STATE OF ALASKA VILLAGE SAFE WATER
KONGIGANAK FEASIBILITY STUDY UPDATE

DRAFT REPORT

Prepared for:

Kongiganak Traditional Council
And State of Alaska Village Safe Water

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State of Alaska Village Safe Water
Kongiganak Feasibility Study Update

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List of Acronyms and Abbreviations

ACVS	AIRVAC Container Vacuum Station
AH	Air Handler
ATV	all-terrain vehicle
AVCP	Association of Village Council Presidents
CDC	Centers for Disease Control and Prevention
CFM	Cubic Feet per Minute
EDC	Engineering Design & Consulting, Inc.
e.g	for example
EPA	Environmental Protection Agency
FPS	Feet per Second
gpm	gallons per minute
HDPE	high density polyethylene
KTC	Kongiganak Traditional Council
LF	Lineal Feet
MG	Million Gallons
O&M	Operations & Maintenance
psi	pounds per square inch
R&M	R&M Consultants, Inc.
SDR	Standard Dimension Ratio
VSW	Village Safe Water
WTP	Water Treatment Plant
YKHC	Yukon-Kuskokwim Health Corporation

Executive Summary

State of Alaska Village Safe Water has retained R&M Consultants Inc. to evaluate the feasibility of proposed future water distribution and wastewater collection alternatives for the community of Kongiganak, AK.

R&M considered and evaluated three water distribution alternatives and three wastewater collection systems, which included the no-action alternative for water and wastewater. The build alternatives are listed below with estimated construction costs:

W2 - Uptown Watering Point (Self Haul)	$900,000
W3 - Community Wide Closed Haul	$1,500,000
S2 - Closed Sewer Haul and Home Improvements	$2,300,000
S3 - Vacuum Sewer (Uptown) & Home Improvements	$4,200,000

1.0 Introduction – Purpose & Need

The Kongiganak Feasibility Study Update Report has been prepared by R&M Consultants, Inc. (R&M) and Engineering Design & Consulting, Inc. (EDC) in cooperation with the Native Village of Kongiganak, the Kongiganak Traditional Council (KTC), and the State of Alaska Village Safe Water (VSW). The Village of Kongiganak is growing and needs to improve their water distribution and wastewater collection systems to meet water demand and improve the overall health and safety of the community. The purpose of this feasibility study update is to identify the existing water and wastewater facilities, describe the water and wastewater system alternatives, and recommend the most feasible and cost efficient alternatives for the community of Kongiganak.

Representatives from VSW, R&M, and EDC visited the community of Kongiganak (2013 Site Visit) to gather information on the water and wastewater systems and configurations currently in use at the water treatment plant, washeteria, school, and residential areas. The uptown residential area was also visited to determine the current number of homes and possible future growth area in the vicinity. The community was involved in discussions that have outlined the water and wastewater alternatives for this report.

Additional information regarding existing facilities, water distribution systems, wastewater collection systems, climate, population, and community background was obtained from reports/drawings provided by the State of Alaska Village Safe Water (refer to section 11.0 References).

The Kongiganak Feasibility Study Update Report will address the following topics:

- Existing facilities for water and wastewater systems.
- Water distribution alternatives
- Wastewater collection alternatives.
- In-house water and wastewater treatment alternatives.
- Necessary upgrades to the water treatment plant and washeteria.
- Cost estimates for water and wastewater system alternatives.
- Selected alternatives.
- Plan of action for the selected alternatives.

<u>Location</u>

Kongiganak is a Yupik Eskimo community that is located within the Yukon Delta National Wildlife Refuge, approximately 80 miles southwest of Bethel. The community was established on a shallow permafrost bluff along the bank of the Kongnignanohk River and is located in Section 32, Township 2 South, Range 79 West, Seward Meridian.

Population

According to the Alaska Community Database Community Information Summaries, Kongiganak has 462 residents (2011 Alaska Department of Labor Estimate). Design calculations for the projected population are based on a population growth rate of 2.5% (2005 Preliminary Engineering Report) which is slightly higher than historic growth rates for Kongiganak, but has been used because experience in similar Alaskan communities has shown that village populations increase after significant improvements are made to the water and sewer infrastructure.

Climate

Kongiganak is in the transitional climatic zone, as described in the Alaska Environmental Atlas. The mean annual temperature is approximately 30 degrees and the annual average precipitation is 20 inches including 50 inches of snowfall. Prevailing winds are southwest during summer and periodically during winter storms and are northwest during the majority of the winter season.

2.0 Existing Facilities (refer to Figure A – Existing Facilities Site Plan)

2.1 Water Supply, Storage, Treatment and Distribution

General Information

Residents of Kongiganak currently obtain water from several sources including a year round self-haul watering point at the water treatment plant, rainwater catchment in the summer, and ice melt during the winter.

Water Supply

Kongiganak's main supply of water comes from Contractor's Lake which is located approximately 1.8 miles northeast of the community and is accessible by boardwalk. Contractor's Lake is a 5.1 acre shallow tundra pond with a 23.4 acre watershed and approximately 4,100 foot perimeter. With recent snow fence and dike construction the average depth of the lake increased to 4.5 feet and total capacity of approximately 7.53 MG. Raw water is pumped at a rate of 50 gpm through an above ground uninsulated 3 inch high density polyethylene (HDPE) transmission line from Contractor's Lake using a 2 horsepower 60S20-4 Grundfos submersible pump powered by a 9.5 kilowatt diesel generator and stored in the community raw water storage tank through the winter.

Water Storage

The community raw water storage tank is a 1.2 MG bolted steel tank located in the downtown area next to the water treatment plant and washeteria. Typically, the raw water storage tank is pumped full as late in the fall as possible before freeze-up, which usually occurs in mid-October and cannot be refilled until late May or early June. The raw water storage tank is approximately ¼ full at the end of the 7 to 8 month winter season. During the summer season the raw water storage tank can be refilled at any time to meet water demand. The old 570,000 gallon raw water storage tank has been removed and is no longer in service.

Water Treatment

Raw water is pumped from the 1.2 MG community raw water storage tank to the second floor of the water treatment plant where it is treated at a rate of 20 gpm. Raw water is treated using 8-micron and 5-micron bag filters, a flocculation tank, two media filters tanks, and chlorine, fluoride, and soda ash injection systems. Treated water is stored downstairs in 61 polyethylene tanks, 165 gallons each, for a total potable water storage capacity of 10,065 gallons.

Water Distribution

The water distribution system utilizes two pumps to pressurize four hydro-pneumatic tanks, which supply potable water to the existing watering point at the water treatment plant, and to the adjacent washeteria. Residents of Kongiganak collect water from the coin operated watering point located on the outer north wall of an enclosed structure attached to the water treatment plant. The watering point consists of 1 inch supply piping, a solenoid valve, a vacuum breaker, and a hose that penetrates the north wall. The enclosed structure has been built in anticipation of a community haul system and has two opposing doors wide enough for ATVs such as 4-wheelers and snow machines to drive thru.

2.2 Wastewater Collection and Treatment

General Information

Kongiganak does not currently have a wastewater collection system for community residents. Residents currently self-haul honey buckets to a designated area at the wastewater lagoon. Sewage is pumped from the new school to the old school where an existing gravity sewer system empties into the wastewater lagoon. The washeteria also utilizes a gravity sewer system which empties into the wastewater lagoon. It is estimated that the water treatment plant and washeteria produce approximately 400,000 gallons of wastewater per year.

Treatment

There is currently no treatment of sewer before it empties to the sewage lagoon.

2.3 Washeteria (Water Supply, Wastewater Disposal)

General Information

The washeteria is a public laundry and bathing facility that receives water from the water treatment plant. Community residents can obtain water from the washeteria at no cost; however, residents must climb stairs and obtain water from the interior of the laundry facility, which is inconvenient for both the individual and laundry facility customers. Water collected from the facility is predominately used for “steam baths”, personal hygiene, and dish washing; few (if any) residents use this source for drinking water.

Equipment

The washeteria facility includes six coin-operated washers and dryers, four coin operated showers, an office for the laundry attendant, guest quarters for outside maintenance personal, and office space for the Village’s Utility.

Wastewater Disposal

Wastewater generated at the washeteria is discharged by gravity to the sewage lagoon.

2.4 School (Water Supply, Wastewater Disposal)

Water Supply and treatment

The Lower Kuskokwim School District has an 80,000 gallon raw water storage tank and water treatment system located at the old school site that annually receives 80,000 to 200,000 gallons from the community raw water storage tank. The water treatment plant treats raw water with PCI Fyne nanofiltration membrane and hypochlorite disinfection systems and is housed in two-connex structures. The new school is operating using temporary potable water that is pumped from the old school and stored in two connexes at the new school which house four 2,600 gallon HDPE storage tanks for a total of 10,400 gallons of potable water storage. Potable water is pumped through an above ground 1.5 inch pipe contained inside an approximately 18 inch glycol heat-traced arctic pipe, approximately 4,600 feet in length. Existing rain water collection systems used at the old school site are no longer in use and are available to the community. Current population at the new school is 144 students, 15 teachers, and 14 support staff.

Wastewater Disposal

It is estimated that the school facilities produce approximately 200,000 gallons of wastewater per year. Sewage is pumped from the new school to the old school where an existing gravity sewer system empties into the wastewater lagoon.

2.5 Lift Stations

Downtown Lift Station

The downtown lift station is located between the sewage lagoon and the downtown area (refer to Figure A). The downtown lift station is substantially complete and was originally designed to handle all wastewater flow for Kongiganak. The downtown lift station is currently not in operation. The downtown lift station consists of a wet well that collects wastewater from the community and pumps the collected sewage to the sewage lagoon. Directly above the wet well is a two compartment heated and insulated enclosed structure approximately 24'x14' supported on piles. One compartment allows access to the wet well and the other compartment houses the boilers and necessary controls for the lift station operation.

East Lift Station

The east lift station is the smaller of the two lift stations and is located just west of the uptown housing (refer to Figure A). The east lift station currently only has the wet well installed and is not in operation. The original design of the east lift station was to handle the wastewater flow from the new school and the uptown area.

3.0 Water System Alternatives

3.1 W1 - No Action (As-Is, Self-Haul)

The No Action (As-Is, Self-Haul) alternative keeps the existing water distribution system as-is and residents of Kongiganak will continue to obtain water from several sources including a year round self-haul watering point at the water treatment plant, rainwater catchment in the summer, and ice melt during the winter. No improvements to the existing water distribution system would be done.

3.2 W2 - Uptown Watering Point (Self Haul)

General Information

The Uptown Watering Point (Self Haul) alternative will add an additional self-haul watering point in the uptown area (refer to Figure B). Two alternatives for the location of the uptown watering point were evaluated. The existing self-haul watering point will be used by downtown residents while the uptown self-haul watering point

will be used by uptown residents. Also, the proposed new Yukon-Kuskokwim Health Corporation (YKHC) health clinic will connect to the new uptown watering point loop in the future.

Piping

This proposed new watering point system would consist of an above ground water supply/return tubing in an insulated carrier pipe that will extend up to 2,500 LF from the connection point at the water treatment plant to the proposed new uptown watering point.

Watering Point

The watering point would consist of 1 inch supply piping, a solenoid valve, a vacuum breaker, a coin operated slot, and a hose that penetrates the wall of an enclosed insulated structure to provide residential self-haul access.

YKHC Health Clinic

The proposed new future YKHC health clinic connection will consist of an above ground water supply/return tubing in an insulated carrier pipe that will extend from the connection point at the water supply/return main line to the clinic. The new health clinic would be connected to the main water supply/return loop with a 1.5” diameter HDPE water supply line and a 1” diameter HDPE return line. A small in-line circulation pump in the water supply line would circulate water around the loop during periods of no demand at the new health clinic. During periods of demand, water would flow from the pressurized main supply/return line. A glycol heat trace loop would be included in the new health clinic carrier pipe to provide heat as required to prevent freezing.

Improvements

Upgrades to the existing boardwalk will be necessary to allow for pipe crossings, access to the proposed new watering point, and the attachment of the water carrier pipe. If the community sewage haul alternative is chosen, additional home improvements will include: an indoor water storage tank with pressure pump, water heater, sink, and toilet.

Water Loop Preliminary Evaluation

A preliminary evaluation of the existing water distribution system at the water treatment plant indicates:

- The existing distribution pumps in the water treatment plant which serve the washeteria and the existing watering point appear adequate to also serve the proposed new watering point in the uptown area.

- The water supply line to the new watering point would be connected to the existing 2" diameter hydro-pneumatic tank discharge piping. A small in-line circulation pump in the water supply line would circulate water around the loop during periods of no demand at the new watering point. During periods of demand, water would flow from the pressure tank system to the watering point.

- A glycol heat trace loop would be included in the watering point carrier pipe to provide heat as required to prevent freezing.

Preliminary flowrate calculations indicate:

- For 3000 LF (2500 plus 500 for fittings) of 2" HDPE supply pipe to the watering point:

  - At the distribution system pressure of 35 psi (pressure tank low pressure setting), the approximate flow rate is 25 gpm.

  - At the distribution system pressure of 55 psi (pressure tank high water pressure setting), the approximate flow rate is 35 gpm.

- For 3000 LF (2500 plus 500 for fittings) of 1.5" HDPE supply pipe to the watering point:

  - At the distribution system pressure of 35 psi (pressure tank low pressure setting), the approximate flow rate is 12 gpm.

  - At the distribution system pressure of 55 psi (pressure tank high pressure setting), the approximate flow rate is 16 gpm.

- Flow rates will be lower than above when there are other simultaneous demands (e.g. WTP watering point, washeteria).

3.3 W3 - Community Wide Closed Haul

General Information

This alternative includes a community wide closed haul system for water distribution (refer to Figure D) in addition to the proposed new uptown watering point discussed previously in section 3.2 Uptown Watering Point (Self Haul). The Village would charge a flat monthly fee and would pay an operator to deliver water to each household. The operator will fill water at the proposed new uptown watering point and deliver water to the community. Residents will have the option to self-haul from either the old watering point at the water treatment plant or the proposed new uptown watering point location, if they prefer not to have water delivered to their home. The school, washeteria, and water treatment plant would continue to receive piped water. Also, the proposed new YKHC health clinic will connect to the proposed new uptown watering point supply/return main line in the future (refer to Section 3.2 Uptown Watering Point (Self Haul) for connection information). Each household would be supplied with an indoor water storage tank that can be filled from outside. The water utility operator would need a similarly sized tank mounted on a trailer, a transfer pump, and a four wheeler and snow machine. Hauling tanks would be limited by the boardwalk and the towing/stopping capacity of the 4-wheeler and snow machine.

Watering Point

In addition to the residential watering point in section 3.2 Uptown Watering Point (Self Haul), the enclosed structure will be built with two opposing doors wide enough for ATVs such as 4-wheelers and snow machines to drive thru. A separate interior watering point will provide the operator with a 15 gpm flow rate to efficiently fill the water storage tank attached to the ATV and provide delivery service to the community. The downtown lift station building, or a portion of, might be usable for the proposed new watering point enclosure.

Equipment & Operations

A 4-wheeler for summer deliveries and a snow machine for winter deliveries would be required to provide water delivery services to each of the residents. The 4-wheeler or snow machine will tow a trailer secured with a 100 to 150 gallon insulated water storage tank. One water haul delivery operator could be used to deliver water to 40 homes. Communities serving more than 40 homes should consider a second operator, trailer, 4-wheeler, and snow machine. As the population of Kongiganak increases, the required equipment and operators also increase, however, many residents may choose to haul their own water from the existing or proposed watering points.

Improvements

Upgrades to the existing boardwalk would be required to support haul equipment, traverse pipe crossings, provide access to the proposed new watering point, and allow for two-way traffic; eight foot wide works, ten foot is ideal. Current boardwalk widths of four feet would need at a minimum, fillets at all intersections and sharp turns, to successfully navigate the boardwalk. It is likely that most houses would need some form of structural improvements to accommodate the water storage tank.

4.0 Wastewater System Alternatives

4.1 S1 - No Action (As-Is, Honey Bucket Self Haul)

The No Action (As-Is, Honey Bucket Self Haul) alternative keeps the existing wastewater collection system as-is and residents of Kongiganak will continue to self-haul honey buckets to a designated area at the wastewater lagoon. No improvements to the existing wastewater collection system would be done.

4.2 S2 - Closed Haul & Home Improvements (Entire Community)

General Information

With a closed haul community wide closed haul system for wastewater collection, the Village would charge a flat monthly fee and would pay an operator to collect wastewater from each household. Each household would be supplied with an insulated and heat traced outdoor sewage holding tank with accompanying in-house plumbing. Sewage would be pumped from the tanks and stored in a similarly sized tank mounted on a trailer, a transfer pump, and a 4-wheeler and snow machine. Hauling tanks would be limited by the boardwalk and the towing/stopping capacity of the 4-wheeler and snow machine.

Equipment & Operations

A 4-wheeler for summer and a snow machine for winter would be required to provide wastewater collection services for each household. The 4-wheeler or snow machine will tow a trailer secured with a 100 to 150 gallon insulated wastewater storage tank. One wastewater haul delivery operator could be used to collect wastewater from 40 homes. Communities serving more than 40 homes should consider a second operator, trailer, 4-wheeler, and snow machine. As the population of Kongiganak increases, the required equipment and operators also increase.

Improvements

Upgrades to the existing boardwalk would be required to support haul equipment and allow for two-way traffic; eight foot wide works, ten foot is ideal. Current boardwalk widths of four feet would need at a minimum, fillets at all intersections and sharp turns, to successfully navigate the boardwalk. Enclosed structures would be built with two opposing doors wide enough for ATVs such as 4-wheelers and snow machines to drive thru. It is likely that most houses would need some form of structural improvements to accommodate the wastewater storage tank. Where applicable, additional home improvements include; low water use sinks, water heaters, and toilets.

4.3 S3 - Vacuum Sewer (Uptown) & Home Improvements

General Information

This vacuum sewer alternative provides a piped vacuum sewer collection system for uptown residents and the proposed new YKHC health clinic while downtown residents will be provided with a closed haul system for wastewater collection (refer to Figure H). The vacuum sewer collection system would be designed per guidelines established by AIRVAC Vacuum Systems (AIRVAC, 2005).

The AIRVAC vacuum sewer system consists of four components: AIRVAC (grey water) collection sump, vacuum toilet, vacuum piping network and collection station. The vacuum station will be located west of the airport and east of the old school (refer to Figure H). Periodic lifts, or profile changes, are required to maintain a desired elevation throughout the collection system. A proposed new sewage force main would transport sewage from the vacuum station to the existing sewage collection system tie-in near the washeteria.

Collection Sump

The AIRVAC collection sump includes the AIRVAC interface valve and it is the entry point, for grey water, into the vacuum system. The wastewater flows by gravity to the 10 gallon collection sump, which can be installed inside the home. Once five gallons of liquid collects inside the sump, the normally closed pneumatic AIRVAC valve will open and the vacuum will pull the contents from the collection sump into the vacuum piping network. The AIRVAC valve does not require electricity and it is triggered via hydrostatic pressure, which is created as the wastewater enters the sump. In regards to maintenance, AIRVAC recommends rebuilding the AIRVAC valve every 15 years and the rebuild cost is $64.

Vacuum Toilet

The next component is the AIRVAC vacuum toilet. The feature of this toilet is the 0.3 gallons of water per flush advantage over the standard gravity flow toilet, which uses 1.6+ gallons of water per flush. In this particular case, each uptown Kongiganak home will only have 15 gallons of water per day available; therefor the water savings with the AIRVAC vacuum toilet will be significant.

Vacuum Piping

Once the wastewater has evacuated from the AIRVAC collection sump and vacuum toilet, the wastewater travels at speeds of 15-18 FPS through the vacuum piping network. The flexibility of the vacuum system, during design and installation, allows for both horizontal and vertical profile changes with the piping. The vacuum piping can be installed above ground and between the homes which, is ideal for Kongiganak.

AIRVAC Container Vacuum Station

The final component of the vacuum system is the vacuum collection station. AIRVAC's recommendation is the AIRVAC Container Vacuum Station (ACVS), which is completely assembled and tested prior to shipping to the project. The insulated container station will be delivered to the project on skids. No additional labor is required, other than connecting incoming power to the main breaker and connecting the vacuum and discharge pipes to the manifolds, to ready the station for use. The ACVS will consist of three 165 CFM vacuum pumps, redundant discharge pumps, a control panel and a 335 gallon collection tank. Special features include an internal coating for the vacuum pumps and collection tank to protect against hydrogen sulfide deterioration. The vacuum pumps are maintenance free other than one pint of gear box oil every two years, no recurring maintenance is required.

AIRVAC Services

Services provided include design assistance from the AIRVAC Engineering Department, installation assistance from the AIRVAC Field Department and one week of onsite start-up services and training from the AIRVAC Service Department. Additionally, 24/7 on-call assistance and support from AIRVAC's Service Department is always available.

YKHC Health Clinic

The proposed new future YKHC health clinic vacuum sewer connection will consist of an above ground 2” HDPE SDR 11 waste pipe with in an insulated 4” HDPE carrier pipe that will extend from the connection point at the vacuum sewer main line to the clinic. A glycol heat trace loop with 1” heat pex supply/return tubing would be included to provide heat as required to prevent freezing.

Improvements

Upgrades to the existing boardwalk would be required to support haul equipment, traverse pipe crossings, and allow for two-way traffic; eight foot wide works, ten foot is ideal. Current boardwalk widths of four feet would need at a minimum, fillets at all intersections and sharp turns, to successfully navigate the boardwalk. Where applicable, additional home improvements at each residence include; a low water use sink, water heater, and vacuum toilet.

Uptown Housing

R&M conducted a site visit in 2013 and identified 48 homes currently exist in the uptown area, 13 more than the latest aerial maps show. The additional homes have been built along an extension of the original row of houses, and extend to the edge of what appears to be the flood plain. There are some gaps in the existing housing area that may allow for an additional 6 to 8 homes in the future. Most of the high ground has been used up but there is a small area, outside of the existing row of homes, where additional homes could be built in the future. The AVCP housing planning department was contacted and identified approximately 5 to 10 homes per year will be built to accommodate future growth in the community. It is anticipated that the vacuum sewer line would provide sewer service to a total of 60 homes.

4.4 Pressure Sewer

General Information

This alternative uses a combination of gravity and pressure piping, collecting wastewater from each house with small lift stations pumping through small pressure piping to localized collection sumps. Due to the flushing requirements of the gravity drain toilet and household lift station, this alternative would most likely increase the water demand for each household. This increased water demand would have to be supplied from the Kongiganak village water system. Pumps for the system are powered by electricity, which cycle on demand, depending on the wastewater demands placed on the system and sump reservoir sizes. This alternative also increases the electrical power and wastewater demands over other alternatives. The intermittent cycling of pumps is unpredictable and can have noticeable effects on smaller power grids.

Gravity Drain Toilet

This style of toilet is commonly installed in houses with piped water and adequate supply. Low flush versions of this style of toilet would use 1.6 gallons of water per flush. Wastewater drains in gravity piping under the house to a pump station sump.

Household Pump Station

Sinks and toilets are piped under the house with gravity piping to the sump of the household lift station. The sump capacity ranges from 35 to 50 gallons and the ejector pump is triggered by float switch, turning off once the fluid level of sump reaches a designated low limit. The individual household pump stations are connected pipe mains or local collection points within the system pipe network.

Pressure Piping

Pressure pipes are smaller than conventional gravity piping wastewater for the same expected flow volumes. Flows within the pressure pipes have reduced frequency and higher pressures due to the upstream sumps with the ejector pumps. This configuration allows for both horizontal and vertical profile changes in pipe alignment, but allowances have to be made in the system design for wastewater being retained in the sags and drain back to the sump at the end of pump cycles. The pressure piping can be installed above ground and between the homes which, is ideal for Kongiganak. Due to the intermittent pipe flows in this alternative, wastewater has significantly less contact time with pressure pipe walls, thus increasing the need to add heat with heat trace, even though the pipes are protected by insulation. Additional heat needs to be provided by heat tracing during arctic conditions to prevent pipe blockage by frozen effluent, if the piping is installed outside the heated envelope of the house. Heat tracing can be provided as electrical or glycol, with glycol being the preferred method, if available for operating cost and long-term maintenance considerations.

Local Collection Points

Each house service pipe is either directly discharges to a local collection point or collected in a main pipe and then discharges to a local collection point. Horizontal system layout and vertical topography of houses to be served will greatly affect the number and size of the local collection points required within the overall system. If gravity drainage is available, even with pipe suspended above grade, then the collection point is drained by gravity piping to the next downstream collection point. Where ground topography excludes gravity pipe drainage, a reservoir is provided, sized to allow for reasonable pump cycle times. Progressively larger pumps at local collection points further downstream in the system are provided as upstream volumes increase.

Increased Utility Demand

This alternative would require related increases in utility demand within the community when evaluated for Kongiganak:

- Gravity flow toilets installed in each home could significantly increase water volume demand, straining the limited supply available.
- All pumps within the pressure sewer system would place additional, electrical load demands on the power generation system, with unpredictable spikes in usage.
- Maintenance and operation of the sewer system would have very high priority, since pump failure within the system has the potential for overflows at local collection points.

Based on the predicted increases in utility and operational demand, this alternative was deemed infeasible for Kongiganak, not advanced for further study.

5.0 In-House Alternatives (Decentralized)

5.1 In-Home Water Treatment Alternatives

General Information

In-home water treatment alternatives include: disinfection, filtration, and grey water reuse. Studies have shown that household water treatment and safe storage interventions improve water quality and reduce diarrheal disease incidence.

Disinfection

The Procter & Gamble Company developed PUR Purifier of Water™ in conjunction with the Centers for Disease Control and Prevention. PUR was designed to reverse-engineer a water treatment plant, incorporating the multiple barrier process of removal of particles and disinfection. To treat water with PUR, users open the sachet, add the contents to an open bucket containing 10 liters of water, stir for 5 minutes, and let the solids settle to the bottom of the bucket, strain the water through a cotton cloth into a second container, and wait 20 minutes for the hypochlorite to inactivate the microorganisms (CDC Household Water Treatment – Flocculant/Disinfectant Powder).

Filtration

A slow sand filter consists of layers of sand and gravel in a concrete or plastic container approximately 0.9 meters tall and 0.3 meters square. To use the filter, users simply pour water into the top, and collect finished water out of the outlet pipe into a bucket (CDC Household Water Treatment – Slow Sand Filtration).

Grey Water Reuse

Grey water is water from bathroom sinks, showers, tubs, and washing machines. It is not water that has come in contact with feces, either from the toilet or from washing diapers. Grey water may contain traces of dirt, food, grease, hair, and certain household cleaning products. If released into rivers, lakes, or estuaries the nutrients in grey water become pollutants, but to plants, they are valuable fertilizer. Grey water is typically used for irrigation but there are systems that can be used for flushing toilets (http://greywateraction.org/content/about-greywater-reuse).

There are also very simple ways to reuse grey water inside the house. Buckets can catch grey water that can be used to bucket flush a toilet or carried outside for irrigation. There are commercially available designs like Sink Positive and more complicated systems like the Brac system to simplify grey water reuse.

5.2 In-Home Wastewater Treatment Alternatives

General Information

In-home wastewater treatment alternatives include toilets using technologies for fluid separation, composting, and incinerating wastewater instead of conventional flushing. These toilets are designed for rural applications where no municipal sewage system exists, or where installation of septic systems is impractical or prohibitively expensive due to shallow soils, steep slopes, high groundwater levels, or extreme cold weather conditions. Commercially available products for decentralized treatment of wastewater are listed at the end of this section with generalized comparisons to other technologies.

Fluid Separation Toilets

Urine and flush water are up to 85% of the wastewater volume. Several commercially available products now use fluid separation to reduce the volume of waste with human pathogens. By separating the urine from the fecal matter, the handling and disposal method for each type of waste can be easier and much more efficient. Urine can also interfere with the composting cycle of feces and be the cause of unpleasant odor that can be eliminated by fluid separation technology. This technology can be used to assist in-home treatment or final centralized waste disposal methods. Widespread installation of toilets using this technology in Kongiganak could reduce or eliminate the amount of plastic bags needed to transport waste for final disposal in the honeybucket lagoon or landfill.

Composting Toilets

A composting toilet is a dry toilet that uses a predominately aerobic processing system that treats excreta, typically with no water or small volumes of flush water, via composting or managed aerobic decomposition. The average annual cost for a composting toilet could range anywhere between $1,200 and $6,000, depending on the system (EPA Water Efficiency Technology Fact Sheet – Composting Toilets).

Incinerating Toilets

An incinerating toilet is a toilet that burns excrement instead of flushing it away with water. Incinerating toilets may be powered by electric, gas or other energy sources. Incinerating toilets gather excrement in a holding tank and then incinerate it, reducing it to sterile ash. Assuming a total purchase price and installation cost of $4,000, for a 10 year service life, the average annual cost including purchase, installation, operation and maintenance averaged over 10 years is $3,148 (EPA Water Efficiency Technology Fact Sheet – Incinerating Toilets). Due to the high cost of electricity in rural areas, the average annual cost to operate this technology in Kongiganak may be higher than the national averages discussed by the EPA fact sheet.

Advantages and disadvantages of in-home wastewater disposal alternatives include:

	Composting Toilets	**Incinerating Toilets**
Advantages	- Little or no water usage - Low quantity and strength of waste water to be disposed of on site - Low power consumption - Nutrient rich end product	- Low water usage - Produces a fine, small sterile ash - Relatively odorless - Portable, easy to use and install - Can be used in unheated shelters
Disadvantages	- Maintenance requires commitment from user - Improperly installed or serviced systems produce odors and health effects	- Requires energy, resulting in higher average energy costs - Anti-foam agents, catalysts or other additives are typically required for use - Loss of nutrient rich end product

Table 1 - Commercially Available In-Home Treatment Product Summary

Product	Treatment Method	Power Needed	Other Expenses	Final Disposal
Incinolet http://incinolet.com	Toilet that burns all waste.	Electric, High	Yes, liners and replacement parts	Air
Sun-Mar Self-Contained http://www.sun-mar.com/prod_self.html	Toilet that dries urine with electricity and composts solids	Electric, Medium	Peat material and replacement parts	Landfill cell or soil medium
Sun-Mar Remote http://www.sun-mar.com/prod_dry.html	Toilet that collects urine and compost under the home.	Electric, High	Peat material and replacement parts	Landfill cell or soil medium
Separette http://www.separett-usa.com	Toilet that collects waste in a bag and dehydrates it.	Electric, Low	Bags and replacement parts	Landfill or Wood burning stove
Nature's Head http://www.natureshead.net	Toilet that separates urine and solids. Solids composted.	Electric, Low	Peat material	Urine down a drain. Landfill cell or soil medium
Loveable Loo http://humanurehandbook.com/store/LOVEABLE-LOO-Eco-Toilet.html	Toilet that collects waste and cover material such as paper. Similar to honeybucket.	No power	Carbon source (shredded paper, sawdust)	Landfill cell or soil medium
Bokashi http://www.bokashicycle.com	Anerobic process that rapidly decomposes waste	No power	Starter medium	Landfill cell or soil medium
Envirolet http://www.envirolet.com/enwatsel.html	Toilet that composts combined waste.	Electric, Medium	Replacement parts	Landfill cell or soil medium
Eco John Incinerating Toilet http://ecojohn.com/ecojohn_sr.html	Toilet that incinerates waste with diesel or propane.	Diesel or Propane, High	Replacement parts	Air

Product	Treatment Method	Power Needed	Other Expenses	Final Disposal
Thetford Toilet http://www.thetford.com	RV toilet that collects waste. Low odor, no bags required.	Battery, Low	Batteries for flush.	Flush or dump to sewer system.
Enviroloo Waterless Toilet http://www.enviro-loo.com	Stand alone restroom.	Heating fuel, High	Replacement parts	Remains in pit.
Biolan Icelett Toilet http://www.biolan.fi/english/default4.asp?active_page_id=1071	Freezes waste	Electric, High	Replacement parts	Landfill cell or soil medium
Big Birkey http://www.bigberkeywaterfilters.com	Treats water without chlorine or electricity.	No power	Replacement filters.	Dispenses water.
Stand Alone Sinks http://www.portablesinkdepot.com/servlet/the-Office-fdsh-Indoor-Portable-Sinks/Categories	Many products promote health by allowing handwashing with fresh water.	Electric, Low	Replacement pumps.	Disposal site currently used by homeowner.

6.0 Washeteria Upgrades

6.1 Energy Efficiency

The Kongiganak Water Treatment Plant and Washeteria have several heating and ventilating system deficiencies that should be remedied to ensure occupant health and comfort and to meet mechanical code requirements. These deficiencies were identified during a site investigation made in January 2013.

Issue 1: The offices on the second floor of the Water Treatment Plant are frequently too cold, and the air supply system often blows cold air. The three offices affected are rented to the Kongiganak Tribal Court Youth Program, the Kongiganak Environmental Department, and the Indian Child Welfare Program.

Three tasks must be accomplished in order to improve the heating and ventilation to the three offices. Together these three tasks would allow a consistent return air path to the air handler, with less dependence on which office doors were open or closed; would allow more even air distribution to the three offices; and would save energy by providing less outdoor air during the winter and night time.

Task 1: The supply air grilles in the floors of these offices should be replaced with grilles that have integral balancing dampers.

Task 2: The return air grille in the Tribal Court wall should be removed and blanked off, and a new return grille should be located in the open space outside the offices, right next to AH-2, in the existing return duct.

Task 3: Automatic controls consisting of an outside air temperature sensor, mixed air sensor, temperature controller, and damper actuator should be added to AH-2. The controller would then modulate the mixing box to provide more or less outside air depending upon the outside air temperature.

Issue 2: The first floor of the WTP is too cold. During occupied periods, this area is typically 60-65 °F. At night, and particularly over the weekend, the temperature can drop significantly lower, though freezing has not been an issue.

Task: The fan section of AH-1 should be reinstalled, the heating coil should be reconnected, the dampers should be opened, and a new fan motor should be installed. In addition to heating the first floor, this may help warm the offices on the second floor, because the ceiling/floor will be warmer, and the return air to AH-2 will be warmer.

Issue 3: The office on the second floor of the Washeteria is usually too hot. The office is heated by a loop of finned-tube baseboard heater running around the outside perimeter wall. At one end is a balancing valve to set the flow rate, and at the other end is a control valve connected to the room thermostat. It is possible that the control valve is "sticky" or does not close completely, allowing some heat to flow through the baseboard all the time.

Task: An HVAC technician should inspect the control valve and thermostat operation further.

Issue 4: The apartment on the second floor of the Washeteria is usually too hot. This is reportedly true all the time, and not just when the Washeteria dryers are in use. It appears that the actuator for the glycol heating control valve supplying the dryer air pre-heat coil is disconnected, allowing the coil to severely overheat and transfer heat up through the ceiling into the apartment. Correcting this should both cool off the apartment and save energy.

Task: Onsite personnel should inspect the coil to determine if the valve actuator linkage is in place. If not, the dryer heating coil control valve actuator should be replaced.

Issue 5: The fuel oil day tank for the three boilers in the WTP sucks fuel from the fuel oil day tank in the generator room. The generator day tank has been valved off and is filled manually when needed.

Task: As a first step, a check valve should be installed in the supply piping to the generator day tank. This will probably correct the problem and allow both day tanks to run automatically. If this does not correct the problem, then the supply line to the generator day tank should be disconnected from the boiler supply line and run back to the fuel oil storage tank.

7.0 Water Treatment Plant Upgrades

7.1 Upgrades for New Watering Point

A preliminary evaluation of the existing water distribution system at the water treatment plant indicates that the existing distribution system appears adequate to also serve the proposed new watering point in the uptown area. A small in-line circulation pump and glycol heat trace loop would be added to circulate water around the loop and prevent freezing of the line during periods of no demand.

8.0 Cost Estimates

Formal construction cost estimates were developed for alternatives that require additional infrastructure beyond the existing water and sewer system in Kongiganak. The cost estimates are based on conceptual design information included in this report and basic knowledge of rural construction practices. Detailed breakdown of the estimates are included in Appendix A.

8.1 Capital, O&M and Life Cycle Costs (Water)

W2 - Uptown Watering Point (Self-Haul)

Construction of water improvements for an Uptown Watering Point will range from $600,000 to $900,000, depending on which physical location is selected in the Uptown area along the existing boardwalk. Additional O&M costs for this alternative will be low, since it is an extension of existing water infrastructure, which does not include additional vehicles or require additional personnel on a daily or weekly basis for upkeep of the system.

W3 - Community Wide Closed-Haul

Construction of water improvements for closed haul for Kongiganak will range from $1,200,000 to $1,500,000, depending on which physical location is selected in the Uptown area. The O&M costs for this alternative will be higher, since it adds small support buildings, haul vehicles, and water delivery, which requires additional personnel on a daily or weekly basis for upkeep of the system. A monthly fee would be charged for water delivery, offsetting the additional O&M costs. Life cycle costs for the overall Kongiganak community would likely increase due to O&M of the new support infrastructure.

8.2 Capital, O&M and Life Cycle Costs (Sewer)

S2 - Closed Haul and Home Improvements

Construction of sewer and home improvements will be $2,300,000. Additional O&M costs for this alternative will be incurred for the small support buildings, haul vehicles, and sewer hauling. The hauling process requires additional personnel on a daily or weekly basis for upkeep of the system. A monthly fee would be charged for sewer hauling, offsetting the additional O&M costs. Life cycle costs for the overall Kongiganak community would likely increase due to O&M of the new support infrastructure.

S3 - Vacuum Sewer, Closed Haul and Home Improvements

Construction of the Uptown vacuum sewer system, hauling support infrastructure and home improvements will be $4,200,000. Additional O&M costs for this alternative will be incurred for the pumping equipment, home improvements, small support buildings, haul vehicles, and sewer hauling in the downtown area. The hauling process requires additional personnel on a daily or weekly basis for upkeep of the system. A monthly fee would be charged for sewer removal, offsetting the additional O&M costs. Life cycle costs for the overall Kongiganak community would likely increase due to O&M of the new support infrastructure.

8.3 Capital, O&M (Washeteria)

Recommended HVAC improvements to the Washeteria detailed within this report are considered routine upkeep, which could be accomplished within the current budgets established for annual M&O.

9.0 Recommended Alternatives

9.1 Water System

Three water distribution alternatives were considered and evaluated to determine the most feasible alternative for the community of Kongiganak and are listed in order of preference; Alternative W3 – Community Wide (Closed Haul), Alternative W2 – Uptown Watering Point (Self-Haul), and Alternative W1 – No Action (As-Is, Self-Haul).

Alternative W3 – Community Wide (Closed Haul) is the recommended alternative for the water distribution system for the residents of Kongiganak. This alternative delivers water to resident homes and includes the uptown watering point for those who choose to self-haul. Ease of access to water encourages higher water consumption and use throughout the community. Additional home improvements if a community sewage haul system is chosen will encourage even more water usage. Higher water consumption and use reduces health and safety concerns associated with viruses and bacteria. This alternative has the highest capital and O&M costs but provides the greatest advantages to the residents of Kongiganak (refer to Table 1 – Water System Advantages & Disadvantages). This alternative may be broken up into phases to accommodate availability of funds; Phase 1 would be Alternative W2 and Phase 2 would be the community haul portion.

Alternative W2 – Uptown Watering Point (Self-Haul) allows for shorter water haul distances encouraging residents to consume and use more water. This alternative has lower capital and O&M costs than Alternative W3 but may not be enough to encourage residents to consume and use more water to deter health and safety

concerns (refer to Table 2 – Water System Advantages & Disadvantages). This alternative is also recommended and could be built first and upgraded later to a community wide closed haul system when funding is available.

Alternative W1 – No Action (As-Is, Self-Haul) has the least amount of cost associated with it but does not address the community's health and safety concerns related to low water consumption and use (refer to Table 2 – Water System Advantages & Disadvantages). This alternative is not a viable alternative and is not recommended.

Table 2 - Water System Advantages & Disadvantages

	Alternative W1 No Action (As-Is, Self-Haul)	Alternative W2 Uptown Watering Point (Self-Haul)	Alternative W3 Community Wide (Closed Haul)
Advantages	- No additional cost - No above ground pipes - Less complex operation	- Shorter haul distances - Less complex operation than community haul	- No self-haul - Shorter haul distances for those who prefer self-haul - Home improvements if you choose community sewage haul system
Disadvantages	- Self-haul - Longer haul distances - Highest health concerns	- Self-haul - Higher capital and O&M costs - Above ground piping and facilities	- Highest capital and O&M costs - More complex operation - Above ground piping and facilities

9.2 Sewer System

Three wastewater collection alternatives were considered and evaluated to determine the most feasible alternative for the community of Kongiganak and are listed in order of preference; Alternative S3 – Vacuum Sewer (Uptown) & Home Improvements, Alternative S2 – Closed Haul & Home Improvements (Entire Community), and Alternative S1 – No Action (As-Is, Honey Bucket Self-Haul).

Alternative S3 – Vacuum Sewer (Uptown) & Home Improvements provides the greatest health benefits and is the recommended alternative for the wastewater collection system for the residents of Kongiganak. This alternative limits the amount

of sewage exposure to utility employees collecting waste in the downtown area. And residents will no longer self-haul honey buckets. This alternative has the highest capital and O&M costs but has the greatest benefits to the community (refer to Table 3 – Sewer System Advantages & Disadvantages). This alternative may be broken up into phases to accommodate availability of funds; Phase 1 would be Alternative S2 and Phase 2 would be the uptown vacuum sewer portion.

Alternative S2 – Closed Haul & Home Improvements (Entire Community) provide higher health benefits to the community of Kongiganak than Alternative S1. This alternative also limits the amount of sewage exposure to utility employees collecting waste in the entire community and residents will no longer self-haul honey buckets. This alternative has high capital and O&M costs but has great benefits to the community (refer to Table 3 – Sewer System Advantages & Disadvantages). This alternative is also recommended and could be built first and upgraded later to include a vacuum sewer collection system for the uptown area when funding is available.

Alternative S1 – No Action (As-Is, Honey Bucket Self-Haul) has the least amount of cost associated with it but does not address the communities health concerns associated with a self-haul honey bucket system.

Table 3 - Sewer System Advantages & Disadvantages

	Alternative S1 No Action (As-Is) (Honey Bucket Self Haul)	Alternative S2 Closed Haul & Home Improvements (Entire Community)	Alternative S3 Vacuum Sewer (Uptown) & Home Improvements
Advantages	- No additional cost - No above ground pipes	- No self-haul - House upgrades - Lower capital and O&M costs than vacuum system - Less complex operation than vacuum system - No above ground pipe - Higher health benefits	- No self-haul - No closed haul - No outside tanks - No hauling in winter conditions - House upgrades - Equipment centralized at single facility, easier for O&M - Highest health benefits
Disadvantages	- Self-haul - Health concerns	- Higher capital and O&M costs than self-haul - Outdoor tank at each home - Hauling in winter conditions	- Highest capital and O&M costs - Above ground piping - More complex operation

9.3 Washeteria

10.0 Plan of Action

10.1 Prioritize and Schedule Tasks

11.0 References

Alaska Native Tribal Health Consortium (ANTHC) Energy Projects Group 2011 Comprehensive Energy Audit for Kongiganak Water Treatment Plant, Tribal Offices, and Hotel

GV Jones & Associates, Inc. 2011 Lower Kuskokwim School District, Water System Upgrades – New Kongiganak School

Summit Consulting Services, Inc. (SCS) 2010 Kongiganak Traditional Council, Water and Sewer Upgrades, Gravity Sewer, 100% Design Issued for Construction

Summit Consulting Services, Inc. (SCS) 2007 Native Village of Kongiganak, Design Analysis Report, Final

Summit Consulting Services, Inc. (SCS) 2006 Native Village of Kongiganak, House Assessment, Volume 1 of 2, Volume 2 of 2

Summit Consulting Services, Inc. (SCS) 2005 Native Village of Kongiganak, Preliminary Engineering Report

Summit Consulting Services, Inc. (SCS) 2005 Kongiganak Traditional Council, Sewer & Water Improvements, Phase 2-2005, 1.2 MG Water Storage Tank, 100% Design Issued for Construction

Summit Consulting Services, Inc. (SCS) 2003 Sanitation Facilities Master Plan Update, Village of Kongiganak

HDR, Inc. 1993 Sanitation Facilities Master Plan, Kongiganak, Alaska

QUADRA Engineering, Inc. 1981 Design Report, Water Supply and Storage Project, Kongiganak VSW Facility

9.3 Washeteria

10.0 Plan of Action

10.1 Prioritize and Schedule Tasks

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QUADRA Engineering, Inc. 1981 Design Report, Water Supply and Storage Project, Kongiganak VSW Facility

FIGURES

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KONGIGANAK FEASIBILITY STUDY UPDATE

EXISTING FACILITIES SITE PLAN

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PROJ.NO:	1788.01
DWG.NO:	FIGURE A

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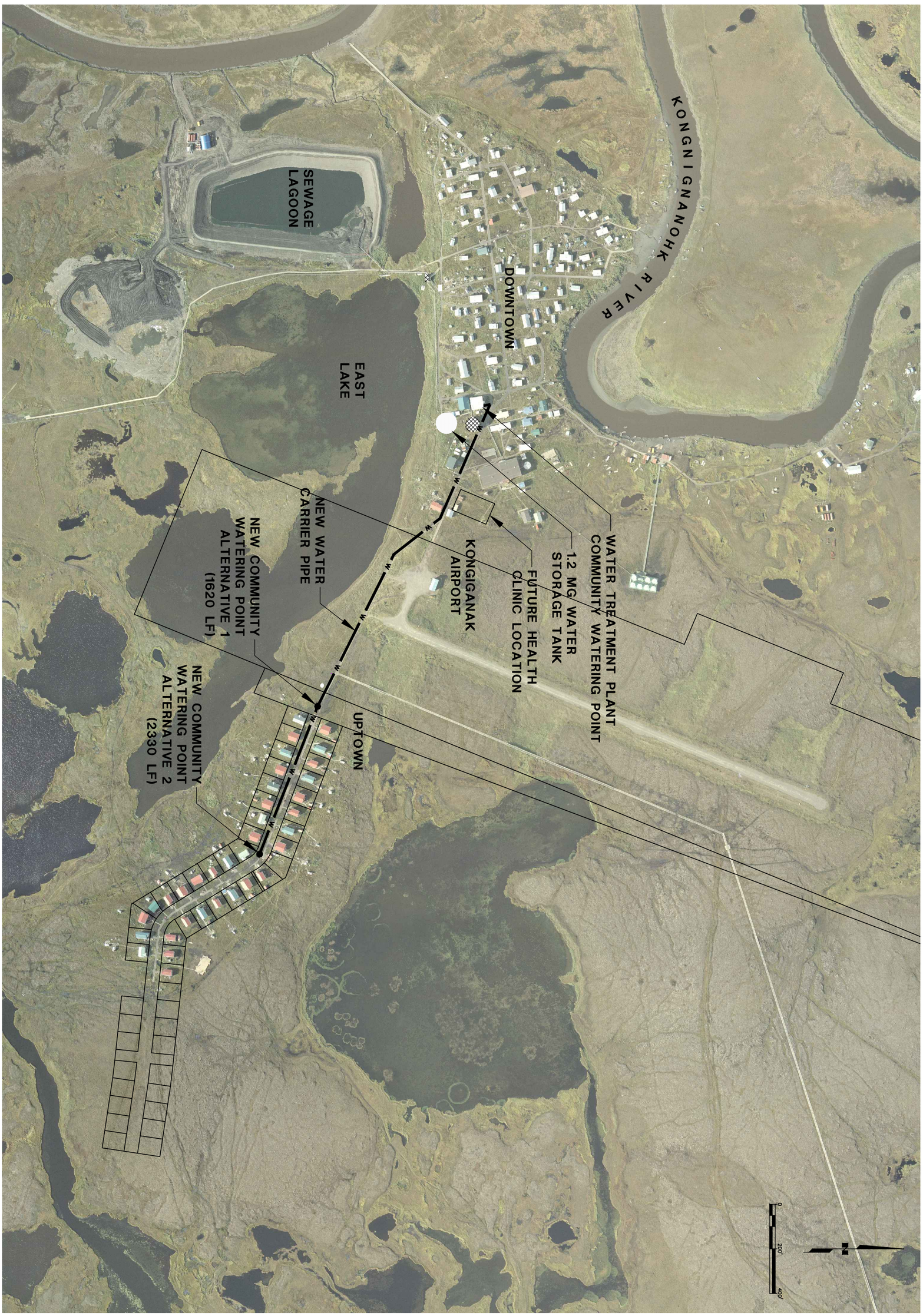

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KONGIGANAK FEASIBILITY STUDY UPDATE

WATER SUPPLY LOOP SITE PLAN

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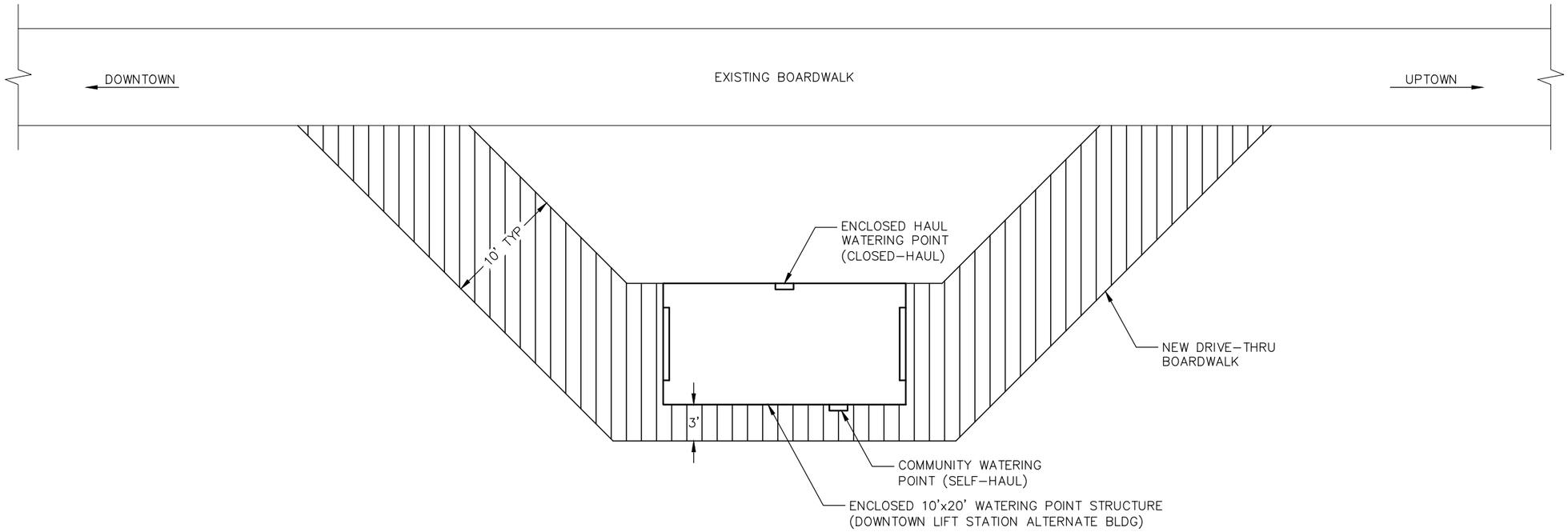
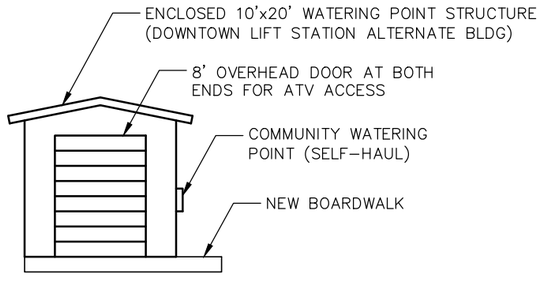
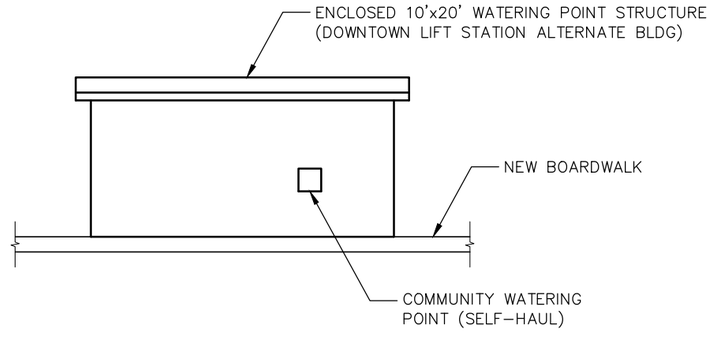


PLAN VIEW



WEST WALL VIEW



SOUTH WALL VIEW

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KONGIGANAK FEASIBILITY STUDY UPDATE

WATERING POINT STRUCTURE PLAN & DETAILS

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SCALE: NTS

KONGNIGNANOHK RIVER

WATER TREATMENT PLANT
COMMUNITY WATERING POINT

1.2 MG WATER
STORAGE TANK

FUTURE HEALTH
CLINIC LOCATION

DOWNTOWN

KONGIGANAK
AIRPORT

CLOSED HAUL
(ENTIRE COMMUNITY)

EAST
LAKE

UPTOWN

SEWAGE
LAGOON

NEW WATER
CARRIER PIPE

NEW COMMUNITY
WATERING POINT
ALTERNATIVE 1
(1620 LF)

NEW COMMUNITY
WATERING POINT
ALTERNATIVE 2
(2330 LF)

0 200' 400'

KONGIGANAK FEASIBILITY STUDY UPDATE

COMMUNITY WIDE
CLOSED HAUL (WATER)
SITE PLAN

FB:
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PROJ.NO: 1788.01
DWG.NO: FIGURE D

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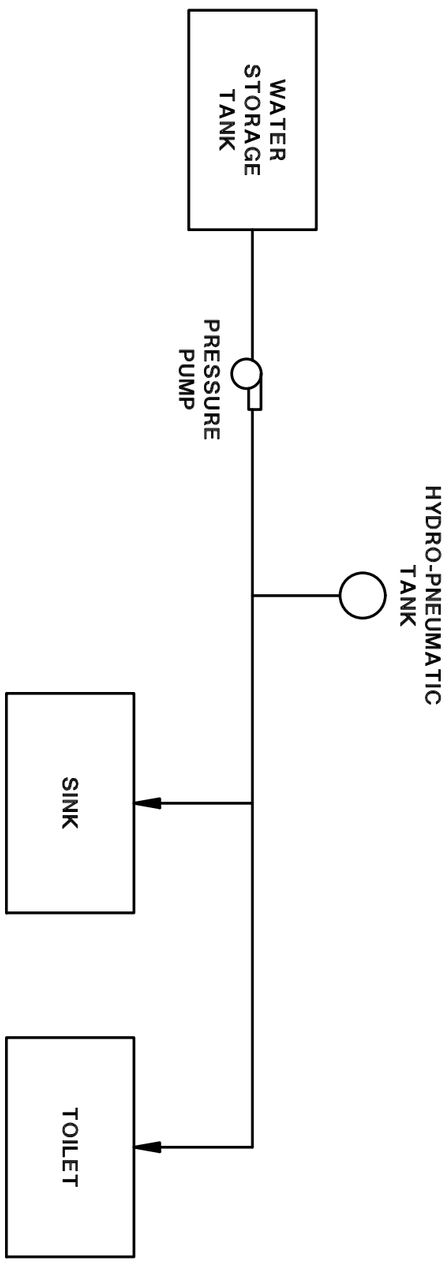

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KONGIGANAK FEASIBILITY STUDY UPDATE

COMMUNITY WIDE CLOSED HAUL (WATER) SCHEMATIC

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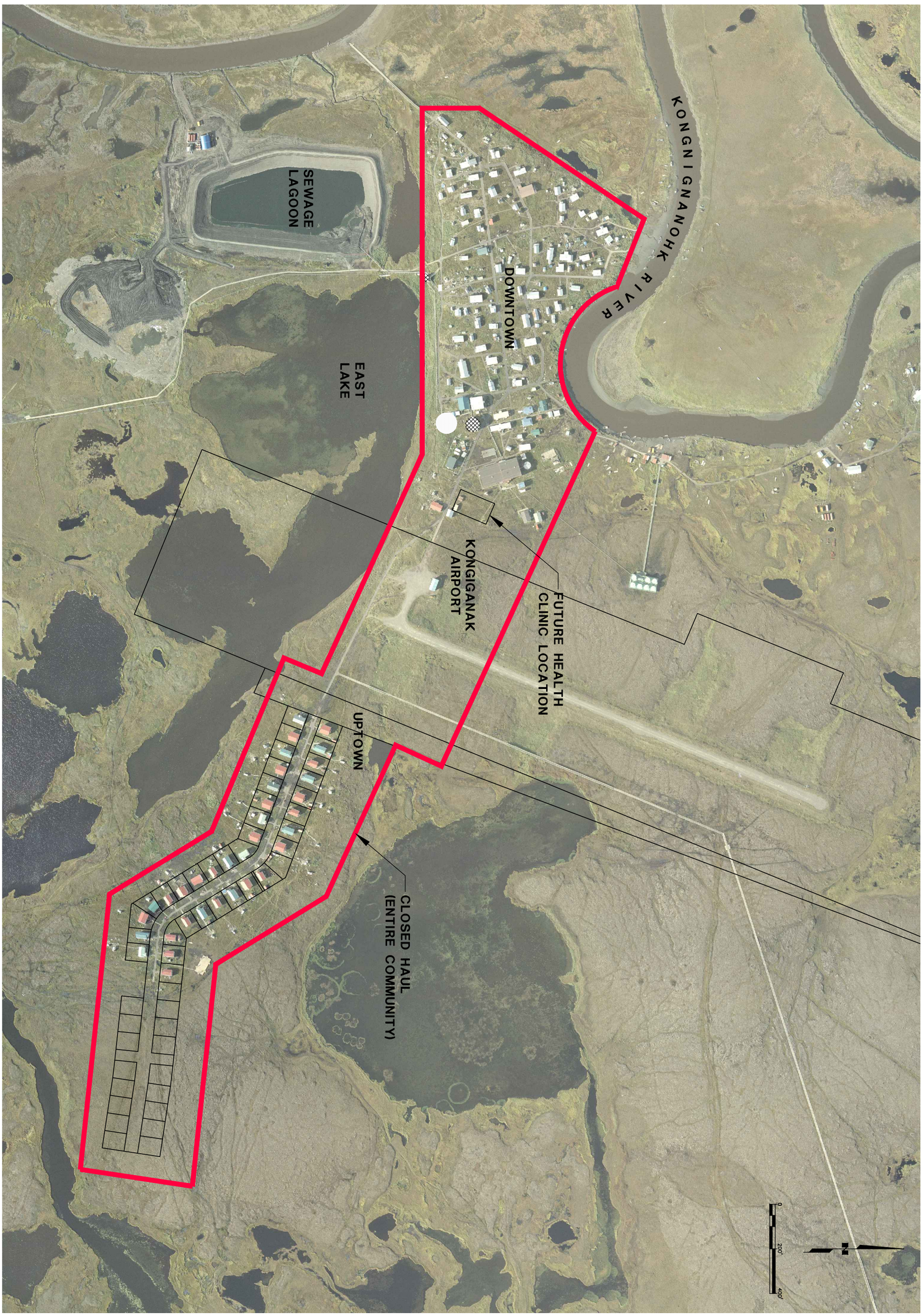

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KONGIGANAK FEASIBILITY STUDY UPDATE

COMMUNITY WIDE CLOSED HAUL (SEWER) SITE PLAN

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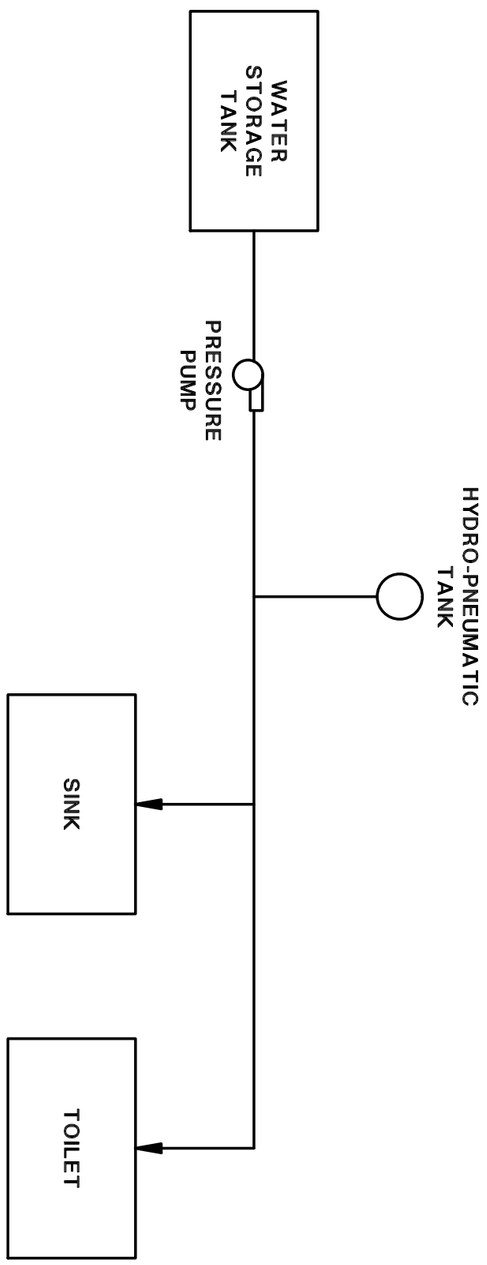
DWG.NO:	FIGURE F



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KONGIGANAK FEASIBILITY STUDY UPDATE

COMMUNITY WIDE CLOSED HAUL (SEWER) SCHEMATIC

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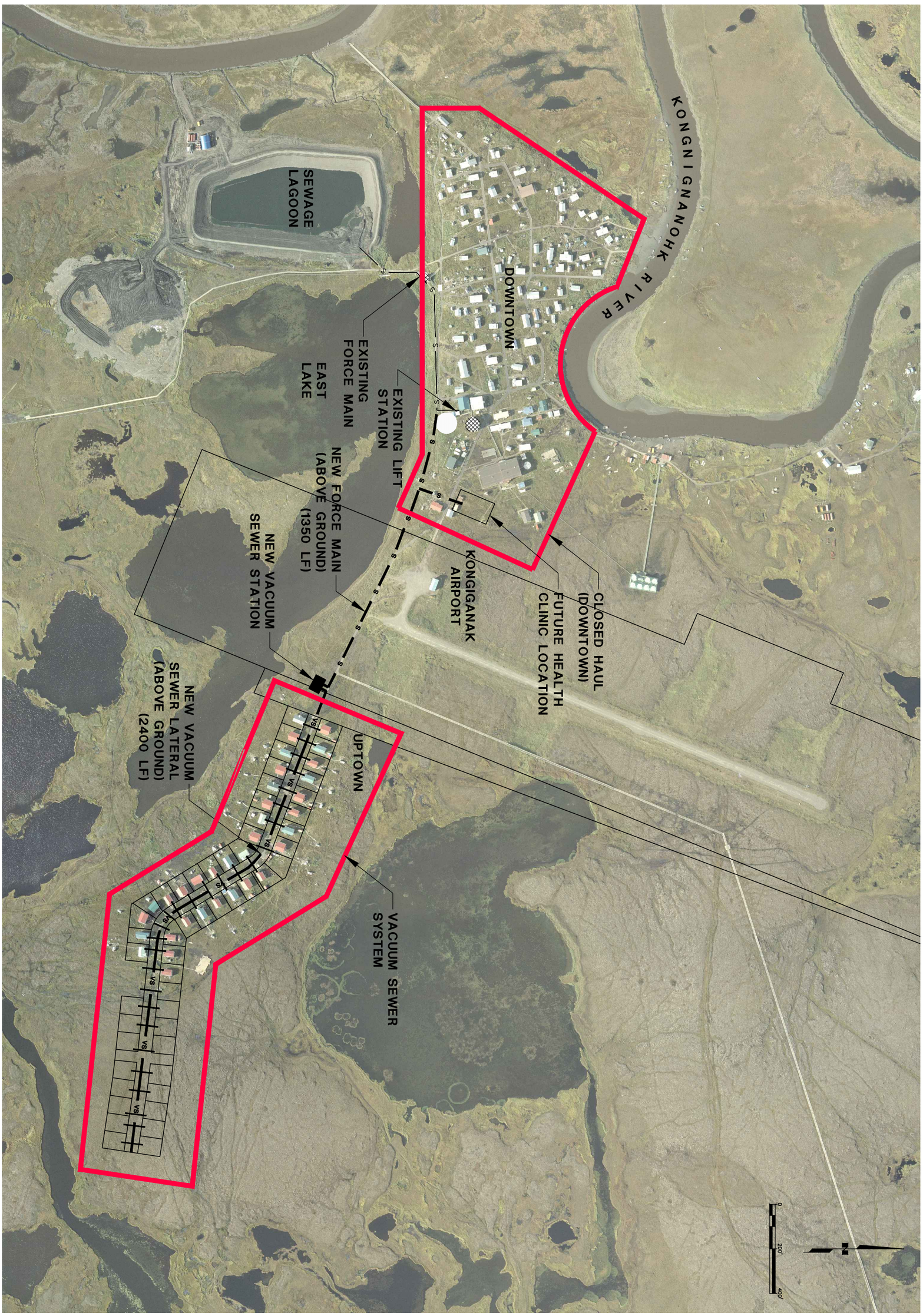

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KONGIGANAK FEASIBILITY STUDY UPDATE

VACUUM WASTEWATER COLLECTION SYSTEM (UPTOWN) SITE PLAN

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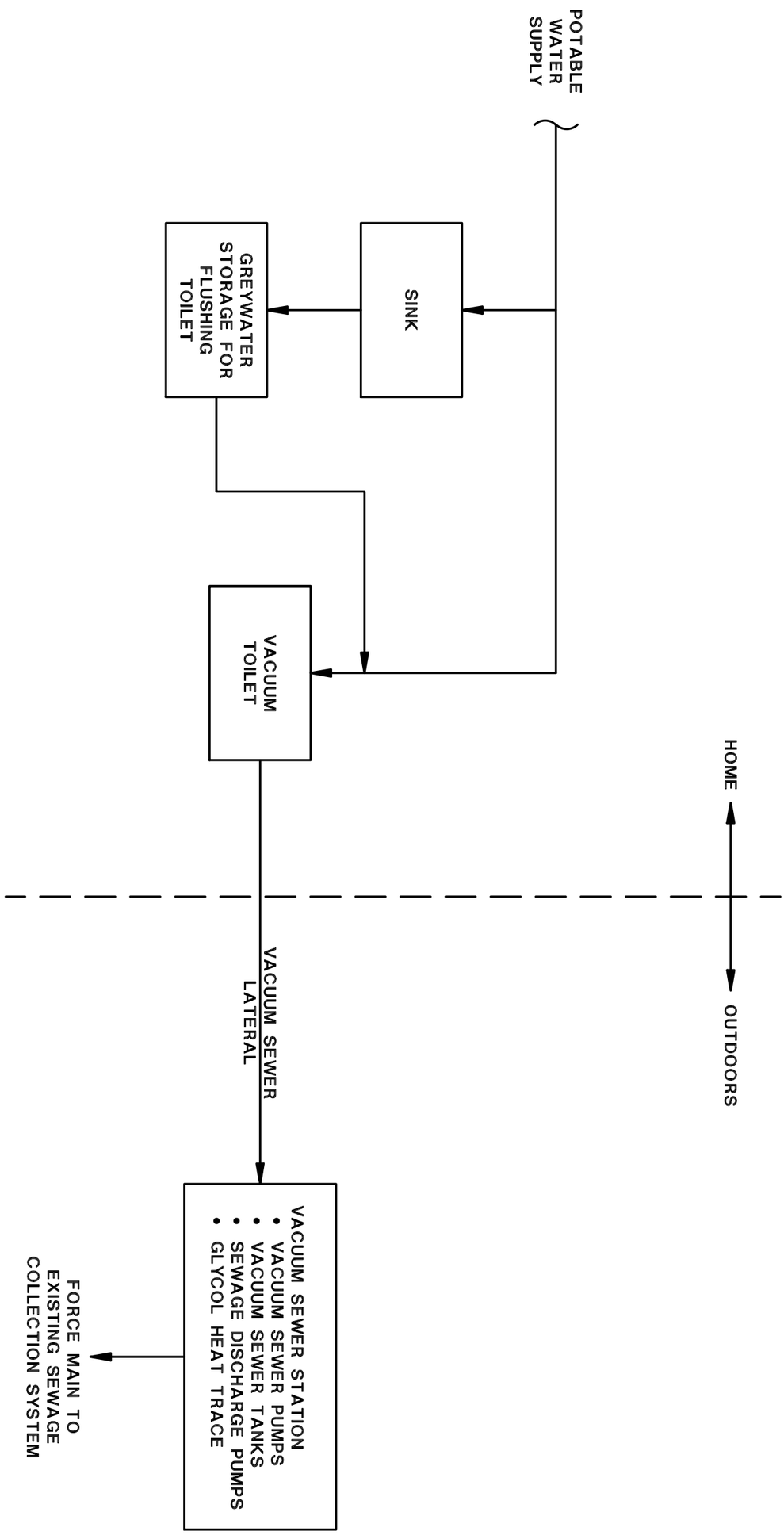

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DATE:	05/16/2013
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KONGIGANAK FEASIBILITY STUDY UPDATE

VACUUM WASTEWATER COLLECTION SYSTEM (UPTOWN) SCHEMATIC

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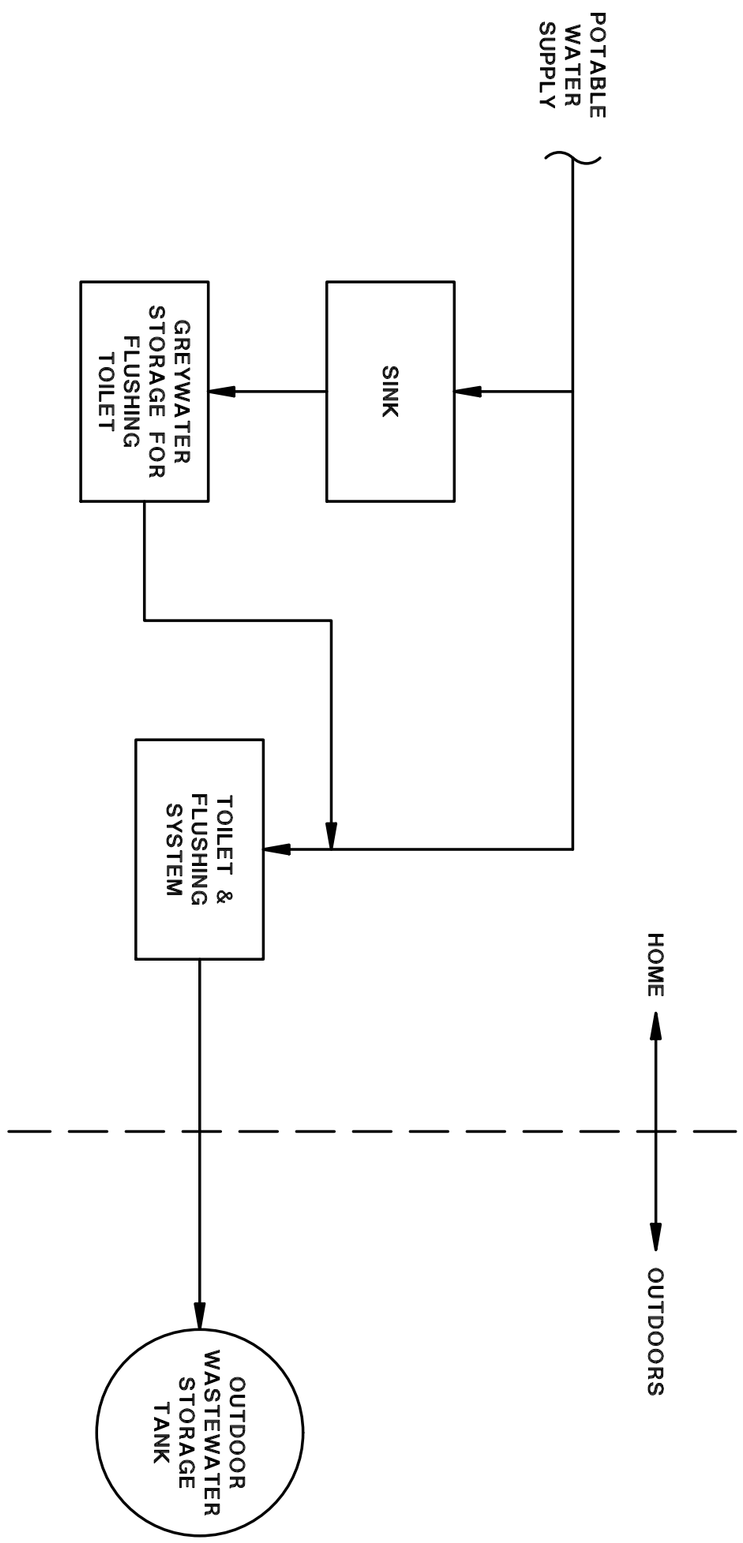

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KONGIGANAK FEASIBILITY STUDY UPDATE

HOME UPGRADES (WATER) SCHEMATIC

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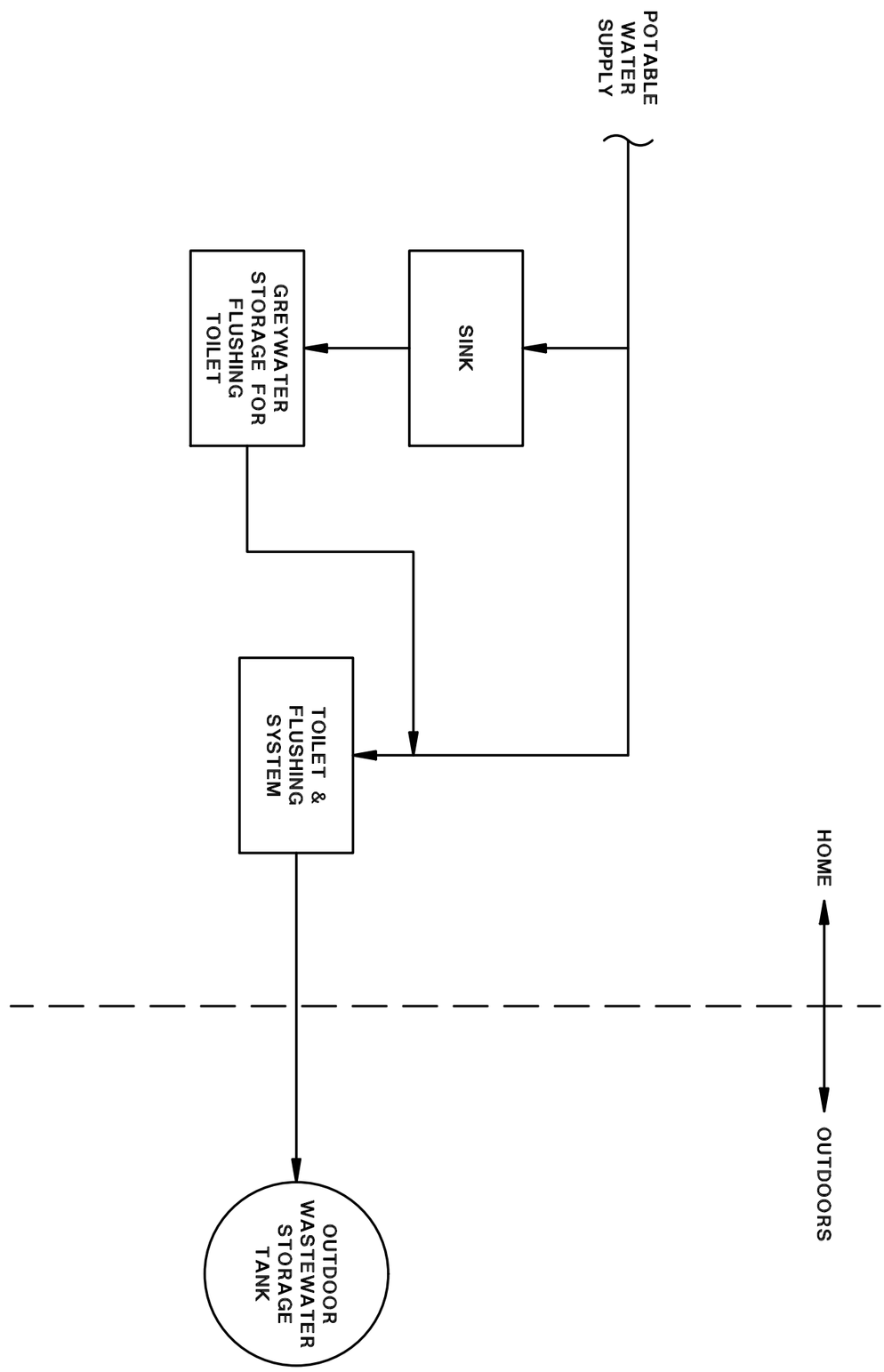

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DATE:	05/16/2013
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KONGIGANAK FEASIBILITY STUDY UPDATE

HOME UPGRADES (SEWER) SCHEMATIC

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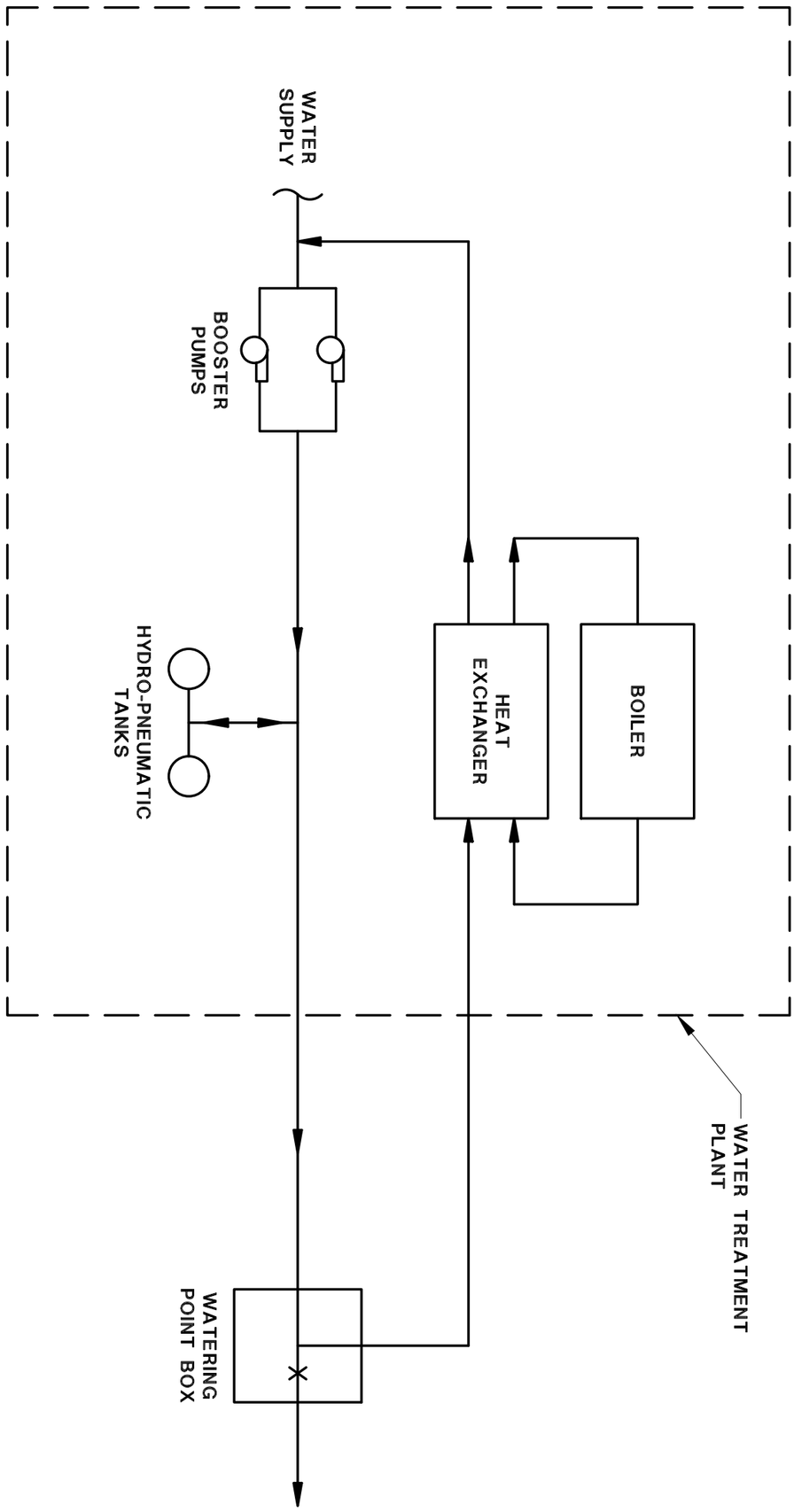

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SCALE:	NA

R&M CONSULTANTS, INC.
ENGINEERS•SURVEYING•EARTH SCIENCES•CONSTRUCTION SERVICES
9101 Vanguard Drive, Anchorage, Alaska 99507
PHONE (907) 522-1707, FAX (907) 522-3403

KONGIGANAK FEASIBILITY STUDY UPDATE

WATER TREATMENT PLANT UPGRADES PLAN & SCHEMATIC

FB:	
GRID:	
PROJ.NO:	1788.01
DWG.NO:	FIGURE L

DWN:	SA
CKD:	GLB/DRP
DATE:	05/16/2013
SCALE:	NA

R&M CONSULTANTS, INC.
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KONGIGANAK FEASIBILITY STUDY UPDATE

WASHETERIA UPGRADES
PLAN & SCHEMATIC

FB:	
GRID:	
PROJ.NO:	1788.01
DWG.NO:	FIGURE M

APPENDICES

A Cost Estimates

Appendix A

HMS Project No. 13050

FEASABILITY STUDY
CONSTRUCTION COST ESTIMATE (REVISED)

WATER AND SEWER OPTIONS
KONGIGANAK, ALASKA

PREPARED FOR:

R&M Consultants, Inc.
9101 Vanguard Drive
Anchorage, AK 99507

May 6, 2013

4103 Minnesota Drive • Anchorage, Alaska 99503 p: 907.561.1653 • f: 907.562.0420 • e: mail@hmsalaska.com

NOTES REGARDING THE PREPARATION OF THIS ESTIMATE

DRAWINGS AND DOCUMENTS

Level of Documents:	Concept
Date:	January 2013
Provided By:	R&M Consultants, Inc.

RATES

Pricing is based on current material, equipment and freight costs.

Labor Rates:	Force account - local labor

BIDDING ASSUMPTIONS

Contract:	Standard construction contract without restrictive bidding clauses
Bidding Situation:	Force account negotiated
Start of Construction:	Spring 2014
Months to Complete:	(4) to (5) months completion

EXCLUDED COSTS

1. A/E design fees
2. Administrative and management costs
3. Remediation of contaminated soils or abatement of any hazardous materials

NOTES REGARDING THE PREPARATION OF THIS ESTIMATE (Continued)

GENERAL

When included in HMS Inc.'s scope of services, opinions or estimates of probable construction costs are prepared on the basis of HMS Inc.'s experience and qualifications and represent HMS Inc.'s judgment as a professional generally familiar with the industry. However, since HMS Inc. has no control over the cost of labor, materials, equipment or services furnished by others, over contractor's methods of determining prices, or over competitive bidding or market conditions, HMS Inc. cannot and does not guarantee that proposals, bids, or actual construction cost will not vary from HMS Inc.'s opinions or estimates of probable construction cost.

This estimate assumes normal escalation based on the current economic climate. While the recent global economic downturn appears to be moderating, it remains unclear how its effects and subsequent economic recovery will affect construction costs. HMS Inc. will continue to monitor this, as well as other international, domestic and local events, and the resulting construction climate, and will adjust costs and contingencies as deemed appropriate.

GROSS FLOOR AREA

N/A

HMS Project No.: 13050

FEASABILITY STUDY COST SUMMARY

	Material	*Labor*	*Equipment*	*Total*
WATER ALTERNATIVES:				
1. Uptown Watering Point (Self Haul) (1,700 LF)	$ 397,353	$ 208,081	$ 0	$ 605,434
2. Uptown Watering Point (Self Haul) (2,400 LF)	596,711	301,831	0	898,542
3. Community Wide (Closed Haul) (1,700 LF)	734,118	303,063	158,983	1,196,164
4. Community Wide (Closed Haul) (2,400 LF)	933,476	430,571	158,983	1,523,030
WASTEWATER ALTERNATIVES:				
1. Closed Haul and Home Improvements	1,592,645	499,637	158,983	2,251,265
2. Vacuum Sewer/Closed Haul and Home Improvements	2,978,983	1,059,331	107,689	4,146,003

HMS Project No.: 13050

WATER ALTERNATIVES ***1. Uptown Watering Point (Self Haul) (1,700 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
SITE PREPARATION											
Site survey, staking and layout	1	AC	1000.00	1,000	110.000	110.000	25.00	2,750			3,750
Erosion and pollution control	34,000	SF	0.04	1,360	0.005	170.000	25.00	4,250			5,610
SWPPP requirements and maintenance	4	MOS	500.00	2,000	15.000	60.000	25.00	1,500			3,500
SITE IMPROVEMENTS											
Upgrade boardwalk as required to accommodate water and sewer traffic (allowance)	1	LOT	25000.00	25,000	500.000	500.000	25.00	12,500			37,500
SITE UTILITIES											
Arctic Pipe Containing											
1 1/2" HDPE water supply	1,700	LF	1.35	2,295	0.210	357.000	25.00	8,925			11,220
1" HDPE water return	1,700	LF	1.35	2,295	0.210	357.000	25.00	8,925			11,220
1 1/4" PEX heat trace supply	1,700	LF	3.10	5,270	0.130	221.000	25.00	5,525			10,795
1 1/4" PEX heat trace return	1,700	LF	3.10	5,270	0.130	221.000	25.00	5,525			10,795
12"x6" arctic pipe	1,700	LF	41.00	69,700	0.850	1445.000	25.00	36,125			105,825
12"x6" arctic pipe joint kits	43	EA	138.00	5,934	2.750	118.250	25.00	2,956			8,890

HMS Project No.: 13050

WATER ALTERNATIVES ***1. Uptown Watering Point (Self Haul) (1,700 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
SITE UTILITIES (Continued)											
Arctic Pipe Containing (Continued)											
Arctic pipe fittings	24	EA	800.00	19,200	4.500	108.000	25.00	2,700			21,900
3"x10" treated timber	680	LF	4.43	3,012	0.035	23.800	25.00	595			3,607
4"x4" treated timber sleeper (at 10' o/c)	340	LF	1.60	544	0.035	11.900	25.00	298			842
Duckbill anchor assembly	170	EA	52.00	8,840	0.850	144.500	25.00	3,613			12,453
12" pipe clamp	170	EA	172.00	29,240	1.000	170.000	25.00	4,250			33,490
Galvanized unistrut	340	LF	2.35	799	0.040	13.600	25.00	340			1,139
3/8"x2" lag bolt with washer	680	EA	0.34	231	0.053	36.040	25.00	901			1,132
1/4"x4" lag bolt	680	EA	0.31	211	0.050	34.000	25.00	850			1,061
Bury pipe at boardwalk crossings	100	LF	3.50	350	0.500	50.000	25.00	1,250			1,600
Allow for tee for connection to future health clinic	1	EA	1200.00	1,200	8.000	8.000	25.00	200			1,400
Test piping	1	LOT	50.00	50	40.000	40.000	25.00	1,000			1,050
WATERING POINT STRUCTURE											
4"x12" treated sleepers	72	LF	6.15	443	0.050	3.600	25.00	90			533
4"x4" support column	2	LF	1.60	3	0.050	0.100	25.00	3			6

HMS Project No.: 13050

WATER ALTERNATIVES ***1. Uptown Watering Point (Self Haul) (1,700 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
WATERING POINT STRUCTURE (Continued)											
5/8" CDX plywood column base and cap	1	SF	0.65	1	0.030	0.030	25.00	1			2
(2) layers 2" rigid insulation	119	SF	1.95	232	0.024	2.856	25.00	71			303
3/16" aluminum plate enclosure	119	SF	16.00	1,904	0.034	4.046	25.00	101			2,005
Angle brace support assembly	182	LBS	1.30	237	0.020	3.640	25.00	91			328
Angle support at base	238	LBS	1.30	309	0.020	4.760	25.00	119			428
3" HDPE piping	14	LF	4.30	60	0.110	1.540	25.00	39			99
1 1/2" copper piping	4	LF	11.98	48	0.133	0.532	25.00	13			61
1" copper piping	6	LF	6.80	41	0.100	0.600	25.00	15			56
1" vacuum breaker	1	EA	195.00	195	0.421	0.421	25.00	11			206
1" solenoid valve	1	EA	850.00	850	0.850	0.850	25.00	21			871
1" ball valve	1	EA	102.00	102	0.600	0.600	25.00	15			117
1 1/2" curb stop with outside handle	1	EA	120.00	120	0.690	0.690	25.00	17			137
1 1/2" polycam adapter	1	EA	4.00	4	0.330	0.330	25.00	8			12
1" delivery hose in heat traced outer hose	5	LF	17.00	85	0.150	0.750	25.00	19			104

WATER ALTERNATIVES ***1. Uptown Watering Point (Self Haul) (1,700 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
WATERING POINT STRUCTURE (Continued)											
Duplex receptacle, GFCI, weatherproof	1	EA	33.00	33	0.900	0.900	25.00	23			56
10 watts/foot heat trace	60	LF	11.00	660	0.030	1.800	25.00	45			705
Token drop	1	EA	350.00	350	2.500	2.500	25.00	63			413
2" weatherhead	1	EA	58.00	58	1.500	1.500	25.00	38			96
2" galvanized rigid steel conduit	9	LF	9.50	86	0.140	1.260	25.00	32			118
100 amp, 240/120 volt, single phase, 3 wire meter/load center in Nema 3R enclosure	1	EA	830.00	830	8.500	8.500	25.00	213			1,043
Junction boxes	5	EA	5.50	28	0.190	0.950	25.00	24			52
Thermostatic controls	2	EA	180.00	360	1.330	2.660	25.00	67			427
Grounding	1	LOT	150.00	150	3.000	3.000	25.00	75			225
Conduit and conductor	40	LF	18.00	720	0.190	7.600	25.00	190			910
MECHANICAL											
Connect to existing pipe supply at water treatment plant	1	EA	150.00	150	3.500	3.500	25.00	88			238
New ___ HP circulation pump for water	1	EA	2600.00	2,600	7.000	7.000	25.00	175			2,775

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WATER ALTERNATIVES ***1. Uptown Watering Point (Self Haul) (1,700 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
MECHANICAL (Continued)											
New circulation pump for heat trace	1	EA	1950.00	1,950	6.000	6.000	25.00	150			2,100
Heat source for glycol heat trace											Existing
Glycol	600	GAL	13.50	8,100	0.020	12.000	25.00	300			8,400
SUBTOTAL:				204,510				107,095			311,605
General Conditions	30%			61,353				32,129			93,482
Estimator's Contingency	20%			53,173				27,845			81,018
Force Account Lost Productivity	20%			63,807				33,414			97,221
Escalation to Spring 2014 Construction Start at 3.5% per Annum	3.79%			14,510				7,598			22,108
TOTAL ESTIMATED COST:				***397,353***				***208,081***			***605,434***

HMS Project No.: 13050

WATER ALTERNATIVES ***2. Uptown Watering Point (Self Haul) (2,400 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
SITE PREPARATION											
Site survey, staking and layout	1.4	AC	1000.00	1,400	110.000	154.000	25.00	3,850			5,250
Erosion and pollution control	47,600	SF	0.04	1,904	0.005	238.000	25.00	5,950			7,854
SWPPP requirements and maintenance	6	MOS	500.00	3,000	15.000	90.000	25.00	2,250			5,250
SITE IMPROVEMENTS											
Upgrade boardwalk as required to accommodate water and sewer traffic	1	LOT	35000.00	35,000	700.000	700.000	25.00	17,500			52,500
SITE UTILITIES											
Arctic Pipe Containing											
1 1/2" HDPE water supply	2,400	LF	1.35	3,240	0.210	504.000	25.00	12,600			15,840
1" HDPE water return	2,400	LF	1.35	3,240	0.210	504.000	25.00	12,600			15,840
1 1/4" PEX heat trace supply	2,400	LF	3.10	7,440	0.130	312.000	25.00	7,800			15,240
1 1/4" PEX heat trace return	2,400	LF	3.10	7,440	0.130	312.000	25.00	7,800			15,240
12"x6" arctic pipe	2,400	LF	41.00	98,400	0.850	2040.000	25.00	51,000			149,400
12"x6" arctic pipe joint kits	60	EA	138.00	8,280	2.750	165.000	25.00	4,125			12,405
Arctic pipe fittings	64	EA	800.00	51,200	4.500	288.000	25.00	7,200			58,400

WATER ALTERNATIVES ***2. Uptown Watering Point (Self Haul) (2,400 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
SITE UTILITIES (Continued)											
Arctic Pipe Containing (Continued)											
3"x10" treated timber	952	LF	4.43	4,217	0.035	33.320	25.00	833			5,050
4"x4" treated timber sleeper (at 10'0" o/c)	476	LF	1.60	762	0.035	16.660	25.00	417			1,179
Duckbill anchor assembly	238	EA	52.00	12,376	0.850	202.300	25.00	5,058			17,434
12" pipe clamp	240	EA	172.00	41,280	1.000	240.000	25.00	6,000			47,280
Galvanized unistrut	476	LF	2.35	1,119	0.040	19.040	25.00	476			1,595
3/8"x2" lag bolt with washer	952	EA	0.34	324	0.053	50.456	25.00	1,261			1,585
1/4"x4" lag bolt	952	EA	0.31	295	0.050	47.600	25.00	1,190			1,485
Bury pipe at boardwalk crossings	280	LF	3.50	980	0.500	140.000	25.00	3,500			4,480
Allow for tee for connection to future health clinic	1	EA	1200.00	1,200	8.000	8.000	25.00	200			1,400
Test piping	1	LOT	70.00	70	60.000	60.000	25.00	1,500			1,570
WATERING POINT STRUCTURE											
4"x12" treated sleepers	72	LF	6.15	443	0.050	3.600	25.00	90			533
4"x4" support column	2	LF	1.60	3	0.050	0.100	25.00	3			6

HMS Project No.: 13050

WATER ALTERNATIVES ***2. Uptown Watering Point (Self Haul) (2,400 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
WATERING POINT STRUCTURE (Continued)											
5/8" CDX plywood column base and cap	1	SF	0.65	1	0.030	0.030	25.00	1			2
(2) layers 2" rigid insulation	119	SF	1.95	232	0.024	2.856	25.00	71			303
3/16" aluminum plate enclosure	119	SF	16.00	1,904	0.034	4.046	25.00	101			2,005
Angle brace support assembly	182	LBS	1.30	237	0.020	3.640	25.00	91			328
Angle support at base	238	LBS	1.30	309	0.020	4.760	25.00	119			428
3" HDPE piping	14	LF	4.30	60	0.110	1.540	25.00	39			99
1 1/2" copper piping	4	LF	11.98	48	0.133	0.532	25.00	13			61
1" copper piping	6	LF	6.80	41	0.100	0.600	25.00	15			56
1" vacuum breaker	1	EA	195.00	195	0.421	0.421	25.00	11			206
1" solenoid valve	1	EA	850.00	850	0.850	0.850	25.00	21			871
1" ball valve	1	EA	102.00	102	0.600	0.600	25.00	15			117
1 1/2" curb stop with outside handle	1	EA	120.00	120	0.690	0.690	25.00	17			137
1 1/2" polycam adapter	1	EA	4.00	4	0.330	0.330	25.00	8			12
1" delivery hose in heat traced outer hose	5	LF	17.00	85	0.150	0.750	25.00	19			104

HMS Project No.: 13050

WATER ALTERNATIVES ***2. Uptown Watering Point (Self Haul) (2,400 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
WATERING POINT STRUCTURE (Continued)											
Duplex receptacle, GFCI, weatherproof	1	EA	33.00	33	0.900	0.900	25.00	23			56
10 watts/foot heat trace	60	LF	11.00	660	0.030	1.800	25.00	45			705
Token drop	1	EA	350.00	350	2.500	2.500	25.00	63			413
2" weatherhead	1	EA	58.00	58	1.500	1.500	25.00	38			96
2" galvanized rigid steel conduit	9	LF	9.50	86	0.140	1.260	25.00	32			118
100 amp, 240/120 volt, single phase, 3 wire meter/load center in Nema 3R enclosure	1	EA	830.00	830	8.500	8.500	25.00	213			1,043
Junction boxes	5	EA	5.50	28	0.190	0.950	25.00	24			52
Thermostatic controls	2	EA	180.00	360	1.330	2.660	25.00	67			427
Grounding	1	LOT	150.00	150	3.000	3.000	25.00	75			225
Conduit and conductor	40	LF	18.00	720	0.190	7.600	25.00	190			910
MECHANICAL											
Connect to existing pipe supply at water treatment plant	1	EA	150.00	150	3.500	3.500	25.00	88			238
New ___HP circulation pump for water	1	EA	2600.00	2,600	7.000	7.000	25.00	175			2,775

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WATER ALTERNATIVES ***2. Uptown Watering Point (Self Haul) (2,400 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
MECHANICAL (Continued)											
New circulation pump for heat trace	1	EA	1950.00	1,950	6.000	6.000	25.00	150			2,100
Heat source for glycol heat trace											Existing
Glycol	840	GAL	13.50	11,340	0.020	16.800	25.00	420			11,760
SUBTOTAL:				307,116				155,347			462,463
General Conditions	30%			92,135				46,604			138,739
Estimator's Contingency	20%			79,850				40,390			120,240
Force Account Lost Productivity	20%			95,820				48,468			144,288
Escalation to Spring 2014 Construction Start at 3.5% per Annum	3.79%			21,790				11,022			32,812
TOTAL ESTIMATED COST:				***596,711***				***301,831***			***898,542***

HMS Project No.: 13050

WATER ALTERNATIVES ***3. Community Wide (Closed Haul) (1,700 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
SITE PREPARATION											
Site survey, staking and layout	1	AC	1000.00	1,000	110.000	110.000	25.00	2,750			3,750
Erosion and pollution control	34,000	SF	0.04	1,360	0.005	170.000	25.00	4,250			5,610
SWPPP requirements and maintenance	4	MOS	500.00	2,000	15.000	60.000	25.00	1,500			3,500
SITE IMPROVEMENTS											
New boardwalk at watering point	660	SF	33.00	21,780	0.610	402.600	25.00	10,065			31,845
Upgrade boardwalk as required to accommodate water and sewer traffic	1	LOT	25000.00	25,000	500.000	500.000	25.00	12,500			37,500
SITE UTILITIES											
Water Line											
12"x6" arctic pipe	1,700	LF	41.00	69,700	0.850	1445.000	25.00	36,125			105,825
12"x6" arctic pipe joint kits	43	EA	138.00	5,934	2.750	118.250	25.00	2,956			8,890
Arctic pipe fittings	24	EA	800.00	19,200	4.500	108.000	25.00	2,700			21,900
1 1/2" HDPE water supply	1,700	LF	1.35	2,295	0.210	357.000	25.00	8,925			11,220
1" HDPE water return	1,700	LF	1.35	2,295	0.210	357.000	25.00	8,925			11,220
1 1/4" PEX heat trace supply	1,700	LF	3.10	5,270	0.130	221.000	25.00	5,525			10,795
1 1/4" PEX heat trace return	1,700	LF	3.10	5,270	0.130	221.000	25.00	5,525			10,795

HMS Project No.: 13050

WATER ALTERNATIVES ***3. Community Wide (Closed Haul) (1,700 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
SITE UTILITIES (Continued)											
Water Line (Continued)											
3"x10" treated timber	680	LF	4.43	3,012	0.035	23.800	25.00	595			3,607
4"x4" treated timber sleeper (at 10'0" o/c)	340	LF	1.60	544	0.035	11.900	25.00	298			842
Duckbill anchor assembly	170	EA	52.00	8,840	0.850	144.500	25.00	3,613			12,453
12" pipe clamp	170	EA	172.00	29,240	1.000	170.000	25.00	4,250			33,490
Galvanized unistrut	340	LF	2.35	799	0.040	13.600	25.00	340			1,139
3/8"x2" lag bolt with washer	680	EA	0.34	231	0.053	36.040	25.00	901			1,132
1/4"x4" lag bolt	680	EA	0.31	211	0.050	34.000	25.00	850			1,061
Bury pipe at boardwalk crossings	100	LF	3.50	350	0.500	50.000	25.00	1,250			1,600
Allow for tee for connection to future health clinic	1	EA	1200.00	1,200	8.000	8.000	25.00	200			1,400
Test piping	1	LOT	50.00	50	40.000	40.000	25.00	1,000			1,050
WATERING POINT STRUCTURE (10'0"x20'0")											
Support pilings	15	EA	285.00	4,275	4.000	60.000	25.00	1,500	175.00	2,625	8,400
Floor structure	200	SF	11.50	2,300	0.300	60.000	25.00	1,500			3,800
Roof structure	264	SF	6.00	1,584	0.150	39.600	25.00	990			2,574

WATER ALTERNATIVES ***3. Community Wide (Closed Haul) (1,700 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
WATERING POINT STRUCTURE (10'0"x20'0") (Continued)											
Exterior closure	500	SF	18.00	9,000	0.250	125.000	25.00	3,125			12,125
8'0"x6'0" overhead door	2	EA	960.00	1,920	6.000	12.000	25.00	300			2,220
Roofing	264	SF	20.60	5,438	0.300	79.200	25.00	1,980			7,418
Piping rough-in	1	LOT	350.00	350	25.000	25.000	25.00	625			975
1" solenoid valve	1	EA	850.00	850	0.850	0.850	25.00	21			871
Vacuum breaker	1	EA	189.00	189	0.650	0.650	25.00	16			205
Coin operator	1	EA	350.00	350	2.500	2.500	25.00	63			413
Hose	10	LF	1.95	20	0.050	0.500	25.00	13			33
Electric unit heaters	2	EA	450.00	900	3.330	6.660	25.00	167			1,067
Electrical service	150	AMPS	50.00	7,500	2.120	318.000	25.00	7,950			15,450
Lighting and power	200	SF	6.50	1,300	0.300	60.000	25.00	1,500			2,800
MECHANICAL											
Connect to existing pipe supply at water treatment plant	1	EA	150.00	150	3.500	3.500	25.00	88			238
New ___ HP circulation pump for water	1	EA	2600.00	2,600	7.000	7.000	25.00	175			2,775
New circulation pump for heat trace	1	EA	1950.00	1,950	6.000	6.000	25.00	150			2,100

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WATER ALTERNATIVES ***3. Community Wide (Closed Haul) (1,700 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
MECHANICAL (Continued)											
Heat source for glycol heat trace											Existing
120 gallon insulated water storage tank	126	EA	980.00	123,480	6.500	819.000	25.00	20,475			143,955
Glycol	600	GAL	13.50	8,100	0.020	12.000	25.00	300			8,400
EQUIPMENT											
4-wheelers	3	EA							11000.00	33,000	33,000
Snow machines	3	EA							11000.00	33,000	33,000
Trailers	3	EA							1800.00	5,400	5,400
110 gallon insulated HDPE water storage tanks and transfer equipment	3	EA							2600.00	7,800	7,800
SUBTOTAL:				377,837				155,981		81,825	615,643
General Conditions	30%			113,351				46,794		24,548	184,693
Estimator's Contingency	20%			98,238				40,555		21,275	160,068
Force Account Lost Productivity	20%			117,885				48,666		25,530	192,081
Escalation to Spring 2014 Construction Start at 3.5% per Annum	3.79%			26,807				11,067		5,805	43,679
TOTAL ESTIMATED COST:				***734,118***				***303,063***		***158,983***	***1,196,164***

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WATER ALTERNATIVES ***4. Community Wide*** ***(Closed Haul) (2,400 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
SITE PREPARATION											
Site survey, staking and layout	1.4	AC	1000.00	1,400	110.000	154.000	25.00	3,850			5,250
Erosion and pollution control	47,600	SF	0.04	1,904	0.005	238.000	25.00	5,950			7,854
SWPPP requirements and maintenance	6	MOS	500.00	3,000	15.000	90.000	25.00	2,250			5,250
SITE IMPROVEMENTS											
New boardwalk at watering point	660	SF	33.00	21,780	0.610	402.600	25.00	10,065			31,845
Upgrade boardwalk as required to accommodate water and sewer traffic	1	LOT	35000.00	35,000	700.000	700.000	25.00	17,500			52,500
SITE UTILITIES											
Arctic Pipe Containing											
1 1/2" HDPE water supply	2,400	LF	1.35	3,240	0.210	504.000	25.00	12,600			15,840
1" HDPE water return	2,400	LF	1.35	3,240	0.210	504.000	25.00	12,600			15,840
1 1/4" PEX heat trace supply	2,400	LF	3.10	7,440	0.130	312.000	25.00	7,800			15,240
1 1/4" PEX heat trace return	2,400	LF	3.10	7,440	0.130	312.000	25.00	7,800			15,240
12"x6" arctic pipe	2,400	LF	41.00	98,400	0.850	2040.000	25.00	51,000			149,400
12"x6" arctic pipe joint kits	60	EA	138.00	8,280	2.750	165.000	25.00	4,125			12,405
Arctic pipe fittings	64	EA	800.00	51,200	4.500	288.000	25.00	7,200			58,400

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WATER ALTERNATIVES ***4. Community Wide*** ***(Closed Haul) (2,400 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
SITE UTILITIES (Continued)											
Arctic Pipe Containing (Continued)											
3"x10" treated timber	952	LF	4.43	4,217	0.035	33.320	25.00	833			5,050
4"x4" treated timber sleeper (at 10' o/c)	476	LF	1.60	762	0.035	16.660	25.00	417			1,179
Duckbill anchor assembly	238	EA	52.00	12,376	0.850	202.300	25.00	5,058			17,434
12" pipe clamp	240	EA	172.00	41,280	1.000	240.000	25.00	6,000			47,280
Galvanized unistrut	476	LF	2.35	1,119	1.500	714.000	25.00	17,850			18,969
3/8"x2" lag bolt with washer	952	EA	0.34	324	0.053	50.456	25.00	1,261			1,585
1/4"x4" lag bolt	952	EA	0.31	295	0.050	47.600	25.00	1,190			1,485
Bury pipe at boardwalk crossings	280	LF	3.50	980	0.500	140.000	25.00	3,500			4,480
Allow for tee for connection to future health clinic	1	EA	1200.00	1,200	8.000	8.000	25.00	200			1,400
Test piping	1	LOT	70.00	70	60.000	60.000	25.00	1,500			1,570
WATERING POINT STRUCTURE (10'0"x20'0")											
Support pilings	15	EA	285.00	4,275	4.000	60.000	25.00	1,500	175.00	2,625	8,400
Floor structure	200	SF	11.50	2,300	0.300	60.000	25.00	1,500			3,800
Roof structure	264	SF	6.00	1,584	0.150	39.600	25.00	990			2,574

WATER ALTERNATIVES ***4. Community Wide*** ***(Closed Haul) (2,400 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
WATERING POINT STRUCTURE (10'0"x20'0") (Continued)											
Exterior closure	500	SF	18.00	9,000	0.250	125.000	25.00	3,125			12,125
8'0"x6'0" overhead door	2	EA	960.00	1,920	6.000	12.000	25.00	300			2,220
Roofing	264	SF	20.60	5,438	0.300	79.200	25.00	1,980			7,418
Piping rough-in	1	LOT	350.00	350	25.000	25.000	25.00	625			975
1" solenoid valve	1	EA	850.00	850	0.850	0.850	25.00	21			871
Vacuum breaker	1	EA	189.00	189	0.650	0.650	25.00	16			205
Coin operator	1	EA	350.00	350	2.500	2.500	25.00	63			413
Hose	10	LF	1.95	20	0.050	0.500	25.00	13			33
Electric unit heater	2	EA	450.00	900	3.330	6.660	25.00	167			1,067
Electrical service	150	AMPS	50.00	7,500	2.120	318.000	25.00	7,950			15,450
Lighting and power	200	SF	6.50	1,300	0.300	60.000	25.00	1,500			2,800
MECHANICAL											
Connect to existing pipe supply at water treatment plant	1	EA	150.00	150	3.500	3.500	25.00	88			238
New ___HP circulation pump for water	1	EA	2600.00	2,600	7.000	7.000	25.00	175			2,775
New circulation pump for heat trace	1	EA	1950.00	1,950	6.000	6.000	25.00	150			2,100

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WATER ALTERNATIVES ***4. Community Wide*** ***(Closed Haul) (2,400 LF)***	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
MECHANICAL (Continued)											
Heat source for glycol heat trace											Existing
120 gallon insulated water storage tanks	126	EA	980.00	123,480	6.500	819.000	25.00	20,475			143,955
Glycol	840	GAL	13.50	11,340	0.020	16.800	25.00	420			11,760
EQUIPMENT											
4-wheelers	3	EA							11000.00	33,000	33,000
Snow machines	3	EA							11000.00	33,000	33,000
Trailers	3	EA							1800.00	5,400	5,400
110 gallon insulated HDPE water storage tank and transfer equipment	3	EA							2600.00	7,800	7,800
SUBTOTAL:				480,443				221,607		81,825	783,875
General Conditions	30%			144,133				66,482		24,548	235,163
Estimator's Contingency	20%			124,915				57,618		21,275	203,808
Force Account Lost Productivity	20%			149,898				69,141		25,530	244,569
Escalation to Spring 2014 Construction Start at 3.5% per Annum	3.79%			34,087				15,723		5,805	55,615
TOTAL ESTIMATED COST:				***933,476***				***430,571***		***158,983***	***1,523,030***

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WASTEWATER ALTERNATIVES 1. Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
SITE PREPARATION											
Site survey, staking and layout	0.25	AC	1000.00	250	110.000	27.500	25.00	688			938
Erosion and pollution control	5,000	SF	0.04	200	0.005	25.000	25.00	625			825
SWPPP requirements and maintenance	2	MOS	500.00	1,000	15.000	30.000	25.00	750			1,750
SITE IMPROVEMENTS											
New boardwalk at building	660	SF	33.00	21,780	0.610	402.600	25.00	10,065			31,845
Upgrade boardwalk as required to accommodate water and sewer traffic (allowance)	1	LOT	35000.00	35,000	700.000	700.000	25.00	17,500			52,500
EQUIPMENT BUILDING											
Support pilings	15	EA	285.00	4,275	4.000	60.000	25.00	1,500	175.00	2,625	8,400
Floor structure	200	SF	11.50	2,300	0.300	60.000	25.00	1,500			3,800
Roof structure	264	SF	6.00	1,584	0.150	39.600	25.00	990			2,574
Exterior closure	500	SF	18.00	9,000	0.250	125.000	25.00	3,125			12,125
8'0"x6'0" overhead door	2	EA	960.00	1,920	6.000	12.000	25.00	300			2,220
Roofing	264	SF	20.60	5,438	0.300	79.200	25.00	1,980			7,418
Electric unit heaters	2	EA	450.00	900	3.330	6.660	25.00	167			1,067

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WASTEWATER ALTERNATIVES 1. Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
EQUIPMENT BUILDING (Continued)											
Electrical service	150	AMPS	50.00	7,500	2.120	318.000	25.00	7,950			15,450
Lighting and power	200	SF	6.50	1,300	0.300	60.000	25.00	1,500			2,800
HOME IMPROVEMENTS											
Water Closet Platforms (126)											
2"x8" framing	3,654	LF	0.80	2,923	0.060	219.240	25.00	5,481			8,404
3/4" CDX plywood floor sheathing	3,150	SF	0.85	2,678	0.030	94.500	25.00	2,363			5,041
Aluminum edge flashing	630	LF	0.85	536	0.036	22.680	25.00	567			1,103
3"x12" grille	126	EA	36.00	4,536	0.500	63.000	25.00	1,575			6,111
Vinyl floor covering	3,150	SF	2.70	8,505	0.105	330.750	25.00	8,269			16,774
Interior Construction											
2"x8" wall framing	11,088	LF	0.80	8,870	0.047	521.136	25.00	13,028			21,898
2"x4" wall framing	8,190	LF	0.58	4,750	0.024	196.560	25.00	4,914			9,664
5/8" gypsum wallboard	27,216	SF	0.55	14,969	0.021	571.536	25.00	14,288			29,257
Paint new walls	27,216	SF	0.25	6,804	0.023	625.968	25.00	15,649			22,453
Spray foam seal at penetrations as required	126	EA	5.00	630	0.750	94.500	25.00	2,363			2,993

WASTEWATER ALTERNATIVES 1. Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
HOME IMPROVEMENTS (Continued)											
Plumbing Fixtures/Equipment											
Lavatory sinks, counter mounted	126	EA	395.00	49,770	2.320	292.320	25.00	7,308			57,078
Water closets, floor mounted	126	EA	595.00	74,970	3.480	438.480	25.00	10,962			85,932
Water heater instantaneous oil fired, 10 gallon Toyotomi Model OM-148 with flue	126	EA	2400.00	302,400	5.900	743.400	25.00	18,585			320,985
Outdoor sewage storage tank, heat traced including support, 160 gallon	126	EA	1300.00	163,800	8.600	1083.600	25.00	27,090			190,890
Seal penetrations with spray foam	126	LOTS	15.00	1,890	1.000	126.000	25.00	3,150			5,040
Domestic Water											
3/4" PEX	3,150	LF	1.45	4,568	0.050	157.500	25.00	3,938			8,506
1/2" PEX	2,520	LF	1.15	2,898	0.040	100.800	25.00	2,520			5,418
1/2" valves	630	EA	11.50	7,245	0.460	289.800	25.00	7,245			14,490
3/4" check valves	126	EA	46.50	5,859	0.500	63.000	25.00	1,575			7,434
3/4" ball valves	126	EA	32.00	4,032	0.500	63.000	25.00	1,575			5,607
Pressure relief valves at water heater	126	EA	42.00	5,292	0.750	94.500	25.00	2,363			7,655

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WASTEWATER ALTERNATIVES 1. Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
HOME IMPROVEMENTS (Continued)											
Waste and Vent Piping											
3" ABS	1,450	LF	6.25	9,063	0.286	414.700	25.00	10,368			19,431
2" ABS	3,500	LF	3.55	12,425	0.258	903.000	25.00	22,575			35,000
1 1/2" ABS	1,900	LF	3.05	5,795	0.205	389.500	25.00	9,738			15,533
4" roof vent	126	EA	115.00	14,490	1.000	126.000	25.00	3,150			17,640
2" air-vac valve	0	EA	750.00		1.000		25.00				
Electrical											
Fractional motor connections	126	EA	15.00	1,890	1.500	189.000	25.00	4,725			6,615
Metal clad cable	3,150	LF	1.80	5,670	0.040	126.000	25.00	3,150			8,820
EQUIPMENT											
4-wheelers	3	EA							11000.00	33,000	33,000
Snow machines	3	EA							11000.00	33,000	33,000
Trailers	3	EA							1800.00	5,400	5,400
110 gallon insulated HDPE water storage tank and transfer equipment	3	EA							2600.00	7,800	7,800
SUBTOTAL:				819,705				257,154		81,825	1,158,684

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WASTEWATER ALTERNATIVES 1. Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
General Conditions	30%			245,912				77,146		24,548	347,606
Estimator's Contingency	20%			213,123				66,860		21,275	301,258
Force Account Lost Productivity	20%			255,748				80,232		25,530	361,510
Escalation to Spring 2014 Construction Start at 3.5% per Annum	3.79%			58,157				18,245		5,805	82,207
TOTAL ESTIMATED COST:				***1,592,645***				***499,637***		***158,983***	***2,251,265***

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WASTEWATER ALTERNATIVES 2. Vacuum Sewer/Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
SITE PREPARATION											
Site survey, staking and layout	0.25	AC	1000.00	250	110.000	27.500	25.00	688			938
Erosion and pollution control	5,000	SF	0.04	200	0.005	25.000	25.00	625			825
SWPPP requirements and maintenance	2	MOS	500.00	1,000	15.000	30.000	25.00	750			1,750
SITE IMPROVEMENTS											
New boardwalk at building	660	SF	33.00	21,780	0.610	402.600	25.00	10,065			31,845
Upgrade boardwalk as required to accommodate water and sewer traffic	1	LOT	35000.00	35,000	700.000	700.000	25.00	17,500			52,500
UTILITIES											
Vacuum Sewer											
Air vac container vacuum station	1	EA	130000.00	130,000	150.000	150.000	25.00	3,750			133,750
10"x4" arctic pipe	6,500	LF	39.00	253,500	0.750	4875.000	25.00	121,875			375,375
10"x4" arctic pipe joint kits	163	EA	118.00	19,234	2.500	407.500	25.00	10,188			29,422
Arctic pipe fittings	92	EA	600.00	55,200	4.000	368.000	25.00	9,200			64,400
2" HDPE	6,500	LF	1.65	10,725	0.280	1820.000	25.00	45,500			56,225
1" PEX heat trace supply	6,500	LF	1.80	11,700	0.100	650.000	25.00	16,250			27,950

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WASTEWATER ALTERNATIVES 2. Vacuum Sewer/Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
UTILITIES (Continued)											
Vacuum Sewer (Continued)											
1" PEX heat trace return	6,500	LF	1.80	11,700	0.100	650.000	25.00	16,250			27,950
3"x10" treated timber	2,485	LF	4.43	11,009	0.035	86.975	25.00	2,174			13,183
4"x4" treated timber sleeper	1,300	LF	1.60	2,080	0.035	45.500	25.00	1,138			3,218
Duckbill anchor assembly	650	EA	52.00	33,800	0.850	552.500	25.00	13,813			47,613
10" pipe clamp	650	EA	134.00	87,100	0.850	552.500	25.00	13,813			100,913
Galvanized unistrut	1,300	LF	2.35	3,055	0.040	52.000	25.00	1,300			4,355
3/8"x2" lag bolt and washer	2,600	EA	0.34	884	0.053	137.800	25.00	3,445			4,329
1/4"x4" lag bolt	2,600	EA	0.31	806	0.050	130.000	25.00	3,250			4,056
Bury pipe at boardwalk crossing	1,800	LF	3.50	6,300	0.500	900.000	25.00	22,500			28,800
Test piping	1	LOT	200.00	200	150.000	150.000	25.00	3,750			3,950
EQUIPMENT BUILDING (10'0"x20'0")											
Support pilings	15	EA	285.00	4,275	4.000	60.000	25.00	1,500	175.00	2,625	8,400
Floor structure	200	SF	11.50	2,300	0.300	60.000	25.00	1,500			3,800
Roof structure	264	SF	6.00	1,584	0.150	39.600	25.00	990			2,574

WASTEWATER ALTERNATIVES 2. Vacuum Sewer/Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
EQUIPMENT BUILDING (10'0"x20'0") (Continued)											
Exterior closure	500	SF	18.00	9,000	0.250	125.000	25.00	3,125			12,125
8'0"x6'0" overhead door	2	EA	960.00	1,920	6.000	12.000	25.00	300			2,220
Roofing	264	SF	20.60	5,438	0.300	79.200	25.00	1,980			7,418
Electric unit heaters	2	EA	450.00	900	3.330	6.660	25.00	167			1,067
Electrical service	150	AMPS	50.00	7,500	2.120	318.000	25.00	7,950			15,450
Lighting and power	200	SF	6.50	1,300	0.300	60.000	25.00	1,500			2,800
HOME IMPROVEMENTS											
Water Closet Platforms (126)											
2"x8" framing	3,654	LF	0.80	2,923	0.060	219.240	25.00	5,481			8,404
3/4" CDX plywood floor sheathing	3,150	SF	0.85	2,678	0.030	94.500	25.00	2,363			5,041
Aluminum edge flashing	630	LF	0.85	536	0.036	22.680	25.00	567			1,103
3"x12" grille	126	EA	36.00	4,536	0.500	63.000	25.00	1,575			6,111
Vinyl floor covering	3,150	SF	2.70	8,505	0.105	330.750	25.00	8,269			16,774
Interior Construction											
2"x8" wall framing	11,088	LF	0.80	8,870	0.047	521.136	25.00	13,028			21,898

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WASTEWATER ALTERNATIVES 2. Vacuum Sewer/Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
HOME IMPROVEMENTS (Continued)											
Interior Construction (Continued)											
2"x4" wall framing	8,190	LF	0.58	4,750	0.024	196.560	25.00	4,914			9,664
5/8" gypsum wallboard	27,216	SF	0.55	14,969	0.021	571.536	25.00	14,288			29,257
Paint new walls	27,216	SF	0.25	6,804	0.023	625.968	25.00	15,649			22,453
Spray foam seal at penetrations as required	126	EA	5.00	630	0.750	94.500	25.00	2,363			2,993
Plumbing Fixtures and Equipment											
Lavatory sinks, counter mounted	126	EA	395.00	49,770	2.320	292.320	25.00	7,308			57,078
Water closets, floor mounted	60	EA	595.00	35,700	3.480	208.800	25.00	5,220			40,920
Vacuum water closet assemblies, floor mounted	66	EA	2300.00	151,800	11.000	726.000	25.00	18,150			169,950
Water heater instantaneous oil fired, 10 gallon Toyotomi Model OM-148 with flue	126	EA	2400.00	302,400	5.900	743.400	25.00	18,585			320,985
Outdoor sewage storage tank, heat traced including support, 160 gallon	60	EA	1300.00	78,000	8.600	516.000	25.00	12,900			90,900
Seal penetrations with spray foam	126	LOTS	15.00	1,890	1.000	126.000	25.00	3,150			5,040

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WASTEWATER ALTERNATIVES 2. Vacuum Sewer/Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
HOME IMPROVEMENTS (Continued)											
Domestic Water											
3/4" PEX	3,150	LF	1.45	4,568	0.050	157.500	25.00	3,938			8,506
1/2" PEX	2,520	LF	1.15	2,898	0.040	100.800	25.00	2,520			5,418
1/2" valves	630	EA	11.50	7,245	0.460	289.800	25.00	7,245			14,490
3/4" check valves	126	EA	46.50	5,859	0.500	63.000	25.00	1,575			7,434
3/4" ball valves	126	EA	32.00	4,032	0.500	63.000	25.00	1,575			5,607
Pressure relief valves at water heater	126	EA	42.00	5,292	0.750	94.500	25.00	2,363			7,655
Waste and Vent Piping											
3" ABS	1,450	LF	6.25	9,063	0.286	414.700	25.00	10,368			19,431
2" ABS	3,500	LF	3.55	12,425	0.258	903.000	25.00	22,575			35,000
1 1/2" ABS	1,900	LF	3.05	5,795	0.205	389.500	25.00	9,738			15,533
4" roof vent	126	EA	115.00	14,490	1.000	126.000	25.00	3,150			17,640
2" air-vac valve	66	EA	750.00	49,500	1.000	66.000	25.00	1,650			51,150
Electrical											
Fractional motor connections	126	EA	15.00	1,890	1.500	189.000	25.00	4,725			6,615

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WASTEWATER ALTERNATIVES 2. Vacuum Sewer/Closed Haul and Home Improvements	*QUANTITY*		*MATERIAL*		*LABOR*				*EQUIPMENT*		*TOTAL*
	No. of Units	*UOM*	*Rate $*	*Cost $*	*Man Hours*	*Total Manhours*	*Rate $*	*Cost $*	*Rate $*	*Cost $*	*$*
HOME IMPROVEMENTS (Continued)											
Electrical (Continued)											
Metal clad cable	3,150	LF	1.80	5,670	0.040	126.000	25.00	3,150			8,820
EQUIPMENT											
4-wheelers	2	EA							11000.00	22,000	22,000
Snow machines	2	EA							11000.00	22,000	22,000
Trailers	2	EA							1800.00	3,600	3,600
110 gallon insulated HDPE water storage tank and transfer equipment	2	EA							2600.00	5,200	5,200
SUBTOTAL:				1,533,228				545,218		55,425	2,133,871
General Conditions	30%			459,968				163,565		16,628	640,161
Estimator's Contingency	20%			398,639				141,757		14,411	554,807
Force Account Lost Productivity	20%			478,367				170,108		17,293	665,768
Escalation to Spring 2014 Construction Start at 3.5% per Annum	3.79%			108,781				38,683		3,932	151,396
TOTAL ESTIMATED COST:				***2,978,983***				***1,059,331***		***107,689***	***4,146,003***