Three Procurement Methods and a Major Sole Source Used to Implement DC WASA's $300+ Million Biosolids Program

Philip Braswell, Lisa Reynolds, Bobby Strickland – Brown and Caldwell
Leonard Benson, Martin Sultan, Walter Bailey – DC Water and Sewer Authority
Eric Petersen, Joseph Sullivan – Hawkins Delafield & Wood, LLP
Brown and Caldwell
1600 Duke Street, Suite 310, Alexandria, VA 22314

ABSTRACT

The District of Columbia Water and Sewer Authority (DC WASA) is implementing a $300+ million digestion project using traditional design-bid-build (DBB) for two component projects, design-build-operate (DBO) for a combined heat and power (CHP) system and design-build (DB) for the fourth component project, the main process train (MPT). The MPT encompasses pre-dewatering, the Cambi™ thermal hydrolysis process (THP), and anaerobic digesters. The economic benefits of this new biosolids program are tremendous compared to the costs associated with the existing lime stabilization system:

- Biosolids quantities will be decreased between 50 and 60 percent, greatly reducing hauling and the risks of the current large land application program.
- Lime purchases essentially will be eliminated.
- A pathogen-free, more marketable Class A product will be produced.
- Digester-generated biogas will fuel gas turbines to produce an estimated 13 MW of power and also produce steam for the THP.
- Greenhouse gases will be greatly reduced.

With these major economic and risk-reduction benefits, it is important to get the project on-line as soon as possible. Therefore, the procurement method(s) selected to move the project forward are critical. Traditionally, DC WASA has utilized the DBB delivery method. This biosolids program includes major movement into alternative delivery (AD) methods. DC WASA's procurement regulations and guidelines have recently been re-written and approved by the Board of Directors to authorize AD.

Specific components of the paper include:

- The Evaluating Team – The Owner's stakeholder groups, its external AD advisor and the Program Management team conducted a thorough evaluation of delivery methods. Its members include nationally-recognized expert "design-builders" and legal counsel that specialize in AD.
- Expectation to Save Time – By implementing AD, DC WASA expects to get its new facility on-line more expeditiously than it would using a DBB procurement process.
- New Procurement Regulations – New procurement policies were enacted by DC WASA in the midst of delivery method selection.

- Alternative Delivery Methods – Various AD methods were considered for each of the four component projects. The evaluation considered the pros and cons of being prescriptive, willingness to accept risk, and other factors.
- Sole-Source Component – DC WASA developed a "determination and findings" that concluded that Cambi is the sole-source provider of the designated THP.
- Risk and More Risk – With each AD method, it was necessary to balance owner-retained risk with transferred risks, evaluating the associated impacts on project costs, the potential for disputes, and the potential for an expedited schedule.
- What Did the Market Survey Tell Us? – DC WASA conducted a comprehensive market analysis of the four potential projects, interviewing 15 design builders, DBO firms, contractors, and engineers to help inform the owner's procurement decisions with the goal of ensuring the maximum amount of competition.

KEYWORDS

Biosolids management, Cambi™, anaerobic digestion, Alternative Delivery, Design-Build, Design-Build-Operate, Combined Heat and Power, Procurement, Class A biosolids

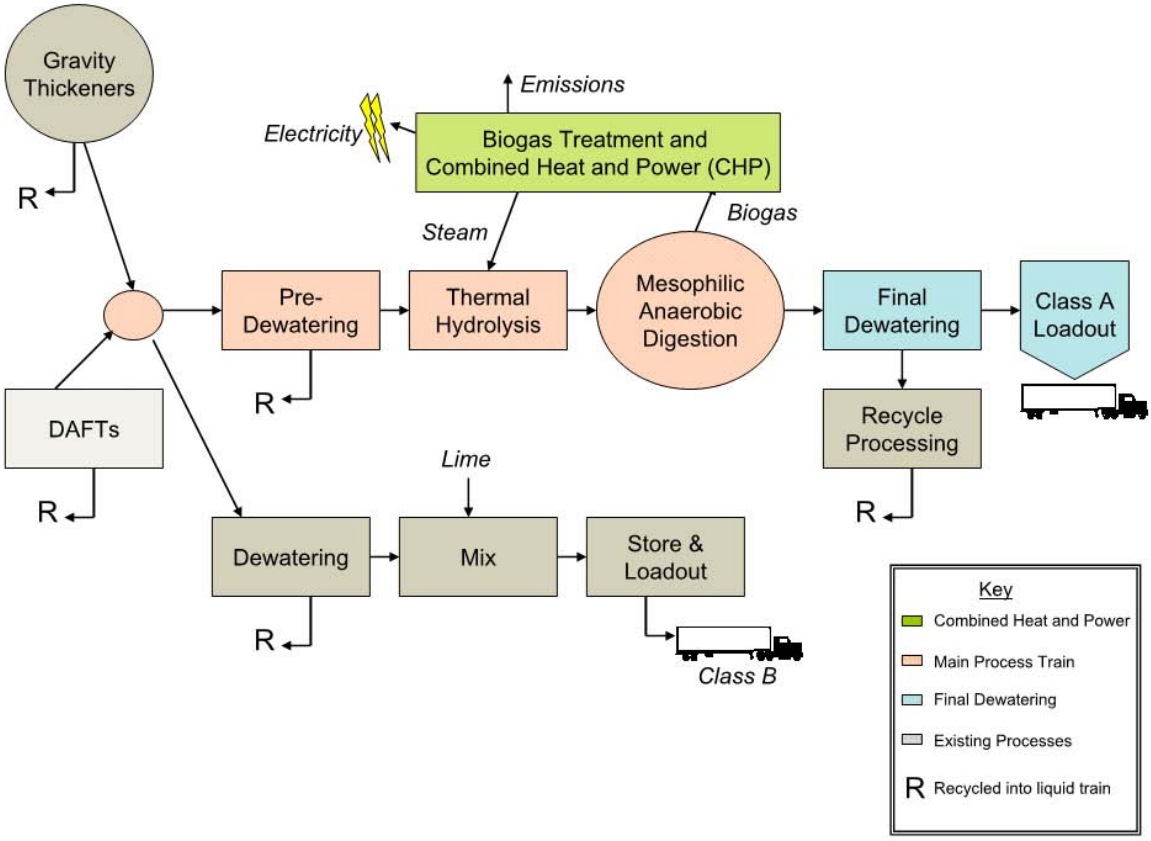
INTRODUCTION

DC WASA's Blue Plains Advanced Wastewater Treatment Plant (AWTP) treats an average of 370 million gallons per day (mgd) of wastewater from the metropolitan Washington, DC area. It is the largest AWTP in the world. The liquid stream will receive major additional improvement in nutrient removal in coming years. Furthermore, by 2018, additional combined wastewater flows will be transported to Blue Plains via a new tunnel and conveyance system – this system is known as the Long Term Control Plan (LTCP).[1]

The biosolids program will largely convert the existing Class B lime stabilization system to a system incorporating advanced anaerobic digestion. The current program produces an average of 1200 wet tons of lime-stabilized biosolids per day that is land applied as a soil amendment. The new system will include thermal hydrolysis of the sludge and the anaerobic digestion system will be capable of producing Class A biosolids. Figure 1 depicts the current processes (gravity thickening, Dissolved Air Flotation Thickening (DAFT), and lime stabilization process) and the proposed processing facilities. The lime stabilization process will remain operational to handle excess biosolids during peak periods and during periods when the THP does not have sufficient capacity.

[1] Approximately one-third of the District of Columbia is served by combined sewers. As part of the NPDES permit modification it received in 2007, Blue Plains is required to develop a LTCP for wet weather flows in the combined sewers. Part of the LTCP involves construction of tunnels to store excess flows during wet weather events until the plant has adequate capacity available for treatment.

Figure 1 – Biosolids Management Program Components



The on-going changes at the Blue Plains AWTP involve over $2 billion of planning, design, and construction. The fact that the biosolids, LTCP, and enhanced nitrogen removal programs are proceeding concurrently makes the procurement and project delivery decisions critical to completing all the projects on schedule. The logistics of constructing all the work on one space-constrained site while clearly defining the interfaces of all the projects adds to the challenges in the development of procurement documents. Based on a preliminary construction analysis, the critical path for the biosolids program lies within the MPT and, in particular, the construction of the four digesters.

Biosolids Planning and Program Development

DC WASA developed a Biosolids Management Plan (BMP) in the late 1990s with the following three primary goals: (1) improve solids processing system reliability, (2) provide adequate treatment capacity for current and future needs, and (3) address community concerns, including odors. In September 1999, the Board adopted the recommendations of the BMP to anaerobically digest all the solids produced at Blue Plains. In the future, if land application became

economically undesirable or otherwise infeasible, thermal drying could be added to the process to further reduce the volume of biosolids and create an improved product.

The 2001 Solids Handling Facility Plan recommended that the BMP be implemented using egg-shaped anaerobic digesters. Design work on the egg-shaped digesters facility was conducted in the 2003 to 2006 period. However, rapid escalation in steel prices, limited competition, and other factors resulted in a project that was considered too costly and risky for the likely benefits that it would provide.

In October 2006, the Board decided to defer the egg-shaped digester facility (EDF) project while DC WASA monitored the construction bidding market, regulatory initiatives influencing land application practices, emerging biosolids treatment processes, and DC WASA's financial position.

Updated Biosolids Management Plan

In 2007/2008, the previous Biosolids Management Plan was revisited with the goal of updating it to provide an affordable, cost-effective, energy-efficient, environmentally sound, and sustainable plan. DCWASA re-evaluated many potential processes, especially newer anaerobic digestion and related technologies that had been advanced over the years. After additional work involving research activities, various process evaluations, economic comparisons, assessments of greenhouse gas emissions, determinations of energy use and energy production, and assessments of product characteristics and other factors, decisions were reached on a revised program.

The alternative that was selected involves thermal hydrolysis coupled with mesophilic anaerobic digestion which will result in the production of Class A biosolids. The use of Cambi's THP allows for increased digester loading and reduces the number of digesters required, thus lowering project cost. The work is documented within the 2008 Biosolids Management Plan Update Report (Ref 1). Although the capital costs for the selected alternative are higher than for the other alternatives, O&M costs are lower, resulting in lower 30-year cumulative life cycle cost.

In early 2009, DC WASA began implementation of the 2008 Update Plan. Specific goals include:

- Use the thermal hydrolysis and anaerobic digestion to decrease life cycle costs of the biosolids program by reducing the quantity of biosolids taken off site by an estimated 55 percent;
- Use the methane gas generated by anaerobic digestion process as fuel for the combined heat and power project to produce steam for the THP and to produce electric power to stabilize the plant's power costs by reducing its reliance on commercial power sources;
- Produce Class A biosolids material for beneficial use purposes;
- Control capital and program costs; and,
- Implement the biosolids program by 2014.

By approving the plan, the Board of Directors also recognized that DC WASA's carbon footprint would be significantly reduced.

NEW PROCUREMENT REGULATIONS

In June 2009, DC WASA issued new procurement regulations that replaced the previous regulations in their entirety. The new regulations allow competitive procurements to be either a one-step or two-step process and allow the contracting officer to determine the appropriate project delivery method. The delivery method is to be "appropriate to the specific contract and to serve the Authority's interests." Subsection 5340 of the regulations addresses contract types and project delivery methods. The only delivery method prohibited is cost plus a percentage of cost. In addition to DBB, other allowable delivery methods specifically identified in the regulations include construction management at risk (CMAR), DB, design-build-operate-transfer (DBOT), design-build-operate-maintain (DBOM), and design-build-finance-operate (DBFO). DC WASA has already elected to utilize DB to deliver the Blue Plains Tunnel (BPT) project, which is a component of the LTCP. The request for qualifications (RFQ) for the BPT was issued in February 2010.

DC WASA issued a Procurement Manual at the same time the new regulations were promulgated. Chapter 22 of the Manual specifically addresses alternate project delivery and directs DC WASA to consider alternatives to DBB if AD is expected to result in cost savings, better achievement of schedule objectives, or if it believes that there are advantages to the project to have the contractor involved prior to completion of design. There are specific sections for DB and CMAR and comments regarding DBOM, DBOT, and DBFOM. The manual states that RFQs are not required for all DB projects and, additionally, allows for comments on draft Requests for Proposals (RFPs). Chapter 13 of the Manual addresses sole source procurements, which are allowed under certain circumstances specified in the regulations, including when goods and services are only available from one vendor. Sole source procurements require the contracting officer to provide written justification and to obtain all required approvals.

On July 2, 2009, the DC WASA General Manager issued a Determination and Findings to allow the sole source procurement of the Cambi THP. DC WASA determined that its objectives for the biosolids program could only be met by using the Cambi system. Specific reasons considered for the Cambi sole source determination included: Cambi's experience with modules of similar size, prospective bidders' positive views of the Cambi system and their experience working with Cambi, and the progressive improvements Cambi has implemented from earlier designs that have improved their system over the course of time.

The designation of Cambi as a sole source, however, poses multiple issues concerning integration of the THP component into the selected procurement method. These issues include:

- How can price be controlled after sole source designation?
- How can the owner evaluate performance of the downstream digesters and the total MPT when the THP process is inserted in the middle of the MPT?
- If AD is the selected procurement method, should Cambi be a sub-contractor to the design-builder or should Cambi contract directly with DC WASA thereby creating a

multi-prime contract arrangement? What are the advantages and disadvantages of the contracting methods?

Each of these questions was effectively resolved as the procurement process proceeded.

PROCUREMENT DECISION TEAM

DC WASA conducted an early evaluation of procurement methods to determine if AD would be a beneficial procurement process that would meet the schedule included in the 2008 BMP. The savings produced from implementing the plan were valued in the tens of thousands of dollars per day (taking into account a modest inflation rate and the expected lowering of electric power and biosolids disposal costs). This evaluation was conducted by a team comprised of: process engineers; business case evaluation experts; lawyers with expertise in AD, including RFQ, RFP, and contract development; experienced design-builders; and representatives of DC WASA. The DC WASA team members included the chief engineer, the director of wastewater treatment, the manager of the program managers, general counsel and her staff assigned to develop AD documents, the director of procurement, and an external AD advisor with considerable experience practicing law in the AD arena.

The program management team initially worked with their technical counterparts at DC WASA to determine whether particular program components would be conducive to AD. Concurrently DC WASA was examining its procurement documents and determining what changes would be needed to allow alternative development. The procurement document review was also underway for DC WASA's LTCP project that involved designing large storage tunnels to help manage the combined sewer overflow situation.

As noted previously, in June 2009, the Board of Directors approved the revised procurement regulations that allowed AD. Once those efforts were complete, the procurement and legal team members began to collaboratively explore how constructing the biosolids program may or may not fit into the AD models.

REASONS TO CONSIDER ALTERNATIVE DELIVERY

DC WASA identified "schedule" as a key reason for implementing AD. In fact, it was determined that if AD was utilized, that the project could in fact be constructed per the schedule identified in the 2008 Plan. If AD was not utilized, the program would take at least an additional 12 months to implement.

Another reason for implementing AD is that the design build approach is expected to improve the coordination between the designer and the builder. The designer and builder are constantly working together to improve how the project will be built in an efficient manner and looking at the difficult design components in a collaborative manner. This collaboration between the designer and the contractor provides maximum value.

Collaboration between the contractor and the designer often produces innovative ideas. The "What if…" questions followed by the "How would we do that?" answers creates a dynamic relationship between the designer and the builder that leads to innovation that can potentially improve the schedule, offer a lower cost solution, or both. For the biosolids project, potential innovations could relate to digester construction, meeting air permitting requirements for the CHP, overall sequencing of the project on a constrained site, and coordination of the interfaces within the project and between it and other projects. In addition, the complexity of starting up, commissioning and testing the various projects provides an opportunity to develop innovative ideas.

For the combined heat and power component of the project, another strong reason to consider AD as a viable option is the fact that generating power and producing high pressure steam requires special expertise. Therefore, considering a DBO option for the combined heat and power component of the project became an attractive option to DC WASA.

EVALUATION AND SELECTION OF DELIVERY METHODS

DC WASA has a history of providing strong engineering, operations, and maintenance direction for their projects. The plans and specifications are detailed and reflect designs and requirements that DC WASA has found to work for their facility. DC WASA frequently uses such tools as pre-selection and pre-qualification to ensure that they obtain the equipment that they know works well and can be cost-effectively maintained. Pilot testing of full scale units and numerous research projects has added to the expertise of the DC WASA staff and their knowledge of processes, equipment, and controls. The results stemming from that level of understanding and their control of the design process has helped DC WASA earn numerous achievement awards from the Environmental Protection Agency (EPA), the National Association of Clean Water Agencies, and the Water Environment Federation.

As previously noted, DC WASA's traditional procurement process has been the DBB method to deliver their wastewater treatment projects. With DBB, the owner retains a design engineer to develop the project design which must be complete before contractors can bid on the project's construction. Consequently, the owner must issue two contracts: one with the design engineer, who is typically selected based on qualifications, and one with a contractor, who is typically selected based on low price. There is little opportunity for time, quality, or cost efficiency and ample opportunity for miscommunication, change orders, disputes, and litigation.

Construction Management at Risk (CMAR) is an AD method that brings the designer and constructor together and allows for contractor input before the design is complete. These "preconstruction services" could include review of the design for constructability, estimating (cost and schedule), and using value engineering to increase the potential for the owner, contractor, and engineer to work together collaboratively. With CMAR, the owner contracts with the engineer and the contractor separately, so there are still two contracts as with DBB. During the design-phase, the contractor's role is as an adviser to the owner. Unlike DBB, the design is not developed to 100 percent completion before the contractor provides a price. When the design is sufficiently complete, the contractor provides a guaranteed maximum price (GMP). In general,

the greater the level of design, the better the GMP will be. If the final cost of the project is higher than the GMP, the owner only pays the GMP. If the final project cost is less than the GMP, the owner pays the final lower cost amount. While in some cases the owner and the contractor may agree to share in any cost savings, this type of arrangement can be challenging due to many municipalities' regulations. Their inability to share cost savings was one of the reasons DC WASA did not elect to pursue CMAR as a delivery method.

The DB method and its variants can offer several advantages over DBB. With a DB approach, there is only one contract with both the engineer and the contractor; thus, there is a single point of accountability for design and construction. The owner is able to consider quality, cost, risk, schedule, and sustainability in its selection of a team or firm that is based on "best value." Schedule can be accelerated because major equipment procurement and construction can begin before the design is complete. In many cases, AD methods, such as DB, can provide the owner with early knowledge of total project costs.

Table 1 summarizes some of the AD choices for owners.

Table 1 – Design-Build Variants

Type of AD Procurement	Description
Design-build (DB)	A single entity is responsible for design, construction, and commissioning
Design-build-operate (DBO)	A single entity is responsible for design, construction, and operation.
Design-build-operate-finance (DBOF)	A single entity is responsible for design, construction, operation and financing, without owning the facility.
Design-build-own-operate-transfer (DBOOT)	A single entity is responsible for design, construction, and operation. This entity owns the facility for a period of time and then the project sponsor / owner eventually takes ownership.

There are three primary variations of DB: (1) performance-based, (2) prescriptive, and (3) progressive. Performance-based DB is best suited for owners who have a clear idea of how the facility must perform, who want to maximize innovation, and who are flexible with respect to the methods used to complete the project. Few, if any, design drawings are prepared for a performance-based design; standard construction specifications outlining minimum quality standards are prepared, along with objectives for operations.

Unlike performance-based design, preliminary design drawings (10-30 percent level) are prepared for a prescriptive DB project. This method is best suited for owners who are very clear on their design preferences. Design-builders are then selected based on qualifications, technical issues, schedule, and price.

With progressive DB, the design-builder is selected based on qualifications, which is why it is often referred to as a "one-step selection." The selected design-builder works with the owner to develop a preliminary design, usually somewhere between 30 percent and 60 percent, at which time the design-builder submits a GMP to the owner. The owner and design-builder can then

negotiate the price and, if they are unable to reach an agreement, the design-builder can complete the design for the owner to use in a DBB procurement or the partial design can be given to another design-builder to price or to complete. This method is best when the project lacks clear definition and/or when the owner wants to control the process of design development. It allows for a higher degree of innovation and for a greater certainty on price, although this occurs later in the project than with other DB methods.

For DB to be successful, the owner must be willing to give up the level of control it would retain when using DBB. The owner also must conduct upfront planning, offer a balanced risk allocation, and provide timely responses to the DB firm's submittals. An attitude, or atmosphere, of "team work" is an essential element of DB and further assures a higher potential for a successful project. Some owners have been skeptical that DB can offer them the best price. For DC WASA, the degree of control desired by the owner, evidenced in part by the fact that the Cambi THP was designated as a sole source, means that the prescriptive method of DB was best suited for the MPT implementation.

TECHNICAL RISKS

As part of the procurement process, DC WASA stakeholders (engineering, wastewater treatment operations, and maintenance) attended a workshop to identify potential technical risks associated with the MPT and CHP projects. Participants were charged with identifying technical, operation, and safety risks independent of procurement or contractual considerations. The top three risks identified by the group were:

- Project does not meet specified requirements (e.g., cost savings not equal to those anticipated)
- Corporate culture needs to become more collaborative to increase the opportunity for a successful project delivery
- Interfaces between the project and other projects at DC WASA (e.g., funding cuts affecting other systems at Blue Plains impact the biosolids project)

Other risks identified are related to feedstock for the various project components (e.g., biogas for the CHP), the lengthy validation and performance testing requirements, and the interface between Cambi and the other MPT components.

Following identification of the risks, the participants worked together to develop potential mitigation strategies. Several of the mitigation strategies related to developing clear, specific expectations. Feedstock input specifications should be accurately defined and carefully specified in the procurement documents. Project expectations, as well as ramifications of failure, should be clearly defined and communicated to all stakeholders. The project should provide for long-term performance validation, while setting realistic targets. Future staffing requirements, including manpower and training needs, should be communicated to human resources and senior management. Also, the stakeholders identified a need to address the minimum standards to be required in the procurement and to consider life cycle costs and net present value associated with asset management.

DEVELOPMENT OF PROCUREMENT DOCUMENTS

Because DC WASA had never implemented an AD procurement, it was necessary to develop entirely new procurement documents. To develop the CHP RFQ, the AD team reviewed a sampling of similar DBO RFQs. The team selected one to use as a template for the CHP RFQ. Simultaneously, others were developing a RFQ for the LTCP DB project. The AD team conformed the CHP RFQ to a format similar to the LTCP RFQ to the extent that was possible in light of the long-term operating services component of the CHP RFQ. This process was utilized so that there would be consistency and uniformity of the procurement documents even though they were being developed by different engineering teams.

The development of the procurement documents is well underway in the spring of 2010 (publication date of this paper). Workshops have been held to preview the design process for DB and DBO procurements so that the proper level of comments and documentation is provided. Recognizing that DB drawings will not have all the details of a DBB procurement is a difficult concept for some owners to accept. The team developing the procurement documents has refrained from assigning a specific percentage to the level of design needed, and has elected to refer to the documents as being the "procurement design documents." The procurement design documents will be developed to a level that communicates DC WASA's needs, preferences, and expectations. The team will develop the designs to a level that meets the expectations of the key staff at DC WASA. Many of DC WASA's typical review comments, such as spacing between major equipment, will have to be incorporated into the procurement documents even though there may not be a written standard. In some cases, the RFP will identify pre-qualified or even pre-selected equipment in order to reflect DC WASA's experience and desire to control the quality of the equipment provided.

MARKET SURVEY NO. 1

DC WASA conducted a market survey of potential bidders for the biosolids projects. The primary focus of the market survey was to gather information related to AD methods being considered for implementing the MPT project of the BMP. The AD team identified target firms, developed a questionnaire, and conducted interviews of a cross-section of market segments.

Representatives from four operating service firms, four integrated design-build firms, and seven construction firms were interviewed regarding various aspects of the recommended delivery process for the MPT component of the BMP. Questions focused on the types of delivery methods preferred, pursuit decision-making factors, performance guarantees that could be offered for the MPT, integration of the THP into the MPT, the duration of a potential commissioning or operations period, and potential variations for the components to be included in the bid package.

With regard to the type of delivery method to be utilized for the procurement of the MPT components, the survey asked respondents to indicate whether they would consider pursuing CMAR, collaborative / progressive design-build (C/PDB), traditional DB, or DBO. Generally,

respondents did not exhibit a favorable impression of CMAR for the biosolids project. However, traditional DB and C/PDB both would be acceptable to the majority of respondents. Among the integrated design-build firms, there was a clear preference for C/PDB. One of the main reasons cited for the preference is the ability for the C/PDB contractor to be more innovative in the design process and also to better meet the design requirements of the Owner. For obvious reasons, the operating services firms showed a clear preference for DBO.

Participants identified factors that would impact whether their firm would decide to pursue a project of this nature. Contract terms and/or risk allocation was identified as a significant factor by 10 of the 15 firms interviewed. Owner reputation, the firm's relationship with the owner, or the relationship with the oversight team was identified by about a third of respondents as being factors for consideration. Other frequently identified factors were certainty of funding for the project, required financial security instruments, and costs to pursue the project.

Across market segments, the respondents were not receptive to the idea of providing THP as owner-furnished equipment (OFE). They would prefer to have a direct relationship with the THP provider. There were various thoughts as to how performance guarantees could be addressed if the owner specified the THP technology, but no consensus was found among the interviewees.

The results of the survey suggested that the use of an AD method would be a viable option for procuring the MPT of the BMP. Some form of DB or DBO would likely be the best received delivery method and would have the greatest potential for a response from the bidding community. Responsiveness from the bidding community was expected to be greatly dependent on the contract terms and conditions and risk allocations proposed by DC WASA.

INVESTIGATION OF A DBO POTENTIAL

DBO was considered as a potential procurement method for the MPT. Before further advancing the DBO option for the MPT, the AD team agreed that a due diligence review of similar DBO contracts for large utilities should be performed. The team reviewed other biosolids DBO projects for mid-size to large wastewater utilities and compiled additional background information on recent trends in the AD market. The AD team's research included reviewing AD market trends as reported from two independent sources: Public Works Financing[2] (PWF) and the Water Design-Build Council.

PWF's annual report for the water sector (March 2009) indicated that there had been very few DBO contracts signed in the previous five years and data from the Water Design Build Council also suggested that the DBO water market currently is not very robust; its recent survey indicates that only three percent of the AD market between 2005 and 2008 was comprised of DBO contracts, compared to 82 percent for DB and 15 percent for CMAR.

The set of facilities (pre-dewatering, thermal hydrolysis, and anaerobic digestion) proposed for DC WASA's DBO project is quite unique. Although there have been dozens of water sector DBO projects over the past two decades, there are no DBO projects in the U.S. that even closely

[2] *Public Works Financing* is a bi-monthly periodical that has been a guide to public private partnerships since 1988.

match the elements of DC WASA's project. To provide the most relevant comparative information, the AD team focused on biosolids DBO projects for mid to large size wastewater utilities. These biosolids projects represent a wide range of performance results. About half of the DBO projects that were evaluated appear to have met their objectives and have biosolids facilities that are performing well. However, some of these owners expressed concern that O&M costs under their long-term contracts are high compared to other biosolids options. On the other end of the spectrum, three of these DBO projects have either failed and have been cancelled or are stalled in their implementation. Others have had mixed performance results and have suffered delays and major equipment failures.

The AD team's further assessment of the DBO delivery options and due diligence review of over a dozen biosolids DBO projects yielded substantial new and relevant information and provided significant insight as to how DC WASA's AD program for biosolids can be well-executed. Not only were significant concerns revealed about the results and performance of several biosolids DBO projects, but the AD team learned more about biosolids DB issues as well.

- The technical team does not believe that the MPT has significant process risk other than insuring proper capacity of the THP. The THP performance is well understood and so the train of dewatering, thermal hydrolysis, and anaerobic digestion should perform as expected, thus lessening one of the benefits of using the DBO method of delivery.
- The main risk in procuring and implementing the MPT is commercial-related risk. Adding the "operations" component to a DB project makes it significantly more complex in terms of negotiations and clearly defining commercial risk.
- In reviewing the DBO assessment results, there is the potential for a limited level of competition with a DBO procurement because this is a capital intensive project and the operations cost element would be less than half of the total value. In contrast, the market survey indicated that DC WASA is likely to have a strong field of engineering firms and contractors interested in a DB delivery.
- DC WASA will be directly responsible for the end use of the biosolids product and is committed to developing several marketable products from the Class A biosolids. With this strategic goal in mind, there is a strong advantage in DC WASA having O&M responsibility for the complete biosolids process train (with the possible exception of the THP step). With a DBO, the biosolids processing responsibility would be split, creating potential interface and responsibility issues.
- The due diligence review of other DBO biosolids projects points out the risk of project delays that can result if labor issues arise or political lobbying impacts the project. This is more likely to happen if the operations element is introduced into the procurement, as would be the case under a DBO.

Based on the due diligence review, the AD team recommended that the DBO procurement for the MPT should not be pursued by DC WASA. The DC WASA team agreed with this recommendation and DBO was not considered further as an option for the MPT.

MARKET SURVEY NO. 2

The AD team needed to make recommendations on how to contract with Cambi. In its other projects, Cambi had been a subcontractor to the DB firms – conditions normally required this approach in Europe. Unique features such as the sole source status of Cambi, the first installation of a Cambi process in the United States, and impact from the sureties, made the decision more complicated for a DCWASA project. A second market survey was developed to elicit information from likely DB bidders and contracting teams.

Conclusions resulting from the survey included the following:

- Contractors generally prefer Cambi to be a subcontractor, instead of using a multi-prime arrangement. A subcontract arrangement gives the DB better control over interface requirements, construction coordination and scheduling, payment schedule, and provides the owner with a single point of contact.
- Whether Cambi was subcontractor to the DB or held a prime contract with DCWASA, there needed to be no gap in liability coverage. If Cambi cannot cover its full liability, the remainder needs to be taken by either DCWASA or the DB contractor. Sureties play a key role in this issue – i.e., how they view the technical, financial and commercial details becomes critical.
- Design-builders would like to be involved in the development of a contract between Cambi and DC WASA so that their coordination concerns are handled appropriately.

SELECTION OF THE ALTERNATIVE DELIVERY METHODS

The selection of the procurement method for each contract underwent a matrix analysis in order to be as objective and defensible as possible. Meetings of the AD team were used to discuss the criteria listed in Table 2 below. Each party presented differing opinions as to how the criteria applied to DC WASA's specific projects and often there was not 100 percent agreement. In the end, however, the box with the check was considered the "best fit" for the criterion and the project. Once the matrix was agreed upon, the AD team decided on the compelling reason for the selection and those will be presented with the discussion of each project. Note that the procurement process for the BMP did sometimes build upon the procurement process evaluation that DC WASA underwent for the LTCP, which was several months ahead of the BMP procurement process. The table below illustrates that even though the projects are very different, the criteria upon which evaluations take place are similar.

Table 2 - Application of Delivery Method Evaluation Criteria to LTCP and BMP

Topic	LTCP	BMP
Total time to deliver project	✓	✓
Schedule flexibility	✓	✓
Initial / final construction price	✓	✓
Ability to influence construction price pre-award	✓	✓

Topic	LTCP	BMP
Minimize cost / schedule uncertainty	✓	✓
Procurement based on some degree of price competition	✓	✓
Cost effective design	✓	✓
Owner control over design	✓	✓
Foster alternative / innovative technical concepts	✓	✓
Pre-award discussions with contractors	✓	✓
Post-award collaboration with contractor	✓	✓
Collaboration between contractor and designer	✓	✓
Shifting risk of design defects away from Owner	✓	✓
Getting responsive bids	✓	✓
Minimizing claims	✓	✓
Marketplace acceptance	✓	✓
Familiarity of Owner with delivery system	✓	✓
WBE / DBE / Local contractors	✓	✓
Community impact	✓	✓
Technology aligned with Owner's core business processes	N/A	✓
Commercial risks	N/A	✓
Performance risks	N/A	✓

SELECTING DESIGN-BUILD–OPERATOR FOR THE CHP

The CHP project was probably the easiest project to evaluate for AD. DC WASA does not have experience in producing power and high pressure steam and the market indicated there are numerous experienced and willing parties who are expert in this type of project. Assuming the AD advantage of schedule was realized, the CHP system could be ready and tested (first on natural gas) before the MPT is put on line. Early price certainty on the CHP construction cost and having approximately 40 percent of Blue Plains' plant power costs stabilized for many years was attractive to DC WASA. The prospect of retaining renewable energy credits also improved the financial ledger. Table 3 below summarizes the criteria used the evaluation.

Table 3 - Analysis of Delivery Methods for CHP

CHP – Topic	DBO	DB	DBB
Total time to deliver project	✓	✓	
Schedule flexibility	✓	✓	

CHP – Topic	DBO	DB	DBB
Initial construction price			✓
Final construction price	✓	✓	
Ability to influence construction price pre-award	✓	✓	
Minimizing cost / schedule uncertainty	✓	✓	
Procurement based on some degree of price competition	✓		✓
Cost effective design	✓		
Owner control over design			✓
Foster alternative / innovative technical concepts	✓	✓	
Pre-award discussions with contractors	✓	✓	
Post-award collaboration with contractor	=	=	=
Collaboration between contractor and designer	✓	✓	
Shifting risk of design defects away from Owner	✓	✓	
Getting responsive bids	✓	✓	
Minimizing claims	✓		
Marketplace acceptance	✓	✓	
Familiarity of Owner with delivery system			✓
WBE / DBE / Local Contractors	=	=	=
Community impact	=	=	=
Technology aligned with Owner's core business processes	✓		
Commercial risks	✓	✓	
Performance risks	✓		

There were several factors that weighed more heavily than others in the selection of DBO for the CHP. CHP is not DC WASA's area of expertise. There are proven and accomplished contractors that could operate the CHP, thus alleviating fears of limited competition. DBO offers unified project responsibility and early price certainty compared to other delivery methods. A CHP DBO would allow DC WASA to have long-term performance guarantees and long-term power price stability. The schedule savings created by DBO delivery provided high reliability that the CHP would be on-line in time to test the THP component of the MPT project.

SELECTING A DESIGN–BUILD PROCUREMENT FOR THE MAIN PROCESS TRAIN

The MPT comprises the pre-dewatering facility, the Cambi process, and the anaerobic digesters. This project is estimated to be over $200 million in construction. In general, pre-dewatering sludge to 18 +/- percent with centrifuges is achievable and was shown to be very adequately done with DC WASA's existing Westfalia and Sharples 29-inch centrifuges during testing in 2009. The planned 3.5-million gallon anaerobic digesters are large, but the process and equipment needed to have successful digestion is well developed. The greatest unknown in the MPT is the Cambi THP as it is a new process to the United States and will be the largest Cambi project to date. Despite these concerns, DC WASA has been following Cambi installations for over a decade and has visited many of the Cambi sites. Cambi has adjusted/improved its designs with each installation to the point that DC WASA does not consider Cambi to have a significant process risk but more of a commercial risk. Table 4 below summarizes the team's evaluation of why DB was selected for the MPT.

Table 4 - Analysis of Delivery Methods for MPT

MPT - Topic	DBO	DB	DBB
Total time to deliver project	✓	✓	
Schedule flexibility	✓	✓	
Initial construction price			✓
Final construction price	✓	✓	
Ability to influence construction price pre-award	✓	✓	
Minimizing cost / schedule uncertainty		✓	
Procurement based on some degree of price competition	✓	✓	
Cost effective design	✓		
Owner control over design			✓
Foster alternative / innovative technical concepts	✓	✓	
Pre-award discussions with contractors		✓	
Post-award collaboration with contractor	=	=	=
Collaboration between contractor and designer	✓	✓	
Shifting risk of design defects away from Owner	✓	✓	
Getting responsive bids		✓	✓
Minimizing claims		✓	
Marketplace acceptance		✓	
Familiarity of Owner with delivery system			✓
WBE/DBE/Local Contractors	=	=	=
Community impact	=	=	=
Technology aligned with Owner's core business processes	=	=	=

MPT - Topic	DBO	DB	DBB
Commercial risks	✓	✓	
Performance risks	✓		

DB was determined to be the best procurement method to meet schedule and have unified project responsibility. The risks associated with THP would need to be mitigated in the procurement process.

The critical path runs through the MPT due to the construction of the digesters. Hence the question was whether AD could improve the schedule. Based on the time needed to get the digester foundations into place, the AD team's construction team members estimated that approximately one year could be saved using AD methods since foundation construction could start early. The team also determined the digester construction would be the project element that contractors and engineers might innovatively control costs. Another major reason was "unified project responsibility." During visits to plants utilizing the Cambi process and discussions with Cambi plant owners, there was recognition that some problems had occurred at Cambi interface points. For instance, the feedstock had too much debris, thus requiring installation of better sludge screening; and in another case, the heat exchangers were not working adequately to meet overall process needs. In terms of project delivery, ensuring proper interfaces between all units is critical to the MPT at DCWASA.

SELECTING THE DESIGN-BID-BUILD PROCUREMENT FOR TWO PROJECTS/SITE PREPARATION AND FINAL DEWATERING

The Site Preparation project is currently estimated at $9 million and is needed to raise the grade of the digester site approximately 20 feet in this eight acre site.

Figure 2 - Biosolids Area – Blue Plains AWTP

The main reason that DBB was chosen for the site preparation contract was that site work by itself does not incorporate the advantages of AD such as schedule, collaboration, and innovation. In order to potentially take advantage of a possible second round of stimulus monies and ensure that soils and or potential contamination did not delay a much larger project (the CHP or the MPT), the actual design was completed by the biosolids team. Construction is expected to begin in fall 2010. The table below includes all the factors used to determine a DBB would be best to implement.

Table 5 - Analysis of Delivery Methods for Site Preparation

Site Preparation - Topic	DB	DBB
Total time to deliver project		✓
Schedule flexibility	=	=
Initial construction price		✓
Final construction price	✓	
Ability to influence construction price pre-award		✓
Minimizing cost / schedule uncertainty		✓
Foster alternative / innovative technical concepts	N/A	N/A
Procurement based on some degree of price competition		✓
Cost effective design	=	=
Owner control over design		✓
Pre-award discussions with contractors	=	=
Post-award collaboration with contractor	=	=
Collaboration between contractor and designer	✓	
Shifting risk of design defects away from Owner	=	=
Getting responsive bids		✓
Minimizing claims	✓	
Marketplace acceptance		✓
Familiarity of Owner with delivery system		✓
WBE/DBE/Local Contractors	=	=
Community impact	=	=

The final dewatering contract was recommended to be procured with a DBB procurement method. As opposed to the "greenfield" construction site for the CHP and MPT projects, the final dewatering project involves significant amounts of renovation work in terms of existing sludge conveyors, odor control equipment, electrical work, and piping within a complex facility where the lime stabilization must remain in service during construction of the entire biosolids facility. The project clearly required other considerations before any plan could be implemented.

Since this project was not originally contemplated in the 2008 BMP, DC WASA required a Conceptual Design Report which was produced as a draft in February 2010. Contact with the engineering and construction community confirmed there would be significant competition for both engineering services and for construction services for the Final Dewatering project. Table 6 summarizes the formal evaluation used to select the DBB procurement method.

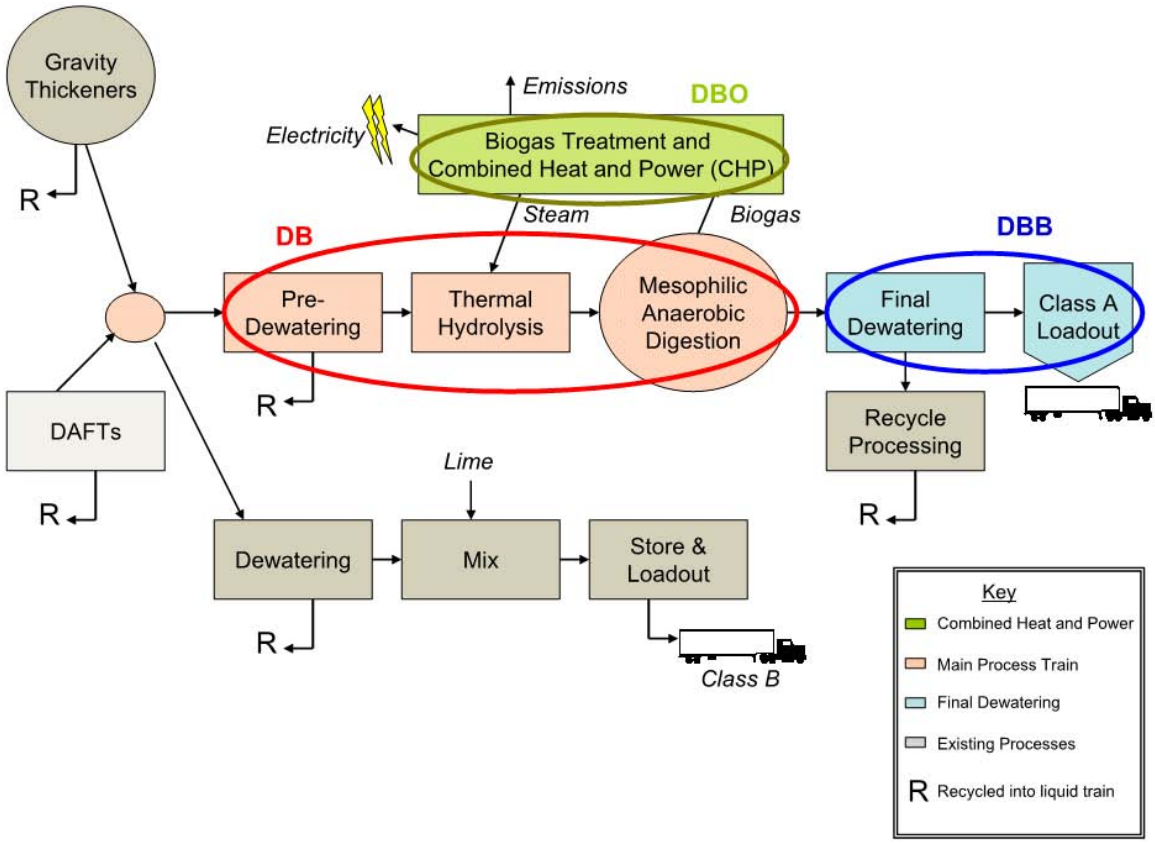
Table 6 - Analysis of Delivery Methods for Final Dewatering

Final Dewatering - Topic	DBO	DB	DBB
Total time to deliver project	=	=	=
Schedule flexibility			✓
Initial construction price			✓
Final construction price	✓	✓	
Ability to influence construction price pre-award	✓	✓	
Minimizing cost / schedule uncertainty			✓
Procurement based on some degree of price competition			✓
Cost effective design		✓	
Owner control over design			✓
Foster alternative / innovative technical concepts	=	=	=
Pre-award discussions with contractors	✓	✓	
Post-award collaboration with contractor	=	=	=
Collaboration between contractor and designer		✓	
Shifting risk of design defects away from Owner	✓	✓	
Getting responsive bids			✓
Minimizing claims			✓
Marketplace acceptance	=	=	=
Familiarity of Owner with delivery system			✓
WBE/DBE/Local Contractors	=	=	=
Community impact	=	=	=
Technology aligned with Owner's core business processes			✓
Commercial risks	N/A	N/A	N/A
Performance risks			✓

SUMMARY

The schematic below shows the final procurement process for each of the biosolids projects based on the evaluations of the previous section.

Figure 3 - Delivery Methods for Biosolids Management Program Components



The schematic and the tables seem straight forward but associated issues and subsequent reasons behind those decisions were carefully debated. Reaching consensus was sometimes difficult as the decisions involved evaluation of technical and commercial risk and modifying the historical "level of control" in project delivery. For the two AD projects, the procurement documents are being developed (as of March 2010) for release as RFPs later in 2010. The development of the procurement documents will continue until all stakeholders feel their objectives for the project are clearly conveyed. Recognition of the effectiveness of the process will be clearly determined upon receipt of the guaranteed maximum price from the design-builder.

REFERENCES

Aecom, 2008. Biosolids Management Plan Update Report, Blue Plains Advanced Wastewater Treatment Plant for the District of Columbia Water and Sewer Authority, December 2008.