ISI INDUSTRIAL SERVICES, INC.

DESALINATION EQUIPMENT
DESIGN/BUILD
TURNKEY PROJECTS
UPGRADES/EXPANSIONS/RETROFITS
CONSULTING

Proposal
Town of Hinesburg Water Treatment Facility
136-153 gpm NF Permeate
Up to 243 gpm Total Blended Flow

Date: 15 June, 2015
Revision No. 6 (In Blue)

Rocky Martin
Town of Hinesburg

Joseph J. Duncan, PE, F.NSPE
Aldrich + Elliott, PC
WATER RESOURCE ENGINEERS
6 Market Place, Suite 2
Essex Junction, VT 05452

ISI
INDUSTRIAL SERVICES, INC.

DESALINATION EQUIPMENT
DESIGN/BUILD
TURNKEY PROJECTS
UPGRADES/EXPANSIONS/RETROFITS
CONSULTING

15 June, 2015

Town of Hinesburg
Hinesburg, VT 05461

Dear Mr. Martin,

Thank you for the opportunity to provide this proposal for your softening treatment plant application. The proposed equipment is manufactured in the United States using name-brand suppliers. Our company takes great care in making sure that the proposed equipment is suitable for the application, and we welcome any questions, design enhancements or other features that you may require. Please do not hesitate to contact us if you have any questions on this proposal. We look forward to your evaluation comments and seek to maintain a long term relationship that includes after-market support of the equipment once it is operating in the field.

Sincerely,

Scott Shumway
Industrial Services Inc.

Proposed System Design

As previously proposed, the process design for the Hinesburg Water Treatment Facility primarily consists of a nanofiltration system as a means to remove hardness from the water from wells 4 and 5.

The following table calculates the blend flows in order to get a target hardness of 125 mg/l as CaCO3. The result shows that the nanofiltration system requires a feed flow of 170 gpm, with a treated flow of 136 gpm, and a bypass flow of 90 gpm. The total treated blended flow is therefore 226 gpm.

Hinesburg Nano-Filtration Blend Calculator Original	Value	Unit
Inlet Water Hardness	322	as CaCO3
Raw Water Flow	260	gpm
Target Hardness	125	mg/l as CaCO3
NF Permeate Hardness	9.12	mg/l as CaCO3
NF Recovery Range 75-90%*	80.0%	Example
Turbidity	<1.0	NTU
NF Feed Flow*	170	gpm
NF Permeate Flow*	136	gpm
NF Concentrate Flow to Waste*	34.0	gpm
Total System Recovery*	86.9%	%
Percent Loss of Total Flow*	13.1%	%
Untreated Bypass Flow*	90	gpm
Total Blended Product Flow*	226	gpm
Calculated Blended Total Hardness*	125	mg/l as CaCO3

*Can be adjusted in the field

Note: The NF system recovery, feed flow, product flow and blending flow can be adjusted in the field. The final operating point should be determined after well water chemical testing has been completed. Chemical testing to measure hardness, TDS, sulfates and other parameters will allow for precise design dosing rates and flows. We understand that the highest recovery is desirable to limit concentrate flow to the wastewater plant. VT State suggested lowering recovery, but Town is not in favor of this option due to additional flow to wastewater plant. The final design point can be determined at startup, and can be adjusted to maximize production and recovery. Expected recovery range shall be between 75 and 90%.

Pretreatment

The water samples indicate that the turbidity of the water is low. This suggests that the pretreatment required for the system is minimal. As such, we are recommending that bag filtration at 100 um followed by micron filtration at 5 micron is all that is required for prefiltration of the feed water. Note that membrane water quality is generally measured by the SDI test. We will assume that the SDI is less

than 5.0 for 10% of the time and that the SDI is less than 3.0 for 90% of the time. Bag filter system includes a dP measurement for filter differential pressure

Note that all the water including the bypass water passes through the 100 um bag filter housing.

Micron Filter

The system will include a 5 micron cartridge filter, similar to what is shown in the following picture.

Micron Filter Housing

Micron filter system includes a dP measurement for filter differential pressure.

NF Membrane Train

The NF System train will be supplied as a single train. We encourage the overall design to include provisions for expansion in the future. Please refer to the attached membrane projection. The system shall have the following features:

- Membrans: DOW Membranes
- Vessels: 4:2:1 array
- Elements per Vessel: 5 each
- Total Elements: 35 each
- Estimated Operating Pressure: 123-159 PSI
- Recovery: 75%-90%
- Temperature: 50-55 deg. F
- Output Permeate: 15 mg/l TDS
- Input Salinity by Calculation: 485 mg/l TDS

Notes:

1. Operating pressure will vary with temperature, input water salinity, and recovery.
2. Operating recovery may vary with salinity and hardness
3. Antiscalants may be required
4. An error is evident between calculated anion cation balance and measured TDS. For the purposes of this document, we have chosen the higher TDS as the design case. This error should be investigated further.

Scope Definition for NF Softening WTP:

ISI proposes to supply the following equipment for the water treatment facility:

1) 1x Nanofiltration skid consisting of:
   - 7x 8 inch diameter 5 element membrane pressure vessels
   - 35x Nanofiltration membranes
   - Structural steel frame with epoxy primer and enamel paint
   - 100 micron bag filter housing (1)
   - 5 micron cartridge filter housing (1)
   - High Pressure Pump (1)
   - 304SS High pressure piping
   - SCH80 PVC low pressure piping
   - All relevant valves and instrumentation (see PID for specifics)
   - Train marshalling cabinet for I/O consolidation, UL Listed
   - Bypass automatic control valve, electric
   - Skid provided “complete” prefabricated for installation by contractor
   - Wiring from skid to MCC and control cabinet by others

2) ISI will supply a central control/PLC cabinet that will serve all the controlled equipment and other inputs and outputs in the water treatment facility. This includes interfacing with all motor control and power distribution as well as any other various instruments within the plant (as per A+E I/O list dated 28-Apr-15). The control equipment shall be OPTO22 and ISI will provide the programming.
   - Includes desktop PC for interface
   - UL Listed
   - Wiring from cabinet to equipment by others
   - Interface with MCC equipment is by I/O (not communication protocols like ethernet IP or Modbus)
   - Interface with remote control system by digital I/O for start/stop commands and alarm outputs
   - System will interface with remote monitoring system and includes acceptance of a dry contact input for start and stop, and an alarm output from ISI SCADA system advising of alarm condition. Details on alarm condition would require operator to log into system directly, or to be physically present at plant site.

3) 1x Product transfer system consisting of:
   - 2x main product pumps (each rated at 280 gpm @134 psi)
   - 1x CIP transfer pump (50 gpm)
   - Suction and discharge piping and manifolds
   - All associated valves and instrumentation (see PID)
     a) CE/CIT-4000 total blended flow conductivity element and indicating transmitter
     b) AE/AIT-4000 total blended flow pH element and indicating transmitter
     c) LET/LI-4000 Softened water clearwell level transmitter and indicator
     d) PET-4000 Product pump suction header pressure transmitter
     e) CE/CIT-4001 Distribution header conductivity element and indicating transmitter
     f) AE/AIT-4001 Distribution header pH element and indicating transmitter
     g) Suction pressure indicators on distribution pumps
     h) Discharge pressure indicators on all pumps
     i) FE/FIT-4000 Total Product flow meter
     j) PET-4001 Total Product distribution line pressure transmitter
     k) PI-4002 Total Product distribution line pressure indicator
     l) AE/AIT-4002 Total product chlorine analyzer and transmitter
     m) AE/AIT-4003 Total product hardness analyzer and transmitter
   - All parts provided “loose” for assembly and installation by contractor (others)

4) Membrane Cleaning System
   - 300 Gallon tank
   - Cleaning pump
   - SCH80 PVC Piping
   - Process valves
   - Structural steel frame painted with epoxy primer and enamel paint
   - Instrumentation (see PID)
     Skid provided “complete” prefabricated for installation by contractor

5) Chemical Dosing systems
   - Antiscalant dosing system
     a) Antiscalant dosing pump
     b) 35 gallon tank
     c) Suction and discharge tubing
     d) Injector
     e) Mounting platform for pump

   - Sodium Hypochlorite dosing system
     a) Sodium Hydroxide dosing pump
     b) (1) 35 gallon tank, *Plus 1 spare tank*
     c) Suction and discharge tubing
     d) Injector
     e) Mounting platform for pump

- Sodium Hydroxide dosing system
  a) Sodium Hydroxide dosing pump
  b) 35 gallon tank
  c) Suction and discharge tubing
  d) Injector
  e) Mounting platform for pump

- All parts provided "loose" for assembly and installation by contractor

6) Additional instrumentation:
   - FE/FIT-1000 Well 4 flow element and transmitter
   - FE/FIT-1001 Well 5 flow element and transmitter
   - PET-1002 Main feed header pressure transmitter
   - LIT-1000 Well 4 level transmitter
   - LIT-1001 Well 5 level transmitter
   - PI-1000 Well 4 pressure indicator (at well)
   - PI-1001 Well 5 pressure indicator (at well)
   - PI-1002 Well 4 pressure indicator (in building)
   - PI-1003 Well 5 pressure indicator (in building)
   - PET-1000 Well 4 pressure transmitter (at well)
   - PET-1001 Well 5 pressure transmitter (at well)
   - Process room temperature sensor
   - Chemical room temperature sensor
   - Process room float switch
   - Basement float switch
   - All above listed sensors to be supplied by ISI. Installation and wiring by contractor.

We are NOT supplying the following as part of this proposal:

- Civil works
- Wells and well pumps
- Piping, valves, and other equipment outside of plant except where noted
- Sanitary Sewer
- Product Clearwell
- 480 VAC Power equipment (service, breakers, starters/drives, and wire)
- Equipment anchors, fasteners, mounts
- Conduit, control cable, instrument cable, power cable, glands etc.
- Primary installation and assembly in building

As part of this proposal we are including one site advisor for 10 working days to aid with installation, and one engineer for commissioning support for 4 days. If additional site time is required, this will be charged at a rate of $850 per day, prorated.

Power Distribution
ISI will supply all motors for process pumps, but all electrical scope prior to the motor pecker-head is by others, including conduit, wire, motor starters and drives and other power distribution equipment.

ISI shall provide 3 VFD Danfoss drives. They shall be suitably sized for the pump motor horsepower and shall be equipped with the following features:

- 4-20mA Remote Control Speed Adjust
- Standard Nema12 Chassis
- Suitable Wall Mount
- Integral Drive Disconnect

The proposal includes (3) 40hp rated drives. This allows the Owner to swap out the HP Pump and Product Pump Drives (as compared to having different sizes) and keep 1 spare vs 2 different drive types (40hp and 25hp. These are Frame2 drives) We are NOT proposing line or load reactors with these drives due to the very short cable runs, although we recommend these for the well pumps (not part of ISI scope).

ISI would encourage that the power distribution system be supplied with TVSS to reduce power surge damage within the plant.

Operating Costs:
The system is intended to operate unattended and will cycle on and off automatically as demand is required. NF systems tend to like to operate at long on/off cycles, so system should operate as long as practical and then off as long as practical etc. Short on-off cycles will cause wear to pumps and membranes. Some variation in production and operation duty is available in range of +- 10%.

Periodic maintenance and monitoring is required. A daily check in on the system is recommended, even if this is remote.

System will alarm and shutdown and/or startup automatically.

Antiscalants may be needed to prevent scale. This is determined by resolution of hardness and TDS issue with water chemistry. This can also be determined after startup. The antiscalant dosing system is included in this proposal but may not be required depending on operating conditions.

Periodic cleaning using an acid solution is required. The interval may be every 2-4 months. NF system cleaning requires 4-6 hours of downtime while the system soaks in citric acid solution. NaOH cleaning may be required if biological activity is found.

Spare parts may be needed from time to time. Generally ISI recommends 3% capital cost for budget purposes spare parts inventory, not including capital spares.

Remote Access
The control system can be remotely accessed if the customer can provide an internet connection. This will allow for remote changes to the software and review of the system operation. Cost for use of login account is $50 annual cost.

ISI can also supply a mobile device interface that is capable of monitoring and control. Please advise if this is of interest.

Drawings and Technical Information
After receipt of purchase order, ISI will release a design package that contains drawings and technical information for approval by Owner/Client. This will include PID, PFD, vendor data, 3D models and other information related to ISI scope. ISI may require Owner/Client supplied information for layout and arrangement. This may include site plans, building information.

ISI is not responsible for as-builts after completion. ISI can be contracted to provide this documentation if needed.

Codes and Standards
The system will conform to NSF61, and water shall meet WHO standards for drinking water quality based on measured test data. Town or Consultant shall approve drawing design package prior to fabrication. Piping shall conform to ANSI, Pressure vessels shall conform to ASME, and electrical to NEC and UL.

Commercial

NF System with accessories as defined above generally includes:

- Nanofiltration Skid with bag filter and cartridge filter
- Membrane CIP skid
- Product distribution system
- Interconnecting piping and instrumentation within building
- Additional misc. instrumentation
- Full plant control system
- Chemical dosing equipment
- Design Package
- Installation support
- Commissioning support
- Freight to site included
- Documentation, Shop Drawings

System Price……**$265,666.00 USD**

Warranty: 12 Months after Installation or 18 months after shipment. Please refer to full warranty information for details. Cancellation may result in restocking charges. Project interruption >2 weeks after project start may incur storage fees and remobilization fee.

Terms:

Down payment on Order Placement	15%
Shop Drawings	15%*
Arrival of ISI supplied Pumps	25%
Shipment of System to Site	25%
Commission and Training	20% NTE + 90 days
	100%

* Shop Drawings require a building model .dwg file so that internal piping arrangement drawings and BOMs can be completed.

Inspection is available at any time during construction.

Delivery:

Typical lead time for NF system is 10 weeks after receipt of purchase order, down payment and design review approval.

ISI INDUSTRIAL SERVICES, INC.

DESALINATION EQUIPMENT
DESIGN/BUILD
TURNKEY PROJECTS
UPGRADES/EXPANSIONS/RETROFITS
CONSULTING

We have reviewed and are in agreement with the scope definition as offered in the technical proposal from Industrial Services Inc.:

Proposal:	Town of Hinesburg Water Treatment Proposal
Date:	11June 2015
Revision:	5

By: **Town of Hinesburg, Vermont USA**

_____
Authorized Signature and Date

_____
Printed and Title

By: **Industrial Services, Inc.**
Offices Located at:
157A Barber Rd.
St. George, VT 05495

_____
Authorized Signature and Date

_____
Printed and Title

-end-