

City of Dillingham officials, community members, and other stakeholders have reviewed this Study throughout its development and have provided valuable feedback. As presented in the Alternatives Analysis Matrix, the conclusions of this Study are in line with Dillingham's preferences with respect to the four highest ranked alternatives:

1. Site 1/Alt. 1 – Defend In-Place with Sheetpile Wall Revetment
2. Site 1/Alt. 2 – Defend In-Place with Armor Rock Revetment
3. Site 3/Alt. 1 – Kanakanak Road with New Wastewater Lagoon
4. Site 2/Alt. 2B – City Shop with New MBBR Packaged Treatment Plant



## **1.0 INTRODUCTION AND BACKGROUND**

The City of Dillingham (City), through their term contract with CRW Engineering Group, LLC (CRW), contracted with Bristol Engineering Services Company, LLC (Bristol) to develop this Wastewater Treatment Relocation Study (Study). Bristol subcontracted with Golder Associates, Inc. (Golder) for geotechnical services, True North Sustainable Development Solutions (True North) for archaeological services, and HMS, Inc. (HMS) for cost estimating services.

### **1.1 PURPOSE AND NEED FOR PROJECT**

Dillingham serves as an economic, transportation, and public services hub for Bristol Bay communities. The National Marine Fisheries designated the area around Dillingham as an essential fish habitat for Pacific salmon (National Oceanic and Atmospheric Administration [NOAA], 2019). The City relies on an aerated wastewater treatment lagoon system, constructed in 1989, which discharges an average of 150,000 gallons per day of treated domestic wastewater into the Nushagak River.

According to the 2018 City Shoreline Emergency Bank Stabilization Environmental Assessment by the US Army Corps of Engineers (USACE), the Nushagak estuary shoreline is highly erosive, with an average erosion rate of 11-12 feet per year. This erosion has been documented by Edge Survey and Design, LLC as part of an ongoing monitoring effort, and is presented graphically on Exhibit 1.

Continued erosion along the Nushagak River places the lagoon system, effluent outfall, and associated site infrastructure at risk of failure.



The City continues ongoing maintenance efforts to stabilize the shoreline. They conducted emergency repairs in the summer of 2016, 2017, and 2018 after a series of storms exposed the lagoon outfall line. In 2017, the lagoon treatment cells were approximately 400 feet from the shoreline. This distance decreased significantly in 2018 due to higher than average erosion associated with summer storms.

A failure of the lagoon system could have serious, long-term consequences, putting the community's health at risk from untreated sewage, as well as the salmon fisheries that the Bristol Bay region relies on for subsistence and economic survivability.

The purpose of this Wastewater Treatment Relocation Study (Study) is to identify alternatives for long-term (25-year) wastewater treatment in Dillingham, Alaska. Multiple treatment and site alternatives are presented in this Study and are analyzed based on life-cycle costs and other qualitative criteria. This Study is intended to be used by the City as a decision-making tool and planning document to secure funding for additional development (design and construction) of the selected alternative. A separate design effort will be required to provide the detail necessary for permitting and construction of the selected improvements.

## **1.2 LOCATION**

Dillingham is located at the extreme northern end of Nushagak Bay in northern Bristol Bay, an arm of the Bearing Sea, at the confluence of the Wood and Nushagak rivers. See Exhibit 2 – Dillingham Location Map. The City lies 327 miles southwest of Anchorage at approximately 59 degrees (°) 02 minutes (') North Latitude, 158° 27' West Longitude (Section 21, Township 013 South, Range 055 West, Seward Meridian). Dillingham is in the Bristol Bay Recording District. The area encompasses 36.84 square miles of land and 397.94 square miles of water (State of Alaska Department of Commerce, Community and Economic Development [DCCED], 2019).



**EXHIBIT 2 – DILLINGHAM LOCATION MAP**

### **1.3 HISTORY**

Yup'ik and Athabaskan peoples originally inhabited the area around Dillingham. The area became a trade center when Russians erected the Alexandrovski Redoubt Post in 1818. Local Native groups and Natives from the Kuskokwim Region, the Alaska Peninsula, and Cook Inlet mingled and intermarried as they came to visit or live at the post. The community was known as Nushagak by 1837, when a Russian Orthodox mission was established. In 1881, the U.S. Signal Corps established a meteorological station at Nushagak. In 1884, the first salmon cannery in the Bristol Bay region was constructed by Arctic Packing Company east of the site of modern-day Dillingham. Ten more canneries were established within the next 17 years. The post office at Snag Point and the town were named in 1904 after U.S. Senator Paul Dillingham, who had toured Alaska extensively with his Senate subcommittee during 1903.

A 1918-1919 influenza epidemic struck the region, leaving less than 500 survivors. A hospital and orphanage were established in Kanakanak after the epidemic, 6 miles from the

present-day City center. The Dillingham townsite was first surveyed in 1947. The City was incorporated in 1963. The modern economy of Dillingham relies on commercial fisheries and tourism, as well as subsistence harvesting of natural resources. Dillingham is an important governmental center for the region (DCCED, 2019).

#### **1.4 CLIMATE**

Dillingham falls within the transitional climate zone, characterized by tundra interspersed with boreal forests, and weather patterns of long, cold winters and shorter, warm summers. Climate is primarily maritime, but the arctic climate of the Interior also affects the Bristol Bay coast. Average summer temperatures range from 37 degrees Fahrenheit (°F) to 66°F. Average winter temperatures range from 4°F to 30°F. The annual average precipitation is 25 inches, with July through October the wettest months (2.2 to 3.9 inches per month). Approximately 65 inches of snowfall occurs during the winter months, with December through March receiving the heaviest snowfalls (12 to 19 inches per month). Heavy fog is common in July and August. Winds up to 60 to 70 miles per hour may occur between December and March. The Nushagak River is ice-free from June through November (DCCED, 2019).

#### **1.5 TOPOGRAPHY AND GEOLOGY**

Dillingham is in an area of rolling topography consisting of irregularly shaped glacial moraine knolls and ridges separated by muskeg. Elevations range from about 20 to 170 feet above sea level. The geology of the area consists primarily of sands and gravels overlain in the uplands by windblown silt derived from unvegetated floodplains and volcanic ash. Swamp deposits of thick organics ranging in thickness from less than 2 to more than 20 feet typically mantle the silts in the lowlands. Fine-grained soils beneath north-facing slopes have been found to be perennially frozen. Shallow bedrock has been reported in one location, at approximately 11 feet below ground surface, at the high school parking lot.

## 1.6 DEMOGRAPHICS AND POPULATION TRENDS

Traditionally a Native area with Russian and Scandinavian influences, Dillingham now has a highly mixed population of non-Natives and Alaska Natives; approximately 55 percent of the population is of Native heritage. The 2010 population was 2,329 individuals; the 2018 population was 2,382 individuals (DCCED, 2019). The population can more than double in the summer months due to commercial fishing and tourism.

A 25-year planning period (2045) is used in this Study for estimating population and ultimate wastewater flows. Due to current economic conditions in the region, significant population growth is not expected in Dillingham. A conservative yet realistic annual growth rate of 0.9 percent is assumed in this Study. Based on the 2018 population and estimated annual growth rate, the 2045 population is estimated to be 2,980 individuals.

The following table summarizes information from the City of Dillingham, Kakanak Hospital, US Census Data, Alaska regulatory and compliance records, and recent site inspections.

**Table 1 City of Dillingham Population Estimate**

DESCRIPTION	VALUE	NOTES
2010 Winter Population	2,329	DCCED
2018 Summer Population	7,000	Estimate from City of Dillingham
2018 Winter Population	2,382	DCCED
2019 Wastewater Service Connections	235	DCCED
2019 Drinking Water Service Connections	215	ADEC Water Watch
2034 Estimated Population	2,625	ADLWD
2045 Estimated Population (Design)	2,980	2018 population with 0.9% growth

## 1.7 COMMUNITY INVOLVEMENT AND KEY STAKEHOLDER OUTREACH

### 1.7.1 Site Visit/Field Investigation

Engineers from CRW and Bristol traveled to Dillingham on July 11, 2019 to meet with the City and to visit the existing lagoon and potential wastewater treatment relocation sites.

The purpose of the site visit was for the engineers to visually assess each site in order to develop conceptual engineering layouts for wastewater treatment system alternatives. As part of the site visit, Golder conducted a subsurface investigation at Site 2, adjacent to the City Shop pad. A copy of Golder's Geotechnical Reconnaissance Findings and Preliminary Engineering Considerations Report is presented in Appendix A. In addition, a copy of True North's Cultural Resources Investigation is presented in Appendix B and a copy of Bristol's July 2019 Trip Report is presented in Appendix C.

### **1.7.2 Coordination with Stakeholders**

Engineers from CRW and Bristol met with City representatives in July of 2019 to discuss preliminary alternatives and City preferences with respect to future wastewater treatment system improvements. Coordination with the City is ongoing.

Robert Himschoot is the owner of approximately 150 acres where Site 3 is located. Per email correspondence in July and October of 2019, Mr. Himschoot said he is willing to entertain the sale of this land, or a portion thereof, to support this critical component of community sanitation infrastructure. Further coordination and negotiations will be required if Site 3 is selected as the preferred location.

Kanakanak Hospital representative Bryan Reed (Facilities Division Manager, Bristol Bay Area Health Corporation) was contacted regarding the status of the hospital's wastewater treatment lagoon. Findings from an associated Wastewater Treatment System Feasibility Study by DOWL HKM (2014) are referenced in this Study.

The FAA was contacted in April of 2019 to discuss wastewater treatment alternatives, their proximity to the existing airport, and construction considerations within the recommended separation distance from the airport. The FAA indicated that construction within the 10,000-foot separation distance from wildlife attractants is possible, and not all that uncommon in rural Alaska, provided the project complies with FAA regulations.

The proposed site alternatives advantages and disadvantages were provided to the City in January of 2020. A copy of the advantages/disadvantages is presented in Appendix C.

### **1.7.3 Presentation of Draft Study/Community Meeting**

Engineers from CRW and Bristol traveled to Dillingham on October 22, 2019 to meet with the City and to present the Draft Study. The purpose of the site visit was to hold a community meeting and for the engineers to present the project and gather community input on the conceptual wastewater treatment improvement alternatives presented in the Draft Study. A copy of Bristol's October 2019 Trip Report is presented in Appendix C.

### **1.7.4 Presentation of Draft Final Study**

The Draft Final Study was submitted to the City for review on February 28, 2020. We received comments on March 23, 2020, including the City's preferences with respect to wastewater treatment improvements in Dillingham. These preferences are reflected in the Alternatives Analysis Matrix in Section 7. Email correspondence with the City on their review of the Draft Final Study is presented in Appendix C.

## **2.0 EXISTING WASTEWATER SYSTEM OVERVIEW**

Two public wastewater treatment systems in operate in the Dillingham area. These systems serve the City and the Kakanak Hospital. The City's existing wastewater system includes gravity sewer services, gravity and pressure (forcemain) mains, lift stations, an aerated two-cell treatment lagoon, and a buried effluent outfall line with a permitted discharge to the Nushagak River. The lagoon and outfall line are located adjacent to a shoreline that is experiencing continued erosion. This poses a potential long-term health and safety risk and a performance risk. The Kakanak Hospital operates a facultative lagoon, with a percolative cell, that serves the hospital complex. The Kakanak Hospital lagoon has also been impacted by erosion concerns. These wastewater systems and their respective wastewater characteristics are detailed in the following sections.

### **2.1.1 Collection System**

The City's existing wastewater collection system consists of gravity sewer services and mains, lift stations, and forcemains which serve the core community area, including the HUD Subdivision (aka Snag Point Subdivision Plat No. 1983-03, Bristol Bay Recording District) north of the lagoon and the Windmill Hill area east of the airport. The wastewater collection system has a larger piped service area than the public water system, as shown on Exhibit 3 from the City's mapper website. There are multiple private and small public wells in service areas with piped wastewater collection.

Construction of the wastewater collection system began in 1964; a variety of improvements were implemented in subsequent years. In 1984, a significant portion of the original system was replaced in conjunction with a major state road reconstruction project. Currently, the collection lines include ductile iron (DI), polyvinyl chloride (PVC), high-density polyethylene (HDPE), asbestos-cement (AC) piping, and HDPE arctic pipe, and range in diameter from 4 to 12 inches.