SEWPCC Upgrading/Expansion
Conceptual Design Report

SECTION 24 - Implementation Plan

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24.0 Implementation Plan

24.1 INTRODUCTION

Today, owners have a myriad of choices with respect to the way in which projects will be delivered. These choices essentially revolve around the degree of risk transferred from the owner to the contractor team and range from the traditional design-bid-build methodology to the various forms of design-build. There is no doubt that alternate project delivery such as design-build have grown in popularity over the past number of years, and some even claim these alternate forms to be a “worry-free panacea” whereby the owner only needs to sign the contract and then arrange the ribbon cutting. The reality, however, is that project delivery methodologies all have advantages and disadvantages that correlate specifically to a project’s unique drivers and characteristics, and it is this factor that makes selection of an appropriate methodology a complex task. Despite the inherent biases of the proponents of the various methodologies, they do agree on one thing – the selection of an appropriate project delivery methodology is a critical success factor.

In this section, project characteristics are reviewed; the unique drivers are examined; various delivery methodologies are analyzed for their suitability and a recommendation is made as to the methodology deemed to be most suitable for the SEWPCC project.

24.2 PROJECT CHARACTERISTICS

The SEWPCC project consists of a conversion from the current treatment process to a Biological Nutrient Removal process driven by regulatory requirements, as well as an expansion of plant capacity driven by significant growth in the SEWPCC catchment area. The composition of the catchment area results in highly fluctuating flows, which is a complicating factor in the design of the treatment process. The City is undertaking ancillary studies (the South End I/I) to assist in determining the cause and potential remediation of some of the fluctuation.

The SEWPCC plant must remain operational at all times to comply with its licence requirements. As such, multiple tie-ins and complex staging are required to ensure that this requirement is met.

In summary, on a scale from basic to complex, the SEWPCC project is ranked as complex from both a technical and a constructability perspective.

24.3 PROJECT DRIVERS

Each project has a unique set of drivers. For the SEWPCC project, the primary drivers were determined to be:

- **Cost certainty,** defined as delivering the project within the approved budget.

- **Lowest life cycle cost,** providing maximum value to ratepayers who ultimately bear the risk of both capital and operating costs.
- **Minimizing time to market,** in order to minimize the erosion in purchasing capacity of the City given the current escalation in construction costs.
- **Least first cost,** achieved by scope definition, appropriate risk allocation and robust project controls.
- **Maintaining owner control,** to ensure appropriate risk allocation.
- **Meeting the regulatory requirements,** of providing nutrient removal no later than the end of 2012.

24.4 RISK ASSESSMENT

The appropriate project delivery methodology is one that responds to the project drivers in concert with a fair and equitable allocation of risk. To this end, the following are guiding principles in risk allocation:

- Risk should be allocated to the entity best able to manage the risk.
- Structure risk allocation such that the owner pays for appropriate risk measures and incurs the costs of dealing with risks that actually occur, resulting in best value.
- Avoid the least value scenario whereby the owner pays a significant risk premium due to uncertainty in the risk definition.

A high level risk assessment of the SEWPCC project yields the following risks:

- **Escalating construction costs.** The portion of this risk associated with increasing raw material prices, and other input costs such as energy and the cost of labor risk is shared by both the owner and the contractor, regardless of delivery methodology. A common misconception is that the at-risk project delivery methodologies such as design-build transfer this risk to the contractor. In fact, the contractor will attempt to mitigate this risk: by charging a risk premium in which case the owner may overpay to mitigate this risk; by insisting on the inclusion of escalation clauses in the contract in which case the risk is shared; or by making trade-offs on the quality of construction in which case the owner bears the operating risk at the time the facility is turned over.

  The portion of this risk associated with limited competition among contractors is borne entirely by the owner.

- **Competition for skilled labor.** This risk is appropriately borne primarily by the contractor. It can however result in schedule delays which obviously impact the owner. In recognition of this potential impact, the owner must decide if delay penalties will be included in the contract.

- **Operating risks.** The risks associated with maintaining operations in an existing facility such as SEWPCC is appropriately borne by the owner. It is difficult to transfer this risk to the contractor even through a design-build-operate contract given the latent risks that are inherent to existing facilities. For greenfield facilities, this risk can be transferred to the contractor through a design-build-operate contract, assuming that there are no overriding labor, regulatory or legal issues.

- **Regulatory risks.** Regulatory risk both during and after construction is borne by the City as the licensee.

24.5 PROJECT DELIVERY OPTIONS

At the highest level, project delivery methodologies fall into two categories – traditional design-bid-build and design-build. There are numerous variations of each of the methodologies and these will be discussed in further detail in subsequent sections, relating specifically to the SEWPCC project.

The following is a general discussion pertaining to the two types of contractual arrangements – traditional delivery models and at risk models.

24.5.1 Traditional Design - Bid-Build Model

The traditional design-bid-build model remains the most highly utilized delivery model.

Advantages include:

- **Quality Design** – the Owner selects the most qualified engineer / architect to design the facility. Provides the opportunity to integrate operator considerations and to standardize technologies, resulting in the optimization of life cycle costs.

- **Competitive Tendering** – generally considered as being the fairest method of selecting and awarding construction contracts, especially on publicly funded projects.

- **Least Scope Risk** – all design decisions have been made and the cost of construction is generally fixed prior to the start of construction, assuming that change orders are kept to a minimum. The owner has the most flexibility in terms of quality / selection of key components. The owner also has the most flexibility in making the trade-off decisions necessary to mitigate cost volatility risk due to rising construction costs.

- **Completion Date** – can be fairly accurately predicted at the start of the construction phase due to the degree of scope definition.
- **Well understood by all parties** – roles / responsibility well understood by all parties in the design-construct process. Legal and commercial frameworks are already in place.
- **Maximum flexibility during the design process** – owner receives the full benefit associated with innovative design approaches. Owner and the design team can better react to potentially changing regulatory requirements.

Commonly cited disadvantages include:

- **Time to market –** the process may take longer given that construction cannot begin until the design is complete. Having said that, a fast track, multiple contract delivery model can be used to expedite time to market.
- **Contract Disagreements –** can result in an adversarial relationship between the owners, consultants and contractors dues to lack of clarity or misinterpretation of contract documents.
- **Contract Revisions –** changes during construction may carry a significant cost premium.

24.5.2 At-Risk (Design-Build) Model

The use of at-risk (design-build) models has increased over the past number of years.

Advantages include:

- **Single point of contact –** responsibility for design and construction rests with one entity. As such, owners have a single point of contact.
- **Constructability –** integration between design and construction is improved as a single entity is responsible for both.
- **Time to market –** may be decreased if the project is relatively straight forward and the project requirements can be defined to a significant level of detail prior to the procurement process. Another caveat is that the design-build expertise is available to deliver the project.

Commonly cited disadvantages include:

- **Loss of owner control –** owner loses the ability to make critical trade-off decisions.
- **High cost of changes –** the cost of changes in a design-build model may be higher than other delivery methods.

- **Lack of legal and commercial framework –** unless owners have used this methodology for previous projects with similar characteristics, both legal and commercial frameworks must be developed before the procurement process can be initiated. In the case of complex facilities such as treatment plants, these frameworks must include performance guarantees. Development of these frameworks can quickly negate time to market advantages implied with this methodology.

- **Increased administrative burden –** for complex projects, owners must engage an owner's advocate to monitor the overall process. Adding to the administrative burden is the cost of monitoring compliance related to performance guarantees.

24.6 ASSESSMENT OF SEWPCC PROJECT DELIVERY OPTIONS

Five project delivery options were considered for the SEWPCC project. They include two versions of the traditional model - 1) traditional design-bid-build / single contract; 2) integrated project management – design-bid-build – multiple contracts; and three versions of at-risk management models - 3) target price contract whereby the contractor provides a baseline cost estimate with a gain share / pain share provision; 4) managed design-build whereby the contractor guarantees a price after a certain portion of design has been completed; 5) design-build whereby the contractor is responsible for both the design and construction of the facility.

Each of the options has been evaluated on the basis of the following criteria:

- Time to market.

- Potential for cost and schedule volatility (controllable).

- Potential for cost and schedule volatility (non-controllable).

- Quality.

- Price Certainty (This is not the same as cost certainty, defined as delivering the project within the approved budget. All delivery methodologies, if executed well, will result in cost certainty.)

- Risk Allocation.

- Life Cycle Considerations.

- Division of responsibility.

- Owner Familiarity with the delivery methodology.

24.7 QUALITATIVE ASSESSMENT OF OPTIONS

The following is a qualitative summary of each of the delivery options.

24.7.1 Design-Bid-Build (Single Contract)

This delivery methodology is premised on the tendering of a single contract for all the work. The current estimated value of construction is $177 million (excluding engineering). It is recommended that a contractor be engaged to provide design-assist services, consisting of constructability input, as well as scheduling and cost estimating services.

Advantages

The design-bid-build model (single contract) provides price certainty as the Contract Documents are completed in advance of the procurement / construction process. Quality and life cycle criteria can be met and the operating risk can be managed. The impact of non-controllable cost and schedule volatility can be mitigated through trade-off analyses throughout the design process and the subsequent delineation of optional items. This model offers the City the opportunity to pre-purchase major pieces of equipment to take advantage of economies of scale as well as procure long delivery items that could adversely impact the schedule. The City is familiar with this delivery methodology. Risk can be allocated in a fair and equitable manner.

The design-bid-build methodology also provides the City with the opportunity to integrate findings from ancillary studies (inflow / infiltration; basement flood relief) as well as integrate the recommendations from the risk and criticality studies.

Disadvantages

The amount of time it would take to prepare a single contract would result in a significant deterioration in the City's purchasing power given the current rate of construction escalation. It is also likely that there would be a limited number of contractors capable of bidding / delivering such a large contract, thereby limiting competition, potentially resulting in higher costs.

24.7.2 Integrated Project Management (d-b-b, multiple contracts)

This delivery methodology is premised on the tendering of multiple contracts on a fast track basis. As with the single contract model, it is recommended that a contractor be engaged to provide design assist services. The team would be led by a professional project manager with experience in this type of delivery.

Advantages

There are two principal advantages to this delivery methodology, namely the decrease in time to market, maximizing the City's purchasing power, and the packaging of Contracts to maximize competitiveness (typically less than $40 million). Quality and life cycle criteria can be met and the operating risk can be managed. The impact of non-controllable cost and schedule volatility can be mitigated through trade-off analyses throughout the design process and the subsequent modification of subsequent Contract packages. This model offers the City the opportunity to pre-purchase major pieces of equipment to take advantage of economies of scale as well as procure long delivery items that could adversely impact the schedule. The City is familiar with this delivery methodology. Risk can be allocated in a fair and equitable manner. The design-bid-build methodology also provides the City with the opportunity to integrate findings from ancillary studies (inflow / infiltration; basement flood relief) as well as integrate the recommendations from the risk and criticality studies.

Disadvantages

The primary disadvantage with this model is that there are multiple points of contact and as such, integration risk increased. In addition, price certainty is not achieved until all the Contracts are awarded. (As noted previously, price certainty is not synonymous with cost certainty. Cost certainty is achievable with all delivery models).

24.7.3 Target Price (Construction Management at Risk, Multiple Contracts, Pain / Gain Share)

This model is similar to the integrated project management model in that it involves the tendering of multiple contracts. The primary difference however is that it is an at-risk model whereby a contractor is contractually obligated to a baseline cost estimate with a pain / gain share formula. This type of contract is often utilized where there is significant scope uncertainty (e.g. emergency response services) and resulting cost risk. The contractor provides design-assist services throughout the design phase.

Advantages

The principal advantages to this delivery methodology, are a decrease in time to market (with the caveat that the legal and commercial frameworks are in place); the potential to package Contracts to maximize competitiveness (typically less than $40 million); and a single point of responsibility. Risk can be allocated in a fair and equitable manner.

Disadvantages

This type of contract is new to the Water and Waste Department (Department) and would require the development of legal and commercial frameworks including dispute resolution mechanisms, potentially negating the time to market advantages. The City loses some control over quality and life cycle considerations. The City must have the ability to validate the baseline cost estimate that forms the basis of the contract. Price certainty is not achieved until all of the Contracts are awarded.

24.7.4 Managed Design-Build

This delivery methodology is premised on the design being developed to a certain point at which time the contractor provides a guaranteed maximum price.

Advantages

The principal advantages to this delivery methodology, are a decrease in time to market (with the caveat that the legal and commercial frameworks are in place); the potential to package Contracts to maximize competitiveness (typically less than $40 million.); and a single point of responsibility, as well as price certainty earlier in the process. The City retains the right to engage the engineer / architect team as well as the contractor.

Disadvantages

This type of contract is new to the Department and would require the development of legal and commercial frameworks including dispute resolution mechanisms, potentially negating the time to market advantages. The City loses a greater degree control over quality and life cycle considerations. The City must have the ability to validate the guaranteed maximum price that forms the basis of the contract. While price certainty is achieved, the City may pay a risk premium given that the scope of the work is not fully defined, potentially adversely affecting cost certainty. Depending on the degree of pre-design that is performed prior to providing the guaranteed price, performance guarantees may need to be considered.

24.7.5 Design-Build

This delivery methodology is the conventional design-build methodology whereby the City requests design-build proposals and the design / construction is the responsibility of the contractor. For wastewater treatment projects, the design-build contract most often contains performance guarantees with respect to meeting regulatory requirements as well as consumptive targets for consumables such as energy and chemicals. Labor issues must also be resolved.

Advantages

The principal advantages to this delivery methodology a single point of responsibility, as well as price certainty earlier in the process. There may be a decrease in time to market (with the caveat that the legal and commercial frameworks are in place) depending on the ability of the contractor's design team to become familiar with the plant. For a complex project such as the SEWPCC upgrade / expansion, it is reasonable to assume that this would take a significant amount of time, negating the time to market advantage.

Disadvantages

This type of contract is new to the Department and would require the development of legal and commercial frameworks including dispute resolution mechanisms, potentially negating the time to market advantages. The City loses virtually all control over quality and life cycle considerations once the contract is awarded. This is mitigated somewhat through the performance guarantees that would be included in the Contract Documents. The City must have the ability to assess the responses as it is unlikely that they will be "apples to apples". The administrative burden increases as the City would need to engage a firm to provide owner's advocate services. While price certainty is achieved, the City may pay a risk premium given that the scope of the work is not fully defined, potentially affecting cost certainty. The City loses the right to engage the engineer / architect team as the design/construct teams are established by the contractor in advance of the procurement process. Wastewater treatment projects at the SEWPCC scale have not been delivered using this methodology in the Manitoba marketplace. The assumption by the contractor of the latent risk associated with an existing plant may result in a significant risk premium, affecting cost certainty.

24.7.6 Public Private Partnerships (P3)

The suitability of a P3 delivery methodology for the SEWPCC project is the subject of a separate study. Public-private partnerships extend well beyond the realm of project delivery and as such, a comprehensive analysis is beyond the scope of this report. As it is an option under consideration however, it does bear some commentary.

Brief Overview of Public-Private Partnerships

Private-public partnerships (P3) are long-term performance based contracts between the government and a private partner to deliver goods or services. Projects must be of a certain scale to justify the significant legal and administrative costs associated with the complexity of the contractual arrangement. This minimum scale ranges from $50 million to $100 million.

The P3 market is mature, has a global footprint, and has significant liquidity. P3 investors are looking to achieve their target rate of return on a long term investment with a moderate risk profile. The P3 market is NOT a venture capital market and as such, the equitable allocation of risk is of paramount importance. There is a misconception in some circles that risk transfer is risk elimination. In fact, risk is not eliminated – it is merely "sold". When risk is transferred to the P3 concessionaire, they must mitigate the potential impact through an equity cushion (a contingency) or if it is insurable risk, by purchasing insurance. If the concessionaire does not believe that it can manage, mitigate or insure the risk, the government will pay a risk premium associated with the inefficient use of the concessionaire's capital or excessive insurance premiums. In short, the government will have "sold" the risk for above market value, impacting the financial viability of the project. In some cases, the perceived inequity of the risk transfer (unresolved labor issues are an example) may preclude concessionaires from even participating in the procurement process.

There is no broad based standard formula to assess the suitability of a P3 procurement process, as suitability is project specific and must be evaluated on a case-by-case basis.

High Level Assessment of SEWPCC project

As mentioned above, a robust P3 suitability analysis is beyond the scope of this technical memorandum. The following table is a summary of the risks that would need to be assessed in the P3 business case analysis. Equitable allocation of risk should be interpreted as the ability to quantify the risk in such a way as to ensure that the City and therefore taxpayers are not paying an inordinate risk premium. The number of items with a "NO" classification and the potential impact of the risk associated with these items may lead to the conclusion that the SEWPCC project is not a suitable P3 candidate.

The one risk not addressed in the table is "mandate risk". The Department is mandated with maintaining and protecting the "public good". As such, the risk tolerance of the Department is significantly different than that of a P3 concessionaire who is only charged with meeting the requirements of the Contract for a specific time period. In short, there is no "asset return" deadline for the Department. Furthermore, in a P3 arrangement, the City is guaranteeing a specific level of funding associated with a stipulated asset management strategy for the period of the contract (e.g. 30 years). By contrast, the Department operates within the uncertainty related to a 5 year capital budget cycle and a one year operating budget cycle. It is hoped that these constraints are recognized when determining the value of the public sector comparator "psc". In other words, what is the value of the psc in a level playing field.

Finally, the intent to evaluate the feasibility of creating a separate water and waste utility was announced some time ago. A pre-existing P3 contractual obligation may in fact be considered to be a negative factor by potential utility proponents.

	Type of Risk	Applicable	Can be equitably transferred to the Concessionarie	Comments
1	**Regulatory Risk**			
.1	2012 Deadline	Y	N	The 2012 deadline could not be met, given the time it would take to implement a P3 procurement process.
.2	Environmental licence	Y	N	The licence includes the plant and the collection system. In the most likely scenario, the City would be the obligated licensee.
2	**Market Timing Risk**			
.1	Competition for resources	Y	Y	Regardless of delivery methodology - P3 or traditional, the Contractor bears the risk of competing for resources.
.2	Degree of competition among contractors	Y	N	Owner bears the risk of market timing associated with degree of competition and the associated cost impact.
3	**Execution Risk**			
.1	Methods	Y	Y	Regardless of delivery methodology - P3 or traditional, the Contractor bears the risk of competing for resources.
.2	Materials (cost volatility)	Y	Y/N	Tieing agreements to cost indices in an environment of significant volatility is a way to share the risk.
4	**Performance Risk**			
.1	Meeting nutrient limits in a predictable manner (investor requirement for moderate risk and predictable rate of return)	Y	N	There is currently significant variability in the characteristics of the wastewater to be treated.
5	**Operations and Maintenance Risk**			
.1	Internal Labor Risk	Y	N	No agreement with CUPE is currently in place with respect to the SEWPCC plant. Lack of labor agreement has caused other P3 projects to be canceled or signficantly delayed.
.2	Utilities / chemicals	Y	N	There is currently significant variability in the characteristics of the wastewater to be treated.
.3	Asset management (existing facilities)	Y	N	There is latent asset degradation risk associated with existing facilities.
6	**Innovative Risk**			
.1	Minimal capacity to innovate	Y	N	Conceptual design is complete and has been reviewed by internal and external review teams. Major processes have been chosen.
7	**Political Risk**	Unknown	Unknown	Wastewater collection and treatment is an essential service with limited redundancy. The City hasn't undertaken a P3 for this type of project / service.
8	**Public Perception Risk**	Unknown	Unknown	Wastewater collection and treatment is an essential service with limited redundancy. The City hasn't undertaken a P3 for this type of project / service.

QUANTITATIVE MEASURES

A quantitative analysis was undertaken to augment the qualitative analysis. It's important to note that the quantitative analysis is a relative comparison ranking. For example, single contract d-b-b and design build have scores of 3 for time to market as compared to a score of 5 for integrated project management. This means that the integrated project management has a much shorter time to market and that the single contract and design-build approaches would have a similar time to market (for reasons described above). The criteria were weighted to reflect the importance of the primary drivers. The weighting and analysis was reviewed and accepted by the Project Team.

The weighted scores for the options shown below and detailed in Table 24.1 in Appendix S are:

Integrated Project Management	**54.25**
Single Contract	**50.25**
Managed Design-Build	**47**
Target Price	**44.5**
Design-Build	**41.25**

The unweighted scores for the options were also calculated to gauge sensitivity of the results to the weighting of the criteria. The unweighted scores are:

Integrated Project Management	**46**
Single Contract	**43**
Managed Design-Build	**40**
Target Price	**38**
Design-Build	**35**

24.9 RECOMMENDATION

The integrated project management option is deemed to be the most favorable both on the basis of the qualitative and quantitative analysis. It decreases time to market, maximizes competitiveness favorably impacting costs; provides an opportunity to mitigate non-controllable volatility; is familiar to the City and therefore does not require further development of legal and commercial frameworks; and provides the City with the necessary degree of control to achieve quality and life cycle considerations and integrate operating requirements.

Augmenting the team with contractor design-assist services will enable the team to integrate constructability, bidability, cost and schedule issues as part of the design process.

Should the decision be made to proceed on the basis of an at-risk project delivery mode, the managed design-build model is deemed to be the most favorable of the at-risk models for reasons described in this document.

24.9.1 Preliminary Contracting Strategy

A preliminary contract packaging and pre-purchase strategy is as follows. It is applicable to both the integrated project management and the managed design-build approaches.

Separate Contracts

- Flood protection berming / snow dump (design / tender / award / construction / complete.
- Outfall upgrade.
- Secondary clarifiers and UV disinfection.
- Bioreactors and adjacent buildings.
- Headworks.
- Solids handling / fermentation.
- Hauled wastewater receiving (separate budget, work scheduled for 2009)

Pre-purchase Items

- Grit and fine screening equipment.
- Fermenter thickener mechanism.
- DAF units.
- IFAS media.
- Secondary clarifier mechanism.

24.9.2 Schedule

A schedule corresponding to the foregoing contracting strategy is attached as Figure 24.1.

This schedule is based on the assumption that in late August the City will confirm they will implement the SEWPCC Upgrading / Expansion project utilizing the integrated project management delivery methodology; and, award the Detailed Design and Construction Engineering services contract to Stantec. If these assumptions are not achieved by the end of August, the start of Detailed Design and the completion of construction of the project will be delayed, potentially placing the City in default of the Environmental Licence.

If the City is not in a position to finalize the selection of the project delivery methodology in August, it is recommended that at minimum the Detailed Design contract be awarded. This would mitigate the schedule risk to some extent, should the City choose to proceed with the managed design-build (at risk) option as a certain amount of detailed design work is required to implement this option.

The following is a brief explanation of the rationale used in developing the proposed design / tender / construction schedule presented in Figure 24.1.

The SEWPCC project is an upgrading / expansion of an existing wastewater treatment facility that must remain in operation throughout the construction process, and must continue to meet the existing Environment Act Licence. Planning for the construction work related to this project requires consideration of interconnection and the maintenance of treatment capacity issues. Since dry weather flows (late fall and winter) are the lowest and most predictable, these are the seasons when interconnections and treatment conversions should be scheduled.

Further complicating the division of the work into appropriate construction contracts is the desire to minimize the amount of connection points between contracts, thereby reducing the integration risk. Each point of connection between independent contracts is a potential scheduling complication and increases the risk of construction claims due to non-performance of the adjacent contractor. Fortunately, the SEWPCC project is arranged such that the system components that are being expanded / upgraded are relatively independent and in most cases separated by either the existing structure or adequate distance to minimize any construction conflicts.

Figure 24.2 delineates the general boundaries of each of the contracts discussed below.

Snow Dump / Flood Protection - This work had to be completed in 2008 regardless of the project delivery methodology selected by the City in order to prepare the site for construction in 2009. In spring of 2008 the City authorized Stantec to proceed with the detailed design and tender preparation of this component of the project. This work is complete and the tender results came in under budget. The City has awarded the construction contract and the work is scheduled to be completed by the end of November 2008.

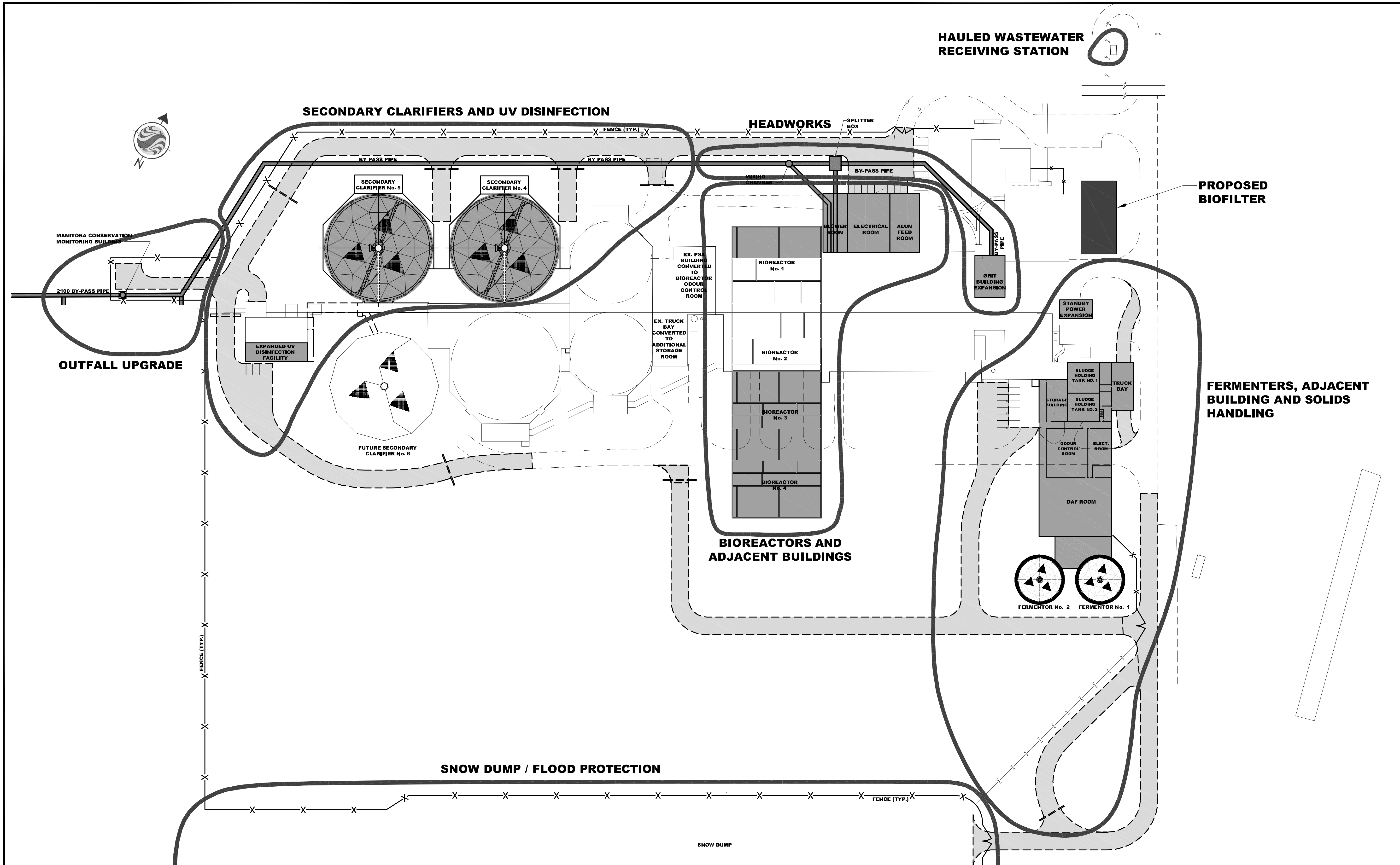
Outfall Upgrade – This is the most straight forward component of the project and could be designed in time for construction work to start in the spring of 2009. Early implementation of the

Figure 24.1 - SEWPCC PROJECT DELIVERY SCHEDULE (July 31, 2008)

ID	Task Name
1	**Traditional Delivery Schedule**
2	Conceptual Design
3	City Review/Value Engineering
4	Scope of Project Defined
5	
6	**Snow Dump/Flood Protection**
7	Design
8	Tender
9	Award
10	Mobilization
11	Construction
12	
13	**Outfall Upgrade**
14	Design
15	Tender
16	Award
17	Mobilization
18	Construction
19	
20	**Hauled Wastewater Receiving Station**
21	Design
22	Tender
23	Award
24	Mobilization
25	Construction
26	
27	**Headworks**
28	**Design**
29	Design
30	**Grit and Fine Screening Equipment Selection**
31	Tender
32	Review
33	Selection
34	Tender
35	Award
36	Mobilization
37	Construction
38	
39	**Fermenters, Adjacent Building, & Solids Handling**
40	**Design**
41	Design
42	**Thickener Mechanism Selection**
43	Tender
44	Review
45	Selection
46	**Dissolved Air Flotation Units Selection**
47	Tender
48	Review
49	Selection
50	Tender
51	Award
52	Mobilization
53	Construction
54	
55	**Bioreactors and Adjacent Building**
56	**Design**
57	Design
58	**IFAS Media Selection**
59	Tender
60	Review
61	Selection
62	Tender
63	Award
64	Mobilization
65	Construction
66	
67	**Solids Separation (Secondary Clarifiers) & UV Disinfection**
68	**Design**
69	Design
70	**Clarifier Mechanism Selection**
71	Tender
72	Review
73	Selection
74	Tender
75	Award
76	Mobilization
77	Construction
78	
79	New Facility Operating within Licence
80	
81	Commissioning
82	Post Construction Services
83	
84	Construction Management

Alternative Delivery Schedule
Date: Sat 12/6/08

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline



METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

APEGM
Certificate of Authorization
Stantec Consulting Ltd.
No. 1301 Expiry: April 30, 2009

LOCATION APPROVED
UNDERGROUND STRUCTURES

SUPV. U/G STRUCTURES COMMITTEE DATE

NOTE:
LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.

B.M. ELEV.

NO. REVISIONS DATE BY

Stantec Consulting Ltd.
905 Waverley Street, Winnipeg, Manitoba
Tel 204-489-5900 Fax 204-453-9012

DESIGNED BY
CHECKED BY
DRAWN BY
APPROVED BY
HOR. SCALE:
VERTICAL:
RELEASED FOR CONSTRUCTION:
DATE 08.04.24
DATE

ENGINEER'S SEAL

TENDER NO.

Winnipeg

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

SOUTH END WATER POLLUTION CONTROL CENTRE
PROPOSED CONSTRUCTION CONTRACTS

CITY DRAWING NUMBER
FIGURE 24.2
SHEET OF

01/000

outfall upgrades would allow the City to increase the level of basement flood protection provided to residents in the collection area during high river levels. It would also allow the City to implement final effluent flow metering, which is currently unavailable at the facility.

Hauled Wastewater Receiving Station – This work will be completed independently of the SEWPCC project but components such as odor control will be interconnected in order to take advantage of systems that will be installed as part of the SEWPCC Upgrade / Expansion. The City currently plans to complete the design of Hauled Wastewater Receiving Facility Upgrade during the 2008 / 2009 winter season with tendering and construction taking place in 2009. The hauled wastewater receiving facility is located away from the remainder of the SEWPCC project and as such can be treated independently.

Solids Separation (Secondary Clarifiers) and UV Disinfection – The City already has a large secondary clarifier and UV disinfection facility at the SEWPCC. The intent is to add two additional secondary clarifiers of similar dimensions as the existing large clarifier and twin the existing UV disinfection facility. As such, the City has a clear understanding of what they like and dislike about the existing facilities. This will simplify the design and review of these components, allowing Stantec and the City to get them ready for tender in the shortest time period of all the major contracts. This would facilitate the successful contractor starting work on the first major contract by mid summer of 2009.

Headworks – This is a fairly small contract that is located for the most part in an isolated area of the existing facility. However, it includes the upgrade of the wet weather bypass system and so is critical to future flow control scenarios that will be required for interconnection of new and existing systems. As such, it is scheduled to be tendered early in the construction phase.

Bioreactors and Adjacent Building – The bioreactors will represent the largest construction contract and the most complicated component of the design and will require the most supplier coordination and City review time. As such, the design phase of this contract has been extended to accommodate these requirements while still providing an extended tender period while facilitating an early spring 2010 construction start date. The intent will be to construct and commission the two new BNR bioreactors first. These would then be commissioned in late summer of 2012, allowing the City to meet their licence requirements that come into effect on Jan 1, 2013. Once the two new bioreactors have been commissioned, the first two existing bioreactors will be converted into a third BNR train, while the existing HPO system is retained for existing bioreactors 1 and 2. The conversion of the existing HPO bioreactors to BNR will be phased to provide the City with adequate treatment capacity in the event of a wet weather event. Once the third BNR train has been commissioned, existing bioreactors 1 and 2 will be converted into the fourth BNR train.

Fermenters, Adjacent Building and Solids Handling – This is a smaller construction contract that is located at the southeast access to the site. Since construction of this component will constrict access to the site, it is scheduled to take place last in order to minimize the negative impact construction of this component will have on the execution of other contracts.

24.9.3 Project Delivery Model

As discussed earlier, a project delivery model is successful when the owner's needs are met. This success is dependent on the integration of the four essential elements of project management – people, processes, structure and tools. In this section, we describe the structure, processes and tools necessary to execute the integrated project management model recommended above.

24.9.3.1 Structure

The proposed team structure is shown on Figure 24.3 - Organization Chart in the organization charts at the end of this section. As the delivery methodology is premised on a fast track, sequentially tendered approach, an org chart is presented for the design portion of the work and the construction portion of the work. Highlights include project leadership continuity throughout the life cycle of the project; an integrated design and construction management team (as per lessons learned on the water treatment plant project); structuring of the teams to enable design and construction to take place in a coordinated and integrated manner; and, the integration of a contractor to provide design-assist services.

Role clarity is a critical success factor. The following is a brief description of the roles of the project leadership team. The Stantec Project Manager will be actively involved throughout all phases of the project, will be the primary point of contact for the City, and will be responsible for the successful execution of the project. The Stantec Deputy Project Manager will be responsible for project controls, risk management, and development of the project delivery / procurement strategy during the design phase and will transition to the role of Construction Manager during the construction phases. The Design Lead will be responsible for the daily coordination of the design team as well as the management of the quality management program. The Site Manager will be responsible for coordination of the Contractors, as well as management of the resident site team, and the health and safety officer.

24.9.3.2 People

The formula for success is "capability x commitment". Stantec has the resources with the necessary skills and competencies to immediately fill the key leadership roles, providing the City with "quick start" capability. Of equal importance is that the City team be in a position to mobilize, and that the decision-making protocol is defined and clear to all team members.

24.9.3.3 Processes

Early implementation of project controls is necessary to focus and prioritize the efforts of the team. At the heart of successful project controls is the immediate development of a project execution plan that will include:

- The Project Charter (project definition, roles and responsibilities, critical success factors).
- Baseline Integrated Resource Loaded Schedule.
- Baseline Cost Estimates.
- Risk Registry (to be monitored and maintained throughout the project lifecycle).
- Cost Control Methodology.
- Change Management Plan.
- Reporting requirements.
- Project accounting and cash flow requirements.
- Document control and file management.
- Communications plan.
- Standards for Contract Documents.

24.9.3.4 Tools

An integrated web-based project management platform will be established to enhance productivity and collaboration. The web portal will facilitate team collaboration and coordination; document and drawing management and reviews, as well as progress reporting (schedule and cost).

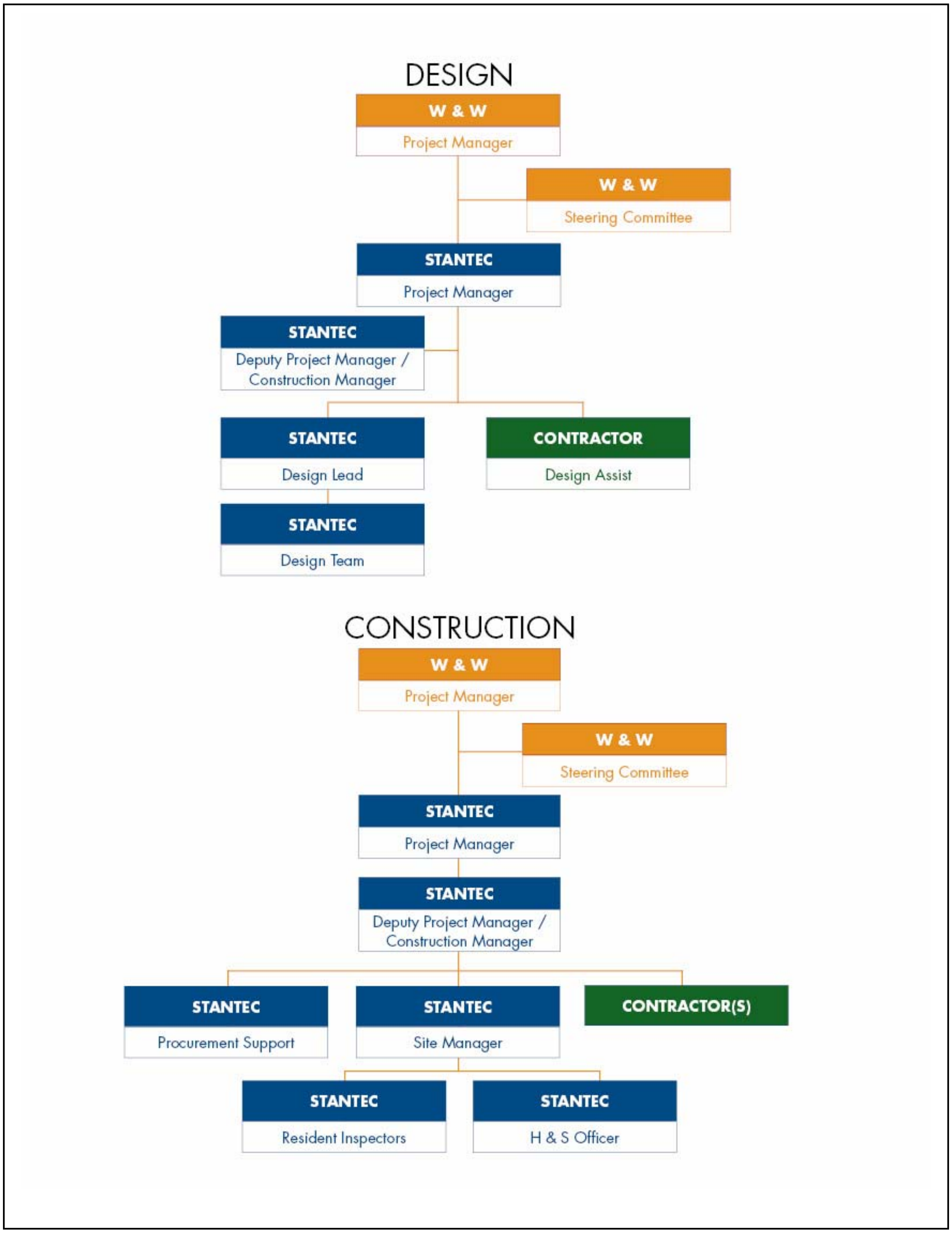


Figure 24.3: Organization Chart