



**STATE OF ALASKA
ALASKA CLEAN/DRINKING WATER FUND
GREEN PROJECT ASSESSMENT FORM**

Under the EPA annual capitalization grants provided to the Alaska Clean/Drinking Water Fund loan programs, it is stated that "To the extent there are sufficiently eligible project applications, not less than 20 percent of the funds appropriated herein for the Revolving (loan) funds shall be for projects to address green infrastructure, water or energy efficiency improvements or other environmentally innovative activities." To meet this condition under the federal grant for administering these funds, this assessment form is provided to document this eligibility or what is termed a "Categorical" or "Business Case" justification, which will be reviewed by DEC for provisional compliance. For more information on green infrastructure development, please review the following EPA web site: http://cfpub.epa.gov/npdes/home.cfm?program_id=298

For those projects requiring a "Business Case," Part 2 will require completion to qualify a "traditional project" as green; justification is broken down into two parts, technical and financial. The technical part should use information from a variety of sources such as maintenance or operation records, engineering studies, project plans or other applicable documentation to identify problems (including any data on water and/or energy inefficiencies) in the existing facility, and that clarifies the technical benefits from the project in water and/or energy efficiency terms. Financial justification needs to show estimated savings to a project based on the technical benefits, and demonstrate that the green component of the project provides a substantial savings and environmental benefit.

For more information and assistance in completing this assessment form, please contact the Municipal Matching Grants & Loans program in Anchorage at 907-269-7673, or in Juneau at 907-465-5300.

GENERAL INFORMATION

Name of Community: City of North Pole

Address: 125 Snowman Lane, North Pole, AK 99705

Contact Name: William Butler Title: Director of City Services Telephone: (907) 488-8593

PROJECT INFORMATION

Project Name: Inflow and Infiltration Reduction Project Location: City of North Pole

Project Type: _____ New Construction Upgrades

_____ Stormwater Infrastructure

_____ Energy Efficiency Project

Water Efficiency Project

_____ Innovative Environmental Project

Green Project Description: The City's proposed Inflow and Infiltration (I&I) Reduction Project is part of a larger effort to increase the capacity of the City's waste water treatment plant (WWTP). The I&I Project will reduce the volume of waste water that the treatment works must process. I&I is calculated to contribute one third of the waste water flow. Reducing flow to the WWTP will reduce the energy needed to pump and treat waste water and will reduce the quantity of treatment chemical required. The treatment works are almost 25 years old; use aging and inefficient technologies; and the infrastructure is deteriorating. A flow rate that periodically approaches permitted capacity combined with deteriorating equipment demand the City either expand its capacity or increase the capacity of the existing facility. Expansion of the WWTP could cost the City between \$20 and \$25 million. Reducing I&I will provide one solution to increase the WWTP's treatment capacity that does not involve the high cost of building a new treatment plant.

PART 1 – GREEN PROJECT CATEGORY & COSTS

Identify the most appropriate “Green” Clean Water or Drinking Water category project type. Note, any selection with (BC) at the end will require a Business Case demonstration.

ENERGY EFFICIENCY – the use of improved technologies and practices to reduce the energy consumption of water quality projects.

- | | |
|--|--|
| <input type="checkbox"/> Wastewater/water utility energy audits | <input type="checkbox"/> Clean power for public owned facilities |
| <input type="checkbox"/> Leak detection equipment | <input type="checkbox"/> Retrofits/upgrades to pumps & treatment processes (BC) |
| <input type="checkbox"/> Replace/rehabilitation of distribution (BC) | <input checked="" type="checkbox"/> Other: <u>Inflow and infiltration reduction</u> (BC) |

WATER EFFICIENCY – the use of improved technologies and practices to deliver equal or better services with less water.

- | | | |
|---|--|---|
| <input type="checkbox"/> Water meters | <input type="checkbox"/> Fixture Retrofit | <input type="checkbox"/> Landscape/Irrigation |
| <input type="checkbox"/> Graywater or other water recycling | <input type="checkbox"/> Replace/rehabilitation of distribution (BC) | |
| <input type="checkbox"/> Leak detection equipment | <input type="checkbox"/> OTHER: _____ (BC) | |

GREEN INFRASTRUCTURE – Practices that manage and treat stormwater and that maintain and restore natural hydrology by infiltrating, evapotranspiring and capturing and using stormwater.

- | | |
|---|---|
| <input type="checkbox"/> Green Streets | <input type="checkbox"/> Water harvesting and reuse |
| <input type="checkbox"/> Porous pavement, bioretention, trees, green roofs, water gardens, constructed wetlands | |
| <input type="checkbox"/> Hydromodification for riparian buffers, floodplains, and wetlands | |
| <input type="checkbox"/> Downspout disconnection to remove stormwater from combined sewers and storm sewers | |
| <input type="checkbox"/> OTHER: _____ (BC) | |

ENVIRONMENTALLY INNOVATIVE PROJECTS – Demonstrate new/innovative approaches to managing water resources in a more sustainable way. This may include projects that achieve pollution prevention or pollutant removal with reduced costs and projects that foster adaptation of water protection programs and practices to climate change.

- | | | |
|---|---|---|
| <input type="checkbox"/> Wetland restoration | <input type="checkbox"/> Decentralized wastewater treatment solutions | |
| <input type="checkbox"/> Water reuse | <input type="checkbox"/> Green stormwater infrastructure | <input type="checkbox"/> Water balance approaches |
| <input type="checkbox"/> Adaptation to climate change | <input type="checkbox"/> Integrated water resource management | |
| <input type="checkbox"/> OTHER: _____ (BC) | | |

PROJECT & GREEN COMPONENT COSTS

	<u>TOTAL PROJECT COSTS</u>	<u>TOTAL "GREEN" COMPONENT COSTS</u>
Administration	\$ 19,664	\$
Legal	\$ 19,664	\$
Preliminary Studies/Reports	\$ 39,329	\$
Engineering Design	\$ 157,315	\$
Inspection/Surveying/Construction Management	\$ 157,315	\$
Construction	\$ 3,146,292	\$ 3,146,292
Equipment	\$ 0	\$
Contingencies	\$ 393,287	\$
Other	\$ 0	\$
Total Costs	\$ 3,932,865	\$

PART 2 – PROJECT "BUSINESS CASE" TECHNICAL/FINANCIAL ASSESSMENT

TECHNICAL ANALYSIS OF BENEFITS*

In addition to this form, a supporting technical and financial analysis is required to verify energy and water saving efficiencies for any green component of the project. For green infrastructure and innovative environmental type projects, the analysis should include any applicable efficiency and environmental benefits. For assisting MGL in evaluating "Business Case" assessments of water main, meter, and pump facility replacement type projects, the attached form titled "ADWF - Water/Energy Efficiency Determination - Water Main Replacement/Meter/Pump Facility" is required to be completed. Once the form is complete along with any supporting documentation, please submit documentation to the MGL program for review and concurrence. Note, only water/energy efficiencies that achieve a 20% or greater increase in efficiency will categorically qualify as a Green project.

CERTIFICATION STATEMENT:

I certify the above information is current and accurate.

William Butler _____

Director of City Services _____

Name

Title

William Butler _____

May 13, 2011 _____

Signature

Date

Submit Completed Form to:
Alaska Department of Environmental Conservation
Municipal Matching Grants & Loans
555 Cordova Street
Anchorage, AK 99501-2617

**Green Project Business Case
and
Project Cost Estimate
City of North Pole
Inflow and Infiltration Reduction Project**

Business Case Summary

The City of North Pole's proposed Inflow and Infiltration (I&I) Reduction Project is part of a larger effort to increase the capacity of the City's waste water treatment plant (WWTP). The I&I Project will reduce the volume of waste water that the treatment works must process. By reducing the volume of the waste water stream the project will reduce the energy needed to pump and treat waste water and will reduce the quantity of treatment chemical required. The greatest savings the I&I project will realize are financial and environmental. The I&I project is part of a coordinated effort to expand the treatment capacity of the City's waste water treatment works within the footprint of the existing facility.

The City's National Pollutant Discharge Elimination System (NPDES) permit for its treatment works is ½ million gallons per day (gpd). The average daily discharge varies by season. Discharge is typically lowest in the winter, approximately 230,000 gpd and highest in early summer, approximately 300,000 gpd. During spring breakup, the discharge per day has approached the facility's permitted ½ million gpd. The treatment works are almost 25 years old; use aging and inefficient technologies; and the infrastructure is deteriorating. A flow rate that periodically approaches permitted capacity combined with deteriorating equipment demand the City either expand its capacity or increase the capacity of the existing facility.

A utility analysis conducted in 2005 by PDC Engineering recommended duplicating the footprint of the City's existing treatment works—a footprint of 10 acres, four treatment lagoons and a new treatment building. PDC recommended the new treatment works be constructed in 2008 at an estimated cost of \$14,250,000 (See Appendix A, City of North Pole Water and Wastewater Utility Analysis.). Using an annual construction inflation rate of 10% (construction and engineering expenses) would equate to the project costing almost \$23 million in 2012 and over \$25 million in 2014. This is an insurmountable financial amount for a city of just over 2000 residents and an annual budget of approximately \$7 million. The City's plan is to pursue an alternative option to increase the WWTP's capacity: Decrease I&I and upgrade the existing treatment capacity by using improved technologies.

The City is moving forward on two tracks to achieve its goal of increasing the treatment capacity of the WWTP. The first track the City is pursuing is technological and operational changes. The first step in achieving technological and operational changes is to conduct an engineering and design project for renovation of the treatment facilities. The City has received funding from USDA and ADEC to conduct the engineering analysis and design project. The City has selected USKH, Inc. as the engineering firm to conduct the engineering analysis and design project. The goal of the project is to generate a series of phased upgrades to the existing treatment works to increase its treatment capacity. The City's NPDES permit is up for renewal in 2013. The City

plans to request an increase in the permitted discharge volume based upon the utility's almost 25 years of treatment data; a record of no significant violations; and any renovations initiated by 2013 as a result of the engineering and design project.

The second track the City is pursuing to increase the capacity of its treatment works is to decrease flow to the treatment works. PDC's 2005 utility analysis calculated I&I as high as 130,000 gpd. (See Appendix A, City of North Pole Water and Wastewater Utility Analysis.). An analysis conducted by the City in 2011 in support of its I&I Reduction Project ACWF loan application estimated that I&I accounted for 34% of total annual flow to the treatment works in 2010 (See Appendix B, Inflow & Infiltration Calculation.). The predominate source of I&I is 7,200 feet of Techite sewer mains and leaking manholes.

Business Case Details

Construction Cost Savings

The I&I Project is a critical part of the City's goal to increase its WWTP treatment capacity. Not constructing a new WWTP is the largest green aspect of the goal to increase the City's treatment capacity. Significant greenhouse gas emission would be generated by the construction of a new WWTP as recommended in PDC Engineering's 2005 Utility Analysis (See Appendix A.). The recommendation was to replicate the footprint of the existing treatment works. The current treatment works occupies a 10 acre footprint and encompasses four treatment lagoons and a treatment building. The lagoons are elevated approximately 10 feet above ground. Construction of new lagoons would require the purchase and clearing of land; excavation of a minimum of five feet below grade to a stable substrate, possibly deeper; and building up levies for the lagoons. Greenhouse gas emissions from land clearing; site excavation and removal of fill from the construction site; quarrying gravel for construction; trucking gravel to the site; and construction and compaction of the lagoon levies would generate tons of unnecessary greenhouse gas emissions.

There is not a sound business case for the City of North Pole to consider replicating its existing treatment works as recommended in the 2005 Utility Analysis. The Utility Analysis recommended work begin on the new WWTP in 2008 at an estimated cost of over \$14 million. The project was never implemented. If construction of a WWTP mirroring the existing treatment works was considered it would cost almost \$23 million if it were built in 2012. It is unrealistic to think that a city of just over 2000 residents and a land area of about four square miles could assemble over \$20 million of financing even from multiple sources. Such a single large project would crowd out all other efforts to rehabilitate crumbling utility infrastructure and be counterproductive.

The City is pursuing an alternative approach to building a new WWTP. The I&I project is a major component of increasing the existing treatment works capacity and lifespan. The I&I project needs to be done in the near term because the remaining Techite sewer mains are a liability that is prone to failure. Municipalities around the nation are dealing with failing Techite pipe. Locally, Techite sewer mains were installed in the City of Fairbanks in 1975 and portions

began collapsing in 1978. Fairbanks sued Techite's vendor, Amoco Chemical Co., in the mid-1980s and won a financial settlement in 1998.

The longer the Techite sewer mains are unaddressed, the more prone they are to failure. When the Techite pipe begins to fail it cannot be lined and the sewer mains will need to be excavated and replaced. Excavating and replacing the Techite sewer mains with ductile iron is a more expensive and disruptive process compared to lining the sewer mains. Excavation is also an intensive activity that will generate high levels of greenhouse gas emissions due to the heavy equipment that must be used. The construction required to replace the sewer mains involve more than excavating and replacing the mains because the majority of the mains are located within roads. If the Techite sewer mains were excavated and replaced, new roads would need to be installed. Road construction would add to the construction cost and volume of greenhouse gases generated.

In addition to the planned I&I project the City has initiated an engineering and design project of its WWTP. The project is being funded by USDA Rural Development and ADEC. The goal of the project is to analyze the WWTP and its technologies and treatment processes. Based upon the engineering analysis USKH will design independently phased renovations that will extend the life to the treatment works that incorporate new technologies that reduce energy consumption and expand the treatment capacity within the existing fence line. The intention is that these goals will be achieved with limited need for major construction and at a cost less than constructing a new WWTP. Less heavy construction will produce fewer greenhouse gases and incorporating new energy efficient technologies will reduce the carbon footprint of any WWTP capacity increase solutions. A rough cost projection by USKH prior to implementation of the WWTP engineering and design project is the costs for renovation should be between \$5 and \$10 million. No capacity increase projections were possible at this early stage of the engineering and design project.

The business case savings that are projected to accrue from lining of the remaining Techite sewer mains in the City were calculated based upon two factors: A cost comparison of lining versus replacement and the projected cost savings from reducing the flow to the WWTP. The most significant cost savings relates to lining sewer mains versus replacement. The City lined 1,800 linear feet of Techite sewer mains in 2001 at a cost of \$207.77 per foot. This cost was comprehensive including engineering, inspection, construction management and construction. Adjusting using a construction inflation rate of 10% per year, the same project in 2012 would cost approximately \$550 per foot. The estimated total project cost in 2010 is \$3.9 million (See Appendix C, Inflow & Infiltration Reduction Project Cost Calculations.).

A comparable project occurred in North Pole in 2010--construction of 2,651 linear feet of ductile iron water mains. It was a privately financed project that cost approximately \$750 per foot. This cost did not include engineering, inspection or construction management. Using an estimated engineering, inspection and construction management expenses as 10% of construction costs, the total project cost approximately \$825 per foot. Installing water mains in this situation was less expensive than the projected cost of installing new sewer mains. The water mains only had to be installed to the City's required five feet below grade. The Techite sewer mains to be lined as part of the I&I project are all gravity mains. Attention must be paid to installing gravity sewer mains

with proper slope, which in some cases would place the mains below the water table. Any construction below the water table would incur additional expense due to the need to dewater, a cost not incurred in the water main installation cost. Lining sewer mains versus installing new ductile iron mains is estimated to be \$275 cheaper per foot to install versus new ductile iron sewer mains. The total estimated cost to replace 7,200 linear feet of Techite sewer mains with ductile iron pipe would be \$5.9 million. The Techite lining project is estimated to cost \$2 million less.

Operational Cost Savings

The Utility Analysis conducted by PDC Engineering in 2005 estimated that approximately one third of all flow to the WWTP was I&I (See Appendix A.). The City confirmed this value by comparing known inputs to the WWTP and known discharges. The analysis conducted found that in 2010, 34% of flow to the WWTP was from I&I, reaffirming PDC's original calculation. (See Appendix B, Inflow & Infiltration Calculation.).

The Techite sewer mains proposed for lining all discharge to a single lift station. This lift station pumps directly to the WWTP. The major energy users at the WWTP are the aerators and boilers. The aerators draw air from within the WWTP heated by the building boilers. To meet the WWTP's NPDES discharge permit, the effluent is first treated with chlorine in contact chambers to kill the majority of the coliform and other bacteria. Before being discharged the effluent is dechlorinated. A crude estimate is one third of the electricity, heating and chemical costs are the result of treating I&I water. Table 1 below details actual treatment costs in 2010 and a projection of the savings that could result if all I&I were halted by the I&I Reduction Project. A conservative estimate of a 25% reduction in I&I is provided as a more likely savings that could be seen as a result of the I&I Reduction Project.

**Table 1. Actual Waste Water Processing Costs
Compared to Projected Savings through I&I Reduction**

Cost category	2010 Actual Cost	Annual Cost Reduction with 33% Reduction in Flow	Annual Cost Reduction with 25% Reduction in Flow
Treatment chemicals	\$13,994	\$9,236	\$10,496
WWTP electricity	\$53,050	\$35,013	\$39,788
Heating fuel, WWTP	\$10,303	\$6,800	\$7,727
Lift station electricity	\$4,772	\$3,150	\$3,579
Total	\$82,119	\$54,199	\$61,589

- * Annual savings projection at 33% I&I reduction: \$27,920
- * Annual savings projection at 25% I&I reduction: \$20,530

Sewer Main Lining Project Cost Estimate

As mentioned above, the City relined 1,800 linear feet of Techite sewer main in 2001. PDC Engineering engineered the project and provided construction inspection and management and generated a construction cost estimate. PDC's data is summarized below in Table 2. The values used by PDC can be found in Appendix D, Engineering Contract and Appendix E, Sewer Lining Design Report.

**Table 2. PDC Engineering and Construction Design Estimate
2001 Techite Sewer Main Lining Project (1,800 linear feet)**

Item	Percent	Cost estimate
Administration	0%	\$0
Legal	0%	\$0
Preliminary Studies/Reports	4%	\$15,654
Engineering Design	3%	\$12,990
Inspection/Surveying/Construction Management	5%	\$19,090
Construction	79%	\$296,361
Equipment	0%	\$0
Contingencies	9%	\$32,929
Other	0%	\$0
Total	100%	\$377,024

The estimated cost to line the remaining 7,200 linear of Techite sewer mains was derived from a cost estimated prepared by PDC in its 2005 Utility Analysis. PDC estimated that a project initiated in 2006 would cost \$2,220,000 to reline these sewer mains and repair leaking manholes. (See Appendix A.). Based upon this figure the estimated cost to initiate the project in 2012 applying a 10% annual construction inflation factor yielded an estimated cost for the I&I project of approximately \$3.9 million (See Appendix C: Inflow & Infiltration Reduction Project Cost Calculations.). The project costs itemized according to ADEC project cost categories contained in Appendix C are provided below in Tables 3 and 4 for your convenience. The percentages applied to the 2012 sewer main lining project closely follow, but do not exactly match, those used in the 2001 project.

Table 3. Estimated Cost Sewer Main Lining Project with ACWF Loan Only
 Cost estimate 2012: \$1,416,500

Item	Percent	Cost estimate
Administration	0.5%	\$7,083
Legal	0.5%	\$7,083
Preliminary Studies/Reports	1.0%	\$14,165
Engineering Design	4.0%	\$56,660
Inspection/Surveying/Construction Management	4.0%	\$56,660
Construction	80.0%	\$1,133,200
Equipment	0.0%	\$0
Contingencies	10.0%	\$141,650
Other	0.0%	\$0
Total	100%	\$1,416,500

Table 4. Estimated Total Project Cost Sewer Main Lining Project
 Cost estimate 2012: \$3,932,865

Item	Percent	Cost estimate
Administration	0.5%	\$19,664
Legal	0.5%	\$19,664
Preliminary Studies/Reports	1.0%	\$39,329
Engineering Design	4.0%	\$157,315
Inspection/Surveying/Construction Management	4.0%	\$157,315
Construction	80.0%	\$3,146,292
Equipment	0.0%	\$0
Contingencies	10.0%	\$393,287
Other	0.0%	\$0
Total	100%	\$3,932,865