

VILLAGE OF WELLINGTON
UTILITY ENGINEERING SERVICES WORK AUTHORIZATION
MEMBRANE TREATMENT SYSTEM IMPROVEMENT PLAN

This Work Authorization authorizes Kimley-Horn and Associates, Inc. to perform work set forth herein and is issued pursuant to the Agreement for Consulting Services, between Wellington (“Client” or “Village”) and Kimley-Horn and Associates, Inc. (“Kimley-Horn” or “Consultant”), dated February 9, 2016 (“Agreement”). All terms and conditions of said Agreement are hereby incorporated and made part of this Work Authorization.

BACKGROUND

A previous project (*Technical Memorandum No. 2a Projected Population Growth, Water Demand and Water Treatment Plant Capacity Requirements – Final, Hazen-Sawyer, October 24, 2018*), established the Village’s projected maximum day firm and total water treatment capacity requirements.

The projected water treatment capacity requirements were established by considering current and future water service areas in the Village and developing population projections to estimate future water demands through the 20-year horizon (to 2038). Water treatment plant (WTP) capacity requirements were also estimated based on projected peak day demands. TM No. 2a stated that the required water plant treatment capacity is 13.0 mgd to meet the peak day demand and assuming a largest train capacity of 1.8 mgd, the water treatment facilities would need to have a capacity of 14.8 mgd to satisfy the redundancy requirement that the plant be able to treat 13.0 mgd with the largest unit out of service.

The purpose of this project will develop a planning level document with overall recommendations, conceptual layouts with a phased planning approach to meet the projected maximum day firm capacity of 13.0 MGD with a total capacity of 14.8 MGD. The project will develop recommendations and conceptual layouts for increased finished water production from the membrane treatment facilities using the best available membrane treatment technologies, techniques, components, and layout of the membrane water treatment systems

The water treatment technology evaluation will focus on the best available membrane treatment and technologies with respect to overall water quality, unregulated contaminants including Contaminants of Emerging Concern (CEC), existing regulatory requirements, and potential future regulatory requirements. It is important to consider future regulatory requirements relative to currently unregulated contaminants and/or Contaminants of Emerging Concern (CEC) in the raw water supply but not currently assigned a regulatory limit in drinking water. The membrane technology evaluation will consider the expected useful life considering, at minimum, a 20-year life cycle with potentially new water quality standards anticipated to be imposed within that time frame.

A qualitative and quantitative discussion and analysis of the best available membrane treatment technologies and current optimized techniques will include, but not be limited to, the following:

- Interstage Boost
- Membrane Array Change
- Increased Recovery
- Increased Train Production
- Improved Membrane Performance through Feed Pressure Reduction
- Optimized Feed Pump VFD Control
- Modulating Concentrate Control Valves
- Installation of New Membrane Treatment Systems between Existing RO1 and RO2
- Use of Center Feed/Exit Membrane Vessels

The following is a description of the scope of work involved.

SCOPE

Task 1 – Develop Recommendations and Improvements to the Membrane Treatment System

- A. Kimley-Horn will create process flow diagrams (PFD) that include all existing hydraulically significant piping, elements, devices controlled by the control system, and instrumentation in both existing membrane treatment facilities. These PFD's will not include I/O paths, PLCs or logic. The PFD's will provide confirmation of all existing controlled or controlling devices available when increasing train capacities.
- B. Kimley-Horn will develop spreadsheet-based membrane treatment train hydraulic models to allow hydraulic analysis of the various pipe segments through the membrane trains. The hydraulic models will include the membrane plant supporting piping and will be used to identify hydraulic bottlenecks, flow imbalances, and capacity limiting factors during the analyses to develop the maximum possible production from each train and each plant.
- C. Kimley-Horn will utilize membrane performance software from several membrane manufacturers to test varying recovery rates, permeate production rates, membrane arrays, and membrane types, and membrane vessel types using the existing train arrays and piping. This information will be used with the PFD and hydraulic models to identify piping or membrane arrays that limit increasing production from the current trains. This work will include determining the extent of modifications needed to eliminate these restrictions.
- D. Kimley-Horn will determine the overall amount of membrane treated water that can be produced using the existing train core facilities assuming Train 1 is re-installed and Train 8 is installed. This analysis will not be limited by existing piping and will make recommendations to replace existing piping if that is possible and allows maximum use of the core facilities.

- E. Based on the best available membrane technology and advancements, Kimley-Horn will evaluate alternatives, produce conceptual layouts, and provide recommendations for the effective use of the existing membrane treatment facilities to achieve the overall goal of 14.8 MGD of finished water (total capacity) from the current raw water supply system.
 - a. Kimley-Horn will produce conceptual level membrane train layouts to include layout details such as required height, width, array configuration, piping configuration, and any other modifications required for each train.
 - b. Kimley-Horn will contract directly with an electrical engineering subconsultant (Hillers Electrical Engineering, Inc) to assist with evaluating the electrical considerations of the recommendations. Hiller's scope of work will include overall electrical and control coordination, reviewing Kimley-Horn's conceptual layouts/options, limited existing electrical system condition assessment, evaluation of existing and proposed electrical/control requirements, and providing a written summary of results in a Technical Memorandum format.
- F. Kimley-Horn will conduct a workshop with Village staff to review and discuss the findings of these initial findings. The goal is to reach a total production capacity of approximately 14.8 MGD which includes ability to produce the projected maximum day production requirement of 13.0 MGD with a largest train out of service (i.e. firm capacity). This workshop will conclude with a plan of how to provide facilities to produce the desired rate of water production capacity.

Task 2 – Planning Document Deliverable

- A. Kimley-Horn will prepare a Membrane Treatment System Improvement Report summarizing the overall evaluation and results. The Report will consist of methodology, qualitative and quantitative discussion, alternative development and evaluation, conceptual layouts for membrane treatment and electrical supply facilities, conceptual train dimensions, results, and recommendations.
- B. The Report will include a summary of capital projects needed to implement the recommendations and a budget level opinion of probable construction cost for each capital project.
- C. Kimley-Horn and Hillers will review the draft Report at a workshop with Village staff. The Village, Kimley-Horn, and Hillers will discuss the alternatives and recommendations in detail to identify any changes or refinements to the recommendations.
- D. Kimley-Horn will revise the Report based on the Village's comments and deliver a final draft Membrane Treatment System Improvement Report for review and comment.
- E. Kimley-Horn will meet with Village staff to discuss the Village's final draft Report comments prior to finalizing and delivering the Membrane Treatment System Improvement Report.

ADDITIONAL SERVICES

Any services not specifically provided for in the above scope, as well as any changes in the scope requested by the Village, will be considered additional services to this Work Authorization and will be performed based on subsequent Work Authorizations approved prior to performance of the additional services.

INFORMATION AND SERVICES PROVIDED BY THE VILLAGE

Kimley-Horn assumes that all information provided by the Village can be relied upon in the performance of professional services. The following information shall be provided to Kimley-Horn and/or the following services will be performed by the Village.

- Facilitate access to the site
- Yard piping and ductbank horizontal and vertical locates as required
- Demand projections
- Detailed condition assessment of components and equipment as required

SCHEDULE

The work set forth in the Scope shall be completed within three (3) months of receipt of a Purchase Order, exclusive of delays beyond the control of the Consultant. The schedule assumes input required from the Village will be supplied within one week of request for same.

COMPENSATION

Kimley-Horn will perform the services described in the Scope of Services on a lump sum basis in the amount of one hundred and twenty-one thousand, nine hundred (\$121,900).

Accepted by:

Village of Wellington

Kimley-Horn and Associates, Inc.

Anne Gerwig, Mayor

Mike Schwarz, P.E., Sr. Vice
President

Date: _____

Date: _____

ESTIMATE FOR ENGINEERING SERVICES

PROJECT:	Village of Wellington WTP Membrane Treatment System Improvements					SHEET	1 of 1		
CLIENT:	Wellington					FILE NO.			
ESTIMATOR:	Matt Tebow/John Potts					DATE:	03/11/20		
DESCRIPTION: See Scope of Services	DIRECT LABOR (MAN-HOURS)								
	Principal		PM	Engineer (PE)	Engineer (EI)	Admin	SUB Electrical	EXP	LINE TOTAL
	JP		MT		AG	TC	Hillers		
Task 1 - Membrane Treatment Evaluation									
Meetings and Coordination	12.0		12.0		4.0				\$5,240
Develop detailed PFD	8.0		10.0		36.0				\$7,490
Develop spreadsheet-based hydraulic models	8.0		15.0		10.0				\$5,455
Membrane projections and analysis	16.0		10.0		20.0				\$7,610
Hydraulic and performance analysis	30.0		20.0		20.0				\$12,550
Develop alternatives and recommendations	15.0		15.0		20.0				\$8,200
Produce conceptual layouts of alternatives	8.0		20.0		56.0				\$11,340
Develop opinions of probable costs	10.0		15.0		30.0				\$8,125
Electrical evaluation and analysis	16.0		16.0				25000.0		\$31,400
Task 2 - Deliverables									
Draft Report	16.0		30.0		10.0	20.0			\$11,410
Review workshop	16.0		6.0		4.0				\$5,190
Final Report	18.0		12.0		8.0	10.0			\$7,890
Total Hours	173		181		218	30			
Hourly Rate	\$235		\$165		\$110	\$80	1.00		
Total	\$40,655		\$29,865		\$23,980	\$2,400	\$25,000		\$121,900