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Wastewater Facility Plan
Technical Memorandum 1
Strategic Direction

City of Whitewater
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TABLE OF CONTENTS

Chapter I – Introduction 2
1.1 Introduction 2
Chapter II – Evaluation Metrics 3
Several metrics will be evaluated with specific criteria developed for each metric. 3
2.1 Energy 3
2.2 Nutrients 3
2.3 Water 3
2.4 Operations 3
2.5 Future Regulations 4
Chapter III – Strategic Direction 5
3.1 Strategic Direction 5
3.2 Economic Evaluation 5

LIST OF TABLES

Table 1: Example Alternatives Evaluation Table 4

LIST OF FIGURES

Figure 1: Example of Graphical Interpretation of the Economic Evaluation 6

CHAPTER I – INTRODUCTION

1.1 INTRODUCTION

Planning projects for clean water agencies provide an opportunity to examine current needs and future industry drivers to establish a long term, sustainable plan of action related to wet infrastructure. For wastewater treatment facilities, identifying a strategic direction related to energy, nutrients, water, and operations is a critical first step towards developing an effective, useful facilities plan. A Strategic Direction Workshop was conducted on December 12, 2013, with the City of Whitewater and Donohue & Associates. This Technical Memorandum (TM) documents the major points of the discussion, and establishes the evaluation criteria for the major upgrades that will be included in the facilities plan.

CHAPTER II –EVALUATION METRICS

Several metrics will be evaluated with specific criteria developed for each metric.

2.1 ENERGY

Current and future energy footprints are both important components of Whitewater's Strategic Direction. Reducing overall power costs to decrease the impact on rate payers is a large driver for the City. This goal of energy reduction will expand to the entire plant site. While major energy impacts of large capital improvements will be quantified, the City will also include smaller scale energy improvements in their plan. Examples of these improvements would be smart motor control centers, higher efficiency HVAC components, and high efficiency lighting. Cost components will be included for these items during the planning phase.

Energy estimation for major process evaluations, mainly related to the liquids treatment, was discussed in two categories: energy required and energy production potential. Energy required will be estimated for the main liquids treatment alternatives based on aeration requirements, pumping requirements, and other major energy usage. Energy production potential will be estimated based on the primary sludge and secondary sludge production rates. An assumed biogas production from these solids will be used to estimate the potential electrical energy from solids produced by the liquids treatment train.

2.2 NUTRIENTS

Low level phosphorus removal will be included as a part of all alternatives. The capital and annual costs associated with biological phosphorus removal and chemical phosphorus removal will be estimated. The impacts of the liquids stream phosphorus management decisions on the potential for sidestream phosphorus recovery from the digestion facility will be estimated in an annual amount per year. In addition, the nitrogen removal potential of each technology evaluated will be quantified.

2.3 WATER

The value of water was discussed in detail. The City of Whitewater has a limitation on the drinking water production capacity, and water availability is a major concern for the utility in the future. The option of producing a sellable water product is of major interest for the City. For alternatives where membrane filtration quality water is produced, a value will be assessed to the produced water product. The target would be to potentially sell this water product to the adjacent power plant.

2.4 OPERATIONS

Balancing complexity, efficiency, and flexibility are major concerns for the Whitewater staff. Across the plant, understanding the complexity introduced by efficiency gains will be a critical consideration. Although this is a qualitative evaluation, the discussion will be had when considering efficiency gains. With respect to the liquids treatment improvements, a large interest in continuing with a biofilm based process was discussed and will be included in the evaluation. For each liquids technology, a qualitative score will be assessed to the operational complexity and operational flexibility. Each will be scored on a

scale of 1 to 10, with 10 being the highest score. The scoring will be developed during workshops with the plant staff. Donohue will provide background information on each alternative, and the score will be developed based on plant staff input.

2.5 FUTURE REGULATIONS

The impact of liquid treatment technologies on future constituents was also discussed. Potential regulations for emerging organic contaminants and metals were of concern for the plant staff. A relative ranking of each alternative on these emerging contaminants will be included in the evaluation.

Table 1 - Example Alternatives Evaluation Table

Metric	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Energy required (kwh/year)				
Energy production potential (kwh/year)				
Biosolids production rate (tons/year)				
Chemical requirement – Liquids (gallons/year)				
Chemical requirements – Sidestream (gallons/year)				
Nitrogen removal potential				
Sidestream phosphorus recovery potential (tons/year)				
Reuse quality water (gallons/year)				
Construction Phasing/Expandability (Scale 1 to 10)				
Operational complexity (Scale 1 to 10)				
Operational flexibility (Scale 1 to 10)				
Impact on emerging contaminants (Relative ranking)				

CHAPTER III –STRATEGIC DIRECTION

3.1 STRATEGIC DIRECTION

Overall, the City of Whitewater has a desire to embrace the idea of converting to a resource recovery facility. The utility staff would like to move towards resource recovery in a manner that is balanced for the rate payers. The facility plan alternatives put forth during this project will develop the direction for the next 20 years and lay the foundation for a positive legacy for the Whitewater Utilities. The strategic direction for this legacy will be to move towards resource recovery in an economical feasible manner, while meeting discharge requirements.

3.2 ECONOMIC EVALUATION

A full economic evaluation will be developed for each alternative. Several key economic factors related to energy and financial values are critical for the economic evaluation. For this first report, the following assumptions will be made for the annual rates:

- Discount rate: 3% (National Institute of Standards, Annual Supplement to NIST Handbook 135)
- Inflation Rate: 0.5% (National Institute of Standards, Annual Supplement to NIST Handbook 135)
- Natural Gas Escalation Rate: 2% (National Institute of Standards, Annual Supplement to NIST Handbook 135)
- Electricity Escalation Rate: 2% (National Institute of Standards, Annual Supplement to NIST Handbook 135)

The initial energy values will be based on the 2013 budgeted values. The initial energy value assumptions were:

- Electrical rate: $0.086/kwh

Using these economic evaluation criteria, a simple payback analysis and a 20-year total present worth savings can be developed. A similar Life Cycle Cost Analysis will be developed for each alternative. These economic evaluations will be compared graphically for each alternative, as shown in Figure 1.
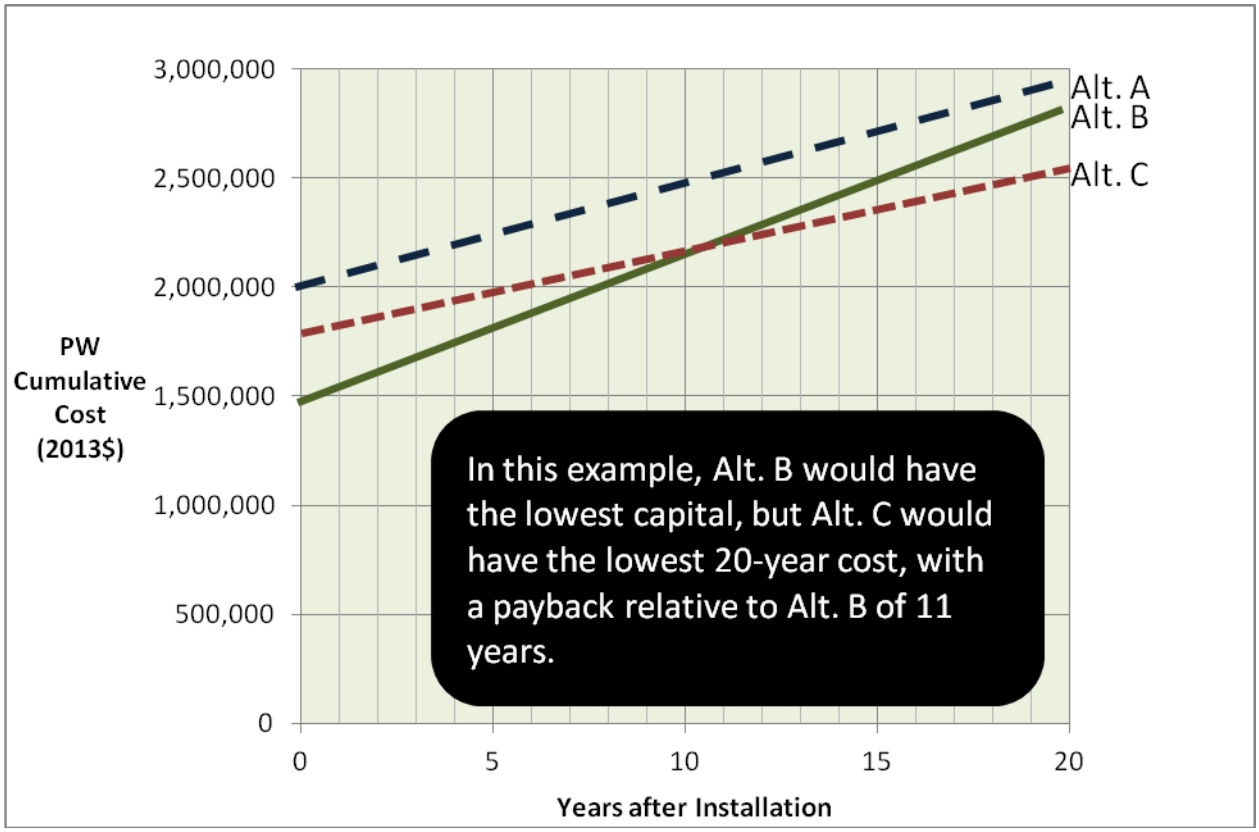
Figure 1- Example of Graphical Interpretation of the Economic Evaluation