application approach discussed above, the City has previously considered potential alternatives for biosolids management. In 2007, the City developed a Biosolids Master Plan (BMP) to identify a preferred management strategy for the next 20 years and beyond. The BMP was carried out as a Municipal Engineers' Association's Municipal Class EA. The City retained Hydromantis, Inc. and XCG Consultants Ltd to assist in the preparation of the BMP.

The BMP identified a long list of potential biosolids management approaches. It should be noted that the BMP focused on identifying not only biosolids Alternatives but also made an effort to identify, where possible, different variations on a specific Alternative. This is consistent with the City-led approach to infrastructure development which was contemplated at the time of the BMP where the City would have selected a specific technology, as opposed to the PPP approach where selection of a specific technology is at the risk of the private sector (subject to an appropriate pre-qualification process).

Table 4: Potential Technology Options

Alternative	Technology Variations	Description
Land Application	• N/A	• Status quo – Class "B" product that is applied to land
Enhanced Treatment Options	• Stabilization • Composting • Alkaline stabilization • Thermal drying approaches	• Various processes that result in a Class "A" product that can be marketed as fertilizer
Incineration (Thermal Reduction)	• Can occur with or without pre-digestion of biosolids	• Destroys organic matter through application of high heat, results in an ash by-product that must be disposed
Landfill	• N/A	• Diversion from land application to landfill

Each of the long list of options was evaluated based on a set of evaluation criteria that included a Triple Bottom Line approach. The evaluation criteria included:

- Health & Safety;
- Social Acceptance;
- Environmental Protection;
- Technical Feasibility;
- Economics; and
- Regulatory Issues.

The BMP's evaluation process indicated that the following two approaches should be short-listed:

- Enhanced Treatment approaches which result in Class "A" biosolids, specifically alkaline stabilization and temperature-phased anaerobic digestion); and
- Thermal Reduction.

The BMP's analysis concluded that from a Triple Bottom Line perspective, the Enhanced Treatment and Thermal Reduction approaches were better options than Land Application since they provided a higher level of treatment to biosolids thereby minimizing social and environmental risks.

After further analyzing the two short listed approaches, the BMP concluded that Thermal Reduction was the preferred approach. Thermal Reduction was viewed as having relatively manageable social and environmental impacts, since the process is carried out on a single site and emissions are highly regulated. This approach also had the advantage of eliminating risks related to land availability, since agricultural land is no longer needed to dispose of biosolids.

The BMP noted some concerns relating to the Enhanced Treatment approaches, including marketing and disposal of the fertilizer end-product. These risks included land availability and market demand, as well as whether metals content in biosolids would allow the product to meet federal regulatory standards.[3] The BMP assumed that Enhanced Treatment approaches would be carried out based on a "City-led" structure under which the City would have to assume such risks. As well, Enhanced Treatment approaches were estimated by the BMP to be more costly than Thermal Reduction, due to assumed requirements for storage and (in the case of Alkaline Stabilization) higher O&M costs.

Subsequently, the City undertook a Class EA Study for biosolids management which was prepared by AECOM. This report evaluated various thermal reduction technologies and recommended that Thermal

[3] At the time of the BMP, two of the eleven regulated metals (selenium and molybdenum) were above the permitted limits. Since the BMP, the City initiated a Sewer Use Control program in order to control the concentration of metals from entering the wastewater treatment system and as a result, the quality of the City's current biosolids are well within all the limits for each of the eleven metals increasing the marketability of the biosolids since the BMP.

Reduction (fluidized bed thermal treatment with energy recovery through steam generation) be the City's preferred long term strategy. This strategy was endorsed by City Council in August 2009.

4.3. Unsolicited proposal from Liberty Energy

In August 2009, the City of Hamilton received an unsolicited proposal from Liberty Energy for the disposal of biosolids generated from the Woodward WWTP at a proposed new thermal reduction with energy recovery facility, to be developed on land owned by Liberty. Liberty's EA was approved in March 2008 with the Certificate of Approval being approved in September of 2008.

The City retained Black & Veatch, an independent engineering consulting firm, to undertake a peer review comparison of the Liberty proposal and a City-led thermal reduction facility identified by AECOM in the Class EA described above ("Peer Review #1"). However, Liberty identified a number of discrepancies in the Black & Veatch analysis and Council resolved that staff be required to carry out further analysis. The City and Liberty jointly retained an independent advisory team to review the prior analysis and reconcile discrepancies, update costing, and provide a revised analysis including a financial comparison and triple bottom line evaluation ("Peer Review #2"). This analysis evaluated the following alternatives:

1. A City owned and operated thermal reduction facility solely financed by the City;
2. A commercial contract with Liberty as per Liberty's unsolicited proposal (City enters into a contract for disposal of biosolids with Liberty Energy); and
3. Liberty P3 Option as per Liberty's unsolicited proposal (City is an equity partner or co-owner in a one-unit facility).

The Peer Review #2 analysis concluded that the proposed Liberty approaches had significant benefits as compared to the City-led approach, particularly from an economic perspective. The analysis also concluded that further review was required on Liberty's technology due to the limited experience in North America of mixing urban biomass and biosolids, a key element of Liberty's technology. There were also concerns relating to whether urban biomass or critical biosolids volumes can be secured.

4.4. Council resolution to proceed via PPP Canada application

The results of Peer Review #2 were presented to Council on May 9, 2011. Council directed staff to proceed with the development of future biosolids management options via an application to the P3 Canada fund. Council directed City staff to, among other things, design a competitive process that allows consideration of various biosolids management options, and submit an application to the P3 Canada Fund for a proposed biosolids management project. This direction from Council has the effect of ruling out consideration of unsolicited proposals since it requires that procurement of a biosolids management solution is carried out through a competitive process. Council's resolution is reproduced below:

> *"That staff be directed to develop a scope of work including an estimate of due diligence costs, with full consideration of the P3 Canada Fund Program, to analyze risks identified in the peer review report entitled "Independent Peer Review and Financial Evaluation of City/Liberty Thermal Reduction Options for the Disposal of Biosolids Generated at Woodward WWTP" as well as those identified in report PW07047c, Business Review – Liberty Proposed Incinerator and report back to General Issues Committee in June 2011;*
>
> *That staff be directed to design a procurement process that incorporates necessary risk mitigation strategies and allows for consideration of biosolids management options that conform to the mandatory competitive process required by the P3 Canada Fund and that a report on the proposed process be brought back to Council for its consideration;*
>
> *That staff be directed to submit a Round Three Application to the P3 Canada Fund for a proposed biosolids management project by the deadline of June 30, 2011".*

In accordance with Council's direction, the City submitted an application to the P3 Canada Fund by the June 30, 2011 deadline. The City was informed on September 30, 2011 that it had been "screened in" through the initial stage of the P3 Canada Fund application process, and was invited to submit a

comprehensive Business Case for funding. The Project Team subsequently appeared before Council on December 12, 2011, to present a work plan and budget for development of the Business Case. The work plan and budget were approved. The text of the December 12 Council resolution is set out below:

> *"That the General Manager, Public Works be authorized and directed to proceed with Phase 1 of the P3 Canada Funding Approval Work plan for the City's Biosolids Management Project as summarized in Appendix B, at a cost estimate of $300,000 to be funded from Project 5160966910 WWTP - biosolids MP Implementation;*
>
> *That after completion of Phase 1 staff report back to Council prior to proceeding to Phase 2."*

4.4.1. Council Direction

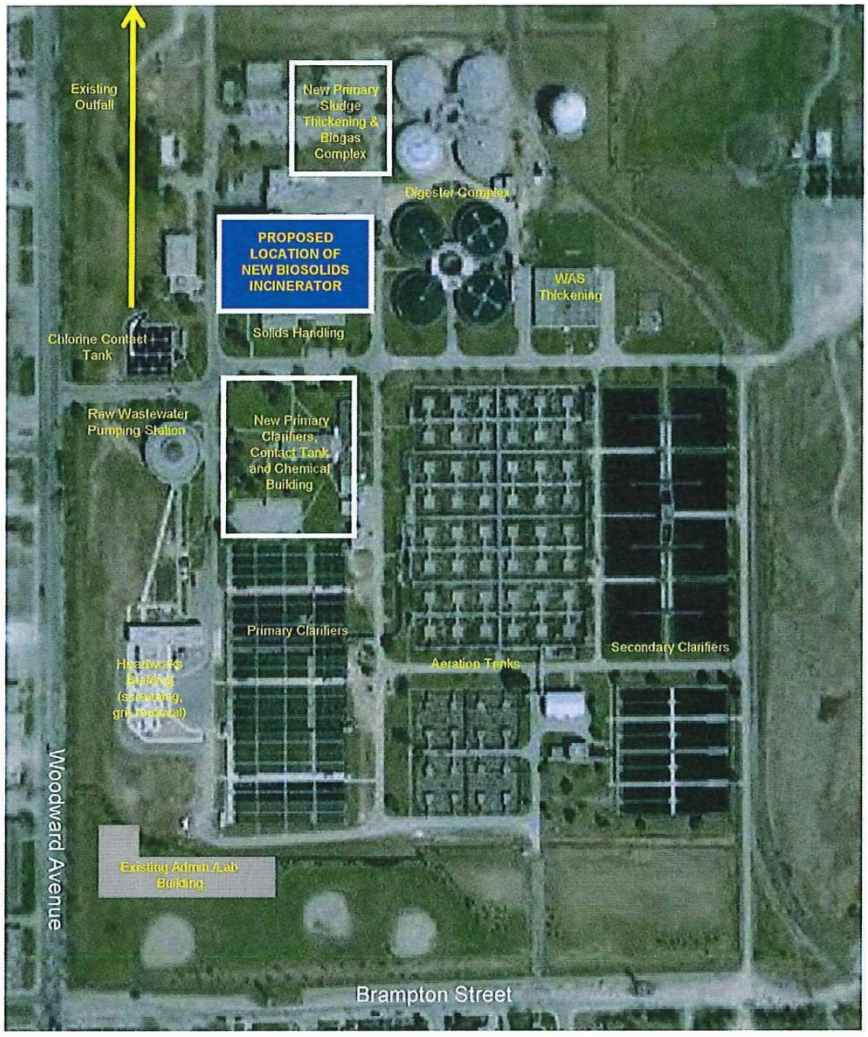
As per the Council resolution set out above, Council has directed City staff to ensure "consideration of biosolids management options". This requires staff to re-consider all available biosolids management options (i.e. Alternatives) and develop a procurement process that allows for as much competition between biosolids management options as possible.

4.5. Woodward Avenue WWTP Site

The City will provide a site at the Woodward Avenue WWTP for the Project. Project Co. will be permitted to construct the Project on this site and will be provided a license to access and use the site for the duration of the Project term. The site is marked in the graphic below. It is co-located with other wastewater infrastructure.

An Environmental Assessment study for thermal reduction technology has been completed and the period for public consultation has concluded. As a result of the public consultation process, additional studies were required by the MOE and these studies have been completed. The City is currently awaiting MOE approval.

Figure 2: Woodward Avenue WWTP Site



Section 5: Market Analysis

5.1. Overview

Given Council's direction to examine all biosolids management options, the Project Team has carried out a market analysis in order to assess the biosolids management approaches in the market as well as the potential service providers. The Project Team has done this through:

- A Request for Information process;
- A jurisdictional scan of other Canadian municipalities to examine biosolids management approaches; and
- Case studies of biosolids management projects carried out using a PPP approach.

5.2. Request for Expressions of Interest Process

The City issued a RFI regarding the Project on January 5th, 2012. The RFI was posted online via the Biddingo service utilized by the City's Procurement Section for most major Projects. As well, the Project Team contacted a group of approximately 20 firms whom the Project Team believed would have an interest in responding to the RFI. These firms are listed in Appendix A[4].

The purpose of the RFI was to assist the City in identifying a range of potential technologies that can form the basis for a biosolids management solution, and to understand key commercial, financial, and procurement issues that need to be addressed to maximize potential bidder interest. The City's key objectives for the RFI were identified as follows:

- To provide preliminary information on the Project to the market;
- To identify private sector firms who are interested in partnering with the City for development of the Project;
- To identify the fullest possible range of potential technologies that may be brought forward by the market in order to provide a biosolids management solution for the City; and
- To gain insight on the commercial parameters, deal structure, and risk allocation that may be acceptable for private sector partners.

The deadline for responses to the RFI was January 26th, 2012. At the request of several respondents, the deadline was extended to February 2, 2012.

Before the release of the RFI as well as during the "open" period (between the time of release of the RFI and close of the RFI) the City received a number of requests from private sector firms to meet to discuss the Project and the RFI process. The City and the Project Team implemented an internal procedure requiring that all requests for meetings be channelled through the Purchasing Department to the Project Team. City staff and Councillors outside the Project Team were requested not to meet with private sector representatives regarding the Project.

Given the relatively informal, non-binding nature of the RFI process and the goal of obtaining the best information possible from the market, the Project Team made best efforts to accommodate requests for meetings. The Project Team also received further requests for meetings following the RFI closing date, but declined these requests as the period for receiving market feedback had concluded.

[4] The list of firms contacted has been redacted from the publicly available report due to confidentiality concerns.

5.2.1. Overview of Responses

Eighteen (18) RFI responses were received. Responses were received from a range of firms which can be classified as follows:

- **Developers** – Respondents who indicated they were primarily interested in investing equity and taking a project management role. Developers would partner with a Technology provider, as well as with design-build and O&M subcontractors.
- **Integrated Developers** – Respondents who indicated that they would provide a technology for biosolids management, as well as investing equity and taking on a Project management role. They may partner with other equity investors, as well as with design-build and O&M subcontractors.
- **Technology Providers** – Respondents who indicated that they would provide a technology for biosolids management. They may partner with Developers, as well as with design-build and O&M subcontractors.

The respondent firms are listed in Appendix A.

5.2.2. Alternatives vs. Technologies

As noted in the Glossary to this Business Case, the Project Team has carefully distinguished between Technologies and Alternatives. To summarize, Alternatives refer to broader categories or groupings of approaches to biosolids management, while Technologies refer to specific processes or methods within each Alternative.

The RFI responses were analyzed in order to assess whether the Technologies put forward are proven technologies. This will help to demonstrate the extent to which each Alternative has a competitive market of proven potential Technologies.

5.2.3. Results

The City received RFIs proposing various Alternatives as follows:

- Eight responses proposing Thermal Reduction;
- Seven responses proposing Enhanced Treatment solutions;
- Two responses proposing Land Application solutions; and
- Two responses proposing other Alternatives.

Because some responses proposed multiple Alternatives and because some responses did not identify an Alternative, this tally does not reconcile with the eighteen responses received.

Each of the specific Technologies described by respondents through the RFI process was screened via a criteria developed by the Project Team. The intent of this approach was to ensure that the Business Case only considers Alternatives that have a competitive marketplace of viable, proven Technologies. The evaluation criteria are set out below:

> *Proven Approach and/or Technology*
>
> *To be considered as part of the Business Case review, any proposed approaches and/or technologies must be deemed proven. For the purpose of this assessment, proven is defined as meeting each of the following:*
>
> - *RFI responses demonstrate that there are at least 3 full scale applications of the approach/technology in North America that process municipal biosolids; and*
> - *Each referenced facility/application can demonstrate full scale operations for a period of time in the order of five consecutive years.*

Note: "Full scale application" is defined as processing more than 5000 dry tons annually of municipal biosolids.

The results of the screening process indicate the following conclusions:

- Thermal Reduction generally includes proven technologies.
- Enhanced Treatment includes some proven technologies. Three technologies were judged to be proven, and another two met some of the criteria for "proven" but not all.
- There is limited evidence from the RFI process to suggest whether the Land Application Alternative is proven or unproven. Given that Land Application does not involve new or complex technology it can be assumed to be proven.
- The Other Alternatives proposed are not proven and in any case do not provide the biosolids management solution the City is seeking.

Table 1: Summary of RFI Proposed Technologies

Alternative	Number of Different Technologies proposed	Number of Proven Technologies	Assessment
Thermal Reduction	8	7	Competitive market of proven potential Technologies for this Alternative.
Enhanced Treatment	7	3	Some proven potential Technologies for this Alternative.
Land Application	2	1	Relatively simple and low risk technology
Other	2	1	Not a wide selection of proven Technologies within this Alternative.

5.2.4. Other input

Respondents provided other input in response to questions in the RFI regarding commercial structure, site, technology, capital costs, and procurement process. Summaries of this input are set out in Appendices A, B, and C.

5.2.5. Conclusions

The main takeaways from the RFI process were:

- There is significant interest in the Project.
- The main Alternatives available for biosolids management include Thermal Reduction, Enhanced Treatment, as well as existing Land Application.
- Based solely on the respondents to the RFI, Thermal Reduction includes a wide variety of proven Technologies. Both Enhanced Treatment and Land Application also include proven Technologies.
- Most respondents, regardless of Alternative, would consider a longer term contract (20+ years).

5.3. Jurisdictional Scan and Case Studies

The Project Team has carried out a Canadian jurisdictional review to assess biosolids management Alternatives and Technologies in use in Canada. Based on the results of the review, Enhanced Treatment, Thermal Reduction and Land Application are all commonly used approaches in Canada. Several larger cities use a mixture of these approaches. For example, Thermal Reduction is employed in five of the cities examined, but in three of those cases Thermal Reduction is complemented with an Enhanced Treatment technology. A summary of the jurisdictional scan is set out in Appendix D.

The Project Team has also noted two biosolids management projects which have been successfully procured using a PPP approach. One of these projects is located in Philadelphia and the other is in Australia. The Project Team has developed detailed case studies of these projects and used certain lessons learned to inform the overall procurement approach set out in this Business Case. The case studies are set out in Appendix D.

Section 6: Description of Alternatives

6.1. Short Listed Alternatives

Based on the RFI process described above in Section 5, the Project Team has determined that Land Application, Enhanced Treatment, and Thermal Reduction are Alternatives which have proven Technologies. Each of these Alternatives has been screened in for further analysis in the Business Case. The Business Case refers to each of these individually as an "Alternative", and collectively as the "Alternatives".

6.2. Consideration of Alternatives for analysis purposes only

As described elsewhere in the Business Case, the City intends to procure the Project based on a pure output based approach which will not prescribe the particular Technology or Alternative, but will define the regulatory, contractual, and performance requirements that will comprise the output specifications[5]. The City will partner with a service provider that can meet the output specifications as well as other technical requirements such as environmental standards and odour control. Therefore, it is not necessary for the City to carry out a detailed analysis of different Technologies.

However, it is still necessary for the purposes of the Business Case to analyze a short list of Alternatives, for the following reasons:

- The proposed output specifications must be developed based on an understanding of the advantages and disadvantages of each Alternative. A Triple Bottom Line analysis of each Alternative has been utilized to assess each one from an environmental, social, and economic point of view. The results of this assessment inform the calibration of the output specifications.

- Since the costs, services, and risks associated with each Alternative are different, the Business Case must confirm that a DBFOM model is appropriate and provides robust Value for Money, for each Alternative. This will ensure that, even using an output based procurement process that does not specify an Alternative, the City is likely to receive solutions that provide Value for Money.

Therefore, the following Sections of the Business Case (Section 6 to 9) will consider each short-listed Alternative, separately, for analytical purposes. The output-based procurement process will not differentiate between Alternatives.

6.3. Overview

This section will describe the Alternatives. Each Alternative will be described in general, summary terms, and specific technologies that are typically used in the market to apply the Alternative will be highlighted. A fuller description of the Alternatives is provided in Appendix E.

The Project Team has chosen one technology for each Alternative to serve as the "basis for design", meaning that in the estimation of the Project Team it is the most likely technology to be brought forward for that Alternative. The cost estimates used in the financial model utilize the "basis for design" for each Alternative. This does not mean that a particular technology is preferred or will be required by the market. The City intends to allow Proponents to select their own technology, subject to a prequalification process

[5] The output based approach is subject to a prequalification process which will ensure that technologies proposed by the private sector are proven.

that ensures technologies are proven. The “basis for design” simply means that for the purposes of comparing one Alternative to another, a “typical” technology approach under each Alternative has been selected.

Each Alternative is assumed to utilize digested, dewatered biosolids from the existing Woodward Avenue WWTP. The WWTP currently anaerobically digests primary and waste activated sludge and dewaters the resulting biosolids with centrifuges. The table below summarizes the assumed biosolids quantities and quality. The descriptions of the Alternatives, as well as the cost estimates which are discussed later in this Business Case, are based on these technical parameters.

Table 2: Summary of Technical Parameters

Item	Assumption
Biosolids quantities:	43,923 wet tonnes per year annual average
Annual growth rate:	1%
Peaking Factors:	1.25 (maximum month); 1. 5 (maximum week)
Dewatered biosolids dry solids content:	27%
Dewatered biosolids volatile solids content:	61% of dry solids (latest value, higher than Peer Review)
Dewatering centrifuge capacity	Dewatering centrifuges have firm capacity of 72 dry tonnes per day (above peak week Projections).
Site	Any on-site processing facility must be accommodated in the footprint established in the Class Environmental Study Report. This footprint allows a rectangular building occupying 3,000 m^3. There is additional space to accommodate 2 tanks or silos of up to 14 m diameter each.

6.4. Land Application

Land Application involves a private contractor accepting the City’s biosolids and applying them to agricultural land. The contractor must truck the biosolids to the application sites, which are typically agricultural sites that accept periodic application of biosolids, free of charge, as a soil enhancement. Land Application is characterized by regulation of the biosolids as a non-agricultural source material under the Nutrient Management Act, often referred to a “Class B” material. Regulations include limitations on the frequency of biosolids application, the location of application (setbacks, proximity to water sources, slope), and the method of application.

The Land Application alternative is based on a service contract with a biosolids land application company. The contractor must maintain adequate off-site storage capacity to accommodate inclement weather and winter conditions (biosolids cannot be land applied during these times). The contractor is also required to prepare certain approvals required by regulation, such as Non-agricultural Source Material plans and system ECA for their vehicles.

For the Land Application alternative, the City’s Woodward Avenue site currently has a temporary truck loading facility. However, for the City to make a long-term commitment to Land Application, a permanent loading facility is required. Therefore, the basis of design for this Alternative includes development of a permanent loading facility with sufficient storage to accommodate long weekends, together with odour control, at the Woodward Avenue Site. The basis of design also assumes that the contractor leases storage space and that ongoing lease payments are included as part of the service fee.

Additional detail on the regulatory framework for Land Application is provided in Appendix E-1.

6.5. Thermal Reduction

Thermal Reduction is defined as a thermal treatment (high temperatures) that completely oxidizes the organic component of the biosolids and results in a product that comprises mostly inert materials – typically ash, which can be trucked to landfill as a non-hazardous material.

Thermal reduction can be carried out via thermal treatment or gasification. Thermal treatment using a fluidized bed technology is the most well-established technology for thermal reduction of biosolids, and

therefore the Business Case has been developed assuming a fluidized bed approach as the basis of design for Thermal Reduction. However, both gasification and thermal treatment are described below.

- **Gasification:** Gasification is an emerging technology with limited commercial experience processing biosolids. Gasification is the conversion of organic matter into a synthetic gas (syngas) comprised mostly of carbon monoxide and hydrogen, with some methane as the combustible components under temperature and in the absence of oxygen. Gasification technologies typically fall into two categories: two-staged combustion (where the syngas is oxidized by adding air in a thermal oxidation chamber and the heat developed is recovered in a boiler or heat exchanger) or as fuel (where the syngas is cleaned, stored and used as a fuel, most typically in an engine generator or combustion turbine).
- **Thermal treatment:** The basis of design for the Thermal Reduction alternative is a fluidized bed system, with recovered heat in the form of steam used to generate electricity. Steam recovered in the boiler is used to drive a steam turbine generator set to generate electricity. Ash removed in the scrubber, settled in an ash thickener and dewatered by a vacuum filter. All equipment, except the ash thickener is located indoors.

A Thermal Reduction approach must be designed to meet requirements that the Ministry of the Environment include as conditions of the ECA. A fluidized bed system may require auxiliary fuel for continuous operation and will require fuel for start-up. Natural gas has been assumed as the fuel of choice.

6.6. Enhanced Treatment

Enhanced treatment can be defined to include any process that changes the quality of the anaerobically dewatered biosolids which are currently applied to land and regulated under the Nutrient Management Act (commonly referred to as Class “B”), to a substance that allows the product to be used in other applications (commonly referred to as Class “A”). Uses of Class “A” biosolids include soil amendments, fertilizer, or other non-agricultural fuel.

Enhanced Treatment processes typically produce a drier solid with reduced water content, resulting in significantly lowered trucking volumes (referred to as “dry” technologies). However, other technologies treat biosolids differently and retain a significant amount of water (referred to as “wet” technologies).

There are several technologies which can be applied for Enhanced Treatment of biosolids. The following technologies have been summarized below in order to provide an overview of some typical Enhanced Treatment processes:

- Alkaline Stabilization
- N-Viro® Process;
- Bioset Alkaline Stabilization Process;
- Lystek biosolids processing technology; and
- Thermal drying.

Table 3: Summary of Enhanced Treatment Technologies

Technology	Description
Alkaline Stabilization	Alkaline stabilization is the addition of an alkaline material to biosolids to destroy pathogens and generally to provide a stable material that is drier than dewatered biosolids and can provide alkaline amendment to soils, in addition to the organic matter and micro and macro nutrients present in Class B material.
The N-Viro® Process	The N-Viro process is based on adding cement kiln dust to biosolids in a mixer, holding in a "heat pulse" step for 24 hours, followed by accelerated drying in a rotary dryer.
Bioset Alkaline Stabilization Process	The Bioset process is based on adding lime and sulfamic acid into a reactor, where the alkaline stabilization process takes place. The resulting soil-like material is stored and then distributed for agricultural land application as a soil enhancer.
Lystek Biosolids Processing Technology	The Lystek technology produces a pumpable product by heating and emulsifying dewatered biosolids that is mixed with potassium hydroxide. The material can be sub-surface injected to agricultural land.
Thermal Drying	The basis of design for the Enhanced Treatment alternative is thermal drying using a belt dryer. The belt dryer system utilizes direct heating of the drying air with natural gas. Belt dryers use the direct contact of circulating hot air on wet biosolids that is pumped onto and conveyed by a slowly moving horizontal belt enclosed in a metal enclosure. The wet material moves through several drying chambers, where the moisture is released into the circulating air. After passing through the drying chambers, the dried material falls off of the belt into a hopper and is conveyed to a loading or storage facility. The dried material may be used as fuel pellets.

Section 7: Triple Bottom Line Analysis of Alternatives

7.1. Approach and Methodology

The Project Team has used a Triple Bottom Line approach in order to analyze and compare between the Alternatives. The Triple Bottom Line approach considers environmental, social, and economic factors. This approach is consistent with City practices, and in particular is consistent with the approach taken in the Biosolids Master Plan and the peer review of Liberty Energy's unsolicited proposal (Peer Review #2), both of which were presented to Council.

The intent of the Triple Bottom Line analysis, in the context of this Business Case, was to determine which Alternative or Alternatives best meet environmental, social, and economic objectives. If one Alternative clearly and robustly outranked the other two Alternatives, then the Project Team would have considered recommending that Alternative to Council as a single Preferred Alternative to be taken forward for P3 Canada funding approval and as the basis for a competitive procurement. However, as will be seen below, the results of the analysis indicated that two Alternatives ranked very close to one another. This result has informed the proposed output based procurement approach.

The objective of the Triple Bottom Line analysis is to determine the basis of the output specification for the City's biosolids management procurement.

7.2. PPP Suitability

The Alternatives were initially assessed for suitability as a PPP Project. This is because, for the purposes of the Triple Bottom Line analysis, it was important to know which Alternatives could be delivered as a PPP, and which Alternatives could be eligible for PPP Canada funding – these variables affect the Triple Bottom Line evaluation of risk to the City and cost to the City.

The Alternatives were assessed for PPP suitability using the criteria set out in the PPP Canada business case guide. The full assessment is provided in Appendix F. Enhanced Treatment and Thermal Reduction are suitable for PPP, whereas Land Application is not suitable for PPP. The rationale is summarized below:

- Land Application is not suitable for PPP, due to its low capital value (it likely does not meet the minimum capital threshold of $20 Million typically needed to support a PPP), limited market of qualified service providers, low potential for innovation, and risk factors which are difficult for the private sector to mitigate or control (including policy and strategic risks as well as operational risks such as availability of volunteer farmer base and uncertainty of operational factors over a long term basis).

- Enhanced Treatment is suitable for PPP, although careful attention should be given to its capital size in proportion to operating costs. There is potential for innovation, and although the associated commercial risks are different from a standard PPP risk profile they can be mitigated by the private sector (case studies from other jurisdictions confirm this). As well, based on responses to the RFI, there appears to be a robust market of service providers.

- Thermal Reduction is suitable for PPP. It has a large capital size and the risks associated with this Alternative can generally be controlled and mitigated by the private sector. Based on responses to the RFI, there appears to be a robust market of service providers.

The Value for Money section of this Business Case (Section 9) provides additional, quantitative support for these conclusions.

For the purposes of the Economic section of the Triple Bottom Line analysis, each Alternative will be analyzed on the basis of "best foot forward". Since Enhanced Treatment and Thermal Reduction are both suitable for PPP and demonstrate Value for Money as a PPP (refer to Section 9), they are analyzed based on the assumption of a DBFOM Project Delivery Model. Conversely, since Land Application is not suitable for PPP, it is analyzed under the Triple Bottom Line as a Traditional (Design-Bid-Build) project.

7.3. Triple Bottom Line Criteria and Weighting

The Project Team have developed a set of Triple Bottom Line evaluation criteria which consider social, environmental, and economic factors. The Project Team developed the Triple Bottom Line criteria based on the Triple Bottom Line criteria used in the Biosolids Master Plan, with some updates in order to reflect an emphasis on reliability, the regulatory environment, risk assessment, and future flexibility. The Project Team believes that, given the potential for a long-term contract of up to 30 years, these considerations have become more salient and justify a departure from the criteria used in the Biosolids Master Plan.

The criteria are summarized below.

Table 4: Summary of Triple Bottom Line Evaluation Criteria

Criteria	Weighting (%)
Environmental Criteria	**40**
Reliability Of Performance & Flexibility	5.7
Demonstrated Technology	5.7
Impacts During Construction	5.7
Non-Renewable Fuel Use (Ghg Emissions)	5.7
Regulatory Risks	5.7
Impacts On Air, Soil And Surface Ground Water	5.7
Compatibility With Future Opportunities	5.7
Social Criteria	**30**
Air Pollutant Emissions/Noise	7.0
Odours	7.0
Traffic/Road Condition/Public Safety	7.0
Community Impacts during Operations & Construction	2.0
Alignment with City Value / Image	7.0
Economic Criteria	**30**
Total Cost to the City	15
Risk Assessment	15
Total	**100**

7.3.1. Scoring of Alternatives

The Project Team evaluated each of the Alternatives against the criteria, using a consensus approach. Each criterion was scored out of 100 based on the scoring guideline below, which was established to

maintain a consistent point of reference when assigning scores. The Project Team assigned scores within the range that corresponded to their overall qualitative evaluation of each criterion.

Table 5: Scoring Guideline Matrix

Qualitative Evaluation	Score Range
Score of 10	Impacts and/or risks of alternative are negligible with no mitigation required, or an alternative would result in an improvement or benefit. The best alternative will get a score of 10 with respect to each criterion, and others will be scored relative to the best.
Score of 7.5	Impacts and/or risks of alternative are minor with little mitigation.
Score of 5	Impacts and/or risks of alternative are moderate with some mitigation.
Score of 1	Impacts and/or risks of alternative are severe with extensive mitigation.

Table 6: Triple Bottom Line Evaluation Criteria Detail

Criteria	Weighting	Description
Environmental Criteria – 40%		
Reliability Of Performance & Flexibility	5.7%	Goal is to achieve consistent, reliable capacity and performance, with minimum downtime, unplanned maintenance, or excessive operational input to address disruption. Considers potential environmental impacts due to poor performance, downtime and contingency management methods.
Demonstrated Technology	5.7%	The development status of the technology is assessed, as to whether it is proven at pilot scale or full scale, and proven in only other jurisdictions, or specifically in Ontario. Minimize risk of poor performance.
Impacts During Construction	5.7%	Minimize impact on plant operations and risk to performance during construction.
Non Renewable Fuel Use (Ghg Emissions)	5.7%	Minimize non-renewable fuels including electricity, gas, and vehicle gasoline.
Regulatory Risks	5.7%	Current and future Regulatory Risks associated with each alternative.
Impacts On Air, Soil And Surface Ground Water	5.7%	Degree to which each alternative impacts air, soil and surface ground water.
Compatibility With Future Opportunities	5.7%	Goal is to provide flexibility to be able to readily adapt to new opportunities for biosolids management or energy recovery without significant capital investment.
Social Criteria – 30%		
Air Pollutant Emissions/Noise	9.0%	Minimize potential impacts to the community or plant operations staff from the release of contaminants in air and noise from the alternative.
Odours	9.0%	Minimize potential health/quality of life effects from odours.
Traffic/Road Condition/Public Safety	9.0%	Minimize potential impacts to the local community during operations from truck traffic.
Community Impacts during Operations & Construction	3.0%	Minimize potential impacts to local community from noise, dust and traffic during construction and minimize period of construction and related impacts.
Economic Criteria – 30%		
Total Cost to the City	15%	• NPV of the cost of each Alternative to the City, over a term of construction + 30 years of operations. • PPP Canada funding taken into account, where applicable, to reduce cost to the City. • Assume the most viable Project delivery models for each Alternative – Land Application via DBB model, Enhanced Treatment and Thermal Reduction via DBFOM. • Lowest cost Alternative gets a score of 100% in this category. Other Alternatives are awarded a score in relation to the lowest cost.

Criteria	Weighting	Description
Risk Assessment	15%	• Risk assessment of each Alternative, considering total risks associated with each Alternative during procurement, design, construction, and operations of each Alternative. • Estimated quantified risks. Lower risk Alternatives receive a higher score. • Assume the most viable Project delivery models for each Alternative – Land Application via DBB model, Enhanced Treatment and Thermal Reduction via DBFOM.

7.4. Application of Criteria

The results of the Triple Bottom Line analysis demonstrate that Enhanced Treatment and Thermal Reduction are the Alternatives which best meet environmental, social, and economic objectives. Land Application scored lower than these two Alternatives, due primarily to social impacts and long-term risks to the City which cannot be transferred to the private sector under commonly accepted commercial terms.

The complete Triple Bottom Line evaluation is presented in Appendix G. A summary of the scoring and the rationale for the scoring is presented below.

Table 7: Summary of Scoring of Alternatives

	Land Application	Enhanced Treatment	Thermal Reduction
Environmental Impact	28.6	30.0	34.3
Social Impact	18.8	22.5	26.3
Economic Impact	16.5	22.5	16.5
Total	**63.8**	**75.0**	**77.0**

7.4.1. Environmental Impact Considerations

Overall, the Land Application Alternative scored the lowest in this category due to heavy use of trucking (diesel fuel and emissions) and due to the fact that the end product which is applied to soil is a “Class B” product with higher pathogen and odour content.

Each of the Alternatives scored well in terms of the development status of the technology, impacts to the Woodward WWTP during construction, and regulatory risks. Each of the Alternatives are in use in multiple locations elsewhere in Canada. The regulatory framework for each Alternative is well-defined and should be relatively stable for the near term. The construction requirements for each Alternative differ in terms of scale but each can be accommodated on the Woodward site with no significant risk to current operations, particularly in view of the fact that similar sized construction projects are currently taking place on the Woodward site with little impact to operations.

Land Application scored lower in respect of reliability of technology, primarily since it is dependent on a volunteer farmer base and since the market of potential service providers appears to be limited based on the City’s recent procurement experience. There is a real potential that over the next 30 years, the City will be unable to find a local land application contractor that can handle the volumes of biosolids produced by the City – i.e. the supply of the service is not reliable. There are also logistical concerns relating to the supply of storage space and the ability to secure a site for new storage tanks if required. Enhanced Treatment scored better since it can be run at all times (not dependant on weather). Thermal Reduction scored the highest since it can also be run at all times and has a shorter timeline process – once the biosolids have been thermally treated on site, the process is complete.

Land Application scored lower than the other Alternatives in respect of non-renewable fuel use and impacts on air, soil, and surface ground water. This lower score results because Land Application requires significantly more trucking as part of its regular operations. In contrast, both the Enhanced Treatment and Thermal Reduction Alternatives typically involve much less trucking. For example, a heat drying technology (form of Enhanced Treatment) requires trucking less than one-third of the weight of material that must transported under the Land Application Approach. The figures are similar for Thermal Reduction. Therefore, heavy use of diesel fuel causes Land Application to score lower under these sub-categories.

Enhanced Treatment and Thermal Reduction technologies require electricity but typically produce electricity for use as part of the process. In the case of Thermal Reduction most technologies produce more electricity than they consume and some technologies may qualify for the FiT program. These considerations entered into the scoring of the non-renewable fuel use sub-category.

Thermal Reduction technology results in air emissions, however they are closely regulated under the Environmental Protection Act and all technologies will have a significant pollution control train.

7.4.2. Social Impact Considerations

Land Application scored lower than the other Alternatives due to concerns about the community impact of odours and truck traffic.

Odours are a common issue during the transportation and application of biosolids under Land Application and can cause a significant community impact. In contrast, most Enhanced Treatment options greatly reduce or eliminate odours (odour-free product is land applied or used as fuel). Thermal Reduction produces an odour-free product (ash). Therefore, there was a significant difference in scores between the Alternatives under this sub-category.

The community impacts of traffic and road safety were also considered in light of the expected truck traffic associated with Land Application (largest truck volume), Enhanced Treatment (likely to be less truck volume) and Thermal Reduction (least truck volume).

The analysis also considered community impacts during construction, due to noise, dust, and traffic (construction related). Although the Woodward site is not located in a residential area, any community impact would be most significant for Thermal Reduction since it would be a larger scale construction project, followed by Enhanced Treatment (medium scale project) and Land Application (small scale project). Therefore, Land Application scored best under this sub-category.

7.4.3. Economic Impact Considerations

The analysis of economic impact examined at two criteria: cost, and risk to the City.

As noted in Section 7.2, each Alternative has been analyzed based on the most suitable Project Delivery Model which provides the best combination of risk mitigation and cost to the City, and optimizes the funding of the Project. The selected combinations of Alternative and Project Delivery Model are set out below.

Table 8: Summary of Economic Impact Analysis for Alternatives

Alternative	Project Delivery Model assumed for Triple Bottom Line Economic Impact analysis	P3 Canada funding assumed?
Land Application	Traditional Design-Bid-Build	No – Design-Bid-Build projects not eligible for PPP Canada funding
Enhanced Treatment	Design-Build-Finance-Operate-Maintain	Yes – DBFOM projects are eligible for PPP Canada funding up to 25% of capital costs
Thermal Reduction	Design-Build-Finance-Operate-Maintain	Yes – DBFOM projects are eligible for PPP Canada funding up to 25% of capital costs

Therefore, the Economic Impact analysis considered the cost to the City and risks to the City of Land Application delivered via Traditional/DBB, Enhanced Treatment delivered via DBFOM with P3 Canada funding for 25% of capital costs, and Thermal Reduction delivered via DBFOM with P3 Canada funding for 25% of capital costs. In addition, since the Enhanced Treatment Alternative is sensitive to market demand and pricing for end products such as fertilizer or fuel pellets, two separate costing scenarios were considered:

- Low cost, “optimistic” scenario where all of the end product is sold at the high end of the price range, resulting in revenue[6]; and
- High cost, “pessimistic” scenario where none of the end product can be sold and it must be trucked to landfill, resulting in zero revenue and additional haulage and disposal costs.

[6] The Business Case costing model assumes heat dried pellets with a price range of anywhere from $0 to $40 per tonne.

Cost

The costing analysis shows that Land Application is generally the lowest-cost Alternative, and therefore received the best score in this category. Enhanced Treatment may be comparable in cost to Land Application but only under the most optimistic view of market conditions for the end product; however it may be up to $60 M more expensive than Land Application on an NPV basis. Therefore, Enhanced Treatment received a score in the middle of the range for this category. Finally, Thermal Reduction is the most costly of all the Alternatives and received a score at the low end of the range for this category. This result is due to capital costs needed to build Enhanced Treatment and Thermal Reduction to further process the biosolids beyond Class B.

These costs include the impact of PPP Canada funding for the DBFOM Project Delivery Models which are considered good candidates for PPP Canada funding – Enhanced Treatment and Thermal Reduction. The cost to for these Alternatives is net of an assumed 25% PPP Canada contribution. The costs are based on the "VFM" scenario in the financial model, and therefore includes VFM assumptions such as a 5% risk premium contingency on the DBFOM model.

Table 9: Costs on an NPV (Discounted) Basis

Alternative	Cost of Traditional (DBB) Project Delivery Model ($ MM, NPV Basis)	Cost of DBFOM Project Delivery Model ($ MM, NPV Basis)
Land Application	97	N/A
Enhanced Treatment (low cost)	102	116
Enhanced Treatment (high cost)	141	155
Thermal Reduction	176	191

Risk

In order to assess the risks to the City under each Alternative, the Project Team developed a risk matrix for the assessment and estimated quantification of risks. Risks were quantified based on the Project Team's estimation of the probability of the risk occurring, the impact on project budget if the risk did occur (based on a worst case and best case scenario), and whether the City or the private sector would bear that risk. The Project Team used industry standard risk matrices, past experience, and professional judgment to develop estimates of risk for each Alternative. The risk assessment is not intended as an actuarial-level quantification of risk, but rather an order of magnitude estimate that functions primarily as a comparative measuring stick between the Alternatives.

A summary description of some of the key risks (68 risks in total) is provided below.

Table 10: Summary of Key Risks

Risk	Description
Public Resistance	The risk that the public will not accept the selected Alternative or technology selected for the Project. This also includes the risk that the public will not accept the role of the private sector in developing, operating, and/or maintaining the Project.
Change in Law or Regulations	The risk of changes in relevant laws and regulations that impact on the capital or operating costs of the facility including: changes in environmental regulations, changes in emissions standards. Relevant legislation includes: Nutrient Management Act.; Canadian Fertilizer Act; Environmental Protection Act and Environmental Assessment Act.
Environmental Assessment Approval - Delays	The risk that environmental assessment (EA) approvals are delayed, or are awarded based on conditions being imposed on the City which impact Project schedule. Delaying the process could result in costs to the City (e.g. construction price inflation during the period of delay). Worst case scenario is the complete failure to get the approval.
Geotechnical Risk	The risk of encountering adverse geotechnical conditions at the Woodward WWTP site, for example encountering rock of a different strength or type than disclose on reports which could delay the works or make them more complex to execute. Depending on the form of contract,

Risk	Description
	this could result in the contractor having a claim for additional time and costs.
Construction Contractor Default	The risk that the construction contractor defaults and must be replaced, resulting in delay and additional costs.
Fuel prices and trucking costs	The risk that the costs associated with trucking increase - this can include rises in fuel prices as well as increased distance to travel depending upon availability of land for storage and/or application.
Performance - Capacity	The risk that the facility cannot process the required quantity of biosolids, i.e. cannot process the contracted or planned-for quantities. For land application, this is the risk of having to send biosolids that cannot be land applied, to landfill.
Volunteer Farmers	The risk that the local supply of volunteer farmers for land application of biosolids is reduced.
Local Market Demand	Risk that local market demand of product is insufficient.
Life-Cycle Maintenance Costs	The risk that life cycle maintenance costs are higher than Projected. This includes the risk that the components or assets identified for life-cycle maintenance would require renewal costs higher or sooner than estimated or fail before renewal.

The results of the risk assessment indicated that Land Application results in the most risk to the City. A main driver of this higher risk to the City is the fact that Land Application is not appropriate for a PPP approach, which could otherwise transfer risk to the private sector over the long term (20 to 30 years). The key area of risk to the City under Land Application is operations and maintenance, which includes risks relating to fuel prices and trucking costs, the ability to find volunteer farmers, and costs of periodic maintenance. Under the City's current contracts these risks can be handled by the private sector for short-term periods (5-year contracts) but over the 30-year period that this risk assessment was based upon, the City would ultimately bear these risks.

Both the Enhanced Treatment and Thermal Reduction Alternatives resulted in significantly less risk to the City. This is primarily because both of these Alternatives are appropriate for a PPP approach (DBFOM Project Delivery Model), under which significant risk can be transferred to the private sector for a long term period (30 years) and secured by private capital invested throughout the project term.

Therefore, the Enhanced Treatment and Thermal Reduction Alternatives received the best scores in the Risk sub-category, and Land Application received the worst score.

The table below summarizes the overall risk profile to the City based on the risk assessment.

Table 11: Summary of Risk Profile for Alternatives

High risk – Greater than $2.5 M estimated quantified risk to the City

Medium risk – Between $1M and $2.5M estimated quantified risk to the City

Low risk – Less than $1 M estimated quantified risk to the City

	Land Application	Enhanced Treatment	Thermal Reduction
Policy and Strategic Risks			
Environmental Assessment Risks			
Property Acquisition, Approvals and Site Condition			
Infrastructure Design & Technology Specification			
Procurement Risk			
Construction Risk			
Operations Risk			
Maintenance Risk			
Ownership and Concession Management			
Project Agreement			
Financial Risks			

7.5. Summary and Conclusions

The Enhanced Treatment and Thermal Reduction Alternatives were rated highest by the Triple Bottom Line Analysis. There is no significant difference in the ranking of these Alternatives.

- Enhanced Treatment produces a Class A end product, has low emissions (reduced truck traffic compared to Land Application), and can result in low risk to the City if procured via a DBFOM method. Depending on the market for the end product, Enhanced Treatment can be relatively cost-competitive with Land Application or can be up to $60M more expensive on an NPV basis over a 30 year period.
- Thermal Reduction produces a non-hazardous end product (ash) and has the lowest truck traffic of all the Alternatives. Thermal Reduction involves controlled emissions. It is the highest cost Alternative, but can result in low risk to the City if procured via a DBFOM method.

The Land Application Alternative was rated the lowest among the Alternatives, by a significant margin.

- Land Application involves the most truck traffic of the Alternatives (diesel emissions). There are logistical concerns relating to the limited market of land application service providers and limited available sites for required storage. This Alternative is not suited to a DBFOM method and is expected to result in the most risk to the City. Land Application may be the lowest cost Alternative, but under some scenarios Enhanced Treatment could be relatively close in cost to Land Application.

Accordingly, the Business Case will recommend that the City develop output specifications that can be met by Enhanced Treatment and Thermal Reduction Alternatives. This will allow the market to determine the best and most economical technical approach within these Alternatives.

Section 8: Project Delivery Models

8.1. Overview

The purpose of this section is to carry out a more comprehensive analysis of Project Delivery Models and confirm the high level PPP screen which identified DBFOM as the preferred model for a project based on Enhanced Treatment or Thermal Reduction.

This section will illustrate the range of potential Project Delivery Models and confirm which Project Delivery Models should be short-listed for a quantitative Value for Money analysis. Due to the multiple Alternatives being considered as part of the Business Case, it will also be important to clearly define how each Project Delivery Model maps onto an Alternative. As an example, this section will illustrate a proposed Design-Bid-Build ("DBB" or "Traditional") Project Delivery Model for Land Application, as well as a proposed Design-Build-Finance-Operate-Maintain ("DBFOM") Project Delivery Model for Land Application.

8.2. Project Delivery Models

This section describes, in general terms, the four Project Delivery Models considered by the City for the Project. Each Project Delivery Model differs in terms of the degree of risk and responsibility delegated to the private sector, duration of private sector involvement, and method of securing contractor performance. The four Project Delivery Models are:

- Design-Bid-Build;
- Design-Build-Finance;
- Design-Build-Operate-Maintain; and
- Design-Build-Finance-Operate-Maintain.

The Design-Bid-Build model can be considered a Traditional form of Project delivery. The Design-Build-Finance, Design-Build-Operate-Maintain, and Design-Build-Finance-Operate-Maintain models can be considered forms of PPP.

The discussion of Project Delivery Models frequently refers to the concept of "securing performance" or "performance security". This means ways in which the City can enforce consequences on a contractor for poor performance. Methods of performance security include:

- Performance bonds. Bonding is considered less robust since cashing a bond requires considerable time and effort and the process may be contested by the surety.
- Letters of credit. Letters of Credit are more liquid than performance bonds, but are limited in amount due to impacts to the issuers balance sheet.
- Performance based payment. This is considered a more robust form of performance security since it is highly liquid (ability to hold back payment in case of poor performance) and closely tied to contractual obligations. It is most robust when Project Co has private capital at risk and must perform in order to repay debt and equity holders.

Design-Bid-Build

Under a Design-Build-Build the City leads the design and construction of the infrastructure. The City takes responsibility for the procurement of design work through a consulting engineering firm, and tenders the construction works to one or more private sector general construction firms. The City assumes

responsibility for the design and would play a strong construction management and coordination role. Payment for construction is made through progress or milestone payments to construction contractors during the construction period. Due to this method of payment, construction contractors do not have to obtain significant amounts of private financing in order to carry out construction. Performance is secured through less liquid methods including performance bonding and limited construction warranties. At completion, the City leads the testing and commissioning process.

Following completion, the infrastructure is turned over to the City which then assumes full responsibility for operations and maintenance ("O&M"). Although budgeting and payment for O&M may be carried out in any manner chosen by the City, typically annual O&M budgets are funded based on the annual budgeting process. This results in a high risk of deferred maintenance which in turn causes accelerated depreciation (i.e. useful life does not meet expected design life).

Under a DBB, the City typically owns the infrastructure at all times.

Design-Build-Finance

Under a Design-Build-Finance ("DBF"), design and all EPC roles are integrated with a single private sector design-build contractor (Project Co.). Therefore, design and construction risks are shifted to Project Co.

The DBF model typically does not provide any payment to Project Co until substantial completion is achieved. This is considered a form of performance based payment and thus provides robust performance security – Project Co is not paid until it executes on its obligation to complete the infrastructure in compliance with specifications (i.e. payment on performance). Project Co must obtain financing from private sector lenders to bridge the construction period. This structure strongly incents Project Co to complete construction on time and in conformance with specifications in order to receive payment and repay its lenders.

As with the DBB model, the infrastructure is turned over to the City following completion. The City would assume full responsibility for O&M, usually funding O&M costs through the annual budgeting process. Similar considerations as with DBB regarding the potential for deferred maintenance apply. Project Co may provide limited warranties following final completion, but generally does not have long-term responsibility for the quality of design and construction.

Under a DBF, the City would own the infrastructure at all times.

Design-Build-Operate-Maintain

Similar to the DBF model, under a DBOM a single private sector partner (Project Co) has final design and EPC responsibilities, is not paid for construction until substantial completion, and generally assumes significant design and construction risks. As with DBF, Project Co has strong incentives to complete construction on time and in accordance with specifications in order to receive payment and repay lenders. Performance is secured through the performance based payment approach.

A variant of DBOM involves progress payments to Project Co. during construction, eliminating any requirement for construction financing but also reducing incentives for on-time completion and requiring less robust forms of performance security such as bonding.

Under all forms of DBOM, Project Co is responsible for operations and maintenance of the infrastructure, usually for a long term period of 20-30 years in exchange for an annual O&M fee. Therefore, Project Co has a greater incentive to ensure the long-term condition of the infrastructure. However, Project Co has no private capital at risk during the operations period (since all construction costs have been re-paid) and therefore the City would have to rely on less liquid methods of performance security such as letters of credit and performance bonds.

Under a DBOM, the City would own the infrastructure at all times.

Design-Build-Finance-Operate-Maintain

As with DBF and DBOM, a single private sector partner (Project Co) has final design and EPC responsibilities, is not paid for construction until substantial completion (resulting in a requirement to source private sector financing), and generally assumes significant design and construction risks. Project Co has strong incentives to complete construction on time and in accordance with specifications in order to receive payment and repay lenders.

Under DBFOM, payment to Project Co for construction of the infrastructure is amortized over the length of a 20 to 30 year operations and maintenance term. Project Co has debt and equity capital at risk over the length of the contract term. Payment to Project Co is contingent upon the condition and performance of the infrastructure and associated operations and maintenance services. Therefore, Project Co has very strong incentives to ensure the long-term quality of the infrastructure and O&M services. The combination of gradual repayment of capital and performance based payment is the most robust form of performance security. It is very difficult for Project Co to walk away from its contractual obligations since it must continue to perform in order to repay its debt and equity investors. This output-based approach ensures that maintenance cannot be deferred.

Under DBFOM, the public sector typically owns the infrastructure at all times.

The table below summarizes the roles and responsibilities typically delegated to the private sector under each of the Project Delivery Models.

Table 12: Private Sector Roles & Responsibilities under Project Delivery Models

	DBB	DBF	DBOM*	DBFOM
Preliminary design		X	X	X
Detail design		X	X	X
Design and construction co-ordination		X	X	X
Construction	X	X	X	X
Maintenance			X	X
Lifecycle (major capital refurbishment)				X
Operations			X	X
Short-term financing during construction		X	X	X
Long-term financing				X

*Variants of DBOM may exclude short-term financing

8.3. Screening Factors

The following factors have been considered in order to screen the long-list of Project Delivery Models and develop a short-list.

Labour

The City has obligations to labour unions under collective agreements. Any Project Delivery Model selected for this project must allow the City to meet its collective bargaining obligations. The Project Team has considered the labour relations impacts of the various Project Delivery Models, in consultation with legal advisors. A summary is provided below, with additional details in Appendix H.

- **Construction:** The City is bound to the Carpenters Union province-wide collective agreement. Therefore, all carpenters work that is procured by the City must be under the terms of the Carpenters Union collective agreement. This obligation exists whether the Project is procured as a Traditional Project or as a PPP, and is not expected to be an obstacle to any Project Delivery Model. Most general contractors who are active in both Traditional and PPP Projects are experienced in labour relations.

- **Operations and Maintenance:** The City's existing labour obligations relevant to Project operations are not expected to be an obstacle to any Project Delivery Model. The Project Team believes that most private sector contractors active in PPP projects have experience in labour relations as required.

Technology Risks

There are a wide variety of Technologies available for biosolids management. The City has experience in operating digesters and executing a Land Application strategy (current approach at Woodward Avenue site), and also has some experience in operating a multiple hearth incinerator (pre-1996). However, the City has no experience in operating a facility based on Enhanced Treatment or modern Thermal Reduction approaches.

As a program policy matter the City has decided to transfer technology selection and operations risks to the private sector. An experienced private sector counterparty will be better positioned to manage these risks than the City. Therefore, the Project Delivery Models will be screened based on their ability to effectively transfer technology risks.

Commercial Risks

Each of the Alternatives carries with it varying degrees of commercial risks. Some of the key commercial risks for each Alternative are summarized in the table below.

Table 13: Summary of Key Commercial risks

Alternative	Commercial Risks
Land Application	• Risk that volunteer farmer base will decrease in size or that available volunteer farmer base will be further away • Costs of transporting biosolids (trucking, diesel) • Storage • Regulatory risks – heavily regulated endeavour
Enhanced Treatment	• Market demand for end product (fertilizer, fuel) • Costs of transporting end product • Storage (to a much lesser extent than Land Application)
Thermal Reduction	• Risks associated with obtaining electricity off-taker agreement • Risks associated with performing electricity off-taker agreement

As a program policy matter, the City wants to bear as little commercial risk as possible. Managing commercial risks associated with biosolids end products is not a core competency of the City. Therefore, the Project Delivery Models will be screened based on their ability to effectively transfer technology risks.

8.4. Application of Screening Factors

Applying the screening factors, the Design-Build-Finance ("DBF") and Design-Build-Operate-Maintain ("DBOM") models are screened out, based on the factors outlined below. The Design-Build-Finance-Operate-Maintain ("DBFOM") meets all of the screening factors, and therefore has been short-listed. The Design-Bid-Build ("DBB") model has also been short-listed since it represents the City's traditional approach and provides a basis for comparison in order to ensure that a DBFOM provides the City with value.

Table 14: Results from Application of Screening Factors on Project Delivery Models

Screening Factor	DBB	DBF	DBOM	DBFOM
Compatible with City's labour obligations	Yes	Yes	Yes	Yes
Ability to effectively transfer technology risks	No	No	No	Yes
Ability to effectively transfer commercial risks	No	No	No	Yes

DBF Project Delivery Model is screened out

This model does not meet the City's Objectives:

- The City cannot effectively transfer technology risks under a DBF model, since the private sector partner will be provided considerable freedom to design and construct the technology but will not bear the long-term performance risks associated with that technology. Alternatively, the City could prescribe a technology, but this would have the same result of the City assuming the risks associated with the long-term performance of the technology.
- The City would also have to bear commercial risks under a DBF, since a DBF contract does not include an operations component. The City could mitigate this risk somewhat by entering into short-term marketing agreements with other private sector partners, but would still have to bear risks associated with the quality and quantity of marketable by-products as well as longer term market conditions.

DBOM Project Delivery Model is screened out

This model does not meet the City's Objectives as it is not supported by PPP Canada:

- The DBOM model also does not allow the City to effectively transfer technology or commercial risks. Although this model includes a long-term operations and maintenance component, it does not require Project Co to invest long-term capital in the Project and instead relies on less robust and limited forms of performance security such as performance bonds and letters of credit. This exposes the City to the risk that Project Co will walk away from the contract or attempt to re-negotiate it in the event that serious commercial or technology issues materialize. Put another way, this model transfers risk but does not secure it.
- The DBOM approach may be an effective one for a number of other Projects, but due to the significant technology and commercial risks associated with this Project, a more robust form of performance security is required.

DBFOM Project Delivery Model is screened in

This model meets the City's Objectives:

- The DBFOM model contractually transfers technology and commercial risks to the private sector and secures this risk transfer via long-term private capital.

DBB Project Delivery Model is retained for comparison

The DBB model does not have a long-term operations and maintenance component and therefore does not transfer technology or commercial risks. However, this model has been short-listed since it represents the City's traditional approach and provides a baseline to ensure that a DBFOM provides the City with value and it will also serve as the Public Sector Comparator for the purposes of Value for Money analysis.

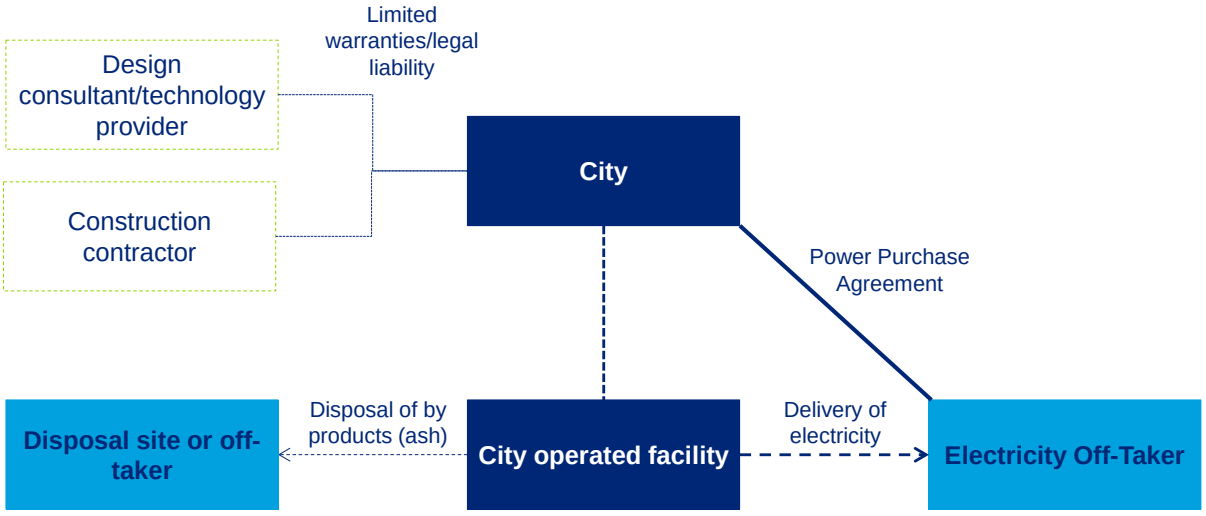
8.5. Application to Alternatives

The short-listed Project Delivery Models have been described in generic terms. This section will illustrate how each of these models maps on to the various Alternatives, providing an outline "deal structure" for each of the following:

- Thermal Reduction Alternative executed via DBB;
- Thermal Reduction Alternative executed via DBFOM;
- Enhanced Treatment Alternative executed via DBB;
- Enhanced Treatment Alternative executed via DBFOM;
- The City's current Land Application program. This is considered to be a Traditional or "Status Quo" approach to Land Application; and
- Land Application Alternative executed via DBFOM.

Thermal Reduction Alternative executed via DBB

Figure 3: Project Structure under Thermal Reduction

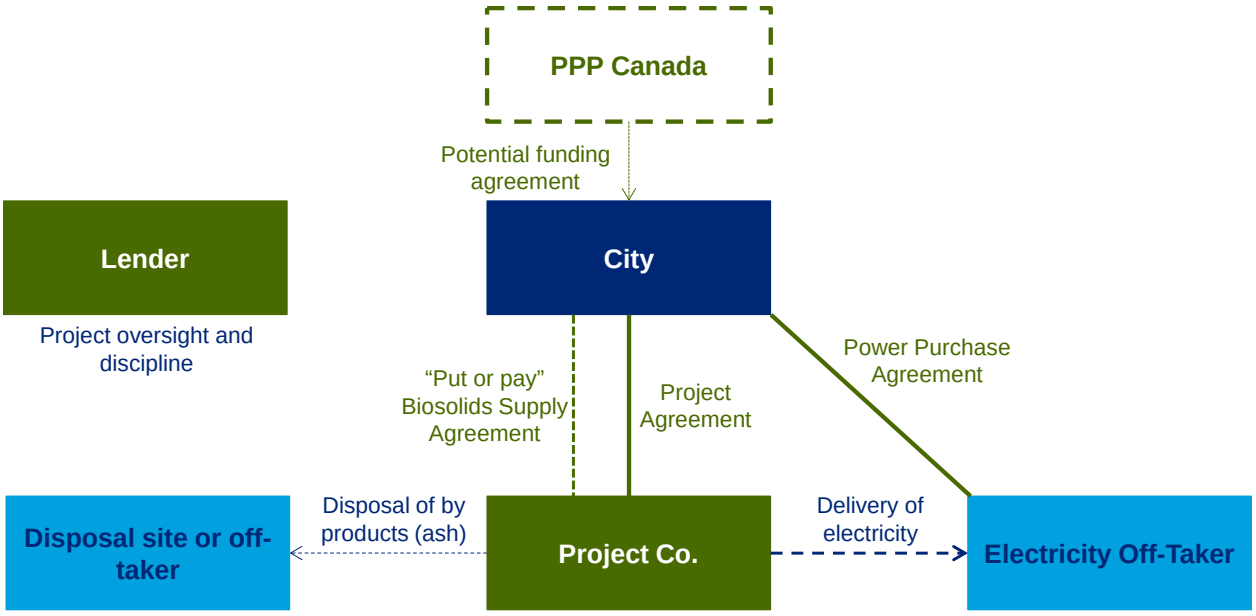


The DBB model requires the City to procure a design and technology for Thermal Reduction of biosolids from a private sector provider, and to separately procure construction contractor(s) to build the required facility. There may be private sector firms who can provide the design, technology and construction as part of an integrated package. The City is then responsible for operating and maintaining the facility throughout the life of the asset. This includes disposal of by-products (likely ash) which may provide a source of revenue. If the thermal reduction technology selected by the City produces electricity, the City will direct the power to be used on-site by the City's other wastewater treatment infrastructure. Alternatively, the City may enter into agreements to sell the power to the Province (FiT contract, Power Purchase Agreement). The City bears the risks associated with operations, disposal, and electricity sales.

The City would develop the infrastructure at the Woodward Avenue site. The facility would be owned by the City at all times.

Thermal Reduction Alternative executed via DBFOM

Figure 4: Project Structure under Thermal Reduction Executed via DBFOM



Under the DBFOM model, the City would enter into a Project Agreement with a single Project Co for the design, construction, financing, operations, and maintenance of facility for Thermal Reduction of biosolids. The choice of Technology would be left to Project Co.[7] The City will pay Project Co. a per-tonne tipping fee based on quantities of biosolids. Project Co would require the City to guarantee a minimum annual quantity of biosolids production made available to Project Co, via a put-or-pay biosolids Supply Agreement.

If the Thermal Reduction technology selected produces electricity, the City will likely direct the power to be used on-site by the City's other wastewater treatment infrastructure and credit Project Co. for the savings achieved by the City. Alternatively, the City may enter into agreements to sell the power to the Province (FiT contract, Power Purchase Agreement). The City would be the contractual counterparty for any such arrangement. Project Co. will be required, under the terms of the Project Agreement, to meet the delivery targets and other obligations associated with the power purchase agreement – these risks will be "dropped down" to Project Co.

The DBFOM structure will require Project Co to obtain long term financing from private sector lenders. Typically, lenders play an important oversight function during the execution of a Project and add discipline to the process.

The City will provide the Woodward Avenue site to all Proponents. In this case, the facility will be owned by the City at all times and in the event of default by Project Co, the City will continue to own and operate the facility under different contractual arrangements.

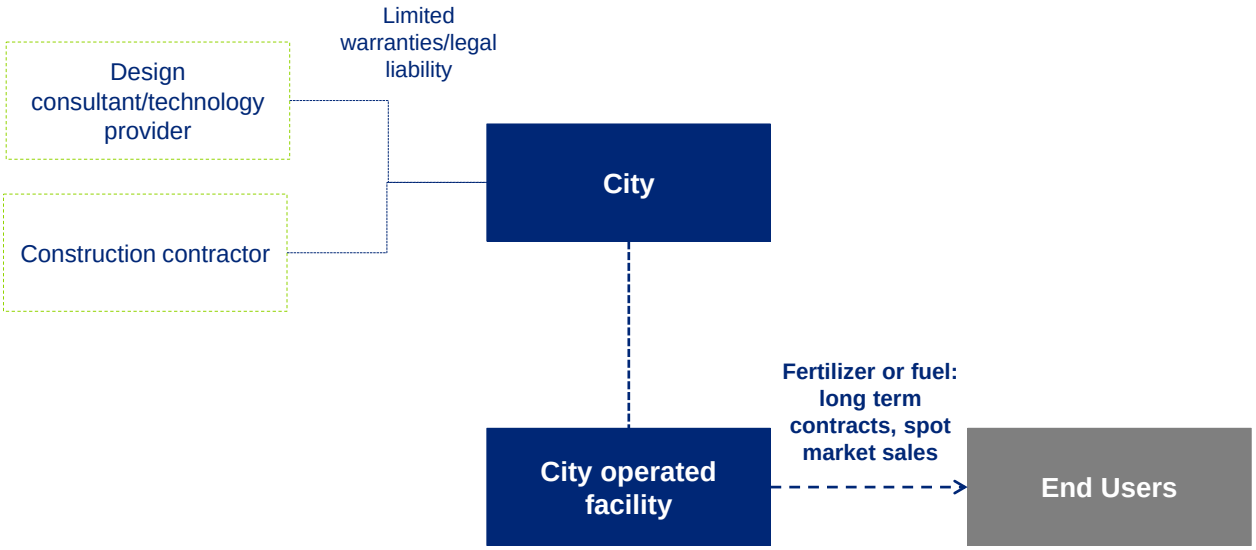
The City is open to considering a Proponent which plans to develop or utilize infrastructure off of the Woodward Avenue site, owned by the Proponent. The City will develop commercial and legal terms which provide the City with appropriate rights and protections and put the City in a similar position as if it owned the infrastructure. These would include terms and conditions around compensation on termination, rights of access, emergencies, and transition at end of term. Please refer to Section 12.3 for further discussion.

It is anticipated that this Project structure would be a good candidate for funding from P3 Canada of up to 25% of the capital cost.

[7] Subject to a pre-qualification process during Project procurement, where bidders would have to demonstrate that their technology is proven and has a strong track record.

Enhanced Treatment Alternative executed via DBB

Figure 5: Project Structure under Enhanced Treatment Executed via DBB



The DBB model requires the City to procure a technology for Enhanced Treatment of biosolids from a private sector provider, and to separately procure construction contractor(s) to design and build the required infrastructure. There may be private sector firms who can provide the design, technology and construction as part of an integrated package. The City is then responsible for operating and maintaining the infrastructure throughout its lifecycle.

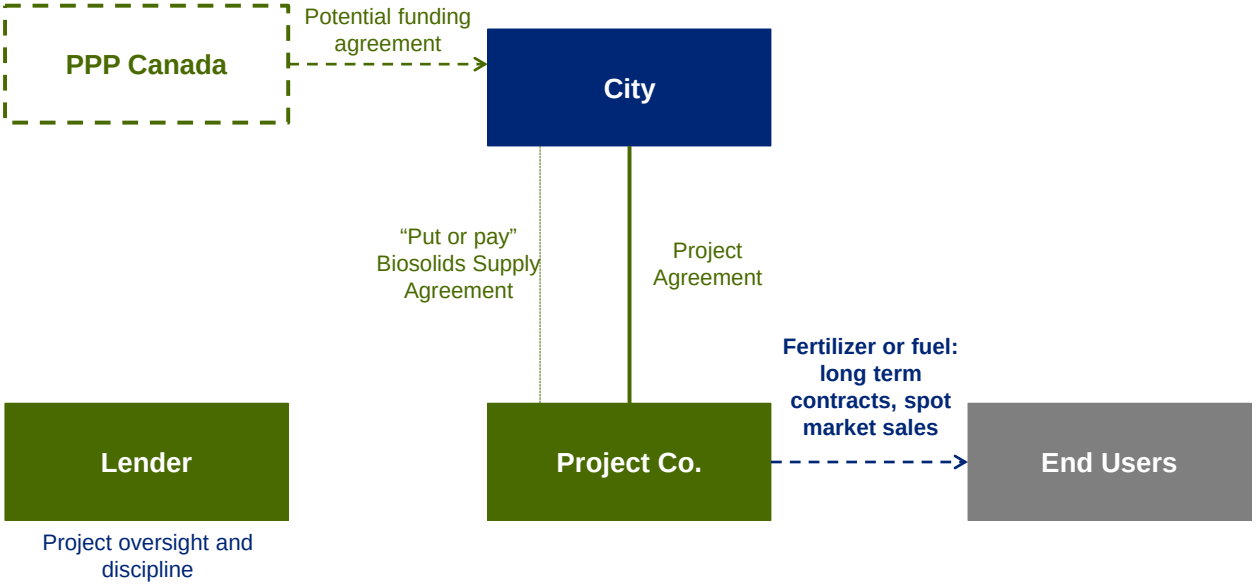
Under a DBB, the City's operations and maintenance responsibilities would typically include marketing and sale of by-products generated from the Enhanced Treatment technology selected by the City[8]. Depending upon the nature of the selected technology this could include fertilizer, fuel pellets, or other "Class A" materials. This provides a source of revenue but also exposes the City to commercial risks. The City may enter into marketing agreements or customer agreements to partially mitigate some short-term risks but nevertheless would bear long-term commercial risks.

The City would develop the facility at the Woodward Avenue site. In this case, the facility will be owned by the City at all times.

[8] Some providers of Enhanced Treatment technology may offer or require their involvement in marketing by-products.

Enhanced Treatment Alternative executed via DBFOM

Figure 6: Project Structure under Enhanced Treatment Executed via DBFOM



Under the DBFOM model, the City would enter into a Project Agreement with a single Project Co for the design, construction, financing, operations, and maintenance of a facility for Enhanced Treatment of biosolids. The choice of technology would be left to Project Co.[9] The City will pay Project Co. a per-tonne tipping fee based on quantities of biosolids. Project Co would require the City to guarantee a minimum annual quantity of biosolids production made available to Project Co, via a put-or-pay biosolids Supply Agreement.

Project Co will be required to bear all commercial risks associated with the sale and marketing of by-products generated from the Enhanced Treatment process. It is anticipated that Proponents will use forecast revenues to reduce their tipping fee and improve their chances of being awarded the contract through the competitive procurement process.

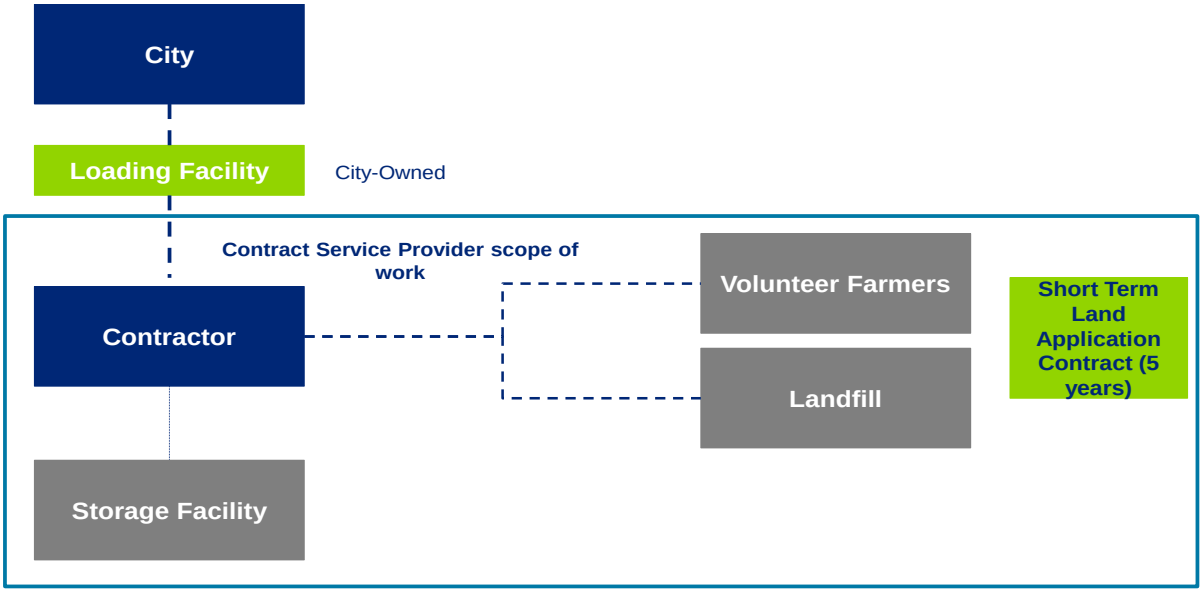
Similar considerations relating to site apply, as set out in the Thermal Reduction DBFOM section.

It is anticipated that this Project structure would be a good candidate for funding from P3 Canada of up to 25% of the capital cost.

[9] Subject to a pre-qualification process, as previously described.

Land Application Alternative executed via Traditional/Status Quo method

Figure 7: Project Structure under Land Application Executed via Traditional Method



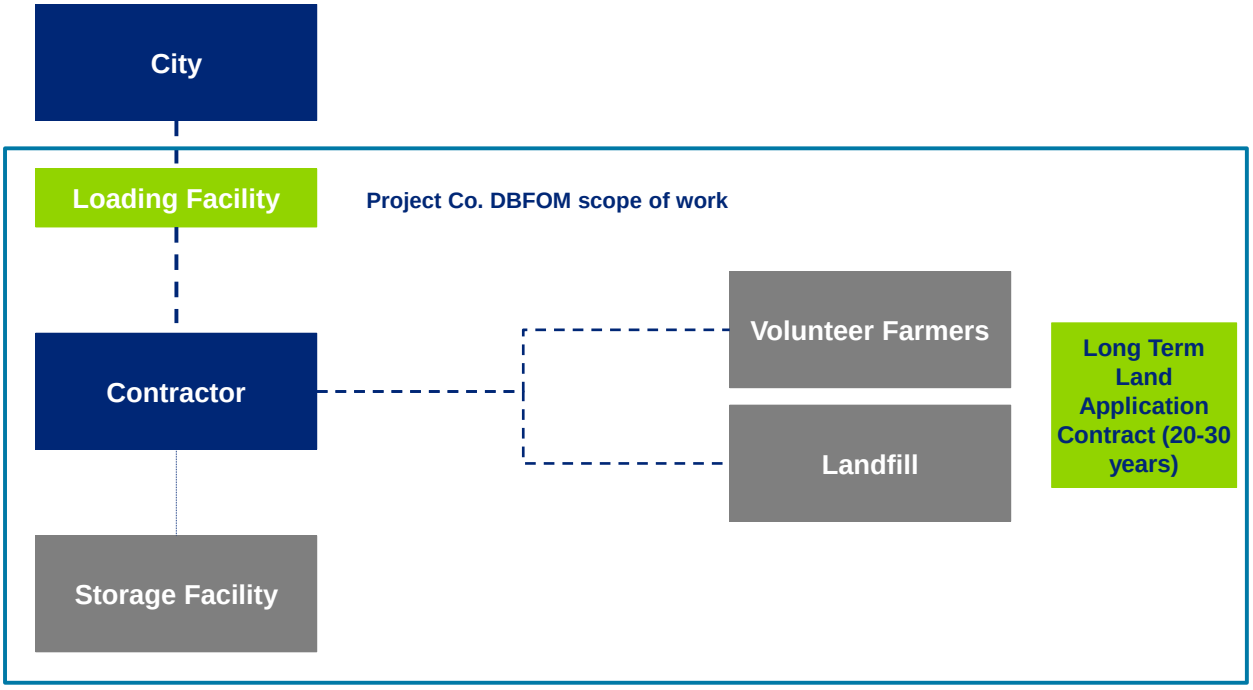
This structure represents the status quo for the City. The City currently contracts with a private sector firm for storage, handling, and land application of biosolids. Contract duration is typically in the range of 5 years. The City pays a tipping fee to the land application contractor based on biosolids quantities. The contractor land applies the biosolids with volunteer farmers. The City maintains a temporary loading facility at the Woodward Avenue site which is used to transfer biosolids to the contractor. Biosolids are stored in an off-site facility operated by the contractor during off-season. The City is considered to be "at risk" in the medium to long term since the size and location of the available volunteer farmer base will impact on the tipping fee. Biosolids may be landfilled by the contractor when storage is at capacity.

Storage is off-site, at a leased facility.

The Business Case assumes that, if the City were to make a long-term commitment to Land Application, the City would construct a new, permanent loading facility at the Woodward Avenue site.

Land Application Alternative executed via DBFOM

Figure 8: Project Structure under Land Application Executed via DBFOM



Under a DBFOM approach, Project Co will be required to accept biosolids under a long-term contractual arrangement. Project Co. will also be required to construct a new, permanent loading facility at the Woodward Avenue site. Project Co may also have to design, construct, and finance an off-site storage facility, depending on what existing infrastructure it may have in place.

Under the DBFOM approach, the City will contract with Project Co for the storage, handling, and land application of biosolids, under a long-term Project Agreement (20 to 30 years). The City will pay a tipping fee to Project Co based on biosolids quantities. Due to the long-term nature of the Project Agreement, the City is able to better transfer the risks associated with the size and location of the available volunteer farmer base will impact on the tipping fee. However, the limited size of the long-term private financing at risk under this approach will likely require the City to rely on less robust forms of performance security, such as letters of credit.

Storage facilities would likely have to be located off of the Woodward Avenue site and secured by Project Co.

It is anticipated that this project structure would not be a good candidate for funding from P3 Canada, due to its small capital value.[10]

8.6. Conclusion

This section has developed a short list of Project Delivery Models and considered how apply to each of the Alternatives:

[10] According to the P3 Canada website: "*To be eligible to receive funding from the P3 Canada Fund, a Project will need to have meaningful private sector involvement in at least two of the following four structural elements: design, build, operate or finance, one of which must include operate or finance. For greater clarity, the "operate" refers to the operation and/or maintenance of the infrastructure asset.*" Depending on the capital build requirements of the selected Project Co under land application, there may not be material build or finance involvement from the private sector.

- Thermal Reduction Alternative executed via DBB;
- Thermal Reduction Alternative executed via DBFOM;
- Enhanced Treatment Alternative executed via DBB;
- Enhanced Treatment Alternative executed via DBFOM;
- “Status Quo” Land Application; and
- Land Application Alternative executed via DBFOM.

These models will be taken through quantitative Value for Money analysis in Section 9, below, to confirm whether the DBFOM Project Delivery Model provides the City with added value in comparison with the traditional DBB model. This analysis will be considered along with the Triple Bottom Line analysis carried out in Section 7. These two evaluations will be combined, in Section 10 to provide an integrated procurement recommendation.

Section 9: Value for Money Analysis

9.1. Overview

This section will present the results of the Value for Money analysis carried out by the Project Team on the Short-Listed Project Delivery Models identified in the previous section:

- Thermal Reduction Alternative executed via DBB;
- Thermal Reduction Alternative executed via DBFOM;
- Enhanced Treatment Alternative executed via DBB;
- Enhanced Treatment Alternative executed via DBFOM; and
- "Status Quo" Land Application.
- Land Application Alternative executed via DBFOM

9.2. Context and purpose of VFM analysis

When reviewing the Value for Money analysis, the following must be noted:

- VFM analysis is applied as a decision assist tool to quantify the estimated costs and benefits of the Project Delivery Models on a risk adjusted basis.
- The VFM results should be considered together with the City's Triple Bottom Line analysis and broader objectives to ensure a fulsome analysis of the Alternatives.
- VFM results will vary over time and are highly sensitive to financing assumptions. Results within this Business Case are preliminary in nature and based on the assumptions stated herein. If the City proceeds with a PPP procurement process, the VFM should be updated as assumptions are confirmed.
- The risk assessment in a VFM is a comparative assessment – any quantification of risk should only be viewed within this context and not interpreted on an absolute basis.

The VFM is intended to demonstrate the optimal Project Delivery Model for each of the Alternatives. The results of the Value for Money analysis will be combined with the Triple Bottom Line analysis in the Integrated Recommendation section, in order to present a recommended procurement approach.

9.3. Summary of Results

The results of the Value for Money analysis demonstrate that Projects based on either Thermal Reduction or Enhanced Treatment technology would provide robust value through a DBFOM Project delivery model. The results also demonstrate that a project based on a Land Application approach would not provide value using a DBFOM model. Therefore, the analysis confirms that Enhanced Treatment and Thermal Reduction are suited to a DBFOM model while Land Application is not well suited to a DBFOM model.

The results are summarized below. The remainder of this Section 9 will provide additional detail on the methodology, process, and results of the VFM analysis.

	Land Application	Enhanced Treatment	Thermal Reduction
Base Case Estimated Value for Money Savings (%)	-6%	10%	9%
Base Case Estimated Value for Money Savings ($)	-7.61 M	19 M	23 M

9.4. Description of Value for Money Methodology

The Project Team has applied standards used by Infrastructure Ontario in their Value for Money methodology, with some minor variances as noted[11]:

- Construction & design contingency ("CDC" or "risk premium") is typically 10% for an IO DBFM shadow bid. The CDC is intended to represent a contingency carried by Project Co to reflect the fact that under a PPP, pricing is based on an outline level design, in contrast to a Traditional Project where pricing is based on more complete design work. The Project Team has used a CDC of 5%, to reflect the fact that the key design elements of the Alternatives are proprietary technologies which will likely have been designed and constructed by the contractor many times. Therefore, there is less uncertainty and less of a need to carry such a contingency.

- There is no adjustment for competitive neutrality. The adjustment for competitive neutrality includes a provision accounting for the benefit of certain taxes paid by the private sector under a PPP that would not be paid to government under a Traditional model. Unlike a provincial or federal government, a municipal government does not obtain tax revenues directly from the private sector, so no such benefit has been taken into account. Leaving out any adjustment for competitive neutrality helps to enhance the transparency and credibility of the VFM calculation.

- The City's base case cost of borrowing is based on the rate that the City could obtain if it borrowed funds to finance the Project through Infrastructure Ontario's municipal lending program. The discount rate used for the VFM assessment is the same as the City's estimated cost of borrowing.

9.5. Input Assumptions

The base case cost inputs and financing assumptions are set out in Appendix I. These inputs have been included in the financial model which was used to develop the Value for Money analysis. The financial model includes a DBB scenario (used as the Public Sector Comparator) as well as a DBFOM scenario.

The VFM analysis is "project-level" and does not consider the impact of a PPP Canada contribution under the DBFOM scenario. The financial model assumes that the City provides Project Co. with a Substantial Completion Payment worth 25% of the Project capital cost, and that the City finances this amount via a bond issued by the City at substantial completion. This is for modeling and analysis purposes only and does not change the City's intention to secure PPP Canada funding for up to 25% of the project capital cost.

The costing and technical inputs have been provided by CH2M Hill, the City's technical advisors for the Project. The costing and technical inputs have been prepared based on a Basis for Conceptual Design prepared by CH2M Hill for each Alternative, as well as certain forecasts regarding future biosolids quantities, haulage costs, and landfill costs.

9.6. Risk Analysis and Quantification

The risk analysis has previously been discussed in Section 7.4, as part of the Triple Bottom Line analysis. The same risk analysis applies for both the Triple Bottom Line and the VFM analysis.

Risk analysis has been carried out for each Alternative, under both DBB and DBFOM Project Delivery Models. In other words, there are three risk matrices, one for each Alternative. Within each risk matrix, risks are assessed under a DBB model and under a DBFOM model.

9.6.1. Outline of Process and Methodology

The following steps were utilized in order to arrive at the risk analysis:

[11] The VFM methodology applied by Deloitte within this Business Case uses a risk assessment tool that is proprietary to Deloitte, but follows industry best practices as defined by IO and other procurement agencies in Canada and worldwide.

- Development of a draft risk matrix, for each Alternative. The draft risk matrix was prepared based on propriety Deloitte methodology augmented by experiences in the renewable energy sector that have some commonality with this Project, and creation of new risk definitions based on the particular requirements of this Project. The risk allocation was based on past experience, typical risk allocation in DBFOM contracts, and risk allocation seen in water/wastewater Projects.

- The Project Team participated in an initial Risk Workshop (Risk Workshop #1). The draft risk matrix was presented to the Project Team for feedback and discussion. The draft risk matrix was adjusted accordingly.

- Draft probabilities and impacts were prepared for each of the risks in the risk matrix, and circulated to the Project Team. The draft probabilities and impacts were based on values from precedent risk matrices, judgment and experience.

- The Project Team participated in a second Risk Workshop (Risk Workshop #2). The revised risk matrix, along with draft probabilities and impacts, was presented to the Project Team for feedback and discussion. The risk workshop was facilitated in order to focus the discussion on a selection of key risks (23 risks) that were judged to be higher priority due to their unique nature (Project-specific), or their magnitude and overall impact on the analysis. Participants in the workshop contributed input based on their technical expertise, professional experience and judgment. The draft risk matrix was adjusted accordingly.

- A revised risk matrix was circulated to the Project Team for any further comments.

9.6.2. Risk Matrix

The risk analysis carried out by the Project Team examined 68 discrete risks, in the following categories.

Table 15: Risk Categories

Risk Categories	
1. Policy and Strategic Risks	7. Operations Risk
2. Environmental Assessment Risks	8. Maintenance Risk
3. Property Acquisition, Approvals and Site Condition	9. Ownership and Concession Management
4. Infrastructure Design & Technology Specification	10. Project Agreement
5. Procurement Risk	11. Financial Risks
6. Construction Risk	

Certain key risks are set out below for summary purposes. These are risks that had an overall risk transfer impact of greater than $2 million, for any one of the Alternatives. This table provides a snapshot of some of the most significant risks.

Table 16: Summary of Significant Risks

Risk	Description
Construction Contractor Default	The risk that the construction contractor defaults and must be replaced, resulting in delay and additional costs.
Fuel prices and trucking costs	The risk that the costs associated with trucking increase - this can include rises in fuel prices as well as increased distance to travel depending upon availability of land for storage and/or application. [Note - risk varies depending on Alternative].
Volunteer Farmers	The risk that the local supply of volunteer farmers for land application of biosolids is reduced.
Environmental and emissions standards	Failure to meet environmental standards set out in regulations, the contract, or certificate of approval conditions.
Residual Value	The risk of the residual value of the asset at the end of the term, i.e. the condition of the asset at the end of the term and the magnitude of any investment required to restore the asset such

Risk	Description
	that it can deliver the service as required.
Unclear Tender or RFP Documentation	The risk that tender documentation (including construction contract or Project Agreement) poorly defines Project scope and/or risk allocation, or is poorly co-ordinated. This results in uncertainty for bidders and may compel them to increase contingencies in their pricing to reflect that fact that the services cannot be priced accurately. Note - this risk refers to procurement at the EPC level, so under DBFOM it is transferred to Project Co.
Scope Changes by City – During Construction	The risks associated with the City changing the scope of work during the construction period through issuing change orders. Change orders are not priced under competitive tension and therefore these risks include risks of non-market pricing. Also includes the risk that method for pricing change orders is not fully prescribed in the contract resulting in change order costs exceeding estimated amounts. An unclear, incomplete or internally inconsistent specification will increase the probability of scope changes.
Acceleration to Maintain Schedule - Construction Impact	The risk associated with the construction contractor having to accelerate the schedule in order to achieve the completion date. Acceleration can result in increased costs to the contractor (such as increased equipment utilization, higher prices for urgent materials, increased labour costs due to overtime, site coordination and safety issues); additionally acceleration may also have a quality assurance impact due to sub -trades working longer hours.
Labour Costs	Risk that labour costs for facility operator staff will be higher than anticipated (wages rise faster than anticipated).
Input Costs - Utilities	Risk that cost of inputs (utilities) required to operate the facility increase in price faster than forecast. Depending on the technology, could be natural gas, water, electricity.
Input Costs - Other Inputs	Risk that cost of other inputs (consumables) required to operate the facility increase in price faster than forecasted, e.g. CPI. Depending on the technology, could be chemicals, sorbents, biomass, etc.
Life-Cycle Maintenance Costs	The risk that life cycle maintenance costs are higher than Projected. This includes the risk that the components or assets identified for life-cycle maintenance would require renewal costs higher or sooner than estimated or fail before renewal.
Local Market Demand	Risk that local market demand for product is insufficient.
Performance – Capacity	The risk that the facility cannot process the required quantity of biosolids, i.e. cannot process the contracted or planned-for quantities. For land application, this is the risk of having to send biosolids that cannot be land applied, to landfill.

9.6.3. Risk Profile

The risk analysis considered, under each Project Delivery Model, whether each risk was allocated to the City, Project Co, or shared. The tables below summarize the overall profile of risks allocated to the public and private sectors under the DBFOM Project Delivery Model. This table provides a summary view by grouping or categorizing individual risks.

Table 17: Risks Allocated to Private Sector under DBFOM

Risk Type	Rationale for Transfer to Private Sector
Design	• Private sector will have full control over design to meet Output Specifications
Technology Selection and performance	• Proponents will be permitted to select technology. City will not prescribe technology.
Engineering, Procurement and Construction	• Most construction risks are commonly transferred to private sector under PPP structure
Operations	• Private sector fully responsible for operations to meet Output Specifications and guaranteed quantities
Performance	• Private sector to be given full control over technology selection, means and methods of construction and operation – so performance is also their risk
Marketing	• Case studies and market soundings indicate that in other PPP biosolids Projects (Philadelphia, Australia) private sector has assumed the risk of marketing an end product
Disposal	• Private sector can plan and contract for trucking and landfill space
Maintenance	• Long-term maintenance risks commonly transferred to private sector under PPP structure

Table 18: Risks Retained by Public Sector under DBFOM

Risk Type	Rationale for Retention by City
Approvals	• Timing not controlled by Project Co.
Quality of biosolids	• Depending on Alternative, the process may require biosolids to meet requirements for metals concentration, etc. Not controlled by Project Co.
Quantity of biosolids	• Put or pay contract. Not controlled by Project Co.
Unknown site conditions	• Industry standard. May include risk sharing approach
Change in law	• Industry standard. May include risk sharing approach
Supervening events	• Industry standard
Political risks	• Not controlled by Project Co.

Other important considerations in developing the overall risk profile for the analysis included:

- The City's current arrangement for biosolids management is 5-year contracts with private land application contractors. Under these contracts, some risks are transferred to the private sector including availability of land for application, operations costs, and off-site storage. Presumably, these risks are transferred for 5 year periods but at the time of contract renewal or re-procurement, would return to the City in the form of higher tender prices. The risk analysis reflects this assumption.

- The Land Application Alternative includes a very small capital component. Based on cost estimates, this may be as little as $800,000 per year in private capital repayment (debt and equity) during the operations and maintenance term. This amount of private capital may not be sufficient to secure and anchor risk transfer. Therefore, the risk analysis considers that for Land Application, some of the long-term operations and maintenance risks may be transferred on paper but are not anchored with sufficient private capital at risk.[12]

9.6.4. Risk Workshop

As noted above, the Project Team has convened for two risk workshops. Risk Workshop #1 reviewed Value for Money and risk assessment methodology in general, and discussed the completeness and accuracy of the risks listed in the risk matrix. Risk Workshop #2 reviewed the probability and impact of 23 key risks, for each of the Land Application, Enhanced Treatment, and Thermal Reduction Alternatives. The probability and impact of the other risks were assessed "off-line" by Deloitte and confirmed via review by the Project Team.

Both Risk Workshop #1 and Risk Workshop #2 were attended by personnel from the City, technical experts from CH2M Hill, financial advisors from Deloitte, and the Project Team's policy consultant. Personnel from P3 Canada also attended each risk workshop. Attendees for both workshops are listed below.

Table 19: Risk Workshops Attendees

Attendee	Organization/Title
Jorge Avalos	Deloitte – Financial Advisor

[12] As an example, in Year 5 of operations, a 9% increase in O&M costs (which could not be absorbed by the O&M contractor) would be sufficient to erode equity returns to zero and endanger cash flows to lenders (Debt Service Coverage Ratio less than 1.0). Under Enhanced Treatment and Thermal Reduction, the Project could withstand O&M costs overruns of 34% and 43% respectively before debt repayment would be affected. This means that the Land Application Alternative would have difficulty attracting third-party lenders and would be much more susceptible to "walk-away" risk due to a mismatch between the magnitude of private capital at risk and the potential magnitude of cost overruns. This analysis is based on the assumed debt-equity ratios for each of the Alternatives, set out in Appendix I.

Attendee	Organization/Title
Dan Chauvin	Director, Water and Wastewater Engineering, City of Hamilton
Chris Shrive	Senior Project Manager, Environment & Sustainable Infrastructure Division, City of Hamilton
John Savoia	Senior Policy Advisor, Financial Planning and Policy, City of Hamilton
Dan McKinnon	Acting Senior Director of Environment and Sustainable Infrastructure - home position Director of Water and Wastewater Operations, City of Hamilton
Remo Bucci	Deloitte – Financial Advisor
Peter Burrowes	CH2M Hill – Technical Advisor
Joseph Rinaldo	Independent Consultant – Policy Advisor to the City
Michael Fishbein	Deloitte – Financial Advisor
James Kraska	PPP Canada (Risk Workshop #1)
James Budd	PPP Canada (Risk Workshop #1 and #2)
James Jupp	CH2M Hill – Technical Advisor

Deloitte facilitated Risk Workshop #1 and #2.

Participants in Risk Workshop #2 were asked to rate the probability of each risk on six-point scale. The scale is reproduced in Appendix J for reference. In addition, participants were provided with the relevant cost base (portion of the Project budget) for each risk, and were asked to rate potential impacts of each risk in terms of a “best case” and “worst case” cost overrun. In each case, participants were presented with a draft probability/impact rating, and were asked to confirm or revise the draft rating.

9.6.5. Results

In summary, the results of the risk assessment demonstrated that the City is able to transfer risk to the private sector under the delivery of the Enhanced Treatment and Thermal Reduction Alternatives via DBFOM. However, the City retains significant risk under the Land Application Alternative, even when it is carried out via DBFOM. This is due to a number of reasons:

- The small capital size of Land Application limits the ability to anchor transferred risk via private capital at risk. Enhanced Treatment and Thermal Reduction have greater capital requirements and therefore additional private capital with which to secure risk transfer.

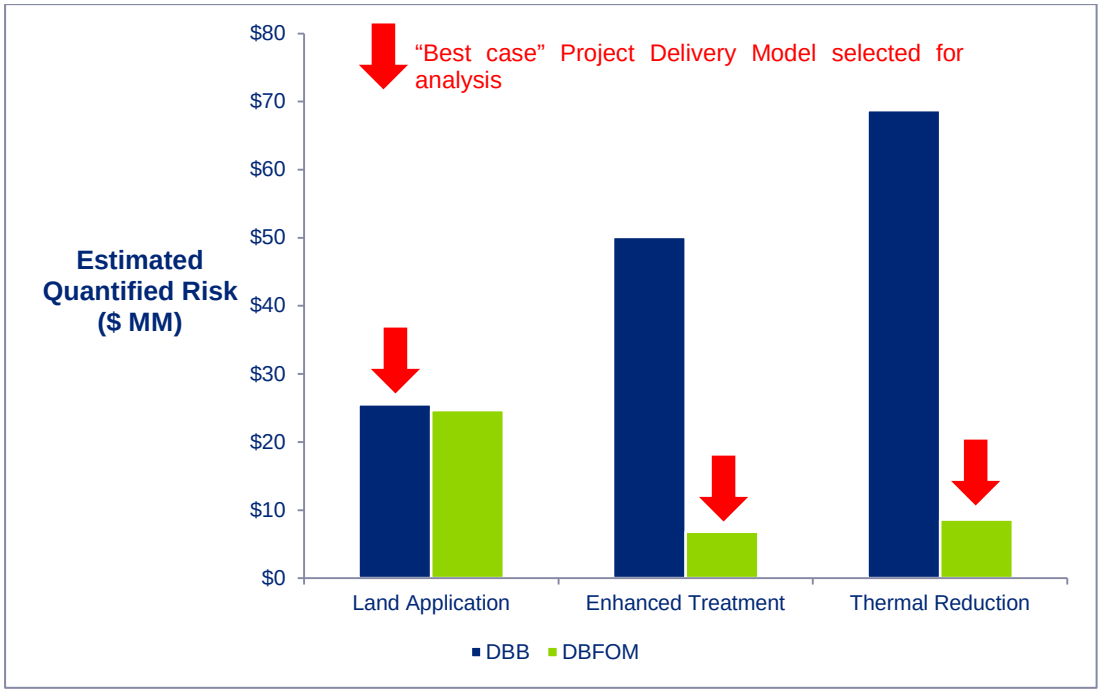
- Enhanced Treatment and Thermal Reduction are have many more risks that can be transferred to Project Co under commonly accepted commercial terms.

- Enhanced Treatment and Thermal Reduction are characterized by risks relating to design, construction, technology, performance, and even marketing that can be controlled by the private sector and thus transferred to the private sector. Conversely, Land Application is characterized by risks relating to volunteer farmers, fuel prices and tipping fees at landfill – risks that are largely out of the control of the private sector and are not good candidates for risk transfer.

- Land Application has higher risks associated with ownership and concession management, since Land Application is not a proven approach under a long-term contract, and there is a limited market for land application contractors.

The graphic below summarizes the results.

Figure 9: Risk Workshops Results



The risk assessment results are presented in further detail in Appendix J.

9.7. Preliminary Value for Money Assessment

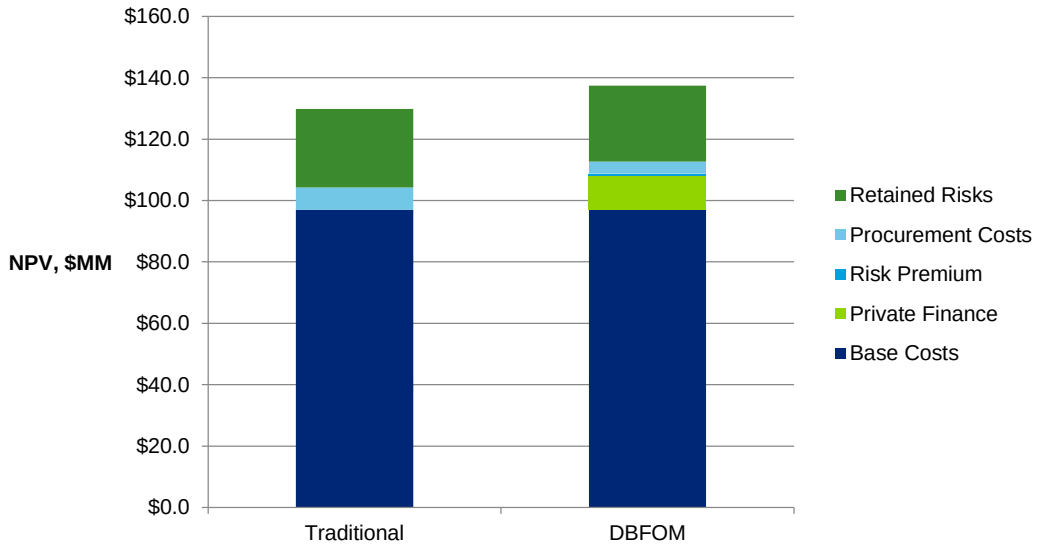
The cash flow models and the risk assessment are brought together to produce the preliminary Value for Money assessment, for each Alternative. The Value for Money results presented below are shown as a percentage, rounded to the nearest whole number. These results are for the "base case" scenario. As set out in Section 9.7, the cost of public and private capital can affect the VFM result, so a range of results is presented.

9.7.1. Land Application

The preliminary base case VFM for Land Application is -6%.

As discussed above, there is little risk transfer associated with DBFOM Land Application due to low private capital (risk transfer is not anchored), and low complexity construction requirements. Although financing costs are quite low for this Alternative due to its small capital size, there are still fixed costs related to private finance which add cost to the DBFOM model and offset the limited risk transfer benefits.

Figure 10: Land Application VFM (Traditional vs DBFOM)



	Traditional ($, MM)	DBFOM ($, MM)
Base Costs (Incl. CDC/Risk Premium)	$97.0	$108.7
Ancillary Procurement and Project Management Costs	$7.26	$4.0
Risk Retained by the City	$25.5	$24.7
Total	$129.8	$137.4

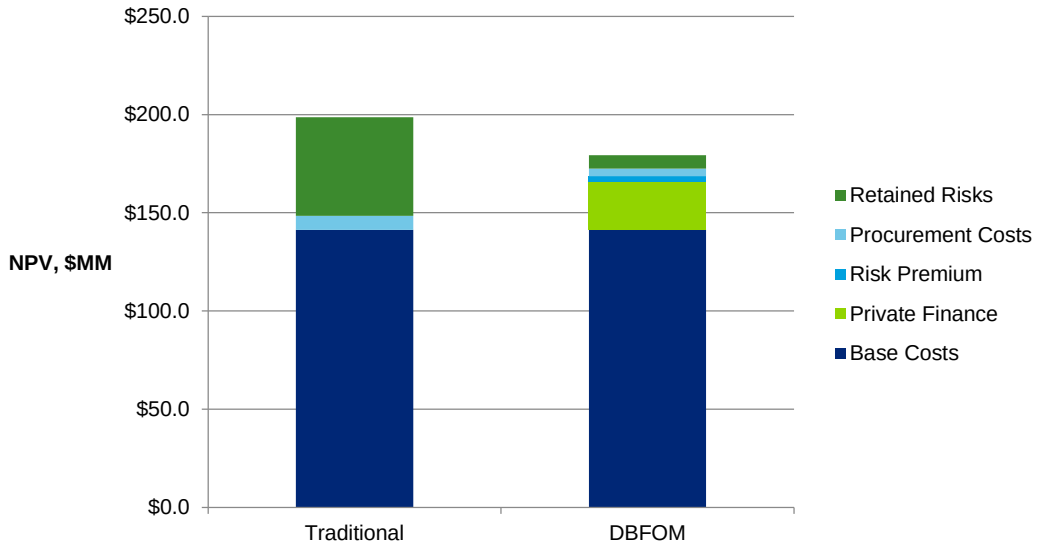
9.7.2. Enhanced Treatment

The Enhanced Treatment Alternative has preliminary base case VFM of 10%.

This is based on a conservative scenario in which fuel pellets produced by the treatment process cannot be sold and must be landfilled, resulting in loss of revenues and increase in operating costs.

These savings are primarily due to the risk transfer to the private sector under DBFOM, in particular for the construction, operations, and maintenance of the Project. There is likely a larger private capital requirement for this Project (greater than $60 Million total capital cost based on current cost estimates for a heat drying facility), so risk transfer is better anchored. As well, the critical risks associated with this Alternative, including design, construction, O&M, and commercial/marketing risks, can be controlled by the private sector and have been allocated to the private sector in other DBFOM-type Projects (refer to Case Studies). Therefore, this Alternative is more likely to have risk transfer benefits.

Figure 11: Enhanced Treatment VFM (Traditional vs. DBFOM)



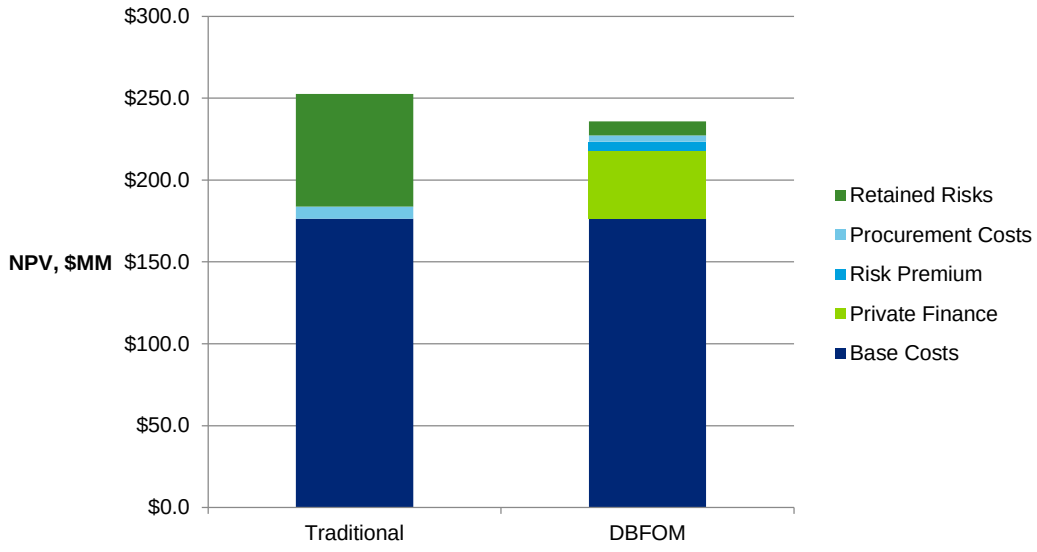
	Traditional ($, MM)	DBFOM ($, MM)
Base Costs (Incl. CDC/Risk Premium)	$141.3	$168.5
Ancillary Procurement and Project Management Costs	$7.26	$4.0
Risk Retained by the City	$50.1	$6.8
Total	$198.7	$179.3

9.7.3. Thermal Reduction

The Thermal Reduction Alternative has a preliminary VFM of 9%.

The DBFOM Project Delivery Model provides robust VFM due to risk transfer primarily during the construction, operations and maintenance phases of the Project. Although development and maintenance of a thermal reduction facility is technically complex, the key risks associated with this Alternative are generally risks that can be controlled and mitigated by the private sector. Therefore, transferring these risks to a private sector counterparty that has experience and expertise in development and maintenance of thermal reduction facilities is expected to result in value savings.

Figure 12: Enhanced Treatment VFM (Traditional vs. DBFOM)



	Traditional ($, MM)	DBFOM ($, MM)
Base Costs (Incl. CDC/Risk Premium)	$176.5	$216.7
Ancillary Procurement and Project Management Costs	$7.26	$4.0
Risk Retained by the City	$68.8	$8.6
Total	$252.5	$229.3

9.8. Sensitivity Analysis

Following base case results of the VFM analysis presented above, a sensitivity analysis is conducted to determine the impact of changes in certain financing assumptions on the VFM results for the Enhanced Treatment and Thermal Reduction that will occur from the date of this Business Case to Financial Close (2 years forward). Sensitivities have been conducted through variation the following parameters:

- Long-term private debt financing spread
- City's long-term borrowing rate

Based on the feedback from market sounding consultations, a range of private long-term spreads have been used to determine sensitivity of the VFM results. Given that only Enhanced Treatment and Thermal Reduction produce positive VFM, sensitivities have been carried out only on these Alternatives to determine whether changes in public and private borrowing rates cause a significant impact on the VFM of the two Alternatives.

The results of the sensitivities are presented below.

Enhanced Treatment

With the base case VFM of 10% (at a long term private debt credit spread of 2.50% and City long-term borrowing rate of 3.99%), the sensitivities in the long-term private debt financing spread along with the City's borrowing rate provides a VFM range between a minimum of 8.7% and a maximum VFM of 15.3%.

Figure 13: Sensitivity Analysis - Enhanced Treatment

VFM Savings %				
		City LT Borrowing Rate		
		3.99%	4.50%	5.00%
Spread	3.00%	8.7%	11.3%	13.8%
	2.50%	9.7%	12.3%	14.8%
	2.25%	10.3%	12.8%	15.3%

Thermal Reduction

The base case VFM under Thermal Reduction, with a long term private debt credit spread of 2.50% and the City's borrowing rate at 3.99%, is at 9.2%. Variation in the long-term private debt borrowing spread between 2.25% to 3.00% and the City's borrowing rate between 3.99% to 5.00% leads to a change in the VFM between a minimum of 7.3% and a maximum of 16.4%.

Figure 14: Sensitivity Analysis - Thermal Reduction

VFM Savings %				
		City LT Borrowing Rate		
		3.99%	4.50%	5.00%
Spread	3.00%	7.3%	10.7%	13.8%
	2.50%	9.2%	12.5%	15.6%
	2.25%	10.0%	13.3%	16.4%

Section 10: Recommended Procurement Approach

10.1. Recommended Procurement Approach

In summary, the Triple Bottom Line Evaluation demonstrated that Enhanced Treatment and Thermal Reduction best meet the City's environmental, social and economic objectives. The Value for Money analysis confirms that these two alternatives are best procured using a DBFOM Project Delivery Model where risks to the City can be mitigated by transferring risk to Project Co.

Taking the Triple Bottom Line and VFM analysis into account, the Project Team is recommending an output based procurement approach that attracts Enhanced Treatment and Thermal Reduction solutions. The procurement should be based on a DBFOM contract structure that provides an opportunity to attract P3 Canada funding.

In addition, the RFI and market sounding process confirmed that there is strong interest from the private sector in bidding on the Project.

10.1.1. Affordability Threshold

Once a satisfactory funding agreement and procurement process has been reached with PPP Canada, the City is proposing to develop and include an affordability threshold in the RFQ and RFP documents in order to ensure that the Project will be within its budgetary and fiscal constraints.

This approach is also beneficial to the bidders. They will know in advance if the Alternative that they are proposing is affordable and therefore do not have to invest a significant amount of resources on approaches which are not economically viable to the City. As well, this will also provide greater certainty to PPP Canada since it will establish a funding limit.

This threshold can also be used by PPP Canada to set maximum funding limits to provide certainty that such a limit will not be exceeded.

The affordability limit is intended to provide structure and certainty to the City, PPP Canada, and the bidders. It also encourages low cost technical solutions which meet the output specifications. The precise parameters of the affordability threshold will be developed once the City knows the level of funding which will be provided by PPP Canada.

10.1.2. Recommendation

Therefore it is recommended that:

- Enhanced Treatment and Thermal Reduction alternatives required for the City's long-term biosolids management solution proceed through the procurement process based on a DBFOM Project Delivery Model.
- That the procurement process proceeds with an output based process that sets a clearly defined performance specification and lets the bidders determine which technology best meets the performance specifications and evaluation criteria.
- That the procurement process includes a RFQ Stage and a RFP Stage.

- That the RFQ include the funding agreement with P3 Canada, a detailed contractual term sheet, the evaluation criteria for the RFP and the affordability threshold.

The Procurement Strategy Section included in this report (Section 11) provides additional detail on the proposed procurement process

Section 11: Procurement Strategy

11.1. Overview of Proposed Approach

Based on the results of the City's Triple Bottom Line analysis, the strengths and weakness of a DBFOM for Thermal Reduction and Enhanced Treatment to the City tend to balance-off and the result is that both Alternatives are effectively identical (in terms of benefits to the City). From a procurement perspective, it is not obvious which Alternative would yield the best result to the City. Therefore, the recommended procurement approach is to proceed with an output based process, that sets a clearly defined performance specification and enables bidders to select Thermal Reduction or Enhanced Treatment based on their assessment of which approach best meet the stated performance specifications. The performance specification will include, at a high level:

- Requirement to process biosolids to produce minimum Class A material or to thermally treat them – this can only be achieved by Enhanced Treatment or Thermal Reduction approaches;
- Requirement to accept specified quantity of biosolids per year;
- Compliance with applicable legislation and regulations; and
- Performance requirements regarding odour, truck traffic, site management, and reporting.

The evaluation criteria will include price (NPV) and non-price factors such as construction, quality management and marketing plans.

The evaluation of NPV will be 'after' PPP Canada funding to capture the benefits of this fund to the City. Bidders who propose an alternative site to Woodward will have to ensure that their proposal qualifies to meet the funding benefit. This can be achieve by 'self-qualifying' their proposal against the following PPP Canada investment criteria:

- Public Infrastructure – Is the asset publically owned?
- Eligible Applicant – Is the applicant eligible to receive funding criteria?
- Eligible Category – Does the asset fall into an eligible category?
- Eligible P3 Model – Does the project apply an eligible P3 model?
- Competitive Procurement – Is the applicant committed to a competitive procurement process?

The intent is to allow bidders to determine which technology best meets the performance specifications and evaluation criteria. This concept to "let the market decide" ensures that the City will achieve the best procurement result.

11.2. Considerations

As a counter consideration to the procurement benefits brought by "letting the market decide", there is the challenge that this is a novel procurement process and therefore the following risks should be considered in the development of the procurement strategy, each of which is assessed in the subsequent sub-sections:

- Variability will confuse the market and limit interest;
- Lowest cost (net present value) will likely win – how do higher capital solutions compete?; and
- Variability will make it difficult to set funding amounts.

11.2.1. Variability will confuse the market and limit interest

The best practice to mitigate a procurement process that has not been used and introduces innovative approaches is to maximize the information provided to bidders at the earliest stage, the RFP ("RFQ") stage.

The first enhancement would be to include a detailed contractual term-sheet in the RFQ which outlines the risk allocation and commercial terms that will form the basis of the Project Agreement to be provided in the second stage, the RFP. This term sheet, which would be based on the framework provided in Figure 14, will ensure that bidders understand and accept the deal structure and will not be surprised by the approach taken in the Project Agreement. In order to ensure that the term sheet is comprehensive, the City will need to undertake legal and contractual work during the RFQ stage (typically this occurs in the later RFP stage). This term sheet has been structured on a 'pure' output specification basis to ensure that bidders are provided with the key operating parameters to enable the selection of the most appropriate technology. Since the facility is focused primarily on availability only (service and quality performance indicators are not critical) the Output Specifications and payment mechanism will be straight forward given the ability of inputs and outputs of the facility to be measured. The term sheet also enables flexibility on site selection. The balance of the term sheet follows the components of a typical DBFOM Project agreement used in the Canadian PPP Market to ensure that performance risks are anchored.

The use of Commercial-in-Confidence meetings during the RFQ process is recommended to obtain feedback from potential bidders (one per bid team on as-requested basis) to ensure that each bidder understands the process and the term sheet. It may also be necessary to enable bidders to comment on the term sheet and allow for addenda to issue revised drafts to address bidder comments.

The City also intends to structure the procurement process to maximize innovation that may be brought forward by Proponents. This innovation is not just limited to the Technology, but to other synergies that could reduce overall costs at Woodward for the City's wastewater treatment processes.

Figure 15: Proposed Deal Structure

Item		Description	Responsibility	
			City	Project Co
1. **Term**		• 30 years.	Joint	Joint
2. **Woodward Site**	**Access**	• The Woodward Site will be made available for the Facility under a license arrangement as per typical DBFOM practice used in the Canadian PPP sector.	100%	
	EA Approvals	• City will ensure that all EA approvals are in place.	100%	
	Site Information	• Provide Geotechnical and Utility information, as require during the bid process.	100%	
	Hand back	• At termination of the license, the Facility will be handed back to the City in compliance with Hand back Standards.		100%
3. **Alternative Site (Optional)**	**Access**	• If applicable, make an alternative site available for the Facility. (Proponents can choose to use the Woodward site, or provide their own site).		100%
	EA Approvals	• Project Co. responsible for EA approvals if it selects its own site, with reasonable cooperation by City as required.		100%
	Site Information	• Provide Geotechnical and Utility information, as require during the bid process.		100%
	Termination	• If applicable, the City's obligations for the supply of biosolids waste will expire at the end of the Term with no further obligation.		100%
4. **Biosolids Forecast**	**Annual Supply**	• Provide annual tonnage forecast of biosolids to be processed at the Facility over the term ("Put or pay" contract).	100%	
	Quality	• Provide data on chemical composition for a typical waste-year to serve as the benchmark for specifying the expected performance of the Facility (i.e. biosolids quality must fall within this defined "window").	100%	
5. **Construction**	**Design / Build**	• The Facility will be designed and built to comply with the Performance Specifications.		100%
	Approvals	• As per typical practices used in the Canadian PPP sector, obtain all approvals (other than EA).		100%
	Site Conditions	• Assessment of geotechnical and utility conditions.		100%

Item		Description	Responsibility	
			City	Project Co
	Facility Acceptance	• The Facility will be inspected at Substantial Completion to ensure compliance with the Performance Specifications following the Shakedown and Acceptance Protocol. • Acceptance or, Commencement of Operations Date, will occur after successful completion of the Shakedown and Acceptance Protocol.		100%
	Payment at Commencement Operations Date	• Payment for 25% of total Capital Costs, based on Project Co's Financial Model as at Financial Close (balance of 75% will be financed and repaid through the Capital Payment of the Payment Mechanism).	100%	
6. **Performance Specifications**	**Shakedown and Acceptance Protocol**	• The Facility will be operated under continuous operational procedures for up to 3 months to ensure compliance with Performance Specifications.		100%
	Quantity / Throughput	• Size and configure the Facility to meet the Annual Supply and Quality forecast provided by the City		100%
	End Product	• Residual/end product must meet one of two classifications: – "Class A" product which meets applicable Canadian Fertilizer Act standards ; and/or – Ash product which is suitable for landfilling as an inert, non-hazardous material.		100%
	Emissions	• If applicable, any emissions must meet Provincial Standards		100%
	Hand back Standards	• For Facilities proposed to be constructed on the Woodward Site, the Facility must be in a condition that will enable the City to assume and continue its use to the end of its expected Design Life.		100%
	Marketing of End Product	• Revenue derived from the sale of the end product (e.g. fertilizer) - this includes distribution, promoting and supply risk.		100%
	Energy By-Product	• Annual commitments for the production of electricity, if applicable, for use by the City based on the Annual Supply and Quality forecasted by the City.		100%
	Consumables and Utilities	• Consumption of all Consumables and Utilities must be guaranteed based on the Annual Supply forecast. • Adjustments will be made for amounts that exceed the Annual Supply forecast.		100%
	Reporting	• Will follow typical procedures used in the Canada PPP sector.		100%

Item		Description	Responsibility	
			City	Project Co
7. **Payment Mechanism**	**Quantity / Throughput**	• Availability payment based on Annual Supply forecast tonnage (i.e. minimum payment regardless of actual tonnage). • Adjustments will be made on a per/tonnage basis for amounts that exceed the Annual Supply forecast.	100%	
	Form of Payment	• Payments will be made on a monthly basis calculated from the Annual Service Payments, net of any deductions. • Annual Service Payments will be comprised of the Capital Components (repayment of Debt and Equity), Operating and Maintenance, and Periodic Lifecycle Renewal, based on Project Co's financial model as at Financial Close.	100%	
	Indexation	• The Operating and Maintenance and Periodic Lifecycle Renewal components of the Annual Service Payment will be subject to inflation adjustment following provisions used in the Canadian PPP sector. • Certain indexation on Consumables (chemicals) and Utilities (natural gas, diesel consumption, water, electricity) will be 'carved out' and indexed individually. • Payments for Insurance will be on a 'flow-through' basis following practices used in the Canadian PPP sector.		100%
	Deductions	• Deductions will be applied for failure to meet Quantity / Throughput requirements, environmental requirements on Emissions and / or Residual Waste / By-product Disposal (as applicable), quality measures such as odor control and site cleanliness, and Energy By-Products.		100%
	Performance Regime	• Payment deduction and failure point approach, consistent with market standard		100%
8. **Step-in Rights**	**Direct Lender**	• The Direct Lender will have 'step-in' rights consistent with provisions used in the Canadian PPP sector during the long-stop period that will be senior to the City.		100%
	City	• The City's 'step-in' rights will follow those of the Direct Lender.	100%	
9. **Insurance Provisions**	**City**	• Insurance for the City will follow market precedents.	100%	
	Project Co	• Insurance for the Facility will follow market precedents used in the Canadian PPP sector.		100%

Item		Description	Responsibility	
			City	Project Co
10. **Default Provisions**		• Will follow market precedents used in the Canadian PPP sector.	Joint	Joint
11. **Compensation on Termination**	**Default by Project Co**	• Will follow market precedents used in the Canadian PPP sector (adjustments will be provided for the alternative where Project Co. provides its own site)		100%
	Termination by City (for convenience)	• Will follow market precedents used in the Canadian PPP sector (adjustments will be required for the alternative where Project Co. provides its own site)	100%	
	Non-Default Termination	• Will follow market precedents used in the Canadian PPP sector (adjustments will be required for the alternative where Project Co. provides its own site)	100%	
12. **Excusing Causes**	**Force Majeure**	• Will follow market precedents used in the Canadian PPP sector.	Joint	Joint
	Delay Events	• Will follow market precedents used in the Canadian PPP sector.	Joint	Joint
	Relief Events	• Will follow market precedents used in the Canadian PPP sector.	Joint	Joint
	Change in Law	• Will follow market precedents used in the Canadian PPP sector but may require some adjustment to suit different technologies.	Joint	Joint
13. **Changes**		• Scope Change and Change Orders will follow market precedents used in the Canadian PPP sector.	Joint	Joint
14. **Dispute Resolution**		• Will follow market precedents used in the Canadian PPP sector.	Joint	Joint

Since a DFBOM is not widely used in the biosolids sector, there is the risk that a pre-qualified bidder decides, during the RFP stage, that the risk profile of the Project is not acceptable and does not submit a proposal. This result would reduce competitive tension to the point where a positive outcome of the procurement process is at risk. To ensure that all pre-qualified bidders accept the pending risk transfer obligations in the RFP/Project Agreement, it is also recommended that all prequalified bidders post a bid-bond that would remain in place until a compliant proposal is received. The purpose of the bid-bond would be to enable the City to recover its procurement costs, so its value should be sufficient (e.g. in the order of $500K to $1M). The bid-bond should be in a liquid form (e.g. Letter of Credit) to allow the City to receive funds quickly without risk of claims or legal proceedings.

The combination of the enhanced information provided by the term sheet and requirement for the Bid Bond will help screen in credible and committed respondents at the RFQ stage.

Feedback from market soundings at this stage indicates that market participants are concerned about cost and effort involved in a variable procurement. Specifically, there may be considerable time and effort required to develop teaming arrangements, as Project sponsors/developers will have to analyze which Alternative they believe is best suited to meet the Output Specifications in order to begin making teaming decisions. Therefore, the procurement process will include a longer RFQ open period in order to allow for teaming to take place, and will also provide for an appropriate honorarium to compensate RFP proponents at the end of the process. It is recommended that the City provide an honorarium of $250k to $500K to the un-successful bidders. In addition, this honorarium would be paid should the City choose to cancel the process (would act as a break fee). Feedback also confirmed that a ‘simple’ and ‘scaled-down’ PPP process should be applied to recognize the unique nature of the Project. In addition, participants also emphasized that the process must encourage feedback during the bid-open period to ensure that terms and conditions are commercially acceptable. This includes instances where feedback should be respectful of and protect the confidential and proprietary nature of the related Technology solutions.

The City also intends to encourage innovation in the development of proposals to seek a Technology that will not only manage the biosolids but potentially offer synergies and cost savings to other processes at Woodward,

11.2.2. Lowest cost (net present value) will likely win – how do higher capital solutions compete?

In keeping with the concept to maximize information in the RFQ, it would also be necessary to provide the RFP evaluation criteria in the RFQ. The typical approach would be to weight RFP proposals on a basis of 50% Technical Compliance / Quality and 50% Costs (e.g. NPV of Costs to the City after PPP Funding); by providing this information in the RFP, RFQ bidders will begin to assess capital and operating costs of alternatives under consideration to select the most optimal solution.

It will also be clear in the RFQ that bidders will not be required to commit to a technology until they prepare their RFP bid. The RFQ will focus on the track-record of respondents to provide technologies that are similar and compliant with the term sheet, as well as the financial condition, capacity and track-record.

To provide guidance on the cost that the City is willing to commit to the Project, the RFQ would note that an affordability cap will be provided in the RFP, which will be a mandatory criterion. This approach will ensure that bidders can not only select the technology that best suits the City’s criteria, but they can size the facility to ensure that the capital and operating constraints are met. The affordability cap will be a pass-fail criterion; proposals that comply with the affordability cap will then be evaluated based on price.

Consideration should be given to allow bidders to submit base-bids and innovation submissions that may allow for synergies within the Woodward site that could provide ancillary benefits to the City.

With respect to funding, any variability can be addressed by setting the amount provided by PPP Canada to ‘not exceed’ a maximum amount based on the affordability constraint contained in the RFP.

11.2.3. Conclusions

The proposed approach will provide bidders with the clarity that is needed for them to decide on the best alternative that meets the City's budgetary needs and performance and risk transfer objectives. The proposed approach will also ensure that the City will receive committed, compliant and affordable bids under a contractual structure that follows typical risk allocation used in the Canadian PPP market for DBFOM Projects.

Market soundings to date have indicated that, while market participants have concerns about the approach, they will participate if the process appropriately addresses these concerns. Critical concerns and potential mitigating measures are listed below.

Market Concern	Mitigating Measures
• **Increased cost of bidding**	• Higher honorarium • Costs may be offset through simpler process overall (output based as opposed to highly prescriptive)
• **Inability to compete against low cost providers**	• Performance specification which requires at least Class A material will eliminate lowest cost providers
• **Teaming**	• RFQ will provide additional time for teaming to take place

11.3. Site Variability

As noted previously, the City will make the Woodward Avenue site available to all bidders. The City will own the Woodward Avenue site at all times as well as the infrastructure that is developed on the site. This is consistent with a typical DBFOM Project Delivery Model in Canada – the site and the asset are publically owned at all times.

The City is aware that there may be bidders that prefer to provide their own site, and may even leverage existing facilities on sites that they already own. The City is amenable to this type of arrangement if it results in procuring a private sector partner that provides the City with the best biosolids management solution over a 30 year term. However, there are two concerns with this approach:

- The City may not have ownership rights to the asset, and therefore would be at risk in the case of early contract termination as it would be without any biosolids management infrastructure
- There is a risk that P3 Canada would not fund a Project which was privately owned

At this point, with the above risks in mind the City's approach to site variability for the procurement is as follows:

- The City will allow bidders to utilize their own sites. In this event, bidders will be fully responsible for their own approvals.
- The Project Agreement will require that "off-site" facilities provide the City with certain rights that mitigate the risk of private ownership. This will include the right of the City to "take the keys" and process biosolids for a defined period of time in the event of Project Co default, as well as letters of credit to cover the cost of alternate solutions in the event of default. As well, on termination (expiry of the term), the assets will revert to the City.
- The City will work with P3 Canada to determine a list of objective criteria for P3 Canada funding. Proposals that meet these criteria will be evaluated taking into consideration 25% P3 Canada funding, i.e. net of P3 Canada funding. Proposals that do not meet these criteria will be evaluated based on their full cost. This is intended to capture the best possible solution for the City and provide appropriate credit to approaches which are likely to result in P3 Canada funding.

As noted above Proponents who propose an alternative site should consider the PPP Canada funding eligibility requirements.

11.4. Evaluation Criteria

The City plans to evaluate proposals at the RFQ stage based primarily on experience, track record, and financial strength. The City plans to evaluate proposals at the RFP stage based on an overall value approach which considers price as well as technical and commercial quality. The proposed high-level evaluation criteria are set out below.

RFQ Evaluation Criteria

Category	Criteria
Technical (70-85% of points)	• Construction qualifications, experience, and track record in relation to similar, relevant Project (3-5 examples of actual Projects completed) • Qualifications, experience and track record in applying their selected biosolids management approach (3-5 examples of actual Projects in operation) • Qualifications, experience, and track record in public-private partnership contracts or similar output based contracts (3-5 examples of actual Projects in operation)
Financial (15-30% of points)	• Financial strength and capacity, based on financial statements

RFP Evaluation Criteria

Category	Criteria
Technical Quality (50% of points)	• Quality of construction plan • Quality of operations and maintenance plan (includes marketing plan, if applicable) • Impact on community (stakeholder relations, design aesthetics, minimizing dust, odour, and traffic) • Commercial structure • Innovation proposals (guaranteed benefits to City)
Financial (50% of points)	• Present value of City payments, net of P3 Canada funding • Innovation proposals (guaranteed benefits to City)

The RFP evaluation criteria will consider the willingness of proponents to hold their construction pricing during the anticipated 4-6 months approvals period. This process is described in Section 12.1.2, below.

11.5. Affordability Cap

The City will utilize estimated costs of relevant Alternatives, as well as budgetary constraints, to develop an annual affordability limit that will be used as part of the RFP process. The affordability limit is intended to add structure and certainty to the procurement process. The precise parameters of the affordability cap (annual numbers) will be developed in advance of the RFQ.

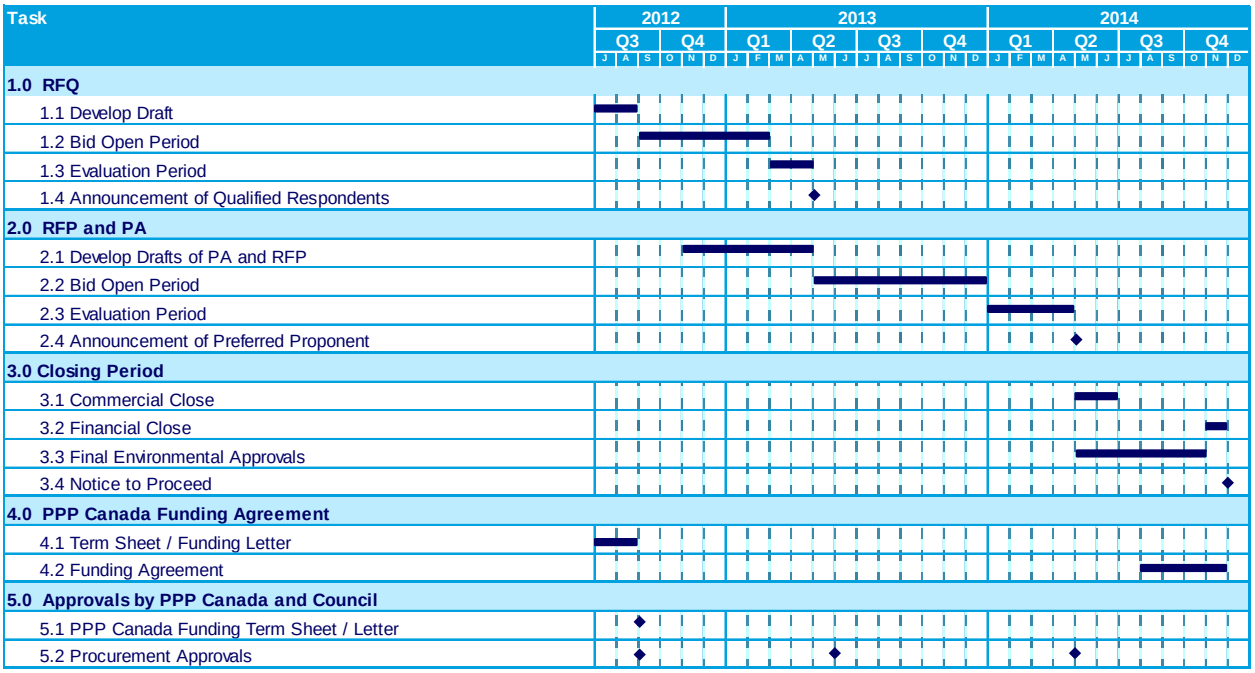
11.6. Procurement Plan and Timelines

The procurement plan is provided in Figure 16. This plan follows a typical DBFOM procurement timeline with the following exceptions:

- RFQ Timing: given the potential variability in technology alternatives allowed by the performance specification, the bid-open period is proposed to be six months, or about 2 months longer that a conventional period. This extended period will allow bidders the opportunity to assess the term sheet and organize a team with appropriate technology alternative(s) to meet the performance requirements.

- Closing Period: All technologies will require an Environmental Compliance Approval ("ECA") which can only be applied for once the preferred technology has been selected at the Preferred Proponent. As a result, there will be a 'gap' in the period from Commercial Close to Financial Close to obtain this ECA. As a result a rate setting regime is require to enable construction prices and debt costs to adjust based on third party benchmarks (e.g. similar to Credit Re-Set process that is current used in the Canadian PPP sector). The RFP may also be drafted to require Proponents to bid the period of time for which prices are fixed. Such an approach has worked successfully on at least one other Project in the Canadian energy sector.
- Approvals: Approvals from PPP Canada and Council will be important to ensure that each party has no concerns with respect to key components of the procurement, with the key components being:
    - The funding agreement with PPP Canada;
    - The term sheet;
    - RFP evaluation criteria; and
    - The Affordability threshold.

Figure 16: Procurement Schedule



Notes:

1) Task 3.3 Environmental Approvals includes 2 months for the EA + 4 months for ECA

2) Task 5.2 Procurement Approvals: RFQ, RFP, PA, Term Sheet (for RFQ), Evaluation Criteria, Affordability Cap, Qualified Respondents and the Preferred Proponent

Section 12: Market Sounding

12.1. Introduction

A market sounding consultation was conducted by Deloitte to gain further insight into the various assumptions and procurement strategy components for the Project. The purpose of market sounding was to engage in a confidential interactive session with potential market participants to learn their perspectives on the possible procurement process, experiences with similar Projects, potential interest in the Project, and ability to undertake this Project. The results on the market sounding consultations were used to support the financial assumptions applied in this Business Case.

12.2. Market Sounding Approach

The consultations were conducted on a confidential, non-attributable basis. The market participants were provided with a market sounding guide that provided background information on the Project, including assumptions to guide the consultations. The consultations were scheduled for 1 hour periods and all interviews were conducted on either a one-on-one basis in person or via teleconference.

For the purposes of the market sounding discussions, the following details / assumptions were provided to the participants with regards to the Project that would aid the participants in developing an understanding of the Project and the purpose of the consultations.

Table 23: Market Sounding Information

Item	Details
Design-Build-Finance-Operate-Maintain ("DBFOM") PPP Option	• The private partner would finance its construction costs which would be re-paid during the operating term of 20-30 years provided that the facility meets performance requirements (e.g. Availability Based); • Any funding from PPP Canada (may be up to 25% of capitalized costs) would be applied as a payment at substantial completion (the private partner would finance the balance); and • For clarity, the private partner would be required to provide fixed pricing over the term of the contract (subject to indexation) for a scope of work including operations, maintenance, lifecycle maintenance, and by-product disposal.
Thermal Reduction	• The City will be in a position to use all power produced (electricity will not be exported to the grid); and • The City recognizes that compliance under the Province's Feed-in-Tariff program could qualify the Project for the sale of power to the grid; however, for simplicity of this discussion, it assumed that the City would be the off-taker for the electricity / energy by-product.
Site for the Project	• The Site should be assumed to be provided by the City at its Woodward Wastewater Treatment Facility; and • The City recognizes that some private partners may provide their own site; however for simplicity of this discussion it should be assumed that the City will provide the Site.
Procurement Process	• City would apply a two-step, RFQ and RFP process following PPP best practices. • Approach would rely on documents that are scaled down and made simpler for application to this Project.
Technology Selection	• Technology would be open to 'let the market decide'.

The key findings from the market sounding process have not been attributed to any specific participant to ensure that each participant's confidentiality is maintained.

12.3. Market Sounding Participants and Topics

Out of the 12 firms approached for the market sounding exercise, 11 firms agreed to participate in the market sounding discussions. The list of market sounding participants is provided in Appendix K.

The market soundings gathered input covering financing assumptions and the procurement strategy for the Project, such as:

- **Financing:**
  - Lender interest in the Project based on capital size of the Alternatives.
  - Key financing metrics, as applicable to the Alternatives: Debt-Equity leverage and DSCR;
  - Cost of debt;
    - Cost of equity; and
    - Fees.
  - Financing approach.
  - View on commercial risk and other risks and the anticipated impact on gearing.

- **Procurement**:
  - Market interest in a procurement strategy involving multiple Alternatives ("Output Based" approach described in the Procurement Strategy).
  - Inclusion of a bid bond at the RFQ stage and size of honorarium.
  - Inclusion of a detailed term sheet and any other information that the market may require early on in the procurement process.
  - Inclusion of an 'affordability cap' in the RFP.
  - Any other issues / concerns in undertaking such a procurement process to ensure adequate market interest is achieved in the Project.

A detailed summary of the market soundings is provided in Appendix K.

12.4. Summary of Key Findings

The key findings from the ensuing discussions with the market sounding participants are summarized below:

- **Land Application will drive away bidders.** Most participants have indicated that they would be willing to participate in an "Output Based" procurement process, where the City prescribes Output Specifications and does not prescribe a Technology, allowing the market to decide on the technology for the Project. However, bidders clearly expressed that they would only participate if Land Application was excluded. The market sounding participants clearly expressed that it would be very difficult to compete, on a cost basis, with Land Application and would not bid on the Project if they were competing against Land Application.

- **Output-based procurement approach will introduce some risks.** Participants have indicated a concern that the 'open' procurement process would drive up the costs for the bidders as additional analysis would be required to determine the most appropriate technology to bid with. There were several ways to mitigate this concern:

  - Honorarium. Some of the bid preparation costs could be recovered through an honorarium to be provided to the unsuccessful bidders at the end of the RFP stage with a range of $250,000 to $500,000, as indicated by the participants. It has been indicated that the amount of the honorarium should be disclosed at the RFQ stage and should be a substantial amount to incentivise the bidders to participate in the 'open' procurement process.
  - Up front term sheet. Almost all of the participants have indicated that inclusion of a detailed term sheet within the RFQ would be helpful in teaming and preparing the bid.

- Affordability cap. Participants have welcomed the idea of including an affordability cap in the RFP. The affordability cap would enable the bidders to determine whether their technology selection (to be confirmed at the RFP stage) is within the threshold and hence submit bids that are only below the threshold to avoid any future issues

- Additional time. As the procurement process is not a particularly simple process (with multiple Alternatives), participants have appreciated the idea that the RFQ and RFP open period should be longer than usual. It has been proposed, for example, that the RFQ open period could be around 6 months, which would allow the bidders with enough time to conduct their analysis on multiple technologies, prepare teams, and hence submit a bid that would be most appropriate.

Section 13: Project Implementation Plan

13.1. Current Status and Approvals

The Project requires approval from Council in order to proceed. The Project also requires completion of a provincial Environmental Approval (EA) as well as an Environmental Certificate of Approval (ECA).

13.1.1. Council Approvals

Council has previously directed the Project Team to submit a Stage 1 application to P3 Canada (May 2011 Council resolution – refer to Section 4.2.2). Council has also authorized the Project Team to prepare this Stage 2 Business Case (December 2011 Council resolution – refer to Section 4.2.2). The next steps for Council approval are:

- May 2011 - Present the Business Case to Council and request Council's approval for submission of the Business Case to PPP Canada. This will take place on May 11, 2012, at a special General Issues Committee meeting.
- Summer 2011 - The Project Team and Council will wait to see the outcome of the PPP Canada funding decision
- Late Summer/Early Fall 2011 - Based on the outcome of the PPP Canada funding decision, the Project Team will request Council's approval to hire advisors and initiate a procurement process for the Project.
- If the PPP Canada funding application is successful, the Project Team expects to present the procurement plan set out in the Business Case, for approval
- If the PPP Canada funding application is unsuccessful, the Project Team may reconsider elements of the procurement plan and will present an amended procurement plan to Council at that time
- Short-listing of RFP Proponents – Council will approve the short-listing of Proponents for the RFP process. It is anticipated that Council's decision will be based on the recommendation of a Council Subcommittee. The Subcommittee is discussed in greater detail in the Project Governance section, below.
- Naming of Preferred Proponent and Contract Award – Council will be required to approve the naming of the preferred proponent and the award of the contract. It is anticipated that Council's decision will be based on the recommendation of a Council Subcommittee.

13.1.2. Environmental Approvals

The City has submitted an EA application for the Woodward Avenue site, based on thermal reduction technology. The application is currently with the MOE for approval.

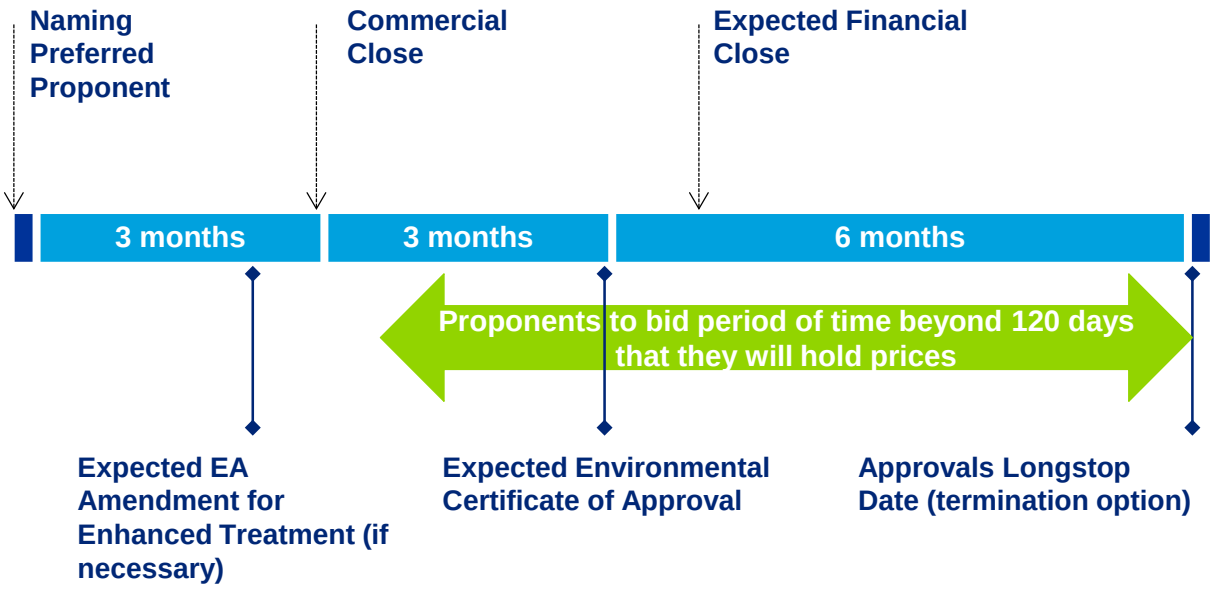
An amendment to the EA will be necessary if the eventual Preferred Proponent will be providing an Enhanced Treatment technology. Such an amendment to the EA will be undertaken following notification of Preferred Proponent. The Project Team, based on its experience and the advice of its technical advisor, believes that this amendment process should take approximately two months. The Project Agreement will provide for contract termination if the EA amendment is not executed by a certain drop-dead date, such as twelve months following notification of Preferred Proponent, with Project Co being awarded reasonable bid costs as compensation.

An ECA will also be necessary to undertake the Project. An ECA is a technology specific operating license that sets out the environmental terms and conditions of operating the facility. Therefore, the ECA cannot be obtained until after the Preferred Proponent is determined. The ECA application process will be started following notification of Preferred Proponent. The application requires a site plan, outline plans and sections and an emissions summary and dispersion modeling (ESDM) report. The RFP will require the upfront preparation of drawings as well as the emissions report. The only item that needs to be prepared is the ESDM report, which can typically be completed in a couple of weeks. Therefore, the ECA application can be lodged within a month of naming Preferred Proponent. The Project Team, based on its experience and the advice of its technical advisor, believes that obtaining the ECA should take approximately four months. A similar termination event and compensation will be provided as with the EA.

The RFP and Project Agreement will provide for a process whereby Proponents can bid the length of time they will hold prices during the Projected 6 month approvals process. Following the price hold period, construction prices can be escalated according to an agreed index. This approach has been successfully used before on Projects in Ontario in the waste-to-energy sector. There will also be a finance rate re-setting process, similar to the process already utilized in most Ontario and BC Projects.

The diagram below sets out the proposed process.

Figure 17 – Approvals Timeline



13.2. Project Team and Governance Structure

The Project team and governance structure for the procurement phase of the Project is set out below. The organizational chart is set out, followed by a description of the responsibilities associated with each position identified in the chart. Finally, a description of the individuals who will occupy each role is provided.

A key element of the governance structure is the role of the Council Subcommittee (technically, a Public Works Subcommittee). Council will be required to approve the following during the course of the Project procurement:

- Procurement plan, including affordability cap, term sheet, procurement approach and evaluation criteria, and schedule. Approval will result in issuing the RFQ;
- Evaluation of RFQ submissions and short-listing of RFP proponents; and
- Selection of Preferred Proponent and contract award.

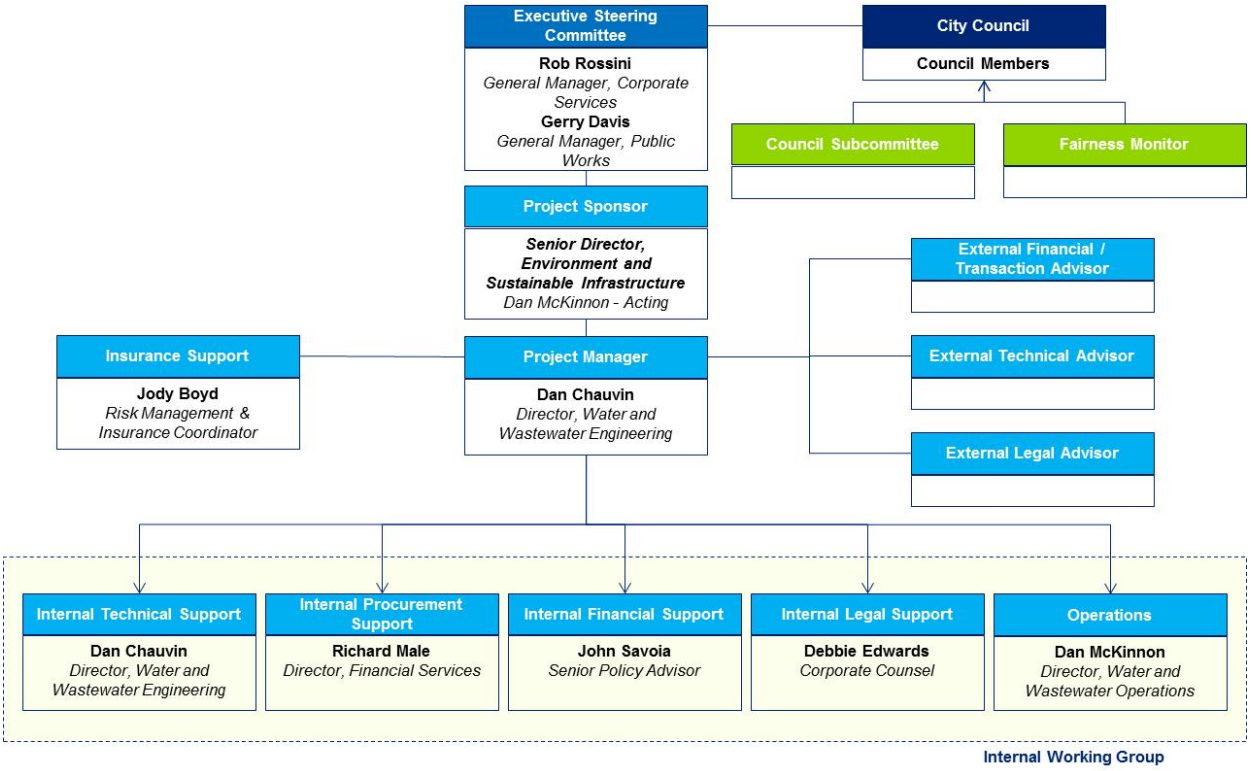
In order to provide as much certainty as possible to the process, the proposed governance structure includes a Council Subcommittee. The role of the Subcommittee (which will be defined by a Terms of Reference approved by Council) is to monitor the process and ensure that the procurement plan approved by Council is implemented. At key Project checkpoints with Council, including short-listing of RFP proponent and selection of Preferred Proponent, the Subcommittee will report to Council on conformance with the procurement plan and will provide a recommendation to Council. The intent is to mitigate political risks associated with the Project and ensure an appropriate mechanic for Council involvement and oversight of the process.

An Executive Steering Committee will be in place for the Project with all key partners and stakeholders engaged in the Project's development. In order to ensure oversight and accountability throughout the process, the Executive Steering Committee will report to the City Council. Appointment of a Fairness Monitor will be undertaken to ensure that best practices are followed during the procurement process and the process is conducted in a fair manner. The Fairness Monitor shall also report to the City Council.

The project team structure is ultimately centred around a dedicated Project Manager, supported by internal technical, procurement, financial, legal, and operations leads. Dan Chauvin will be the dedicated project manager. The team will be supported by key external advisors. There are three essential types of advisors required to support the delivery of the Project – transaction / financial, legal, and technical – that can be sourced from internal capacity and third party firms. Each of these advisors plays an important role in supporting the development and execution of the procurement process (RFQ and RFP), supporting the City in negotiating the final Project agreement with a selected proponent and advising the City on the performance of the preferred proponent from the period post-financial close to the commissioning of the infrastructure assets.

The figure below illustrates the expected team structure.

Figure 18: Illustrative Project Team Structure



13.2.1. Description of Roles and Responsibilities

Role	Responsibility
Council	• Oversight and governance to ensure that the City's strategic objectives are met • Delegate authority to the Council Subcommittee, as appropriate • Approve submission of business case to PPP Canada • Approve procurement plan, affordability cap, term sheet and issuance of RFQ • Approve short-listing of Qualified Respondents based on recommendation from Council Subcommittee • Approve Preferred Proponent based on recommendation of Council Subcommittee
Council Subcommittee	• Monitors the procurement to ensure that the procurement plan and term sheet are being followed • Ensures compliance with the affordability cap • Will make recommendations to Council on whether the agreed procurement plan and term sheet have been implemented • May review documents, observe meetings, and discuss with Project Team in order to carry out the monitoring function • Will not evaluate RFQ or RFP submissions • Terms of reference will define their role
Project Sponsor	• Responsible for interfacing with Council and Subcommittee • Strategic oversight and advice to Project Manager
Executive Steering Committee	• Due-diligence and oversight, as required • Provide direction to the Project Manager on key strategic decisions, as required • Has authority to sign the Project Agreement
Project Manager	• Responsible for day-to-day management and co-ordination of all activities

Role	Responsibility
	• Ensure compliance with Project schedule and budget • Lead contact for all bidders during Procurement Process • Direct advisors on the development of the RFQ and the RFP
Fairness Monitor	• Independent monitoring of the procurement process to ensure compliance with best practices on fairness and transparency • Provide opinion to Council at key checkpoints in the process
Technical Support	• Provide direction to the Technical Advisor to ensure compliance with the City's biosolids management policies and procedures • Lead the technical evaluation of the RFQ and RFP responses • Support the Project Manager with internal approvals and briefings, as required
Procurement Support	• Assist the Project Manager with the coordination of all advisors to complete RFQ, RFP and Project Agreement including the preparation of Addenda and Clarifications • Manage the Project data room (FTP Site) including the posting of all bid documents, clarifications, addenda and other notices to bidders • Manage the development of the Evaluation Framework to guide the evaluation of the RFQ and RFP responses, including facilitation of evaluator training sessions • Manage all procurement functions including completeness and compliance with RFP and RFQ submission requirements • Develop confidentially processes and procedures to prevent conflicts of interest • Work with the Fairness Monitor to resolve fairness issues, as required • Co-ordinate RFQ and RFP evaluations and document results • Assist in the selection of Legal and Technical Advisors, as required
Financial Support	• Provide direction to Financial Advisor to ensure compliance with the City's financial policies and procedures • Lead the financial evaluation of the RFQ and RFP responses • Support the Project Manager with internal approvals and briefings, as required
Legal Support	• Provide direction to Legal Advisor to ensure compliance with the City's contractual and procurement policies, and procedures • Provide legal support during the RFQ and RFP process, as required • Lead development of PPP Funding Agreement • Support the Project Manager with internal approvals and briefings, as required
Financial and Transaction Advisor	• Develop the affordability benchmark • Develop overall procurement and transaction structure and framework • Develop all financial submission requirements for the RFQ and RFP including the development of evaluation worksheets required for the Evaluation Framework • Develop Value-for-Money ("VfM") benchmarks • Lead the identification and quantification of risk required for the VfM • Assist the Finance Team Lead during the evaluation of submissions, as required • Review financial models submitted as part of the RFP submission to ensure compliance with the RFP and the PA • Attend Commercially Confidential Meetings ("CCMs"), as required • Work with the Technical Advisor to develop and calibrate the Payment Mechanism • Provide input to the Legal Advisor, as required, regarding PA commercial and financial matters • Prepare responses to bidder questions and addenda, as required • Provide support on the development of the PPP Funding Agreement • Provide support during the Commercial and Financial Close periods, as required
Technical Advisor	• Develop all technical submission requirements for the RFQ and RFP including the development of evaluation worksheets required for the Evaluation Framework • Assist the Technical Team Lead during the evaluation of submissions, as required • Participate in risk workshops required for the VfM, as required • Review Technical RFP submissions to ensure compliance with the RFP and the PA • Attend CCMs, as required

Role	Responsibility
	• Develop the Output Specifications • Develop Hand back specifications • Provide input to the Legal Advisor, as required, regarding technical matters within the PA • Prepare responses to bidder questions and addenda, as required • Provide support on the development of the PPP Funding Agreement • Provide support during the Commercial and Financial Close periods, as required
Legal Advisor	• Review RFP submissions to ensure compliance with the RFP and the PA • Attend CCMs, as required • Lead the development of the PA and obtain input from the Financial Advisory and Technical Advisors, as required • Prepare responses to bidder questions and addenda, as required • Provide support on the development of the PPP Funding Agreement • Provide support during the Commercial and Financial Close periods, as required

13.2.2. City's Project Team

The City's project team consists of City staff that has years of experience in large and complex infrastructure Projects and procurement processes. The key team members include:

Rob Rossini – Executive Steering Committee

Rob has 26 years of broad work experience within the municipal finance area covering a wide array of policy and administrative subjects. He holds an Honours Degree in Economics & Political Science from McMaster University and a Master's Degree in Economics, also from McMaster.

Rob started his career with the Province of Ontario in 1985 where he spent about four and half years; first with the Municipal Finance Branch of the Ministry of Municipal Affairs and then later with the Intergovernmental Finance Policy Branch of the Ministry of Treasury & Economics. Rob worked on a number of Projects and policy initiatives including municipal economic development, property taxation outside of municipal boundaries and the infamous Paper E of the 1989 Ontario Budget. In 1989, Rob moved to the Region of Halton where he later became the Manager of Budgets. During his tenure at the Region, he worked on finance policy, development charges, debt and investments and all budget matters. He was also active at the working level with the Municipal Finance Officers Association ("MFOA") of Ontario and prepared a number of responses to the annual Ontario and Federal Budgets.

In December of 2000, Rob accepted the position of Director of Budgets & Fiscal Policy with the *New* City of Hamilton where he implemented a number of budget process and finance policy reforms during amalgamation, including the Business Tax Reduction Plan and the introduction of business planning within the budget process. After an internal restructuring, he later became the Director of Budgets, Taxation & Policy and assumed new responsibilities for tax billing and collection. Rob also completed a 6 month position as the Acting General Manager of Finance & Corporate Services while he was at the City of Hamilton. Since January of 2004, Rob has been the Director of Finance for the City of Mississauga where he is responsible for financial services (accounts payable, payroll and accounting), risk management & investments, budgeting & financial planning, development and capital financing, and policy. He has been active in a number of new initiatives including the Development Charges, City Services Review, Business Planning and introducing budget process and financial planning improvements. Since May of 2009, Rob has been the General Manager of Finance & Corporate Services for the City of Hamilton. In that position, Rob is responsible for all activities that fall under the scope of City Treasurer, Financial Services, Taxation, Financial Planning & Policy, City Clerk's, Information Services and Customer Service, Access & Equity. His duties also include providing professional opinions, advice and guidance to Senior Management Team, Standing Committees and Council on the delivery of the City's strategic plan policies, programs and services. Throughout his career, Rob has been heavily involved in various inter-governmental finance policy issues and has had numerous dealings and consultations with the Province, the Regional / Single Tier Treasurers group and other municipalities on

such matters as municipal grants, service and funding realignments, taxation reform and infrastructure funding.

Rob is part of the Executive Steering Committee for the Project responsible for liaising with the City Council and providing guidance and advice on the Project to the City's internal team and the City Council.

Gerry Davis – Executive Steering Committee

Gerry Davis is the General Manager of Public Works for the City of Hamilton. Gerry is a Certified Management Accountant and a graduate in Business Administration. His portfolio includes responsibility for three Divisions, namely Environment & Sustainable Infrastructure, Operations & Waste Management and Transportation, Energy & Facilities. Prior to his current position, Gerry held the position of Senior Director of Capital Planning & Implementation and before that he was Manager of Asset Management with the Public Works Department. Other positions within the City of Hamilton included Manager of Finance & Administration for the Environment Department and Manager of Financial Planning and Policy for Corporate Finance.

Reporting to the City Manager and members of Council, for the overall management of the City's Public Works Department, Gerry's responsibilities encompass over 2000 staff and numerous contractors in the delivery of all activities. Gerry oversees all work related to the planning, design, construction, operations and maintenance of the City's transportation network of roads and bridges, water, wastewater system, solid waste management, transit, parks, forestry and cemeteries programs and Corporate fleet, buildings and facility services. Heading one of the largest Departments within the Corporation, Gerry is a proven team player focusing on the development of new initiatives and processes to provide optimum service to the citizens of Hamilton. Gerry and a team of Departmental employees created "Innovate Now". As the Department's Business Plan it is a compass for Public Works for the next ten years. One of their fundamental purposes is to be recognized as the center of environmental and innovative excellence in Canada by 2017.

Gerry is part of the Executive Steering Committee for the Project, along with Rob Rossini, is responsible for working with the City's internal team and the City Council to provide guidance and advice on the Project.

Dan McKinnon, C.E.T – Project Sponsor

Mr. McKinnon currently holds the position of Director, Water and Wastewater Operations with the City of Hamilton Environmental and Sustainable Infrastructure Division of the Public Works Department. Mr. McKinnon is currently Acting Senior Director of the Water Wastewater Program area for the City and is the Project sponsor for the biosolids Management Project. Dan has 26 years of experience in the Water and Wastewater industry both in the private and municipal sectors including capital delivery and operations. With 18 years of experience at the City of Hamilton, Dan has worked as Construction Inspector, Supervisor of Contracts, Senior Project Manager of Construction, Superintendent of Wastewater Collection, Manager of Water Distribution and Wastewater Collection, Manager of Customer Service and Community Outreach, Director of Operations and Senior Director.

Over the years Dan has worked with the delivery of large capital as well as operations and has been responsible for and assisted in the development of large capital works as well as a variety of operational/maintenance and grant programs for the City. Dan is currently responsible for all Water and Wastewater Operations, Environmental Laboratory Services, Drinking Water Quality Management System, Water and Wastewater Engineering including approximately 290 staff, $90 million operating budget and $150 million Capital budget.

Dan Chauvin – Project Manager & Technical Lead

Mr. Chauvin currently holds the position of Director, Water and Wastewater Engineering with the City of Hamilton Environmental and Sustainable Infrastructure Division of the Public Works Department. Mr. Chauvin has 14 years of experience in managing large infrastructure Projects over a variety of delivery models including Design-Bid-Build (DBB), Design-Build (DB) as well as Engineering, Procurement and

Construction Management (EPCM). Projects which Mr. Chauvin recently managed ranges in size from a $5 million DB Co-generation Facility, $45 million EPCM Biogas and Digester Upgrade and is currently Project lead for a multi-year $700 million DBB wastewater treatment plant expansion. In addition, Mr. Chauvin was Project Manager for a large public-private partnership for the ten (10) year, $200 million operations and maintenance contract for the City's water and wastewater system. Mr. Chauvin also lead many government funding agreements over the years on behalf of the City including, a $35 million Canadian Ontario Infrastructure Program (COIP), a $75 million Canadian Strategic Infrastructure Fund (CSIF) and a $180 million Infrastructure Stimulus Fund program (ISF), each of which he was involved with preparation of all contract documents and associated Agreements.

Mr. Chauvin is the City's Project Manager and the Technical Lead for the Project. Mr. Chauvin is dedicated towards the Project and the City has made him available for his Project Manager and Technical Lead role.

Jody Boyd – Risk Management & Insurance Coordinator

Jody has 22 years of Insurance and Risk Management experience, 10 of those in the area of municipal risk management and 5 years in private sector risk management for water wastewater operators such as Philip Utilities Management Corp., Azurix North America and American Water Canada Corp. Contracts worked on included the public-private partnership, operations and maintenance contract for the City of Hamilton's water and wastewater system.

Jody obtained an Honours Bachelor of Arts Degree in English from McMaster University and is an Associate of the Insurance Institute of Canada and holds the Canadian Risk Management designation through McMaster University.

Jody currently holds the position of Senior Risk Management and Insurance Coordinator for the City of Hamilton. The Risk Management department at the City of Hamilton is responsible for identifying and monitoring the physical and financial assets, resources, and liabilities of the City of which the Water/Wastewater division plays an important role. Jody will provide assistance to the City's internal staff on any insurance and risk matters related to the Project.

Richard Male – Director, Financial Services

Rick has 33 years of Public Sector experience within the municipal finance area. He holds a Bachelor of Science Degree (Math) and Master of Business Administration degree both from McMaster University and has also obtained his Certified Management Accounting Designation.

Rick commenced his public sector career with the Regional Municipality of Hamilton-Wentworth as a Budget Officer in 1979 which was followed by promotions to the Supervisor of Payroll, Pensions and Benefits (1980), Supervisor of Accounting (1982), Accounting Analyst (1984), Manager of Revenue (1986) and then Director of Accounting (1989). In 1998, The City of Hamilton and the Region of Hamilton-Wentworth amalgamated their administrative areas including Finance and Rick was appointed the Director of Accounting Services within the amalgamated Finance area. In 2001 Rick was appointed to the position of Director of Financial Services for the newly amalgamated City of Hamilton, which is the position he currently holds. This position is responsible for Accounts Payable, Procurement, Banking, Accounting Services, Accounts Receivable, Payroll and Pensions and user support for the City's major financial software applications including policy development for these areas. The budget for this division is $6.5 million gross and $3.4 million net with a staff of 64.

During the 33 years of municipal service Rick was responsible for selecting and implementing Human Capital Management and Financial software packages and has served on various task groups including a committee struck by the Association of Municipalities of Ontario to review Unconditional grants and make recommendations to the Province, the Regional Chief Administrative Officers committee established with the mandate to review municipal performance measurements and identify best practices, a Finance Task Force established to review the finance functions of the Hamilton and Hamilton-Wentworth School Boards and to make recommendations on best practices to the new amalgamated School Board, a joint Task group of municipal and Provincial representatives to review various Go Transit issues including

development charges, funding and allocation of costs to affected municipalities and several task groups established by the Transition Board overseeing the amalgamation of The Region of Hamilton-Wentworth, the Cities of Hamilton and Stoney Creek, the Towns of Dundas, Ancaster and the Townships of Glanbrook and Flamborough to review services and service levels to be provided by the newly amalgamated City of Hamilton.

Richard will provide support to the Project Manager with regards to the procurement process for the Project.

John Savoia – Senior Policy Advisor

Mr. Savoia currently holds the position of Senior Policy Advisor with the City of Hamilton Financial Planning and Policy Division of the Corporate Services Department. Mr. Savoia has 21 years of broad finance experience in both the private and public sectors including the past 6 years with the City of Hamilton. During his tenure with the City, Mr. Savoia has supported the financial analysis of several high profile Projects that the City has been involved with including the $75 million rebuild of City Hall, the $29 million purchase of a rebuilt Lister Block and the $20 million City investment towards the soon to be constructed McMaster Health Campus. Mr. Savoia has supported City efforts with respect to several grant programs provided by the senior governments including stimulus funding and other infrastructure grant programs, as well as, securing low cost loans via programs offered by the Canada Housing and Mortgage Corporation and the Federation of Canadian Municipalities.

Mr. Savoia is proposed as part of the City's Project Team for the Project and will provide the financial support function to the team.

Deborah A. Edwards – Senior Solicitor

Ms. Edwards is currently a Senior Solicitor in the Legal Services Division of the City of Hamilton. She has over 22 years of providing legal services on various municipal projects as legal counsel to the former Regional Municipality of Hamilton-Wentworth and to the City of Hamilton. She has extensive experience in several areas of law, including municipal, commercial, construction, procurement and environmental law.

She received a Bachelor of Arts degree in Political Science from the University of Toronto in 1982 and a Bachelor of Laws degree (with distinction) from the University of Western Ontario in 1985. She was Called to the Bar in 1987.

13.2.3. Post Financial Close

The Project Manager will lead the management and oversight of the contract with Project Co during the construction phase. The City will reserve the right to contract with the Technical Advisor:

- to provide compliance procedures during the Design and Construction phase; and
- to oversee the acceptance process at Substantial Completion.

Unlike traditional Projects, P3 Projects involve long-term contractual relationships that require a Project sponsor to invest in resources to manage these long term arrangements. International best practice is to ensure that individual/team that will be ultimately responsible for managing the contract with Project Co. should be involved as early as possible, preferably at the pre-procurement stage, in the development of the Project to ensure a number of risks do not occur. These risks include:

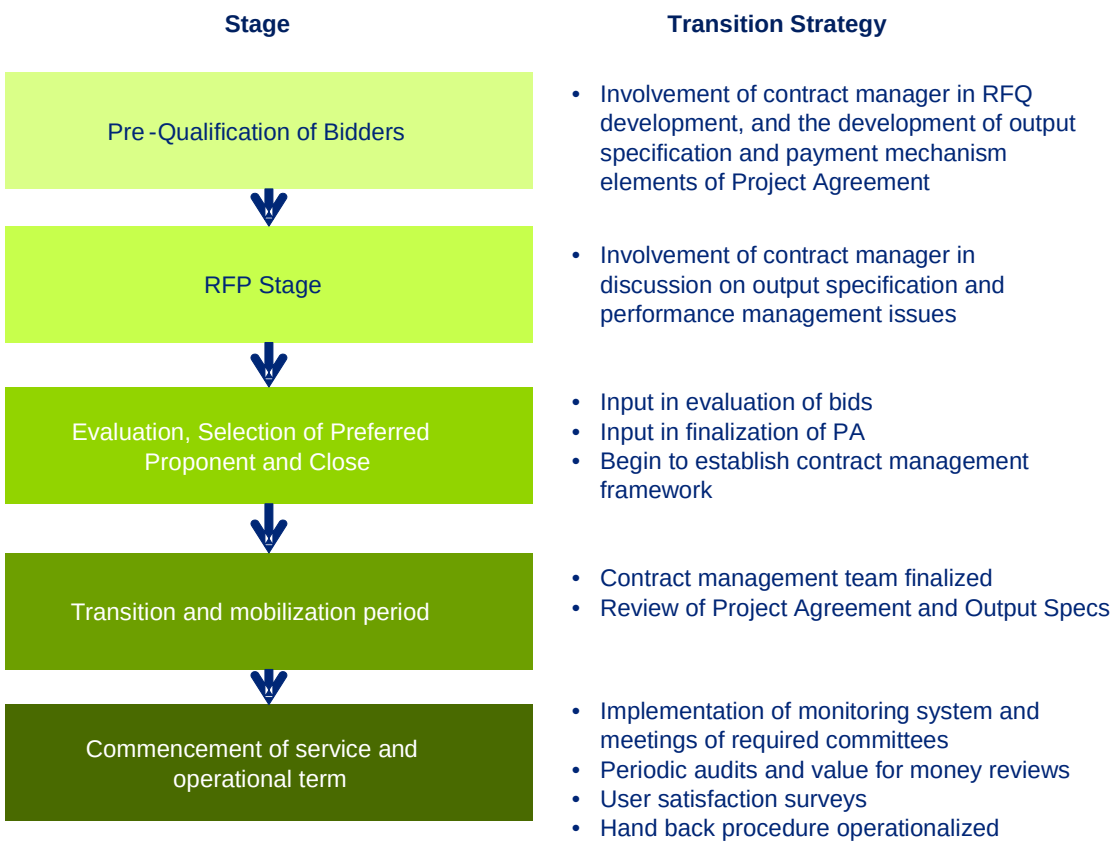
- Late appointment of the contract management team, leading to the team having to balance the need to “get up to speed” on the contract documents while actively managing the contract itself;
- Relationship conflicts related to the contract management team lacking knowledge and understanding of the Project Co.’s service solutions and relevant contract provisions;
- Inappropriate or inconsistent application of deductions for poor performance because of the contract management team’s lack of knowledge of the payment mechanism and monitoring system; and

- Inappropriate scope or poor services implementation resulting from not involving the contract management team in the mobilization of the Project.

The Project Manager during the procurement phase, Dan Chauvin, will lead the oversight and contract management with Project Co. This will ensure a smooth transition between the procurement phase, construction phase, and the operations phase. The Project Manager will be supported by staff, to ensure knowledge transfer and appropriate succession planning.

The figure below illustrates, at a high level, the City's transition/succession management strategy at different stages of delivering the Project:

Figure 19 – Illustrative Transition Management Strategy



13.3. Project Resourcing and Costs

The City has estimated a cost of approximately $2.5 million required to cover the planning and procurement costs in relation to the Project. The estimated costs are currently in-principle and will be required to be approved by the City Council as a budget item. The funding requirement for each category within the process has been identified as follows:

Table 24: Estimated Planning and Procurement Costs

Category	Estimated Costs
Financial / Transaction Advisor	$550,000
Legal Advisor	$550,000
Technical Advisor	$400,000
Owner's Engineer during Construction	$1,000,000
Total	**$2,500,000**

Mr. Dan Chauvin, Project Manager, has committed at least 50% of his time towards this Project. The City staff will continuously work with the City Council and other stakeholders to secure any further resources that may be required to move the Project through the planning, procurement, and post-procurement phases of the Project in terms of time, the training, and budget.

13.4. Procurement Approach

Where possible, the City intends to base contractual risk allocation on standard PPP document templates in Canada. The City will also refer to precedent documents for other successful PPP transactions in the biosolids sector. Market soundings have emphasized:

- the need for a simple approach and therefore while template documents will be used as a reference, the City's intent is to craft more concise project documents; and
- a procurement process that is open to allow for bidder feedback and input, and also includes processes that will protect commercially confidential issues.

The City intends to follow best practices for DBFOM procurement and will implement procedures to address the concerns and lessons learned raised through market soundings.

There will also be some important differences for the RFQ for the Project. This is because some information would be required to be disclosed at the RFQ stage which has primarily not been done so in the past; this will cause slight variations in the procurement documents. Information would be disclosed to assist the respondents / bidders in preparing their bids. A detailed term sheet will be provided within the RFQ, containing the detailed terms and conditions for the Project. Further, the RFQ document will also look to contain guidelines on the RFP evaluation criteria.

13.5. Procurement Safeguards

Consistent with best practices in Canadian procurement, the City will utilize a Fairness Monitor, conflict of interest and confidentiality provisions, and evaluator training in order to safeguard the integrity of the procurement process.

13.5.1. Fairness Monitor

The City will retain an independent Fairness Monitor to oversee the RFQ and RFP process. The role of the Fairness Monitor will be:

- To observe and input into the procurement process in order to assess the extent to which the process is transparent, free from bias, and conducted in accordance with the terms and conditions of the RFQ or RFP, as applicable
- To report to and advise the Council on the extent to which the process is transparent, free from bias, and conducted in accordance with the terms and conditions of the RFQ or RFP, as applicable
- To prepare a final report on procurement process

13.5.2. Confidentiality and Conflict of Interest Agreements

All participants in the procurement process will be required to sign confidentiality and conflict of interest declarations. Any disclosed conflicts will be reviewed by the City's legal counsel and procurement lead to determine if that individual should be excused from the evaluation process. Procedures will follow best practices in the Canadian PPP market.

13.5.3. Evaluator Training

All evaluators will receive training, in advance of the RFQ and RFP evaluations.

The training session will be conducted to provide an overview of the Evaluation Process, to review privacy, confidentiality and conflict obligations of all participants, and to inform the Evaluation Teams of the Evaluation Process, communication protocol, and their respective evaluation requirements during the process.

Section 14: Project Sponsor

14.1. City of Hamilton and the Public Works Department

The City of Hamilton is Canada's ninth largest City with a total population of just over 500,000. Hamilton is a port City in the Canadian province of Ontario and has become the centre of a densely populated and industrialized region at the west end of Lake Ontario known as the Golden Horseshoe. On January 1, 2001, the new City of Hamilton was formed through the amalgamation of the Cities of Hamilton and Stoney Creek, the Towns of Ancaster, Flamborough and Dundas, and the Township of Glanbrook. Since 1981, the metropolitan area has been listed as the ninth largest in Canada and the third largest in Ontario. The most important economic activity in Ontario is manufacturing, and the Toronto–Hamilton region is the most highly industrialized section of the country. The City is also referred to as the Steel Capital of Canada with approximately 60% of the country's steel being produced in Hamilton. Hamilton is a combined residential, commercial, institutional and industrial City and is home to McMaster University and Mohawk College.

The Public Works Department within the City of Hamilton is responsible for undertaking the Project, on behalf of the City. The Public Works Department is responsible for providing the essential services to the residents of Hamilton. The department provides services under three main categories:

Table 25: City of Hamilton - Public Works Department Services

Environment & Sustainable Infrastructure	Operations & Waste Management	Transportation, Energy & Facilities
Road Construction	Road Maintenance	Energy Policy
Parks and Open Space Development	Trees and Flowers	Greening out Fleet
Bridges	Parks Maintenance	Meeting Room Rentals
Water and Wastewater	Cemeteries	Bus Schedules
Drinking Water	ONE Container Limit Information	HSR Ride Guide
Rapid Transit	Green Cart – Organics Program	
Environmental Assessment Projects	Blue Box – Recycling Program	
Streetlights	What's My Collection Day?	

Within the Public Works Department, the Project falls under the ambit of the Water and Wastewater Group. The Water and Wastewater Group provides a variety of services to the City, including:

- **Plant Operations** – responsible for day-to-day operations of the City's water and wastewater treatment facilities;
- **Water Distribution and Wastewater Collection** – responsible for the operation and maintenance of Hamilton's water distribution and wastewater collection systems; and
- **Water and Wastewater Engineering** – responsible for the design and construction of all water and wastewater treatment facility Projects within the Public Works Department.

The main drivers for the capital works program, under the Water and Wastewater Engineering Section, include Projects related to development, sustainable asset management, and improvements to water quality through both our water and wastewater systems. Each design and construction Project is

developed with sustainability as the main focus utilizing the Triple Bottom Line approach for seeking the best balance between Social, Economic and Environmental factors.

14.1.1. City Council

The citizens of Hamilton are represented by three tiers of government: federal, provincial, and municipal. The municipal tier consists of one mayor (elected City wide) and 15 City councillors (elected individually for each of the 15 ward divisions) to serve on the Hamilton City Council. The Hamilton City Council is granted authority to govern by the province through the Municipal Act of Ontario Municipal elections occur in Hamilton every four years with the last election taking place on October 25, 2010 and the next elections scheduled for October 27, 2014.

The City Council is responsible for all final approvals regarding expenditure of all operating and capital funds. This occurs through an annual approvals process for the City's budget. Furthermore, the City Council is also responsible for approval of all tax rates, utility rates, fees, charges etc. in order to ensure that the City has adequate revenues to meet all its expenditure requirements. Hence, the City Council is ultimately responsible for the approval of all infrastructure Projects to be undertaken by the City.

14.1.2. City's Experience with PPPs and the Private Sector

The City of Hamilton has previous experience in PPP Projects which over the last 10 to 15 years include waste management contracts (facility and operations), the Water & Wastewater Treatment Plant Facility Operations contract, and the Quad Pad Arena Partnership Project. In addition, the City is currently acting in the capacity of a sponsor for the Pan Am Games Project procured by Infrastructure Ontario.

The City is also currently contracting with Terra Tech (a subsidiary of American Water Services Canada) for storage of its dewatered biosolids at the Power Grow Systems Facility in the Niagara region. The storage facility is currently leased and operated by Terra Tech. The City's internal team is familiar with working with private sector partners in the water and wastewater sector.

Section 15: Summary of Funding Request

Based on the Business Case, the City's request for funding is as follows:

- 25% of total eligible capitalized costs, based on the Affordability Cap set by the City and accepted by P3 Canada. This is expected to be no higher than $30 Million. The final contribution may be lower, depending on the technology selected.

- 25% of eligible development costs, as follows:

Category	Estimated Cost	Eligible Amount
Financial / Transaction Advisor	$550,000	$137,500
Legal Advisor	$550,000	$0
Technical Advisor	$400,000	$100,000
Owner's Engineer during Construction	$1,000,000	$250,000
Total Budget	**$2,500,000**	**$487,500**

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Appendix A – Detailed RFI Process

List of firms contacted re: RFI

Plenary Group

Brookfield Financial

Forum Equity Partners

SNC Lavalin Inc.

Macquarie Capital Group

AECOM Canada Ltd.

ACS Infrastructure Canada

Veolia Water Solutions and Technologies

Dalkia Canada Inc.

Liberty Energy Resources

EPCOR Utilities Inc.

Corix

Bilfinger Berger

Anaergia

Terra Tech

Covanta Energy

N-Viro Systems Canada LP

Graham Construction and Engineering

Maple Reinders

Lystek International Inc.

Waste Management Canada

List of Respondents to RFI

Developers	Integrated Developers	Technology Providers
Plenary Group	Veolia Water Solutions and Technologies Canada	Eisenmann Corporation
	Anarergia	Infilco Degremont Inc. (IDI)
	AECOM	Secural Datashred Inc.
	Lystek International Inc.	Natureworks Limited DBA
	WeCare Organics LLC	WESSUC Inc.
	Enertech Environmental Inc.	
	Kenaidan Contracting Inc.	
	N-Viro Systems Canada LP.	
	Terra Tech Environmental Ltd.	
	Synagro – WWT Inc.	
	Biosolids Distribution Services & Schwing Bioset Inc.	
	Liberty Energy Resources	

Appendix B – Summary Chart of Technical Responses to RFI

Respondents		Veolia (VWS) A	Veolia (VWS) B	EISENMANN	Infilco (IDI)	Secural Datashred	Anaergia	AECOM	Naturewor ks/Nexteq	WESSUC	Lystek	WeCare Organics	Enertech	Kenaidan (KCL)	N-Viro	Plenary Group	Terratec Environme	Synagro-WWT A	Synagro-WWT B	BDS/SBI	Liberty Energy[3]	Total
Parameter																						
Classification																						
	Thermal Reduction	1		1	1			1				1		1				1			1	8
	Enhanced Treatment		1				1		1		1		1		1				1			7
	Land Application									1							1					2
	Other					1														1		2
Screen-in Criteria																						
	3 full scale applications	Y	Y	N[1]	Y	N	Y	Y	N	0	Y	N	N	Y	Y	0	Y	Y	Y	N[2]	Y	12
	5 years operation (3 appl)	Y	Y	N	Y	N	Y	Y	N		N	N	N	Y	Y		Y	Y	Y	N	Y	11
	≥5000 dry tons per year (3)	Y	Y	N	Y	N	Y	Y	N		N	N	N	Y	N		Y	Y	Y	N	Y	10
	meet all three (3 appl)	3	3	0	3	0	3	3	0	0	1	0	0	3	2	0	3	3	3	0	3	10
Marketable By-products																						
	Fertilizer		Y				Y				Y		Y		Y				Y	Y		7
	Fuel												Y		Y				Y			3
	Ash	Y		Y	Y							Y		Y				Y			Y	7
	Electricity (FIT)				Y									Y				Y			Y	4

Appendix D – Case Studies and Jurisdictional Review

Jurisdictional Review

The Project Team has carried out a Canadian jurisdictional review to assess biosolids management Alternatives and Technologies in use in other major Canadian cities. Based on the results of the review, the most common approach to biosolids management is Enhanced Treatment which is used in all but four of the sample below. Land application is exclusively used in Calgary, Ottawa, Winnipeg and Saskatoon, in which specific programs for biosolids management have been developed by those cities. Thermal Reduction is employed in five of those localities but in three of those is complemented with Enhanced treatment. There are only two localities (Region of Peel and Durham) where Thermal Reduction is employed exclusively.

Location	Alternative	Technology	Comments
1) Toronto	Thermal Reduction, Enhanced Treatment, Land Application	Fluidized bed thermal treatment, Alkaline Stabilization, Pelletization, Landfill, Site Remediation	Currently has contracts with: -) Terratec: Haulage and land appplication -) WeCare: 5 year contract for reception and processing of biosolids at an alkaline stabilization facility in US. -) Lystek: Agreement to take title to up to 20,000 tonnes of biosolids per year.
2) Metro Vancouver Region	Enhanced Treatment	Anaerobic thermophilic, Anaerobic mesophilic, Aerobic cryophilic	Produces biosolids type Class A & B
3) City of London	Thermal Reduction, Enhanced Treatment	Fluid Bed Incinerators, Bioset Schwing	Mainly incinerates, only treated in the Bioset if the incinerator is down for maintenance
4) Region of Peel	Thermal Reduction	Fluid Bed Incinerators	Plant installation by Infilco Degremont teamed with Kenadian and Black & Veatch
5) Calgary	Land Application	Subsurface injection	Biosolids reuse program called Calgro
6) Edmonton	Enhanced Treatment, Land Application	Composting	biosolids managed at the Edmonton Waste Management Centre together with house hold waste
7) Ottawa	Land Application	Land applied, Landfill Cover and Landfilled	A Technology assessment is currently ongoing.
8) Winnipeg	Enhanced Treatment, Land Application	Digestion and dewater	WinGRO program operated by the City of Winnipeg
9) Halifax	Enhanced Treatment	N-Viro	N-Viro has an operating contract for complete operations of the biosolids processing facility plus approvals, marketing and distribution of the product. Approximately 35,000 product tonnes are produced each year.

Location	Alternative	Technology	Comments
10)City of Windsor	Enhanced Treatment	Pelletization	Terratec provides the management of the biosolids in partnership with the City trough a 20 year contract. Terratec is also responsible for the marketing of the pellets as an approved fertilizer including haulage and spreading.
11) City of Saskatoon	Land Application	Liquid injection	The sludge is injected at a depth of 0 - 10 centimeters depending on soil conditions and the density of the biosolids.
12) Region of Waterloo	Currently Land Application, Shifting to Enhanced Treatment	Heat drying, ATAD	-) Terratec provided management of liquid biosolids for ten years, as well as complete haulage and land application, and was also responsible of storage, supertant, and mixing operations of the liquid biosolids. -) The biosolids Management Master Plan (2011), recommended: -) To process the Region's biosolids into Class A products. -) To Install a second-generation ATAD to process solids a Class A biosolids product that can be land applied or marketed as a fertilizer. -) To install a centralized heat drying facility to process dewatered biosolids.
13) City of Greater Sudbury	Shifting to Enhanced Treatment	Schwing Bioset ATTAD N-Viro	Procurement for new provider of enhanced treatment technology underway
14) Region of Halton	Enhanced Treatment, Land Application	Dewater to cake material.	-) Terratec has provided management of the biosolids for the past 30 years. Terratec is responsible for the management of storage, for the operation and minor maintenance and also stores dewatered biosolids at its own operated facility. -) Halton Region initiated a comprehensive Master Plan Study to evaluate alternative technologies and biosolids management options
15) Niagara Region	Enhanced Treatment	Alkaline Stabilization,	Currently has contracts with: -) N-Viro and Walker industries own the contract and the facility in Thorold, which is managed by the joint venture. Approximately 19,000 product tonnes are produced, marketed and distributed each year. -) Terratec: Provides haulage and land application services.
16) Region of Durham	Thermal Reduction	Fluid Bed Incinerators	Plant installation by Infilco Degremont teamed with Kenadian
17) City of Guelph	Enhanced Treatment	Alkaline Stabilization,	Lystek system designed for processing over 6,000m3 of dewatered biosolids per year.
18) Town of St. Mary's	Enhanced Treatment	Alkaline Stabilization,	Lystek system designed for processing over 6,000m3 of dewatered biosolids per year.
19) City of Sarnia	Enhanced Treatment	Alkaline Stabilization,	N-Viro provides technical support, QA/QC, product approval, marketing and distribution of the product. Approximately 10,000 product tonnes are produced each year.
20) Town of Leamington	Enhanced Treatment	Alkaline Stabilization,	N-Viro co-manage the plant, provides technical support, QA/QC, product approval, marketing and distribution of the product under an operating contract. Approximately 11,000 product tonnes are produced each year.

Case Study of Biosolids PPP Projects - Barwon Water Biosolids Management

Project Description

The Barwon Region Water Corporation ("Barwon Water") is Victoria's largest regional water corporation and provides quality water and sewerage management services to more than 271,000 people. The Barwon Water Biosolids Management Project ("Barwon Project") will provide an environmentally sustainable, long-term management scheme for the utilization of biosolids produced at Barwon Water's water reclamation plants. For this purpose, the Barwon Project includes the construction of sludge

receiver facilities, fully enclosed sludge storage systems, dual train Keppel Seghers HARD Pelletisers (indirect gas fired dryers), fully enclosed intermediate storage at the black rock site, and a program ensuring all biosolids are used without prolonged storage.

The Barwon Project involves the design, construction and operation of a fully enclosed thermal drying facility for the treatment of approximately 54,000 tonnes of biosolids per year. The facility has been designed and constructed with sufficient capacity to cater to the Barwon Water's needs for the next 20 years and to deal with the full range of expected operating conditions. The facility treats the biosolids to the highest possible T1 treatment grade and allows for the beneficial use of the treated biosolids as farm fertilizer or fossil fuel replacement. The biosolids facility replaced the practice of transporting biosolids to another facility for drying.

The Project was one of the first Projects to be delivered as a PPP (Design-Build-Finance-Operate-Maintain) Project under the Partnerships Victoria framework for a local water authority, Barwon Water, located at Conneware, Victoria. To ensure the technology was suitable, a pilot plant was imported to test operate under local conditions.

Project Facts

The Project was valued at a **Net Present Value ("NPV") of $68 million** with a contract term (operating term) of 20 years. The Project achieved financial close in August 2007 and is expected to be completed in 2012.

Project Sponsor - Plenary Group ("Plenary") is the Project sponsor, equity investor and financial arranger for the Project.

Design and Construction - Water Infrastructure Group; Key subcontractors: Applied Group and Keppel Seghers.

Operations & Maintenance – Water Infrastructure Group

Beneficial Use Provider – Australian Biolife

Australian Biolife, as subcontractor within the Project Co., is responsible for the marketing and sale of the end-product from the processing of the biosolids in the Barwon Project. For this purpose, the Project Co. was able to take risk on around 8% of the revenues. To mitigate this risk, the Project Co. did have some contracts in place, at the time of financial close, with customers. However, there was residual risk ultimately left with the Project Co.

The plant must produce T1 grade biosolids as dictated by the EPA so the biosolids may be used in agriculture reducing the reliance on fertilizers and improving soil structure. Also, the biosolids may be used for fuel resulting in 100% beneficial use of biosolids. Other environmental mitigations include an 80% reduction in land area required for biosolids processing at the Black Rock water reclamation plant, a 40% reduction in greenhouse gas emissions when compared with biosolids treatment by long-term storage, 60% less truck movements reducing emissions, and a zero odor emissions arising from the biosolids treatment and application.

Project Funding

The Project has been financed with a debt-equity ratio of 71:29. Details of the financing are as follows:

Equity Financing: Underwritten equity financing of $20 million by the Plenary Group and subscribed during the Project construction period by way of secured subordinated loans.

Debt Financing: A single tranche of senior debt of $48 million with a tenor of 20 years, fully underwritten by the Bank of Tokyo-Mitsubishi UFJ.

For the Barwon Project, Barwon Water has leased 2 hectares of land to the concessionaire for the entirety of the Project term. At expiration, the concessionaire will return the land to Barwon Water.

Revenue Stream (Cash Flow) Created through Initial Commitment of Public Sponsor(s): The concessionaire will receive monthly payments from Barwon Water during the operations term by way of a payment mechanism that is subject to variability determined by the concessionaire's ability to meet the contract service requirements. Charges are based on availability to accept input materials, volume of biosolids processed, and volume of biosolids beneficially used.

Lessons Learned

The following represent the key takeaways from the Project, as applicable to the City of Hamilton biosolids Project:

- Quality of inputs can serve as a cause of concern to the Project Co. as that would impact the quality of the end-product (Class A pellets) produced from the Enhanced Stabilization process and hence impact revenue generation from sale of the pellets. As there are no long-term contracts with customers, Project Co. may be forced to dispose / landfill the end-products due to low quality, leading to loss of revenues.
- To aide in the sale of the biosolids end product through the Enhanced Stabilization process, the marketing and sale can be subcontracted to a firm part of the consortium, forming an integrated approach, where that firm would assume responsibility for sale of end-products (Class A pellets).
- **Commercial Risk:**
    - Risk for sale of end-product is retained somewhat by the Project Co. through its subcontractor, Australian Biolife.
    - Project Co. was able to take risk on some of the revenues which was somewhat mitigated through having contracts with customers of the biosolids end-products in place at the time of bidding for the Project.
    - As the Project Co. still retained some revenue risk on the end products after mitigating, other risk mitigation efforts might be required by the Project Co. to further reduce its risk in the Project.
- **Financing:**
    - With the capital cost and commercial risk transfer structure as discussed, the Project was funded with a debt-to-equity ratio of 71:29, representing a relatively low gearing in a Project where reasonable risk for sale of end-product is still on the Project Co.

Case Study of Biosolids PPP Project – Philadelphia Biosolids Facility

Project Description

The biosolids Recycling Center ("BRC"), an arm of the City of Philadelphia Water Department ("PWD"), was in need of critical support to manage the City's dewatered biosolids, with the looming risk of regulatory enforcement due to an expired Title V air management operating permit. Remedial measures were required to be conducted to: reduce odours, improve site aesthetics, and produce, distribute, and market Class A biosolids. The BRC is located in the southwestern section of Philadelphia, adjoining the Southwest Water Pollution Control Plant and the Philadelphia International Airport.

Synargo Technologies ("Synargo"), through the Philadelphia biosolids Services ("PBS"), assumed control of managing the BRC's Dewatering Complex in October 2008 with the focus to build a thermal drying facility based on Synargo's technology to provide dewatering and beneficial use management. The new facility will manage 100% of the City's biosolids into a "Class A" pathogen free biosolids product (fertilizer), processing up to 65,000 dry tonnes of biosolids per year.

The Project consisted of an interim operations phase, followed by the DBO of the new facilities. The interim operations phase required Synagro to assume the operation of the existing BRC dewatering facility and provide management of all biosolids generated – approximately 220,000 tons per year from the PWD's three water pollution control plants.

Project Facts

PBS has entered into a 23 year contract with the City of Philadelphia with a construction period of 5 years to Design-Build-Operate ("DBO") a Class "A" Drying Facility at the BRC, under a PPP delivery method.

The DBO phase required the demolition of the moth-balled composting equipment, design and construction of the new **$75 million** Philadelphia Renewable Bio-Fuels ("PRBF"), thermal drying facilities, and operations of the PRBF to provide long-term, cost effective and environmentally sound management of PWD's biosolids. The new facility is expected to result in savings of estimated $200 million over the life of the contract. The new recycling center was on track to be fully operational by February 2012.

Under the contract, PBS assumes the responsibility for the testing, hauling, storage, marketing, reuse, and disposal (where necessary) of the Class A product (fertilizer). Next steps in the Project is the development of a long-term management plan ("Marketing Plan") for the movement and sale of up to 60,000 dry tons of pellets, which will be produced annually by the BRC. PBS's Marketing Plan involves identification and targeting of highest value markets for the Class A product and developing an action plan to maximize tonnage sold and sales revenues from each market.

Revenue from sale of the Class A biosolids, although small, is shared between the City of Philadelphia and Synargo. From commercial risk perspective, Synargo assumes the entire risk of marketing of the Class A biosolids (Synargo has the ultimate responsibility for the sale). At the time of bidding of the Project, there had been no customer lined up by Synargo and hence there was a risk element during the procurement process. For marketing purposes, Synargo would look at different alternatives for sale where the Class A biosolids would either be sold as fertilizer, fuel, or if no customer could be sought, the biosolids would be sent for landfill.

Project Risks:

The most significant risks relate to construction and to potential future regulatory changes:

1. Construction risk is largely mitigated by cash flow from the Project Co.'s interim agreement to operate the City of Philadelphia's existing biosolids Recycling Center. The cash flows from this application are available for application to construction overruns. Construction and equipment contracts also benefit from customary bonding, retainage and liquidated damages provisions.

2. Changes in law regarding pellet utilization, transportation, storage or disposal of sludge could alter the Project Co.'s process requirements and cost profile. 'Change in Law' provisions in the service contract that might protect bondholders explicitly exclude changes in local law.

Project Funding

Construction (Equity) Financing - PBS provided approximately $7 million as construction financing for the Project.

Debt Financing – $68 million BBB+ rated bonds issuance. Bonds are fully amortizing and secured solely by a first and exclusive lien on the trust estate and a leasehold mortgage.

- The Project will earn a fixed capacity charge sized to debt service payments and equity return as well as fixed and variable operating charges. The fixed and variable operating charges are sized to cover all of the plant's anticipated normal operating expenses. The Project can, however, incur revenue reductions from PMA if it disposes of any more than 4,000 DTPY without converting it into Class A pellets.
- A base case scenario assumes that 60,000 DTPY are processed and that all expenses are passed through according to the formulas in the service agreement. In this scenario, the **debt service coverage ratio** averages approximately 1.5x during the first 10 years of the Project. In a scenario where the Project receives processing revenue from only the contracted minimal volume, the ratio averages 1.4x. An alternative case considers processing revenues from 54,000 DTPY and a 10% operating expense increase that cannot be passed through to the PMA. In this scenario, the ratio falls to 1.2x[13].

Lessons Learned

The following represent the key takeaways from the Project, as applicable to the City of Hamilton biosolids Project:

- Marketing and sale of the end product was not subcontracted out to another firm, as an outside party or part of the Project Co. consortium. Hence, the entire responsibility for sale of the end-product (Class A biosolids) was retained by Synargo.
- **Risks:** The following significant risks, as identified in this Project, may exist as relevant to an Enhanced Stabilization technology based Project:
    - Construction risk
    - Change in law risk – Regulatory changes regarding utilization of end-products from the biosolids process as well as other environmental regulatory changes can alter the process requirements and cost profile of the Project for the Project Co.
- **Revenue Sharing**:
    - Marketing and sale of the end-product (Class A pellets) from the Project has been structured such that there is sharing of revenue between the City of Philadelphia and Synargo (Project Co.) from the sale to customers.
- **Commercial Risk:**
    - All commercial risk (for sale of end-product) is assumed by the Project Co. as it retains full responsibility for the sale / disposal of the Class "A" biosolids. No risk transfer or risk sharing between Project Co. and the City.
    - No customer had been locked into a long-term agreement for the biosolids end-product at the time of procurement / bidding by the Project Co. As stated by the Project Co., this did not have a material adverse impact on the bid.
    - Hence, under this case, the Project Co. shares the upside of the sale of the end-product with the City whereas the City does not retain any commercial risk for the sale.

[13] Based on Fitch Ratings

- **Financing:**
    - Financing for the Project was conducted at a high gearing with a D/E ratio of approximately 91:9 with long-term debt financing of $68 million through BBB+ bonds issued by the Pennsylvania Economic Development Financing Authority.
    - Short-term financing / construction financing all through equity by Project. Co.
    - A DSCR within the range of 1.2x to 1.5x, varying based on factors such as:
        - Quantities of DTPY processed (and sold); and
        - Pass-through of operating expenses

Appendix E - Basis for Design

TECHNICAL MEMORANDUM CH2MHILL®

Hamilton Biosolids P3 - Basis of Conceptual Design for Base Case

PREPARED BY: Burrowes, Peter/KWO

DATE: September 27, 2011

PROJECT NUMBER: 434618.03.40

The following provides the assumptions used in developing the conceptual design of three alternatives for the Base Case development. The three alternatives are: Land Application, Thermal Reduction and Enhanced Treatment.

General

The conceptual design is based on the alternatives utilizing digested, dewatered biosolids from the existing Woodward Avenue WWTP. The WWTP currently anaerobically digests primary and waste activated sludge and dewaters the resulting biosolids with centrifuges. The following summarizes the biosolids quantities and quality of the dewatered anaerobically digested biosolids:

- Base Year: 2014 (all opinions of cost are in 2012$)
- biosolids quantities: 43,923 wet tonnes per year annual average (RFI Appendix A)
- Annual growth rate: 1%
- Peaking Factors: 1.25 (maximum month); 1. 5 (maximum week)
- Dewatered biosolids dry solids content: 27%
- Dewatered biosolids volatile solids content: 61% of dry solids (latest value, higher than Peer Review)
- Digester capacity upgrades will be included as part of WWTP expansion
- Dewatering centrifuges have firm capacity of 72 dry tonnes per day (above peak week Projections).
- Any on-site processing facility must be accommodated in the footprint established in the Class Environmental Study Report. This footprint allows a rectangular building occupying 3,000 m^3. There is additional space to accommodate 2 tanks or silos of up to 14 m diameter each.

(Agricultural) Land Application

The land application alternative is based on a service contract with a biosolids land application company. The service fee includes adequate off-site storage during inclement weather and winter conditions. With the Nutrient Management Act and regulations, the land applicator prepares required approvals, such as

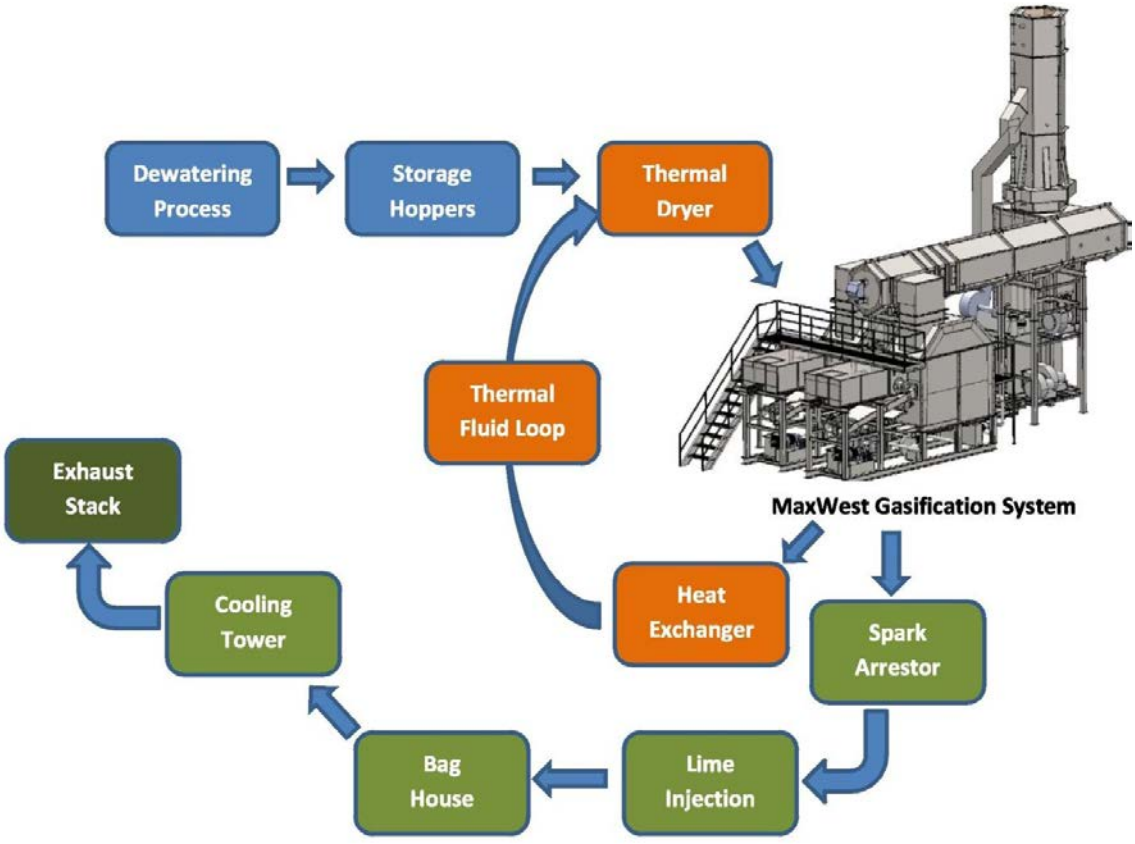
Non-agricultural Source Material (NASM) plans and system Certificates of Approval for their vehicles. It is assumed that no additional capital works is required for truck loading. However, the existing facility was installed as a temporary measure. Therefore, a permanent loading facility with sufficient storage to accommodate long weekends, together with odour control, has been developed.

Thermal Reduction

Thermal reduction, for the purposes of the RFI, is defined as a thermal treatment that completely oxidizes the organic component of the biosolids and results in a product that comprises mostly inert materials. Current technologies that are commercially available or are emerging are thermal treatment and gasification. Gasification is an emerging technology with limited commercial experience processing biosolids. Two proprietary technologies (MaxWest Biogasification System and Eisenmann Pyrobuster Process) were submitted as part of the RFI. Modern incinerators for biosolids use the fluid bed technology and the basis of design is based on this. A brief discussion on gasification is provided before the basis of design.

Gasification. Gasification is the conversion of organic matter into a synthetic gas (syngas) comprised mostly of carbon monoxide and hydrogen, with some methane as the combustible components under temperature and in the absence of oxygen. As energy is required to heat the organic material, in practice some of the organic matter is oxidized in the presence of some oxygen. As a result, the syngas also contains carbon monoxide, nitrogen (from the air used to oxidize the organic matter) and water. Gasification technologies typically fall into two categories: two-staged combustion (where the syngas is oxidized by adding air in a thermal oxidation chamber and the heat developed is recovered in a boiler or heat exchanger) or as fuel (where the syngas is cleaned, stored and used as a fuel, most typically in an engine generator of combustion turbine).

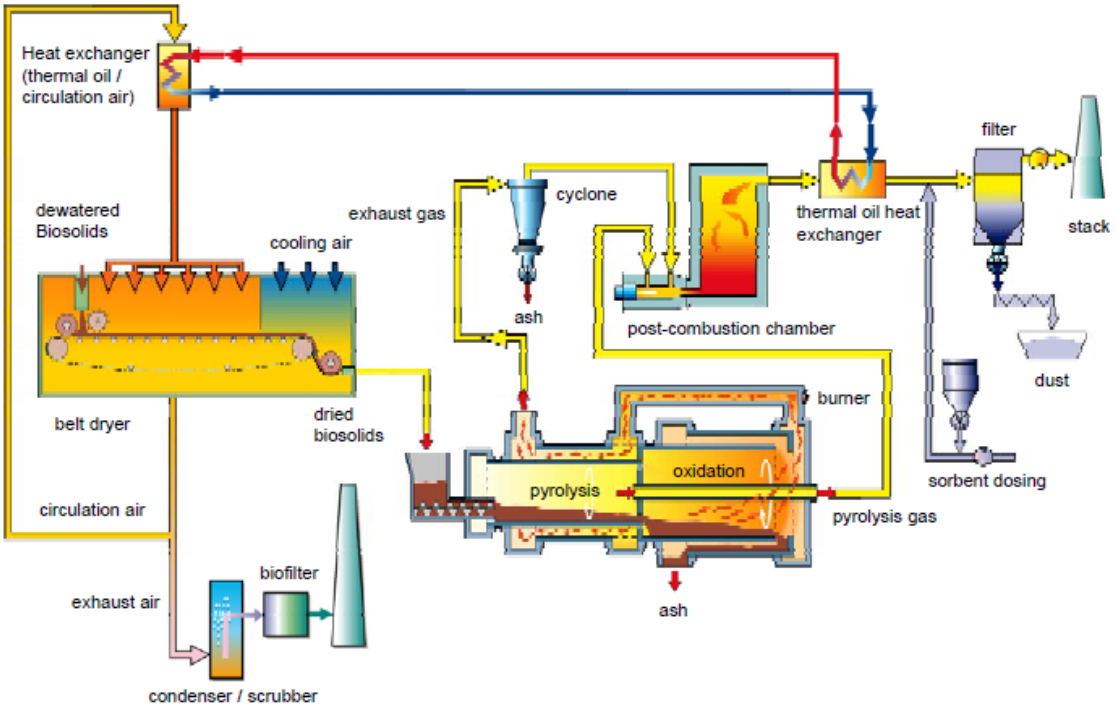
MaxWest Biogasification System. The MaxWest technology offered by WeCare Organics is a two-stage combustion system. Dewatered biosolids are dried and then introduced into the gasifier (see Figure 1).



MaxWest Biogasification System Schematic

In the gasifier, the biosolids are heated by injection of some air and the majority of the biosolids are converted into a syngas. The syngas passes through the thermal oxidizer where the syngas is oxidized and the temperature is increased. The gas then passes through a thermal oil heat exchanger where the gas is cooled and the heat transferred to the thermal oil is used in an indirect dryer to dry the dewatered biosolids. The exhaust gas is passed through an air pollution control system before exiting the stack

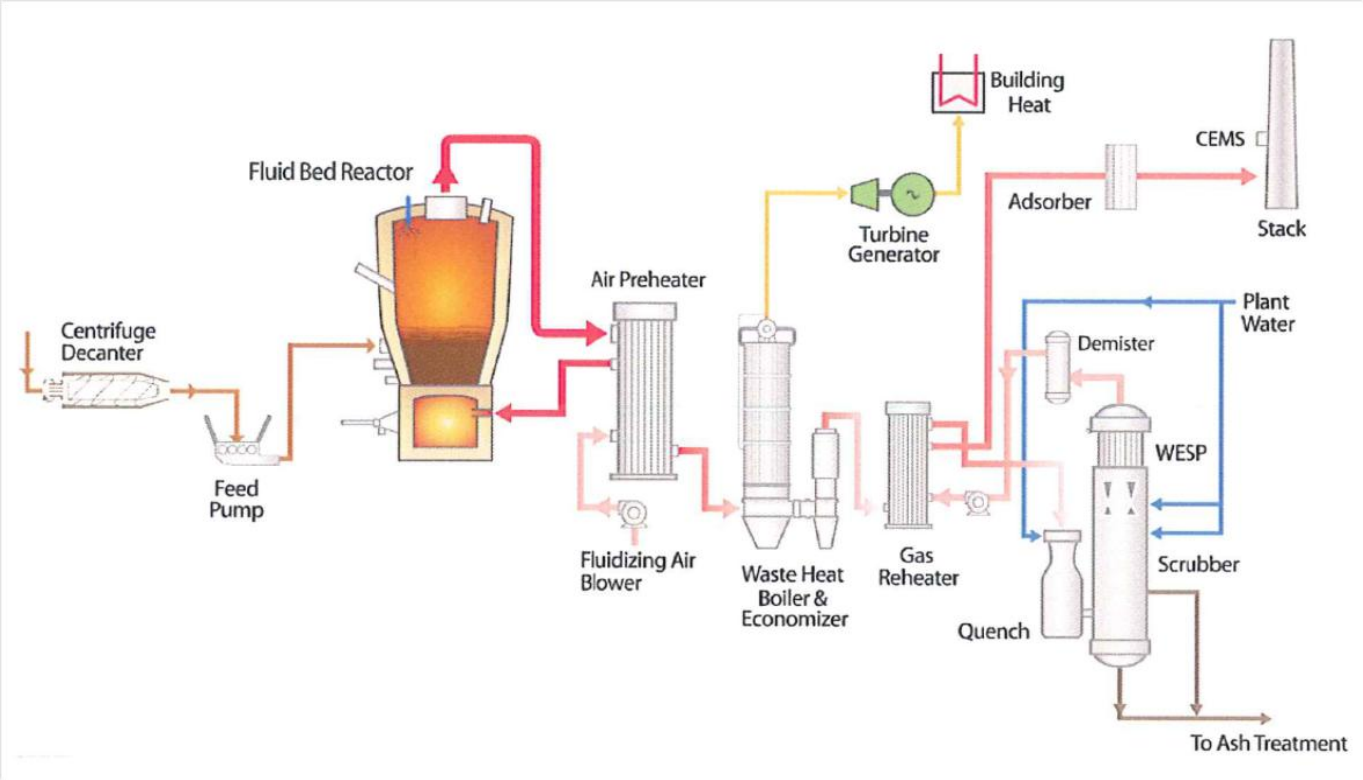
Eisenmann Pyrobuster Process. The Eisenmann Pybusted Process is a two-stage combustion system that uses rotary kiln technology (see Figure 2). Similar to the MaxWest system, dewatered biosolids are dried then gasified.



Pyrobuster Equipment Diagram

The Pyrobuster system uses a belt dryer that is heated with energy recovered from the gasification process. Dried biosolids are fed to the Pyrobuster rotary kiln where Pyrolysis produced syngas, followed by an oxidation chamber which provides heat for the Pyrolysis chamber. Syngas is oxidized in the post combustion chamber and resulting heat is recovered in a thermal oil heat exchanger. The thermal oil heats the air used in the belt dryer. Gases from the post combustion chamber are treated in the air pollution control train before discharge through the stack.

Basis of Design - Incineration. The thermal reduction alternative is based on a fluidized bed incinerator system, with recovered heat in the form of steam used to generate electricity. The thermal reduction train (see Figure 3) includes a hot windbox reactor, a fluidizing air-to-flue gas heat exchanger, a waste heat recovery boiler, a Venturi-Pak style wet scrubber, a mercury removal system incorporating a gas conditioner a flue gas reheater and a static bed carbon absorber. A fluidizing air blower and induced draft fan provide gas movement. Cake pumps are provided to feed dewatered biosolids to the reactor. Steam recovered in the boiler is used to drive a steam turbine generator set to generate electricity. Ash removed in the scrubber is settled in an ash thickener and dewatered by a vacuum filter. All equipment, except the ash thickener is located indoors.



Thermal Reduction System

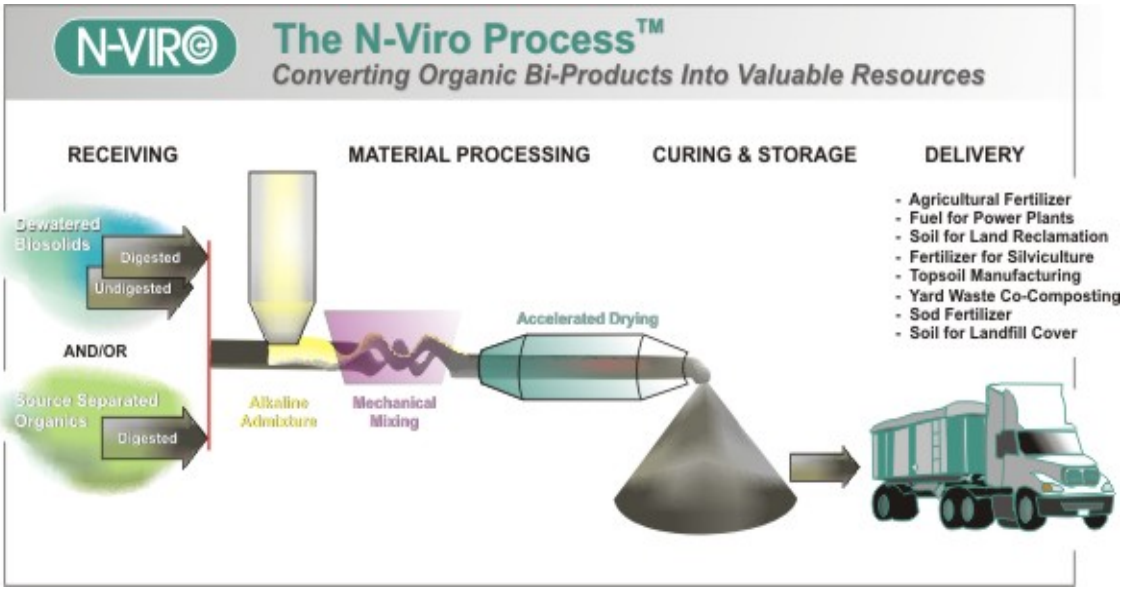
The system will be designed to meet requirements that the Ministry of the Environment include as conditions of the Environmental Compliance Approval (ECA). As such, the air pollution control train will be as described earlier. The WESP (wet electrostatic precipitator) shown in Figure 1 is not required. The fluid bed reactor may require auxiliary fuel for continuous operation and will require fuel for start-up. Natural gas has been assumed as the fuel of choice. Steam generated will be used to generate electricity. The electricity could be eligible for FIT pricing, if the level of auxiliary fuel is below the threshold. (The FIT program is under review by OPA and could change during the planning of this Project. Preliminary indications are that FIT level of pricing for biomass will not change). Plant effluent water is required for gas scrubbing and condenser cooling for the steam turbine generator. It is assumed that the water will be supplied internally. However, the electricity required for pumping is included in the basis of design. City water is required for boiler feedwater make-up and chemicals are required for boiler water treatment. As the plant will produce steam above 105 kPag, it will be registered under the Operating Engineers Act as a Second Class Power Plant and will require licensed operators (a chief operator with a 2nd Class Operating license and a shift operator with a 3rd Class operating license). An auxiliary shift operator will also be required on shift. It is assumed that three maintenance staff will be assigned to the facility to carryout routing mechanical, electrical and instrumentation maintenance.

Enhanced Treatment

Enhanced treatment, for the purposes of the RFI, includes any processes that changes the quality of the anaerobically dewatered biosolids (commonly referred to as Class B) and would allow the product to be used in applications other than the current land application program (commonly referred to as Class A). Uses include soil amendments, fertilizer, and other non-agricultural fuel. The following are examples of enhanced treatment and were included in responses to the ROI: alkaline stabilization (The N-Viro® Process; Bioset Alkaline Stabilization Process and Lystek biosolids processing technology) and thermal drying. Thermal drying covers several generic systems, including direct and indirect heating and variety types of equipment, such as drum dryers, belt dryers, paddle dryers, fluid bed dryers, and disc dryers. As such, thermal drying, which is the most readily available and proven of these technologies, with multiple vendors. Thermal drying has been used to develop a conceptual design for enhanced treatment. A brief discussion is provided for the alkaline stabilization technologies prior to discussing the basis of design.

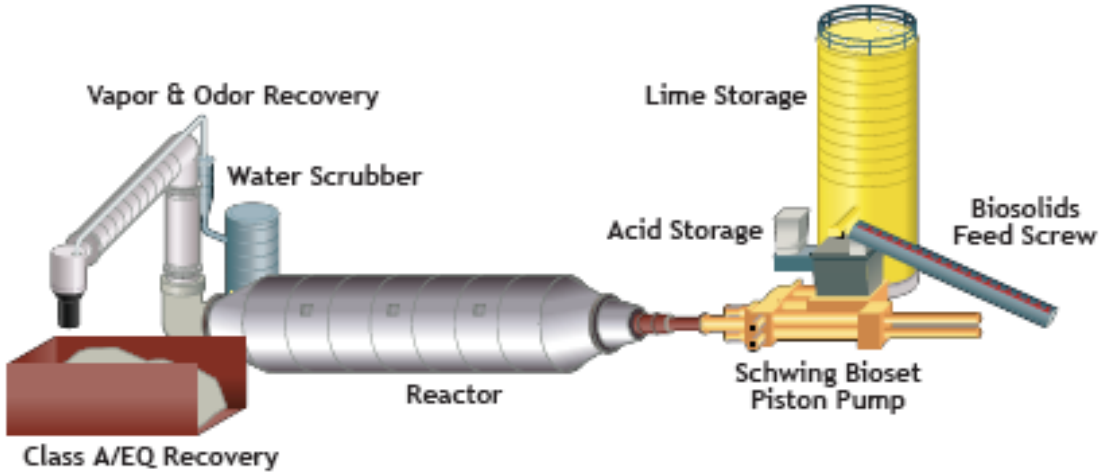
Alkaline Stabilization. Alkaline stabilization is the addition of an alkaline material to biosolids to destroy pathogens and generally to provide a stable material that is drier than dewatered biosolids and can provide alkaline amendment to soils, in addition to the organic matter and micro and macro nutrients present in Class B material.

The N-Viro® Process. The N-Viro process is based on adding cement kiln dust to biosolids in a mixer, holding in a "heat pulse" step for 24 hours, followed by accelerated drying in a rotary dryer (see Figure 4).



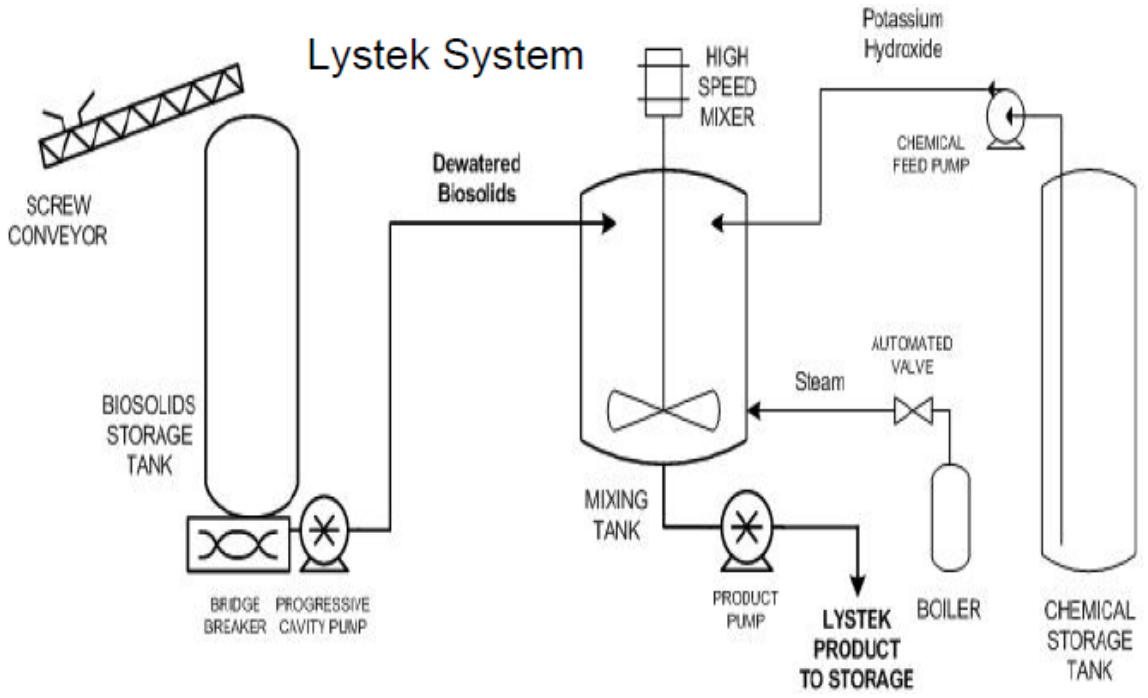
N-Viro Process Flow

Bioset Alkaline Stabilization Process. The Bioset process is based on adding lime and sulfamic acid into a reactor, where the alkaline stabilization process takes place.



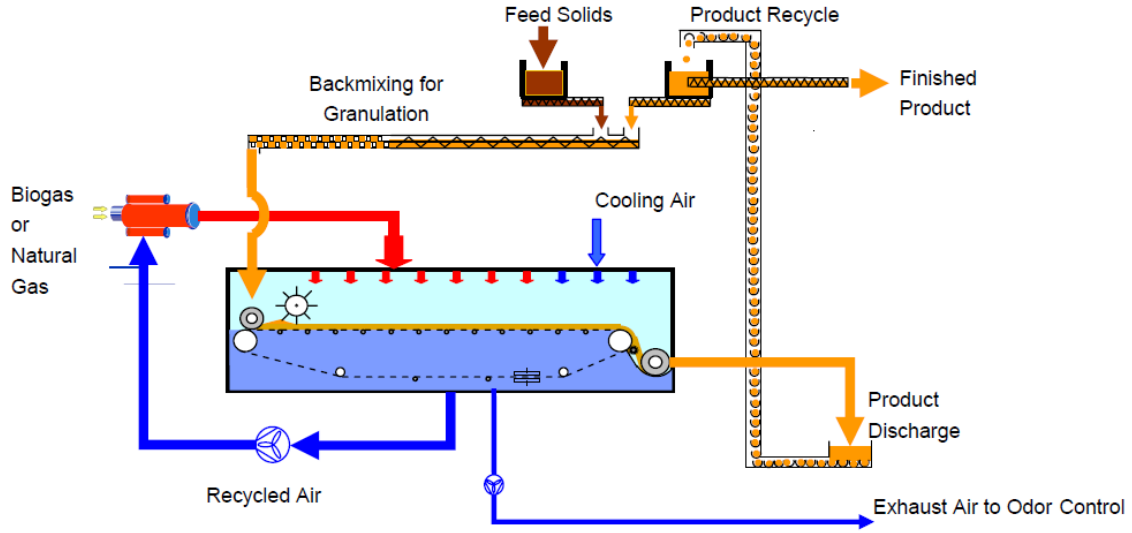
The resulting soil-like material is stored and then distributed for agricultural land application as a soil enhancer.

Lystek biosolids Processing Technology. The Lystek technology produces a pumpable product by heating and emulsifying dewatered biosolids that is mixed with potassium hydroxide. The material can be sub-surface injected to agricultural land.



Lystek Flow Schematic

Basis of Design – Thermal Drying. The enhanced treatment alternative is based on thermal drying using a belt dryer. The belt dryer system (see Figure 6) utilizes direct heating of the drying air with natural gas.



Belt Dryer Flow Schematic

Belt dryers use the direct contact of circulating hot air on wet biosolids that is pumped onto and conveyed by a slowly moving horizontal belt enclosed in a metal enclosure. The wet material moves through several drying chambers, where the moisture is released into the circulating air. After passing through the drying chambers, the dried material falls off of the belt into a hopper and is conveyed to a loading or storage facility.

Each drying zone has its own circulating fans and air temperature controls. Excess moisture is removed from the air stream in a saturator. Heat for the air circulation loop in each zone is provided in a heat exchanger by indirect contact with hot air serving as the heat source. The drying temperatures are controlled at approximately 150°C at the belt entry and at 100°C at the belt discharge. The biosolids is heated to approximately 75°C in its dried state. The lower drying temperature is claimed to produce a less

odorous exhaust stream, and the drying process is less prone to accidental combustion than rotary drum dryers, which operate at much higher temperatures.

Cake pumps feed biosolids to a mixing screw, where dried product is recycled and mixed with the biosolids. The resulting mixture is discharged to the belt where it is dried and discharged to a product conveyor and conveyed to storage. Exhaust is treated in a saturator with plant water to condense moisture removed during drying. This air is recycled to the dryer and a portion is treated in a thermal oxidizer and discharged to atmosphere.

The system is sized to operate 24 hours a day 5 days per week. This allows time for weekly maintenance and to manage peak loading. The plant will utilize 3 belt dryers, each sized to evaporate 3 tonnes of water per hour.

The plant will be staffed by two operators per shift and three maintenance staff will be assigned to the facility to carryout routing mechanical, electrical and instrumentation maintenance.

Appendix E-1 – Land Application Regulatory Framework

Prior to 2002, the application of biosolids to agricultural land was regulated under the Environmental Protection Act (EPA) and Ontario Regulation 347, General - Waste Management. The Ministry of the Environment (MOE) regulated land application through issuance of Certificates of Approval (CofA) and enforcement of conditions in the CofA. Conditions generally were based on Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Lands. In 2002, the Ontario Ministry of Agriculture and Rural Affairs (OMAFRA) developed the Nutrient Management Act, followed by Ontario Regulation 267, General in 2003, to address several aspects relating to the land application of nutrient products in Ontario, including biosolids. The new regulation contained many of the requirements of the Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Lands and in addition had a requirement for municipalities to provide 240 days of storage and prepare nutrient management strategies. Biosolids were referred to as non-agricultural source materials (NASM) under both the EPA and the NMA. This new regulatory structure regulated NASM under two acts. In addition to still requiring CofAs for land application, municipalities had to prepare nutrient management strategies and invest significant capital in storage facilities to provide 240 days of storage. The industry believed that this regulatory framework could result in a decline in land application in Ontario.

In recognition of the confusion caused by duplication of regulations, the MOE and OMAFRA proposed amendments to the EPA and Ontario Regulation 267 in 2009. NASM would be regulated under the NMA and not under the EPA. The objectives were:

- Ensure that environmental protection is maintained
- Manage material as nutrients, not wastes
- Reduce regulatory duplication
- Establish standards based on the quality of the material
- Ensure consistency of standards across the province
- Ensure clear requirements are outlined.

The proposed changes in Ontario Regulation 267 included eliminating the requirement for 240 days of storage, a definition of three categories of NASM, two sub-categories of criteria for pathogens (equivalent to U.S. EPA Class A and Class B), two sub-categories of criteria for metals and three sub-categories of criteria for odours. With these categories, application rates, setbacks from environmentally sensitive features and adjacent properties were well defined. Municipalities would be responsible for source sampling biosolids and farmers responsible for soil sampling and preparing NASM plans, which would replace CofAs. The Ministry's NMAN nutrient model was also refined to determine allowable application rates with respect to nitrogen and phosphorus (macro-nutrients) and metals (micro-nutrients). The amendments were implemented in two phases in 2010 and 2011. With the new NASM regulatory framework in place, application of biosolids to agricultural land is well defined and well understood by the industry.

Appendix F - PPP Suitability Screen

See following page.

Criteria	Land Application	Enhanced Treatment	Thermal Reduction
Project Size	• Less than $20 Million, and proportionally high operating costs – clear size and operational gearing issue	• Likely greater than $20 Million, but still some concerns about operational gearing	• Likely to be well in excess of $20 Million
Market	• Recent experience suggests limited market of qualified service providers	• Market scan and RFI responses suggest competitive market of qualified service providers	• Market scan and RFI responses suggest competitive market of qualified service providers
Nature of the Project	• Combination of new infrastructure on City site and possible upgrade/expansion of existing off-site infrastructure (storage, trucking fleet)	• New infrastructure	• New infrastructure
Integration	• Single integration point	• Single integration point	• Single integration point
Consistency	• Service requirements expand based on biosolids production. Can be dealt with through forecasting and payment mechanism.	• Service requirements expand based on biosolids production. Can be dealt with through forecasting and payment mechanism.	• Service requirements expand based on biosolids production. Can be dealt with through forecasting and payment mechanism.
Performance Measurement	• Yes – acceptance of biosolids, compliance with regulations, maximum quantity to landfill.	• Yes – acceptance of biosolids, compliance with regulations, maximum quantity to landfill.	• Yes – acceptance of biosolids, compliance with regulations, maximum quantity to landfill.
Asset Life	• Typically no long term asset base	• Plant designed for 20-30 year life	• Plant designed for 30 year life or more
Maintenance Requirements	• Significant operating requirements	• Significant operating and maintenance requirements	• Significant operating and maintenance requirements
Refurbishment Requirements	• Limited	• Yes	• Yes
Limiting Factors	• Continued availability of volunteer farmers who provide land for biosolids application. Risk likely cannot be transferred to Project Co. for 20-30 years.	• Commercial risks associated with end product. Precedent Projects and market soundings suggest that this can be managed by private sector.	• Public perception of emissions. Emissions are closely controlled by regulation.
Innovation	• Limited scope for innovation	• Potential for innovation – many different technologies	• Potential for innovation – many different technologies
Revenue	• No revenue opportunities	• Potential opportunities – sale of end product	• Potential opportunities – provide electricity to City or via FIT
Overall Assessment	**Not suitable for PPP**	**Suitable for PPP, subject to further consideration on operational gearing issue**	**Suitable for PPP**

Appendix G – Triple Bottom Line Analysis

Criteria		Criteria weighting	Land Application	Score (1 - 10)	Weighted Score	Enhanced Treatment	Score (1 - 10)	Weighted Score	Thermal Reduction	Score (1 - 10)	Weighted Score
Environmental Impact		40%									
Reliability of Performance and Flexibility	Goal is to achieve consistent, reliable capacity and performance, with minimum downtime, unplanned maintenance, or excessive operational input to address disruption. Considers potential environmental impacts due to poor performance, downtime and contingency management methods. Including ability to meet future biosolids volumes	5.7%	Land Application is not a high-technology approach, so in a sense this makes it highly reliable. There is limited potential for the system as a whole to break down or be off-line. However, there are still many steps in the process (transfer, transportation, storage, land application) which introduces greater vulnerability. biosolids cannot be land applied in winter or in bad weather, so there is an inherent risk. However, this risk is typically managed through storage capacity. City's recent operational history is that this mitigation strategy is effective. There is a limited supply of land application contractors in Ontario that can handle the volumes produced by Hamilton. Recent procurement experience of the City is that there is a very limited market of qualified contractors and if this market were to thin out any further, it would make land application very challenging and perhaps unworkable. Ability to meet future volumes is dependent on volunteer farmer base, which is out of the control of the City.	5	2.9	Higher level of technology than land application so potentially greater vulnerability to downtime. Similar to Land Application, there are many points in the process (treatment, transport of end product, sale of end product) that add variability and potential for downtime. Not dependent on weather or season - can be run any time. Ability to meet future volumes is dependent only on initial plant sizing - within the control of the City.	7.5	4.3	Fewer points in the process - once biosolids are thermally treated on site, the critical phase of the process is completed. Not dependent on weather or season - can be run any time. Ability to meet future volumes is dependent only on initial plant sizing - within the control of the City. Higher level of technology means greater risk of downtime.	10	5.7
Demonstrated Technology	The development status of the technology is assessed, as to whether it is proven at pilot scale or full scale, and proven in only other jurisdictions, or specifically in Ontario. Minimize risk of poor	5.7%	Land Application is in wide use and is a proven method. Currently used in Ottawa, Winnipeg, Calgary (sub-surface injection), Saskatoon (sub-surface injection), Halton Region, Region of Waterloo.	10	5.7	Enhanced Treatment includes newer technology (generally in use for less than 15 years) but has been demonstrated in many locations across Canada. In use in Toronto (pelletizer), Vancouver, Halifax (N-Viro), Windsor (heat drying and pelletization), Niagara/Sarnia/Leamington (N-Viro). Region of Waterloo's biosolids Master Plan has recommended Enhanced Treatment. Guelph - Lystek technology.	7.5	4.3	Thermal Reduction is in wide use and is a proven method. Fluidized bed reactors (currently the most widely used approach for application of Thermal Reduction) have been in use since 1963. Fluidized bed thermal treatment for biosolids is in use in London (Ont.), Mississauga (fluid bed).	10	5.7

Criteria		Criteria weighting	Land Application	Score (1 - 10)	Weighted Score	Enhanced Treatment	Score (1 - 10)	Weighted Score	Thermal Reduction	Score (1 - 10)	Weighted Score
	performance										
Impacts during Construction	Minimize impact on WWTP plant operations and risk to WWTP performance during construction	5.7%	Minimal - just building a loading facility.	10	5.7	Minor impact - a larger Project than Land Application.	7.5	4.3	Larger Project so slightly more impact than Land Application.	7.5	4.3
Non-renewable Fuel Use (GHG Emissions)	Minimize non-renewable fuels including electricity, gas, and vehicle gasoline	5.7%	Heavy use of diesel fuel for trucking biosolids to land application locations.	5	2.9	Also includes some use of diesel fuel for trucking end product to market. Potential for lower truckload requirements if Enhanced Treatment solution is a "dry" solution as opposed to wet product which weighs more. Enhanced Treatment technologies require electricity but many technologies produce power for use within the process.	7.5	4.3	Typically produces more electricity than it consumes. Some natural gas use. Very little material sent to landfill (ash).	10	5.7
Regulatory Risks	Current and future Regulatory Risks associated with each alternative	5.7%	Recent revisions to the Nutrient Management Act have clarified the regulatory environment and generally reduced regulatory risk factor. Land application is regulated under Ontario Reg. 267/03 which sets out quality criteria for biosolids to be land applied. Land applicators (volunteer farmers) must file a non-agricultural source materials (NASM) Plan, which must be completed by a certified developer and requires soil testing. This replaces the old system of site certification. The regulations prescribe 12 month loading restrictions, beneficial use criteria, maximum application rates, setback and separation requirements, and waiting periods. Maximum application rate of 22 tonnes/hectare/5 years, or as restricted by content of metals, sodium, or other parameters.	7.5	4.3	Enhanced Treatment solutions are typically regulated under Canadian Fertilizers Act. There is little regulatory risk at this time - the Act is not expected to change significantly. Fertilizers or supplements (compost) sold in Canada are regulated by the Canadian Fertilizers Act and must meet safety, efficacy, and labeling standards (basically looking at trace metals, whether amount of nutrients satisfies guidelines, and whether labeling is misleading. May require pre-market approval before sale, or may simply be required to comply with standards. Letter of No Objection to Sale (LONO), renewed every 3 years. The trigger for CFIA is sale and representation that it contains nutrients.	7.5	4.3	Air emissions are regulated under the Environmental Protection Act (EPA). The EPA is already quite strict and not expected to change significantly. Any Thermal Reduction technology will be engineered to meet air emissions regulations.	7.5	4.3
Impacts on air, soil and surface ground water	Degree to which each alternative impacts air, soil and surface ground water	5.7%	Positive impact on soil - land application of biosolids does provide soil with nutrients. However, it is a less processed product as compared to Enhanced Treatment products which are land applied. Extensive use of diesel fuel	5	2.9	Enhanced Treatment has the least air emissions of the Alternatives. The process itself has few emissions and less trucking is required after processing (less diesel use). Soil impact (as a fertilizer) is more beneficial as it is a Class A material (more processed and less pathogens, etc.).	7.5	4.3	Thermal Reduction does have air emissions but they are tightly regulated by the EPA and the technology will have to include a significant air pollution control train. Less impact from trucking, as compared to the other two Alternatives. No impact on soil or ground water.	7.5	4.3

Criteria		Criteria weighting	Land Application	Score (1 - 10)	Weighted Score	Enhanced Treatment	Score (1 - 10)	Weighted Score	Thermal Reduction	Score (1 - 10)	Weighted Score
			to transport biosolids to land application sites has a negative impact on air quality.								
Compatibility with Future Opportunities	Goal is to provide flexibility to be able to readily adapt to new opportunities for biosolids management or energy recovery without significant capital investment	5.7%	Provides a high level of flexibility to invest in new technologies in the future - low "barriers to exit'. However, no significant infrastructure is developed through this approach so major capital investment is required to develop any new opportunity.	7.5	4.3	Opportunities for nutrient recovery. Opportunities to grow the market for the product and to utilize the product in other industries.	7.5	4.3	Can still do nutrient recovery. Could take advantage of opportunities for resale of ash.	7.5	4.3
Total Environmental Impact					**28.6**			**30.0**			**34.3**

Criteria		Criteria weighting	Land Application	Score (1 - 10)	Weighted Score	Enhanced Treatment	Score (1 - 10)	Weighted Score	Thermal Reduction	Score (1 - 10)	Weighted Score
Social Impact		30%									
Air Pollutant Emissions/Noise	Minimize potential impacts to the community or plant operations staff from the release of contaminants in air and noise from the alternative	9.0%	Alternative creates a great deal of truck traffic, which impacts on air (emissions) and creates noise impacts to the community as well.	7.5	6.8	Alternative involves less trucks than Land Application, but still creates an air and noise impact. There may also be a small stack associated with the facility itself, but should be pretty minimal, not an emissions intensive process.	7.5	6.8	Uses fewer trucks than the other two Alternatives but involves controlled air emissions from a large stack.	7.5	6.8
Odours	Minimize potential health/quality of life effects from odours	9.0%	Odours can be a common issue during the transportation and the application of biosolids. However, the City's current land application program has recently taken steps to mitigate this issue which have been effective to date.	5	4.5	May be some odours if the Enhanced Treatment technology is a "wet" solution that is land applied, however dry technologies offer the potential for relatively odour free approaches.	7.5	6.8	No odours.	10	9.0
Traffic/Road Condition/Public Safety	Minimize potential impacts to the local community during operations from truck traffic	9.0%	Will likely have the greatest truck traffic during operations.	5	4.5	Will likely have a lesser amount of truck traffic (although "wet" solutions could have truck traffic that approaches Land Application).	7.5	6.8	Will have the least amount of truck traffic - minimal, used for periodic disposal of ash.	10	9.0

Criteria		Criteria weighting	Land Application	Score (1 - 10)	Weighted Score	Enhanced Treatment	Score (1 - 10)	Weighted Score	Thermal Reduction	Score (1 - 10)	Weighted Score
Community Impacts during Construction	Minimize potential impacts to local community from noise, dust and traffic during construction and minimize period of construction and related impacts	3.0%	Small Project, should have minimal impact on community during construction.	10	3.0	Medium sized Project - will have some impact on community during construction.	7.5	2.3	Large Project - will have the greatest impact on the community during construction.	5	1.5
Total Social Impact					**18.8**			**22.5**			**26.3**

Criteria		Criteria weighting	Land Application	Score (1 - 10)	Weighted Score	Enhanced Treatment	Score (1 - 10)	Weighted Score	Thermal Reduction	Score (1 - 10)	Weighted Score
Economic Impact		30%									
Net Present Value (NPV) & Life Cycle Costs	Net present value (NPV) of the total costs to the City for the design, construction, operations and maintenance of the facility/service using a 30 year operating term.	15.0%	Estimated NPV of $97M under Traditional (Design-Bid-Build) Project delivery model.	10	15.0	With P3 Canada funding, total estimated NPV cost to the City under a Design-Build-Finance-Operate-Maintain Project delivery model could range from $112M to $147M, depending on forecast sales and pricing of end product (pellets). Without P3 Canada funding, total estimated NPV cost to the City under a Design-Build-Finance-Operate-Maintain Project delivery model would be $10 to $15 M higher.	5	7.5	With P3 Canada funding, total estimated NPV cost to the City under a Design-Build-Finance-Operate-Maintain Project delivery model is $180M. Without P3 Canada funding, total estimated NPV cost to the City under a Design-Build-Finance-Operate-Maintain Project delivery model is $10 to $15 M higher.	1	1.5
Risk Assessment	Degree of risks associated with each alternative for the municipality. This criteria considers whether risks can be transferred to the private sector under a PPP structure or not.	15.0%	Risk assessment indicates that City bears approximately $40 million in estimated quantified risks over a construction + 30 year period, under the Traditional Design-Bid-Build method. These risks include risk related to regulatory approvals, construction, operations, lifecycle maintenance, and Project management. The Business Case provides more detail on the risk assessment. The risk assessment has been carried out assuming the Traditional Design-Bid-Build method. This is because the Land Application alternative is not likely to be a suitable candidate for a public-private partnership model such as Design-Build-Finance-Operate-Maintain, due to its low upfront capital costs, low complexity, and relatively high operations and maintenance costs. Therefore, a public-private partnership model	1	1.5	This Alternative is suitable for Design-Build-Finance-Operate-Maintain due to its larger upfront capital costs and increased technical complexity. The risk assessment indicates that under a Design-Build-Finance-Operate-Maintain Project delivery method City bears approximately $5 - $10 million in estimated quantified risks over a construction + 30 year period, as this model shifts risks to the private sector. The Business Case provides more detail on the risk assessment. Under a Traditional Design-Bid-Build method, the City bears approximately $50 million in estimated quantified risks over a construction + 30 year period, using a Traditional DBB Project delivery method. This was not considered for the Triple Bottom Line analysis since the City's optimal approach for this Project is using the Design-Build-Finance-Operate-Maintain.	10	15.0	This Alternative is suitable for Design-Build-Finance-Operate-Maintain due to its high upfront capital costs and high technical complexity. The risk assessment indicates that under a Design-Build-Finance-Operate-Maintain Project delivery method City bears approximately $5 - $10 million in estimated quantified risks over a construction + 30 year period, as this model shifts risks to the private sector. The Business Case provides more detail on the risk assessment. Under a Traditional Design-Bid-Build method, the City bears approximately $70 million in estimated quantified risks over a construction + 30 year period, using a Traditional DBB Project delivery method. This was not considered for the Triple Bottom Line analysis since the City's optimal approach for this Project is using the Design-Build-Finance-Operate-Maintain.	10	15.0

Criteria		Criteria weighting	Land Application	Score (1 - 10)	Weighted Score	Enhanced Treatment	Score (1 - 10)	Weighted Score	Thermal Reduction	Score (1 - 10)	Weighted Score
			that would shift significant risks to the private sector is not available for Land Application.								
Total Economic Impact					**16.5**			**22.5**			**16.5**
Total Score		**100%**			**63.8**			**75.0**			**77.0**

Appendix I - Financial Model Input Assumptions

Costing and Technical Inputs

Item	Assumption	Rationale
Construction Costs – Land Application	$9,152,639.849	As provided by CH2M Hill.
Construction Costs – Enhanced Treatment	$46,384,727.062	As provided by CH2M Hill.
Construction Costs – Thermal Reduction	$93,090,691.771	As provided by CH2M Hill.
Annual Operations & Maintenance Costs – Land Application	$3,188,631.414	Calculated with the inputs provided by CH2M Hill ($2012). It considers Labor and Haulage costs.
Annual Operations & Maintenance Costs – Enhanced Treatment	$3,400,017.443	Calculated with the inputs provided by CH2M Hill ($2012). It considers Labor, Haulage, Utilities and Disposal costs. Disposal only applies when the fertilizer is not sold.
Annual Operations & Maintenance Costs – Thermal Reduction	$2,862,443.029	Calculated with the inputs provided by CH2M Hill ($2012). It considers Labor, Haulage, Utilities, Disposal (biosolids to landfill and Ash to landfill) and other inputs (Sand for FBI, Chemical, and Activated Carbon) costs.
Lifecycle Costs – Land Application	$75,911.999	Calculated with the inputs provided by CH2M Hill ($2012). Includes equipment and building maintenance.
Lifecycle Costs – Enhanced Treatment	$422,287.726	Calculated with the inputs provided by CH2M Hill ($2012). Includes equipment and building maintenance.
Lifecycle Costs – Thermal Reduction	$965,234.098	Calculated with the inputs provided by CH2M Hill ($2012). Includes equipment and building maintenance.
Electricity rate Kwh	$0.085	Liberty assumptions. Rate was based on analysis of Hamilton WWW electricity costs over the past six months at that time.
Labor Cost per worker	$81,818.182	Liberty assumptions. City Master Plan Assumption: Annual administration charge of $80,000, based on salary and overhead for administrative clerk position using an FA I pay grade as the compensation rate.
Gas GJ rate	$8.450	Liberty assumptions. Based on forecast commodity prices and regulated delivery charges, from City energy department.

Costing and Technical Inputs

Item	Assumption	Rationale
Land Application		
Labor (Employees #)	1.00	As provided by CH2M Hill.
Haulage $/year	$3,106,813	As provided by CH2M Hill (biosolids Quantity * $69.34/tonne).
Equipment maintenance	$53,100	As provided by CH2M Hill.
Building Maintenance	$22,812	As provided by CH2M Hill.
Enhanced Treatment		
Pellets price per wt	$40	As provided by CH2M Hill.
Fertilizer wt/year	12,716.03	As provided by CH2M Hill.
Fertilizer wt growth	1%	As provided by CH2M Hill.
Labor Operator (Employees #)	1.00	As provided by CH2M Hill.
Labor Maintenance (Employees #)	3.00	As provided by CH2M Hill.

Disposal $/year (in case pellets not sold)	$989,935	As provided by CH2M Hill (biosolids Quantity * $76.92/tonne).
Haulage $/year	$186,610	As provided by CH2M Hill (biosolids Quantity * $14.5/tonne).
Electricity usage kWh/h year in 2016	5,455,965	As provided by CH2M Hill.
Gas usage GJ/year in 2016	111,424.12	As provided by CH2M Hill.
Equipment maintenance	$380,960	As provided by CH2M Hill.
Building Maintenance	$41,328	As provided by CH2M Hill.
Thermal Reduction		
Labor Supervisor (Employees #)	1.00	As provided by CH2M Hill.
Labor Operator (Employees #)	9.00	As provided by CH2M Hill.
Labor Maintenance (Employees #)	3.00	As provided by CH2M Hill.
Disposal (biosolids to Landfill)	$186,610	As provided by CH2M Hill (biosolids Quantity * $76.92/tonne).
Disposal (Ash to Landfill)	$989,935	As provided by CH2M Hill (biosolids Quantity * $100/tonne).
Sand for FBI $/year	$43,061	As provided by CH2M Hill.
Chemicals $/year	$35,000	As provided by CH2M Hill.
Activated Carbon $/year	$3,864	As provided by CH2M Hill.
Electricity usage kWh/h year in 2016	3,330,951.20	As provided by CH2M Hill.
Gas usage GJ/year in 2016	29,021.12	As provided by CH2M Hill.
Water $/year in 2016	$11,978	As provided by CH2M Hill.
Equipment maintenance	$931,080	As provided by CH2M Hill.
Building Maintenance	$34,154	As provided by CH2M Hill.
Electricity FIT price	$0.138	Liberty Assumptions. FIT rate (only 20% inflated) same inflation rate.
Electricity production growth	0.46% yearly (average)	As provided by CH2M Hill.
Electricity production KW/year	5,409,460.76	As provided by CH2M Hill.

Biosolids Quantities

Year	Annual Wet Tonnes	Year	Annual Wet Tonnes
2012	44,271	**2027**	49,988
2013	44,857	**2028**	50,488
2014	43,923	**2029**	50,993
2015	44,362	**2030**	51,503
2016	44,805	**2031**	52,018
2017	45,254	**2032**	52,538
2018	45,706	**2033**	53,063
2019	46,163	**2034**	53,594
2020	46,625	**2035**	54,130
2021	47,091	**2036**	54,671
2022	47,562	**2037**	55,218
2023	48,038	**2038**	55,770
2024	48,518	**2039**	56,328
2025	49,003	**2040**	56,891
2026	49,493	**2041**	57,460

Economic Assumptions

Item	Assumption	Rationale
Construction Period	24 months	Based on technical input from CH2M Hill.
Indexation Base Year	2012	All costs provided in 2012 dollars.
Discount Rate	3.99%	As per City's assumed 30-year borrowing rate.
Inflation rate – construction costs	3.5% annual rate	Conservative assumption – applied to both DBFOM and PSC models.
Inflation rate – operations costs (Labor, Haulage, Disposal, Chemicals, Water)	2.5% annual rate	Bank of Canada core inflation target plus .5%.
Inflation rate – electricity	2.7% annual rate	Liberty assumptions.

Item	Assumption	Rationale
Inflation rate – Gas	2.0% annual rate	Liberty assumptions.
Inflation rate – Lifecycle	2.5% annual rate	Bank of Canada core inflation target plus .5%.
Inflation rate – Pellets	2.0% annual rate	As provided by CH2M Hill.
Annual growth rate (Haulage, Disposal, Gas, Water & Electricity)	1.0% annual rate	As provided by CH2M Hill.
Date of start operation	1-Jan-16	It considers that financial close would be reaching at the end of December 2013 and 2 years of construction.
Operation length	30 years	It is the time Projected for operation.
Spending curve	4.2% monthly - equally distributed during the 24 construction period.	As provided by CH2M Hill.

Financing Assumptions

The financing assumptions are based on market observations from recent transactions, market soundings for this Project conducted by the Project Team, and responses to the RFI where applicable.

City financing assumptions, as well as assumptions relating to the City's transaction costs and Project management costs, have been confirmed with the City.

Project Co. Financing and Commercial Assumptions

Item	Assumption	Rationale
Base Rate for long-term financing	2.77%	Based on Government of Canada 30 year bond yield, at market close March 16 2012.
Long-Term financing	Bond solution. Spread of 2.50% above base rate.	Canadian private placement bond market has previously funded mid-market Projects at the municipal level. Assumed spread based on recent market observations and market sounding consultations with potential participants and private lenders plus 15 bps premium for municipal counterparty risk.
Base Rate for short-term financing	1.49%	Based on swap rate for 2 year CDOR at market close, March 16 2012 .
Short-Term financing	Bank solution. Spread of 1.65% above base rate.	Assumed spread based on recent market observations plus 15 bps premium for municipal counterparty risk.
Target rate of return for equity (IRR)	12%	Typical rate of return on availability based DBFM/DBFOM Projects.
Fees	Underwriting fee on long-term bond – 1.75% Upfront fee on short-term bank – 1.00% Standby fee on short-term bank – 0.66% of spread.	As per recent market observations.
Debt-Equity Ratio	• Land Application – 70:30 • Thermal Reduction - 80:20 • Enhanced Treatment - 70:30	Achievable for availability based Projects with appropriate risk allocation. Based on market sounding consultations with potential participants and private lenders.
Average Debt Service Coverage ratio during operations	• Land Application – 1.79 • Thermal Reduction: 1.46 • Enhanced Treatment: 1.79	Outcome of equity IRR and D/E ratio.
Financial Close Costs	$3.0 Million	Based on market observation from similar sized DBFM Projects (~$50 - $100 M capital cost).
SPV Costs during construction	$300,000 per year	Based on market observation from similar sized DBFM Projects (~$50 - $100 M capital cost).
SPV Costs during operations	$150,000 per year	Based on market observation from similar sized DBFM Projects (~$50 - $100 M capital cost).

City Financing Assumptions

Item	Assumption	Rationale
City long-term borrowing rate (30 years)	3.99%	As per City borrowing from Infrastructure Ontario lending program. Rate current as of March 19, 2012.
Terms	• City borrows to fund all construction payments. • Bond financing, amortized. • City borrows once per year during construction – borrows in January to fund all progress payments to the contractor in the upcoming year. • Debt service once per year.	

Transaction Structure

Item	Assumption	Rationale
Substantial Completion Payment	25% of capital costs.	Model assumes that Substantial Completion Payment is funded by City borrowing. In reality, P3 Canada funding would be applied to fund substantial completion payment.
Financing Approach – DBFOM	• Long-term bond drawn first. • Short-term debt sized to substantial completion payment, drawn once long-term debt is exhausted. • Equity injected last.	Market standard financing approach to optimize efficiency of financing.

VFM Assumptions

Item	Assumption	Rationale
Contractor's Design Contingency	5%	Premium added to base costs of construction for DBFOM based on partial design submission at RFP close, in contrast to Traditional approach where contractors bid on completed design documents. Assume that key aspects of design (technology) are relatively standardized and providers have experience in building this technology previously, so reduced need for contingency.
Upfront Transaction Costs – PSC	$500,000	Fees for design work and legal counsel for tender process.
Project Management Costs during construction – PSC	$800,000 annually	Assume 3 FTE's required to manage construction, plus $500,000 per year for owner's engineer.
Project Management Costs during operations – PSC	$300,000 annually	Assume 3 FTE's required to manage and oversee operations of facility.
Transaction costs during operations – PSC	$300,000 every 5 years	Re-procurement of operations and maintenance contractors every 5 years.
Upfront Transaction Costs – DBFOM	$1,500,000	Costs of financial, legal, and technical advisors for PPP transaction. As per estimate contained in Dec. 12th report to Council.
Project Management Costs during construction – DBFOM	$600,000 annually	Assume 1 FTE required to oversee Project Co., plus 500,000 per year for owner's engineer.
Project Management Costs during operations – PSC	$100,000 annually	Assume 1 FTE required to oversee Project Co.
Transaction costs during operations – PSC	$ -	No additional procurement of contractors required.

Appendix J – Risk Analysis

Risk Scales and Descriptions

Overall Risk Rating	Probability Range		General Description
Remote	1%	5%	• The risk is generally very unlikely to occur and is not expected to materialize on this Project. • The Project Team's experience is that this risk never or almost never transpires on Similar Projects. • Almost all Service Providers are able to avoid this risk through application of standard practices and normal course diligence.
Low	5%	15%	• There is some possibility that the risk could materialize during the Project Period. However, overall the risk is still quite unlikely to materialize during the Project Period. • The Project Team's experience generally supports a sense that the risk does not often transpire on Similar Projects. • This is a risk which most qualified service providers are able to avoid through application of standard practices and normal course due diligence.
Moderate	15%	35%	• There is a reasonable possibility that the risk could materialize on the Project. • Based on the experience of the Project Team, this risk occurs from time to time on Similar Projects. • A well-qualified Service Provider should be able to reduce the probability of this risk occurring through application of best practices and due diligence.
Significant	35%	50%	• There is a good chance that the risk will transpire on this Project, although broadly speaking still less than a 50% chance. • Based on the experience of the Project Team, this risk is relatively common and has materialized on many Similar Projects. • Although the risk arises fairly frequently, a well-qualified Service Provider should be able to reduce the probability of this risk occurring through application of best practices and reasonable due diligence.
Probable	50%	75%	• This risk is more likely to occur than not. • Based on the experience of the Project Team, this risk transpires on the majority of Similar Projects. The risk is prevalent but however is also not a certainty to occur. • Mitigation measures may exist, but they could be very challenging to implement, imperfect, or only partially effective.
Endemic	75%	90%	• This risk occurs on almost all Similar Projects. • It is almost a certainty that this risk will transpire and the risk may be regarded as systemic to a certain extent. • Although mitigation measures may exist, they may be very challenging to implement, imperfect, or only partially effective.

Risk Assessment Results

Land Application

Risk	Estimated Quantified Risks Retained by the City - DBB	Estimated Quantified Risks Retained by the City - DBFOM
Policy and Strategic Risks	$3,751,572	$3,830,306
Environmental Assessment Risks	$58,310	$58,310
Property Acquisition, Approvals and Site Condition	$92,728	$55,636
Infrastructure Design & Technology Specification	$139,945	$69,972
Procurement Risk	$898,214	$730,280
Construction Risk	$732,964	$732,964
Operations Risk	$16,587,774	$12,301,524
Maintenance Risk	$1,981,555	$1,411,725
Ownership and Concession Management	$1,257,790	$5,345,607
Project Agreement	$0	$90,561
Financial Risks	$45,280	$90,561
TOTAL	**$25,546,133**	**$24,717,446**

Enhanced Treatment

Risk	Estimated Quantified Risks Retained by the City - DBB	Estimated Quantified Risks Retained by the City - DBFOM
Policy and Strategic Risks	$3,235,823	$2,039,978
Environmental Assessment Risks	$118,205	$118,205
Property Acquisition, Approvals and Site Condition	$883,096	$506,821
Infrastructure Design & Technology Specification	$709,228	$354,614
Procurement Risk	$3,848,745	$988,191
Construction Risk	$7,626,421	$421,331
Operations Risk	$19,022,101	$1,886,477
Maintenance Risk	$14,411,613	$239,978
Ownership and Concession Management	$218,740	$0
Project Agreement	$0	$131,244
Financial Risks	$65,622	$131,244
TOTAL	**$50,139,593**	**$6,818,083**

Thermal Reduction

Risk	Estimated Quantified Risks Retained by the City - DBB	Estimated Quantified Risks Retained by the City - DBFOM
Policy and Strategic Risks	$1,381,972	$1,703,396
Environmental Assessment Risks	$28,467	$28,467
Property Acquisition, Approvals and Site Condition	$1,751,053	$1,011,757
Infrastructure Design & Technology Specification	$1,423,368	$711,684
Procurement Risk	$7,724,144	$1,983,226
Construction Risk	$15,283,191	$848,168
Operations Risk	$11,318,106	$1,441,648
Maintenance Risk	$29,474,517	$548,525
Ownership and Concession Management	$290,131	$0
Project Agreement	$0	$174,078
Financial Risks	$87,039	$174,078
TOTAL	**$68,761,989**	**$8,625,028**

Appendix L – Project Funding and Affordability

Capital Structure

The Project capital structure is envisioned to include a substantial completion payment of 25% of capital costs. The remaining 75% of capital costs will be withheld and paid to Project Co. over the project term.

If P3 Canada funding is obtained, it will be used to fund the substantial completion payment to Project Co.

The tables below show sources and uses of funds for Project Co. under the DBFOM scenario for Enhanced Treatment and Thermal Reduction Alternatives.

Figure 2: Sources & Uses - Enhanced Treatment

Sources		Uses	
Long-Term Private Debt	$30,862,518	Construction Costs	$50,558,028
Short Term Private Debt	$14,696,437	Interest during Const.	$3,821,454
Subs. Comp. Pmt	$14,696,437	SPV Costs	$600,000
Equity Financing	$13,226,793	Fees and FC Costs	$3,806,267
		Repayment of ST Debt	$14,696,437
	$73,482,185		**$73,482,185**

Figure 3: Sources & Uses - Thermal Reduction

Sources		Uses	
Long-Term Private Debt	$69,079,432	Construction Costs	$101,466,195
Short Term Private Debt	$28,783,096	Interest during Const.	$8,303,646
Subs. Comp. Pmt	$28,783,096	SPV Costs	$600,000
Equity Financing	$17,269,858	Fees and FC Costs	$4,762,545
		Repayment of ST Debt	$28,783,096
	$143,915,482		**$143,915,482**

Project Cost

The estimated costs of the Project to the City are set out below, on an annual basis. The costs are provided for:

- Enhanced Treatment, DBFOM model, assuming “best case” market conditions for the end product
- Enhanced Treatment, DBFOM model, assuming “worst case” market conditions for the end product
- Thermal Reduction, DBFOM model
- Land Application Traditional model, provided as a basis for comparison

Costs with P3 Canada funding

The table below sets out the estimated annual costs of the Project to the City under each of the four scenarios. This table assumes that P3 Canada funding has been provided in the amount of 25% of project capital costs, for the Enhanced Treatment and Thermal Reduction options. Therefore, the City’s share of payment to Project Co. is limited to 75% of Project Co. capital costs (paid in annual instalments) and100% of Project Co. operating and maintenance costs. The estimated costs of Land Application are provided for comparison, based on the Land Application – Traditional model.

Costs with P3 Canada Funding

	Enhanced Treatment (“optimistic” case)	Enhanced Treatment (“pessimistic” case)	Thermal Reduction	Land Application - Traditional
2016	$6,451,434	$8,145,726	$10,822,610	$4,844,852
2017	$6,530,538	$8,281,740	$10,949,811	$4,979,136
2018	$6,612,006	$8,422,039	$11,081,236	$5,118,067
2019	$6,695,910	$8,566,760	$11,217,029	$5,261,806
2020	$6,782,325	$8,716,046	$11,357,342	$5,410,521

2021	$6,871,330	$8,870,045	$11,502,326	$5,564,384
2022	$6,963,003	$9,028,907	$11,652,143	$5,723,574
2023	$7,057,428	$9,192,791	$11,806,958	$5,888,278
2024	$7,154,689	$9,361,858	$11,943,218	$6,058,686
2025	$7,254,874	$9,536,277	$12,083,332	$6,234,998
2026	$7,358,075	$9,716,219	$12,227,412	$6,417,419
2027	$7,464,384	$9,901,863	$12,375,575	$6,606,161
2028	$7,573,898	$10,093,395	$12,527,942	$6,801,445
2029	$7,686,717	$10,291,005	$12,684,636	$7,003,499
2030	$7,802,944	$10,494,889	$12,845,785	$7,212,558
2031	$7,922,684	$10,705,253	$13,011,520	$7,428,866
2032	$8,046,047	$10,922,304	$13,183,309	$7,652,677
2033	$8,173,146	$11,146,262	$13,360,046	$7,884,250
2034	$8,304,098	$11,377,350	$13,541,880	$8,123,857
2035	$8,439,023	$11,615,800	$13,728,963	$8,371,778
2036	$8,578,046	$11,861,851	$13,921,454	$8,628,303
2037	$8,721,294	$12,115,751	$14,119,515	$8,893,730
2038	$8,868,900	$12,377,756	$14,323,313	$9,168,372
2039	$9,021,001	$12,648,129	$14,533,023	$9,452,548
2040	$9,177,738	$12,927,144	$14,748,822	$9,746,592
2041	$9,339,256	$13,215,081	$14,970,895	$10,050,847
2042	$9,505,706	$13,512,234	$15,209,807	$10,365,670
2043	$9,677,243	$13,818,901	$15,456,014	$10,691,429
2044	$9,854,026	$14,135,395	$15,709,747	$11,028,505
2045	$10,036,223	$14,462,037	$15,971,246	$11,377,294
Total Nominal	**$239,923,986**	**$325,460,809**	**$392,866,909**	**$227,990,105**

Costs without P3 Canada Funding

The table below sets out the estimated annual costs of the Project to the City under each of the four scenarios, assuming that no P3 Canada funding has been provided. Therefore, the City must borrow to fund the 25% substantial completion payment to Project Co. Therefore, there is an additional annual cost to the City related to repayment of City debt.

The estimated costs of Land Application are provided for comparison, based on the Land Application – Traditional model.

Costs without P3 Canada Funding

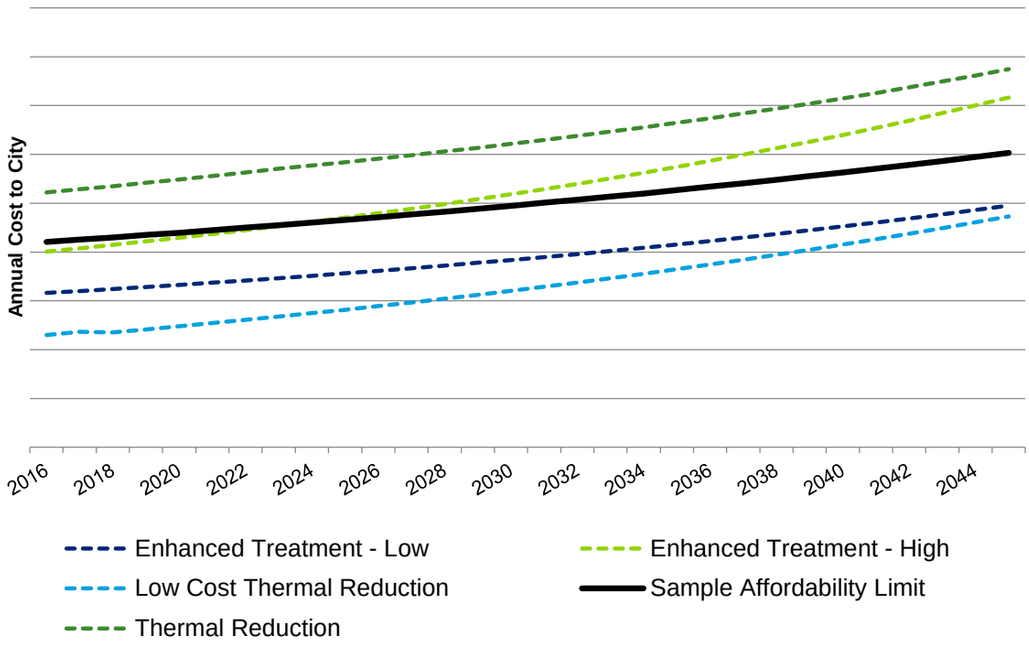
	Enhanced Treatment ("optimistic" case)	Enhanced Treatment ("pessimistic" case)	Thermal Reduction	Land Application - Traditional
2016	$7,407,458	$9,101,750	$12,694,992	$5,084,733
2017	$7,486,562	$9,237,764	$12,822,192	$5,219,017
2018	$7,568,030	$9,378,063	$12,953,617	$5,357,949
2019	$7,651,934	$9,522,784	$13,089,411	$5,501,688
2020	$7,738,350	$9,672,071	$13,229,723	$5,650,402
2021	$7,827,354	$9,826,069	$13,374,708	$5,804,265
2022	$7,919,027	$9,984,932	$13,524,525	$5,963,456
2023	$8,013,452	$10,148,816	$13,679,340	$6,128,159
2024	$8,110,713	$10,317,883	$13,815,600	$6,298,568
2025	$8,210,899	$10,492,301	$13,955,714	$6,474,879
2026	$8,314,099	$10,672,243	$14,099,794	$6,657,300
2027	$8,420,409	$10,857,887	$14,247,957	$6,846,042
2028	$8,529,923	$11,049,419	$14,400,323	$7,041,327
2029	$8,642,742	$11,247,029	$14,557,017	$7,243,380
2030	$8,758,968	$11,450,914	$14,718,166	$7,452,439
2031	$8,878,708	$11,661,277	$14,883,902	$7,668,748
2032	$9,002,071	$11,878,329	$15,055,691	$7,892,558
2033	$9,129,170	$12,102,286	$15,232,428	$8,124,131
2034	$9,260,122	$12,333,374	$15,414,261	$8,363,739
2035	$9,395,048	$12,571,824	$15,601,345	$8,611,660
2036	$9,534,070	$12,817,875	$15,793,836	$8,868,184
2037	$9,677,318	$13,071,776	$15,991,896	$9,133,612
2038	$9,824,924	$13,333,780	$16,195,695	$9,408,253
2039	$9,977,025	$13,604,153	$16,405,405	$9,692,430
2040	$10,133,762	$13,883,168	$16,621,204	$9,986,473
2041	$10,295,280	$14,171,106	$16,843,277	$10,290,728
2042	$10,461,730	$14,468,258	$17,082,189	$10,605,551
2043	$10,633,267	$14,774,926	$17,328,396	$10,931,310
2044	$10,810,051	$15,091,419	$17,582,129	$11,268,386
2045	$10,992,247	$15,418,061	$17,843,627	$11,617,175
Total Nominal	**$268,604,716**	**$354,141,538**	**$449,038,361**	**$235,186,542**

Affordability Cap

The City will utilize estimated costs of relevant Alternatives, as well as budgetary constraints, to develop an annual affordability limit that will be used as part of the RFP process. The affordability limit is intended to add structure and certainty to the procurement process. The graphic below depicts a "conceptual level" affordability limit that is intended to challenge Proponents to seek out low cost technical solutions which meet the output specifications.

The precise parameters of the affordability cap (annual numbers) will be developed in advance of the RFQ.

Affordability Cap - Conceptual



Appendix C – Summary Chart of Commercial Responses to RFI

	Company	Alternative	Lead / Tech supplier	Preferred approach	Term	Capital Costs	Operating Costs	Does Resp. prefer technology to be prescribed?
1	Veolia (VWS)	TR	Lead	Both	30	$35-50 M	4% - 8%	No*
	Veolia (VWS)	ET	Lead	Both	30	$22-30 M	4% - 8%	No*
2	EISENMANN	TR	Tech supp	Up to lead	X	X	$75-80/wet tonne	No
3	Infilco (IDI)	TR	Tech supp	None	X	X	X	X
4	Secural Datashred	ET	Tech supp	X	X	X	X	X
5	Anaergia	ET	Lead	Both	15-20+	$30 M	.9 M/year	X
6	AECOM	TR	Lead	Availability	20 +	X	X	No
7	Natureworks/Nexteq	ET	Tech supp	X	X	X	X	X
8	WESSUC	LA	Tech supp	X	X	X	X	X
9	Lystek	ET	Tech supp	Both	5-30	$10 M	$24-28/wet tonne	No
10	WeCare Organics	TR	Lead	Both	20	X	X	No
11	Enertech	ET	Lead	DBOO, Both	20	$8 - 16 M	X	No
12	Kenaidan (KCL)	TR	Lead	Availability	20	X	X	Yes
13	N-Viro	ET	Lead	Both	20	X	X	X
14	Plenary Group		Lead	Availability	20	X	X	No*
15	Terratec Environmental	LA	Lead	Both	10-20	$15 - 20 M	$3 M/year	Yes
16	Synagro-WWT	TR	Lead	Commercial	20	$25-30	X	No
	Synagro-WWT	ET	Lead	Commercial	20	$8-18	X	No
17	BDS/SBI	ET	Lead	Both	5 -10	< $20 M	X	No*
18	Liberty Energy/ SNC-Lavalin	TR	Lead	Both	30 - 40	$88 - 147M	X	No*
	* As long as the evaluation criteria are clearly defined in the RFPs							
	X: Information not provided							

Commercial Factors

The key points from the RFI responses on commercial issues are as follows:

Transaction Structure: Most respondents expressed a willingness to proceed under either a Commercial Approach or an Availability Approach.[14] Some Enhanced Treatment respondents favoured the Commercial Approach since marketing of by-products is their strength, while three other respondents (2 Thermal Reduction and a Developer) favoured the Availability Approach.

Capital Costs: Some but not all respondents provided order of magnitude capital cost estimates for their solutions:

- Thermal Reduction – only 3 respondents provided costs, 2 in the $25-$50 Million range, and a third respondent (Liberty) at $88 Million and up.

[14] Under a Commercial Approach, the private sector takes the risks associated with marketing by-products. Under an Availability Approach, the public sector assumes these risks. Hybrid approaches could also be possible.

- Enhanced Treatment – 6 respondents provided costs, ranging from $8 to 30 Million.

- Land application – only 1 respondent (Terra Tech) provided a cost estimate, between $15 to 20 Million. This estimate related to development of a new off-site storage facility as well as new loading infrastructure at Woodward WWTP.

Term Length: The desired length term is:

- Thermal Reduction – all respondents who provided input on term length favoured a long term contract of 20 years and up.

- Enhanced Treatment – the majority of respondents favoured, or were at least willing to accept, a long term contract of 15-20 years and up. One respondent stated 5-10 years.

- Land application – only 1 respondent (Terra Tech) provided input, stating that a term of 10-20 years was acceptable.

Financial Strength: Based on a high-level assessment of publicly available measures of financial strength and robustness (balance sheet, company size, history), the respondents that proposed Thermal Reduction tend to have more financial strength than the others.

Prescribed Technology: Almost all respondents indicated that they have no issue with a procurement process that does not identify a specific technology. Only one respondent (Terra Tech) indicated that the technology must be prescribed in order for them to participate. Many respondents emphasized that the evaluation criteria in the RFP has to be clearly defined.

Appendix H – Summary of Labour Issues

The City has obligations to labour unions under collective agreements, which must be met under any Project Delivery Model selected for this Project. The paragraphs below consider the extent of the City's labour union obligations, whether they would apply if the Project were carried out via a Traditional method or a PPP method, and whether they present an obstacle to any particular Project Delivery Model.

Construction: The City is bound to the Carpenters Union province-wide collective agreement.[15] Therefore, all carpenters work that is procured by the City must be under the terms of the Carpenters Union collective agreement. The definition of "carpenters work" in the collective agreement is such that all construction works for the Project will be included within this definition. Therefore, the general contractor(s) that carry out the construction work for the Project must be signatories or bound by the terms of the Carpenters Union collective agreement. This obligation exists whether the Project is procured as a Traditional Project or as a PPP. However, this requirement is not expected to be an obstacle to any Project Delivery Model. Most general contractors who are active in both Traditional and PPP Projects are experienced in labour relations.

Operations and Maintenance: The City also has a collective agreement with the Hamilton Ontario Water Employees Association (HOWEA). This collective agreement applies to facilities "owned and operated" by the City, where the employer is City of Hamilton. Therefore, it is likely that the collective agreement would apply to the Project if it were carried out via a Traditional procurement and operated by the City. However, under a typical PPP structure, the employer is Project Co., not the City of Hamilton, and the facility is operated by Project Co. and not the City. Therefore, under a PPP structure, it is likely that the HOWEA collective agreement would not apply during the operations period. There would likely be no requirement that Project Co.'s operations period employees be unionized.

In practice, even under a PPP structure Project Co could still be subject to a certification drive during the operations period, which would result in a unionized work force. Therefore, a private sector partner might still consider the strategic option of voluntarily recognizing HOWEA from "Day 1", in order to avoid organizing drives and achieve certainty on labour costs. The Project Team believes that most private sector contractors active in PPP Projects have experience in labour relations and, given appropriate information during the procurement process, can assume the risk of labour relations and determine whether they wish to hire organized labour or not. The City's existing labour obligations relevant to Project operations are not expected to be an obstacle to any Project Delivery Model.

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[15] A government or private sector firm may be a "signatory" to a collective agreement, which can be understood in simple terms a voluntarily signing up. Alternatively, a government or private sector firm can be "bound" to a collective agreement, which is generally an involuntary process that arises through a certification process. Regardless of whether status is "signatory" or "bound", the end result is that the employer must pay its employees according to union rates and otherwise abide by the terms of the collective agreement, which typically include work rules, payment of union dues, contributions to union funds, and subcontracting work only to union subs.

Appendix K –Market Sounding

List of Market Sounding Participants

Firm	Type	Participated?	Date	Location	Name	Title
Plenary Group	Developer	Yes	April 3	Deloitte Office	Martin Stickland	Senior VP, Finance/Commercial - Canada
Liberty Energy Resources	Developer	Yes	April 4	Deloitte Office	Wilson Nolan	Chief Executive Officer
					Larry Dilanni	Manager, Outreach & Communication Services
Veolia Water Solutions and Technologies	Developer	Yes	April 18	Deloitte Office and Teleconference	Carlyle Khan	Regional Manager, Greater Golden Horseshoe and Atlantic Canada
					Timothee Murillo	N/A
					Mark Rupke	N/A
N-Viro Systems Canada LP	Developer	Yes	April 4	Teleconference	Rob Sampson	President
Brookfield Financial	Developer	Yes	April 9	Teleconference	Daniel Reidy	N/A
					Will Chow	Associate
Bank of Montreal	Lender	Yes	April 2	Teleconference	Mariano Ficocelli	Debt Capital Markets
					Laith Qamheiah	Debt Capital Markets
Manulife Financial	Lender	Yes	April 12	Teleconference	Divya Shah	Senior Investment Analyst, Canadian Private Placements
Synargo	Contractor	Yes	March 30	Teleconference	Robert Montenegro	N/A
Lystek	Contractor	Yes	April 11	Deloitte Office	Rick Mosher	President
					Kevin Litwiller	Director, Business Development
					Bill Mullin	Business Development Manager
Anaergia	Contractor	Yes	April 4	Teleconference	Deo Phagoo	Vice President, Municipal Sales, Americas
Terra Tech Environmental Ltd.	Contractor	Yes	April 10	Deloitte Office	Phil Sidhwa	President
					Mark Strauss	VP, Strategy & Business Development – American Water
					James F. Sheridan	VP, Military Services – American Water
					Douglas Anthony	Chief Financial Officer, American Water Enterprises
					Mark W.S. Bain	PPP Advisor to Terra Tech, Torys LLP
Siemens	Contractor	No	N/A	N/A	N/A	N/A
Macquarie	Developer	No	N/A	N/A	N/A	N/A

Summary of Market Sounding Findings

Topics	Key findings
Financing	
Lender interest in Project based on capital size of Alternatives	• Almost all interviewed market participants representing the financing market have indicated that due to the small capital requirement of Land Application, private financing would most likely not be possible. This is primarily due to the time and effort that is required for transaction execution. • Most of the participants have indicated that the long-term financing should approximately be, at a minimum, within the range of $40 - $50 million.
Debt-Equity leverage and DSCR	• Lenders have indicated that they would most likely look at a worst-case scenario when evaluating the Project, i.e. for Enhanced Treatment assuming that the end-product is not sold and hence no revenue generated. • Most of the participants provided similar leverage ranges based on the Alternatives: − Enhanced Treatment – 60:40 to 75:25 − Thermal Reduction – 75:25 to 90:10 • Participants indicated however that leverage would primarily depend upon the risk profile and capital size applicable for the Alternatives, especially with regards to Enhanced Treatment.
Cost of debt	• For long-term financing, lenders and developers have primarily provided a similar range for spreads, based on similar Projects previously undertaken, between 225 to 300 bps.
Cost of equity	• Feedback from most participants on the cost of equity for such a Project has been approximately a 12% - 15% IRR.
Fees	• A rough estimate of approximately 1% - 1.5% of the deal size has been indicated by participants who have provided feedback on the transaction fees.
Financing approach	• Project financing structure should be utilized for the Project. Creation of a Special Purpose Vehicle (“SPV”) would be dependent upon the size of financing required. • Short-term financing should be possible through a bank facility. However, short-term financing for a small capital size Project, such as Land Application, might be difficult through the bigger commercial banks as they favour bigger Projects due to dedication of time and resources. • Long-term financing would be possible for larger size Projects (minimum of $40 - $50 million financing requirement) through life insurance companies, based on a bond structure. • Most life insurance companies prefer to partner with another for financing and have a minimum investment requirement of approximately $20 million. • For the smaller capital size Projects, larger bidders may also be willing to undertake balance sheet financing.
Commercial risk and other risks	• Most participants have indicated that there should be some degree of risk sharing between the City and the private sector for the sale and marketing risk of end-products from the Project. • The degree of risk assumed by the private sector would impact the gearing / capital structure of the Project and lenders would usually look towards pushing revenue risk back to the City. • In the scenario that the private sector has to undertake significant commercial risk, they would look to obtain guarantees on the inputs from the City (e.g. metals content, quantities etc.). • Some of the other risks that have been identified by market sounding participants which would impact the risk profile of the Project are: − Change in law / regulations; − Inputs volume risk; − Inputs quality risk; − Gas price risk; and − Cost escalation risk for energy and other commodities.
Procurement	
Interest in procurement strategy with multiple Alternatives	• Most participants have indicated that they would be willing to participate in a procurement process allowing the market to decide on the technology for the Project with the caveat that this would be only if Enhanced Treatment and Thermal Reduction Alternatives were included in the process. • Most participants see it difficult for them to be involved in the procurement if Land Application is included in the list of Alternatives. • However, participants have indicated a concern that the ‘open’ procurement process would also drive up the costs for the bidders as additional analysis would be required to determine the most appropriate technology to bid with.
Bid Bond and Honorarium	• Varying feedback from the market has been received on the inclusion of the bid bond at the RFQ stage. • Smaller firms have mostly objected to inclusion of a bid bond at the RFQ stage primarily due to the cost incurred towards preparing a bid. • Some participants feel that if a bid bond is included in the process, then $1 million might be excessive due to the already incurred costs by bidders. • Some of the bid preparation costs could be recovered through an honorarium to be provided to the unsuccessful bidders at the end of the RFP stage with a range of $250,000 to $500,000, as indicated by the participants. It has been indicated that

Topics	Key findings
	the amount of the honorarium should be disclosed at the RFQ stage and should be a substantial amount to incentivise the bidders to participate in the 'open' procurement process.
Term sheet in the RFQ	• Almost all of the participants have indicated that inclusion of a detailed term sheet within the RFQ would be helpful in teaming and preparing the bid. • Participants indicated that the term sheet should indicate the desired risk allocation by the City along with performance specifications, as well as any other terms and conditions for the Project that would aid the bidders in preparing their teams and bids. • The inclusion of the term sheet in the RFQ would also allow for more serious bidders to submit their bids, knowing the terms and conditions involved. • Participants have also indicated that the City should allow for comments / feedback on the term sheet during the RFQ open period with the possibility of holding commercially confidential meetings ("CCMs") with the bidders. • During this process, participants have mentioned that the City should look to adopt a 'partnership' approach with the bidders. There are some risks that may be beyond the control of the bidders and hence the City should look to work with them in allocating and mitigating these risks.
Affordability cap in the RFP	• Participants have welcomed the idea of including an affordability cap in the RFP. The affordability cap would enable the bidders to determine whether their technology selection (to be confirmed at the RFP stage) is within the threshold and hence submit bids that are only below the threshold to avoid any future issues. • Overall, the indication from the market sounding participants has been that the more information is disclosed upfront during the procurement process, the easier it would make it for bidders to prepare their bid and select their most appropriate technology.
Other issues / concerns / suggestions on the procurement process	• As the procurement process is not a particularly simple process (with multiple Alternatives), participants have appreciated the idea that the RFQ and RFP open period should be longer than usual. It has been proposed, for example, that the RFQ open period could be around 6 months, which would allow the bidders with enough time to conduct their analysis on multiple technologies, prepare teams, and hence submit a bid that would be most appropriate. • A longer open period at the RFQ stage would also allow feedback discussions and CCMs between the City and the bidders. • Participants have highlighted that as the procurement process may be open for Enhanced Treatment and Thermal Reduction Alternatives, it would be useful to them if some guidance is provided within the RFQ regarding the RFP evaluation criteria. • Inclusion of the evaluation criteria would again provide more information to the bidders and aid them in understanding how their different technologies would be evaluated against each other (cost, innovation, etc.).

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Business Case Process Flow