95% Draft Preliminary Engineering Report
Water Treatment Plant and Washeteria
Tununak, Alaska


Photo of Washeteria, Credit BEES 2015

Prepared for:

Native Village of Tununak IRA Council
P.O. Box 97
Tununak, AK 99681

And

Alaska Department of Environmental Conservation
Village Safe Water Program
555 Cordova Street
Anchorage, AK 99501

Prepared by:

Stantec Consulting Services Inc.
725 East Fireweed Lane, Suite 200
Anchorage, AK 99503

April 2, 2020

This document, entitled Preliminary Engineering Report Water Treatment Plant and Washeteria, Tununak, Alaska was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of the Native Village of Tununak IRA Council (the “Client”) and Alaska Department of Environmental Conservation (ADEC) Village Safe Water Program (VSW). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in consideration of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.



Prepared by _____
(signature)
Robert (Bob) Gilfilian, P.E., Principal, Civil Engineer, Stantec

Prepared by _____
(signature)
Leslie Petre, EIT, Small (Treated) Water System Operator, Stantec

Reviewed by _____
(signature)
Michael A. Zidek, PMP, Project Management and Commercial Leader, Stantec

Approved by _____
(signature)
Enter Name

95%
PER
Draft, r2

Table of Contents

ABBREVIATIONS AND ACRONYMS I

EXECUTIVE SUMMARY III

FOREWORD IV

1.0 PROJECT PLANNING **1**
1.1 LOCATION 1
1.2 ENVIRONMENTAL RESOURCES PRESENT 2
1.2.1 Topography 2
1.2.2 Geology and Soils 3
1.2.3 Floodplains 3
1.2.4 Water Quality 4
1.2.5 Wetlands 4
1.2.6 Groundwater Sources 4
1.2.7 Endangered Species and Critical Habits 5
1.2.8 Cultural Resources 5
1.3 GROWTH AREAS AND POPULATION TRENDS 6
1.3.1 Population Forecast 6
1.3.2 Growth Areas 6
1.4 COMMUNITY ENGAGEMENT 6

2.0 EXISTING FACILITIES **8**
2.1 LOCATION MAP 8
2.2 HISTORY 10
2.3 CONDITION OF FACILITIES 10
2.3.1 Water Treatment Plant 10
2.3.2 Condition of the Washeteria 12
2.3.3 2018 Assessment of 50,000 Gallon Water Storage Tank 15
2.3.4 2018 Assessment of Wastewater Disposal System (Septic Tank/Drainfield) 17
2.3.5 2018 Assessment of Existing Water Transmission Line 17
2.3.6 2018 Assessment of the Infiltration Gallery on Unnamed Creek 19
2.4 FINANCIAL STATUS OF EXISTING FACILITIES 21
2.5 WATER/ENERGY/WASTE AUDITS 22

3.0 NEED FOR PROJECT **24**
3.1 HEALTH, SANITATION, AND SECURITY 24
3.2 AGING INFRASTRUCTURE 25
3.3 REASONABLE GROWTH 27

4.0 ALTERNATIVES CONSIDERED **28**
4.1 ALTERNATIVE 1 – NO BUILD 28
4.1.1 Description 28

95%
PER
Draft, r2

4.1.2 Design Criteria 29
4.1.3 Historic Floor Plan 29
4.1.4 Environmental Impacts 31
4.1.5 Land Requirements 31
4.1.6 Potential Construction Problems 31
4.1.7 Sustainability Considerations 31
4.1.8 Cost Estimates 32
4.2 ALTERNATIVE 2 - REHABILITATION OF CURRENT BUILDING 33
4.2.1 Description 33
4.2.2 Design Criteria 37
4.2.3 Water Treatment Process Flow 40
4.2.4 Environmental Impacts 41
4.2.5 Land Requirements 41
4.2.6 Potential Construction Problems 41
4.2.7 Sustainability Considerations 41
4.2.8 Alternative 2 Cost Estimates 42
4.3 ALTERNATIVE 3 – NEW MODULAR BUILDING AND DEEP WELL 45
4.3.1 Description 45
4.3.2 Design Criteria 47
4.3.3 Alternative 3 Conceptual Drawings 47
4.3.4 Environmental Impacts 49
4.3.5 Potential Construction Problems 50
4.3.6 Sustainability Considerations 50
4.3.7 Alternative 3 Cost Estimates 50

5.0 SELECTION OF AN ALTERNATIVE 53
5.1 LIFE CYCLE COST ANALYSIS 53
5.2 RECOMMENDED ALTERNATIVE 55

6.0 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE) 55
6.1 PRELIMINARY PROJECT DESIGN 55
6.1.1 Drinking Water 55
6.1.2 Wastewater/Reuse 55
6.1.3 Solid Waste 56
6.1.4 Stormwater 56
6.2 PROJECT SCHEDULE 57
6.3 PERMIT REQUIREMENTS 57
6.4 SUSTAINABILITY CONSIDERATIONS (IF APPLICABLE) 57
6.4.1 Water and Energy Efficiency 57
6.4.2 Green Infrastructure 58
6.4.3 Other 58
6.5 TOTAL PROJECT COST ESTIMATE (ENGINEER'S OPINION OF PROBABLE COST) 58
6.6 ANNUAL OPERATING BUDGET 58
6.6.1 Income 58
6.6.2 Annual O&M Costs 59

95%
PER
Draft, r2

7.0 CONCLUSIONS AND RECOMMENDATIONS 60

8.0 REFERENCES.....62

D.2.2 Stantec Technical Memos 2018 .....D.16
D.2.2.1 Technical Memorandum 1.....D.16
D.2.2.2 Technical Memorandum 2.....D.17
D.2.2.3 Technical Memorandum 3.....D.18
D.2.2.4 Technical Memorandum 4.....D.19

LIST OF TABLES

Table 1 Summary of September 4, 2018 ANTHC Best Practice Scores.....23
Table 2 Alternative 1 Annual O&M Expenses 32
Table 3 Alternative 1 Summary Table of Capital, O&M, and Life Cycle Cost 32
Table 4 Alternative 2 Cost Estimate.....43
Table 5 Alternative 2 Annual O&M Expenses 44
Table 6 Alternative 2 Summary Table of Capital, O&M, and Life Cycle Cost 45
Table 7 Alternative 3 Cost Estimate.....51
Table 8 Alternative 3 Annual O&M Costs.....52
Table 9 Alternative 3 Summary Table of Capital, O&M, and Life Cycle Cost 52
Table 10 Life Cycle Analysis of Alternatives 53
Table 11 Comparison between Life Cycle Costs of Alternatives 54
Table 12 Alternative 3 Estimates of Total Cost 58
Table 13 Short Lived Assets Annualized Cost 60

LIST OF FIGURES

Figure 1 Vicinity and Location Map of Tununak..... 2
Figure 2 Tununak Existing Facilities Site Map..... 8
Figure 3 Tununak 2007 Subdivision Plat Map New Village, 11x17”..... 9
Figure 4 Existing Facility Drawing, 11x17” 30
Figure 5 Process Flow Diagram of Water Treatment Plant.....40
Figure 6 Conceptual Floor Plan for Alternative 3.....48
Figure 7 Alternative 3: New Waterline to Deep Well.....49

LIST OF PHOTOS

Photo 1 Exterior Condition of North East Side of Washeteria Building from 2009 13
Photo 2 Exterior Condition of North East Side of Washeteria Building from 2017 13
Photo 3 Rotting Floors.....14
Photo 4 Shower Stall 14
Photo 5 Incorrect Plumbing of Washers 15
Photo 6 Entrance to Washeteria is Unsafe.....15
Photo 7 Foundation Issue 15
Photo 8 Damaged Siding on Water Tank.....16
Photo 9 Damaged Insulation.....16
Photo 10 Missing Tank Lining.....16

95%
PER
Draft, r2

Photo 11 Failed Waterline Supports....18
Photo 12 Waterline Sagging on Failing Supports....18
Photo 13 Unnamed Creek Pumphouse....20
Photo 14 Inside Pumphouse....20
Photo 15 Pumphouse Flood Levels....20

LIST OF APPENDICES

APPENDIX A COST ESTIMATES....A.1
A.1 Estimation for Reservoir Tank Relining....A.1
A.2 Capital Cost Calculations....A.2
A.2.1 Alternative 2 Capital Cost....A.2
A.2.2 Alternative 3 Capital Cost....A.3
A.3 O&M Cost Calculations....A.4
A.3.1 Alternative 1 O&M....A.4
A.3.2 Alternative 2 O&M....A.5
A.3.3 Alternative 3 O&M....A.6
A.4 Life Cycle Cost Calculations....A.7
A.5 Inflation Calculation for O&M on Alternative 1....A.8

APPENDIX B WATER DEMAND....B.9

APPENDIX C POPULATION GROWTH....C.10

APPENDIX D SUPPORTING DOCUMENTS....D.11
D.1 Agency Assessments and Reports....D.11
D.1.1 2012 ANTHC-DEHE Comprehensive Energy Audit For Tununak WTP....D.11
D.1.2 March 2017 Rural Alaska Village Grant (RAVG) MEMORANDUM....D.12
D.1.3 2018 September Best Practice Trip Report Memorandum....D.13
D.1.4 October 2018 RMW Routine Trip Report....D.14
D.2 Engineering Assessment Reports and Memos....D.15
D.2.1 MWH December 2010 Report....D.15
D.2.2 Stantec Technical Memos 2018....D.16
D.2.2.1 Technical Memorandum 1....D.16
D.2.2.2 Technical Memorandum 2....D.17
D.2.2.3 Technical Memorandum 3....D.18
D.2.2.4 Technical Memorandum 4....D.19
D.2.3 Stantec Environmental Report December 2017....D.20
D.3 As-Built Records....D.21
D.3.1 1980 As-builts for Tununak Sanitation Project....D.21
D.4 Well Records, Permits, and Classification....D.22
D.4.1 October 2019 Engineer Report Request to ADEC for Approval of Well....D.22
D.4.2 2019 Application for Water Right....D.23
D.4.3 2012 ADEC Reclassification of WTP as a Non-Public Water System....D.24
D.5 Community Records....D.25
D.5.1 Quit Claim Deed 8/24/2016....D.25
D.5.2 Tununak Income Records November 2009- 2016....D.26

95%
PER
Draft, r2

D.5.3 Resolution 2015-02 Requesting Planning Project Funding D.27
D.5.4 February 2020 Profit and Loss Statement D.28

APPENDIX E ADDITIONAL RECORD PHOTOS E.29

95%
PER
Draft, r2

Abbreviations and Acronyms

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ANTHC	Alaska Native Tribal Health Consortium
AVCP	Association of Village Council Presidents
BEES	Building Energy Efficiency Standard
BGS	Below the Ground Surface
BIA	Bureau of Indian Affairs
CWS	Community Water System
CFR	Code of Federal Regulations
DBPs	Disinfection By-Products
DNR	Alaska Department of Natural Resources
EIT	Engineer In Training
EUL	Expected Useful Life
FBRR	Filter Backwash Recycling Rule
FTH	Flush Tank Haul
GPCD	Gallons per Capita per Day
GPM	Gallons per Minute
HAA5s	Five Halo Acetic Acids
hdpe	high density polyethylene
IBC	International Building Code (used by Alaska State Fire Marshal)
IRA	Indian Reorganization Act
LCR	Lead and Copper Rule
LKSD	Lower Kuskokwim School District
LT2ESWTR	Long-Term 2 Enhanced Surface Water Treatment Rule
mg/L	Milligram per Liter
MCL	Maximum Contaminant Levels
MPH	Miles per Hour
MWH	MWH Global Engineering Company acquired by Stantec Consulting, Inc. in 2016
NPV	Net present value
NTU	Nephelometric Turbidity Units
O&M	Operations and Maintenance
pe	polyethylene
P.E.	Professional Engineer
PER	Preliminary Engineering Report
PSF	Pounds per Square Foot
PWS	Public water system
PWSID	Public Water System Identification
pvc	polyvinyl chloride
P&L	Profit and Loss Statement
RAA	running annual average
RAVG	Rural Alaska Village Grant
RMW	Remote Maintenance Work Program
RUS	Rural Utility Service
RV	Residual Value
SWTR	Surface Water Treatment Rule

SHPO	State Historic Preservation Officer
Tununak	Native Village of Tununak, Tununak IRA Council
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDA-RD	U.S. Department of Agriculture-Rural Development
USEPA	U.S. Environmental Protection Agency
TTHMs	Total Trihalomethanes
USFWS	U.S. Fish and Wildlife Service
USPHS	U.S. Department of Public Health Service or the U.S. Health, Education, & Welfare Department
USPW	Uniform Series Present Worth
VSW	Village Safe Water
WTL	Water Transmission Line
WST	Water Storage Tank
WTP	Water Treatment Plant
YKHC	Yukon-Kuskokwim Health Corporation

95%
PER
Draft, r2

Executive Summary

The Native Village of Tununak, (Tununak IRA Council and herein referred to as Tununak), in cooperation with the Alaska Department of Environmental Conservation (ADEC) Village Safe Water (VSW) retained Stantec Consulting Service, Inc. (Stantec) to prepare this Preliminary Engineering Report (PER) with funding from the United States Department of Agriculture Rural Development (USDA-RD). This PER was prepared in accordance with USDA-RD Rural Utilities Services Bulletin 1780-2, dated April 4, 2013. All cost estimates in this document are based on 2020 dollars.

The purpose of this PER is to identify, evaluate, and make a recommendation about the washeteria and water treatment plant (WTP) that will best serve the community with a safe, reliable, and affordable laundry facility and potable water for hygiene use and drinking water for many years. Tununak would like to eventually have adequate sanitation in their homes.

This PER evaluated the 42-year old washeteria and WTP facility that is currently serving the community of Tununak. The washeteria and WTP have experienced significant degradation over the past two decades and will require replacement or extensive renovation to meet the needs of the community. This PER provides detailed descriptions and documentation of the decayed state of the washeteria. The facility has been marginally functional with inadequate laundry equipment and no bathrooms or usable showers for more than 11 years. The WTP cannot produce drinking quality water that meets ADEC requirements for a washeteria serving more than 25 people and has been a Non-Public Water System since 2012. The facility requires a constant, high level of maintenance for all systems.

The alternatives evaluated in this PER include the following:

Alternative 1: No Build (continue to operate the existing Water Treatment Plant/Washeteria)

Alternative 2: Rehabilitate the Washeteria and Water Treatment Plant; Reline the Interior of the 50,000 Gallon Water Storage Tank, Decommission the existing Water Line, Replace the Infiltration Gallery and install of a New Water Transmission Line.

Alternative 3: Construct Modular Combined Washeteria and Water Plant, Reline the Interior of the 50,000 Gallon Water Storage Tank, Decommission the Existing Raw Water Line and Infiltration Gallery and Replace the water source with the 2019 Deep Water Supply Well and a Construct a New Raw Water Transmission Line between the 2019 Well and the WTP.

In summary, the recommended alternative for Tununak is Alternative 3 – Modular Combined Washeteria and Water Plant and other water system improvements. This Alternative was determined to be the optimum solution for addressing Tununak's current and future sanitation (laundry/hygiene) needs as well as providing the community with a reliable and affordable water plant facility utilizing the 2019 deep water well that can produce clean, potable water that will require no treatment. This Alternative will benefit residents of Tununak with the most return on investment and give the community a new, safe, efficient building compared to the other alternatives. The estimated capital costs for this project are $5.0 M.

Foreword

This Preliminary Engineering Report (PER) will cite previous reports from various agencies, Stantec Technical Memos from 2018, Stantec Environment Review, Tununak Financial Records, and drawings from 1980 and from 1995. These sources are included in Appendix D for this PER are MWH, Stantec, RMW, and ANTHC reports for the assessment of this project. Some of these documents will also have other studies or reports included in the appendix for that document that should be reviewed for pertinent content. For improved readability, the sources that are cited multiple times will be called out in the report as:

Acronym	**Title, Topic, Location**
ANTHC 2012	ANTHC 2012 "*Comprehensive Energy Audit for Tununak Water Treatment Plant & Well House*". Report in Appendix D.1.1
ANTHC 2018	September 4, 2018 Memorandum "*Trip Report, Tununak-Water Treatment Plant and Washeteria Training Trip for Best Practice Scores-August 21-22, 2018*" The document includes utility conditions, system needs, and operational requirements. Report in Appendix D.1.3
MWH 2010	MWH December 2010 "*Report on Site Conditions and Recommended Plan of Action For Sanitation Improvements in Tununak, Alaska*" gives a base assessment of the Tununak Washeteria, WTP, infiltration gallery and community needs in 2009 and 2010. Report in Appendix D.2.1
RAVG 2017	March 2017 Review of the 2012 Energy Audit, assess training needs, and identify deficiencies of system. Report in Appendix D.1.3
RMW 2018	October 9-11,2018 Maintenance and training trip. 50,000 gallon water storage tank was emptied and cleaned. Report located Appendix D.1.4.
Stantec Tech Memo	Four Technical Memorandums Assessing the Existing Septic, Assessment of Existing Water Transmission Line, Structural Assessment of WST, and Source Assessments. Memos are located in Appendix D.2.2.
1980 As-builts	1980 Record Drawings, *"Construction Plans Sanitation Facilities Tununak, AK"* The signed As-Built record for the original Tununak Water, Septic, and Washeteria project completed between 1978-1980. Report in Appendix D.3.1.

95%
PER
Draft, r2

1.0 PROJECT PLANNING

The Native Village of Tununak, (Tununak IRA Council and herein referred to as Tununak), in cooperation with the Alaska Department of Environmental Conservation (ADEC) Village Safe Water (VSW) retained Stantec Consulting Service, Inc. (Stantec) to prepare this Preliminary Engineering Report (PER) with funding from the United States Department of Agriculture Rural Development (USDA-RD). This PER has been prepared in accordance with USDA-RD Rural Utilities Services (RUS) Bulletin 1780-2, dated April 4, 2013. All cost estimates in this document are based on 2020 dollars.

The purpose of this PER is to identify, evaluate and recommend a washeteria and water treatment plant (WTP) that will best serve the community with a safe, reliable, and affordable laundry facility and potable water for hygiene use and drinking water for many years. Tununak would like to eventually have adequate sanitation in their homes. This PER evaluated a 42 year old washeteria and water treatment plant that is currently serving the community of Tununak.

The washeteria and WTP has experienced significant degradation over the past two decades and will require replacement or renovation to meet the needs of the community. The washeteria is marginally functional with inadequate laundry equipment and no bathrooms with showers. The water treatment plant needs a new treatment system that can produce finished water that meets the U.S. Environmental Protection Agency (USEPA) Surface Water Treatment Rule (SWTR). This PER included an assessment and analyses of alternatives for upgrading or replacing the water treatment plant and washeteria that would best serve and meet the long term sanitation needs of Tununak.

1.1 LOCATION

Tununak is located in western Alaska on the northwest coast of Nelson Island along the eastern coast of the Bering Sea. The village is about 519 miles west of Anchorage and approximately 115 miles northwest of Bethel at approximately 60.5862° North Latitude and -165.2514° West Longitude. The community is located within Sections 21, 27 and 28, T06N, R91W, Seward Meridian, Alaska.

The community of Tununak is comprised of two residential areas: the original village (original Townsite herein known as original village) where most of the community is located on a narrow spit of land between the Tununak River and Tununak Bay (Bering Sea), and the new developed community area (new village or new Tununak) that is located on higher ground on the east side of Tununak encompassing primarily of the 23 homes in the Association of Village Council Presidents (AVCP). New Tununak includes the Yukon-Kuskokwim Health Corporation (YKHC) health clinic, the Lower Kuskokwim School District (LKSD) Paul Albert High School and the existing washeteria and WTP. The new village is located on the North Fork of the Tununak River at the base (foothills) of the Ugchirnak Mountains.

Tununak is only accessible by aircraft and watercraft and is not linked to a road system. Snow machines or 4-wheel ATVs are used to travel overland via trails to nearby villages. During open water times of the year, boats are used to travel along the Bering Sea to the water accessible villages. Ocean going barges

transport cargo to the village during the short summer months. The State of Alaska owns and operates a 4,000-foot-long gravel airstrip in the southeast section of the village that has scheduled weekday air services. Gravel roads and wooden board walks connects areas of the village with an upgraded gravel road connecting new Tununak with the airport. Figure 1 shows Location and Vicinity map for Tununak.

Figure 1 Vicinity and Location Map of Tununak



Source Google Earth Pro 3/1/2020

1.2 ENVIRONMENTAL RESOURCES PRESENT

1.2.1 Topography

The area surrounding Tununak is dominated by the Tununak Bay with the Bering Sea to the west, Tununak River to the south and Ugchirnak Mountain to the east. The washeteria and WTP are located on higher ground, approximately 30 feet above mean sea level, in the eastern portion of the community, overlooking the original village that is located on the sandspit a few feet above the sea level. Local topography surrounding the washeteria and WTP is relatively flat with the project site gently increasing in slope in a northeast direction.

95%
PER
Draft, r2

1.2.2 Geology and Soils

The soil on the sandspit underlying the original village is primarily permafrost free sand deposits. Soils in the Tununak area are underlain by discontinuous permafrost. Conditions vary considerably from the toe of the Ugchirnak Mountain foothills to the Tununak River. There is very high ice content in organic soils blanketing the area that are susceptible to thaw-induced instability.

In 1978, the U.S. Department of Public Health Service (USPHS) completed a geotechnical investigation for the design of the existing washeteria and WTP. The USPHS noted the following subsurface soil conditions:

- silty sand and cobbles found from 1 to 2 feet below the ground surface (BGS)
- slightly silty sand and gravel found from 2 to 3 feet BGS
- slightly silty sand from 3.1 to 4.3 feet BGS
- bedrock was encountered in one of the test holes at a depth of 4.3 feet BGS while the other test holes did not encounter bedrock to a depth of 7 feet BGS.

The soil test borings encountered frozen soil with evidence of ice in the entire soil strata which was indicative of permafrost since the extent of the frozen soil exceeded the depth of the annual seasonal frost.

A second geotechnical investigation in 1979, was completed on LKSD's proposed site for the Paul Albert High School. Three soil borings were drilled across the site and ground water was not encountered in any of the soil borings to a maximum depth of 19.5 feet. The subsurface soils primarily consisted of ice rich silty gravel extending to a depth of 13 to 16.5 feet and underlain with fractured bedrock.

A sanitation feasibility study was completed in 1993 for Tununak describing the general soil characteristics in the project area as consisting of mostly peat, silts, and clays, with permafrost occurring between 2 and 7 feet below the surface.[1] The feasibility study noted a shallow ground water table was encountered within the active soil layer above the permafrost in the low lying areas located outside of the washeteria project area.

1.2.3 Floodplains

Flood Insurance Studies or Flood Insurance Rate Maps do not currently exist for Tununak. Longtime residents have reported flooding only occurs in the original village on the sandspit due to storm-driven waves in combination with high tides to a maximum height of approximately 6 inches above the ground surface of the sandspit. The project area for the washeteria and WTP is approximately 400 feet away from the north fork of the Tununak River and is located on higher ground that is approximately 20 to 25

[1] Phukan Consulting Engineers and Associates Inc, *Sanitation Feasibility Study and Environmental Review*,1993

feet above the river and sandspit. According to residents the project area has not been susceptible to flooding in the past. The U.S. Army Corps of Engineers (USACE) rates the flood hazard at Tununak as low average.[2]

1.2.4 Water Quality

The existing system uses a shallow infiltration gallery (the village refers to this structure as the pump house or well, herein known as gallery) installed in 1978 under a project lead by the USPHS in Unnamed Creek. The gallery consists of a 9-foot deep, 24-inch diameter perforated steel culvert pipe, constructed in the middle of the creek. The gallery is located inside a small 8-foot by 8-foot well house that is located approximately 900 feet east and downhill of the existing washeteria and WTP as shown on Figure 2 (Tununak Site Map) that is presented in Section 2.1.

The current system does not provide adequate source protection with identified vulnerabilities to biological contamination from its close proximity (less than 100 feet) to existing homes and dog yards upstream of the infiltration gallery. Some residents have previously expressed concern about the purity of the WTP's treated water from Unnamed Creek. Multiple boil water notices issued by ADEC for the system show there are historic operation and performance issues that need to be addressed.

1.2.5 Wetlands

Tununak is not in the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory. Based on available aerial and ground photography provided by community members in 2009, the ground surrounding the existing washeteria and WTP appears to be disturbed. Evidence of saturated soil, hydrophytic vegetation, and hydrology are not visible. In lower areas outside and further west of the washeteria project area, vegetation appears to grow on tussocks. Snow machine tracks have scarred the tundra, showing evidence of darker, possibly wet soils underneath. It is likely wetlands occur within undisturbed tundra outside the project area, but that areas immediately adjacent to the existing washeteria and WTP are highly disturbed and appear to be better drained. The USACE must be consulted should any proposed activities occur outside of previously disturbed lands adjacent to existing structures within the project area.

1.2.6 Groundwater Sources

The LKSD Tununak Paul Albert HS water well (PWSID # AK2270613) is the only groundwater source being used in the community. The well is a 38 foot deep well drilled on the sandspit in 1964 by the U.S. Bureau of Indian Affair's (BIA) for the local BIA school. The geologic log for the School Well indicates that the unconfined groundwater table is normally 10 feet below ground surface, (MWH 2010 Report Appendix D.2.1). The ground surface at the school well is approximately 5 to 10-feet above the sea level and is approximately 15 to 20 feet lower than the ground surface at the washeteria and WTP. The school well was determined to be under the influence of surface water and is classified by ADEC as a community

[2] Alaskan Community Flood Hazard Pertinent Data, 1977

water system (CWS) Under the Direct Influence of Surface Water with a potential 1 mile area that can directly affect water quality. There are currently three active contaminated sites within 800 foot radius of the school well according to the ADEC Contaminated Sites Database. The LKSD owns and operates the Tununak School Well and water treatment plant which is permitted under the ADEC Public Water System (PWS) AK2270613. In 2015 the LKSD upgraded the water treatment plant to comply with all of the ADEC water quality requirements.

For over 10 years, the LKSD has provided a public watering point at their water treatment plant. The water from the LKSD BIA School Well is used as the primary drinking water source by the community at no charge. Community users haul water to their residences. Also, the Village of Tununak uses the watering point to haul water for the community's flush tank haul water and sewer system.

More recently, in the summer of 2019, Stantec directed the drilling of a 6-inch diameter steel cased exploratory well that was drilled to a depth of 180-feet. The drilling of the exploratory well was funded under a grant from the USDA-RD Program that was administered by the VSW for Tununak. The well was pump tested and determined to yield a minimum sustained flow of 50-gallons per minute (gpm) with excellent water quality characteristics. The well is located approximately 200-feet south of Unnamed Creek and approximately 100-feet west of the center of the recently constructed airport haul road as shown on Figure 2 Tununak Existing Facilities Site Map (Section 2.1). The new well is located approximately 400-feet west of the infiltration gallery located on Unnamed Creek. Stantec prepared an engineering report dated October 16, 2019, that provides a detailed description of the new deep-water supply well. A copy of the engineering report is provided in Appendix D.4.1. In December 2019, Stantec filed a water rights application for the new deep water well on the behalf of the Village of Tununak with the Alaska Department of Natural Resources (DNR). The water rights application requested the DNR grant the village the right to use the deep water well to provide an estimated flow of 46,600 gallons per day (GPD). A copy of the water rights application is provided in Appendix D.4.2.

1.2.7 Endangered Species and Critical Habits

The community of Tununak including the project area is within the potential breeding range of the endangered Spectacled Eider; however, no critical habitat for this species has been designated in the washeteria area.[3] Consultation with the USFWS must take place to determine construction measures that may be implemented, if any, to avoid accidental takes of Eiders. Given that the project area is surrounded by development and is actively used by the community daily, it is not likely Spectacled Eiders would use the area for nesting.

1.2.8 Cultural Resources

There is little available information regarding potential cultural and historic resources present within or adjacent to the proposed project area for the existing washeteria, WTP, and associated water systems. While no visible surface resources were reported during a cultural resource survey conducted in 2000

[3] USFWS IPaC Information for Planning Conservation website https://ecos.fws.gov/ipac/

immediately north of the proposed project area (resource classified), there is no record of any subsurface investigations having been completed in the project area. Depending on the level of disturbance proposed for foundations and utility installations, a cultural resource survey may be required prior to construction. The Alaska Department of Natural Resources Office of History and Archaeology must be consulted to determine measures to avoid impacts to cultural resources from construction of the preferred alternative.

1.3 GROWTH AREAS AND POPULATION TRENDS

1.3.1 Population Forecast

The population of Tununak has steadily increased from 327 reported in 2010 to a population of 362[4] as noted in the 2017 estimate from the Alaska Department of Labor, yielding a population growth of 10.7% in seven years. This equates to a recent population growth rate of 1.5% per year. In 2018, Tununak's population was 370 as reported by the Alaska Department of Commerce, Community, and Economic Development, Division of Community and Regional Affairs.

Tununak's annual growth of population has fluctuated between 0 - 0.9% over the past several decades[5], with a notably increased growth rate since 2010. While the future growth rate for Tununak cannot be accurately forecasted, it is reasonable to use the general Bethel Census Area population projections. Tununak currently comprises 2.0% of the Bethel Census Area population. The Bethel Census Area is currently projected to maintain a 0.87% growth rate until at least 2040. Using linear extrapolation of the State's population projections, the population of Tununak in the design year 2040 is estimated at 447 people. Population information and calculations are presented in Appendix C.

1.3.2 Growth Areas

Community growth will be probably be predominantly residential. New housing would probably be located on building sites located to the east of the existing washeteria and WTP in new Tununak.

1.4 COMMUNITY ENGAGEMENT

The Tununak Traditional Council was awarded a grant in 2008 from USDA and the State of Alaska for the development and preparation of a sanitation facilities master plan. The master plan was to evaluate and assess the possible upgrade or replacement of the existing washeteria and associated facilities that included a water treatment plant, a water storage tank, and a laundromat with bathroom and shower facilities. In 2010, MWH Global Engineering Company (MWH), was hired by the Tununak Traditional Council in cooperation with the VSW program to investigate the condition of the existing sanitation facilities serving the community of the Tununak.

[4] Alaska Department of Labor online database.
[5] Alaska Department of Labor and Workforce Development Research and Analysis.

MWH issued a report December 2010 on their preliminary findings, titled *Report on Site Conditions and Recommended Plan of Action for Sanitation Improvements in Tununak, Alaska*, Appendix D.2.1. The report provides a photo log of the site conditions observed during the MWH site visit. Additional photos of the existing washeteria and WTP and aboveground utilidors to the school and health clinic are provided in Appendix E.

MWH and VSW's on-site assessment of sanitation facilities in Tununak included engaging the community in a two hour long public meeting, May 2010. The meeting was attended by more than 56 residents and noted to be one of the largest public turnouts ever recorded for a community meeting in Tununak. Valuable information concerning the residents' desires, experiences, and frustrations with the existing sanitation facilities was collected during the public meeting.

As a follow-up to the May 2010 public meeting, a sanitation questionnaire prepared by MWH with input from VSW was sent to all the households in Tununak. The results of the questionnaire provided valuable information on the community's position on sanitary issues. The questionnaire had an excellent return rate that represented nearly 75% of the residential population in over 60% of the housing units. Most of the respondents did not want an expansion of the Flush Tank Haul (FTH) system that served the homes in the new village, nor did they want to pay more than about $60/month for piped water and sewer service. The majority of the residents favored a new community washeteria that included laundry and public bathrooms with shower facilities.

In 2016, the Tununak Traditional Council signed a quitclaim deed that conveyed all its assets and liabilities with rights and titles to the Native Village of Tununak IRA Council. A copy of the quitclaim deed is provided in the Appendix D.5.1. On January 9, 2015, the Native Village of Tununak approved a resolution (Appendix D.5.3) that supported the plan for a new washeteria and water treatment plant to serve Tununak.

From 2017 to present, Stantec has participated in several teleconferences with VSW staff and key personnel from Tununak who included James James (Administrator), Xavier Post (Administrative Assistant), and Josephine Hooper (resident of Tununak). These individuals provided information and photos on the current conditions of the washeteria and WTP. Part of the information gathering process includes Tununak providing copies of their written records on the cost of operating the washeteria and WTP from 2014-2016, and income from the washeteria from 2009-2016. Additional financial information for the operation of Tununak's water and sewer services including the operation of the washeteria in 2019 was provided from Tununak's accountant MDM Financial Management, LLC.

In 2018 and 2019, Stantec made site visits to Tununak to conduct field work (site assessments and drilling of the exploratory well). During the site visits, Stantec met with Tununak administrative staff and had opportunities to assess the physical and operational conditions of the washeteria and WTP, inspected the infiltration gallery with pump house on Unnamed Creek and supervised the drilling of the exploratory deep water supply well.

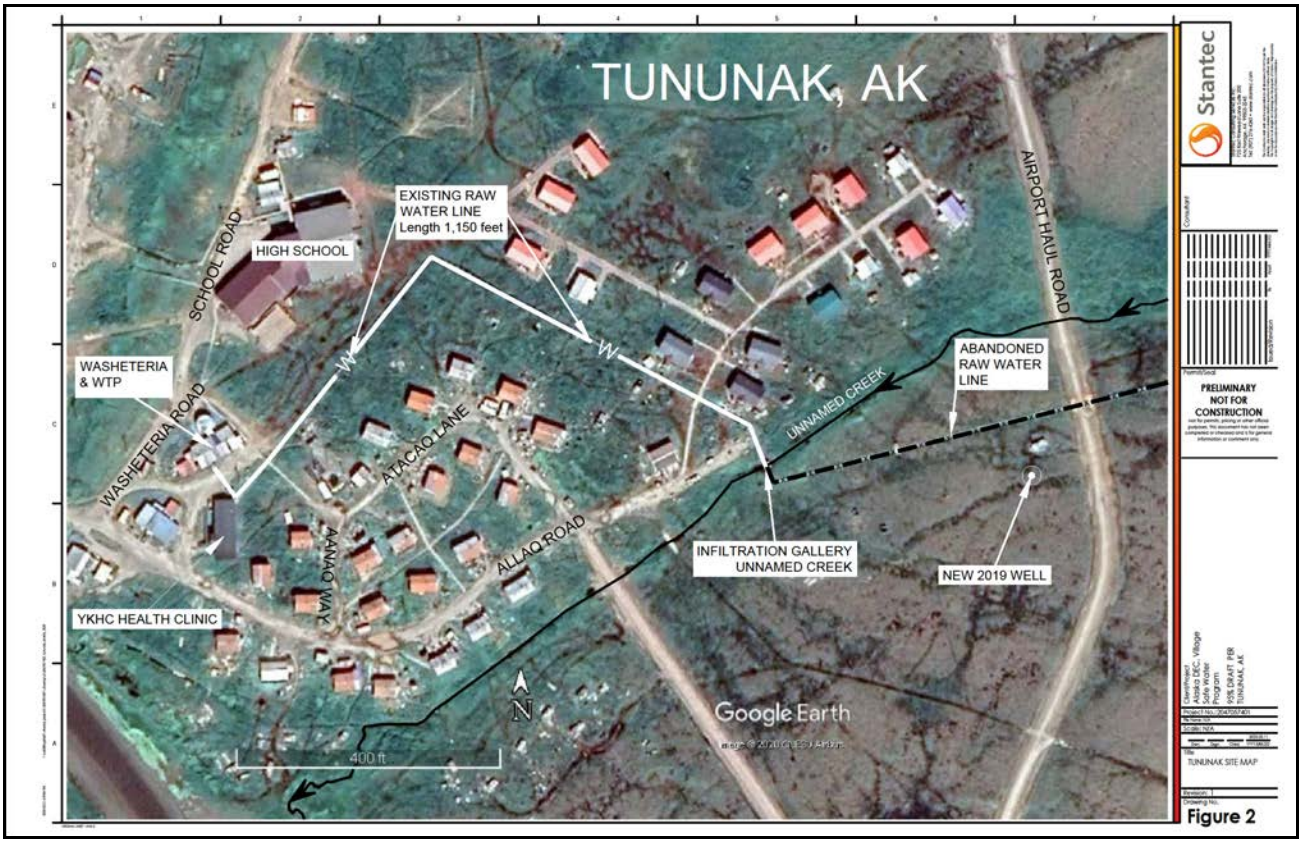
95%
PER
Draft, r2

2.0 EXISTING FACILITIES

2.1 LOCATION MAP

Figure 2 provides a site plan that shows the layout of the existing washeteria and WTP with respect to surrounding developments in Tununak.

Figure 2 Tununak Existing Facilities Site Map



95%
PER
Draft, r2

Figure 3 provides a survey plat of the Tununak 2007 Subdivision. The location of the washeteria and WTP facility is shown on the plat map on Tract D-1A-1 in U.S. Survey 4028, Tununak Townsite which is owned by Tununak as conveyed in 2016 in the Quitclaim Deed, (Appendix D.5.1).

Figure 3 Tununak 2007 Subdivision Plat Map New Village, 11x17”

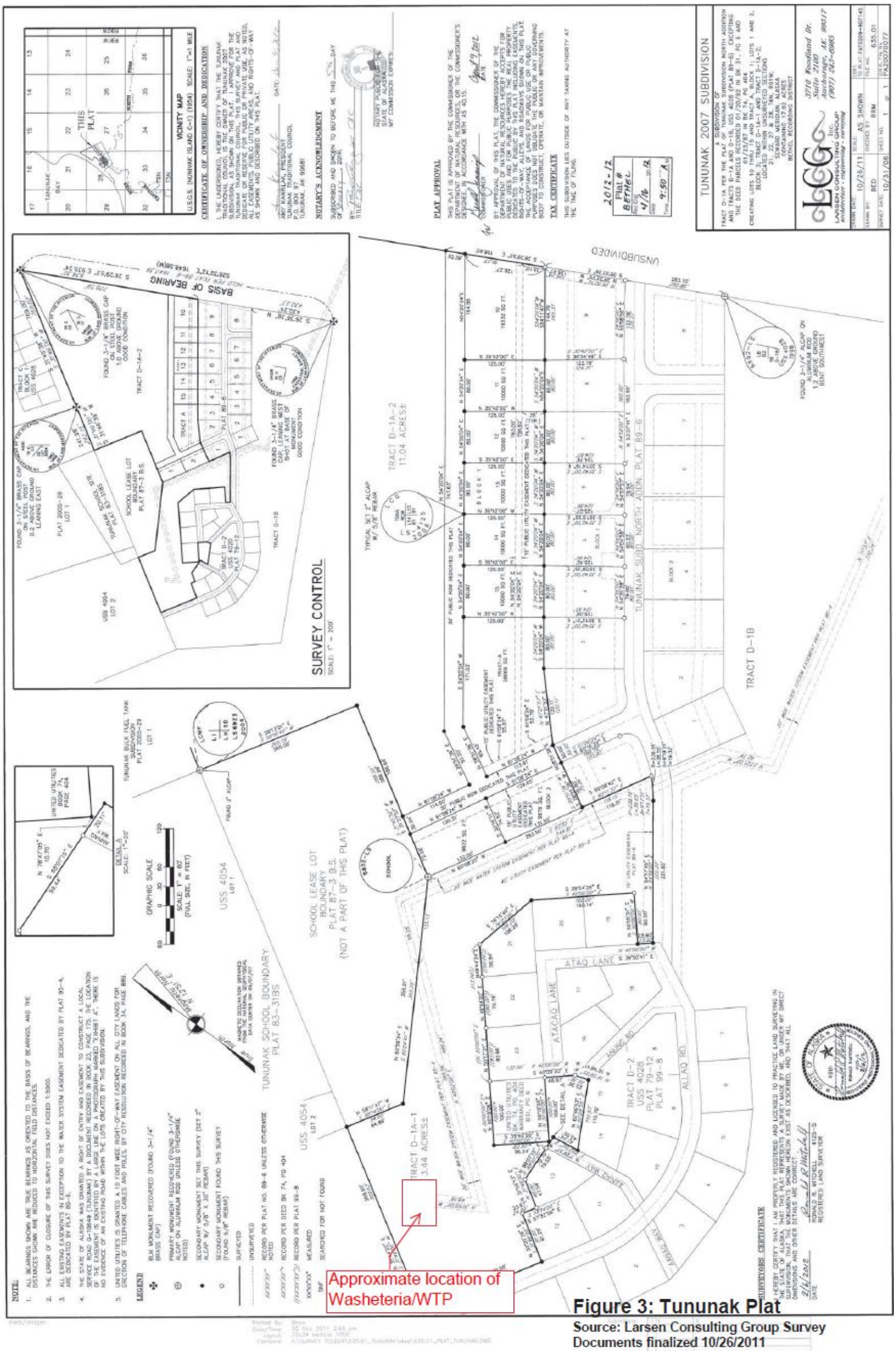


Figure 3: Tununak Plat
Source: Larsen Consulting Group Survey
Documents finalized 10/26/2011

95%
PER
Draft, r2

2.2 HISTORY

The washeteria and WTP were constructed as a combined use, single building in 1978 by the USPHS. The completed facility was based on a similar style to others designed and built by USPHS in that time period throughout many rural Alaskan communities. As-built drawings of the completed washeteria and WTP are provided in Appendix D.3.1. The washeteria and WTP is a single story building that is 32-feet wide by 64-feet long (2,048 square foot area) with spaces dedicated to:

- A washeteria with four 20 lb. washers and two 50 lb. electric dryers.
- Two public bathrooms (men's and women's) each housing one toilet, one sink and two showers.
- A mechanical room with two oil-fired boilers, a hydronic heating system, domestic hot water generators, and a standby power generator.
- A water treatment room with a pressure filter, a backwash pump, pressure pumps, and a hydropneumatic tank.
- Treated water from the WTP is pumped into a 50,000-gallon water storage tank (WST). The WST was also constructed in 1978 and is connected via an aboveground insulated utilidor to the WTP building.
- A bunkhouse room.
- A kitchen/laboratory/office

The original water distribution system was designed and constructed to circulate water to several public watering points on a community distribution system that serves the original Village of Tununak located along the sandspit. All of the watering points on the distribution system have failed and were subsequently abandoned. A public watering point was also constructed on the south side of the WTP but has been abandoned and removed due to operational problems.

2.3 CONDITION OF FACILITIES

2.3.1 Water Treatment Plant

The existing WTP was constructed over 40 years ago by the USPHS and needs complete renovation to stay in service. The treated water from the WTP does not meet current ADEC drinking water regulations for SWTR (see requirements in Section 4.2.2). During the past several years, the ADEC drinking water program regulators noted multiple serious deficiencies with the existing water treatment system; and therefore, had issued a long-term boil water orders to the community of Tununak that remain in effect to this day. Consequently, the water produced by the WTP is only used for non-drinking water purposes for the operation of the washeteria and bathrooms in the nearby health clinic.

The most of the equipment is not useable and is arranged in the same configuration when it was installed as shown on the as-built plan sheets 11 & 12 (see Figure 4 in Section 4.1.3) titled "Plumbing Schematic"

prepared by USPHS for the Construction Plans for Sanitation Facilities, Tununak, Alaska, dated September 1980 (1980 As-builts) with the exception of some minor upgrades to filtration filters prior to 1995. The primary components of the WTP's treatment processes are:

- Granular Media Filtration, 4-foot diameter pressure granular media filter with pressure filter backwash pump
- Injection of Fluorine (the system was in original design is no longer in use)
- Disinfection by Hypochlorination with a Chlorine injection system equipped with chemical pumps and mixing tanks
- 1 backwash sump for discharge water
- "Upstream" bag filter, nominal 5 microns (3M 500 LP Series filter, product #525A). Installed 1995.
- "Downstream" bag filter, nominal 1 to 3 microns (Wetco Filter HE Series filter, product #4200PYLOO555) installed in 1995.
- 2 pressure pumps and 2 water distribution circulating pumps with heat exchanger
- 1 620 gallon hydropneumatic pressure tank and 1 80 gallon hydropneumatic pressure tank (Well X Trol)
- 325 gallon hot water heater
- 2 boilers with hydronic water lines
- 2 water meters

On June 14, 2012, ADEC issued Tununak a letter of determination that reclassified the community water treatment system to a non-public water system, because the system no longer had a bathroom, shower, or a watering point that could be utilized by the public and was no longer regulated as was Community Water System under 18 AAC 80. A copy of the ADEC determination letter is provided in Appendix D.4.3. This re-classification was determined as the washeteria did not have working shower or bathroom facilities and one operating washing machine. The WTP only supplied non-potable water to the nearby health clinic for toilets and flushing/cleaning purposes.

In March 2017, ANTHC conducted a Rural Alaska Village Grant Assessment (RAVG, Appendix D.1.2) that identified several non-compliant items on the water system that were considered potential health risks and safety concerns. Many of these water treatment deficiencies with the building and distribution system were documented during the MWH site assessment May 2010. Issues with the building having mold, insulation damage, exposed wiring, non-functioning equipment, building settling, blocked emergency exits, leaking underground septic pipes, broken windows, and sanitation facilities being inoperable were noted. Issues with the water system included proximity of a 300 fuel tank to the water treatment plant, malfunctioning heat trace for freeze protection and inoperable pumps.

The Remote Maintenance Work Program (RMW) performed an inspection in Aug. 2018 and completed some system repairs in October of 2018. The RMW reports for both visits are in Appendix D.1.3 and D.1.4 respectively. RMW recommended replacement of the chlorinator from the vat to the injection point and replacement of the roof of the WTP building as several leaks were found throughout the building.

Reports conflict on if there is a working shower and toilet, there was not a working facility during the 2018 condition assessment by Bob Gilfilian, P.E. If the shower facility has been repaired, the Tununak infiltration gallery and WTP would be classified as CWS with ADEC because the system is community owned and the number of permanent residents that could use the facility is greater than 25.

2.3.2 Condition of the Washeteria

The Washeteria side of the building needs extensive repairs. Floors have hole caused by wood rotting through, concrete slabs within the building are noticeably sloped, there are plumbing issues, exposed wiring in common areas, and egress exits are permanently blocked. Some of the building's exterior issues were documented with a photo in 2009 then compared with ANTHC and Stantec condition assessment completed in 2018. Photo 1 has red arrows with numbers for seven issues on the seen from the northeast side of the building and they are:

1. Sealed/boarded over egress door on Water Treatment half of building.
2. Abandoned Watering Point
3. Board up window
4. Decaying, damaged, and missing siding. Siding needs to be sealed/painted. Foundation lower at corner than center of building.
5. Soil under foundation washing out under foundation cribbing.
6. Handrail unstable and requiring repair/replacement.
7. Missing Chimney Caps.

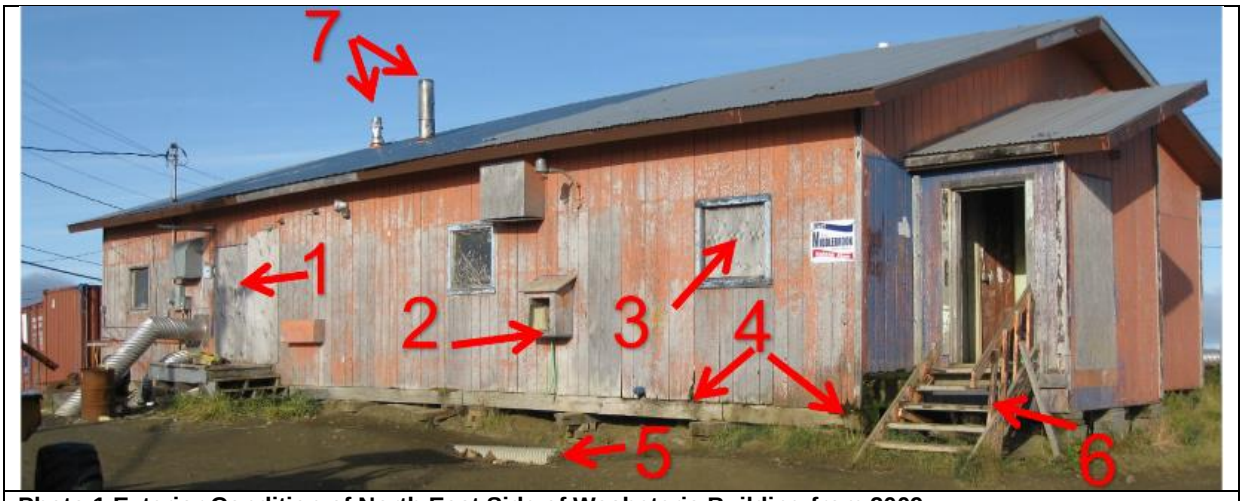


Photo 1 Exterior Condition of North East Side of Washeteria Building from 2009
Visual inspection of building finds a minimum of 7 items that need to be addressed. (File photo 9/24/2009)

Photo 2 is the same view of the Washeteria taken almost 8 years later as part of the Rural Alaska Village Grant (RAVG) assessment in March of 2017. All of the deficiencies present in 2009 are present in the 2017 photo. White arrows and numbers matching the callouts of the items identified in photo 1 that were not identified by the RAVG assessment. One chimney stack is shorter, the handrail at entrance of the washeteria is gone, more siding is missing and there are no longer stairs leading up to the boarded up mechanical room entrance on the east side of the building.

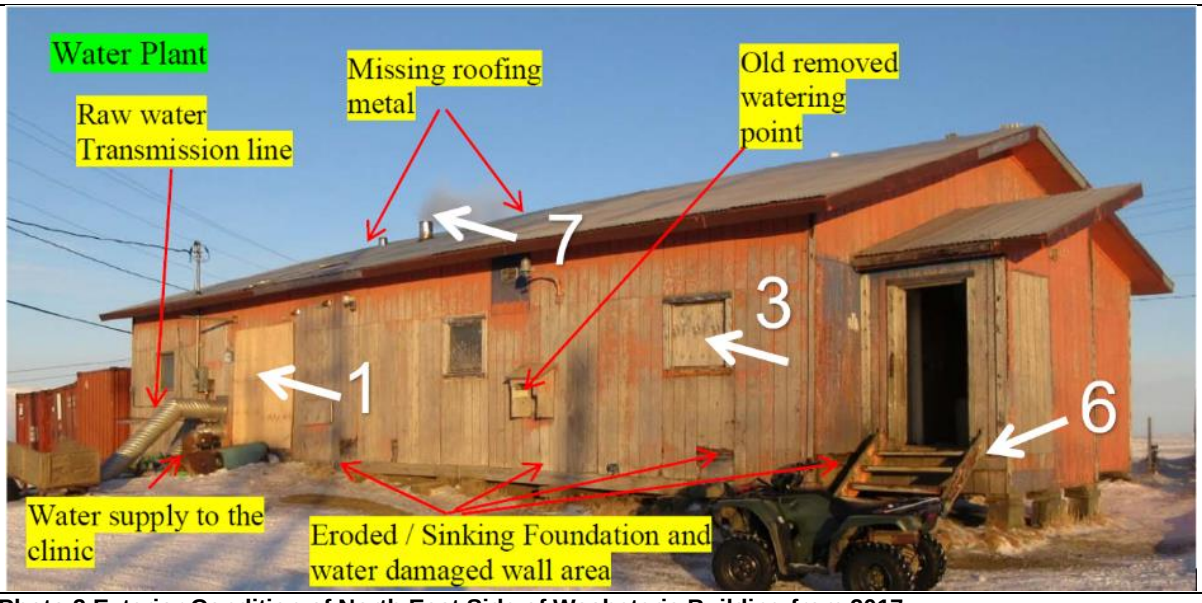


Photo 2 Exterior Condition of North East Side of Washeteria Building from 2017
Visual inspection of building finds a that the 7 items identified in the 2009 Photo were not addressed and the building condition continued to deteriorate further. (RAVG 3/21/2017)

There are issues that pose a hazard to the washeteria patrons. Missing and mis-wired light fixtures, a broken heating unit, and interior plywood walls so water damaged and dry rotted that a set of blunt plyers

could be pushed into plywood easily. Water damage from the roof leaking previously had caused the sheet rock to fall of the ceiling of the public hallway, leaving exposed wiring and mechanical piping components visible. The wall and floor rim joint on the SE side of the building was rotting (RAVG 2017).

Stantec completed an initial assessment in 2017 and a utility condition assessment in 2018, finding that every system almost inoperable due missing components, dangerous wiring, mold and decay involving the structure, and that all of the system would require extensive upgrades or complete replacement to bring the Washeteria back into a safe operational status. The current facility is not meeting the needs of the community and the limited laundry facilities are failing. The overall condition of the facilities is dangerous for both the patrons and the facility staff. Photos 3-7 show conditions that are hazardous both inside and outside of the Washeteria as documented by Bob Gilfilian in June of 2018.



Photo 3 Rotting Floors
Plywood floor is rotting out next to toilet, hole circled in yellow. (Stantec 6/2018)



Photo 4 Shower Stall
There is an unfinished plywood floor with nail head protruding. It is unknown if the shower was operational. (Stantec 6/2018)

ANTHC completed a Training Trip for Best Practice Scores in September of 2018 (Table 1) at the facility which listed structural, plumbing, electrical, and operational issues throughout the buildings. Most notably was that the current electrical transformer for the facility is not sized correctly for the system if every system and appliance were repaired or replaced. The system does not have a viable emergency generator, it was not operational and cannot be repaired due to replacement parts no longer being made. The original energy audit by ANTHC in 2012 stated that during the winter dryer exhaust is venting into the building for supplemental heating because the ambient heat from the boiler was not enough to keep the space comfortable.

		
Photo 5 Incorrect Plumbing of Washers Incorrect venting of washer septic drain line inside of building. Water supply line hooked up incorrectly. Large holes (Stantec 6/2018)	**Photo 6 Entrance to Washeteria is Unsafe** Railing is missing, stairs have need to be replaced, siding is heavily weather damaged. (Stantec 6/2018)	**Photo 7 Foundation Issue** Red Arrow, concrete floor is sloped. Wall has water damage. Black Arrow shows window that has been boarded over. (Stantec 6/2018)

2.3.3 2018 Assessment of 50,000 Gallon Water Storage Tank

Treated water from the WTP is pumped to a 50,000 gallon water storage tank (WST). The WST is attached to the Washeteria and WTP via an insulated aboveground utilidor/manway as shown on Figure 4 (see Section 4.1.3). The WST is filled on an as needed basis dependent on the water usage in the Washeteria and the nearby clinic. The operators pump raw water via the water transmission line from the Unnamed Creek infiltration gallery to the WTP for treatment prior to pumping to the WST according to the WTP operator. Operator said that tank is normally filled approximately four times a year. Freeze protection for the WST is provided by foam board insulation sheathed in aluminum siding.

The structural integrity and usability/functionality of the WST and its foundation system was non-intrusively observed in June 2018 by Stantec. The interior of the tank was visually checked from the roof hatch to assess the tank's interior condition above the tank's water level. The observable portion of the tank foundation was assessed to the greatest extent possible. The inspection of the WST did not involve intrusive measurements of the tank material nor the foundation as destructive testing was outside of the contract scope. The findings and recommendations of the tank's assessment including photographs of the tank are reported in Stantec Tech Memo #3 (Appendix D.2.2.3) and summarized as follows:

- The exterior of the WST appeared to be in reasonable condition for a tank installed in 1978. On the northwest exterior side of the tank there are rust stains on the aluminum siding. The access ladder to the tank is missing as well as a section of siding located just below the top of the tank. There was one small section of siding on the exterior of the tank that was missing siding, but the

remainder of the exterior appeared to be intact and completely covered the underlying foam insulation. The overflow drain needs to be screened to prevent anything from nesting or crawling into it.

- Overall, the timber and high-density foam insulation board appeared to be in fair condition. The lumber members of the foundation visually appeared to be in good condition with no obvious signs of significant deterioration; however, some minor weather-worn sections of the exterior side panels on the lumber foundation were noted.
- The exterior of WST's cover was checked for deficiencies and was found to be in fair condition, with small sections of foam insulation missing. There was a missing section of insulation over the roof hatch. The condition of the ladder cage at the tank top appeared to be intact and functional.
- The interior of the WST was visually checked via access through the roof hatch. The water surface in the tank was observed to have a considerable amount of floating debris that included an empty soda pop can, fragments of foam insulation, and rust particles. The tank's north side interior wall appeared to be in good condition above the water surface; however, the remaining exposed interior wall had obvious signs of surficial deterioration. The underside of the WST cover appeared to be in fair to good condition.

Photos 8-10 are photos taken of the Water Storage Tank in 2018.



Photo 8 Damaged Siding on Water Tank
Missing access ladder and siding with exposed insulation circled in red. (Stantec 6/2018)



Photo 9 Damaged Insulation
Roof insulation showing sun damage where missing protective paint has left it exposed. Insulation missing from hatch. (Stantec 6/2018)



Photo 10 Missing Tank Lining
Interior condition prior tank cleaning. Tank lining is floating in water, outflow assemble is bent. (RMW 10/2018)

In October 2018, Allan Paukan, a YKHC Remote Maintenance Worker (RMW), completed a site visit to Tununak. On that site visit, he and the WTP operator emptied and cleaned the WST (RMW 2018). His trip report and findings showed that the lining within the reservoir tank has completely failed and will need to

be replaced for the tank to meet potable water storage regulations. The red arrow in photo 10 is pointing to one of several pieces of tank lining floating at the bottom of the tank during the maintenance work. The tank lining is unrepairable, and tank will need to be relined for the system to be capable of storing potable water. Damage to the outflow assembly is also evident in the photos. The current condition of the tank will require further assessment to gauge where the conditions seen have compromised of the steel tank wall strength.

2.3.4 2018 Assessment of Wastewater Disposal System (Septic Tank/Drainfield)

Assessment of the operating condition of the existing septic tank and drainfield system serving the Tununak Washeteria and WTP was completed in June 2018 by Stantec. The purpose of the assessment was to provide recommendations for future use and/or corrective action for the septic tank system. The assessment of the existing septic tank system was based on conducting an adequacy flow test in accordance with the standards and procedures adopted by the ADEC.

There are two septic tanks, one is 4,000 gallons and one is 2,000 gallons arranged in a series flow. The manholes on the septic tanks were uncovered and inspected. Their locations and configuration matched the 1980's as-built drawings in D3.1, prepared by the USPHS. As shown on as-built plans from LKSD, in 2015 the school district constructed a separate, new replacement drainfield system that consisted of several buried Infiltrators™. Connected to the outlet of the 2,000-gallon septic tank is a sewage lift station that pumps effluent into the buried header pipe on the south end of the new drainfield system. A sewer pipe in the lift station is connected to the school's new wastewater treatment plant located to the west of the septic system which would be used as an emergency backup system in the event the school district's wastewater treatment plant had operational problems.

The findings and recommendations of the septic system's assessment including photographs of the surficial site conditions are reported in Stantec Tech Memo #1. Based on the findings of the adequacy test reported by Bob Gilfilian, P.E., in the Tech Memo, the existing septic tank and drainfield system serving the Tununak Washeteria and WTP appeared to be functioning properly and was determined to be adequate to serve the facility. The 4,000- and 2,000-gallon septic tanks will need to be periodically cleaned out to remove septage by the Village waste management workers with a vacuum tanker at least once every 3 to 4 years for the existing drainfield system of the four 125-foot long laterals of Infiltrators™ to handle the discharge of a minimum of 1,400 gallons of wastewater effluent per day.

2.3.5 2018 Assessment of Existing Water Transmission Line

The existing water transmission line (WTL) was built in two sections (zones). The original water transmission line was installed in 1978 by the USPHS for the purpose of supplying raw water from an infiltration gallery on Unnamed Creek (current water source) to the WTP. The original WTL installed by USPHS was approximately 1,153 feet in length and consisted of a 2-inch diameter polyethylene (pe) pipe with a heat trace line that was located within a 4-inch diameter insulated Arctic pipe.

The second section (zone) was commissioned in 1995 when the WTL was replaced as part of a VSW and USDA-RD sanitation improvement project. The water line included replacement of the WTL from Unnamed Creek to the WTP and extended the water line approximately 3,000 feet to connect to a new infiltration gallery located at Muskox Creek. The Muskox Creek water source failed in 1997 and has since been abandoned. As a result, the community resumed water production from the infiltration gallery on Unnamed Creek which remains as the current water source for the washeteria and WTP.

The second section (zone) of WTL connected the pump house at Unnamed Creek infiltration gallery to the Washeteria and WTP building. The 1995 replacement WTL consists of two 2-inch diameter high density polyethylene (hdpe) water lines and a ¾-inch copper tubing heat trace line enclosed in an aboveground Arctic pipe utilidor that consists of a 6-inch diameter polyvinyl chloride (pvc) pipe (carrier) located within a high density insulated outer wall and 15-inch diameter aluminum jacket.

The WTL traverses above the ground surface supported by two types of foundation systems. Most of the WTL is supported on a timber foundation system but a small portion near the Unnamed Creek pump house is held on a wire rope suspension connected to steel screw-piles. The WTL has three insulated wooden access boxes for maintenance of the water line which are located on 90 degree turns in the alignment of the pipeline.

There are two short, buried sections of pipe within the second zone. The first is the water supply line between the WTP and the health clinic. The second is a short section of buried water line between Access Box #1 and the WTP.



Photo 11 Failed Waterline Supports
Support has failed and is pulling waterline down. (Stantec 6/2018)



Photo 12 Waterline Sagging on Failing Supports
Supports are unstable and falling over, line has visible sagging. (Stantec 6/2018)

Stantec completed a visual assessment in June 2018 on the structural integrity and usability/functionality of the WTL and the foundation support system, including the water line turn boxes. The assessment involved a physical inspection of the visible components of the WTL to determine the usefulness of the WTL for serving the Tununak water supply system. The findings and recommendations of the WTL's assessment conducted by Bob Gilfillan, P.E., included photographs of the water line are reported in Stantec Tech Memo #2 (D.2.2.2) and summarized as follows:

- The WTL was found to be barely functional as reported by the operator. Operational problems with the circulating glycol heat trace system historically has caused the water line to freeze up

and requires considerable effort to thaw. On many past occasions, the operators had to wait over a week or two until they could receive assistance from YKHC RMW.

- The operators typically attempt to treat and fill the community 50,000-gallon water storage tank prior to the onset of winter. Most winters, the washeteria runs out of water which requires the operators to refill the tank with the WTL from the infiltration gallery.
- There are many sections on the WTL that have been repaired in the past as a result of line freeze up. Operators have inserted replacement glycol heat trace lines inside the Arctic pipe utilidor that has resulted in a "band-aid" repair effort that has compromised the integrity of the WTL.
- As shown in Photos 11-12, the failing condition of the timber foundation system supporting many sections of the WTL has caused water line to developed significant sags in the water line profile. The sags in the water line causes air entrapment and is difficulty for the operators to clear from the lines. Normally, the lines can only be the flushed when ambient temperatures are above freezing. The WTP operator has stated that the effort required for flushing with compressed air requires additional labor and can take more than a day to complete.

2.3.6 2018 Assessment of the Infiltration Gallery on Unnamed Creek

The current water source for the existing washeteria and WTP uses an infiltration gallery located in Unnamed Creek that was constructed in 1978 by the USPHS. A pump house structure encloses the infiltration gallery. A submersible well pump is used to pump raw water to the WTP for treatment prior to storage in the WST. The gallery remains in the same configuration as it did when it was installed in Unnamed Creek. The gallery consists of a 9-foot deep, 24-inch diameter, perforated (slotted) corrugated metal culvert, that was installed vertically in the middle of the Unnamed Creek. The top of the well's culvert is approximately 3.5 feet above the surface of the creek.

Unnamed Creek flows through a tundra area and has a width that varies from 1 foot to a few feet and has a shallow depth of approximately 1 to 2 feet. The flow of the creek varies throughout the year, depending on precipitation and snow accumulation. During the winter, the creek freezes and often develops aufeis (overflow ice conditions). The drainage basin for Unnamed Creek is on the south side of Ugchirnak Mountains and has a surface water drainage area of approximately 1 to 1.5 square miles.

The gallery is located inside an 8- by 8-foot wooden well house structure. The pump house is located approximately 900 feet east and downhill of the existing washeteria and WTP. The raw water from the well house is pumped via a 2-inch diameter HDPE pipe inside a 4-inch diameter Arctic pipe in an aboveground utilidor to the WTP.

Stantec completed an assessment June of 2018 on the structural integrity and usability/functionality of the infiltration gallery. The findings and recommendations of the infiltration gallery's assessment conducted by Bob Gillian, P.E., including photographs of the infiltration gallery are reported in Stantec Tech Memos #2 and #4 and summarized as follows:

- Stantec observed the water in the infiltration gallery had floating scum. The original 9-foot-deep infiltration gallery has filled in several feet with mud and debris. The WTP operators reported they have attempted, in vain, to remove the mud, but the gallery quickly refills with mud – resulting in reduction in the flow of raw water.
- Tununak experiences severe windstorms during the winter months that cause very dense and deep snowdrifts around the pump house and block the entrance. Consequently, the operators often have to gain entry into the pump house via the opening in the building's roof. Accessing the building this way is dangerous due to it becoming both a confined space and creates a fall hazard that requires fall protection (Federal Occupational Hazard Agency standards 29 CFR 1910.146 2 and 29 CFR 1926.501, respectively.)
- The WTP operator is exposed to dangerous electrical wiring in multiple areas of the pump house and within the gallery. Previously, a submersible pump had been installed to pump raw water from the gallery but was found to be too dangerous to leave the pump in place due to the exposed electrical wiring and the deteriorated pump control located inside the pumphouse.

Photos13-15 show the pumphouse on Unnamed Creek.



Photo 13 Unnamed Creek Pumphouse
Looking north. The fencing around the gallery is falling into the stream. (Stantec 6/2018)



Photo 14 Inside Pumphouse
Red arrows point to open electrical connections. Roof access panel is used to get into building in winter (yellow arrow). (Stantec 6/2018)



Photo 15 Pumphouse Flood Levels
In the winter and spring, it is common for winter ice to cause flooding. (MWH 2010)

The pump house with foundation needs to be replaced, the current structure would cost more to repair than a new structure and the foundation for the structure is failing. A new infiltration gallery needs to be installed to meet Tununak's continued water demand from Unnamed Creek.

2.3.6.1 Water Treatment Requirements for Unnamed Creek Infiltration Gallery

At such time in the future when the existing WTP is upgraded or replaced, the new WTP would then be reclassified to a public water system by the ADEC. The upgraded WTP would produce treated drinking water for the new washeteria that would be used by more than 25 customers per day. The WTP would be required to meet the drinking water requirements given in 18 AAC 80 which requires compliance with the regulatory requirements described herein below that may be applicable to the nature of the source water from the Unnamed Creek infiltration gallery. The operator for this water system would be required to hold a Level 1 Water Treatment Certification. Currently, the operator for the WTP is not certified by the ADEC.

The design, operation and monitoring of public drinking water systems is regulated by federal and state agencies. The USEPA has granted the State of Alaska the authority to administer these regulations and the ADEC has been designated the state agency responsible for enforcement and compliance. The State has adopted the federal regulations pertaining to water system operation, monitoring and reporting requirements which are presented in the following regulations: Drinking Water Regulations in 18 AAC 80; and Water and Wastewater Operator Certification and Training regulations in 18 AAC 74. The regulations in 18 AAC 80 stipulate primary and secondary maximum contaminant levels (MCLs) for selected water contaminants.

The primary standards protect public health by limiting the levels of contaminants in drinking water. The contaminants addressed in the primary standards include microorganisms, disinfectants, disinfection byproducts, inorganic chemicals, organic chemicals and radionuclides. The secondary standards are non-enforceable guidelines regulating contaminants that may cause cosmetic and aesthetic effects - such as odor, taste, or color.

The water source(s) must be tested for water quality, and after treatment, found to be in compliance with the maximum contaminant levels (MCLs) referenced in 18 AAC 80.300 and 40 Code of Federal Regulations (CFR) 141. To facilitate achieving this goal, and to satisfy State plan review requirements for use of new sources, the water quality parameters listed in Table B of 18 AAC 80.205 must be identified, including: total coliform bacteria, inorganic chemicals, nitrate, nitrite, volatile organic chemicals and secondary contaminants (iron, manganese, color, etc).

2.4 FINANCIAL STATUS OF EXISTING FACILITIES

The most recent financial status of the existing WTP/Washeteria is not known; however, past financial records with a breakdown of budgeted operating expenditures for the years 2014, 2015 and 2016 (Appendix D.5.2) was provided by Tununak for the operation of the existing washeteria, water treatment plant and the flush haul system. Additional financial information (Profit and Loss Statement for 2019) for the operation of Tununak's water and sewer services including the operation of the washeteria was provided in February 2020 from Tununak's accountant MDM Financial Management, LLC. A copy of the P&L Statement is provided in Appendix D.5.4. Currently, Village of Tununak charges a washeteria user $3 per single load cycle for either washing or drying. Tokens are used to operate the laundry machines.



The washeteria is open to users 10-hours per day, 6 days per week and an attendant is available on a 4 hour per day basis.

2.5 WATER/ENERGY/WASTE AUDITS

In 2012 the Alaska Native Tribal Health Consortium (ANTHC) conducted an energy audit of the existing washeteria and WTP. The ANTHC prepared a report on its findings titled "Comprehensive Energy Audit for Tununak Water Treatment Plant Well House" dated June 12, 2012, (ANTHC 2012).

The scope of the ANTHC report was a comprehensive energy study, which included an analysis of building shell, interior and exterior lighting systems, HVAC systems, and plug loads. Based on electricity and fuel oil prices at the time of the 2012 audit, the annual predicted energy costs for the building were $7,847 for electricity and $14,672 for fuel oil, for a total energy cost of $22,519 per year. The facility was receiving a power cost equalization subsidy from the State of Alaska that was artificially lowering the actual operation costs of electricity from $18,309.

The following energy efficiency measures were recommended in the ANTHC audit and remain to be implemented:

- disconnect heat tape on old watering point loop
- lower the heating set point to 40° in the well house
- fill the empty 2"x6" cavity in the cathedral ceiling of the WTP with R-19 fiberglass insulation
- remove insulation in the exposed floor of the water treatment plant and replace with R–21 insulation
- remove existing glass windows and replace with double pane glass

A RAVG Assessment in 2017 was conducted by William Hickey (ANTHC Energy Auditor) and Martin Wortman, (Senior Utility Operations Specialist ANTHC). The assessors reviewed the system, assessed operator training needs, and reviewed the 2012 energy audit recommendation on the existing washeteria and WTP. The ANTHC prepared a trip report memorandum on a training trip to improve best practices scores for the utility dated September 4, 2018, on its findings and recommendations, (ANTHC 2018), Table 1 provides a summary table of the operational, energy, safety, and health issues identified in the 2018 memorandum. All issues noted either needed to be repaired or replaced with further investment into training the system operator needed for the accepted industry O&M practices.



95%
PER
Draft, r2

Table 1 Summary of September 4, 2018 ANTHC Best Practice Scores

System	Item(s)	Finding	Solution	Repair	Replace	Training
Alarms	Smoke, CO_2, General Alarm Panel	Alarms and fire suppression equipment missing, Alarm Panel Inoperable	Replace all life & safety equipment, repair/replace alarms	Yes	Yes	Yes
Electrical	Generator	Inoperable and cannot be repaired	Replacement		Yes	Yes
Electrical	Exposed Wiring	Exposed wiring on wall outside of shower	Bring up to code	Yes		Yes
Electrical	Transformer	Building Transformer is undersized for previous design demand	Replace to meet system needs		Yes	
Heating	Maintenance	Boiler Maintenance not being completed, valves not exercised	Service/repair, develop standard operating procedures (SOP).	Yes		Yes
Heating	Operation	Boiler is Short Cycling	Need SOP			Yes
Heating	Redundancy	Boiler #2 is non-functional	Replacement of missing parts	Yes		Yes
Heating	Electrical	Both Boilers have dangerous wiring	Bring all wiring up to current codes	Yes		Yes
Heating	Ventilation	Both boilers not ventilated correctly	Correct deficiencies, replace missing parts	Yes		Yes
Heating	Gauges missing	Heat ADD system missing pressure or temperature gauge	Install working gauges		Yes	Yes
Plumbing	Septic Tank	Septic Tank not being maintained	Training, develop standard operating procedures	Yes		Yes
Plumbing	Toilet and Shower	Floor around toilet rotten, mold & mildew	Repair existing facilities, remediate mold/mildew	Yes		Yes
Septic	Broken Sewage Line	Sewage line to drainage field is broken. System not maintained.	Repair or replace immediately. Training, develop SOP	Yes		Yes
Structural	Pumphouse	Building not level, deck & fence for building broken	Repair building foundation, deck, & fence	Yes		Yes
Structural	Washeteria	Mold and Mildew, non-functioning Ventilation	Repair systems and remediate mold/mildew	Yes		Yes
Structural	Water Storage Tank	Foundation Disrepair, Insulation Damage, Sanitation issues	Proper maintenance/upkeep and installation of screening	Yes		Yes
Water	Distribution Pumps	Only one pump operable & labeled "BAD need to change ASAP"	Replace pumps		Yes	Yes
Water	Heat ADD System	System not regulated; system can be drained to below the thermostatic control sensors	Training, develop SOP, fill the tank more frequently			Yes
Water	Exposed Wires, No Redundancy	Pumphouse has exposed pump wires, Controls are outdated. Only one pump	Needs to be brought up to code or replaced as needed, keep a spare pump on hand	Yes		Yes
Water	Valve Seizure	Few valves within system have been exercised	Training, develop SOP, replace worn/seized valves	Yes	Yes	Yes
Water	System Flow and Temperatures	Missing flow meters & temp gauges on all supply and distribution systems	Install necessary flow meters	Yes		Yes
Water	Treatment System in Disrepair	All filters missing, chorine pump inoperable, parts unavailable	Replacement of systems Training, develop SOP		Yes	Yes

95%
PER
Draft, r2

3.0 NEED FOR PROJECT

Sanitation is a critical priority for the residents of Tununak. The Village is actively seeking to improve the quality of life for its residents. A significant part of their effort is focused on improving the community sanitation facilities consisting primarily of the washeteria and WTP with a safe, potable water supply that has the capacity to serve the community. In January 2015, Tununak passed Resolution #2015-02 (Appendix D.5.3) giving highest priority to sanitation need through the development of a new washeteria and water treatment plant. The resolution addresses:

- Sanitation issues as a high priority for the Village Tununak. They have requested USDA-RD funding for a new washeteria-water plant in 2017 but to date has not been approved.
- Funding is required to provide upgrades to the washeteria and the production of potable water.
- The existing WTP cannot produce potable water that meets the federal and state regulations for a potable community water system. As a result, the WTP's inability to adequately treat the raw surface water leads to decreased usage of the public health facilities for drinking water and laundry staining.
- The washeteria restrooms and showers are simply not working so that residents do not have access to the bathing facilities necessary, increasing the likelihood of preventable wash-related diseases.
- The project under consideration for this PER will improve hygiene, health and safety conditions for the community and meet anticipated growth for the 20-year planning period.
- The washeteria and watering point are critical to the community's health and their current deteriorated condition does not allow for the facilities to be used as intended to improve community health.

3.1 HEALTH, SANITATION, AND SECURITY

During the past decade, Tununak has been operating a washeteria that cannot meet the current laundry, bathing, and restroom needs of the community. The WTP as designed in 1976, no longer produces potable water meeting the current state and federal drinking water regulations required for shower facilities in communities with over 25 residents. In addition, the quality of the treated water is not reliable nor consistent due to operational difficulties caused by equipment that cannot be maintained or is still in use long after it should have been replaced.

The structure of the washeteria and WTP has rotting floors, mold caused by leaks and ventilation issues, egress exits that are not functional, and main floor supports that are decaying on a shifting foundation. The entire roof needs to be replaced due to a history of leaks that have caused extensive interior damage and mold. The washeteria portion of the building does not meet the need of the community for accessible

toilets, showers, and laundry equipment. The equipment within the building has deteriorated to a point that the facility can no longer serve its intended purpose with any reliability. The laundry equipment is in poor condition with only one working washer and one working dryer. The showers and toilets in both public bathrooms are nonfunctional.

Some of the more serious problems with the current washeteria and WTP facility, described in Section 2.3, may pose health and safety risks for the community. The ventilation systems have been inoperable during assessments in the past three years. It is not safe for anyone with any type of respiratory sensitive to use the facility cause of the mold caused by poor ventilation and leaks.

Most of the residents haul additional water from the LKSD school well watering point to their home so they can bathe, and hand wash their clothes because there are not showers safe to use at the Washeteria and the working washer and dryer are prone to frequent breakdowns. This really limits the frequency that people are able to bath, especially in the winter months when hauling extra water is more difficult during the frequent winter storms. It is understood many residents rely on the use of graywater for washing their laundry.

The residents of Tununak strongly support and encourage their local government to provide a water treatment system that will deliver dependable and safe potable water, a modern washeteria for laundry with public showers, and bathrooms that has the capacity to serve the entire community. Improving or replacing the existing WTP and the washeteria has clearly been identified as a critical sanitation need for Tununak.

3.2 AGING INFRASTRUCTURE

The Tununak Washeteria and WTP is more than 40 years old and was not built to meet current building, plumbing, or electrical codes. The facility requires constant, high level of maintenance for all systems. The existing washeteria and WTP facility was constructed in 1980. If it were built to meet today's standards, it would have an expected to be constructed to have useful life of 35 years with routine maintenance and be built to meet the Arctic conditions of the Yukon-Kuskokwim Area. Today's standards would also have the building with thick walls that use rigid insulation with a higher insulation factor than batt insulation. The roof would be a "cold" roof to reduce heat loss and the windows would have vinyl casings that cannot decay.

There are breakdowns caused by constant use and overloading of the laundry equipment because there are not enough machines to meet the laundry demands of the community. The emergency generator can't be repaired because parts are no longer made for it. The redundancies necessary for normal operations are broken and offline, making the likelihood of entire system like heating or water will require a complete shut down if a major component like a boiler or water pump breaks down.

Structurally, the entire building is falling apart as the foundation continues to move, the floor joists rot, and the weight of the exterior walls cause the floor to visibly slope in multiple directions. Water damage from roof leaks has caused many of the ceilings to collapse in, has ruined the roof batt insulation, and caused mold throughout the building. Leaking pipes and bathroom fixtures have rotted the bathroom floors.



Dangerous electrical issues exist in every room of the facility, with the current, inefficient electrical system demanding more power than the utility transformer is sized for.

The existing washeteria and WTP are substandard, and adversely impacts the health of the community. The existing WTP process does not meet the USEPA Safe Drinking Water Act (SDWA) or ADEC drinking water requirements under 18AAC 80 regulations.

The infiltration gallery is failing, filling in with silty material quicker than the operators can clear it. The pumphouse operational controls no longer function. The electrical wiring is dangerous and poses a real risk of shock or death to the operator. Accessing the pumphouse through roof in the winter is very dangerous but necessary to refill the reservoir manually. Climbing ladders in the winter is exposing the operator to an increased risk of falling within a confined space that has dangerous, live wires that are not correctly secured within conduit and control boxes.

Almost all of the equipment in the WTP is inoperable or no longer has replacement part available because of the age of the equipment. The WTP lacks the necessary equipment to consistently produce high quality water for the washeteria and health clinic. In addition, significant oversight is needed by an experienced operator who understands all the nuances associated with the treatment plant and its aging equipment. Most of the electrical equipment within the building has deteriorated past its useful life. The power distribution and utilization equipment show signs of significant deterioration due to corrosion. Building code violations were found throughout the facility in the power distribution and lighting systems.

The upgrade and/or replacement of the existing washeteria and WTP facilities that are proposed in the Alternative sections of this PER will have a major positive impact on the ability of Tununak to provide reliable and adequate treated water and washeteria facilities to the community. The WTP will be capable of treating water to meet the original design production rate of 20 gpm. The following provides a summary of the deficiencies that were identified during the ANTHC sponsored 2017 RAVG Assessment and the 2010 MWH site visits:

- The operation of the WTP did not meet current ADEC drinking water regulations.
- The WTP was in poor physical condition and disrepair.
- Circulation was the main source of heating for the pipelines. All existing community watering points on the WTP's water distribution system were found to be non-functional. The local clinic uses of less than 100 gpd, this is not enough system demand for correct system circulation.
- Limited circulation requires additional freeze protection in the winter. The heat trace controllers were not operating properly, making the pipelines vulnerable to freezing and requires frequent maintenance during the winter operation.
- The toilet and shower facilities were non-functional due to missing fixtures and equipment.
- Only one of the two water supply pressure pumps were operational.

- The laundry equipment consisted of only one working washer and one dryer. The equipment is not enough to meet community needs, requiring continuous maintenance over-use by the residents.
- Heat loss is primarily through broken windows replaced with Plexiglas or plywood, improperly sealed window frames, and roof insulation becoming damaged from prior roof leaks.
- Life and safety concerns exist due to an emergency exit exterior door from the boiler room being sealed shut and a back-up heater has a stack too close to combustible materials.
- Proximity of an aboveground heating fuel tank that approximately 300 gallons within 5 feet of the building. The tank should be replaced with a double walled tank and located to a safer separation distance (to be determined) from the building.
- The building has settled with a noticeable slope to the interior floors due to exterior foundation erosion caused by improperly discharged backwash water from the existing water treatment filtration.
- Wastewater from the existing washeteria is discharged into the existing sewer drain connected to the septic tank system that is no longer shared with the LKSD Paul Albert High School. The approximate location of the washeteria sewer line and septic tank system is shown on Figure 2.

3.3 REASONABLE GROWTH

The community of Tununak is expected to continue to grow for the next 20 years. The decayed building and lack of water treatment equipment capable of producing safe drinking and potable water poses a health risk for the growing community. The WTP that is marginally operable and washeteria has limited capacity that is not enough for the current population of the community. This combined facility will not be able to meet the needs the projected future growth or be able to provide for the sanitation needs of a healthy community.

95%
PER
Draft, r2

4.0 ALTERNATIVES CONSIDERED

The alternatives presented in this PER were developed with input from Tununak's Administrator and staff, Stantec staff and representatives from VSW. Given the limited resources available in Tununak and using good engineering judgment, three alternatives were selected for the PER.

The following three alternatives were evaluated in this PER for the Tununak Washeteria and WTP:

Alternative 1: No Build (continue to operate the existing Water Treatment Plant/Washeteria)

Alternative 2: Rehabilitate the Washeteria and Water Treatment Plant; Reline the Interior of the 50,000 Gallon Water Storage Tank, Decommission the existing Water Line, Replace the Infiltration Gallery and install of a New Water Transmission Line.

Alternative 3: Construct Modular Combined Washeteria and Water Plant, Reline the Interior of the 50,000 Gallon Water Storage Tank, Decommission the Existing Raw Water Line and Infiltration Gallery and Replace the water source with the 2019 Deep Water Supply Well and a Construct a New Raw Water Transmission Line between the 2019 Well and the WTP.

4.1 ALTERNATIVE 1 – NO BUILD

4.1.1 Description

This No Build (No Action) Alternative would result in the continued use of the existing 40 year old, washeteria and WTP facility. This alternative would result in the continued production of water that is only suitable for laundry and toilet flushing but not for drinking, showering, hand washing, or consumption. The WTP would only be used to serve the existing washeteria and the neighboring health clinic. The existing washeteria, deficient in its current condition, would continue to be used, as is, without upgrades. While the option of doing nothing is not viable as it perpetuates the use of the existing system that produces finished water quality not suitable for public water systems. This alternate is included here for comparison with the other alternatives, and as the basis for incremental operational cost estimating. The No Build Alternative 1 does not meet the purpose and need of the project.

Alternative 1 assumes the continuation of routine repairs and maintenance for the operation of the washeteria and WTP facility. During the past couple of years, the Tununak staff made some improvements (painting and minor repairs) to the interior of the washeteria which are shown in the photos in Appendix E. The structure would still have a failing foundation and will continue to have exterior walls that are only 2x4 construction, with doors that don't seal, a ventilation system that doesn't work and limited to only having one working dryer because of building transformer being too small to handle the building power demand for a second dryer.

The existing water supply source from Unnamed Creek would continue to be used and partially treated with the existing direct (pressure) filtration water treatment process that is not in compliance with SWTR requirements.

Wastewater from the existing washeteria would continue to be discharged into the existing sewer line that flows to the off-site septic tank system (consisting of a 4,000 gallon and 2,000 tanks) and soil absorption system (drainfield). Also, backwash water from the existing water filtration process in the WTP would continue to be discharged directly onto the ground surface along the exterior of the washeteria and WTP building as discussed in Section 3.0.

4.1.2 Design Criteria

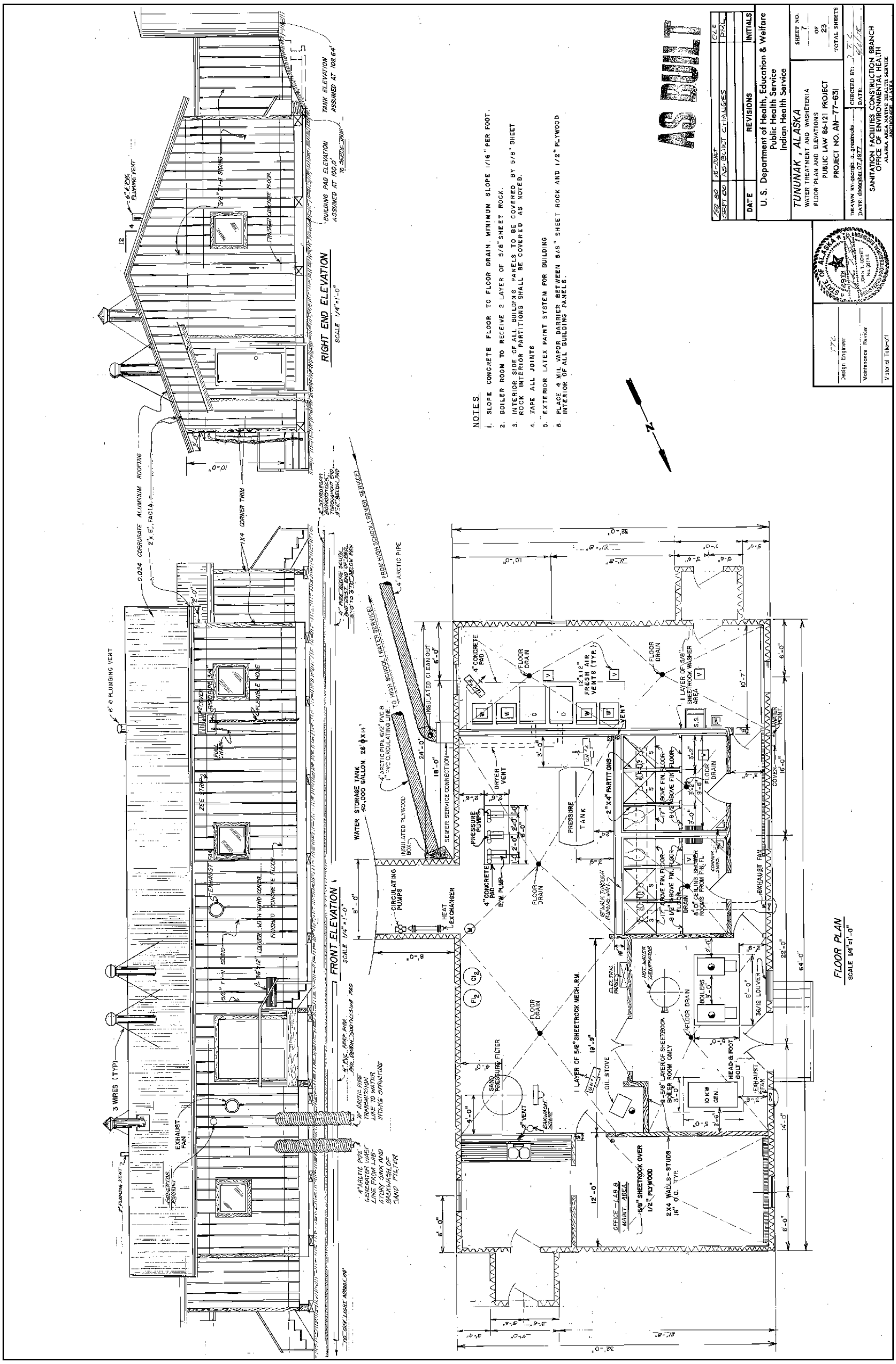
Since Alternative 1 proposes to continue the use of the existing washeteria and WTP for an indefinite period of time; the design life and other pertinent design criteria would not apply. The existing washeteria and WTP would continue to be maintained with its existing processes and resources without capital improvements. There would be no changes to the current operation of the existing washeteria/water treatment plant facility. Also, there would be no reduction in the operator time and labor but rather probably result in an increase in labor to repair old worn equipment.

4.1.3 Historic Floor Plan

On the page that follows, Figure 4 is an as-built drawing of the existing Washeteria and WTP that shows the floor plan and elevation view of Alternative 1. It should be noted that the Arctic entrances on the As-builts do not match the configuration shown in photos in 2.3.2, there may be other aspects that were not built as designed in 1978.

95%
PER
Draft, r2

Figure 4 Existing Facility Drawing, 11x17”



Source: Alaska Area Native Health Service, Office of Environmental Health, September 1980 As-Built

4.1.4 Environmental Impacts

No environmental impacts are anticipated for Alternative 1 since it presents no new development, however, the continuation of the direct land discharge of the backwash water would result in prolongation of environmental damage.

4.1.5 Land Requirements

No additional land requirements are anticipated for Alternative 1.

4.1.6 Potential Construction Problems

No potential construction problems are anticipated for Alternative 1.

4.1.7 Sustainability Considerations

The No Build Alternative would not provide a reliable and affordable sanitation facility for the community. Over time, this alternative would require more operator attention and expertise due to the continued degradation of the existing equipment in the washeteria and WTP. The No Build alternative will result in steadily increasing cost to operate and maintain the existing facility.

The aging equipment has deteriorated to a point that the WTP can no longer serve its intended purpose with any reliability. As noted in Section 3.0, the washeteria currently has only 1 non-commercial grade washer and 1 commercial grade dryer that would continue to decline from overuse.

4.1.7.1 Water and Energy Efficiency

Alternative 1 would result in the continued operation of an energy inefficient water treatment plant and washeteria. Given the 40 year plus age of the facility, the operation of the existing facility is less energy efficient compared to a renovated or new facility that would be built with new insulated walls having improved R values for reduction of heat loss. The walls are only 2x4” construction with batt insulation, windows and doors have been boarded over to reduce heat loss, and electrical wiring issues throughout the utility would continue to negatively affect the P&L for this facility.

4.1.7.2 Green Infrastructure

Green infrastructure is the management of stormwater runoff which is not applicable to this project.

4.1.7.3 Other

The community will not experience the beneficial health and environmental effects associated with a properly functional WTP and washeteria.

4.1.8 Cost Estimates

No capital costs are expected for this No Build Alternative 1 as it features no new development. A summary of the estimated annual Operating and Maintenance (O&M) expenses for Alternative 1 are presented below in Table 2. Detailed cost estimates are provided in Appendix A. In 2016, Tununak took over the operation of the existing washeteria and WTP, and consequently, does not have long term records for operational costs. The following costs were estimated from Tununak's limited records and include other costs from sources that have similar washeteria and water treatment plant operations in other communities in this general area of Alaska.

Table 2 Alternative 1 Annual O&M Expenses

Category	Cost
Operator Labor[1]	$18,357
Electricity[2]	$9,000
Heating Fuel Oil[3]	$17,000
Chemicals, Supplies, Freight, and Expendables[4]	$1,699
Office and Administrative[4]	$2,500
Equipment Replacement[5]	$2,500
Other Line Items[6]	$5,000
Estimated Annual O&M Cost	**$56,056**

Notes:

1 Tununak employs operator at $14 per hour for 4 hours per day for 6 days a week equates to $17,472 plus $885 for fringe benefit ((P&L) Statement for 2019 in Appendix D)

2 2017 Costs in 2020 dollars (adjusted at 4.1% annual inflation).

3 Cost based on 2019 cost estimate with a 4.1% inflation factor for 2020 cost

4 P&L Numbers supplied from Tununak

5 Cost based on similar facilities per VSW and ANTHC experience.

6 Assumed cost for insurance, training, lab costs and miscellaneous operating expenses.

Table 3 provides a summary of the estimated construction (capital), annual O&M expenses (assuming 2040 water demands), and a life-cycle cost analysis for Alternative 1. Detailed cost estimates calculations are provided in Appendix A. The estimated life-cycle costs for Alternative 1, in 2020 dollars, assuming uniform series present worth based on a 20 year life is $1,424,562.

Table 3 Alternative 1 Summary Table of Capital, O&M, and Life Cycle Cost

Total Construction Cost	Annual O&M	20 Year Life Cycle Cost
$0	$56,056	$1,424,562

95%
PER
Draft, r2

4.2 ALTERNATIVE 2 - REHABILITATION OF CURRENT BUILDING

Rehabilitate Washeteria and Water Treatment Plant; Reline the interior of the 50,000 Gallon Water Storage Tank; and Decommission and Replace Water Transmission Line and Infiltration Gallery

4.2.1 Description

Alternative 2 would rehabilitate the existing washeteria and WTP facility and replace its foundation at its current location. Alternative 2 provides for the upgrade of the existing WTP facility to treat the current surface water source from Unnamed Creek for the production of finished treated water that complies with the SWTR for use at the rehabilitated washeteria and health clinic. This alternative includes relining the interior of the existing 50,000 gallon water storage tank (WST), decommissioning and replacement of the water transmission line (WTL) from the Infiltration Gallery to the WTP, and decommissioning and replacement of the Infiltration Gallery on Unnamed Creek.

The rehabilitation alternative would mitigate the current risk to the operators and public users. In addition, this alternative would upgrade/replace the washeteria and public bathrooms to meet the original operating conditions and functionality as shown on Figure 4.

The following list describes the proposed improvements that are included in scope of work for Alternative 2 for the rehabilitation of the existing washeteria and WTP:

1. The existing wooden frame structure would be temporarily elevated to remove the 40 year old rotting post and pad foundation system. The water piping connections for the incoming water supply line, piping to the water storage tank, and water supply lines exiting the building would be temporarily disconnected. The sewer line connection would be temporarily disconnected while the building structure was raised to accommodate the removal and replacement of the foundation system. A multipoint foundation system, equivalent to the Triodetic type, would be used to replace the deteriorated wood foundation system. The building structure would be lowered and leveled onto the new Triodetic foundation. The plumbing system would be reconnected to the sewer drain lines and waterlines to the water storage tank and other waterlines entering and exiting the building.

2. The existing structure would be rehabilitated to include replacement of the entire facility's electrical and mechanical components along with necessary structural components. It would also include new insulation and interior wall coverings (sheetrock) and painted as required to bring the facility to meet current applicable building codes and standards. All interior wall finishes will be removed and replaced with new wall finishes.

3. All windows will be replaced with energy efficient thermal windows consisting of high-performance triple-pane windows with composite frames and screens.

4. The WTP equipment would be replaced with new equipment and be upgraded to meet the current SWTR drinking water requirements and produce the equivalent flow of treated water as originally designed, i.e., 20 gallons per minute (gpm).

5. Ventilation will be rehabilitated to indoor-air quality code for the dryer, process area, and general building exhaust air. Ventilation systems with local controls meeting current code criteria and recommendations would be provided for mechanical room, WTP, and occupied spaces. Combustion air and ventilation for boiler room will be provided. Install new ventilation fans in all bathrooms.

6. The glycol heat exchangers for water treatment and power plant waste heat recovery will be replaced with new modern controls, adequately sized glycol heat exchangers, and a new heat exchanger for heating the exterior insulated water storage tank.

7. The washeteria portion of the building would be reconstructed as originally designed. The washeteria would include 4 new commercial grade energy efficient 20-pound top load washers and 2 commercial grade energy efficient 50 pound load hydronic dryers to match the number of laundry units that were originally installed in the washeteria.

8. The washeteria would be rehabilitated with new electrical wiring, wall surfaces with insulation and mechanical equipment as needed or required.

9. The existing windows and doors would be replaced with thermally efficient doors and windows.

10. The existing boilers in the mechanical room will be replaced with new adequately sized boilers, flues, hydronic heating system with local controls, and a new interior double wall fuel oil day tank.

11. Replacement of the domestic water pressure pumps, distribution piping and fixtures, and hot water generator sized for washeteria demands.

12. The glycol heat exchangers for water treatment will be replaced with new modern controls, adequately sized glycol heat exchangers, and a new heat exchanger for heating the exterior insulated water storage tank.

13. The exterior siding of the building would be replaced as needed with a similar material (T-111 siding) as currently in place. The new siding would be painted.

    a. The existing metal roof surface has deteriorated and will be replaced with 6-inches of rigid insulation.

14. The exterior stairs and entrances to the building would be replaced with new weather resistant material and new stairs and ramps meeting handicap access requirements including a parking space for a handicap vehicle.

15. The bathrooms would be reconstructed as originally designed to provide 1 men's and 1 women's room, equipped with 2 showers, 1 sink and 1 toilet, each.



16. The 10 KW standby (emergency) generator would be replaced with a new equivalent diesel fueled generator with a new double wall fuel tank.
17. Wastewater from the existing washeteria would continue to be discharged into the existing sewer drain that is connected to the existing off-site septic tank system.
18. Backwash water from the water treatment pressure granular filter would be plumbed to discharge to the existing sewer drain line that flows to the existing off-site septic tank system.
19. All electrical wiring and panels would be replaced to support the renovation efforts. All receptacles will be replaced to extend their useful life.
20. Remove existing power transformer and install a new transformer sized to the maximum draw of the facility would be installed with a new service.
21. Replace the vinyl composite tile flooring throughout the washeteria except install new sheet vinyl flooring in bathrooms, and clean/re-seal concrete floor in the WTP.
22. Replace all interior and exterior lighting with new high efficiency LED lighting.
23. Install zoned fire alarm system with a new analog addressable fire alarm system.
24. Re-paint all painted interior walls and ceilings including existing beams. Replace fiberglass reinforced panels (FRP).
25. Install new baseboard units throughout the entire facility.
26. Enclose hot domestic water piping in chases in order to protect public from hot water piping and to prevent vandalism of piping.
27. Install new benches and folding table(s) in laundry area.
28. Install new utility sink in laundry area.
29. Install new drinking fountain that meets accessibility requirements.
30. Install new doors and hardware throughout, solid core painted wood doors on interior and insulated fiberglass doors on the exterior.
31. Install all new water-saving plumbing fixtures and accessories in all bathrooms including the showers and replace toilet partitions.
32. Install additional new 6 inches of rigid insulation under building, held in place with new soffit plywood and install skirt fence around base of building for security.
33. Install new fascia and trim on the roof eaves.

34. Remove the abandoned water and sewer aboveground utilidor pipelines between the WTP and the Paul Albert High School as well as the abandoned water line between Unnamed Creek gallery and Airport Haul Road with disposal at the Tununak sanitary landfill.

35. The existing exterior diesel fuel storage tank will be replaced with a double wall 5,000-gallon AST connected to the building via above grade schedule 80 welded pipe supply and return lines and connect to an interior double wall 50-gallon fuel oil day tank located in the mechanical room.

36. Recommendations presented in Section 2.3.3 regarding the findings reported in Tech Memo #3 for the 50,000 gallon WST, the tank would continue to be used as is for a few more years provided the tank is thoroughly cleaned and its interior coating relined. Also, repairs and modifications to the tank's overflow pipe and vent will be made.

37. The aboveground manway/utilidor between the 50,000 gallon WST and WTP be upgraded with new insulated walls. The existing pair of water lines (in-out flow) with heat-add lines will be replaced connected via the manway between the WTP and WST.

38. Recommendations presented in Section 2.3.5 would replace the entire WTL from the infiltration gallery on Unnamed Creek to the WTP. In addition, the WTL access boxes also will be replaced with new boxes that are more functional for use by the operators. The foundation system for the replacement Arctic pipe will be similar to the type used for the elevated sections of the former water transmission line from Muskox Creek.

39. Recommendations presented in Section 2.3.6 the Infiltration Gallery and pump house on Unnamed Creek will be replaced and located in near proximity to the existing gallery.

40. The abandoned water line and wastewater lines in the aboveground arctic pipe utilidor will be removed and disposed in Tununak's sanitary landfill.

95%
PER
Draft, r2

4.2.2 Design Criteria

All major system components in Alternative 2 would be constructed with materials and methods to provide a minimum 20-year life. Design criteria for the rehabilitation of the existing washeteria/water treatment plant includes the following:

- Most Recent Measured Population — 370 (2018)
- Design Population — 447 (2040)
- Freezing Index (Typical Year) — 3,000 °F days
- Thawing Index (Typical Year) — 2,000 °F days
- Heating Degree Days — 13,000 °F days
- Design Ground Snow Load
  - 10-year reoccurrence — 74 pounds per square foot (PSF)
  - 25-year reoccurrence — 93 PSF
  - 50-year reoccurrence — 117 PSF
- Design Wind Speed
  - 10-year reoccurrence — 90 miles per hour (MPH)
  - 25-year reoccurrence — 100 MPH
  - 50-year reoccurrence — 110 MPH
- Design Snow Load — 30 PSF
- Design Live Load — 125 PSF
- Seismic Zone — Zone 1
- Water Demand — 541 Gallons Per Day (GPD), with a flow rate of 20 GPM
- Water Treatment — Meet Regulatory SWTR Drinking Water Standards

The design, operation and monitoring of public drinking water systems is regulated by federal and state agencies. The USEPA has granted the State of Alaska the authority to administer these regulations and the ADEC has been designated the state agency responsible for enforcement and compliance. The State has adopted the federal regulations pertaining to water system operation, monitoring and reporting requirements which are presented in the following regulations: Drinking Water Regulations in 18 AAC 80; and Water and Wastewater Operator Certification and Training regulations in 18 AAC 74. The regulations in 18 AAC 80 stipulate primary and secondary maximum contaminant levels (MCLs) for selected water contaminants.

The primary standards protect public health by limiting the levels of contaminants in drinking water. The contaminants addressed in the primary standards include microorganisms, disinfectants, disinfection byproducts, inorganic chemicals, organic chemicals and radionuclides. The secondary standards are non-enforceable guidelines regulating contaminants that may cause cosmetic and aesthetic effects - such as odor, taste, or color.

The water source(s) must be tested for water quality, and after treatment, found to be in compliance with the maximum contaminant levels (MCLs) referenced in 18 AAC 80.300 and 40 Code of Federal Regulations (CFR) 141. To facilitate achieving this goal, and to satisfy State plan review requirements for



use of new sources, the water quality parameters listed in Table B of 18 AAC 80.205 must be identified, including: total coliform bacteria, inorganic chemicals, nitrate, nitrite, volatile organic chemicals and secondary contaminants (iron, manganese, color, etc).

The use of Unnamed Creek as Tununak's water source requires treatment in accordance with the SWTR established by USEPA in 1989 which sets the maximum contaminant levels for specific pathogenic microbial contaminants. The SWTR requires the use of filtration and disinfection that will result in a prescribed level of contaminant removal or inactivation in accordance with Long-Term Stage 1 Enhanced variation of the SWTR to achieve the following treatment levels:

- 2-Log (99%) removal or inactivation of Cryptosporidium
- 3-log (99.9%) removal or inactivation of Giardia
- 4-log (99.99%) removal or inactivation of viruses

Under the SWTR, the filtration system must provide a maximum of 0.3 Nephelometric Turbidity Units (NTU) in 95% of monthly turbidity measurements with no excursions above 1 NTU. In addition, the disinfectant residual for chlorine at the distribution system entry point may not be less than 0.2 milligrams/liter (mg/L) for four hours and trace chlorine residual must be maintained in more than 95% of samples collected throughout the distribution system.

The following section provides a description of additional water testing requirements that Tununak would be expected to comply with if the water source is under the influence of surface water or a surface water source such as the infiltration gallery.

Total Coliform Rule

Tununak is also under the Total Coliform Rule (TCR) that was established by USEPA in 1989. The TCR sets MCLs and monitoring requirements for coliforms in drinking water which includes periodic collection and testing of a number of samples based on size of the water system. Also, the TCR requires sanitary surveys be completed every 3 years.

Interim Enhanced Surface Water Treatment Rule and Long-Term 1 Enhanced Surface Water Treatment Rule

Critically important to Tununak is the presence of naturally occurring dissolved organic materials in their source water. When exposed to chlorine as a disinfectant, these naturally occurring organic substances form disinfection by-products (DBPs) that include total trihalomethanes (TTHMs), five haloacetic acids (HAA5s), chlorite, bromate and other compounds. USEPA has found evidence that when these compounds are consumed in drinking water at elevated levels over a period of time, they can cause cancer and other illnesses. Consequently, in 1999 USEPA promulgated the Stage 1 and Stage 2 Disinfectants and Disinfection By-Products Rule (D/DBPR) that set a maximum residual disinfectant level for chlorine at 4.0 mg/L and established an MCL for TTHM and HAA5s of 0.080 mg/L and 0.060 mg/L,



respectively. Compliance with the MCL is based on a running annual average (RAA) of samples taken quarterly from the distribution system.

Lead and Copper Rule

In addition to the above rules that impact Tununak's water treatment system is the Lead and Copper Rule (LCR) that USEPA promulgated in 1991 that set limits of lead and copper at consumers' drinking water taps. The source water may be aggressive or corrosive that causes lead and copper to leach out from water piping materials. When water systems exceed the "action levels" for lead (0.015 mg/L) and copper (1.3 mg/L) in more than 10% of samples taken, then USEPA requires a three step mitigation approach be implemented. The first step involves collecting and testing representative samples for specific parameters to determine the characteristics of the water with regard to its reactivity to the piping/plumbing materials. The next step involves performing a "desk-top" study to identify a corrective action program which is submitted to ADEC for approval. As the final step, the approved corrective action program is implemented and evaluated to determine its effectiveness.

Long-Term 2 Enhanced Surface Water Treatment Rule

The USEPA under the 1996 reauthorization of the 1986 Safe Drinking Water Act developed a set of interrelated regulations to strengthen the control of microbial and DBP contaminants which are referred to as the "Microbial/Disinfection By-Products Rules". Currently, the rules which became effective on March 6, 2006, consist of the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and Stage 2 D/DBPR. Basically, these rules require source water monitoring for microbial quality, and improved treatment for microbial inactivation.

The LT2ESWTR addresses the control of the occurrence of Cryptosporidium in samples from surface water sources. The water systems using surface water will need to establish the microbial quality of their source waters unless their treatment system processes provide for better than 5.5 log removal/inactivation of Cryptosporidium found. Water systems serving less than 10,000 persons, will sample for E. coli in lieu of Cryptosporidium every two weeks for 12 months beginning in October 2008 as determined by the State. Tununak needs to complete the routine E-coli samples of their source water and demonstrate they would remain below the trigger level of 100 col/100 mL. These findings would determine if Tununak would be exempt from being required to treat for Cryptosporidium.

Filter Backwash Recycling Rule

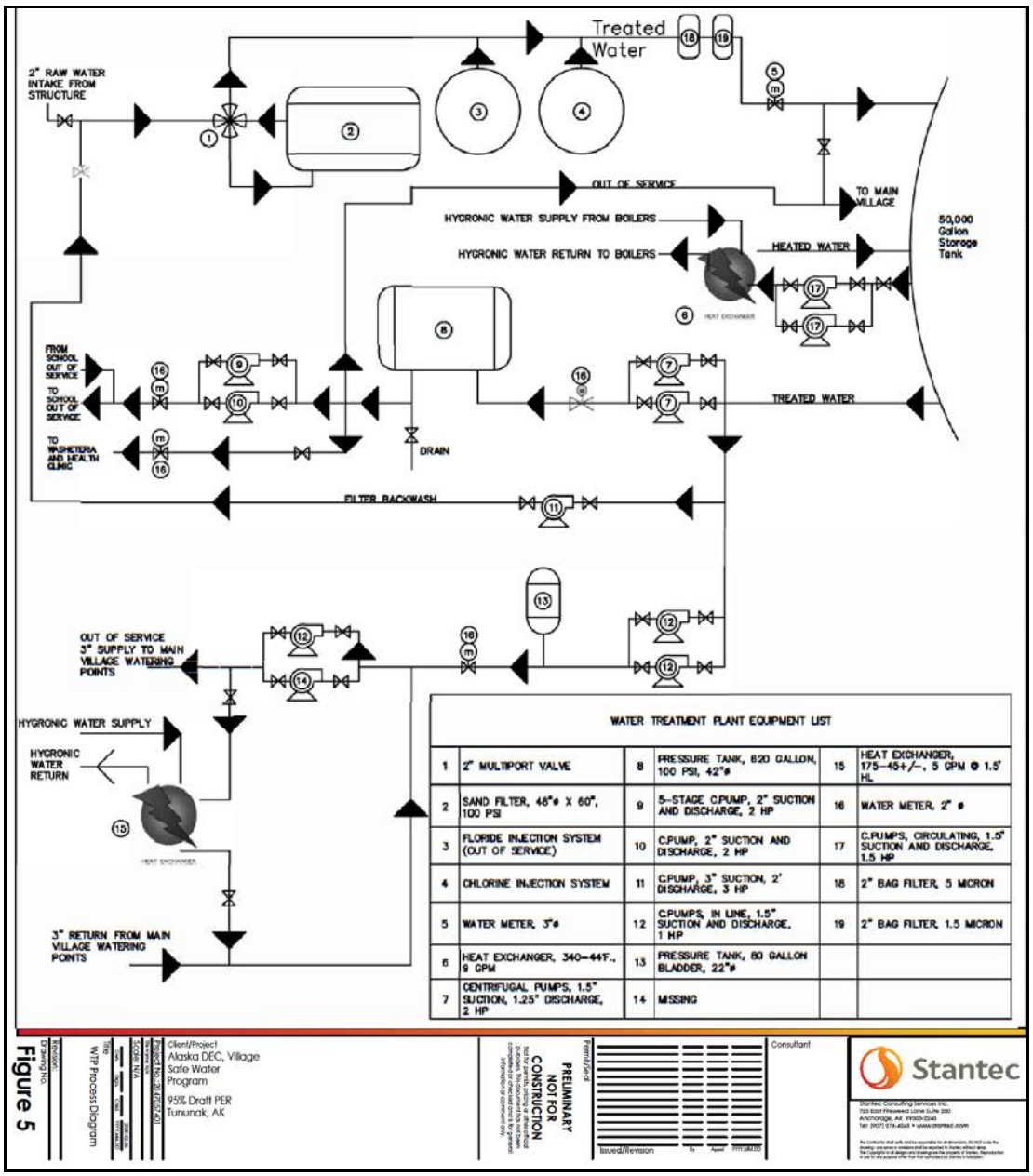
The Filter Backwash Recycling Rule (FBRR) was promulgated in 2001 and requires public water systems operating direct and conventional filtration plants to review their backwash water recycling practices and make approved changes as necessary to ensure they do not compromise pathogenic microbial control, particularly by passing Cryptosporidium oocysts through the filter. Generally, the FBRR requires that impacted systems introduce waters to be recycled to the head of the water treatment plant, treat recycled waters through all existing unit processes, report to the ADEC the configuration and operation of the system, and maintain records of recycle operations. This rule may affect the design and implementation of future upgraded treatment systems for Tununak.



4.2.3 Water Treatment Process Flow

Figure 4, Existing Facilities Map under Section 4.1.3, shows the layout of Alternative 2. Figure 5 presented below provides a Process Flow Diagram for the replacement water treatment plant – the treatment process would be designed and altered to comply with the water treatment requirements for a surface water source and will only include one service to the neighboring health clinic.

Figure 5 Process Flow Diagram of Water Treatment Plant



4.2.4 Environmental Impacts

No environmental impacts are anticipated for Alternative 2 since it presents no new ground disturbance. Minimal ground disturbance may occur during installation of the new foundation under the existing building; however, no excavation is anticipated. Should excavation be required to install the new foundation, the State Historic Preservation Officer (SHPO) must be consulted and measures to avoid adverse impacts to cultural resources will be implemented. In addition, the USFWS must be consulted to determine any proposed avoidance measures that can be incorporated into the project construction methods that would avoid accidental impacts to Spectacled Eiders. In addition, Alternative 2 would eliminate the discharge of the backwash water onto the ground surface adjacent to the WTP since the backwash flow would be discharged to the septic tank and drainfield system.

4.2.5 Land Requirements

No additional land requirements are anticipated for Alternative 2.

4.2.6 Potential Construction Problems

Construction problems that could occur with Alternative 2 is the potential for existing buildings to test positive for either lead or asbestos that would require special permitting for disposal.

4.2.7 Sustainability Considerations

Alternative 2 would provide an improvement in meeting the sanitation needs in Tununak. However, this alternative would probably not generate sufficient revenue based on current user fees to cover the estimated annual O&M costs presented below due to the limited number of laundry units and bathrooms. Also, the proposed renovation of the washeteria would probably be too small to meet sanitation needs expected from the future growth in Tununak.

4.2.7.1 Water and Energy Efficiency

The rehabilitated building including replacement of WTP equipment and washeteria laundry equipment will be energy efficient, thereby decreasing energy and resources currently used. The renovation of the building would also allow for replacement of doors and windows, reinsulating areas with damaged insulation, repairing the ventilation system, and upgrading lighting to LED lighting throughout the building.

4.2.7.2 Green Infrastructure

Not applicable.

4.2.7.3 Other

A disadvantage to Alternative 2 is that the water treatment process would have to be temporarily shut down to allow for the replacement of the treatment equipment. However, the operators could treat a



enough water to store in the 50,000 gallon WST and continue to provide non-potable water to the health clinic. A temporary water line for the WST to the clinic may need to be provided in order to make this possible. In addition, the community would experience another disadvantage from Alternative 2 since they will not be able to have laundry services during the upgrade of the existing washeteria that may last for several months.

The operators would also have to achieve a Level 1 Water Treatment Certification before the WTP could achieve compliance with ADEC.

4.2.8 Alternative 2 Cost Estimates

Project costs associated with this alternative are broken down in terms of construction and non-construction costs. The construction costs are based on material and labor for 2020 with all the work being advertised and bid under one contract. Planners and designers will also need to adjust prices and contingency as the project progresses depending on the proposed year of construction, portions of work to be completed by Tununak crews (if any), specific project parameters (e.g. funding requirements, environmental documentation), and if existing building tests positive for either lead or asbestos that requires encapsulation or disposal. The construction contingency is to address unforeseen conditions or other change orders that may occur during construction.

Non-construction costs which have been estimated as a percentage of construction are stated below. Additional non-construction costs related to environmental compliance and cleanup, legal services, bonds, property and easement acquisition, and interest charges could also be encountered and should be considered by Tununak in the final formulation of project budgets. These are the other costs associated with implementing the construction project – engineering, design, permitting and administration.

- Engineering costs are estimated at 10% herein to address the design, construction document preparation and permitting of the projects prior to construction.
- Administration costs are estimated at 8% herein to cover Tununak's costs associated with procuring construction contractors, grant administration and agency project involvement.
- Construction administration costs are estimated herein at 10% to cover inspections, submittal reviews, construction contract administration, and other functions required by or on the Tununak's behalf for oversight of the construction project.

Table 4 shows the Project Cost as Construction Costs, Construction Contingency Funds, Non-Construction Costs (i.e. Administrative, Design, Permitting, and Construction Administration) Costs. The table also shows the Residual Values of the assets at the end of a 20 year life cycle.

95%
PER
Draft, r2

Table 4 Alternative 2 Cost Estimate

Alternative 2 - Rehabilitate Washeteria and Water Treatment Plant Construction Estimate (PER)							
Item #	ITEMS / WORK DESCRIPTION	UNIT	Est. Quantity	Unit Price	Estimated Cost	EUL	Residual after 20 Years
1	Mobilization and Demobilization	LS	1	$ 105,000	$105,000	0	$0
2	Building Modifications/Rehabilitation, includes replacement of foundation	LS	1	$ 2,200,000	$2,200,000	25	$440,000
3	Replacement of Electrical Transformer and Service	Each	1	$ 25,000	$25,000	20	$0
4	Water Treatment System Equipment	LS	1	$ 650,000	$650,000	0	$0
5	Washeteria complete bath and shower materials with Coin Operators (4 showers total)	LS	1	$ 108,000	$108,000		$0
6	Decommission and Replace Water Transmission Line from Infiltration Gallery to WTP at 1,150 LF (with disposal at Tununak sanitary landfill)	LF	1,150	$ 350	$402,500	35	$172,500
7	Decommission and Replace Infiltration Gallery and Pump House, dispose of abandoned waterline between gallery and Airport Haul Road	LF	1	$ 140,000	$140,000	20	$0
8	Remove and Dispose of water/sewer lines utilidor between WTP and school including disposal in landfill	each	1	$ 75,000	$75,000	0	$0
9	Reline Interior Coating 50,000 Gallon Water Storage Tank	each	1	$ 567,000	$567,000	20	$0
10	10 KW Standby generator and 5K gallon AST	each	1	$ 110,000	$110,000	25	$22,000
11	Washers (Commercial washer - 20 lb front load, coin operated)	each	4	7650	$30,600	0	$0
12	Dryers (Commercial dryer - hydronic heat front load 50lb with coin box)	each	2	5700	$11,400	0	$0
				Construction Estimate	$4,424,500	Residual Value	$812,160
				Construction Contingency		10%	$442,450
				Construction Total			$4,866,950
				Agency Administration		8%	$389,356
				Engineering Design and Permitting		10%	$486,695
				Construction Administration		10%	$486,695
				Non-Construction Estimate			$1,362,746
				Estimating Contingency		0%	$0
				Total Estimated Project Cost			**$6,229,696**

Note
There is a potential of Lead and/or Asbestos due to age of the existing buildings.
Appliances and Equipment EUL under 20 is reviewed in O&M after initial investment

For this report, O&M costs associated with each alternative are qualitative comparison that does not allow for a concrete comparison on a cost basis. The final configuration, selection of equipment, and finishes can have a huge effect on the O&M work that is necessary to maintain the facility. Overhead costs will vary depending on if there is an increase in usage of the facility. A practical effort has been made to analysis of the alternatives to identify the major changes that will occur in the O&M activities with the



implementation of each alternative. Materials costs for parts and equipment replacement are estimated using 2020 values for an O&M cost change.

O&M budgets for each alternative specifically address labor (e.g. salaries, benefits), utilities and supplies for the identified O&M tasks. No contract services have been identified for the existing system or alternatives considered (e.g. water purchase, waste treatment, other). Insurance, engineering, legal, and other costs associated with new or existing wastewater treatment has not been estimated and will be covered by Tununak as part of current operations.

O&M costs for Alternate 2 are expected to increase over the existing WTP and washeteria, with the costs associated with operations and maintenance of the new equipment including the chemical systems. The detail of these increases is summarized in Table 4. Note that these represent only cost increases to the existing O&M and do not address deferred maintenance, unfunded short-lived assets accounts, short staffing or other deficiencies within the existing O&M program.

Table 5 Alternative 2 Annual O&M Expenses

Category	Cost
Operator Labor[1] (for WTP and Washeteria)	$39,000
Electricity and Utilities[2]	$10,000
Heating Fuel Oil[3]	$14,400
Chemicals, Supplies, Freight, and Expendables[2]	$3,000
Office and Administrative[2]	$2,500
Emergency Repair Budget[2]	$2,000
Short Lived Asset Reserve[2]	$10,784
Other Line Items[4] (Insurance, etc.)	$5,000
Estimated Annual O&M Cost	**$86,684**

Notes:

1 Based on operator time estimated at 30 hours per week at a pay rate of $25/hr includes benefits.

2 Cost assumed based on similar facilities per VSW and ANTHC experience. Annual cost was increased over the cost for the no-build due to assumed higher power demand for operation.

3 Cost based on 2017 cost estimate with a 3% inflation factor for 2020 cost

4 Assumed costs for insurance, training, lab costs and miscellaneous operating expenses

Table 6 provides a summary of the estimated construction (capital), annual O&M expenses (assuming 2040 water demands), and a life-cycle cost analysis for Alternative 2. Detailed cost estimates calculations are provided in Appendix A.

Table 6 Alternative 2 Summary Table of Capital, O&M, and Life Cycle Cost

Total Construction Cost	Annual O&M	20 Year Life Cycle Cost
$6,229,696	$86,684	$7,620,454

The estimated life-cycle costs for Alternative 2, in 2020 dollars, assuming uniform series present worth based on a 20 year life cycle cost is $7,620,454. The building improvements, relining the water tank, and other long term assets continue to have a depreciated value after 2040.

4.3 ALTERNATIVE 3 – NEW MODULAR BUILDING AND DEEP WELL

This alternative proposes to demolish the existing washeteria and WTP and replace it with the construction of a Modular Combined Washeteria/Water Plant and include the following water system improvements: Reline the Interior of the 50,000 Gallon Water Storage Tank; Decommission and Replace Water Transmission Line; and decommission Existing Source of Water Supply (Infiltration Gallery on Unnamed Creek) and Replace water source with the 2019 Deep Water Supply Well.

4.3.1 Description

Alternative 3 would demolish the existing washeteria and WTP and foundation. A new foundation would be installed at the same location to support a new 40-foot by 60-foot (2,400 square foot) modular building that would house a combined washeteria and water plant constructed on a new foundation system. The existing washeteria building and all unusable equipment would be hauled to the Tununak sanitary landfill for disposal. In addition, the scope of this alternative includes the following water system improvements:

- Relining the existing 50,000 gallon water storage tank (WST)
- Decommissioning the raw water transmission line (WTL) from the Infiltration Gallery to the WTP
- Install a new raw water transmission line between the new deep water well and the WTP
- Decommissioning the existing source of water supply consisting of the Infiltration Gallery on Unnamed Creek and replacing the water source with the 2019 deep water supply well

Alternative 3 consists of the following components:

1. The new modular combined washeteria/water plant would be shipped by barge to Tununak and transported in sections overland from the Tununak barge site to the location of the former washeteria and WTP.
2. The modular building would be erected on a new multipoint steel frame foundation.
3. The modular building would consist of a 2,400 square foot (40’ by 60’) structure that would include a 1,600 square foot fully functional washeteria and a 800 square foot area for the new Water Plant Figure 6 shows the conceptual floor plan for the modular combined washeteria and



water plant. The modular building will have a footprint that is 350 feet larger than the original footprint of current building.

4. The new modular building would have arctic insulated walls 8" thick, energy efficient vinyl clad windows, and the warranties that come with new construction.

5. Remove existing power transformer and install a new transformer sized to the maximum draw of the facility would be installed with a new service.

6. The Water Plant would house equipment needed to pump and control the distribution of water to the WST and the nearby clinic. Treatment of the raw water would not be required due to the exceptional quality of raw water from the new deep-water supply well. The well would be equipped with a submersible well pump that would produce a minimum flow rate of 50 gpm. In addition, the level of operator required by the ADEC would be the minimum level classified Small Water System Operator. Given the simplicity of the water plant operation, the same operator would have sufficient time and qualifications to operate the washeteria.

7. The new Water Plant would be plumbed to deliver water via a new aboveground insulated utilidor (manway) to the existing 50,000-gallon WST and pump water to the washeteria and to the neighboring health clinic.

8. The modular washeteria would be designed to accommodate 5 commercial grade washers and dryers, and 2 bathrooms (separate men and women) equipped with 5 toilets, 1 urinal, 2 sinks, and 4 showers that are designed for handicap access.

9. The exterior stairs and entrances to the modular building would be constructed with new weather resistant material and include stairs and ramps meeting handicap access requirements and a parking space for a handicap vehicle.

10. The wastewater from the modular washeteria would be plumbed to discharge into the existing sewer drain that flows to the existing off-site septic tank and drainfield system.

11. The 50,0000 WST would continue to be used until the condition warrants a capital project, provide the interior coating on the tank is relined. Also, repairs and modifications to the tank's overflow pipe and vent will be made.

12. This alternative includes the decommissioning and disposal of the 1,150-foot long WTL including the water line access boxes from the Infiltration Gallery to the WTPT.

13. The new 180-foot deep water well that was drilled in Tununak during the summer of 2019 will replace the Infiltration Gallery and serve as Tununak's water source. The approximate location of the well is shown on Figure 2 in Section 2.1. The well will be connected via a 1,435-foot long aboveground arctic pipe water line to the new water plant as shown below in Section 4.3.3 on Figure 7. The foundation system for the replacement aboveground Arctic pipe utilidor will be similar to the type used for the abandoned WTL from Muskox Creek.



14. Remove the abandoned water and sewer aboveground utilidor pipelines between the WTP and the Paul Albert High School as well as the abandoned water line between Unnamed Creek gallery and Airport Haul Road with disposal at the Tununak sanitary landfill.

4.3.2 Design Criteria

All major system components in Alternative 3 would be constructed with materials and methods to provide a minimum 20-year life. Design criteria for the new modular combined washeteria and water plant are identical for the criteria for Alternative 2 with the exception of the total daily flow rate which would increase to 673 GPD due to the increase in the size of the proposed bathrooms and the number of clothes washing machines in the new washeteria. The wastewater flow from the water plant would not include backwash since water treatment is not required for the use of the new deep water well. The water well is capable to provide a sustained flow rate that is greater than 50 gpm and would be available in the future to serve the entire community of Tununak with a piped water system.

The new water system would be subject to regulation as a CWS under 18 AAC 80.007. A certified operator would be required to operate the system and would need to comply with regulations for routine monitoring and reporting under the Revised Total Coliform Rule.

4.3.3 Alternative 3 Conceptual Drawings

The proposed modular washeteria and water plant will be located at the same location of the existing washeteria and WTP as shown in Figure 1. Figure 6 shows a conceptual floor plan for the modular combined washeteria and water plant. The outer dimension of the building are 60 feet by 40 feet, resulting in a footprint of 2,400 square feet.

95%
PER
Draft, r2

Figure 6 Conceptual Floor Plan for Alternative 3

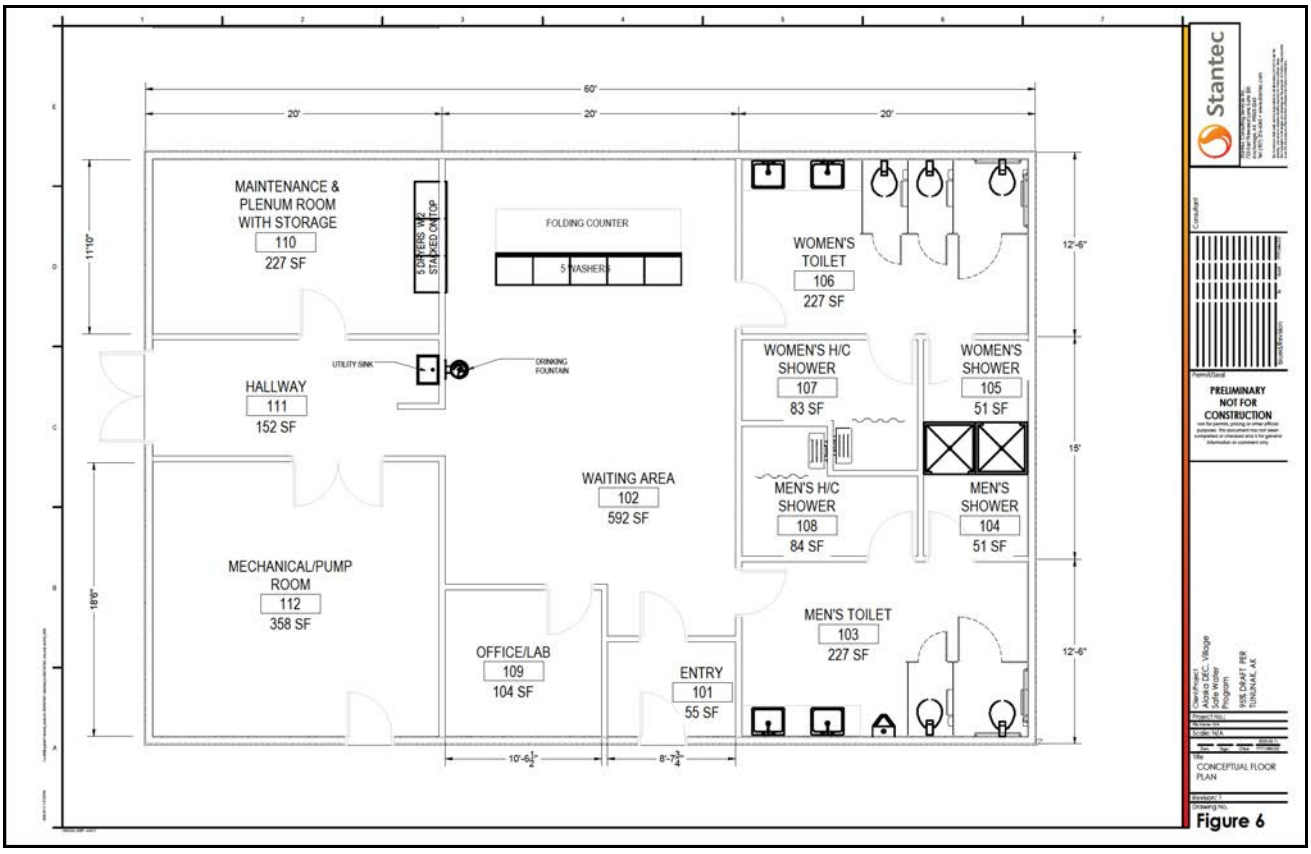
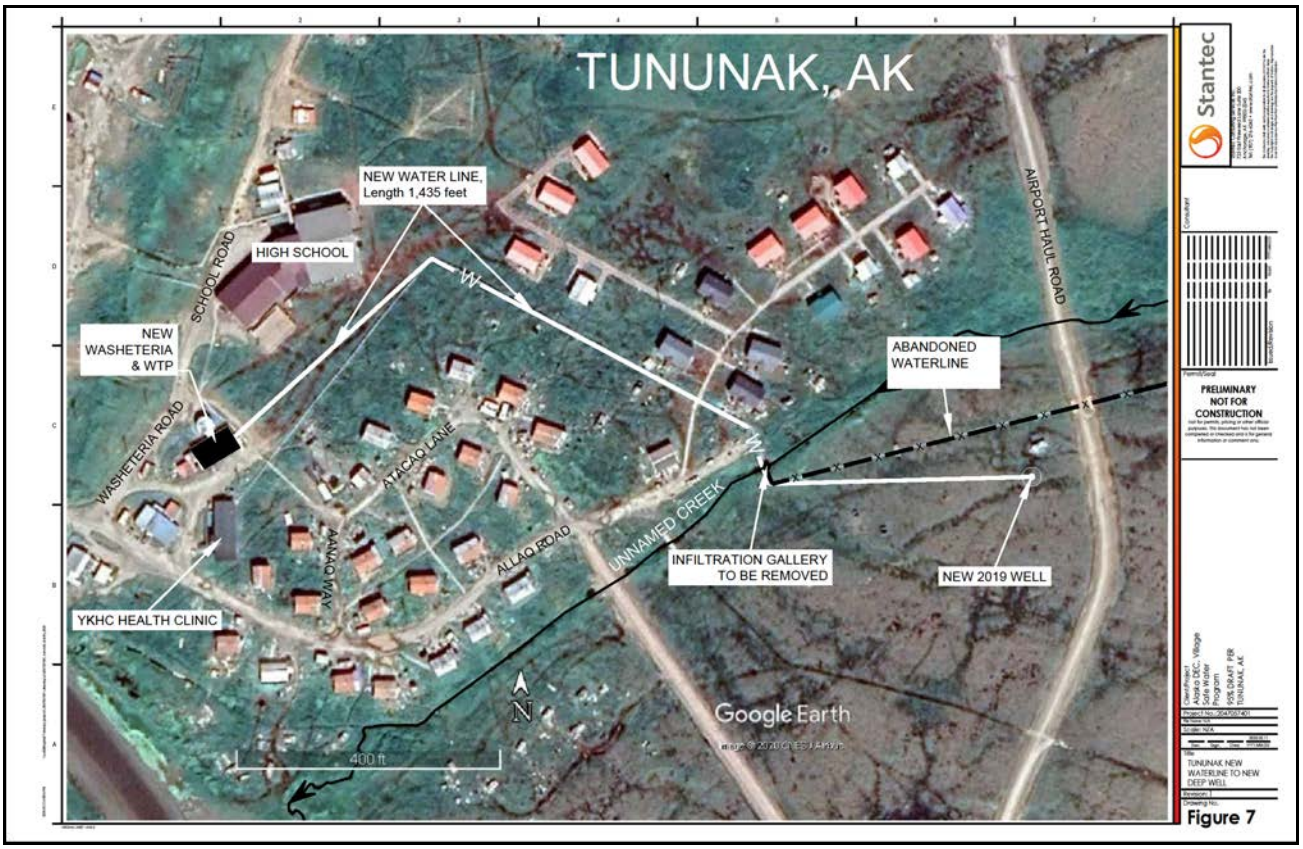


Figure 7 is a site plan layout of the connection to the new deep water well and proposed alignment of the replacement water transmission line is shown in aerial view on Figure 2.

Figure 7 Alternative 3: New Waterline to Deep Well



4.3.4 Environmental Impacts

No environmental impacts are anticipated for Alternative 3 since it presents minimal new ground disturbance. Minimal ground disturbance may occur during installation of the new foundation and installation of portions of the above ground, raw water transmission line. Should excavation be required to install the new foundation, the SHPO must be consulted and measures to avoid adverse impacts to cultural resources will be implemented. In addition, the USFWS must be consulted to determine any proposed avoidance measures that can be incorporated into the project construction methods that would avoid accidental impacts to Spectacled Eiders during construction. Also, the Corps of Engineers must be consulted if any excavation and/or wetlands disturbance is anticipated.

Alternative 3 proposes to place the new modular washeteria building in very close proximity to the existing washeteria/water plant. According to the administrators of Tununak, they have site control (ownership) of all property surrounding the existing washeteria/water plant. This area is adequate in size to accommodate the placement of the new modular washeteria/water plant building. Also, Tununak has

site control of property along the alignment of the proposed WTL from the new 2019 well to the water plant.

4.3.5 Potential Construction Problems

Construction problems are not anticipated for Alternative 3. Minimum ground surface preparation may be required for the construction of the foundation for the new modular washeteria and water plant building, and manway utilidor to the WST and health clinic. In addition, there would be minimum ground disturbance for the installation of a portion of the new aboveground raw water transmission line. If existing building tests positive for either lead or asbestos that would require special permitting for disposal.

4.3.6 Sustainability Considerations

Alternative 3 would construct a reliable and affordable sanitation facility that will meet the current and future 20-year design life washeteria water treatment plant needs in Tununak. Alternative 3 is anticipated to generate enough revenue to cover the estimated annual O&M and repair and replacement costs presented in the table below.

4.3.6.1 Water and Energy Efficiency

The new modular building with new equipment for the washeteria and water treatment plant would be energy efficient, thereby, decreases energy and resources compared to that currently used.

4.3.6.2 Green Infrastructure

Not applicable.

4.3.6.3 Other

A new modular washeteria and water plant would provide long life and be less expensive and easier to operate and maintain for the community of Tununak. Prior to the erection of the modular building, the abandoned washeteria and WTP would be demolished and disposed of at the local sanitary landfill operated by the Village of Tununak.

4.3.7 Alternative 3 Cost Estimates

Table 7 shows the Project Cost as Construction Costs, Construction Contingency Funds, Non-Construction Costs (i.e. Administrative, Design, Permitting, and Construction Administration) Costs. The table also shows the Residual Values of the assets at the end of a 20 year life cycle. Note that the residual values for Alternative 3 are greater than Alternative 2.

95%
PER
Draft, r2

Table 7 Alternative 3 Cost Estimate

Alternative 3 - New Modular, Combined Washeteria and Water Treatment Plant with Deep Well Source Construction Estimate (Conceptual)							
Item #	ITEMS / WORK DESCRIPTION	UNIT	Est. Quantity	Unit Price	Estimated Cost	EUL	Residual after 20 Years
1	Mobilization and Demobilization	LS	1	$ 105,000	$105,000	0	$0
2	Modular Building (Includes shipment, erection, foundation and finished bathrooms with 4 coin operated showers)	SF	2,400	$ 600	$1,440,000	40	$720,000
3	Replacement of Electrical Transformer and Service	Each	1	$ 25,000	$25,000	20	$0
4	Demolish washeteria, WTP and abandoned water line (470 lf) between Gallery and Airport Haul Road with disposal of waste at Tununak sanitary landfill	LS	1	$ 165,000	$165,000	0	$0
5	Decommission and Replace Water Transmission Line from Infiltration Gallery to WTP at 1,150 LF (disposal at Tununak sanitary landfill)	LF	1150	$ 350	$402,500	35	$172,500
6	Connect New Deep Water Well via 415 LF aboveground arctic utilidor water line including electrical line and installed submersible pump	LF	285	$ 350	$99,750	35	$42,750
7	Remove and Dispose of water/sewer lines utilidor between WTP and school including disposal in landfill	LS	1	$ 75,000	$75,000	20	$0
8	Reline Interior Coating 50,000 Gallon Water Storage Tank	LS	1	$ 567,000	$567,000	30	$189,000
9	Decommission Infiltration Gallery and Pump House and dispose waste material in Tununak sanitary landfill.	LS	1	$ 18,000	$18,000	0	$0
10	Aboveground utilidors to the existing 50,000 gallon water storage tank, clinic, and existing sewer system. Includes all other site work, handicap access and parking, mechanical, electrical, and other miscellaneous construction items	LS	1	$ 325,000	$325,000	30	$108,334
11	10 KW Standby generator and 5K gallon AST	EA	1	$ 110,000	$110,000	25	$22,000
12	Washers (Commercial washer - 20 lb front load, coin operated)	EA	5	$ 7,650	$38,250	0	$0
13	Dryers (Commercial dryer - hydronic heat front load 50lb with coin box)	EA	5	$ 5,700	$28,500	0	$0
14	Water Plant Equipment (pumps, piping, valves, hydropneumatic tank)	LS	1	$ 150,000	$150,000		$0
				Construction Estimate	$3,549,000		$1,605,868
				Project Contingency		10%	$354,900
				Construction Total			$3,903,900
				Agency Administration		8%	$312,312
				Engineering Design and Permitting		10%	$390,390
				Construction Administration		10%	$390,390
				Non-Construction Estimate			$1,093,092
				Estimating Contingency		0%	$0
				Total Estimated Project Cost			**$4,996,992**

Note
There is a potential of Lead and/or Asbestos due to age of the existing buildings.
Appliances and Equipment EUL under 20 is reviewed in O&M after initial investment
Realignment of Raw Water Line and the addition of 415' of water line to deep well comes up to a horizontal length of 1435' total.

O&M costs for Alternate 3 are expected to increase compared to the current the existing WTP and washeteria, with the costs associated with operations and maintenance of the new equipment. However, the estimated O&M costs for Alternative 3 are lower than Alternative 2 since there is no water treatment equipment to operate which results in employing a lower level of operator certification. The detail of these increases is summarized in Table 8. Note that these represent only cost increases relative to the existing O&M costs for the current washeteria/WTP and do not address deferred maintenance, unfunded short-lived assets accounts, short staffing or other deficiencies within the existing O&M program.

Table 8 Alternative 3 Annual O&M Costs

Item #	Item / Work Description	Estimated Labor	Unit	Hours Per Year	Annual Estimated Labor, $20/hour	Power / Supply Cost	Estimated Annual O&M Cost
1	Operator Labor[1]	24	hours/week	1248	$24,960		$24,960
2	Electricity and Utilities[2]		annual cost			$7,500	$7,500
	Heating Fuel Oil		annual cost			$7,500	$7,500
3	Chemicals, Supplies, Freight, and Expendables[2]		annual cost			$1,500	$1,500
4	Office and Administrative[2]		annual cost			$2,500	$2,500
5	Emergency Repair Budget[2]		annual cost			$1,000	$1,000
12	Short Lived Asset Reserve[2]		annual cost			$15,794	$15,794
13	Other Line Items[3] (Insurance, etc.)		annual cost			$4,000	$4,000
14							$0
15							$0
	Estimated Initial Annual O&M		**0.60 FTE**	**1248 hours**	$24,960	$39,794	**$64,754**

Notes:
1 Based on operator time estimated at 24 hours per week at a rate $20/hr
2 Cost based on similar facilities per VSW and ANTHC experience.
3 Assumed costs for insurance, training, lab costs and miscellaneous operating expenses

Estimated construction (capital) costs, annual O&M expenses (assuming 2040 water demands with a minimum flow rate of 50 gpm), and a life-cycle cost analysis for Alternative 3 are presented in Table 9. Detailed cost estimates calculations are provided in Appendix A. The estimated life-cycle costs for Alternative 3, in 2020 dollars, assuming uniform series present worth based on a 20 year life is $5,036,731.

Table 9 Alternative 3 Summary Table of Capital, O&M, and Life Cycle Cost

Total Construction Cost	Annual O&M	20 Year Life Cycle Cost
$4,996,992	$64,754	$5,036,731

5.0 SELECTION OF AN ALTERNATIVE

5.1 LIFE CYCLE COST ANALYSIS

Life cycles can be considered in a number of ways over to address the variability that can be expected when projecting O&M costs over 20 years. Table 10 shows the 2020 estimated costs for construction, non-construction, project and O&M cost increases. The total life cycle cost over 20 years is then calculated assuming either constant, arithmetic or geometric growth (see calculations in Appendix A). For this PER, the values generated with the arithmetic growth are used for Life Cycle comparisons.

Table 10 Life Cycle Analysis of Alternatives

Life Cycle Cost Analysis	Alternative 1 - Do Nothing	Alternative 2 - Rehabilitation of Existing	Alternative 3 - Replacement with New
CONSTANTS			
Construction Cost	$0	$4,424,500	$3,549,000
Non-Construction Cost	$0	$1,362,746	$1,093,092
Construction Contingency	$0	$442,450	$354,900
Total Project Cost, PC	$0	$6,229,696	$4,996,992
Residual Value (RV) in n years	$0	$812,160	$1,605,868
Annual O&M, first year	$56,056	$86,684	$64,754
Annual O&M Increase (g)	3.0%	3.0%	3.0%
Annual O&M Increase, arithmetic gradient	$1,682	2600.52	$1,943
Geometric Gradient Factor	22.86	22.86	22.86
		ANALYSIS	
Assuming Constant Costs			
Equivalent Annual O&M, Constant Cost	$56,056	$86,684	$64,754
Present Worth of O&M, Constant Cost	$967,166	$1,495,608	$1,117,237
Total Present Worth	$967,166	$7,725,304	$6,114,229
Total Cost at End of Lifecycle (20 years)	**$1,121,120**	**$7,151,216**	**$4,686,204**
Assuming Arithmetic Growth			
Equivalent Annual O&M, Arithmetic Growth	$71,228	$110,146	$82,280
Present Worth of O&M, Arithmetic Growth	$1,228,939	$1,900,409	$1,419,628
Total Present Worth	$1,228,939	$8,130,105	$6,061,720
Total Cost at End of Lifecycle (20 years)	**$1,424,562**	**$7,620,454**	**$5,036,731**
Assuming Geometric Growth			
Equivalent Annual O&M, Geometric Growth	$74,257	$114,830	$85,780
Present Worth of O&M, Geometric Growth	$1,281,203	$1,981,229	$1,480,002
Total Present Worth	$1,281,203	$8,210,925	$6,476,994
Total Cost at End of Lifecycle (20 years)	**$1,485,146**	**$7,714,140**	**$5,106,715**

For the Life Cycle analysis, assumptions for useful life for structures and waterlines is 35 years. This gives Alternate 2 and Alternate 3 Table 11 presents a Life Cycle cost comparison of the three alternatives:

Table 11 Comparison Between Life Cycle Costs of Alternatives

Cost	Alternative		
	Do Nothing	Rehabilitate	New Construction
Construction	$0	$4,866,950	$3,903,900
Non-Construction	$0	$1,362,746	$1,093,092
Total Project	$0	$6,229,696	$4,996,992
Annual O&M	$56,056	$86,684	$64,754
20 Year Life Cycle	$1,424,562	$7,620,454	$5,036,731

The No Build Alternative 1 has the lowest Life Cycle cost of the three alternatives; however, the No Build Alternative does not address any of the community's current or future sanitation need. The O&M costs will remain high for a facility that doesn't not meet the minimum needs of the community and will lead to a Life Cycle Cost of almost $1.5M.

Alternative 2 will address the current sanitary deficiencies as well as the health and safety issues throughout the facility. It has the highest Life Cycle Cost because the annual O&M and the overall project cost is highest out of the three alternatives.

Alternative 3 addresses the health, safety, and sanitation deficiencies of the current washeteria and WTP. The lifecycle cost for Alternative 3 is higher than Alternative 1 (No Build) because there is an initial capital investment. In providing a functional facility with the ability to generate revenue with 5 washers, 5 dryers, and four showers, Alternative 3 has the potential to generate higher gross profits during peak use times that is not possible with either Alternate 1 or Alternate 2. The investment in Alternative 3 is less that Alternative 2 and results in both a lower capital cost and a significantly lower 20 year Life Cycle cost.

Alternative 2 reflects the costs of replacing the Unnamed Creek Infiltration Gallery, installing a new raw water line with treatment plant, removal of abandoned lines between the WTP and School west of Airport Haul Road, and would not change the alignment of the waterline. The cost is $865,000 and it does not address well head protection of the infiltration gallery. Formal acceptance of the 2019 well for drinking water use by ADEC has not occurred yet, making this source a viable alternative at this time.

Alternative 3 reflects acceptance of the 2019 well by ADEC with the costs of decommissioning and removing all raw water lines west of Airport Haul Road and of the Unnamed Creek Gallery, installing a new raw water line with an alignment that is different than the original water line, connection to the well, replacement of utilidors to accommodate the pipe alignment, and water plant equipment for $390,000.

If the new well could be utilized for Alternative 2, the total Project Cost would decrease by $500,000 and the O&M would decrease by $15,000 as a result of decreased labor costs and not needing to add chlorine to the system. This would bring the initial cost of Alternative 2 down to $5.7 million. Alternative 2

would still be the most expensive alternative and would have the highest 20 Year Life Cycle and lowest Residual Value in 2040.

5.2 RECOMMENDED ALTERNATIVE

Alternative 3 (New Modular Combined Washeteria and Water Plant and other improvements to the water system) is the recommended alternative to meet the current and future sanitation needs of Tununak. Alternative 3 has the additional benefit of new construction that is superior to Alternative 1 and the renovations of Alternative 2.

6.0 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

6.1 PRELIMINARY PROJECT DESIGN

6.1.1 Drinking Water

6.1.1.1 Water Supply

The source of water for the recommended Alternative 3 (modular combined washeteria/water plant and other improvements to the water system) will be the deep water supply well that was drilled in 2019.

6.1.1.2 Treatment

In accordance with the requirements given in 18 AAC 80 for Drinking Water, the 2019 deep water well requires no treatment.

6.1.1.3 Storage

Treated water from the new water plant will be pumped and stored in the existing 50,000 gallon WST. The interior coating in the WST will relined.

6.1.1.4 Pumping Stations

Not applicable.

6.1.1.5 Distribution Layout

Not applicable.

6.1.2 Wastewater/Reuse

Not applicable – wastewater would continue to be discharged to the existing off-site septic tank system.

6.1.2.1 Collection System/Reclaimed Water System Layout

Not applicable.

6.1.2.2 Pumping Stations

Not applicable.

6.1.2.3 Storage

Not applicable.

6.1.2.4 Treatment

Not applicable.

6.1.3 Solid Waste

6.1.3.1 Collection

Not applicable.

6.1.3.2 Storage

Not applicable.

6.1.3.3 Processing

Not applicable.

6.1.3.4 Disposal

Not applicable.

6.1.4 Stormwater

6.1.4.1 Collection System Layout

Not applicable.

6.1.4.2 Pumping Stations

Not applicable.

6.1.4.3 Treatment

Not applicable.

6.1.4.4 Storage

Not applicable.

6.1.4.5 Green Infrastructure

Not applicable.

6.2 PROJECT SCHEDULE

The schedule for the construction of the recommended alternative #3 (Modular Combined washeteria and water plant and other water system improvements) is solely dependent upon the availability of funding. An important factor in the scheduling for this project is the discontinuation of current services that would be disrupted to the community users during the construction of the proposed modular building. When funding becomes available, the design of the recommended alternative could take approximately 4 to 8 months and several more months for the agency review process. The construction, delivery and erection of the modular building could take approximately 12 months depending on the time of year and availability of barging services.

6.3 PERMIT REQUIREMENTS

Construction of the new water plant and use of the new (2019) deep water supply well will require an Approval to Construct from the ADEC Drinking Water program. Engineering plans and specifications for the proposed water system will need to be submitted to the ADEC for review and approval. The project would anticipate receiving an approval to construct within 90 days of submittal of the 95% design. After installation of the water plant the ADEC will issue an interim approval to operate the treatment system for a period of one year and then a final approval to operate.

6.4 SUSTAINABILITY CONSIDERATIONS (IF APPLICABLE)

6.4.1 Water and Energy Efficiency

Alternative 3 (modular water plant with washeteria and other water system improvements) is expected to have an overall process efficiency of at least 95%. Power consumption is also expected to be lower than the current operation of the existing washeteria and WTP. These efficiencies will benefit the community and provide a means in the future to provide a piped water system to the entire community.



6.4.2 Green Infrastructure

Not applicable.

6.4.3 Other

The new washeteria will have modern equipment that will be a substantial improvement for the laundry facilities. Also, the operators of the existing washeteria are familiar with the routine maintenance of the laundry equipment. In consideration of the lack of piped water system in Tununak, the new public bathrooms/restrooms will be valued by the community residents.

6.5 TOTAL PROJECT COST ESTIMATE (ENGINEER'S OPINION OF PROBABLE COST)

Table 12 presents the anticipated construction and non-construction costs for the recommended Alternative 3, a new Modular Water Plant with Washeteria and other water system improvements. Based on the proposed schedule provided above, the project cost of $5.0M in 2020 dollars. Land and right-of-way costs are not included as the project is located within property owned by Tununak.

Table 12 Alternative 3 Estimates of Total Cost

Proposed Alternative	
Alternative 3 – New Modular Building and Deep Well	
Estimated Construction Cost	$3.904M
Non-Construction Costs	$1.093M
Construction Contingency	$355,000
Total Estimated Project Cost	$4.997M
Initial O&M Cost	$65,000
Annual Short-Lived Asset Reserve Payment	$16,000

6.6 ANNUAL OPERATING BUDGET

6.6.1 Income

It is understood Tununak would continue their current user fee program for water services and washeteria usage. A copy of Tununak's operation budget for the past several years includes the water treatment plant and washateria as provided in Appendix C. It is anticipated that the user fee program to cover the projected O&M budget presented in Table 8 for the future operation of the water plant and washeteria proposed in Alternative 3 will have to be adjusted accordingly (user fees) by Tununak to cover the additional costs of approximately $9,000 per year to operate the new facility. However, the user fee



charges may not have to be increased when the community realizes the benefits of the improved washers and dryers thereby increasing the number of users which in turn increases the income.

Leslie Petre, EIT, reviewed the of cost for laundry and shower facilities in Fairbanks and in North Pole, Alaska current as of 3/9/2020 and found that the rates being charged in Tununak, Alaska are notably lower. She found that single load of laundry is $3.50-$4.50 to wash and $3.00-$4.00 to dry. The rate for a double load machine is $5.50-$6.00 and a rate of $7.50-$8.00 is common for a triple load washer. Showers are $5 for 10 minutes.

The Initial O&M of $65,000 would require that the Washeteria generates a monthly average of $5,520 to cover all expenses and to save money for the reserve fund. The Washeteria is open 6 days a week and would need to have sales of $230 a day on average. It would be necessary for every machine and shower to be operated a minimum of 5 times at $3 a cycle each day of operation to make this level of sales. If $4 a cycle was charged, each piece of equipment/shower would only need to be ran 4 times a day to cover the operational cost and allow the utility to save for replacement of short term assets.

6.6.2 Annual O&M Costs

The annual O&M budget of $65,000 for Alternative 3 was presented in Table 8 in Section 4.3.7.

6.6.2.1 Debt Repayments

Tununak does not currently maintain debt.

6.6.2.2 Reserves

Debt Service Reserve

Tununak does not currently maintain debt.

Short-Lived Asset Reserve

Table 13 presents the detailed costs of the annual Short-lived reserve for the recommended alternative, Alternative 3 Combined Modular Washeteria and Water Plant. See Appendix A for a breakdown and basis for the costs. The Annual Short-lived reserve is the money that needs to be saved every year so that the utility can fund replacement of equipment as it wears out. The estimated amount of savings (in 2020 dollars) is $15,794 per year. This would mean that the utility would need to bank $1320/month or less than $3 per resident per month.



95%
PER
Draft, r2

Table 13 Short Lived Assets Annualized Cost

Alternative 3 - New Modular, Combined Washeteria and Water Treatment Plant with Deep Well Source Short-Lived Asset Reserve					
Item #	Item Description	Expected Useful Life (EUL)	Estimated Replacement Cost (C)	Number of Units (#)	Annualized Replacement Cost =#*C*(A/F)*(F/P)
1	Commercial Washer	6	$7,650	5	$7,951
2	Commercial Dryer	6	$5,700	5	$5,925
3	Commercial Hot Water Heater	8	$4,000	1	$602
4	Circulation Pumps	10	$400	4	$173
5	Expansion Tank	15	$225	2	$49
6	Heat Circ Pumps	10	$400	2	$87
7	Heat Exchanger	10	$1,150	2	$249
8	Flow Meter	10	$2,000	1	$216
9	Hydropneumatic Tank (100 gal)	10	$1,000	2	$216
10	Distribution Pumps	8	$650	2	$196
11	Submersible Pump	15	$1,200	1	$130
			Total Annual Reserve Payment		$15,794

Short-lived assets are those with an EUL of 20 years or less

7.0 CONCLUSIONS AND RECOMMENDATIONS

Three options were reviewed to answer the Tununak Community's need for a washeteria and water treatment plant that produces safe, potable water. Alternative 1 is a "No Build" approach examining the feasibility of changing nothing. Alternative 2 is a "Rehabilitation of Existing Building and Systems" approach that would involve a large capital investment to restore a building and infiltration gallery that is more than 40 years old with modern building supplies on the originally framework. Alternative 3 is a "New Modular Building and Connection to the 2019 Deep Well" approach that could involve a smaller capital investment that Alternative 2 and would give the Community of Tununak a modern facility that would address the Village's needs.

Alternative 1 considered continuing with the existing building and making no capital investment. This alternative's "Do Nothing" approach fails to address:

1. Tununak's need and desire for a working Washeteria where the community can bathe and do their laundry safely.
2. The failed mechanical, electrical, plumbing, and structural issues that are a health and safety issue for the community.
3. The water quality issues due to equipment that is non-functional or the lack of an operator qualified to run a CWS in Alaska.



4. The issue that the Unnamed Creek Infiltration Gallery is failing and that the pump house on Unnamed Creek has dangerous electrical issues and poses a safety risk when the operator must access the gallery through the roof in the winter in order to refill the 50,000 WST. It would also make necessary repairs to the WST.

Alternative 1 does nothing to address the Village of Tununak's need for a reliable, working Washeteria to serve the community for the next 20 years.

Alternative 2 does address the existing building and utility conditions through a substantial capital investment and required that the plant operator attain a Level 1 Water Treatment for the CWS to be in compliance with state and federal regulation. This alternative will address:

1. Tununak's need and desire for a working Washeteria where the community can bathe and do their laundry safely. The alternative will restore the systems to meet building and safety regulations.

2. The failed mechanical, electrical, plumbing, and structural issues that are a health and safety issue for the community. The work will be extensive to make the necessary corrections and the building will gain some residual value. The upgrades would not make the facility as energy efficient as new construction and the work on site will have an extended timeline.

3. The water quality issues due to equipment that is non-functional or the lack of an operator qualified to run a CWS in Alaska. The system would become a CWS again and would act as a secondary source of water for Tununak in the event that the School Well and Treatment System became non-functional.

4. The issue that the Unnamed Creek Infiltration Gallery is failing and replace the current pump house on Unnamed Creek. The WST would be relined to allow it to safely store potable water. There would be a risk that the new infiltration gallery could develop the same issues seen with the current gallery.

Alternative 2's Rehabilitation of the current facilities addresses the Village of Tununak's need for a reliable, working Washeteria to serve the community for the next 20 years. It is the most expensive alternative up front and the most expensive over the propose 20 year life cycle cost of the facility.

Alternative 3, the New Modular Combined Washeteria and Water Plant with other water system improvements, is the lowest capital cost alternative. This alternative offers substantially more benefit for the welfare and health for the residents of Tununak compared to the other alternatives. This alternative will give the community a new, safe, efficient building and utilize the new 2019 deep well that is capable of producing clean, potable water that will require no treatment.

Based on these findings and conclusions as presented herein, Alternative 3 – Modular Combined Washeteria and Water Plant and other water system improvements is the recommended alternative to serve the future drinking water and laundry/hygiene needs of Tununak. The estimated capital cost for this project is $5.0 M.

95%
PER
Draft, r2

8.0 REFERENCES

Alaska Native Tribal Health Consortium. 2012. *Comprehensive Energy Audit for Tununak Water Treatment Plant and Well House*

CRW. 2016. *Tununak Piped Water and Sewer Assessment*

Google Earth PRO Imagery 7/5/2019, accessed Web 2/25/2020

Larsen Consulting Group, Tununak 2007 Subdivision Survey Documents, 10/26/2011.

MWH. 2009. Additional Site Photos

MWH. 2010. *Report on Site Conditions and Recommended Plan of Action.*

Native Village of Tununak IRA Council. 2016. Quitclaim Deed

Phukan Consulting Engineers and Associates Inc. 1993. *Sanitation Feasibility Study and Environmental Review.*

U.S. Army Corps of Engineers. 1977. *Alaskan Community Flood Hazard Pertinent Data*

USFWS IPac Information for Planning Conservation website https://ecos.fws.gov/ipac/. Accessed March 20, 2017

USPHS. 1980. AS BUILT Construction Plans Sanitation Facilities Tununak, Alaska

95%
PER
Draft, r2

APPENDICES A-E

Appendix A Cost Estimates
Appendix B Water Demand
Appendix C Population Growth Estimate
Appendix D Supporting Documentation
Appendix E Supplemental Photos

95%
PER

APPENDICES A-E

Appendix A Cost Estimates
Appendix B Water Demand
Appendix C Population Growth Estimate
Appendix D Supporting Documentation
Appendix E Supplemental Photos

95%
PER

Appendix A COST ESTIMATES

A.1 Estimation for Reservoir Tank Relining

Tununak Water Storage Tank
Clean and Recoat
Tununak, Alaska

Construction Cost Estimate
Concept Design Submittal
July 31, 2018

ESTIMATIONS
1225 E. International Airport Road, Suite 205
Anchorage, Alaska 99518
907.561.0790

Prepared for:
Stantec
725 E Fireweek Lane #200
Anchorage, AK 99503
888-706-8754

Tununak Water Storage Tank

Clean and Recoat
Prepared for Stantec by Estimations

Construction Cost Estimate

Concept Design Submittal
July 31, 2018

Documents

Damage Assessment and Schmatic Design Narrat	21-Sep-16
Drawings	21-Sep-16

Notes and Assumptions

1 Based on 2017 procurement/2017 construction.
2 Labor rates based on Davis Bacon, 50 hours/week.
3 Assumes open competitive bid procurement.
4 Materials storage area will be designated near the building.
5 Local contractor.

Tununak Water Storage Tank

Clean and Recoat
Prepared for Stantec by Estimations

Construction Cost Estimate

Concept Design Submittal
July 31, 2018

Description	Estimated Cost	Estimated Cost Plus Contingency & Escalation	Div.
Basic Bid			
01 - GENERAL REQUIREMENTS	$358,161	$426,301	1
33 - UTILITIES	$91,239	$108,597	33
Total Estimated Cost - Basic Bid:	**$449,400**	**$534,898**	**<<<<<**

Estimating Contingency:				15.0%
Escalation For Inflation:	12 Mths	@	3.5%	3.5%

Tununak Water Storage Tank

Clean and Recoat
Prepared for Stantec by Estimations

Construction Cost Estimate

Concept Design Submittal
July 31, 2018

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
1	**01 - GENERAL REQUIREMENTS**										
2											
3	**Project Management**										
4	Project Manager, 8 Hour/Week	8	WEEKS			8.000	64.0	$6,240		$6,240	$6,240
5	Supervisor, 60 Hour/Week	6	WEEKS			60.000	360.0	$30,240		$30,240	$30,240
6											
7	**Subsistence**										
8	Room & Board	183	MANDAY	$250.00	$45,824					$45,824	$45,824
9											
10	**Travel**										
11	Air Fare - Anchorage - Site	10	EA	$700.00	$7,000					$7,000	$7,000
12											
13	**Small Tools & Consumables**										
14	Consumables	1	LS	$300.00	$300					$300	$300
15	Small Tools	1	LS	$900.00	$900					$900	$900
16											
17	**Mobilization**										
18	Mobilization/Demobilization, Misc Labor	1	LS			160.000	160.0	$14,935		$14,935	$14,935
19	Equipment	51	TONS	$1,500.00	$77,100					$77,100	$77,100
20	Freight										
21	Materials	1	TONS	$520.00	$602	2.857	3.3	$308		$910	$910
22	Temp Materials	5	TONS	$520.00	$2,600	2.857	14.3	$1,335		$3,935	$3,935
23	Scaffolding	2	TONS	$520.00	$1,040	2.857	5.7	$532		$1,572	$1,572
24	Connex Storage, Tools	10	TONS	$520.00	$5,200	2.857	28.6	$2,670		$7,870	$7,870
25	Air Freight Anchorage - Job Site	1,300	LBS	$1.20	$1,560					$1,560	$1,560
26											
27	**Equipment (for Duration + 2 months)**										
28	Fourwheeler	15	WEEKS						$3,750	$3,750	$3,750
29	Forklift (1 Ea)	15	WEEKS						$12,750	$12,750	$12,750
30	Manlift (1 Ea)	15	WEEKS						$4,500	$4,500	$4,500
31	Boom Truck (1 Ea)	15	WEEKS						$32,500	$32,500	$32,500
32	Vacuum Pump	15	WEEKS						$3,000	$3,000	$3,000
33	H.Pressure Pumps	15	WEEKS						$2,250	$2,250	$2,250
34											
35											
36											

Tununak Water Storage Tank

Clean and Recoat
Prepared for Stantec by Estimations

Construction Cost Estimate

Concept Design Submittal
July 31, 2018

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
37	**Other Requirements**										
38	Project Meetings, Safety, Misc meetings	6	EA			4.000	24.0	$1,440		$1,440	$1,440
39	Test Lab Services	1	LS	$5,000.00	$5,000					$5,000	$5,000
40	Temporary Facilities										
41	Project Office - Rental House	2	MTHS						$3,750	$3,750	$3,750
42	Office Equipment/Supplies	2	MTHS	$500.00	$750					$750	$750
43	Project Tool Sheds	2	MTHS						$300	$300	$300
44	Project Safety Equipment	1	LS	$450.00	$450					$450	$450
45											
46	Temporary Services										
47	Chemical Toilets	2	MTHS	$690.00	$1,035					$1,035	$1,035
48	Electrical	2	MTHS						$2,550	$2,550	$2,550
49	Lighting	1	LS	$1,000.00	$1,000					$1,000	$1,000
50	Heat Temporary	2	MTHS	$12,000.00	$24,000					$24,000	$24,000
51	Cleaning	1	LS			60.000	60.0	$5,082		$5,082	$5,082
52											
53	Record Documents	1	LS	$1,000.00	$1,000					$1,000	$1,000
54	Contract Closeout and Training	1	LS	$2,500.00	$2,500					$2,500	$2,500
55	Certified Payroll Fee	1	LS	$1,348.82	$1,349					$1,349	$1,349
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66	**General Contractor Profit (Fee)**	10.0%									$39,858
67	**General Contractor Bond & Insurance**	2.5%									$10,961
68											
69	**Subtotal: 01 - GENERAL REQUIREMENTS**				$179,210		719.9	$62,782	$65,350	$307,342	**$358,161**
70											
71											
72											

Tununak Water Storage Tank

Clean and Recoat
Prepared for Stantec by Estimations

Construction Cost Estimate

Concept Design Submittal
July 31, 2018

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
73	**33 - UTILITIES**										
74	**33 16 13.13 Steel Aboveground Water Utility Storage Tanks**										
75	**Ventilation**										
76	Setup Ventilation System	1	EA			20.000	20.0	$1,694		$1,694	$1,694
77	Operate Ventilation System	20	DAYS						$4,000	$4,000	$4,000
78											
79	**Temp Storage**										
80											
81	**Drain Tank**										
82	6 Man Crew	4	DAYS			60.000	240.0	$20,329		$20,329	$20,329
83											
84	**Cleaning**										
85	Area	2,621	SF								
86	Top	531	SF								
87	Framing	416	SF								
88	Bottom	531	SF								
89	Walls	1,144	SF								
90	6 Man Crew	4	DAYS			60.000	240.0	$20,329		$20,329	$20,329
91	Vac Pump	4	DAYS						$800	$800	$800
92	Boom Truck	4	DAYS						$1,400	$1,400	$1,400
93	Manlift	4	DAYS						$800	$800	$800
94	Scaffolding	1,143	SF	$2.00	$2,286	0.071	81.2	$6,878		$9,164	$9,164
95											
96	**Coatings (3 Coat System)**										
97	Paint	2,621	SF	$1.50	$3,932	0.103	270.0	$22,870	$2,621	$29,423	$29,423
98	Top	531	SF								
99	Framing	416	SF								
100	Bottom	531	SF								
101	Walls	1,144	SF								
102	Boom Truck	6	DAYS						$2,100	$2,100	$2,100
103	Manlift	6	DAYS						$1,200	$1,200	$1,200
104											
105											
106	**Subtotal: 33 - UTILITIES**				$6,218		851.2	$72,100	$12,921	$91,239	**$91,239**
107											
108											

95%
PER

A.2 Capital Cost Calculations

A.2.1 Alternative 2 Capital Cost

Alternative 2 - Rehabilitate Washeteria and Water Treatment Plant Construction Estimate (PER)

Item #	ITEMS / WORK DESCRIPTION	UNIT	Est. Quantity	Unit Price	Estimated Cost	EUL	Residual after 20 Years
1	Mobilization and Demobilization	LS	1	$ 105,000	$105,000	0	$0
2	Building Modifications/Rehabilitation, includes replacement of foundation	LS	1	$ 2,200,000	$2,200,000	25	$440,000
3	Replacement of Electrical Transformer and Service	Each	1	$ 25,000	$25,000	20	$0
4	Water Treatment System Equipment	LS	1	$ 650,000	$650,000	0	$0
5	Washeteria complete bath and shower materials with Coin Operators (4 showers total)	LS	1	$ 108,000	$108,000		$0
6	Decommission and Replace Water Transmission Line from Infiltration Gallery to WTP at 1,150 LF (with disposal at Tununak sanitary landfill)	LF	1,150	$ 350	$402,500	35	$172,500
7	Decommission and Replace Infiltration Gallery and Pump House, dispose of abandoned waterline between gallery and Airport Haul Road	LF	1	$ 140,000	$140,000	20	$0
8	Remove and Dispose of water/sewer lines utilidor between WTP and school including disposal in landfill	each	1	$ 75,000	$75,000	0	$0
9	Reline Interior Coating 50,000 Gallon Water Storage Tank	each	1	$ 567,000	$567,000	20	$0
10	10 KW Standby generator and 5K gallon AST	each	1	$ 110,000	$110,000	25	$22,000
11	Washers (Commercial washer - 20 lb front load, coin operated)	each	4	7650	$30,600	0	$0
12	Dryers (Commercial dryer - hydronic heat front load 50lb with coin box)	each	2	5700	$11,400	0	$0

Construction Estimate	**$4,424,500**	**Residual Value**	**$812,160**
Construction Contingency	10%		**$442,450**
Construction Total			**$4,866,950**
Agency Administration	8%		**$389,356**
Engineering Design and Permitting	10%		**$486,695**
Construction Administration	10%		**$486,695**
Non-Construction Estimate			**$1,362,746**
Estimating Contingency	0%		**$0**
Total Estimated Project Cost			**$6,229,696**

Note

There is a potential of Lead and/or Asbestos due to age of the existing buildings.
Appliances and Equipment EUL under 20 is reviewed in O&M after initial investment

95%
PER

A.2.2 Alternative 3 Capital Cost

Alternative 3 - New Modular, Combined Washeteria and Water Treatment Plant with Deep Well Source Construction Estimate (Conceptual)

Item #	ITEMS / WORK DESCRIPTION	UNIT	Est. Quantity	Unit Price	Estimated Cost	EUL	Residual after 20 Years
1	Mobilization and Demobilization	LS	1	$ 105,000	$105,000	0	$0
2	Modular Building (Includes shipment, erection, foundation and finished bathrooms with 4 coin operated showers)	SF	2,400	$ 600	$1,440,000	40	$720,000
3	Replacement of Electrical Transformer and Service	Each	1	$ 25,000	$25,000	20	$0
4	Demolish washeteria, WTP and abandoned water line (470 lf) between Gallery and Airport Haul Road with disposal of waste at Tununak sanitary landfill	LS	1	$ 165,000	$165,000	0	$0
5	Decommission and Replace Water Transmission Line from Infiltration Gallery to WTP at 1,150 LF (disposal at Tununak sanitary landfill)	LF	1150	$ 350	$402,500	35	$172,500
6	Connect New Deep Water Well via 415 LF aboveground arctic utilidor water line including electrical line and installed submersible pump	LF	285	$ 350	$99,750	35	$42,750
7	Remove and Dispose of water/sewer lines utilidor between WTP and school including disposal in landfill	LS	1	$ 75,000	$75,000	20	$0
8	Reline Interior Coating 50,000 Gallon Water Storage Tank	LS	1	$ 567,000	$567,000	30	$189,000
9	Decommission Infiltration Gallery and Pump House and dispose waste material in Tununak sanitary landfill.	LS	1	$ 18,000	$18,000	0	$0
10	Aboveground utilidors to the existing 50,000 gallon water storage tank, clinic, and existing sewer system. Includes all other site work, handicap access and parking, mechanical, electrical, and other miscellaneous construction items	LS	1	$ 325,000	$325,000	30	$108,334
11	10 KW Standby generator and 5K gallon AST	EA	1	$ 110,000	$110,000	25	$22,000
12	Washers (Commercial washer - 20 lb front load, coin operated)	EA	5	$ 7,650	$38,250	0	$0
13	Dryers (Commercial dryer - hydronic heat front load 50lb with coin box)	EA	5	$ 5,700	$28,500	0	$0
14	Water Plant Equipment (pumps, piping, valves, hydropneumatic tank)	LS	1	$ 150,000	$150,000		$0
				Construction Estimate	**$3,549,000**		**$1,605,868**
				Project Contingency		10%	**$354,900**
				Construction Total			**$3,903,900**
				Agency Administration		8%	**$312,312**
				Engineering Design and Permitting		10%	**$390,390**
				Construction Administration		10%	**$390,390**
				Non-Construction Estimate			**$1,093,092**
				Estimating Contingency		0%	**$0**
				Total Estimated Project Cost			**$4,996,992**

Note
There is a potential of Lead and/or Asbestos due to age of the existing buildings.
Appliances and Equipment EUL under 20 is reviewed in O&M after initial investment
Realignment of Raw Water Line and the addition of 415' of water line to deep well comes up to a horizontal length of 1435' total.

95%
PER

A.3 O&M Cost Calculations

A.3.1 Alternative 1 O&M

Alternative 1 - Do Nothing
O&M Estimate

Item #	Item / Work Description	Estimated Labor	Unit	Hours Per Year	Annual Estimated Labor, $14/hour	Power / Supply Cost	Estimated Annual O&M Cost
1	Operator Labor[1]	24	hour/week	1248	$17,472	$885	$18,357
2	Electricity[2]		annual cost	0	$0	$9,000	$9,000
3	Heating Fuel Oil[3]		annual cost	0	$0	$17,000	$17,000
4	Chemicals, Supplies, Freight, and Expendables[2]		annual cost	0	$0	$1,699	$1,699
5	Office and Administrative[2]		annual cost	0	$0	$2,500	$2,500
6	Equipment Replacement[4]		annual cost		$0	$2,500	$2,500
7	Other Line Items[5]		annual cost		$0	$5,000	$5,000
	Estimated Initial Annual O&M		**0.60 FTE**	**1248 hours**	$17,472	$38,584	**$56,056**

1 Tununak employs operator at $14 per hour for 4 hours per day for 6 days a week equates to $17,472 plus $885 for fringe benefit (see Profit and Loss (P&L) Statement for 2019 in Appendix D)

2 Based on P&L Statement for 2019. Value far below 2017 Costs.

3 Cost based on 2019 cost estimate with a 3% inflation factor for 2020 cost

4 Cost based on similar facilities per VSW and ANTHC experience.

5 Assumed cost for insurance, training, lab costs and miscellaneous operating expenses.

Alternative 1 - Do Nothing Short-Lived Asset Reserve

Item #	Item Description'	Expected Useful Life (EUL)	Estimated Replacement Cost (C)	Number of Units (#)	Annualized Replacement Cost =#*C*(A/F)*(F/P)
1	0	10	$0.00	1	$0
2	0	10	$0.00	2	$0
3	0	15	$0.00	2	$0
4	0	20	$0.00	1	$0
5					
6					
				Total Annual Reserve Payment	**$0**

Short-lived assets are those with an EUL of 20 years or less

95%
PER

A.3.2 Alternative 2 O&M

Alternative 2 - Rehabitate Washeteria and Water Treatment Plant							
Item #	**Item / Work Description**	**Estimated Labor**	**Unit**	**Hours Per Year**	**Annual Estimated Labor, $25/hour**	**Power / Supply Cost**	**Estimated Annual O&M Cost**
1	Operator Labor[1] (for WTP and	30	hours/week	1560	$39,000		$39,000
	Electricity and Utilities[2]		annual cost			$10,000	$10,000
	Heating Oil		annual cost			$14,400	$14,400
2	Chemicals, Supplies, Freight, and		annual cost		$0	$3,000	$3,000
3	Office and Administrative[2]		annual cost		$0	$2,500	$2,500
4	Emergency Repair Budget[2]		annual cost		$0	$2,000	$2,000
13	Short Lived Asset Reserve		annual cost		$0	$10,784	$10,784
14	Other Line Items[3] (Insurance, etc.)		annual cost		$0	$5,000	$5,000
	Estimated Initial Annual O&M		**0.75 FTE**	**1560 hours**	$39,000	$47,684	**$86,684**

Notes:

1. Based on operator time estimated at 30 hours per week at a pay rate of $25/hr includes benefits.
2. Cost assumed based on similar facilities per VSW and ANTHC experience. Annual cost was increased over the cost for the no-build due to assumed higher power demand for operation.
3. Assumed costs for insurance, training, lab costs and miscellaneous operating expenses

Alternative 2 - Rehabilitation of Existing Short-Lived Asset Reserve						
Item #	**Item Description**	**Expected Useful Life (EUL)**	**Estimated Replacement Cost, Unit Price (C)**	**Number of Units (#)**	**Units**	**Annualized Replacement Cost =#*C*(A/F)*(F/P)**
1	Commercial Washer	6	$7,650	3	each	$4,771
2	Commercial Dryer	6	$5,700	3	each	$3,555
3	Commercial Hot Water Heater	8	$4,000	1	each	$602
4	Circulation Pumps	10	$400	4	each	$173
5	Expansion Tank	15	$225	2	each	$49
6	Heat Circ Pumps	10	$400	2	each	$87
7	Heat Exchanger	10	$1,150	2	each	$249
8	Chlorine Injection Sytem	10	$4,000	1	each	$432
9	Flow Meter	10	$2,000	1	each	$216
10	Hydropneumatic Tank (100 gal)	10	$1,000	2	each	$216
11	Jet Pump	8	$650	2	each	$196
12	Pressure Filter Backwash Pump	10	$1,000	1	each	$108
13	Submersible Pump	15	$1,200	1	each	$130
			Total Annual Reserve Payment			**$10,784**

Short-lived assets are those with an EUL of 20 years or less

Replacement costs are taken at 20% more than construction cost estimates to account for labor, procurements, and shipping.

95%
PER

A.3.3 Alternative 3 O&M

Alternative 3 - New Modular, Combined Washeteria and Water Treatment Plant with Deep Well Source O&M Estimate

Item #	Item / Work Description	Estimated Labor	Unit	Hours Per Year	Annual Estimated Labor, $20/hour	Power / Supply Cost	Estimated Annual O&M Cost
1	Operator Labor[1]	24	hours/week	1248	$24,960		$24,960
2	Electricity and Utilities[2]		annual cost			$7,500	$7,500
	Heating Fuel Oil		annual cost			$7,500	$7,500
3	Chemicals, Supplies, Freight, and Expendables[2]		annual cost			$1,500	$1,500
4	Office and Administrative[2]		annual cost			$2,500	$2,500
5	Emergency Repair Budget[2]		annual cost			$1,000	$1,000
12	Short Lived Asset Reserve[2]		annual cost			$15,794	$15,794
13	Other Line Items[3] (Insurance, etc.)		annual cost			$4,000	$4,000
14							$0
15							$0
	Estimated Initial Annual O&M		**0.60 FTE**	**1248 hours**	$24,960	$39,794	**$64,754**

Notes**:**

1 Based on operator time estimated at 24 hours per week at a rate $20/hr
2 Cost based on similar facilities per VSW and ANTHC experience.
3 Assumed costs for insurance, training, lab costs and miscellaneous operating expenses

Alternative 1 - New Modular, Combined Washeteria and Water Treatment Plant with Deep Well Source Short-Lived Asset Reserve

Item #	Item Description'	Expected Useful Life (EUL)	Estimated Replacement Cost (C)	Number of Units (#)	Annualized Replacement Cost =#*C*(A/F)*(F/P)
1	Commercial Washer	6	$7,650	5	$7,951
2	Commercial Dryer	6	$5,700	5	$5,925
3	Commercial Hot Water Heater	8	$4,000	1	$602
4	Circulation Pumps	10	$400	4	$173
5	Expansion Tank	15	$225	2	$49
6	Heat Circ Pumps	10	$400	2	$87
7	Heat Exchanger	10	$1,150	2	$249
8	Flow Meter	10	$2,000	1	$216
9	Hydropneumatic Tank (100 gal)	10	$1,000	2	$216
10	Distribution Pumps	8	$650	2	$196
11	Submersible Pump	15	$1,200	1	$130
			Total Annual Reserve Payment		**$15,794**

Short-lived assets are those with an EUL of 20 years or less

95%
PER

A.4 Life Cycle Cost Calculations

Life Cycle Cost Analysis	Alternative 1 - Do Nothing	Alternative 2 - Rehabilitation of Existing	Alternative 3 - Replacement with New	Notes
CONSTANTS				
Construction Cost	$0	$4,424,500	$3,549,000	
Non-Construction Cost	$0	$1,362,746	$1,093,092	
Construction Contingency	$0	$442,450	$354,900	
Total Project Cost, PC	$0	$6,229,696	$4,996,992	*See separate calculation*
Residual Value (RV) in n years	$0	$812,160	$1,605,868	*See separate calculation*
Annual O&M, first year	$56,056	$86,684	$64,754	Varies with project, see O&M calculation
Annual O&M Increase (g)	3.0%	3.0%	3.0%	Geometric gradient (g) also % increase for arithmetic gradient, may be varied slightly based on alternative and condition, g ≠ i
Annual O&M Increase, arithmetic gradient	$1,682	2600.52	$1,943	= 1st Year Annual O&M * Annual Increase (%)
Geometric Gradient Factor	22.86	22.86	22.86	*See formula above*
		ANALYSIS		
Assuming Constant Costs				
Equivalent Annual O&M, Constant Cost	$56,056	$86,684	$64,754	Constant from above, 1st Year Annual O&M
Present Worth of O&M, Constant Cost	$967,166	$1,495,608	$1,117,237	= 1st Year Annual O&M * P/A
Total Present Worth	$967,166	$7,725,304	$6,114,229	= PC + O&M Present Worth
Total Cost at End of Lifecycle (20 years)	**$1,121,120**	**$7,151,216**	**$4,686,204**	= PC + Equivalent Annual O&M (Constant) * n - RV
Assuming Arithmetic Growth				
Equivalent Annual O&M, Arithmetic Growth	$71,228	$110,146	$82,280	= 1st Year Annual O&M + Annual O&M Increase * A/G
Present Worth of O&M, Arithmetic Growth	$1,228,939	$1,900,409	$1,419,628	= A/G * Equivalent Annual O&M (Arithmetic)
Total Present Worth	$1,228,939	$8,130,105	$6,061,720	= PC + Present Worth of O&M (Arithmetic)
Total Cost at End of Lifecycle (20 years)	**$1,424,562**	**$7,620,454**	**$5,036,731**	= PC + Equivalent Annual O&M (Arithmetic) * n - RV
Assuming Geometric Growth				
Equivalent Annual O&M, Geometric Growth	$74,257	$114,830	$85,780	= Present Worth of O&M (Geometric) ÷ P/A
Present Worth of O&M, Geometric Growth	$1,281,203	$1,981,229	$1,480,002	=1st Year Annual O&M * GG
Total Present Worth	$1,281,203	$8,210,925	$6,476,994	= PC + Present Worth of O&M, Geometric
Total Cost at End of Lifecycle (20 years)	**$1,485,146**	**$7,714,140**	**$5,106,715**	= PC + Equivalent Annual O&M, Geometric * n -RV

General Factors/Equations	Factor	Life Cycle, n (years)	Interest Rate, i (percent)	Factor Designator	Formula	Use
Present Worth of Uniform Series	17.25	20	1.45%	P/A	$\frac{P}{A} = \left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$	converts uniform annual series (A) into present worth (P)
Arithmetic Gradient Factor	9.02			A/G	$\frac{A}{G} = \left[\frac{1}{i} - \frac{n}{(1+i)^n - 1}\right]$	converts uniform annual growth (G) into equivalent uniform series (A)
Geometric Gradient Factor	see table for Alternatives, varying g			GG	$GG = \frac{1 - \left(1+g/1+i\right)^n}{i-g}, g \neq i$	converts geometric annual growth (g) into present worth (P)

Interest rate (i) is based on the Real Discount Rates published in OMB Circular No. A-94, Appendix C as revised November 2018 (http://www.whitehouse.gov/omb/circulars_a094_a94_appx-c/)

95%
PER

A.5 Inflation Calculation for O&M on Alternative 1

Inflation Adjustments for Alternatives 1

Alternative 1

O&M	2017 Cost	2019 Cost 4.1%	2020 cost 3%
Operator Labor	$13,595	$14,732.64	$15,337
Electricity and Utilities	$8,326	$9,392.66	$9,098
Heating Fuel	$15,567	$16,869.66	$17,010
Chemicals, Supplies, Freight, and Expendables	$5,000	$5,418.41	$5,464
Office and Administrative	$2,500	$2,709.20	$2,732
Equipment Replacement	$4,112	$4,456.10	$4,493
Total Estimated Annual O&M Cost	$49,100	$53,578.67	$53,653

2017 conversion at 3% annual

Notes:

For this PER, only the the Fuel and Electricity/Utilities Rates after inflation are Utilized. Rates for other O&M items is have been set to either comparable rates seen from other VSW projects
Current Labor is $14/hr + $895 in benefits with an expected work week of 6 days a week and 4 hours a day.

95%
PER

Appendix B WATER DEMAND

Tununak Washeteria Water Demand

Base Water Demands

Clinic 100 gpd Applies to all alternatives

Alternative 1: No Build

No design flow estimates necessary

Alternative 2:

Type	Use/Day	Gal/Use	Gal/Day
Showers	10	10	100
Washers	10	14.1	141
Toilets/Sinks	20	2.5	50
Backwash WTP*	150	1	150
Clinic			100
		Total	**541** gpd

*Assumes 5 minutes per day at 30 gpm

Alternative 3:

Type	Use/Day	Gal/Use	Gal/Day
Showers	20	10	100
Washers	30	14.1	423
Toilets/Sinks	20	2.5	50
Backwash WTP*			
Clinic			100
		Total	**673** gpd

*Assumes 5 minutes per day at 30 gpm

95%
PER

Appendix C POPULATION GROWTH

Bethel Census Area Population by Age and Sex, and Components of Change: 2015 to 2045

Return

Components of Population Change, 2015-2045

	Average Annual				
	Births	Deaths	Net Migration	Population Change	Growth Rate
2015-2020	463	122	-183	158	0.9%
2020-2025	471	131	-181	159	0.8%
2025-2030	482	142	-177	163	0.8%
2030-2035	498	153	-166	179	0.9%
2035-2040	530	161	-153	216	1.0%
2040-2045	570	166	-139	265	1.1%

Note: Average annual numbers are rounded to whole numbers.

Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

Tununak Population 2010-2017 Growth Calculation

2010 Population	327
2017 Population	387
% Growth	2.40%

Tununak Population Future Growth Calculation

2017 Population	387	
Bethel Census Area	18134	
% Tununak of BCA	2.1%	
Est. BCA 2037	21822	Sourced from AKDOL BCA Projections
Est. Tununak 2037	466	

95%
PER

Appendix D SUPPORTING DOCUMENTS

D.1 Agency Assessments and Reports

D.1.1 2012 ANTHC-DEHE Comprehensive Energy Audit For Tununak WTP

ANTHC 2012 "*Comprehensive Energy Audit for Tununak Water Treatment Plant & Well House*" Energy Audit listing energy costs, savings, and issues seen during assessment. It is reference in text as "ANTHC 2012". Length 18 Pages.

Comprehensive Energy Audit
For
Tununak Water Treatment Plant & Well House



Prepared For

Native Village of Tununak

June 12, 2012

Prepared By:

ANTHC-DEHE
1901 Bragaw Suite, Suite 200
Anchorage, Alaska 99508

Table of Contents

1. EXECUTIVE SUMMARY 3
2. AUDIT AND ANALYSIS BACKGROUND 5
2.1 Program Description 5
2.2 Audit Description 5
2.3. Method of Analysis 6
2.4 Limitations of Study 7
3. Tununak Water Treatment Plant & Well House 7
3.1. Building Description 7
3.2 Predicted Energy Use 9
3.2.1 Energy Usage / Tariffs 9
3.2.2 Energy Use Index (EUI) 11
3.3 AkWarm© Building Simulation 12
4. ENERGY COST SAVING MEASURES 13
4.1 Summary of Results 13
4.2 Interactive Effects of Projects 14
5. ENERGY EFFICIENCY ACTION PLAN 17
Appendix A – Listing of Energy Conservation and Renewable Energy Websites 17

PREFACE

The Energy Projects Group at the Alaska Native Tribal Health Consortium (ANTHC) prepared this document for the Native Village of Tununak. The authors of this report are Carl Remley, Certified Energy Auditor (CEA) and Gavin Dixon.

The purpose of this report is to provide a comprehensive document that summarizes the findings and analysis that resulted from an energy audit conducted over the past couple months by the Energy Projects Group of ANTHC. This report analyzes historical energy use and identifies costs and savings of recommended energy efficiency measures. Discussions of site specific concerns and an Energy Efficiency Action Plan are also included in this report.

ACKNOWLEDGMENTS

The Energy Projects Group gratefully acknowledges the assistance of James James, Tribal Administrator, and Vincent, Water Plant Operator for the Native Village of Tununak.

1. EXECUTIVE SUMMARY

This report was prepared for the Native Village of Tununak. The scope of the audit focused on Tununak Water Treatment Plant & Well House. The scope of this report is a comprehensive energy study, which included an analysis of building shell, interior and exterior lighting systems, HVAC systems, and plug loads.

Based on electricity and fuel oil prices in effect at the time of the audit, the annual predicted energy costs for the buildings analyzed are $7,847 for Electricity and $14,672 for #1 Oil. The total energy costs are $22,519 per year.

It should be noted that this facility received the power cost equalization (PCE) subsidy from the state of Alaska last year. If this facility had not received PCE, total electrical costs would have been $18,309.

Table 1.1 below summarizes the energy efficiency measures analyzed for the Tununak Water Treatment Plant & Well House. Listed are the estimates of the annual savings, installed costs, and two different financial measures of investment return.

Table 1.1
PRIORITY LIST – ENERGY EFFICIENCY MEASURES

Rank	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR[1]	Simple Payback (Years)[2]
1	Other Electrical - Controls Retrofit: Heat Tape	Disconnect hard wired heat tape on the old watering point loop.	$844	$10	522.19	0.0
2	Other Electrical - Controls Retrofit: Well House Electrical Load	Lower heating set point to 40 degrees in the well house.	$1,030	$500	17.34	0.5
3	HVAC And DHW	Clean and tune boilers to increase efficiency. This estimate assumes a technician travels from Anchorage and works with the water plant operator and teaches him how to clean the boiler.	$526	$4,000	2.29	7.6
4	Cathedral Ceiling: WTP	Fill empty 2x6 cavity with R-19 fiberglass batts.	$1,127	$12,230	2.18	10.9
5	Exposed Floor: WTP	Remove insulation from 2x6 cavity and replace with R-21 dense-pack blown-in insulation.	$663	$10,024	1.57	15.1
6	Window: WTP	Remove existing glass and replace with double pane,low-E,argon glass.	$51	$786	1.13	15.3
	TOTAL, cost-effective measures		**$4,241**	**$27,551**	**2.41**	**6.5**
	The following measures were *not* found to be cost-effective:					
7	Window/Skylight: WTP	Remove existing glass and replace with double pane,low-E,argon glass.	$85	$1,573	0.94	18.5

Table 1.1
PRIORITY LIST – ENERGY EFFICIENCY MEASURES

Rank	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR[1]	Simple Payback (Years)[2]
	TOTAL, all measures		**$4,326**	**$29,123**	**2.33**	**6.7**

Table Notes:

[1] Savings to Investment Ratio (SIR) is a life-cycle cost measure calculated by dividing the total savings over the life of a project (expressed in today's dollars) by its investment costs. The SIR is an indication of the profitability of a measure; the higher the SIR, the more profitable the project. An SIR greater than 1.0 indicates a cost-effective project (i.e. more savings than cost). Remember that this profitability is based on the position of that Energy Efficiency Measure (EEM) in the overall list and assumes that the measures above it are implemented first.

[2] Simple Payback (SP) is a measure of the length of time required for the savings from an EEM to payback the investment cost, not counting interest on the investment and any future changes in energy prices. It is calculated by dividing the investment cost by the expected first-year savings of the EEM.

With all of these energy efficiency measures in place, the annual utility cost can be reduced by $4,326 per year, or 19.2% of the buildings' total energy costs. These measures are estimated to cost $29,123, for an overall simple payback period of 6.7 years. If only the cost-effective measures are implemented, the annual utility cost can be reduced by $4,241 per year, or 18.8% of the buildings' total energy costs. These measures are estimated to cost $27,551, for an overall simple payback period of 6.5 years.

Table 1.2 below is a breakdown of the annual energy cost across various energy end use types, such as Space Heating and Water Heating. The first row in the table shows the breakdown for the building as it is now. The second row shows the expected breakdown of energy cost for the building assuming all of the retrofits in this report are implemented. Finally, the last row shows the annual energy savings that will be achieved from the retrofits.

Table 1.2
Annual Energy Cost Estimate

Description	Space Heating	Space Cooling	Water Heating	Lighting	Refrigeration	Other Electrical	Cooking	Clothes Drying	Ventilation Fans	Total Cost
Existing Building	$6,638	$0	$2,771	$809	$0	$2,619	$5,769	$3,914	$0	**$22,519**
With All Proposed Retrofits	$4,428	$0	$2,528	$809	$0	$745	$5,769	$3,914	$0	**$18,193**
SAVINGS	$2,210	$0	$243	$0	$0	$1,873	$0	$0	$0	**$4,326**

2. AUDIT AND ANALYSIS BACKGROUND

2.1 Program Description

This audit included services to identify, develop, and evaluate energy efficiency measures at the Tununak Water Treatment Plant & Well House. The scope of this project included evaluating building shell, lighting and other electrical systems, and HVAC equipment, motors and pumps. Measures were analyzed based on life-cycle-cost techniques, which include the initial cost of the equipment, life of the equipment, annual energy cost, annual maintenance cost, and a discount rate of 3.0%/year in excess of general inflation.

2.2 Audit Description

Preliminary audit information was gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is used and what opportunities exist within a building. The entire site was surveyed to inventory the following to gain an understanding of how each building operates:

- Building envelope (roof, windows, etc.)
- Heating, ventilation, and air conditioning equipment (HVAC)
- Lighting systems and controls
- Building-specific equipment
- Water consumption, treatment (optional) & disposal

The building site visit was performed to survey all major building components and systems. The site visit included detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs provided by the building manager were collected along with the system and components to determine a more accurate impact on energy consumption.

Details collected from Tununak Water Treatment Plant & Well House enable a model of the building's energy usage to be developed, highlighting the building's total energy consumption, energy consumption by specific building component, and equivalent energy cost. The analysis involves distinguishing the different fuels used on site, and analyzing their consumption in different activity areas of the building.

Tununak Water Treatment Plant & Well House is classified as being made up of the following activity areas:

1) Water Plant, Washeteria & Well House: 2,048 square feet

In addition, the methodology involves taking into account a wide range of factors specific to the building. These factors are used in the construction of the model of energy used. The factors include:

- Occupancy hours

- Local climate conditions
- Prices paid for energy

2.3. Method of Analysis

Data collected was processed using AkWarm© Energy Use Software to estimate energy savings for each of the proposed energy efficiency measures (EEMs). The recommendations focus on the building envelope; HVAC; lighting, plug load, and other electrical improvements; and motor and pump systems that will reduce annual energy consumption.

EEMs are evaluated based on building use and processes, local climate conditions, building construction type, function, operational schedule, existing conditions, and foreseen future plans. Energy savings are calculated based on industry standard methods and engineering estimations.

Our analysis provides a number of tools for assessing the cost effectiveness of various improvement options. These tools utilize **Life-Cycle Costing**, which is defined in this context as a method of cost analysis that estimates the total cost of a project over the period of time that includes both the construction cost and ongoing maintenance and operating costs.

Savings to Investment Ratio (SIR) = **Savings** divided by **Investment**

Savings includes the total discounted dollar savings considered over the life of the improvement. When these savings are added up, changes in future fuel prices as projected by the Department of Energy are included. Future savings are discounted to the present to account for the time-value of money (i.e. money's ability to earn interest over time). The **Investment** in the SIR calculation includes the labor and materials required to install the measure. An SIR value of at least 1.0 indicates that the project is cost-effective—total savings exceed the investment costs.

Simple payback is a cost analysis method whereby the investment cost of a project is divided by the first year's savings of the project to give the number of years required to recover the cost of the investment. This may be compared to the expected time before replacement of the system or component will be required. For example, if a boiler costs $12,000 and results in a savings of $1,000 in the first year, the payback time is 12 years. If the boiler has an expected life to replacement of 10 years, it would not be financially viable to make the investment since the payback period of 12 years is greater than the project life.

The Simple Payback calculation does not consider likely increases in future annual savings due to energy price increases. As an offsetting simplification, simple payback does not consider the need to earn interest on the investment (i.e. it does not consider the time-value of money). Because of these simplifications, the SIR figure is considered to be a better financial investment indicator than the Simple Payback measure.

Measures are implemented in order of cost-effectiveness. The program first calculates individual SIRs, and ranks all measures by SIR, higher SIRs at the top of the list. An individual measure must have an individual SIR>=1 to make the cut. Next the building is modified and re-simulated with the highest ranked measure included. Now all remaining measures are re-

evaluated and ranked, and the next most cost-effective measure is implemented. AkWarm goes through this iterative process until all appropriate measures have been evaluated and installed.

It is important to note that the savings for each recommendation is calculated based on implementing the most cost effective measure first, and then cycling through the list to find the next most cost effective measure. Implementation of more than one EEM often affects the savings of other EEMs. The savings may in some cases be relatively higher if an individual EEM is implemented in lieu of multiple recommended EEMs. For example implementing a reduced operating schedule for inefficient lighting will result in relatively high savings. Implementing a reduced operating schedule for newly installed efficient lighting will result in lower relative savings, because the efficient lighting system uses less energy during each hour of operation. If multiple EEM's are recommended to be implemented, AkWarm calculates the combined savings appropriately.

Cost savings are calculated based on estimated initial costs for each measure. Installation costs include labor and equipment to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers.

2.4 Limitations of Study

All results are dependent on the quality of input data provided, and can only act as an approximation. In some instances, several methods may achieve the identified savings. This report is not intended as a final design document. The design professional or other persons following the recommendations shall accept responsibility and liability for the results.

3. Tununak Water Treatment Plant & Well House

3.1. Building Description

The 2,048 square foot Tununak Water Treatment Plant & Well House was constructed in 1982, with a normal occupancy of two people. The number of hours of operation for this building average 6 hours per day, considering all seven days of the week.

The water plant is servicing three washing machines and a small circulation loop to the nearby clinic. Circulation loops for village watering points and the washeteria are no longer used, the BIA in town provides those services. Water is sourced from an electrically heated well house on the edge of town.

Water is storage in a 50,000 gallon water storage tank with 5" of insulation in fair to good condition and metal siding.

Description of Building Shell

The exterior walls are 2x4 construction with 3.5 inches of fiberglass batt insulation.

The roof of the building is a warm roof with 3.5 inches of fiberglass batt insulation.

The floor of the building is built on pilings with 3.5 inches of fiberglass batt insulation.

Typical windows throughout the building are double paned glass windows, though there are several broken windows.

Exterior doors in the facility are of metal construction.

Description of Heating Plants

The Heating Plants used in the building are:

Burnham PF-35

Fuel Type:	#1 Oil
Input Rating:	375,000 BTU/hr
Steady State Efficiency:	80 %
Idle Loss:	1.5 %
Heat Distribution Type:	Glycol
Boiler Operation:	All Year

Space Heating Distribution Systems

The building is currently heated primarily by jacket losses off the boiler, however there are three unit heaters which do run occasionally. When the facility is cold in the winter, the operator will exhaust the dryers into the facility to provide heat.

Dryer exhaust air should always be exhausted to the exterior of the facility. Increased humidity will degrade insulation value and not result in energy savings as anticipated.

Domestic Hot Water System

An amtrol in line 55 gallon hot water tank is heated by the boilers. The facility only uses about 20 gallons of hot water per day in the washing machines.

Lighting

Lighting in the facility is made up of eleven T12 magnetic ballast, fluorescent fixtures, each with a mixture of 34 watt or 40 watt four foot bulbs.

Plug Loads

A radio, a microwave and an air blower make up the majority of the plug loads in the facility.

Major Equipment

Significant energy using equipment in the facility includes a one horsepower pressure pump running 3% of the time.

There are two smaller speed queen washing machines, and one large washing machine which are used more regularly.

There is an old heat tape in the facility that appeared to be disconnected and shut off that serviced the old watering points. The heat tape was actually hard wired and had not been shut off. This was repaired by the operator at the time of the audit.

The water storage tank is circulated with a Grundfos UP 15-42SF circulation pump which maintains the temperature of the storage tank at about 40 degrees.

The electric dryer in the facility are Speed Queen Model STO30EBCK4GZW02. The dryer uses about 13 kilowatts when it's on, which is about 20 hours per week.

3.2 Predicted Energy Use

3.2.1 Energy Usage / Tariffs

The electric usage profile charts (below) represents the predicted electrical usage for the building. If actual electricity usage records were available, the model used to predict usage was calibrated to approximately match actual usage. The electric utility measures consumption in kilowatt-hours (kWh) and maximum demand in kilowatts (kW). One kWh usage is equivalent to 1,000 watts running for one hour.

The fuel oil usage profile shows the fuel oil usage for the building. Fuel oil consumption is measured in gallons. One gallon of #1 Fuel Oil provides approximately 132,000 BTUs of energy.

The following is a list of the utility companies providing energy to the building and the class of service provided:

Electricity: AVEC-Tununak - Commercial - Sm

The average cost for each type of fuel used in this building is shown below in Table 3.1. This figure includes all surcharges, subsidies, and utility customer charges:

Table 3.1 – Average Energy Cost

Description	Average Energy Cost
Electricity	$ 0.21/kWh
#1 Oil	$ 6.75/gallon

3.2.1.1 Total Energy Use and Cost Breakdown

At current rates, Native Village of Tununak pays approximately $22,519 annually for electricity and other fuel costs for the Tununak Water Treatment Plant & Well House.

Figure 3.1 below reflects the estimated distribution of costs across the primary end uses of energy based on the AkWarm© computer simulation. Comparing the "Retrofit" bar in the figure to the "Existing" bar shows the potential savings from implementing all of the energy efficiency measures shown in this report.

Figure 3.1
Annual Energy Costs by End Use

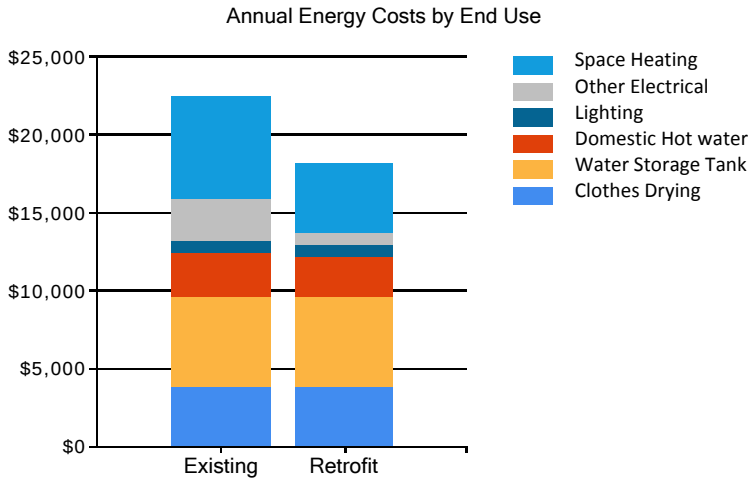


Figure 3.2 below shows how the annual energy cost of the building splits between the different fuels used by the building. The "Existing" bar shows the breakdown for the building as it is now; the "Retrofit" bar shows the predicted costs if all of the energy efficiency measures in this report are implemented.

Figure 3.2
Annual Energy Costs by Fuel Type

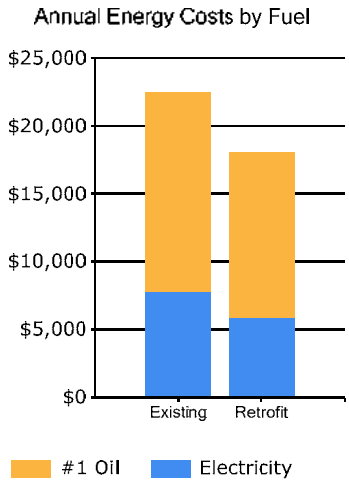
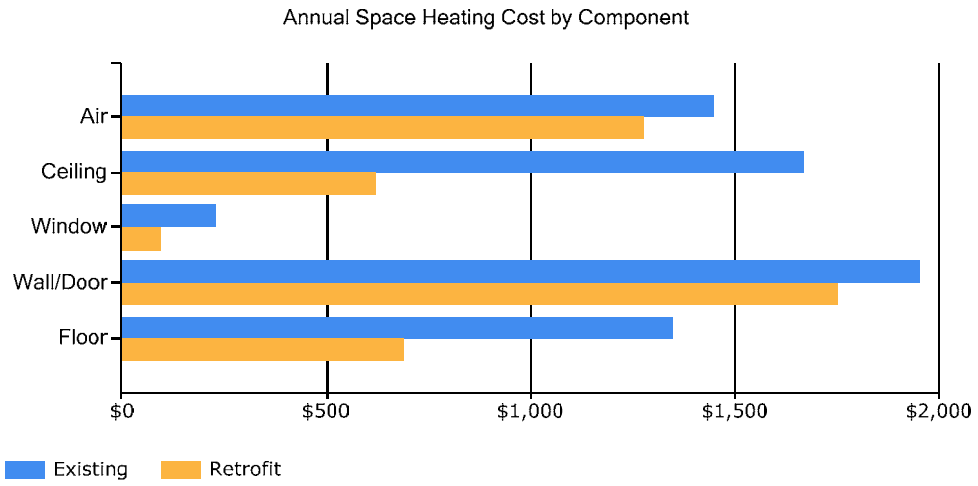


Figure 3.3 below addresses only Space Heating costs. The figure shows how each heat loss component contributes to those costs; for example, the figure shows how much annual space heating cost is caused by the heat loss through the Walls/Doors. For each component, the space heating cost for the Existing building is shown (blue bar) and the space heating cost assuming all retrofits are implemented (yellow bar) are shown.

Figure 3.3
Annual Space Heating Cost by Component



The tables below show AkWarm's estimate of the monthly fuel use for each of the fuels used in the building. For each fuel, the fuel use is broken down across the energy end uses. Note, in the tables below "DHW" refers to Domestic Hot Water heating.

Electrical Consumption (kWh)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Lighting	327	298	327	316	327	316	327	327	316	327	316	327
Other_Electrical	1342	1223	1342	1298	1342	478	494	494	478	1342	1298	1342
Water Storage Tank	160	146	160	155	160	155	160	160	155	160	155	160
Clothes_Drying	2102	1915	2102	2034	2102	36	37	37	2034	2102	2034	2102
DHW	2	1	2	3	7	7	7	7	7	4	2	1
Space_Heating	82	72	65	35	12	11	12	12	11	27	52	82

Fuel Oil #1 Consumption (Gallons)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Water Storage Tank	101	92	101	98	101	0	0	0	0	101	98	101
DHW	23	21	24	27	48	46	48	48	46	32	24	23
Space_Heating	190	167	149	73	6	6	6	6	6	51	117	191

3.2.2 Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for

one year, to British Thermal Units (Btu) or kBtu, and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. The ORNL website determines how a building's energy use compares with similar facilities throughout the U.S. and in a specific region or state.

Source use differs from site usage when comparing a building's energy consumption with the national average. Site energy use is the energy consumed by the building at the building site only. Source energy use includes the site energy use as well as all of the losses to create and distribute the energy to the building. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, which allows for a complete assessment of energy efficiency in a building. The type of utility purchased has a substantial impact on the source energy use of a building. The EPA has determined that source energy is the most comparable unit for evaluation purposes and overall global impact. Both the site and source EUI ratings for the building are provided to understand and compare the differences in energy use.
The site and source EUIs for this building are calculated as follows. (See Table 3.4 for details):

$$\textit{Building Site EUI} = \frac{(\textit{Electric Usage in kBtu + Fuel Oil Usage in kBtu})}{\textit{Building Square Footage}}$$

$$\textit{Building Source EUI} = \frac{(\textit{Electric Usage in kBtu X SS Ratio + Fuel Oil Usage in kBtu X SS Ratio})}{\textit{Building Square Footage}}$$

where "SS Ratio" is the Source Energy to Site Energy ratio for the particular fuel.

Table 3.4
Tununak Water Treatment Plant & Well House EUI Calculations

Energy Type	Building Fuel Use per Year	Site Energy Use per Year, kBTU	Source/Site Ratio	Source Energy Use per Year, kBTU
Electricity	37,367 kWh	127,533	3.340	425,961
#1 Oil	2,174 gallons	286,928	1.010	289,797
Total		**414,461**		**715,758**
BUILDING AREA		2,048	Square Feet	
BUILDING SITE EUI		202	kBTU/Ft^2/Yr	
BUILDING SOURCE EUI		349	**kBTU/Ft^2/Yr**	
* Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued March 2011.				

3.3 AkWarm© Building Simulation

An accurate model of the building performance can be created by simulating the thermal performance of the walls, roof, windows and floors of the building. The HVAC system and central plant are modeled as well, accounting for the outside air ventilation required by the building and the heat recovery equipment in place.

The model uses local weather data and is trued up to historical energy use to ensure its accuracy. The model can be used now and in the future to measure the utility bill impact of all types of energy projects, including improving building insulation, modifying glazing, changing air handler schedules, increasing heat recovery, installing high efficiency boilers, using variable air volume air handlers, adjusting outside air ventilation and adding cogeneration systems.

For the purposes of this study, the Tununak Water Treatment Plant & Well House was modeled using AkWarm© energy use software to establish a baseline space heating and cooling energy usage. Climate data from Tununak was used for analysis. From this, the model was be calibrated to predict the impact of theoretical energy savings measures. Once annual energy savings from a particular measure were predicted and the initial capital cost was estimated, payback scenarios were approximated. Equipment cost estimate calculations are provided in Appendix D.

Limitations of AkWarm© Models

• The model is based on typical mean year weather data for Tununak. This data represents the average ambient weather profile as observed over approximately 30 years. As such, the gas and electric profiles generated will not likely compare perfectly with actual energy billing information from any single year. This is especially true for years with extreme warm or cold periods, or even years with unexpectedly moderate weather.
• The heating and cooling load model is a simple two-zone model consisting of the building's core interior spaces and the building's perimeter spaces. This simplified approach loses accuracy for buildings that have large variations in cooling/heating loads across different parts of the building.
• The model does not model HVAC systems that simultaneously provide both heating and cooling to the same building space (typically done as a means of providing temperature control in the space).

The energy balances shown in Section 3.1 were derived from the output generated by the AkWarm© simulations.

4. ENERGY COST SAVING MEASURES

4.1 Summary of Results

The energy saving measures are summarized in Table 4.1. Please refer to the individual measure descriptions later in this report for more detail. Calculations and cost estimates for analyzed measures are provided in Appendix C.

Table 4.1
Tununak Water Treatment Plant & Well House, Tununak, Alaska
PRIORITY LIST – ENERGY EFFICIENCY MEASURES

Rank	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR	Simple Payback (Years)
1	Other Electrical - Controls Retrofit: Heat Tape	Disconnect hard wired heat tape on the old watering point loop.	$844	$10	522.19	0.0

Table 4.1
Tununak Water Treatment Plant & Well House, Tununak, Alaska
PRIORITY LIST – ENERGY EFFICIENCY MEASURES

Rank	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR	Simple Payback (Years)
2	Other Electrical - Controls Retrofit: Well House Electrical Load	Lower heating set point to 40 degrees in the well house.	$1,030	$500	17.34	0.5
3	HVAC And DHW	Clean and tune boilers to increase efficiency. This estimate assumes a technician travels from Anchorage and works with the water plant operator and teaches him how to clean the boiler.	$526	$4,000	2.29	7.6
4	Cathedral Ceiling: WTP	Fill empty 2x6 cavity with R-19 fiberglass batts.	$1,127	$12,230	2.18	10.9
5	Exposed Floor: WTP	Remove insulation from 2x6 cavity and replace with R-21 dense-pack blown-in insulation.	$663	$10,024	1.57	15.1
6	Window: WTP	Remove existing glass and replace with double pane,low-E,argon glass.	$51	$786	1.13	15.3
	TOTAL, cost-effective measures		**$4,241**	**$27,551**	**2.41**	**6.5**
	The following measures were *not* found to be cost-effective:					
7	Window/Skylight: WTP	Remove existing glass and replace with double pane,low-E,argon glass.	$85	$1,573	0.94	18.5
	TOTAL, all measures		**$4,326**	**$29,123**	**2.33**	**6.7**

4.2 Interactive Effects of Projects

The savings for a particular measure are calculated assuming all recommended EEMs coming before that measure in the list are implemented. If some EEMs are not implemented, savings for the remaining EEMs will be affected. For example, if ceiling insulation is not added, then savings from a project to replace the heating system will be increased, because the heating system for the building supplies a larger load.

In general, all projects are evaluated sequentially so energy savings associated with one EEM would not also be attributed to another EEM. By modeling the recommended project sequentially, the analysis accounts for interactive affects among the EEMs and does not “double count” savings.

Interior lighting, plug loads, facility equipment, and occupants generate heat within the building. When the building is in cooling mode, these items contribute to the overall cooling demands of the building; therefore, lighting efficiency improvements will reduce cooling requirements in air-conditioned buildings. Conversely, lighting-efficiency improvements are anticipated to slightly increase heating requirements. Heating penalties and cooling benefits were included in the lighting project analysis.

4.3 Building Shell Measures

4.3.1 Insulation Measures

Rank	Location	Existing Type/R-Value	Recommendation Type/R-Value
4	Cathedral Ceiling: WTP	Framing Type: Standard Framing Spacing: 24 inches Insulated Sheathing: None Bottom Insulation Layer: None Top Insulation Layer: R-11 Batt:FG or RW, 3.5 inches Insulation Quality: Damaged Modeled R-Value: 13.3	Fill empty 2x6 cavity with R-19 fiberglass batts.

Installation Cost	$12,230	**Estimated Life of Measure (yrs)**	30	**Energy Savings (/yr)**	$1,127
Breakeven Cost	$26,654	**Savings-to-Investment Ratio**	2.2	**Simple Payback yrs**	11

Auditors Notes: Adding fiberglass batt insulation to the ceiling would reduce the heating load in the facility.

Rank	Location	Existing Type/R-Value	Recommendation Type/R-Value
5	Exposed Floor: WTP	Framing Type: 2 x Lumber Insulating Sheathing: None Top Insulation Layer: R-11 Batt:FG or RW, 3.5 inches Bottom Insulation Layer: None Insulation Quality: Damaged Modeled R-Value: 15.5	Remove insulation from 2x6 cavity and replace with R-21 dense-pack blown-in insulation.

Installation Cost	$10,024	**Estimated Life of Measure (yrs)**	30	**Energy Savings (/yr)**	$663
Breakeven Cost	$15,694	**Savings-to-Investment Ratio**	1.6	**Simple Payback yrs**	15

Auditors Notes: Replacing the insulation in the floor would reduce the heating load in the facility.

4.3.2 Window Measures

Rank	Location	Size/Type, Condition	Recommendation
6	Window/Skylight: WTP	Glass: No glazing - broken, missing Frame: Wood\Vinyl Spacing Between Layers: Half Inch Gas Fill Type: Air Modeled U-Value: 0.94 Solar Heat Gain Coefficient including Window Coverings: 0.11	Remove existing glass and replace with double pane,low-E,argon glass.

Installation Cost	$786	**Estimated Life of Measure (yrs)**	20	**Energy Savings (/yr)**	$51
Breakeven Cost	$891	**Savings-to-Investment Ratio**	1.1	**Simple Payback yrs**	15

Auditors Notes: Replacing broken windows with new double paned windows would reduce the heating load in the building.

Rank	Location	Size/Type, Condition	Recommendation
7	Window/Skylight: WTP	Glass: No glazing - broken, missing Frame: Wood\Vinyl Spacing Between Layers: Half Inch Gas Fill Type: Air Modeled U-Value: 0.94 Solar Heat Gain Coefficient including Window Coverings: 0.11	Remove existing glass and replace with double pane,low-E,argon glass.

Installation Cost	$1,573	**Estimated Life of Measure (yrs)**	20	**Energy Savings (/yr)**	$85
Breakeven Cost	$1,477	**Savings-to-Investment Ratio**	0.9	**Simple Payback yrs**	19

Auditors Notes: Replacing broken windows with new double paned windows would reduce the heating load in the building. Though replacing the south facing windows that are broken doesn't pay back individually, if done at the same time as the other windows, it would be an acceptable payback period.

4.4 Mechanical Equipment Measures

4.4.1 Heating/Cooling/Domestic Hot Water Measure

Rank	Recommendation
3	Clean and tune boilers to increase efficiency. This estimate assumes a technician travels from Anchorage and works with the water plant operator and teaches him how to clean the boiler.

Installation Cost	$4,000	**Estimated Life of Measure (yrs)**	20	**Energy Savings (/yr)**	$526
Breakeven Cost	$9,145	**Savings-to-Investment Ratio**	2.3	**Simple Payback yrs**	8

Auditors Notes:

4.5 Electrical & Appliance Measures

4.5.1 Lighting Measures

The goal of this section is to present any lighting energy conservation measures that may also be cost beneficial. It should be noted that replacing current bulbs with more energy-efficient equivalents will have a small effect on the building heating and cooling loads. The building cooling load will see a small decrease from an upgrade to more efficient bulbs and the heating load will see a small increase, as the more energy efficient bulbs give off less heat.

4.5.3 Other Electrical Measures

Rank	Location	Description of Existing	Efficiency Recommendation
1	Heat Tape	Old Heat Tape for Watering Points with Manual Switching	Improve Manual Switching

Installation Cost	$10	**Estimated Life of Measure (yrs)**	7	**Energy Savings (/yr)**	$844
Breakeven Cost	$5,222	**Savings-to-Investment Ratio**	522.2	**Simple Payback yrs**	0

Auditors Notes: Heat Tape was repaired on site by the operator under the supervision of Chris Mercer of ANTHC. This heat tape is no longer needed since the watering point is no longer used.

Rank	Location	Description of Existing	Efficiency Recommendation
2	Well House Electrical Load	Well House electrical Loads with Manual Switching	Improve Manual Switching

Installation Cost	$500	**Estimated Life of Measure (yrs)**	10	**Energy Savings (/yr)**	$1,030
Breakeven Cost	$8,672	**Savings-to-Investment Ratio**	17.3	**Simple Payback yrs**	0

Auditors Notes: The well house facility only needs to be kept from freezing. The temperature set point on the electric heat should be set and locked to 40 degrees.

5. ENERGY EFFICIENCY ACTION PLAN

Through inspection of the energy-using equipment on-site and discussions with site facilities personnel, this energy audit has identified several energy-saving measures. The measures will reduce the amount of fuel burned and electricity used at the site. The projects will not degrade the performance of the building and, in some cases, will improve it.

Several types of EEMs can be implemented immediately by building staff, and others will require various amounts of lead time for engineering and equipment acquisition. In some cases, there are logical advantages to implementing EEMs concurrently. For example, if the same electrical contractor is used to install both lighting equipment and motors, implementation of these measures should be scheduled to occur simultaneously.

Appendix A – Listing of Energy Conservation and Renewable Energy Websites

Lighting
Illumination Engineering Society - http://www.iesna.org/

Energy Star Compact Fluorescent Lighting Program - www.energystar.gov/index.cfm?c=cfls.pr_cfls

DOE Solid State Lighting Program - http://www1.eere.energy.gov/buildings/ssl/

DOE office of Energy Efficiency and Renewable Energy - http://apps1.eere.energy.gov/consumer/your_workplace/

Energy Star – http://www.energystar.gov/index.cfm?c=lighting.pr_lighting

Hot Water Heaters

Heat Pump Water Heaters -
http://apps1.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12840

Solar Water Heating

FEMP Federal Technology Alerts – http://www.eere.energy.gov/femp/pdfs/FTA_solwat_heat.pdf

Solar Radiation Data Manual – http://rredc.nrel.gov/solar/pubs/redbook

Plug Loads

DOE office of Energy Efficiency and Renewable Energy – http:apps1.eere.energy.gov/consumer/your_workplace/

Energy Star – http://www.energystar.gov/index.cfm?fuseaction=find_a_product

The Greenest Desktop Computers of 2008 - http://www.metaefficient.com/computers/the-greenest-pcs-of-2008.html

Wind

AWEA Web Site – http://www.awea.org

National Wind Coordinating Collaborative – http:www.nationalwind.org

Utility Wind Interest Group site: http://www.uwig.org

WPA Web Site – http://www.windpoweringamerica.gov

Homepower Web Site: http://homepower.com

Windustry Project: http://www.windustry.com

Solar

NREL – http://www.nrel.gov/rredc/

Firstlook – http://firstlook.3tiergroup.com

TMY or Weather Data – http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/

State and Utility Incentives and Utility Policies - http://www.dsireusa.org

D.1.2 March 2017 Rural Alaska Village Grant (RAVG) MEMORANDUM

An assessment for ANTHC and VSW of the Tununak Washeteria, WTP, and infiltration gallery in 2017 that found several operational issues that pose a hazard. It is referenced in text as “RAVG”. Length 11 Pages.

MEMORANDUM

DATE:

FROM: Utility Operation Specialist

SUBJECT: Trip Report, Tununak March 20th-21st Rural Alaska Village Grant (RAVG) Assessment

TO: FOR THE RECORD

OBJECTIVE:

1) To familiarize and understand Tununak's water and sewer system, associated heating systems, operational parameters and system conditions.

2) Review 2012 energy audit recommendations and identify needed parts and equipment for energy efficiency recommended repairs.

3) Collect information to develop RAVG operator training plan and energy efficiently improvements.

4) Establish community dialog and start planning for RAVG operator training.

5) Identify system deficiencies or improvement for operation and maintenance.

CONTACT(S):

Mr. Vincent Billie, Water Plant Operator (WPO), Native Village of Tununak

Mr. Gregory Angaiak, Tribal maintenance, Native Village of Tununak

Mr. James James, Tribal Administrator, Native Village of Tununak

Mr. Allan Paukan, RMW, Yukon Kuskokwim Health Corporation (YKHC)

Mr. Brian Lefferts, RMW Supervisor, YKHC

Ms. Susan Randlett, VSW Engineer, VSW

ACCOMPANIED BY:

Mr. Martin Wortman, Sr. Utility Operations Specialist, Alaska Native Tribal Health Consortium (ANTHC)

FINDING(S) AND ACCOMPLISHMENT(S):

Mr. Wortman and I arrived in Tununak at about 11:00 AM March 20th, 2017. The skies were clear and the temperature was approximately 10° F. Water Treatment Plant (WTP) operator Mr. Vincent Billie and the tribal maintenance employee Mr. Gregory Angaiak met us at the airport and took us to the tribal office.

At the tribal office we met with the tribal administrator Mr. James James. We discussed the RAVG program and the objectives for operator training and energy efficiency improvements. We discussed the purpose of our assessment trip and the plan for a future follow-up training and improvement trip.

Mr. James strongly emphasized their water treatment plant (WTP), washeteria and well house are "ancient buildings" (built in the late 1970s) and are in very poor condition. He stated WTP / Washeteria building currently supplies water to the clinic and that most of the washers and dryers are broken. He added the WTP water is not consumable and the drinking water for the clinic is hauled from the school. Mr. James described Tununak' s current water and sewer system to be in very poor condition and community is currently in efforts with the state VSW group pursuing funding to build a new water treatment plant / washeteria.

After the meeting we were able to set up overnight accommodations at the Tununak's Health Clinic thankfully with assistance provided from Mr. Brian Lefferts, RMW Supervisor at YKHC in Bethel.

Following are the findings and the observations of Tununak water and sewer system facilities:

Water Source / Well House

Tununak WTP's water source comes from a small Well house (8 X 8 foot) building approximately 500 feet east of the WTP. Well house is built directly over the middle of a small creek steam and surface water is pumped from a shallow infiltration gallery placed in the creek bed. Upon arrival we discovered the well house door was blocked from the inside by snow and ice blown in through the roof. We were able to enter the building through a small roof originally designed to lift and remove well pump. We removed the snow blocking the entrance door and opened to daylight so we could inspect inside.

The water is pumped by a submersible well pump set inside a vertically set, 24 inch diameter, galvanized culvert buried into the creek bed as the infiltration gallery. We could not inspect inside gallery as it was frozen over. It appeared the submersible pump when is not in use is removed from the gallery and was observed stored inside the corner of the building. The well pump's discharge stand pipe manifold was about 6 feet tall and or the depth it was set below the well house floor. Mr. Billy stated he has problems with the pump plugging with silt and required him to routinely lift it out and clean inside the culvert area and the inlet of the pump. The observed well pump was a GOULDS model # 35GS15 fitted to a 1.5 horse power, 230 Volt, 1 phase pump motor. The operator Mr. Billy stated he only pumps periodically (4-5 times a year) to fill his 50,000 gallon water storage tank (WST).. During the winter months the gallery and

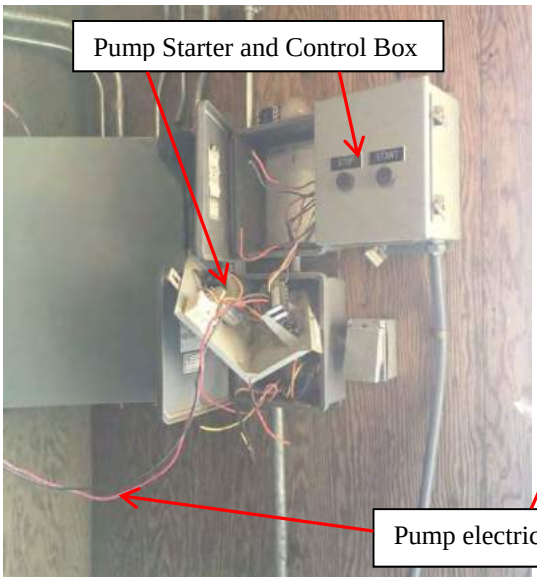
well house is allowed to freeze. He said he uses a cold water jetter to thaw the transfer line and intake gallery in order to re-establish pumping operation during the winter.

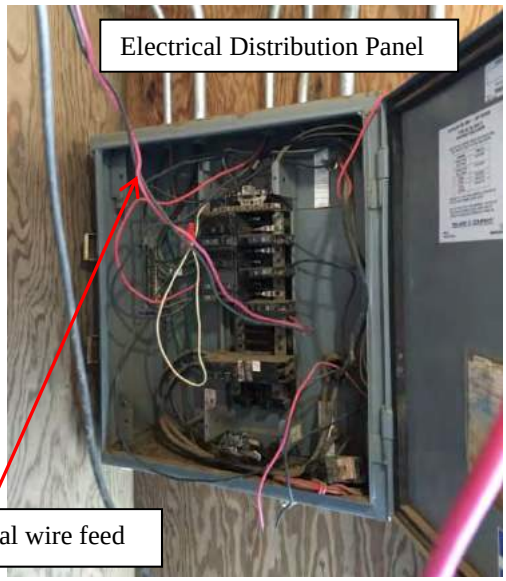
The well house building structure was observed in rough condition. The metal roof has started to rust and the roof hatch penetration frame was weathered and covered with a loose piece of nailed plywood. The pump control panels were bypassed. The pump starter control box and distribution panel were left open, covers removed and the electrical wires run openly exposed with no conduit and potentially easy to damage. No operational lighting.





Well House Entrance / Top of Gallery





Water from wells house is transferred through an insulated above ground arctic carrier pipe. Arctic carrier pipe is an insulated 4 inch high density poly propylene (HDPE) pipe X 12 inch outer galvanized culvert shell pipe approximately 1150 feet in total length and is supported above ground by treated timber blocks. 2 inch HDPE water pipe with a 1/2 inch PEX pipe heat loop is threaded inside the carrier pipe. The glycol heat trace loop was not observed operating and Mr. Billie stated the pipes are currently damaged and cannot circulate. He again stated he must cold water jet the line when he needs to pump water in the winter.



Water Treatment Process

The surface water from the well house after entering the WTP is pre-filtered by a single 48 inch diameter pressure filter fitted with a “Solo” valve. Solo valves are currently obsolete and no longer used for filtration due to the potential cross connection contamination of the raw and treated water. After flowing through the pressure filter the water is injected with chlorine then filtered through two bag filter canisters with a 5 and a 10 micron filter bags before entering the 50,000 gallon WST. Mr. Billie informed us that the bag filters are changed only once a year. WST is heated by a circulating water heat add system. The WST heat-add exchanger is a Bell and Gossett P/N # BY526004024011 / shell and tube unit and is “not” a double wall heat exchanger and “not” currently rated for potable water use.

Water Distribution

The water from the WST is currently pressurized by one operational pressure pump. The #2 position pressure pump was disassembled; pump volute removed and missing and the inlet and outlet manifold ports were capped. We observed a violent water hammer during pressure pump shut down and noticed a swing check valve was installed on pump discharge. Replacement to “silent / spring” check valve will be required to correct hammer problem. The pressurized water is stored in a 325 gallon air-over-water tank. The pressure water system does not currently have a high demand and observed to only serve the washateria’ s 1 operating toilet,, 1 shower stall, 1

operational washer and the water service for health clinic's 1 shower, a few sinks and toilet. The drinking water for clinic is manually hauled from the school watering point to fill and maintain a public area water dispenser.

The public watering point at the WTP no longer exists and was completely removed from the side of building. People of the community rely on the school watering point for water.

Portion of the community homes apparently had been served with water and sewer in the late 1980s and reminisces of a heated circulating water distribution system was observed installed in the WTP but is currently not operational. Parts of the circulation pumps and the manifold piping still exist. Operator Mr. Billie stated the system has not operated in years. We did not investigate or research any further details to this distribution system outside the building envelope.

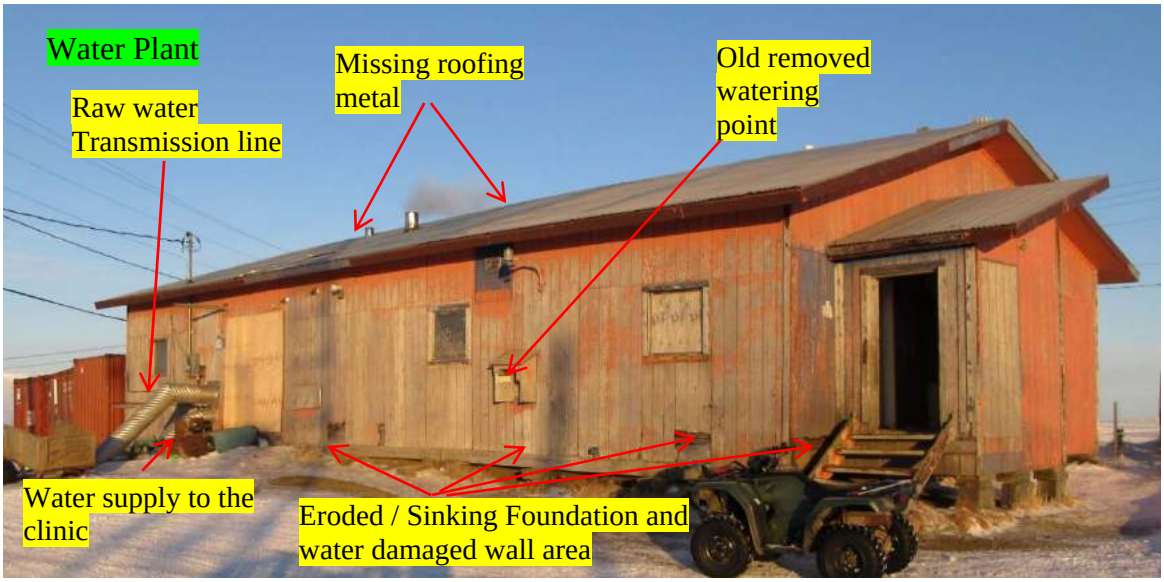
Water Treatment Plant / Washeteria

The WTP / Washeteria building structure is in very poor condition. The original metal roofing is damaged and missing in areas. Repairs to the metal roofing appeared to have been made in the past however some of the roofing has currently torn off and damaged by the wind with sections missing from the roof. Water damaged was observed and visible from inside and outside of the structure. The public bathrooms and hallway and access to mechanical room appeared the worst area. The ceiling over the public hallway area has fallen down exposing electrical and mechanical piping components. Water damage along the south east (SE) long wall can be seen at interior plywood sheathing and exterior T1-11 siding along the lower wall section with exposed foam building panel insulation, rotten wall plate and floor rim joist. Bathroom raised floor area is soft and suspect water damage. The pad under the SE long wall's wood foundation has eroded and the foundation and floor is sloping towards the damaged exterior wall and west corner towards the washeteria. Four of the windows are broken and plywood boarded over. The two remaining windows are in very poor condition.

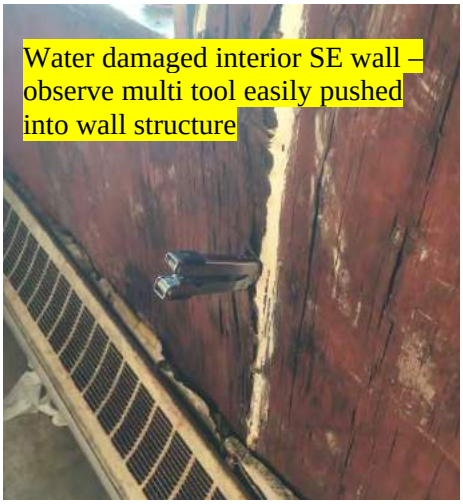
When constructed the washeteria was originally provided with 4 washers, 2 electric dryers, 1 utility sink, 2 bathrooms both fitted with a 1 lavatory sink, 1 toilet and 2 showers each and an office / Lab / Maintenance area fitted with a dual lab sink. Currently only 1 washer, 1 electric dryer, 1 toilet and possibly 1 shower operate.

Broke down washers and components are stored in the mechanical room area The building is appearing to be currently used as a warm storage staging area and the excess rooms and space in the building is filled with random objects. One of the bathrooms is filled to the point where you cannot set a foot inside and the other just enough room to access the 1 toilet and 1 shower.

Not all the lighting operates. The exterior light fixtures and the arctic entrance light are damaged. Fluorescent light fixture in the mezzanine has been altered to power an incandescent bulb.







We were approached by a few of the community washeteria patrons who repeatedly ask the same question; “Are you hear to fix the washers? We need washers to do out laundry” The single washer and dryer was operated non-stop during our assessment trip.







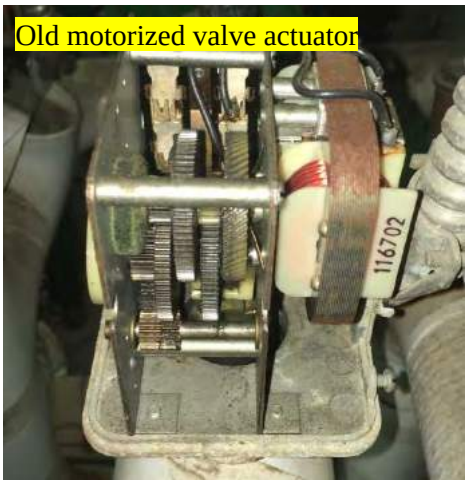
Heating System

Two fairly new replaced Weil-McLain WGO-8 231,000 BTU oil fired hot water boilers were observed installed in the WTP. Mr. Billie stated he worked with the RMW Mr. Allen Paukan to install the new boilers. In closer inspection we observed that only one of the boilers is actually capable to operate. The other boiler was not fully vented outside of the building with a chimney. Due to the minimal system and heat demand a second operating boiler is probably not required although a back-up boiler would be beneficial second boiler components can be used as a parts boiler. The 1970s hot water hydronic heat system appears mostly original and to provide the space. Hot water is provided by 2 each parallel pipe Amtrol model # WH-10 CDW 80 gallon indirect hot water heaters. The hydronic heat piping although simple in design was observed as a web of pipes near the boiler area. The heat in the building was relatively warm and the controlled actuated valves for the fin tube heat enclosures were not operating correctly and require repair or replacement. The heating fin tubes and enclosures were observed in rough shape but still able to provide heat. Only one of the two original unit heaters in the mechanical / treatment area still exist and requires a replacement fan motor.


WGO-8 boilers


Hydronic heat piping near boiler

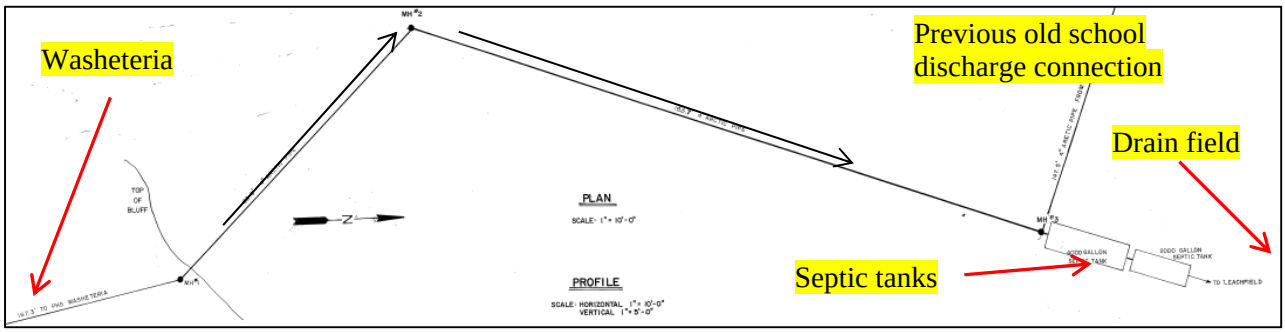

Unit heater with broken fan



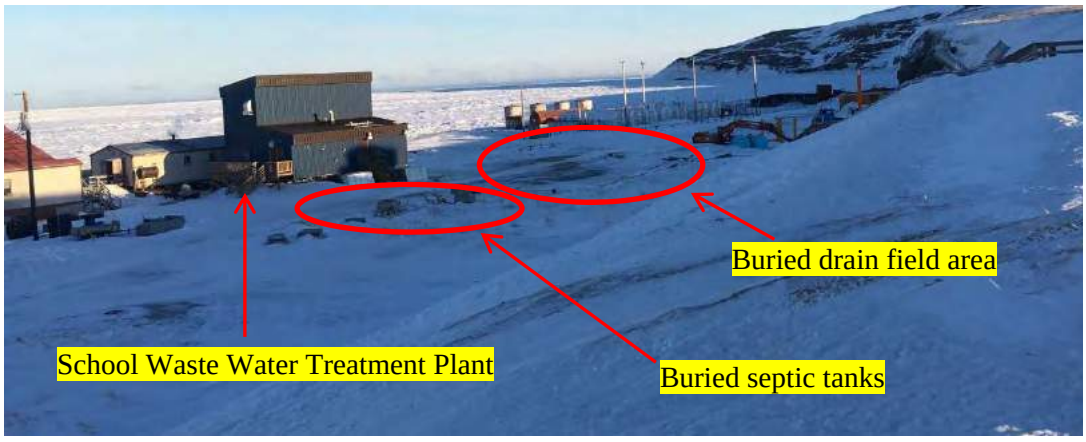
Old motorized valve actuator

Sewer System

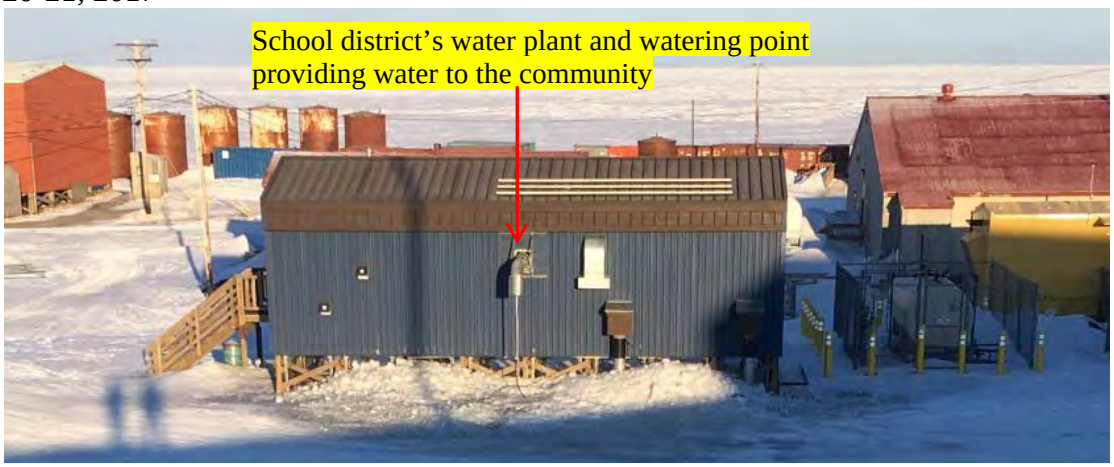
Per record plan as-builts; the sewer and waste water from the WTP / Washeteria gravity feeds through a 4 inch arctic pipe and sewer manholes and finally discharge into a 4000 and a 2000 gallon septic tanks connected in series. Effluent from septic tanks discharges into a buried drain field. According to Mr. Billie the septic tanks have been cleaned once every ten years or so. Due to the winter weather conditions and temperature we did not open or inspect the manholes, septic tanks or monitor ports at the drain field to verify or confirm condition or operation.



The Lower Kuskokwim School District (LKSD) currently operates and maintains a wastewater treatment system for the Tununak School facility and discharges the school's treated waste water effluent into the bay.



The Lower Kuskokwim School District operates and maintained its own WTP that provides a watering point used by the community. Water is provided free of charge.



We departed Tununak late Tuesday morning about 11:15 AM March 21st, 2017.

Summary of findings;

Tununak's current water and sewer facilities is old and in very poor operational condition. The structural condition of the WTP Washeteria is a concern. The actual water and sewer service provided by the old facility to the community of approximately 350 people is minimal and inadequate. Similar rural Alaskan communities without piped water and sewer rely heavily on their washeteria for community bathing and laundry purposes. The water service provided by the current WTP to the local health clinic is not potable.

Due to the condition of the old water and sewer facilities, the limited RAVG funding and efforts for operator training and energy improvement will slightly reduce the current operational costs but the overall benefit to the community of Tununak will be minimal because the facility requires more than small energy improvements. Larger scale systems rehabilitation and or complete replacement and upgrades are required to meet community sanitation needs.

RECOMMENDATION(S) AND/OR CONCLUSION(S):

Coordinate with Native Village of Tununak's operator and administrator, RMWs, VSWs and ANTHC to:

1. Order and ship a Shop-Vac and cleaning materials to Mr. Billie for water treatment plant cleanup prior to RAVG return training trip.

2. Investigate future community water and sewer improvement to help determine current energy improvement planning.

3. Develop a RAVG training plan based on the 2012 energy audit recommendations, the current RAVG assessment trip and future VSW / Tununak community water and sewer improvements.

4. Develop a materials take off (MTO) list based off the RAVG operator training plan and energy efficiency improvements.

5. Coordinate with the community operators and leadership to schedule the return RAVG training trip.

William Hickey

cc: Vincent Billie, WPO, Native Village of Tununak
Gregory Angaiak, Tribal maintenance, Native Village of Tununak
James James, Tribal Administrator, Native Village of Tununak
Allan Paukan, RMW, YKHC
Brian Lefferts, RMW Supervisor, YKHC
Susan Randlett, VSW Engineer, VSW

ec: DEHE – Cody Uhlig / Pierre Costello / Darrin Bartz / Martin Wortman

D.1.3 2018 September Best Practice Trip Report Memorandum

September 4, 2018 Memorandum "*Trip Report, Tununak-Water Treatment Plant and Washeteria Training Trip for Best Practice Scores-August 21-22, 2018*". It is referenced in text as "ANTHC 2018" Length 15 Pages.

MEMORANDUM

DATE: September 4, 2018

FROM: Energy Auditor I

SUBJECT: Trip Report, Tununak—Water Treatment Plant and Washeteria Training Trip for Best Practice Scores—August 21–22, 2018

TO: FOR THE RECORD

OBJECTIVES:

- Assist the Tununak IRA in identifying methods of obtaining and maintaining a minimum best practice score (BPS) of 60 points.
- Train IRA administration and the water treatment plant (WTP) operator on requirements and expectations of the BPS.
- Train the WTP operator on the preventative maintenance plan, logbooks, checklists, and monthly reporting to improve utility support and operations.
- Assist the WTP operator with questions/concerns regarding regular operation of the WTP and washeteria building (PHS Building).

CONTACTS:

Mr. James James, Administrator, Tununak IRA
Mr. Xavier Post, Clerk, Tununak IRA
Mr. Joseph James, Primary Water Plant Operator, Tununak IRA

ACCOMPANIED BY:

Mr. Allan Paukan, Remote Maintenance Worker (RMW), Yukon Kuskokwim Health Corporation (YKHC)

FINDINGS AND ACCOMPLISHMENTS:

Note: *The BPS is a method of continually assessing the capacity of a rural village to manage and maintain its utilities based upon a 100-point scoring system. The BPS consists of three main categories: technical (45 points), managerial (10), and financial (45). Each category consists of specific criteria to reflect a village's capacity to maintain compliance in various subcategories. This training addresses specific areas where improvement can be made.*

To qualify for USDA and State matched grants the community needs to obtain, and maintain, a minimum best practice score of 60 throughout the duration of the design and construction phases.

We arrived in Tununak at approximately 2:00 PM and dropped gear off at the washeteria/water treatment plant (hereafter referred to as the PHS Building). The weather was partly sunny and approximately 65° F.

Mr. Paukan remained at the PHS Building, meeting with Mr. Joseph James to discuss needed repairs in the water treatment portion of the facility. I continued on to the IRA office building to meet with Mr. James James and Mr. Post. I explained the importance of the BPS and then reviewed each item in the financial and managerial sections. Mr. James and Mr. Post were very receptive and began to collect the documentation that Eli Jacobson, the Local Government Specialist (LGS), would need to review during their meeting next week. I also highlighted the upcoming Rural Utility Business Advisor (RUBA)-sponsored training sessions and encouraged Mr. James and Mr. Post to nominate an IRA employee to attend one of the sessions.

I departed the IRA office and returned to the PHS Building, where Mr. Paukan and I provided BPS training and technical assistance to Mr. Joseph James over the next two days.

Training included the following:

Meeting—Overview of the BPS and requirements and expectations thereof.

- During the meeting, we reviewed the BPS and how the community is scored. Requirements and expectations for the WTP/washeteria operator and IRA administration were also reviewed.
- In attendance:
    - James James, Administrator, Tununak IRA
    - Xavier Post, Clerk, Tununak IRA
    - Joseph James, Primary Water Plant Operator, Tununak IRA (separate meeting from IRA administration)

Operator certification—comments

- Tununak does not have a public water system. Community members either haul water from the Paul Albert School watering point or collect water from local streams and lakes about one mile from the community. Community members are unwilling to pay for the IRA water delivery service ($25 for 100 gallons of water).
- The IRA does provide a sewage-haul service for residents, commercial entities, and contractors. The IRA administration has a billing and collection system in place, and it discontinues service to community members who have unpaid haul fees until said bills are paid.
- Mr. Joseph James does not hold any water treatment certifications. Mr. Paukan encouraged him to attend a small treated certification class as soon as possible.

Preventive Maintenance Plan (PMP)—Training WTP operator and IRA administration

- Mr. Joseph James was trained on how to complete daily logs and daily checklists. All items listed in the daily log were labeled accordingly in the WTP to assist him and future operators in locating the correct item.
- Mr. James was trained on the monthly checklists, which include annual and winterization items. We also reviewed the monthly operator report. The training reviewed the contents of the checklists and report, as well as the submission process.
- A submission poster was given to the water plant operator and the IRA administration as a reminder for who/when the checklists/logs need to be submitted. Contact information for the RMW, the RUBA LGS, and the Village Safe Water (VSW) project engineer were included on the poster.
- Mr. Paukan instructed Mr. James to submit a copy of the previous month's checklists, logs, and monthly operator report with the PHS Building's water quality sample, which is sent to the YKHC Office of Environmental Health and Engineering (OEHE) each month. Another copy of the checklists, logs, and monthly operator report will be submitted to the IRA administration for its records and to include in the IRA's monthly meeting minutes.

In addition to reviewing the checklists, training was conducted on how to perform each task:

- We checked/tested the indicator lights on the alarm panel. Due to the age of the facility, the main alarm panel in the plant is inoperable. There were no fire or carbon monoxide alarms present in the PHS Building during the training visit.
- We checked the fire extinguishers to ensure they were adequately charged. During the review, it was found that one out of the three fire extinguishers in the boiler room had an adequate charge. There was no additional fire suppression equipment in the vicinity. There were additional fire extinguishers in the building's apartment (adjacent to the water treatment room), which was occupied at the time by the village police officer (VPO).
- Mr. James was shown the equipment manuals provided in the PMP. He was instructed how to use the manuals to order needed parts and repair kits/parts and how to use the manuals as a reference guide.
- Mr. James was trained on the importance of annual boiler tuning and cleaning. Mr. Paukan recommended that boiler-specific training be provided on a subsequent trip.

Compliance monitoring—Training WTP operator and IRA administration

- Although Tununak does not have a public water system, Mr. Joseph James regularly tests the water treated at the PHS Building for turbidity, and he tests the water monthly for residual chlorine. He sends a monthly water sample to YHKC Office of Environmental Health and Engineering for microbial testing.
- Mr. James requested additional turbidity monitoring cuvettes and water sampling bottles so he could continue to monitor water quality.

Utility management training—comments

- Mr. Post attended a RUBA-sponsored training last year (March 2017).
- Even though Tununak has full points for this section, the IRA administration was encouraged to send at least one employee to one of the upcoming RUBA-sponsored training programs.

Meetings of the governing body—Training WTP operator and IRA administration

- The Tununak IRA meets on a monthly basis except during subsistence season. The IRA administration will provide the RUBA LGS with its meeting minutes during his upcoming visit. The administration was also made aware of the monthly operator's report and that the report needs to be included in its meeting minutes.
- The operator was provided with an operator report template he can fill out every month and provide to the IRA administration or present during the monthly meetings. A template was included in the PMP binder.

Budget/Revenue—Review with the IRA administration

- The Tununak IRA is doing an excellent job of tracking water and sewer-related billing, as well as discontinuing service to customers who have unpaid fees. The administration also reported having a general budget in place. The Tununak IRA may need general formatting and document submission assistance from the RUBA LGS, as well as budget development assistance for the PHS Building and sewage haul service.
- The RUBA LGS plans to visit Tununak during the week of August 27, 2018 to review the Tununak IRA's current budget and billing documents.

Workman's compensation insurance—comments

- A policy was in place and displayed in the IRA office during the training visit.

Payroll tax liability—comments

- The Tununak IRA may have supporting documentation showing the IRS waived the tax lien inherited from the Tununak Traditional Council. The RUBA LGS should verify these documents during his upcoming site visit.

Toolkit review

- Items included in the toolkit include the below:
    - PMP notebook (includes log sheets, checklists, monthly operator reports, and manufacturer's literature for regularly maintained equipment).
    - Monthly submittal list (includes when and where to send samples/logs). This will be posted in the PHS Building and IRA office.

- Monthly operator report to present to the Tununak IRA. This was reviewed with the operator and IRA administrators. A template is located in the PMP notebook, and a digital copy was provided to the IRA administration.
- Labeling gauges and fuel meters. The labels correspond with the PMP logbook items. This will prevent confusion and increase accuracy when multiple people are working in the WTP and recording information.

Mr. Paukan and I also instructed Mr. Joseph James on potential energy improvements that included:

- Maintaining the boiler.
- Adjusting the boiler low and high temperature set points to reduce boiler short cycling.
- Reducing the water storage tank (WST) heat add temperature to maintain the WST at 40° F, particularly during the summer when freezing temperatures are unlikely.

Additional findings

- The well house is not level, and much of the surrounding infrastructure (fencing and decking) is broken. The well pump wiring connections are not waterproof and are near the water surface level. The well pump controls are outdated and need to be replaced. Tununak does not have a spare well pump.
- The PHS Building transformer is just large enough to run the current equipment. The Tununak IRA is unable to install additional washers and dryers due to the capacity of the current transformer.
- The PHS Building is in very poor condition due to age and past neglect. The structure has significant mold and mildew damage. Only one shower and one toilet are operable. The shower appears to be in good condition although there is exposed electrical wiring on the wall outside of the stall. The flooring around the toilet is rotten and needs to be replaced. The building's exhaust system was inoperable.
- The WST platform and exterior insulation are damaged. The tank needs to be drained and cleaned. The WST overflow pipe is not screened off or otherwise protected to prevent animal intrusion.
- There was no temperature gauge installed on the raw water line.
- Water treatment consists of a multimedia filter and chlorination. Two cartridge filter vessels are plumbed into the filtration system, but no filters are currently in place. Both filter systems are so outdated that Mr. Paukan has been unable to locate replacement filters. The filter vessels currently serve as chlorine contact time before water is stored in the WST. Mr. Paukan tested the media inside of the multimedia filter about five years ago and determined the media was still in good condition.
- The chlorine pump (LMI model A151-91FS) ball valves are clogged and the pump is currently inoperable. Mr. Paukan may have a spare replacement pump; otherwise, the pump should be replaced.

- The WST heat-add circulation pump temperature controls were decreased from 60° F to 40° F to conserve fuel oil. The operator was told about the potential energy savings that this change has. He was asked to work with the RMW to readjust the heat-add set point in the winter if needed (due to the WST age, a higher WST temperature set point may be advisable due to the deteriorating quality of the tank's insulation). The operator did not have spare circulation pumps on hand for any of the building's heating processes. Note: the water level inside of the storage tank may be lower than the thermostatic control sensors, causing the WST heat add system to respond to the air temperature inside of the WST, not the water temperature.
- There are no flow meters on the raw water, washeteria, or clinic water supply lines.
- The PHS Building has a watering point and is connected to an old, community-wide water distribution system. Neither the watering point or the distribution system is used. Mr. Paukan and Mr. James began removing the old water distribution plumbing in the PHS Building to provide Mr. James with more room for storage and organization.
- Only one pressure pump for the PHS Building and clinic water supply line is operable. The operable pump was labeled "BAD need to change ASAP".
- The hot water tanks' cold water supply line has no check valve. The cold water supply line was hot to the touch as heat was back feeding into the system.
- Very few of the valves within the WTP have been exercised. As a result, a majority of the valves are potentially seized in place posing a large problem should there be a leak in the water and/or glycol heating systems. We did not exercise the valves due to the potential of breaking valves and/or creating leaks.
- The operator has never cleaned out the PHS Building's septic tank. The tank should be emptied regularly to properly dispose of the building's sewage.
- The sewage line to the PHS Building's drain field is broken, reportedly during a construction project at the school. Since the PHS Building is disposing of sewage containing human waste, this line needs to be repaired or replaced immediately. The septic tank and drainage field should be inspected at that time.
- The main alarm panel in the WTP is inoperable, possibly due to brownouts. There were no fire or carbon monoxide alarms present in the building. The boiler room has insufficient fire suppression equipment should an emergency arise. There were no fire extinguishers available in the public washeteria area.
- The WTP backup generator is inoperable and outdated. The RMW cannot find replacement parts or controls to repair the generator.
- There is no pressure gauge on the glycol add line to monitor the amount of glycol added to the system. The one boiler in operation did not have a functional pressure/temperature gauge (one boiler was offline). There was no other pressure gauge installed in the glycol heating system.

- Both boilers need substantial electrical work to bring them up to code. One boiler, labeled Boiler B-1, is powered by a plug-in electrical extension cord. Boiler B-2 was not online during the training visit.
- While inspecting Boiler B-2, an old electrical conduit was bumped by the boiler door. The conduit sparked, blowing four circuit breakers at the electrical panel. Later, Mr. Paukan discovered that the wiring for all four circuits were contained in the conduit, plus an additional wire that we were unable to trace. The circuit wires had not been separated or taped individually; only the top of the electrical conduit had been taped closed. Mr. Paukan separated and taped each wire and left the boiler and electrical circuits disabled. It should be noted that boiler B-2 is inoperable, as the flue piping does not extend through the roof. As such, it should not be operated and the breakers should be locked out and tagged out.
- The boiler room ventilation is not automatically controlled. The boiler room damper remained closed throughout the training visit.
- The low temperature set point on Boiler B-1 was reset to 140° F, and the high temperature set point was set to 160° F to prevent short cycling during low heat demand periods. The PHS Building does not have hydronic dryers. The building's only heat demands are space heating, the heat add system for the WST, and a short glycol heat trace along the raw water line to an exterior valve box. The operator was shown how to adjust the boiler set points in the future. He was also instructed not to lower the boiler low temperature set point below 140° F to prevent gas condensation.
- The Tununak IRA will need to work with the operator to purchase critical spare parts; a spare well pump, circulation pumps, and a chlorine injection pump; new fire detection and suppression equipment; water quality testing supplies; and any tools or supplies that the operator may need to keep the PHS Building in operation. The critical spare parts list will be supplied as part of the toolkit.
- It is recommended that Mr. Joseph James attend a small treated certification class as soon as possible.

RECOMMENDATIONS AND/OR CONCLUSIONS:

The following items will be completed or followed up on over the next month:

- Create an updated toolkit and send copies to the Tununak IRA and the PHS Building. The toolkit will include operator logbooks and checklists, monthly operator reports, a critical

spare parts list, wall charts, and manuals for critical equipment. The toolkit will be coordinated and completed with RMW and community input.

- Encourage the Tununak IRA to select an employee to attend an upcoming DCRA-approved training session.
- Encourage the Tununak IRA to send Mr. Joseph James to the next available Small Treated certification class.
- Continue to collaborate with the RUBA LGS and VSW to ensure Tununak's success.

The following list contains items that should be addressed for the continued operation of the water plant:

1. Inspect the PHS Building septic tank and drainage system. Pump out the septic tank if needed. Repair or replace the damaged line to the drain field.
2. Trace all electrical wiring in the PHS Building. Repair or remove any electrical hazards and bring the building up to code. Replace blown circuits in the circuit breaker.
3. Rewire both boilers and bring Boiler B-2 back online.
4. Replace the main alarm panel.
5. Stabilize the well house and replace the well pump controls. Rewire or protect the well pump wiring connections. Purchase a spare well pump.
6. Replace the backup generator and generator controls.
7. Install fire and carbon monoxide detectors. Install additional fire suppression equipment in the boiler room. Recharge or replace fire extinguishers as needed.
8. Replace the chlorine injection pump. Purchase pump replacement parts and injection quills.
9. Replace the broken pressure gauge on Boiler B-1. Install additional pressure gauges before and after the boilers and on the glycol add line so the operator can properly monitor the hydronic heating system.
10. Drain and clean the WST prior to filling the tank this fall. Install a mesh screen on the WST overflow pipe.
11. Replace the cartridge filtration systems in the PHS Building according to ADEC guidelines for surface water treatment. Purchase replacement cartridges for new filtration systems.
12. Replace the WST heat-add heat exchanger with a brazed plate heat exchanger.
13. Install flow meters on the raw water, washeteria, and clinic water supply lines.
14. Exercise valves in the water and heating systems slowly, and ensure they are operational. If the valves are seized, then replace them.
15. Renovate the washeteria bathrooms so that there is a men's and a women's bathroom.

We departed Tununak on Wednesday afternoon at 6:45 PM.

Kelli Whelan

Attachments:
Photos

cc: Mr. James James, Administrator, Tununak IRA
Mr. Xavier Post, Clerk, Tununak IRA
Mr. Joseph James, Primary Water Plant Operator, Tununak IRA
Mr. Allan Paukan, RMW, YKHC

ec: Mr. Eli Jacobson, RUBA LGS, Alaska Department of Commerce, Community and Economic Development (ADCCED)
Ms. Susan Randlett, VSW Engineer I, VSW
Mr. Brian Lefferts, RMW Supervisor, YKHC
Bill Griffith, Facilities Program Manager, ADEC
Carrie Bohan, Operations Assistance Program Manager, ADEC
Cindy Christian, Drinking Water Program Manager, ADEC
John Johnson, RMW Program Coordinator, ADEC
John Nickels, RUBA Manager, ADCCED

DEHE—Chris Mercer/ Brian Menghini/
Cody Uhlig/ Sharnel Vale

WTP labeling for PMP logbook



General WTP Labeling

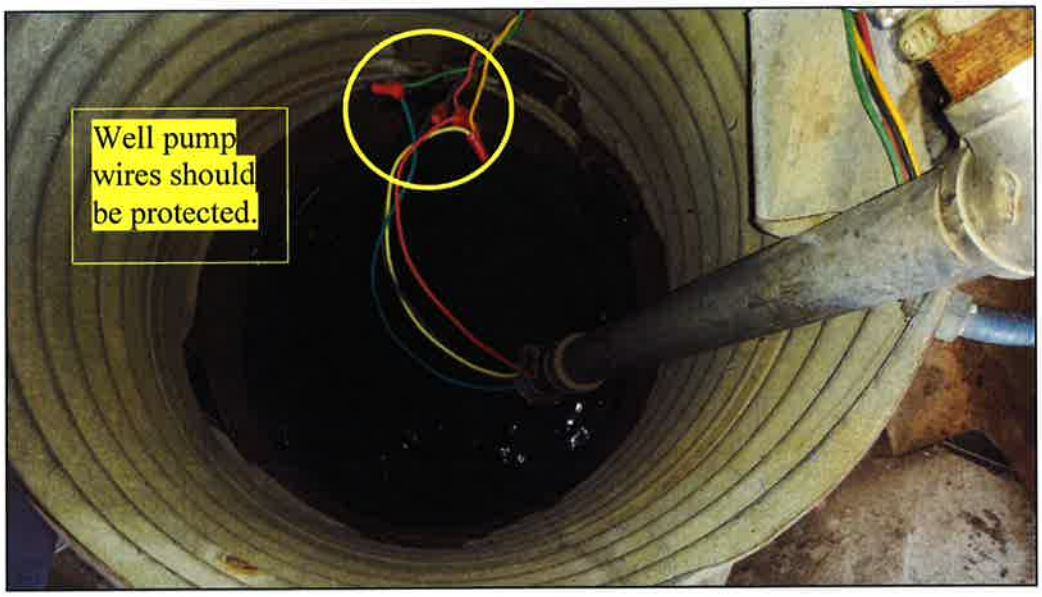


Well House Exterior





Well House well shaft



Well House well pump controls



PHS Building WST foundation damage and overflow issue.



PHS Building interior





Wiring Issues in Bathroom



Burnt wiring after spark near Boiler B-2





IRA Water and Sewer Haul service boards





D.1.4 October 2018 RMW Routine Trip Report

Remote Maintence Worker Report of site visit including 50,000 gallon Tank Cleaning. Length 5 Pages.

RMW: Allan Paukan
Region: YKHC
Community: Tununak
Trip Dates: 10/9/2018 to 10/11/2018
Trip Type: Routine

Travel Costs

Transportation Cost: $1,310
Mode of Transportation: Yute Air Charter
Per Diem Cost: $144

Trip Contacts

Accompanied By:

Gerald Agimuk, Water Operator Backup

Telephonic Contacts:

James James, Tribal Administrator

Trip Details

Trip Purpose: 1) To clean water storage tank and inspect for corrosion.
2) To assist AWPO with installing a check valve on cold water supply line for the hot water generators.
3) Take abandoned hdpe water distribution line apart and install valve on end of building domestic cold water line.
4) Assist AWPO with with identifying what electrical lines are abandoned and rewire correctly.

Trip Summary: October 8
I made telephonic contact with TA James to verify that I would be able to complete above tasks. He said a person will be able to help with all the tasks.

October 9
I checked into Yute air for a trip out of Bethel for Tununak. Once airline had plane available they brought me out with all my gear. Once into Tununak the AWPO met me at the airport and we brought all the gear to the water plant.

We began by filling some containers of water, we then backwashed the water filter until clear, we then dewatered the water storage tank of all water, opened the manway, once manway was opened we set up the dewatering pump and began to clean all silt and debris from inside of water tank. Took pictures of interior and buttoned up the manway to the water tank. We attempted to get the water going but had but we had some problems so we called it a day at 2100 hours.

October 10

The day was started by getting water started, to open the washeteria, after enough water pumped. While we were waiting for enough water to be pumped the WPO and I took all the floor hdpe plumbing out and installed a 3" valve with a 3" electrofusion coupling I brought. While the water was down we then installed the 1 1/2" check valve on the cold water supply line. Once the water had came up and we pressurized the system a 3/4" valve had began to leak real bad, after looking to see if we had one since it was late we will complete that in the morning.

October 11
The WPO and started by getting the water in the hot water section of pipe dewatered so we could replace old gate valve with a new 1/2" ball valve. We got the valve replaced and then went on to the last task, work on wiring in the well house. The AWPO and I proceeded to the well house to conduct some training on well house maintenance. We began at the power pole and turned the breaker on to the well house and the well pump immediately turned on, so we first invested that and what ever else was powered. I told the AWPO to turn the breaker off so we could correct the wiring to the well pump control wiring. Once that was done I instructed the AWPO how to wire for a 120 volt outlet that was there but not wired to, for winter operation. With all the wiring back to normal we could close the panel doors. THe AWPO then turned the breaker on at the panel, all the electrical was on.
I then taught the AWPO how to turn the well pump on, he completed the task a few times, Now he is able to turn the well pump om in a safe manor. The AWPO asked if we could clean the corrigated pipe area of silt for more water volume for winter months. We had all the tools there and completed the task in a about a half an hour.

With all tasks completed i got a hold of Yute and proceeded to the airport tarmac with all my gear and more jetter equipment left back from a previous job. I got to the airport and a plane landed, it was Yute air with the wrong kind of plane, a cherokee rather then a 207 that was needed for the charter. So I waited till a 207 came in a few hours later.

On the Job Training Hours: 24

Critical Observations:
The roof of building needs to be replaced with new tin, a lot of leaks were evident through out the building.

Noted Deficiencies:
The chlorinotor needs replacing, from the vat to the injection point.
Reoccurring: Yes
Cost to Address: $400

Follow Up Activities:
See how the roof is doing going into winter.
Entity to Follow Up: Operator

See pictures on following pages.

Tununak Water Tank:



Tununak water tank first look:



Tununak interior of water tank:



95%
PER

D.2 Engineering Assessment Reports and Memos

D.2.1 MWH December 2010 Report

"Report on Site Conditions and Recommended Plan of Action For Sanitation Improvements in Tununak, Alaska" A base assessment of the Tununak Washeteria, WTP, and infiltration gallery in 2009 and 2010. It is referenced in text as "MWH 2010". Length 74 Pages.

FINAL

Report on Site Conditions and Recommended Plan of Action For Sanitation Improvements in Tununak, Alaska

Prepared for the

TUNUNAK TRIBAL COUNCIL

and

VILLAGE SAFE WATER

Prepared by

MWH
1835 South Bragaw Street, Suite 350
Anchorage, Alaska 99508
MWH Job No. 1008675.040101

December 2010

Table of Contents

ACRONYMS AND ABBREVIATIONS ii
EXECUTIVE SUMMARY ES-1
1.0 INTRODUCTION 1-1
2.0 DESCRIPTION OF EXISTING SANITATION FACILITIES 2-1
2.1 Water Facilities 2-1
2.2 Sewage Facilities 2-2
3.0 OPERATIONAL ASSESSMENT OF SANITATION FACILITIES 3-1
3.1 Water Treatment Plant and Washeteria 3-1
3.1.1 Mechanical 3-1
3.1.2 Electrical 3-2
3.1.3 Structural 3-2
3.2 Water Source and Treatment Process 3-3
3.3 Water Storage Tank 3-3
3.4 Water Sources 3-4
3.4.1 Muskox Creek Intake Structure 3-4
3.4.2 Unnamed Creek Intake Structure 3-4
3.5 Watering Points 3-5
3.5.1 Mechanical 3-5
3.5.2 Electrical 3-5
3.6 Water Distribution Lines 3-6
3.7 Wastewater Disposal Systems 3-6
3.7.1 Septic Tank System Serving the Washeteria and School 3-6
3.7.2 Septic Tank System Serving Flush Tank and Haul System (Co-Water System) 3-7
3.7.3 Honey Bucket Disposal Bunkers 3-8
4.0 SANITARY FACILITY QUESTIONNAIRE 4-1
5.0 RECOMMENDED PLAN OF ACTION 5-1
5.1 Water Source 5-1
5.1.1 Candidate Sources of Potable Water 5-1
5.1.2 Source Water Regulatory Issues 5-2
5.1.3 Work Plan for Developing a Water Source 5-4
5.2 Water Treatment Process 5-6
5.3 Water Treatment Plant and Washeteria 5-6
5.4 Water Storage Tank 5-8
5.5 Water Distribution and Watering Points 5-9
5.6 Wastewater Disposal Systems 5-9
5.6.1 On-Site Septic Tank System for School, Teacher Housing and Washeteria 5-9
5.6.2 On-Site Septic System for Co-Water FTH System 5-10
5.6.3 Honey Bucket Disposal and Conversion to a Community-Wide FTH System 5-10

6.0 COST ESTIMATE FOR RECOMMENDED SANITATION IMPROVEMENTS..... 6-1
7.0 RECOMMENDATIONS AND CONCLUSIONS 7-1

List of Appendices

Appendix A ADCRA Community Maps of Tununak (3 Figures)
Appendix B Site Photographs Taken During the May 2010 Field Trip
Appendix C Sanitary Facility Questionnaire
Appendix D Figures

Acronyms and Abbreviations

%	percent
AAC	Alaska Administrative Code
ADCRA	Alaska Division of Community and Regional Affairs
ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation and Public Facilities
AWWA	American Water Works Association
BIA	Bureau of Indian Affairs
Community	Tununak Tribal Council
DBP	disinfection byproduct
EPA	U.S. Environmental Protection Agency
FTH	Flush Tank and Haul
gpd	gallons per day
hp	horsepower
IBC	International Building Code
MCL	maximum contaminant level
MG	million gallons
MSL	mean sea level
MWH	MWH Americas, Inc.
PCA	Phukan Consulting Engineers & Associates, Inc.
SWTR	Surface Water Treatment Rule
VAC	volt alternating current
VSW	Village Safe Water
WST	water storage tank
WTP	water treatment plant

EXECUTIVE SUMMARY

The Tununak Tribal Council was awarded a grant in 2008 from the Alaska Department of Environmental Conservation Village Safe Water Program for the development of a sanitation facilities master plan to upgrade, replace, or abandon the existing washeteria and associated facilities (water treatment, water storage tank, and laundromat) and address problems associated with the all-season remote watering points. The community desired to make additional improvements to their community-wide water and wastewater facilities to improve the quality of life for Tununak residents. As a first step to identify needs and alternatives to meet these community goals, MWH Americas, Inc. (MWH) was requested in 2010 to prepare the *Report on Site Conditions and Recommended Plan of Action for Sanitation Improvements in Tununak, Alaska.* The report was prepared under the direction of the Tununak Tribal Council and the Village Safe Water Program.

During the spring of 2010, the MWH design team consisting of senior staff from MWH, EDC and GV Jones & Associates, Inc. completed a site visit with representatives from VSW to the village of Tununak. During the site visit, the MWH design team conducted an on-site assessment of the existing water and sewer systems serving Tununak and then met with the community residents at a project kick-off meeting. Several serious sanitary infrastructure deficiencies were identified. Resident dissatisfaction was consistent with our observations. Summarizing, persons neither trust nor drink Tununak water (they obtain water from the school), there is no community honey bucket haul system, even so, the honey bucket waste bunkers are full. And, as itemized herein, the washeteria, water treatment plant, water point distribution system, flush tank and haul system, and school and flush tank and haul wastewater disposal systems are antiquated, substandard, non-functional, and/or include significant health and safety code violations

Currently, the sanitation facilities operating in Tununak consist of a surface water source, washeteria, water treatment plant, water distribution system that delivers water to six community watering points used by residents to haul water to their homes, a small percentage of homes are served by a flush tank and haul system while most homes in the community use honey buckets that dispose waste in below grade sewage bunkers. The community's school has running water and flush toilets that are served by a shallow ground water well and on-site septic tank system. Nearly all the residents in Tununak haul their drinking water from a community watering point served by the school's well.

The site investigation completed by the MWH design team found the following serious and health threatening deficiencies in the existing sanitation facilities:

- Water Source (Un-named Creek) – The water source well house is in poor physical condition. It is located downgradient of nearby existing and potential future new residential structures and, therefore, subject to contamination from fuel and/or wastewater stored on those properties. Also, it is subject to seasonal burial from drifting snow and aufeis (ice overflows) formation in the creek immediately below the intake structure as well as flooding and immersion of the building structure components- the uncovered well casing was observed to be inundated by flood water during the site visit.

- Washeteria - The equipment within the building has deteriorated to a point that the facility can no longer serve its intended purpose with any reliability. Of the laundry equipment only one working washer remains and both dryers have been removed. The toilet/shower rooms have missing fixtures and are no longer usable. Control systems for the water storage tank and washeteria mechanical equipment appear to be non-functioning. Numerous building code violations exist. The heating boilers are deteriorated beyond economical repair.
- Water Treatment Plant - The treatment plant is in poor physical condition and disrepair. The treatment system does not meet current drinking water regulations for Cryptosporidium removal. The majority of electrical equipment within the building has deteriorated past its useful life. The power distribution and utilization equipment showed signs of significant deterioration due to corrosion. Numerous building code violations were found throughout the facility in the power distribution and lighting systems. These violations represent a significant hazard to maintenance personnel working in the facility.
- Water Storage Tank – It has been reported that the 50,000 gallon tank experiences leakage and its foundation is in very poor condition. The tank exterior has obvious signs of physical deterioration. The condition of the tank interior is unknown as it has not been inspected nor cleaned for many years. The water storage tank appears to be unsuitable for reconditioning or upgrade.
- Community Watering Points - Of the six watering points located in the village, only one was found to be usable. All of the watering points' enclosures were deteriorated, with damage to the access doors and floors. The water distribution lines serving the watering points appear to provide adequate flow to the watering points; however, the physical condition of the water lines is unknown and the water demand is very low due to the number of unusable watering points. Because of the non-operational circulation pumps and heat trace controls (both at the water treatment plant and watering points), the distribution piping has a high potential to freeze as winter weather progresses.
- Flush Tank and Haul System - The community currently has 18 homes that are served by the flush tank and haul system. The homeowners expressed their frustration and dissatisfaction with the current operation of the flush tank and haul system. They explained that many of the operational problems were primarily associated with the failure of valves and lack of adequate maintenance.
- Honey Bucket Usage - It is estimated 64 households currently rely on the use of honey buckets. Residents and businesses using honey buckets typically self-haul their water. The honey bucket waste is self-hauled and disposed of in several sewage bunkers that are located in near proximity to the homes throughout the community. Most of these bunkers appeared to be in a state of failure with overflow of raw sewage onto the surrounding ground surface which is accessible to contact by animals and humans.
- Septic Tank Systems – The septic tank system serving the school, teacher housing and washeteria was found to be in a state of failure. Based on discussions with the operators of the septic tank system, hydraulic failure occurs frequently and they temporarily relieve the hydraulic overload by pumping effluent from the drainfield observation pipes to the nearby failing septic tank system serving the flush tank and haul system. The septic tanks

serving the flush tank and haul system are currently in a state of failure. Consequently, the operators dump their haul contents of raw sewage in an open trench located next to the septic tanks. The trench is accessible to the public and animals (especially loose dogs).

The recommended plan of action for future sanitation improvements in Tununak are based on a comparison of technical, health and cost benefits with a consideration of ease of operation. The following provides a list of the recommended sanitation improvements that should be further evaluated for future development to meet the goals of Tununak:

- Replace the Unnamed Creek well house with an upgradient (hillside) water source.
- Replace the water treatment plant.
- Replace the Washeteria.
- Replace the existing 50,000 gallon water storage tank with a 100,000-gallon tank.
- Replace all of the community watering points.
- Expand the flush tank and haul system to serve all households in the community. This recommendation involves the installation of interior plumbing to connect to the flush tank in existing households that currently use honey buckets. Also, the flush tank and haul system will need additional upgrades to the water and sewage haul equipment and expansion of the on-site septic tank/drainfield system.
- As an interim corrective action measure, until such time as the flush tank and haul system can be implemented throughout the community, it is recommended honey bucket waste transfer system and a waste disposal facility be installed at a suitable location outside of the residential area.
- Upgrade the septic tank system for the flush tank and haul system, new water treatment plant, new washeteria, school, and school housing.

As a sanitation deficiency stop gap measure, a honey bucket collection and disposal system is immediately warranted. Furthermore, it is recommended that development of a new “safe” water source be a priority. A site investigation to evaluate a suitable water source should be completed as the first step in addressing sanitation needs of Tununak.

1.0 INTRODUCTION

A contract was awarded to MWH Americas, Inc. (MWH) by the Tununak Tribal Council (TTC) on March 31, 2010, to provide a Phase I Engineering Design Services for the Washeteria and Water Treatment Facility for Tununak, Alaska. The Alaska Department of Environmental Conservation (ADEC), Village Safe Water (VSW) was assigned to act as TTC's agent in all matters concerning the VSW project. The MWH design team for the Phase I engineering design services included the subconsultants firms of GV Jones & Associates, Inc. and EDC.

Tununak is located in western Alaska on the northwest coast of Nelson Island along the Bering Sea coast. The village is about 519 miles west of Anchorage and approximately 115 miles northwest of Bethel. The community of Tununak is comprised of two residential areas: the "main" part of the community lies on a narrow spit of land between the Tununak River and Tununak Bay, and the "new" area consists of 23 homes in AVCP Subdivision located on the North Fork of the Tununak River at the base of the foot slope to Ugchirnak Mountains. According to an uncertified population estimate completed in 2009 reported by the Alaska Division of Community and Regional Affairs (ADCRA), Tununak has a population of 330 who are primarily Yup'ik Eskimo. The 2000 U.S. Census reported 93 households in the community of which 11 were vacant.

The scope of work for the Phase I Engineering Design Services included the following tasks:

- Compile and review existing project data and background reports
- Conduct site assessment of existing sanitation facilities and project kick-off meeting
- Prepare site conditions report with a recommended plan of action for future sanitation improvements

During the spring of 2010, the MWH design team compiled and reviewed the background reports in preparation for a site visit to the community. The site visit was completed on May 18 and 19, 2010. During the site visit the design team meet with the residents at a Project Kick-off Meeting held in the Paul T. Albert Memorial School and conducted an assessment of the existing water and sewer systems serving Tununak. Photographs of the existing sanitation facilities taken during the May 2010 site visit are provided here in Appendix B. The photo captions describe the sanitary deficiencies that were observed by the design team.

The preliminary findings of the May 2010 site visit were described in two field trip reports prepared by MWH and EDC that were submitted to TTC and VSW. The following bulleted list summarizes the significant sanitary issues and concerns were identified during the site visit which included community input during the Project Kick-off Meeting:

- The community residents do not trust the existing drinking water system that supplies water to the community watering points.
- During the Project Kick-Off Meeting, the community residents delivered a very clear message to the MWH team that … "No one who is on a flush tank and haul system likes it."

- The community residents strongly desire to have a new Washeteria facility with a new safe water source and new water treatment plant (WTP).
- During the kick-off meeting, there was a consensus that a new sanitary facility questionnaire should be completed by the residents as soon as possible to determine what improvements were needed to address the critical deficiencies in the sanitary facilities serving Tununak. Following the meeting, the new questionnaire was prepared by MWH and approved by VSW for distribution in the community. TTC assisted in the solicitation of input from the residents for the completion of the questionnaire.
- The Washeteria, 50,000-gallon water storage tank (WST), and WTP were found to be in very poor operating condition and appeared to be marginally (barely) functional and deficient in reliability.
- The condition of the abandoned Musk-Ox Creek water well, pump house, and arctic pipe transmission line appeared to be not suitable for upgrade and/or replacement with another source on Musk-Ox Creek. However, the arctic pipe appears to be in good enough condition to be used elsewhere in the community.
- The Unnamed Creek well and pump house were found to be in a flooded condition that prevented reasonable entry to hook up the well pump. The creek was overflowing the entire structure, which resulted in an unsanitary condition for a community drinking water source.
- The community watering points were found to be in very poor condition and appeared to be unsuitable for upgrade and should be replaced.
- The Lower Kuskokwim School District operates the Paul T. Albert Memorial School which was a former Bureau of Indian Affairs (BIA) school. The School has its own water source well (referred to as the old BIA well) and water treatment system. It was learned that the majority of the residents haul their drinking water from the watering point at the old BIA well house. Drinking water for the flush tank and haul (FTH) system is also obtained from the same watering point.
- The two septic tank/drainfield systems serving the Paul T. Albert Memorial School, teacher housing and WTP/Washeteria and the FTH system were determined to be in a state of failure and need substantial upgrade and/or replacement.
- The existing sewage bunkers located throughout the community all appeared to be in a state of failure and a serious health concern due to overflow of raw sewage from the dumping of honey-buckets.
- The community needs a new pumper truck for pumping the septic tanks and a new backhoe or excavator for underground utility repair work.

The final task of the Phase I Engineering Design Services is the preparation of this report (*Report on Site Conditions and Recommended Plan of Action*). The purpose of this report is to provide an assessment of the condition of the existing sanitary facilities serving Tununak. This report includes a summary of the findings of the 2010 Sanitary Facility Questionnaire and provides a recommended plan of action for addressing the deficiencies noted in the existing sanitary facilities.

2.0 DESCRIPTION OF EXISTING SANITATION FACILITIES

Community profile maps prepared by ADCRA are provided in Appendix A (Figures A-1 and A-2). The ADCRA maps provide a general overview of the layout of the community and show the locations of the creeks used for water sources. These profile maps are also helpful to note the locations of the community developments with respect to the surrounding physical terrestrial features such as the river, sea, and mountains.

A comprehensive description of the existing sanitation facilities was provided in the report titled *Tununak Sanitation Feasibility Study and Environmental Review*, dated March 22, 1993, prepared by Phukan Consulting Engineers & Associates, Inc. [PCA]). Although the report was prepared by PCA over 17 years ago, it is still a good overall guide to understanding the conditions of the sanitation facilities, many of which are still in operation and have since further degraded. PCA recommended the construction of a FTH system and new water transmission line to a proposed water well source on Muskox Creek. These improvements were installed during the mid-1990s. A drawing from the 1993 PCA report showing the locations of the sanitation facilities that currently exist in the community is shown on Figure A-3 in Appendix A.

The following provides a description of the existing sanitation facilities in Tununak:

2.1 WATER FACILITIES

The community operates a public water system that includes:

- A pair of surface water intake structures and pumping stations located on:
  - Unnamed Creek
  - Muskox Creek
- Raw water transmission mains
- A WTP designed to treat surface water
- A washeteria
- Treated WST
- Potable water distribution system:
  - Pressure and Circulation Pumps
  - Water Distribution System
    - Six community watering points
    - Service connection to the Village Clinic

The existing water system and washeteria is aged and in need of upgrades and/or replacement to sustain service. A sanitary survey of the water system was recently completed in August 2010 on behalf of the ADEC Drinking Water Program. The sanitary survey identified several non-compliance items on the water system that are potential health risks and safety concerns. Many of these deficiencies were noted during the site assessment work completed during the May 2010 site visit completed by the MWH design team and were described in the field trip reports. These deficiencies are addressed in this report, as well as recommendations for corrective action.

2.2 SEWAGE FACILITIES

The majority of the households in Tununak lack complete plumbing facilities, consequently most of the residents use honey buckets for disposal of their wastewater. It is estimated that approximately 64 households rely on the use of the honey bucket. The honey bucket waste is disposed by the residents in sewage disposal bunkers located in close proximity to the homes. These bunkers consist of buried timber cesspools that are located along the north and west banks of the Tununak River. The remainder of the community consisting of 18 households has interior plumbing facilities that are serviced with the FTH system.

Two on-site community septic tank systems and drainfields currently exist in Tununak. The community septic systems are located on the sand spit north of the old "main" village and northwest of the school and WTP/washeteria facility. These septic systems include:

- One septic tank system serves the School, teacher housing, and the WTP/washeteria.
- The second septic tank system is used for the disposal of wastewater collected from the flush tank and haul system.

3.0 OPERATIONAL ASSESSMENT OF SANITATION FACILITIES

3.1 WATER TREATMENT PLANT AND WASHETERIA

3.1.1 Mechanical

The WTP and washeteria were constructed in the mid-1970s based on a similar style to others built in that timeframe. The building is configured as:

- A washeteria with four washers and two hydronic dryers.
- Two toilet/shower rooms, each with two showers, a toilet and a lavatory.
- A mechanical room with two oil-fired boilers, a hydronic heating system, domestic hot water generators, and standby power generator.
- A water treatment room with a pressure filter, two bag filters, a backwash pump, pressure pumps, and a hydropneumatic tank.
- A bunkhouse room.
- A kitchen/laboratory.

A 50,000-gallon WST stands adjacent to the building.

The equipment within the building has deteriorated to a point that the facility can no longer serve its intended purpose with any reliability. Of the laundry equipment only one working washer remains and both dryers have been removed. The toilet/shower rooms have missing fixtures and are no longer usable. Drain piping where fixtures have been removed has been left open or is closed with makeshift materials – such as plastic bags stuffed in the opening. This has a potential to allow sewer gasses into the building and to create a health hazard if a drain were to clog and back up. Only one of the two pressure pumps work to deliver water to the washeteria, clinic, and watering points. The system designed to circulate water to the watering point distribution piping is no longer operational, because both pumps have been fully or partially removed. Circulation is the main source of heating for the pipelines, with electrical heat tracing being a backup heat source. The heat trace controllers do not appear to operate, so with no circulation or heat, the pipelines are vulnerable to freezing.

The building envelope is severely deteriorated, contributing to higher fuel consumption to offset high heat losses. Contributing to high heat losses are leaking window frames and broken windows replaced with single panes of Plexiglas or plywood, as well as roof leaks around the boiler stacks that have caused deterioration of insulation and finishes. The public watering point on the south side of the building has been abandoned, with the insulation value of the wall compromised.

Numerous building code violations exist, including an exit door from the boiler room that has been sealed shut and a fuel tank located within 5 feet of the building. The standby heater installation is not proper, with the stack located too close to combustible materials. It is unknown whether the heater is operational. The heat exchanger for the WST is a single-wall design, which

is not allowed by current codes due to the possibility of contamination of the water from the glycol heating fluid in the event of leakage.

The heating boilers are both obsolete models (last produced 10 to 15 years ago) and are deteriorated beyond economical repair. Boiler 1 has jacket corrosion caused by acidic flue gasses leaking through firebox section gaskets. Boiler 2 is off-line with a disassembled burner, no expansion tank, and evidence of firebox leakage at the burner mounting plate. Direct combustion air piping to the boiler burners has been disconnected, and the plastic piping to the Boiler 2 burner housing has been melted. The boiler stack caps are missing and the stacks are dented above the roof line.

3.1.2 Electrical

The existing electrical service for the WTP/Washeteria building includes a 200 amp, 240 volt, alternating current (VAC), single-phase meter/main panel with an overhead drop from the adjacent village utility. The incoming service feeder is routed through a manual transfer switch connected to a 75 kilowatt (KW) diesel-fired engine generator. The main distribution for the building is provided from Panel 'B' at 100 amp, 240VAC, single-phase. Panel 'B' sub-feeds Panel 'A' with a 100 amp, 240VAC circuit breaker.

The majority of electrical equipment within the building has deteriorated past its useful life. Given the observed level of deterioration, the facility can no longer serve its intended purpose with any reliability.

Lighting fixtures were found to be in poor condition. A number of the fixtures were disconnected or deteriorated beyond repair. All of the code-required exit and emergency lighting fixtures were not functioning and present a hazard to life safety in the facility.

The power distribution and utilization equipment showed signs of significant deterioration due to corrosion, resulting in potential hazards to equipment and personnel.

The stand-by diesel-fired engine generator set was not functioning at the time of the May 2010 site visit. The system had not been maintained and tested in compliance with industry standards and showed signs of deterioration due to age and local environment.

Control systems for the WST/washeteria mechanical equipment appear to be non-functioning. Equipment enclosures and components show signs of deterioration due to corrosion.

Numerous building code violations were found throughout the facility in the power distribution and lighting systems. These violations represent a significant hazard to maintenance personnel working in the facility.

3.1.3 Structural

The WTP/washeteria building is approximately 30 feet by 60 feet (approximately 1,800 square feet in area). The building consists of a wood frame shell with T-11 plywood siding and metal

roofing. The building has a poured concrete floor and sits on a post-pad foundation. The building is in very poor structural condition (see photos in Appendix B) due to severe weathering conditions, normal aging (nearly 40 years), deterioration, and apparent lack of maintenance.

The building appears to lack adequate insulation and is not weather tight. Overall, the building shows obvious signs of serious exterior deterioration, with a foundation system that has not been adjusted to compensate for building movement due to frost heave and permafrost degradation. The watering point and backwash waste discharge have contributed to erosion of the building foundation, which has settled along the south side of the building.

3.2 WATER SOURCE AND TREATMENT PROCESS

The existing community water treatment system is operated on a periodic basis to maintain a reserve of treated water in the 50,000 gallon WST. These intermittent operations include pumping source water from the Unnamed Creek Intake Structure to the WTP located at the washeteria, source water treatment, and filling the WST with treated water.

From the WST, treated water is withdrawn, pressurized, and distributed to the clinic, washeteria, and community watering points.

The WTP is comprised of the following unit processes:

- Granular Media Filtration
- Bag Filtration, nominal 5 and 1.5 micron bags
- Hypochlorination
- Storage and Disinfection Contact Time
- Distribution System Pressure and Circulation Pumping

The WTP is in poor physical condition and disrepair. The WTP does not meet current drinking water regulations for Cryptosporidium removal.

At the time of this report, the WTP only provides service to the clinic and washeteria. The community watering points are frozen and/or otherwise non-functional.

3.3 WATER STORAGE TANK

The WST consists of a steel-bolted, insulated, aboveground WST. The tank has a reported capacity of 50,000 gallons – apparently the tank volume is sufficient for the current limited water production rate for the WTP, but may be inadequate in size to accommodate future demand.

The tank is located adjacent to the WTP/washeteria building with a “dog house” attachment between the tank and the WTP that accommodates the insulated water supply and discharge lines. It has been reported that the tank experiences leakage (unknown rate), which was not visible during the May 2010 site visit.

The foundation for the WST is in very poor condition as noted in the photos presented in Appendix B. The tank exterior has obvious signs of physical deterioration. The WST appears to be unsuitable for reconditioning or upgrade. The condition of the tank interior is unknown, but the current operator noted the tank's interior has not been inspected nor cleaned for many years.

3.4 WATER SOURCES

3.4.1 Muskox Creek Intake Structure

The Muskox Creek Intake Structure is:

- In poor physical condition.
- Located over a drainage swale, presumably Muskox Creek that appeared to be very nearly dry during the May 2010 visit to the community.
- No longer used by community.

The raw water pipeline connecting the Muskox Creek Intake Structure to the Unnamed Creek Intake Structure is:

- An above-grade Arctic pipe system.
- Subject to freezing.
- No longer used by the community.
- The water pipeline appeared to be salvageable for possible reuse.

3.4.2 Unnamed Creek Intake Structure

The Unnamed Creek Intake Structure is:

- In poor physical condition.
- Located downgradient of nearby existing and potential future new residential structures and, therefore, subject to contamination from fuel and/or wastewater stored on those properties.
- Subject to seasonal burial from drifting snow.
- Subject to infrastructure freezing from:
  - Breaches in the integrity of the existing building structure.
  - Inability to add heat to the existing structure.
- Subject to aufeis formation in the creek immediately below the intake structure
- Subject to flooding and immersion of the building structure components

The raw water pipeline connecting the Unnamed Creek and the washeteria is:

- An above-grade Arctic pipeline.
- Subject to seasonal movement and realignment of support cribbing.

- Currently functional.

TTC has applied for funding assistance from the Coastal Villages Regional Funds (CVRF) for possible relocation of the intake structure further upstream on Unnamed Creek in order to be upgradient of residential contamination sources.

3.5 WATERING POINTS

3.5.1 Mechanical

The watering point design included buried Arctic piping, with a valve pit at each watering point location. The enclosures were designed with electric heaters in the aboveground portion and also in the valve pit. Heat tracing power points and controls were also included at each watering point location. Of the six watering points located in the village, only one showed signs of being usable. All of the watering points' enclosures were deteriorated, with damage to the access doors and floors, including:

- Watering Point #1 nearest the Tribal Council Store #1 was boarded up due to vandalism.
- Watering Point #2 was accessible with non-operational heaters and heat trace controllers.
- Watering Point #3 had snow and ice inside the enclosure and valve pit, indicating possible freeze-up of the piping. The electrical panel face had been removed and heat trace controls had been disconnected. The enclosure heater had failed.
- Watering Point #4 could not be entered because of snow and ice built up inside.
- Watering Point #5 could not be entered because of snow and ice built up inside. The bottom of the door was severely corroded, which let blowing snow inside.
- Watering Point #6 had been boarded up and was not inspected.

Because of the non-operational circulation pumps and heat trace controls (both at the WTP and watering points), the distribution piping has a high potential to freeze as winter weather progresses.

3.5.2 Electrical

The existing services for the watering point buildings/enclosures include an overhead drop from the adjacent village utility pole to an interior 100 amp, 240VAC, single-phase main disconnect switch. The incoming service feeder is routed through the disconnect switch to an interior 100 amp, 240VAC, single-phase branch circuit panel.

The majority of electrical equipment within the watering point enclosures has deteriorated past its useful life. Given the observed level of deterioration, the facility can no longer serve its intended purpose with any reliability and safety. See mechanical for a list of watering point enclosures available for inspection.

The watering point enclosures interior and exterior lighting fixtures were found to be in poor condition. A number of the fixtures were disconnected or damaged beyond repair.

The power distribution and utilization equipment at the watering point enclosures showed signs of significant deterioration due to corrosion, resulting in potential hazards to equipment and personnel. Many of the dead-front panel board covers have been removed, exposing live parts to personnel entering the building/enclosure. This represents a significant life safety hazard and the covers that should be replaced as soon as possible. Exposed wiring was also present within the enclosures and should be re-installed in the existing junction boxes for safety.

Heat tracing power points and controls at the enclosures were found to be in very poor condition. A number of the units were disconnected or damaged beyond repair.

3.6 WATER DISTRIBUTION LINES

The treated water distribution lines from the WTP to the six community watering points that serve the community consists of buried circulating water lines. These circulating water lines are reported to be 3-inch diameter and have been in continuous use for the past 40 years. The water distribution piping consists of high-density polyethylene (HDPE) insulated Arctic pipe that is heat traced; however, the heat tracing appeared to be non-functional during the time of the May 2010 site visit.

According to verbal comments from the WTP operator, the water distribution lines appear to be functioning as originally designed and provide adequate flow to the downstream watering points. The physical condition of the water lines is unknown and assumed to be adequate for the current water demand conditions; however, the water demand is very limited due to the defective watering points. The community hauls most of its drinking water from the school well watering point. Consequently, additional investigation work is needed to determine the physical condition of the water lines. The investigative work should include line leakage testing and measurement of flow rate.

3.7 WASTEWATER DISPOSAL SYSTEMS

3.7.1 Septic Tank System Serving the Washeteria and School

The septic tank and soil absorption system serving the Paul T. Albert School, teacher housing complex and washeteria consists of a 4,000-gallon septic tank and a 30-foot by 30-foot drainfield. The septic tank system is located down-slope of the washeteria and school in a level area a few feet above the high water mark along Tununak Bay.

According to the findings reported in the 1993 *Tununak Sanitation Feasibility Study*, the records available from the U.S. Public Health Service on the original installation of the septic tank system are of questionable accuracy. The septic tank system is approximately 30 years old and appears to be undersized to handle the typical daily wastewater flow.

The operation of the septic tank system was assessed during the May 2010 site visit. The liquid levels in the septic tank pump out pipes and drainfield observation pipes were measured. All of the liquid levels were found to be at or near the surrounding ground surface. These measurements indicated the drainfield was in hydraulic failure. Depending on the rate of incoming sewage, the hydraulic overload could cause blockage of the upstream sewer lines and/or discharge of raw sewage onto the ground surface via the pump-out pipes and drainfield observation pipes.

Apparently, based on discussions with the operators of the septic tank system, hydraulic failure occurs frequently. The operators temporarily relieve the hydraulic overload by pumping effluent from the drainfield observation pipes to the nearby septic tank system serving the FTH system.

3.7.2 Septic Tank System Serving Flush Tank and Haul System (Co-Water System)

The community currently has 18 homes that are served by the FTH system installed by Co-Water. The septic tank system that handles the sewage effluent collected by the FTH system consists of an "In-complete Septic System". This descriptive term "in-complete" was used in the 1993 *Tununak Sanitation Feasibility Study*, because the septic tanks were originally to be connected to the non-operational sewer system serving the 23 homes in the U.S. Department of Housing and Urban Development subdivision. However, the sewer line from the non-functional sewage pump station was never connected to septic tanks; hence, the term "in-complete" was used to describe the condition of the septic system.

The "In-complete Septic System" is located approximately 100 feet north of the septic tank system serving the washeteria and school and consists of two 6,000-gallon septic tanks, siphon operated dosing tanks, and three 60-foot by 100-foot drainfields. The septic tanks are not connected to an incoming community sewer line, except for the gravity discharge line from the FTH dumping station that is located a few feet from the septic tanks.

During the May 2010 site visit, MWH assessed the operation of the "In-complete Septic System." The following site observation comments on the operation of the FTH septic tank system were provided in the MWH site visit trip report dated June 3, 2010:

> *We met on-site with Christopher, the current operator of the flush haul system. Christopher informed us of the problem that occurred this morning where the community tank trailer had gotten stuck in the mud while attempting to discharge its effluent at the septic tank system.*
>
> *A second issue that was brought to our attention was that septic tank system for the flush haul system failed last fall due to blockage in one or both septic tanks. We learned the septic tanks had not been pumped because of the lack of a pumper truck. In checking the septic tanks, it was noted that the tanks' contents were frozen. Consequently, the operator has been disposing the flush tank haul effluent for the past several months directly into a shallow trench located next to the septic tank.*

The site observations reported above confirmed the septic tanks are currently in a state of failure. Consequently, the operators of FTH system have been dumping their haul contents of raw

sewage in an open trench located next to the septic tanks. The trench was observed to be easily accessible to the public and animals (especially loose dogs) in the community.

During the project kick-off meeting that was held on May 18, 2010, comments were received from homeowners who are served by the FTH system. According to information provided by Co-Water, the FTH operates as follows:

> *Fresh water is collected from a watering point and delivered to the home by a water haul tank and "pumped" into the in-house holding tank. Each house or building is supplied with an indoor fresh water storage tank. Inside the home, the water is delivered around the house through normal water pipes by a pressure system consisting of a small pump, filter, and pressure tank. This system provides water to various connected plumbing fixtures, including toilet, hand basin, bath/shower, and kitchen sink.*
>
> *The sanitation system consists of the sewer piping and venting system that collects the wastewater from the various plumbing fixtures, including the toilet, and delivers the sewage to a specially designed sewage holding tank that is located outside the home. When the holding tank is full, the sewage is evacuated into the sewage haul tank using the sewage vacuum blower, which puts a vacuum on the haul tank to draw the sewage into the haul tank.*

The homeowners attending the Project Kick-Off Meeting expressed their frustration and dissatisfaction with the current operation of the FTH system. They explained that many of the operational problems were primarily associated with the failure of valves. Overall, the community was overwhelmingly opposed to continued use and expansion of the FTH system. These issues and concerns necessitate further investigation to determine the extent and nature of the operational problems with the FTH system.

3.7.3 Honey Bucket Disposal Bunkers

With the exception of the 18 homes served by the FTH system and the piped water and sewer system serving the school and associated teacher housing, the remainder of homes and businesses in the community use honey buckets. It is estimated 64 households currently rely on the use of honey buckets.

Residents and businesses using honey buckets typically self-haul their water. The honey bucket waste is self-hauled and disposed of in several sewage bunkers that are located in near proximity to the homes throughout the community.

The bunkers consist of buried wooden structures with open bottoms – basically the bunkers serve as cesspools. Most – if not all – of these bunkers are overflowing with raw sewage. It was noted that every bunker observed during the 2010 site visit appeared to be functioning improperly, i.e., in a state of failure. Nearly all of them had sewage overflowing the bunker's manhole openings and accessible to direct contact by animals and humans.

4.0 SANITARY FACILITY QUESTIONNAIRE

During the May 2010 Project Kick-off Meeting, residents expressed a lack of trust in the quality of water produced in the existing WTP. During the meeting's discussion it was noted that the last sanitary questionnaire conducted in the community was nearly 20 years ago. The MWH design team suggested a new questionnaire be conducted to update the old questionnaire and obtain current information from the residents regarding their current water supply and sewage disposal methods. Also, the questionnaire would be used to obtain feedback from the residents on their desire for future improvements to the sanitary facilities serving Tununak.

Subsequent to the kick-off meeting, MWH prepared a new questionnaire that requested residents provide information on the following sanitary issues:

- Present water source (broken down for seasons and source type).
- Present water consumption.
- Present sewage disposal method.
- Preference for future sewage disposal (allowed for ranking of preferences).
- Preference for future water improvements (allowed for ranking of preferences).
- Use of home washing machine.
- Use of the existing Washeteria.
- Desired user fees for piped water and sewer services, use of new washeteria and new watering point.

The questionnaire was reviewed by VSW and then sent out to the community for distribution. TTC arranged for the solicitation of questionnaire input from the residents during the early summer months of 2010. A copy of a blank questionnaire, housing survey map, and a spreadsheet summary of the questionnaire data are provided in Appendix C.

Overall, the questionnaire was successful in obtaining valuable information on the community's response to the above listed sanitary issues. Most important, the questionnaire had an excellent return rate that represented nearly 75 percent (%) of the residential population and over 60% of the housing units.

The following provides a summary of the questionnaire findings:

• Average water use per person per day	2.3 gallons/day
• Total water use per day (represents 226 persons surveyed)	395 gallons/day
• Percent of residents using BIA School Well	100%
• Total number of honey bucket users	40 households
• Total number of households served by the FTH system	11 households
• Percentage desiring honey buckets	8%
• Percentage desiring FTH system	8%

- Percentage desiring sewer lines 81%
- Percentage desiring new washeteria 52%
- Percentage desiring piped water 33%
- Percentage desiring new watering points 13%
- Percentage current users of existing washeteria 75%
- Average desired user fee for piped water and sewer $42.30 per month
- Average desired user fee for new washeteria washer $4.68 per wash load
- Average desired user fee for new washeteria shower $1.69 per shower
- Average desired user fee for new watering point $22.18 per month

One of the most important findings of the questionnaire was that 100% of the residents obtain their drinking water from the BIA school well rather than the water produced by the existing WTP. Given the numerous issuances of "boil water" notices, the residents apparently do not have confidence in the quality of water provided at the community watering points. Future upgrades to the community's water supply system need to be done so that the water system gains respect and trust by the public. A safe and reliable year-round source of water needs to be developed that is protected from contamination and has good natural water quality.

After reviewing the above questionnaire findings, an adjustment was made to account for the "reasonable cost" residents were willing to pay for new services, i.e., many respondents indicated they wanted piped water and sewer, but listed unreasonable low monthly user fees (less than $100 per month). The respondents that indicated their first choice was a piped water and sewer system but submitted very low (unreasonable) user rates were replaced with their second choice – a new washeteria. The adjusted percentage of those who favor a new washeteria increased from 52% to 77%.

It is recommended that a follow up questionnaire be completed during the next phase of design work to solicit input from residents on their preferred choice of future sanitation facility improvements. The questionnaire needs to provide detailed estimates on the associated costs for operation and maintenance of the proposed improvements.

5.0 RECOMMENDED PLAN OF ACTION

5.1 WATER SOURCE

5.1.1 Candidate Sources of Potable Water

Candidate sources of water for Tununak are reviewed below.

5.1.1.1 Surface Fresh Water Sources

Fresh (non-saline) surface waters in the vicinity of Tununak include Muskox Creek, Un-named Creek, the Tununak River, and local artesian spring water. These are reviewed below.

Muskox Creek. This is a small creek to the east of the community with drainage basin of approximately 0.5 to 0.75 square miles on the south side of Ugchirnak Mountain. It is up-gradient of the community, but as previously noted, it appeared to be virtually dry during the May 2010 visit.

Un-named Creek. Like Muskox Creek, the drainage basin for Un-named Creek is also on the south side of Ugchirnak Mountain, but is somewhat larger – perhaps on the order of 1 to 1.5 square miles. During the May 2010 site visit, this creek was flowing both at the existing intake structure near existing community housing, as well as further up in the drainage basin.

Upper Tununak River. The Tununak (spelling per U.S. Geological Survey [USGS] Mapping) River is the largest, most productive source of fresh water in the area, but tidally influenced and potentially brackish near the community. Tide extremes in the area reported for Nome and St. Paul are between -1 and 4 feet mean sea level (MSL). Topographic mapping for the region shows the rivers' forks flow through a 25-foot elevation contour between 1.3 and 3.4 miles from the community's existing washeteria site. This suggests fresh water extraction would require an extended transmission pipeline across relatively flat and marshy terrain.

Local Spring Water. Reports received during the May 2010 site visit suggested the occurrence of one or more natural springs originating out of the hillside to the northeast of the community. However, no springs were encountered during a limited reconnaissance of the hillside during the May 2010 visit, nor was there evidence of a spring found on aerial photography recorded in 2004 for the region. It may be that such springs are limited to only seasonal flows.

5.1.1.2 Groundwater Sources

Groundwater resources developed within the community are limited to the BIA's well, which was drilled for the community school in 1964. The log for the well indicates the well to be shallow, cased to 31 feet, and screened to a total depth of 36.5 feet. Static water was reported to be 10 feet below ground surface with a well yield of 6 gallons per minute (gpm).

The well, located on the northeastern end of the spit below a bluff, is subject to potential contamination from the septic systems, sewage haul disposal system, and fuel oil storage tanks.

It is also a likely candidate for classification as a groundwater under the influence of surface water. As such this well, or others within its vicinity, are not good candidates for a community water source.

Similarly, on the southeast end of the spit across the bridge from the community, is an area that may have groundwater reserves similar to those tapped by the existing school well. However, this area is currently used as the community landfill and, as such, would potentially be subject to unacceptable levels of contamination.

Developing groundwater from upland locations within the area may be successful. However, upland areas that would provide physical separation from existing sources of contamination are likely underlain by permafrost and, as such, may not yield the quantities of fresh water required by the community.

5.1.1.3 Brackish or Sea Water Sources

The lower reaches of the Tununak River offer plentiful quantities of water with relative close proximity to water consumers within the community. However, the water quality is expected to be influenced by sea water salinity, as well as contaminants leaching into the water from nearby honey bucket bunkers located along the banks of the river.

Bearing Sea water is similar to the lower reaches of the Tununak River, in that it too is conveniently close to the community. However, intake structures to collect it, whether open ocean submerged diffusers or sub-seabed intake galleries, would all be subject to physical damage from sea ice floe movements along the nearshore areas of tidewater.

Desalination of brackish and/or marine source waters is common enough, but energy intensive, and therefore usually adopted only if freshwater sources cannot be developed or are temporarily unavailable.

5.1.2 Source Water Regulatory Issues

Regulatory issues regarding candidate source water development for the community are addressed below.

5.1.2.1 Source Water Protection

The 1996 Amendments to the Safe Drinking Water Act included requirements to establish a Source Water Protection Program to protect the quality of waters used to produce potable water, including both groundwater and surface water sources. The U.S. Environmental Protection Agency's (EPA's) requirements of the program include:

1. Identification of a source water protection boundary suitable for protection of the community's water supply source.
2. Inventory of known or potential sources of contamination for the community source water within the boundaries established for the protected area.

3. Determination of whether the source water is susceptible to these sources of contamination.
4. Development of public involvement program that involves public notification of:
   - Limits of the source water protection area.
   - Identified sources of contamination within protected area.
   - Steps needed for protection of water from identified contaminants.
5. Implementation of local management plans to reduce the risks of source water contamination.
6. Development of contingency plans for implementation in the event of source water contamination.

The State of Alaska is responsible for implementation of local source water protection programs. Under 18 Alaska Administrative Code (AAC) 80.015(c), public water systems are required to report data to the State related to Items 1 through 3 above.

Under 18 AAC 80.020, the State requires water wells used as a public water source be separated from sources of contamination according to distances published in that regulation. Generally, this distance is 200 feet, and applies to wastewater storage, conveyance, treatment and disposal infrastructure, and landfills.

5.1.2.2 Regulatory Requirements for Treatment of Source Water

New water sources must be tested for quality and, after treatment, found to be in compliance with the maximum contaminant levels (MCLs) referenced in 18 AAC 80.300 and 40 Code of Federal Regulations (CFR) 141. To facilitate achieving this goal, and to satisfy State plan review requirements for use of new sources, the water quality parameters listed in Table B of 18 AAC 80.205 must be identified, including:

- Total coliform bacteria
- Inorganic chemicals
- Nitrate
- Nitrite
- Volatile organic chemicals
- Secondary contaminants

In addition to source water testing required by 18 AAC 80, the Groundwater Rule as published in the Federal Register on November 8, 2006, also requires new groundwater systems brought on line after November 30, 2009, to monitor and report the microbial quality of the water produced by the well. Under the Groundwater Rule, testing is to include evaluation for microbial organisms that are indicators of fecal contamination including *E. coli*, Enterococci, or Coliphage. If the source is found to have a positive response to one of these tests, one of several steps must be taken. These include removing the source of contamination and/or providing a minimum of 4 log inactivation of viruses in the well water treatment system.

Similar to groundwater sources, under EPA regulations, new surface water sources are also to be tested for their microbial quality. Those sources with a higher concentration of target pathogens are required to provide more extensive treatment for microbial quality control.

In particular, the Long Term 2 Enhanced Surface Water Treatment Rule (Federal Register, January 5, 2006) requires systems using surface water as their source water to collect 24 samples for microbial analysis. Smaller, filtered systems serving less than 10,000 people must monitor for *E. coli* every 2 weeks for 12 months. For source waters that are lakes or impoundments, if the monitoring results in an annual mean *E. coli* concentration of less than 10 per 100 milliliters, no further monitoring is required and the treatment system must only meet 2-log Cryptosporidium reduction requirements. If annual *E. coli* monitoring results equal or exceed 10 per 100 milliliters, the system must begin source water monitoring for Cryptosporidium, which may lead to higher microbial removal treatment requirements for the treatment system.

In addition to monitoring source waters for microbial quality, EPA regulations require treated water quality distributed by public water systems meet MCLs for contaminants referred to as disinfection byproducts (DBPs). While these rules do not require source water monitoring, they do address minimum requirements for treated water quality, and therefore should be evaluated as part of the source water quality evaluations noted below.

5.1.3 Work Plan for Developing a Water Source

The following sections identify recommendations for advancing the planning, design, and development of upgrades to the community water source system.

5.1.3.1 Hydrologic and Geotechnical Evaluations

It is our understanding that Tununak is scheduled for a relocation of its airfield. The Alaska Department of Transportation and Public Facilities (ADOT/PF) has a year 2012 line item budget for this of $24 million. It would seem that with this project, a gravel source borrow pit could be developed that, upon completion of gravel extraction efforts, could serve as an impoundment for collection and supply of surface water for the community. Such an effort would, necessarily, have to be coordinated with ADOT/PF, including soils investigations to assess upland bedrock deposits for suitability as airfield embankments, and hydrologic investigations to assess runoff and yield of drainage basins upgradient of the borrow pit.

The community is located within a region of Alaska that is subject to a significant degree of snow drifting. As a result, snow fencing would be an option to improve capture of snow in upland drainage basins for purposes of improving yields of seasonal runoff.

5.1.3.2 Source Water Schematics

Possible source water developments on the upland areas northeast of the community are discussed in the following paragraphs. This area of development is selected because:

- It avoids crossing the Tununak River with a pipeline.
- It minimizes crossing wetland marsh areas of the Tununak River with water system infrastructure.
- It has relatively close proximity to the existing community's existing water system infrastructure.
- It would be relatively easy to serve additional development planned for this area of the existing community.

One alternative source water configuration (Appendix D, Figure D-1) is an impoundment with a free water surface elevation of 300 feet MSL. This could enable a gravity supply of treated water to flow to the community, supplying a minimum static pressure of 50 pounds per square inch to housing at elevation 50 feet MSL, which is approximately the elevation of the highest, newest housing within the community.

The size of the impoundment would depend upon several factors, including:

- Demands for potable water in the community:
  - Domestic use for a new washeteria and hauling of drinking water is assumed to be 50 gallons per person per day for a population of 500 people, or 25,000 gallons per day in 30 years, which yields an estimated annual demand of 9.1 million gallons (MG).
  - Commercial use (fish processing plant), currently estimated to be 15,000 gallons per season, and possibly increased to 100,000 gallons per season in 30 years.
  - Total annual demand of 9.2 MG in 30 years.
- Characteristics of precipitation, and runoff in the drainage basin. Preliminary estimates might include:
  - Five (5) feet average snow depth with the use of catchment basin snow fencing.
  - One (1) square mile drainage basin area.
  - Thirty percent (30%) snow conversion to water.
  - Sixty percent (60%) loss to evaporation and infiltration.
  - Annual net runoff of 125 MG.

To accommodate an impoundment with a water surface elevation of 300 MSL, and sustain projected demands, the impoundment would need to contain approximately 40 MG. With a 15-foot average water depth, and width of 50 feet, the impoundment would be an average of 6,500 feet long at mid-depth of the water column. Available drainage basin area above the 300-foot contour on existing topographic mapping presented on Figure D-2 (Appendix D).

An alternative source water impoundment configuration is presented in Appendix D, Figure D-3. In this alternative, the impounded water supply is lower in elevation and provides only a gravity flow of water to a community WTP, watering point, and washeteria, but does not include a gravity-fed piped water distribution system. For this alternative, a continuous flow of source water would be delivered to the WTP, as needed, for both potable water demands and year-round water supply freeze protection. Un-treated source water used for raw water transmission main

freeze protection would be shunted to the existing creek for natural drainage to the Tununak River.

5.2 WATER TREATMENT PROCESS

Should the project advance adopting the concept of developing an upland surface water impoundment, the quality of surface water runoff from the drainage basin should be evaluated for the following parameters:

- pH
- Alkalinity
- Total dissolved solids
- Total organic carbon
- Dissolved organic carbon
- Ultra-violet absorption
- Inductively-coupled plasma/mass spectrometry scan for metals
- Nitrates/Nitrites (NO2/NO3)
- Volatile organic compounds

In addition, bench or pilot scale testing should be conducted to simulate performance of candidate treatment alternatives, especially as applies to achieving compliance with the DBP rules, using a simulated distribution system DBP evaluation for the source water.

Based on past water quality analyses collected in the past for Unnamed Creek Well House, it appears a direct filtration treatment system with hypochlorination may be suitable for the upland water source. However, this needs to be confirmed during the next phase of water source investigation. A conceptual sketch of the water treatment process is provided in Appendix D, Figure D-4.

5.3 WATER TREATMENT PLANT AND WASHETERIA

The existing WTP/washeteria building and water system have severely deteriorated and would be extremely expensive to repair. In addition, any repairs would add little additional functional life to the facility. Its current operation is limited to one washer, delivery of water to the clinic, and (possibly) delivery of water to the public watering points – assuming that the pipelines have not suffered freezing damage.

Assuming that a good quality water source could be connected to the WTP and washeteria, extensive repairs, including installation of functioning circulating pumps, checkout and rehabilitation of the pipeline heat tracing systems, replacement of non-functioning watering point heaters, and repairs to the WTP boilers would be required to be able to supply water to the public watering points. The washeteria function would still be limited to one washer, unless additional machines were purchased and installed.

These improvements or repairs do not seem justified given the existing condition of the facility. The recommended course of action is to abandon the existing facility and construct a new WTP and washeteria facility. The watering point piping should be checked for freeze damage, and if none is found, the aboveground portion of the watering points should be demolished and reconstructed – with emphasis on weather-tightness of the structures and security from vandalism.

For preliminary consideration purposes, two sketches of conceptual WTP/Washeteria building floor plans are provided in Appendix D, Figures D-5 and D-6. Given the 20-year population projection, it is assumed a new building with an interior area of approximately 3,000 square feet will be sufficient to accommodate a WTP and washeteria for the community. The conceptual floor plans show the following items:

- Five (5) washers
- Five (5) dryers
- A clothes folding counter
- A waiting area
- An office/laboratory
- Two (2) women showers and bathrooms (including handicap accommodations)
- Two (2) men showers and bathrooms (including handicap accommodations)
- Mechanical, plenum/maintenance, and storage rooms
- A WTP (direct filtration treatment system with hypochlorination)
- A community watering point on building exterior

The two conceptual floor plans provide two different layouts of the same items listed above.

The building foundation is undetermined at this time, and will require geotechnical consideration to identify issues of permafrost and thaw possibly. It is assumed the new WTP/washeteria will be located in the same footprint area of the existing WTP building. A possible design approach for the building's foundation may include the use of sleepers and beams similar to that used for the existing building. An alternative design is one that incorporates the use of thermal piles with gravel pads, geofabric and board insulation.

The new building service will be approximately 200 to 300 amp, 240VAC, single-phase served from an adjacent, overhead utility pole. The main distribution for the building will be provided from a 240VAC, single-phase main distribution panelboard (MDP) which will sub-feed 100-amp, 240VAC branch panels within the facility.

Lighting will be provided in accordance with the Illuminating Engineering Society of North America (IESNA) Lighting Handbook and industry standards. The majority of interior lighting will be provided with energy-saving fluorescent fixtures. Exterior fixtures will be High Pressure Sodium (HPS) type. All fluorescent ballasts will have less than 10% Total Harmonic Distortion (THD). Interior lighting will be controlled through manual and automatic means. Where practical, occupancy sensor lighting control will be provided to improve energy efficiency.

Manual switches will be used in areas where the above techniques do not provide an economical or practical solution.

Emergency lighting will be provided to comply with the National Electrical Code, International Building Code (IBC), and the National Fire Protection Association (NFPA) 101 and will use wall mounted units with batter backup. Exit signs will be the energy-saving type with integral battery backup.

Receptacle devices include general receptacles, special receptacles, and other components required to provide convenient points for connection of appliances and/or equipment to power sources. A maximum of six receptacles per circuit will be provided.

Mechanical equipment serving the heating, ventilation, and air conditioning systems will include disconnects, motor starters, and/or thermal manual motor starters to meet the needs of the equipment and sequence of operations. Motor control centers, or stand alone starter units, will be incorporated to suit the physical layout of spaces and number of motors within the space. Motors over 1/2-horsepower (hp) will be served from individual branch circuits or motor control center modules. Unless special considerations require selection of other types of starters, starters will be FVNR (Full Voltage, Non-Reversible) hp-rated and will consist of toggle-type manual starters for fractional hp motors and full NEMA size units sized for those motors greater than 1/2-hp in size or of 3-phase configuration. Variable speed or frequency drives, or reduced voltage starting equipment complying with utilities requirements, will be provided for mechanical system motor loads exceeding 20-hp or as required by mechanical sequences.

A stand-by, diesel-fired engine generator set will be used to provide power to the facility during the loss of normal utility power.

5.4 WATER STORAGE TANK

It is proposed that a bolted steel WST will be provided for Tununak. Current design anticipates that a 100,000-gallon tank will be required. The materials, accessories, and design incorporated into the WST should comply with American Water Works Association (AWWA) D103 and the following specifications:

- Design Loads
  - Specific Gravity: 1.0
  - Wind velocity per International Building Codes/AWWA
  - Shape Factor: 0.6
  - Allowable Soil: to be determined
  - Roof Snow Load: 25 pounds per square foot
  - Seismic per IBC/AWWA

The WST would be prefabricated at a manufactures facility what would incorporate fusion bond coatings for resistance to internal and external tank corrosion. Insulation and an aluminum

jacket protective cover would also be specified. A bolted tank is selected for ease of shipping and construction, with assistance of a local force account.

The foundation for the WST is undetermined at this time and will require geotechnical consideration to identify issues of permafrost and, possibly, thaw. A ring wall is anticipated. However, thermal piles may need to be incorporated into the foundation design, along with gravel pads, geofabric, and board insulation. Another design approach for the tank's foundation may include the use of sleepers and beams similar to that used for the existing WST.

5.5 WATER DISTRIBUTION AND WATERING POINTS

It is assumed the existing water distribution system from the existing WTP to the watering points will remain, subject to satisfactory findings of a future investigation. The new WTP will provide a means for adequate pumping for recirculation purposes and heat-add for thermal protection.

The existing watering points are currently inadequate and need replacement. The new watering points are assumed to be located at the same locations as the existing watering points, which are located strategically throughout the community.

The replacement watering points will be designed to ensure ease of operation and safety for residential use. The same design features will be incorporated in the community watering point proposed for the new WTP/washeteria building.

The new watering point enclosure services will be similar to the existing and include an overhead drop from the adjacent village utility pole to an interior 100 amp, 240VAC single-phase main disconnect switch. An interior 100 amp, 240VAC, single-phase branch panelboard will provided. The panel will feed all loads within the enclosure, including lighting, heaters, receptacles, heat trace, etc.

Exterior lighting will be high pressure sodium wall packs. Interior lighting will be incandescent industrial type fixtures with guards.

5.6 WASTEWATER DISPOSAL SYSTEMS

5.6.1 On-Site Septic Tank System for School, Teacher Housing and Washeteria

The existing septic tank system serving the school, teacher housing, and washeteria was found to be in a state of failure during the May 2010 field trip visit completed by MWH. The septic tank and drainfield is approximately 30 years old and appears to be beyond repair. It is recommended the existing septic system be abandoned in-place and the sewer line re-routed to flow by gravity to the proposed upgraded septic tank system that currently serves the FTH system as described below.

A conceptual sketch for the proposed sewer improvements is provided in Appendix D, Figure D-7. Flow from the proposed new WTP/washeteria, school, and teacher housing would flow by gravity through Manhole #1 to Manhole #2, located at the toe of the hillside west of the School.

Manhole #2 would be modified to accommodate a new, 8-inch diameter sewer line that would take flow northerly along the base of the hillside by gravity to the upgraded septic tanks for the FTH drainfield system. The new sewer line would include a new manhole midway between Manhole #2 and the FTH septic tanks.

5.6.2 On-Site Septic System for Co-Water FTH System

It was noted by MWH during the May 2010 site visit, that the existing septic tank system used for the disposal of tank pumping from the Co-Water FTH system was in a state of failure. The failure is apparently caused by a blockage in the multi-compartment septic tanks. Based on the limited field observations, there is a possibility that the blockage could be corrected and the septic tanks placed back into operation.

However, it is essential that a more comprehensive site investigation be conducted in order to accurately assess the structural condition of the septic tanks to ensure their continued use. Also, the hydraulic adequacy of the existing drainfield needs to be determined. Apparently, the drainfield has had limited use over the years, and may be capable of handling the flow of clarified sewage discharged from the septic tanks. Given the size of the drainfield according to VSW records, the drainfield may be adequate in absorption area to handle the combined flow from the FTH system and the effluent from the school, teacher housing, and new washeteria. The assessment of the hydraulic capacity of the drainfield needs to be completed as soon as possible.

5.6.3 Honey Bucket Disposal and Conversion to a Community-Wide FTH System

All of the existing honey bucket disposal bunkers in the community are filled to capacity. Their continued use is an obvious and serious health hazard to the residents, including their pets. It is understandable that the residents who are currently using honey buckets desire a piped sewer system, but due to funding constraint, the continued use of honey buckets appears to be a necessity for the near term.

Unless significant funding for a piped sewer system is obtained in the immediate future, it is recommended for the interim that an alternative, cost-effective method of disposing the honey bucket wastes in a sanitary method be developed in the immediate future – subject to the availability of funding. However, as a practical long term alternative, MWH recommends the expansion of the FTH system to serve all of the households in Tununak currently on the honey bucket system. These households would be upgraded to accommodate interior plumbing improvements that are compatible to accommodate the use of FTH system.

Until funding is provided for expansion of the FTH system, it is recommended that honey bucket waste is disposed of in new transfer stations that are located in convenient and strategic locations throughout the community where honey buckets are used. Residents would self-haul their honey bucket waste to in “sanitary bags” to special hoppers that are contained in the waste transfer stations. The hoppers would be equipped with sealed covers to contain the bags for temporary storage.

A service would be set up by TTC to routinely inspect the waste transfer stations and empty the hoppers into a transport container that would haul the contents by an all-terrain vehicle to a community-wide disposal facility. This facility would be located at an approved site, possibly near the current landfill (dump) located south of the airfield. The honey bucket disposal site would consist of a large, fenced-in sewage bunker similar to ones used in other remote villages. The bunker would be designed to allow for sequential expansion as portions of the bunker are filled and properly buried.

In addition, the existing honey bucket bunkers need to be properly closed out and limed for final burial. It is recommended the bunkers that are currently overflowing be properly abandoned immediately.

6.0 COST ESTIMATE FOR RECOMMENDED SANITATION IMPROVEMENTS

The following provides a breakdown of the estimated costs for the construction of the proposed sanitation improvements that were recommended in Section 5.0 of this report. Given the limited scope of the investigation completed by the MWH design team, the cost estimates are qualified as conceptual and should only be used for preliminary planning and scoping purposes. It is understood the cost estimates will be used for requesting initial funding to provide a financial means to pursue the development of these urgently needed sanitation improvements for the community.

As recommended in Section 5.0, a more comprehensive investigation on the site conditions should be conducted in order to verify the cost estimates. On the other hand, the future investigation(s) and studies may discover favorable site conditions that could reduce the cost estimates, especially in regard to the development of the water source. It is noted due to project scope limitations that the following cost estimate does not include the estimated cost to expand the FTH system to serve the households currently using the honey bucket disposal system.

Proposed Sanitation Improvements	**Construction Cost**
New Water Source (Hillside Impoundment)	$1,000,000
New WTP and Washeteria (includes demolition of existing structures)	$3,050,000
100,000-gallon WST	$550,000
Watering Points (five community Locations)	$150,000
Honey Bucket Collectors and Disposal Facility	$350,000
Upgraded Septic Tank System (For School, WTP/Washeteria and FTH System, and Includes Septic Tank Pumper Truck)	$350,000
Total Construction Cost Estimate	$5,450,000
Design and Construction Management (20%)	$1,090,000
Contingency (20%)	$1,308,000
TOTAL COST ESTIMATE	**$7,848,000**

7.0 RECOMMENDATIONS AND CONCLUSIONS

The recommended plan of action presented herein provides a simplistic, yet useable, preliminary "guide" for the development of the proposed water and sewer improvements. These improvements were shown in conceptual sketches and drawings to depict fundamental features of the design components. This plan of action included two conceptual floor plans for the replacement WTP and washeteria that show configurations of laundry equipment, bathrooms, showers, mechanical, water treatment equipment and offices. These sketches serve as points of reference for planning and discussion purposes.

Potential water sources were identified, screened, and evaluated. Screening criteria considerations for the candidate sources included: community perception of the source as a supply of public water, the potential for contamination from past or current development, individual source water quality and quantity, and rough cost estimates for complying with applicable rules/requirements for treatment.

The community's sanitation problems identified in this investigation are considered by the MWH design team to be an imminent risk to the health and welfare of its residents. All of the essential components of the water and sewer systems currently serving the community, with the exception of the BIA school well, were found to be in extremely poor operational condition.

In summary, the design team recommends the following sanitation improvements be further evaluated for development as soon as practical:

- Replace the Unnamed Creek water intake with an upgradient (hillside) water source.
- Replace the WTP.
- Replace the washeteria.
- Replace the existing WST with a 100,000-gallon tank.
- Replace the community watering points.
- Expand the FTH system to serve all households in the community. This recommendation involves the installation of interior plumbing to connect to the FTH tank in existing households that currently use honey buckets. Also, the FTH system will need additional upgrades to the water and sewage haul equipment and expansion of the on-site septic tank/drainfield system.
- As an interim corrective action measure until such time the honey bucket use homes are upgraded with interior plumbing to accommodate the use of the FTH system, we recommend the installation of honey bucket transfer stations and construct disposal facility at a suitable location outside of the residential area.
- Upgrade the septic tank system for the FTH system, new WTP, new washeteria, school, and school housing.

It is recommended the <u>first priority</u> is to develop a new "safe" water source. A site investigation for evaluating alternative, suitable water sources should be completed as the first step in

addressing sanitation needs of Tununak. The design of a new WTP will depend on the quality and flow capability of the new water source.

Concurrent with the water source investigation, it is recommended a site investigation be conducted to evaluate the condition of the septic tanks and drainfield at the "In-complete septic system" for upgrade to use in the immediate future.

APPENDIX A

ADCRA Community maps of Tununak



JOB No. 1008675.040101 TIME: 09-DEC-2010 12:06 FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG A-1 ADCRA Tununak area map.dgn

MWH
Anchorage, Alaska

FIGURE A-1
VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

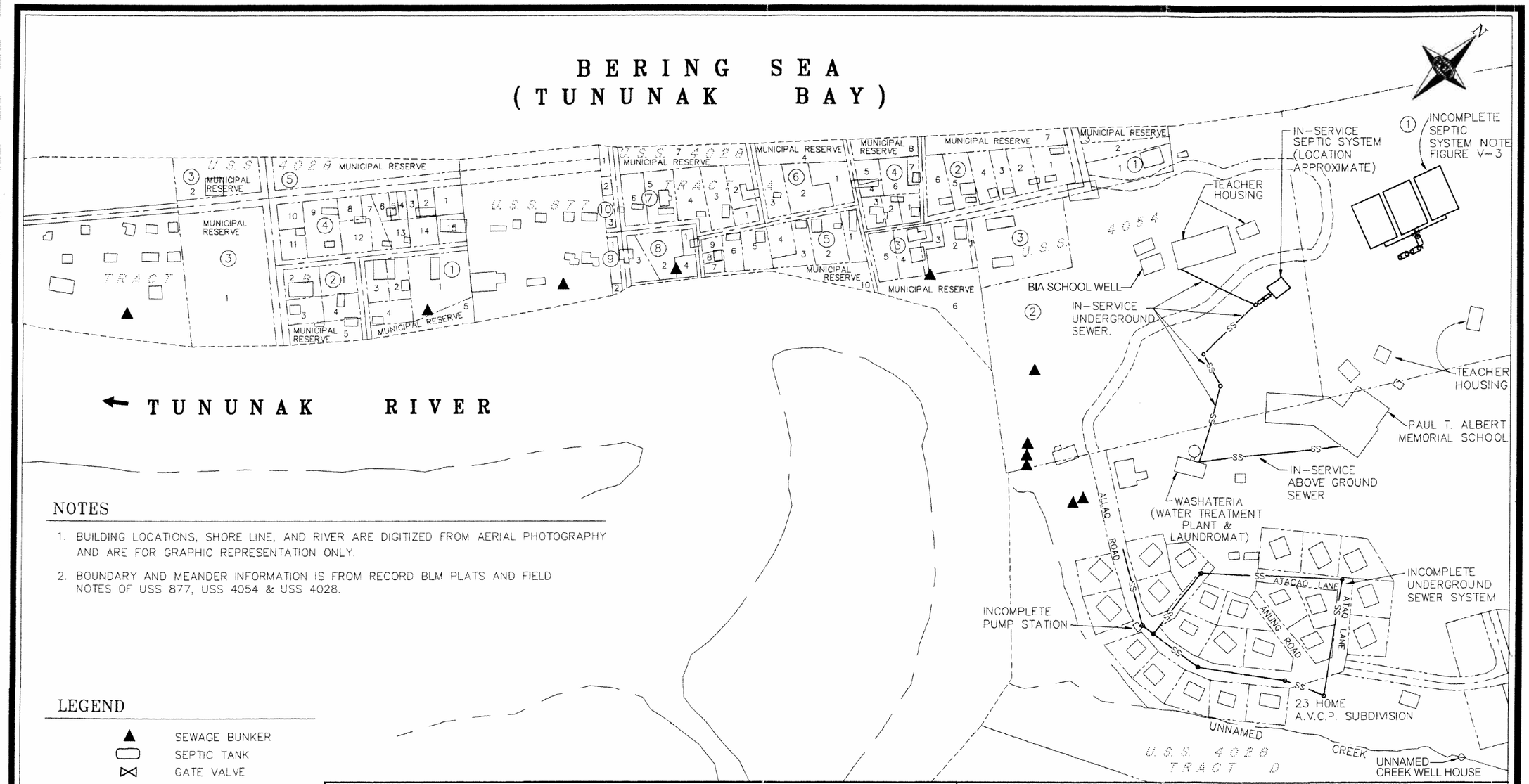
ADCRA TUNUNAK AREA MAP



FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG A-2 ADCRA Tununak community map.dgn
TIME: 09-DEC-2010 12:15
JOB No. 1008675.040101

MWH
Anchorage, Alaska

FIGURE A-2
VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN
ADCRA TUNUNAK COMMUNITY MAP



NOTES

1. BUILDING LOCATIONS, SHORE LINE, AND RIVER ARE DIGITIZED FROM AERIAL PHOTOGRAPHY AND ARE FOR GRAPHIC REPRESENTATION ONLY.
2. BOUNDARY AND MEANDER INFORMATION IS FROM RECORD BLM PLATS AND FIELD NOTES OF USS 877, USS 4054 & USS 4028.

LEGEND

- SEWAGE BUNKER
- SEPTIC TANK
- GATE VALVE
- SEWER MAN HOLE
- SS — EXISTING SEWER LINE
- RECORD BOUNDARY
- RECORD CENTERLINE
- BLM RECORD MEANDERS
- ③ U.S. SURVEY BLOCK

PHUKAN CONSULTING ENGINEERS & ASSOCIATES, INC.
Civil Geotechnical • Surveying • Environmental
PCA
Telephone: (907)272-7111 Fax: (907)272-3177
203 West 15th Avenue Suite 104 Anchorage, AK 99501

TUNUNAK SANITATION FEASIBILITY STUDY
EXISTING SANITATION FACILITIES

DRAWN	GRID	COMP FILE NO. 516V-1	FIGURE V-1
SCALE 1"=200'	DATE 12-21-92	FILE DRAWER NO.	
F.B. PG.	W.O. H92516		

FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG A-3.dgn
TIME: 09-DEC-2010 11:52
JOB No. 1006675.040101

MWH
Anchorage, Alaska

FIGURE A-3
VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN
EXISTING SANITATION FACILITIES

APPENDIX B

Site Photographs Taken During the May 2010 Field Trip



Photo 1: South side of the Water Treatment Plant Washeteria Abandoned watering point drainage area (circled). Boarded-up door to boiler room. Arctic pipeline to clinic in background.



Photo 2: Detail of undermined building cribbing below abandoned watering point.



Photo 3: Abandoned watering point showing erosion of building footings. Arctic pipe from water source previously buried has been exposed.



Photo 4: Another footing eroded along south wall of water treatment plant building.



Photo 5: Discharge from filter backwash above Arctic pipes.



Photo 6: Deteriorated tank foundation.



Photo 7: Rotted window frames and replaced glass with single pane Plexiglas or plywood.



Photo 8: Rotted window frames and replaced glass with single pane Plexiglas or plywood.



Photo 9: Rotted window frames and replaced glass with single pane Plexiglas or plywood.



Photo 10: Showing disconnected drainage piping improperly sealed.



Photo 11: Boiler 2 burner showing firebox leakage and melting of combustion air inlet piping.



Photo 12: Building fuel supply tank located too close to building. Piping is not properly connected. Fill access is at rear contributes to fuel spill potential.



Photo 13: Backwash pump (foreground) and pressure pumps (only one serviceable).



Photo 14: Abandoned watering point at south side of WTP showing deterioration of insulation and building envelope. Exterior siding is visible from building interior.



Photo 15: Watering point distribution piping circulation pumps (foreground) dismantled and inoperative.



Photo 16: Exterior of Watering Point #2. Typical of all watering points.



Photo 17: Interior of Watering Point # 2. Inoperative heater at bottom of photo.



Photo 18: Valve pit of Watering Point #3. Snow packed with heat trace power and sensor wiring connections exposed.



Photo 19: Valve Pit heater for Watering Point #2.



Photo 20: Valve pit of Watering Point #2. Heat trace power and sensor wiring.



Photo 21: Bottom of Watering Point #5 door.
Corrosion is typical of most watering points.



Photo 22: Interior condition of flooded well casing in Un-Named Creek well house.



Photo 23: Flood conditions around Un-Named Creek well house.



Photo 24: Water transmission line from Un-Named Creek well through HUD subdivision, with Paul T. Albert Memorial School in background.



Photo 25: Honey bucket bunker.



Photo 26: Overflowing honey bucket bunker.



Photo 27: Snow drifts around community watering point.



Photo 28: Musk Ox Creek Well House and water transmission line.



Photo 29: Frost heave damage to Musk Ox Well House.



Photo 30: FTH holding tank at HUD subdivision home.



Photo 31: Open stream channel upstream of existing well house on Un-Named Creek drainage near 100 feet MSL elevation.



Photo 32: Upland drainage area of exposed rock debris on Un-Named Creek drainage basin near 300 feet MSL elevation.



Photo 33: Stream channel on Un-Named Creek drainage near 150 feet MSL elevation.



Photo 34: Deteriorated 50,000-gallon bolted steel water storage tank on timber foundation.



Photo 35: WTP/Washeteria connection to water storage tank.



Photo 36: Frozen outlet in dosing tank on the In-Complete septic system.



Photo 37: FTH trailer stuck in mud at off-loading ramp on In-Complete septic system.



Photo 38: Ice blocked outlet baffle in septic tank #1 on the In-Complete septic system.



Photo 39: Open trench used for disposal of FTH hauled waste located near off-loading ramp on the In-Complete septic system.



Photo 40: Overflowing sewage in observation pipe on the drainfield serving the Washeteria, teacher housing, and school.



Photo 41: Overflowing sewage in manhole on septic tank serving the Washeteria, teacher housing, and school.



Photo 42: Exposed section of 4-inch steel well serving the former BIA school water system. Note the duct tape well cover.



Photo 43: Tununak Washeteria interior.



Photo 44: Tununak water treatment plant.

APPENDIX C

Sanitary Facility Questionnaire

MWH
BUILDING A BETTER WORLD

Sanitary Facility Survey
Tununak, Alaska 2010

House # _____

Household Owner Name _____

Number of Household Occupants _____

I. Present Water Source (Check all that Apply):

WINTER		SUMMER	
____	Haul from BIA Well	____	Haul from BIA Well
____	Haul from Washeteria	____	Haul from Washeteria
____	Haul from River, Creek, or Lake	____	Haul from River, Creek, or Lake
____	Delivered by Flush Tank & Haul	____	Delivered by Flush Tank & Haul
____	Other, please describe:	____	Collect Rain Water
	_____	____	Other, please describe:
			_____

II. Present Water Consumption:

Average number of gallons per week used in household: _____ gallons

III. Present Sewage Disposal Method:

____ Flush Tank & Haul
____ Sewage Bunker
____ Other, please describe: _____
_____

IV. Preference for Future Sewage Disposal (Prioritize: 1 for highest, 3 for lowest):

____ Flush Tank & Haul ____ Sewer Lines ____ Honey Buckets with New Bunkers

V. Preference for Future Water Improvements (Prioritize: 1 for highest, 3 for lowest):

____ New Washeteria ____ Piped Water ____ New Community Watering Point

---

Do you use a washing machine in your home? Circle: YES NO

Do you use the washeteria for clothes washing? Circle: YES NO

How much are you willing to pay monthly for piped water & sewer? $_____ per month

How much are you willing to pay to use a Washeteria? $ _____ per load, $ _____ per shower

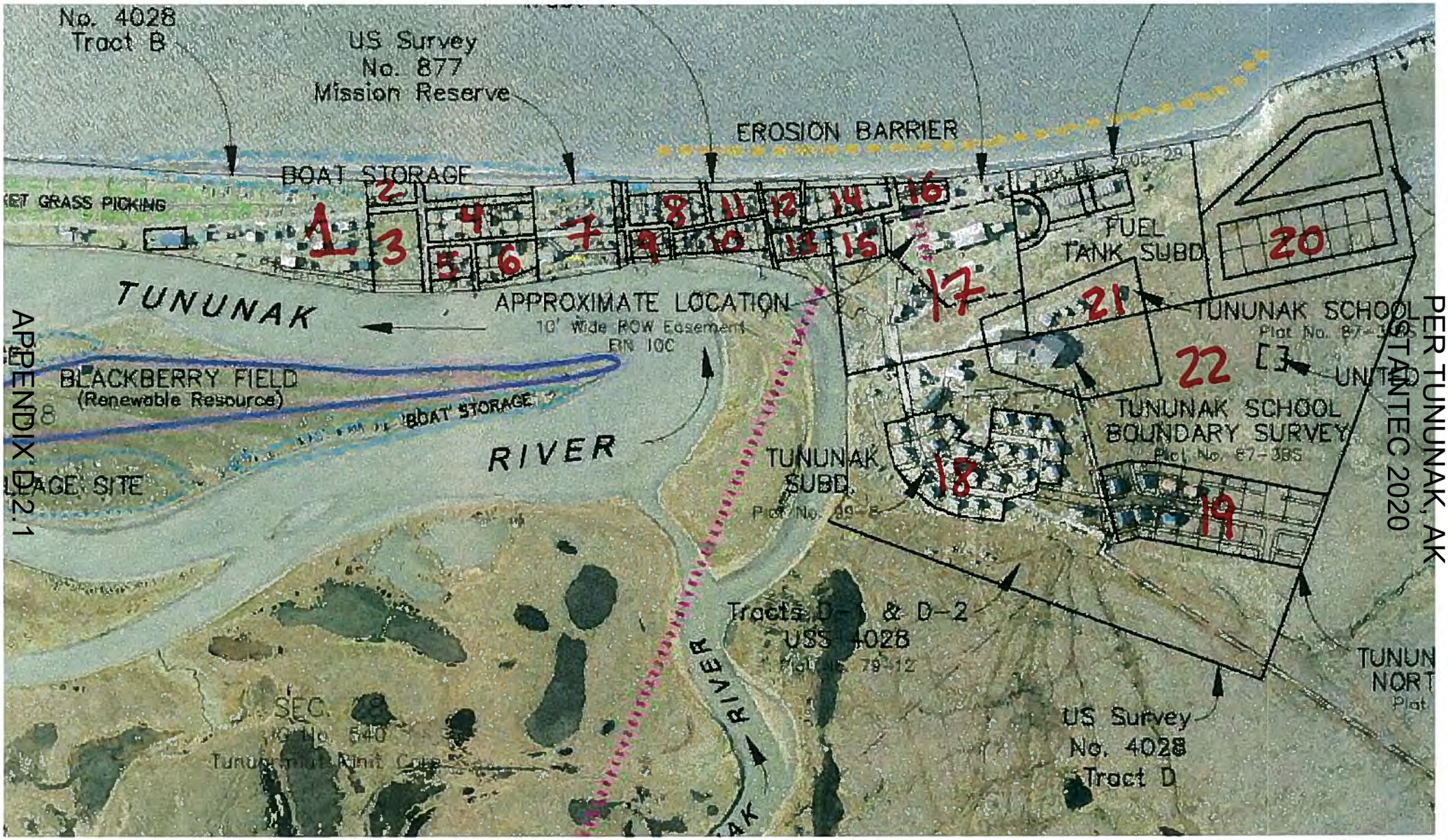
How much are you willing to pay monthly for a new watering point? $ _____ per month

Sanitary Facility Questionnaire for Tununak, Alaska 2010

Household Location (Refer to Housing Area Map)	Number of Household Occupants	Current Water Source	Household Weekly Water Use (gal/week)	Water Use Per Person (gal/day)	Current Sewage Disposal Method	Future Sewage Disposal Method (1st choice)	Future Water Improvement (1st choice)	Use Washing Machine in Home	Use Existing Washeteria	Willing to Pay Piped Water and Sewer Per Month	Willing to Pay Washeteria per Wash Load	Willing to Pay Washeteria Per Shower	Willing to Pay New Watering Point per Month	Comments
1	1	BIA Well	40	5.7	Honeybucket	Sewer Lines	New Washeteria	No	Yes	$ 50.00	$ 2.50	$ 2.00	$ 25.00	
4	1	BIA Well	20	2.9	Honeybucket	Flush Tank Haul	New Washeteria	No	Yes	open	$ 5.00	?	?	Only use creek in summer
1	8	BIA Well	20	0.4	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 25.00	$ 5.00	?	$ 25.00	Also use creek in summer
1	6	BIA Well	200	4.8	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 100.00	$ 5.00	?	?	
1	4	BIA Well	300	10.7	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 80.00	$ 2.50	?	$ 10.00	Also use rain water
1	7	BIA Well	65	1.3	Honeybucket	Sewer Lines	New Washeteria	No	Yes	$ 20.00	$ 3.00	$ 1.00	?	Also use creek in summer
1	1	BIA Well	5	0.7	Honeybucket	Honeybucket	New Water Point	Yes	Yes	?	$ 5.00	$ 5.00	?	
1	7	BIA Well	70	1.4	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 50.00	$ 5.00	$ 2.00	$ 50.00	Equal Priority of New H2O
1	4	BIA Well	150	5.4	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 3.00	$ 1.00	$ 0.50	Equal Priority H2O/Sewer
1	7	BIA Well	12	0.2	Honeybucket	Honeybucket	New Washeteria	Yes	Yes	?	?	?	?	Equal Priority of New H2O
1	4	BIA Well	64	2.3	Honeybucket	Flush Tank Haul	New Water Point	Yes	Yes	?	?	?	?	Use creek & rain in summer
4	6	BIA Well	?	?	Honeybucket	Sewer Lines	New Water Point	Yes	No	?	$ 5.00	$ 1.00	?	
4	4	BIA Well	70	2.5	Honeybucket	Sewer Lines	New Washeteria	Yes	No	$ 100.00	?	?	$ 50.00	Equal Priority of New H2O
4	4	BIA Well	25	0.9	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 3.00	$ 1.00	$ 25.00	Also use rain water
4	8	BIA Well	65	1.2	Honeybucket	Flush Tank Haul	New Water Point	Yes	Yes	$ 25.00	$ 5.00	$ 3.00	$ 25.00	Also use rain water
5	1	BIA Well	3	0.4	Honeybucket	Flush Tank Haul	New Water Point	Yes	No	$ 50.00	$ 2.00	?	$ 25.00	Also use rain water & creek
7	4	BIA Well	21	0.8	Honeybucket	Honeybucket	Piped Water	No	Yes	$ 100.00	$ 3.00	$ 1.50	$ 25.00	Also use creek in winter
7	8	BIA Well	30	0.5	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	?	$ 10.00	?	$ 20.00	
10	6	BIA Well	60	1.4	Honeybucket	Honeybucket	New Washeteria	Yes	Yes	?	$ 5.00	$ 1.75	?	
10	5	BIA Well	20	0.6	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 3.00	$ 1.75	$ 20.00	Also use rain water
10	2	BIA Well	20	1.4	Flush Tank Haul	Sewer Lines	New Washeteria	No	No	$ 25.00	?	?	?	Also favors Piped Water
10	2	BIA Well	50	3.6	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 5.00	?	$ 25.00	Also favors Piped Water
13	1	BIA Well	25	3.6	Honeybucket	Sewer Lines	Piped Water	Yes	No	$ 100.00	?	?	$ 50.00	
14	7	BIA Well	32	0.7	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 2.00	$ 1.00	?	Also uses creek & rain H2O
14	2	BIA Well	20	1.4	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	?	?	?	?	Also uses rain water
15	9	BIA Well	40	0.6	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	?	?	?	?	
?	2	BIA Well	5	0.4	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	?	$ 5.00	$ 5.00	$ 5.00	
6	2	BIA Well	20	1.4	Honeybucket	Sewer Lines	Piped Water	Yes	?	?	?	?	?	
11	3	BIA Well	40	1.9	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 2.50	?	?	
?	1	BIA Well	15	2.1	Honeybucket	Sewer Lines	Piped Water	Yes	No	$ 25.00	$ 1.50	$ 0.50	$ 5.00	
?	2	BIA Well	15	1.1	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 1.00	$ 5.00	$ 1.00	?	Also uses creek & rain H2O
?	2	BIA Well	12	0.9	Honeybucket	Sewer Lines	Piped Water	Yes	No	?	$ 5.00	$ 2.00	$ -	Also uses rain water
?	8	BIA Well	200	3.6	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 70.00	$ 30.00	?	$ 25.00	Also uses rain water
?	8	BIA Well	110	2.0	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	$ 20.00	$ 10.00	?	$ -	Also uses rain water
?	3	BIA Well	50	2.4	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 3.00	$ 1.00	?	Also uses creek & rain H2O
14	7	BIA Well	?	?	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	?	$ 1.00	$ 0.50	?	Also uses rain water
?	3	BIA Well	35	1.7	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	?	$ 2.00	$ 1.00	$ 5.00	Also uses creek & rain H2O
19	3	BIA Well	40	1.9	Flush Tank Haul	Sewer Lines	Piped Water	Yes	Yes	$ 70.00	$ 5.00	$ 2.00	$ 35.00	Also uses rain water
?	7	BIA Well	60	1.2	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 3.00	$ 1.00	$ 20.00	Also uses creek & rain H2O
?	1	BIA Well	10	1.4	Honeybucket	Honeybucket	New Water Point	No	No	?	?	?	?	
21	2	BIA Well	350	?	Septic Tank Sys	Sewer Lines	New Water Point	Yes	No	$ 50.00	$ 3.00	$ 1.50	$ 50.00	
?	3	BIA Well	20	25.0	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 50.00	$ 5.00	$ 2.00	$ 20.00	Also uses all sources
?	1	BIA Well	12	1.7	Honeybucket	Sewer Lines	New Washeteria	Yes	No	?	?	?	?	Only use rain H2O in summer
9	4	BIA Well	25	0.9	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	?	$ 5.00	?	$ 75.00	
?	5	BIA Well	55	1.6	Honeybucket	Sewer Lines	Piped Water	Yes	No	$ 15.00	$ 3.00	$ 0.75	$ -	Also uses rain water
6	5	BIA Well	15	0.4	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 100.00	$ 3.00	$ 1.50	$ 15.00	Also uses rain water
?	6	BIA Well	10	0.2	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 5.00	$ 1.00	$ 20.00	
?	2	BIA Well	30	2.1	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 20.00	$ 5.00	?	$ 15.00	
?	6	BIA Well	60	1.4	Flush Tank Haul	Sewer Lines	New Water Point	Yes	No	$ 25.00	$ 1.00	$ 3.00	?	Also uses creek & rain H2O
?	5	BIA Well	20	0.6	Flush Tank Haul	Sewer Lines	Piped Water	No	Yes	?	?	?	?	
?	8	BIA Well	30	0.5	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	$ -	$ 5.00	$ 1.50	$ -	Also uses creek & rain H2O
?	8	BIA Well	100	1.8	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	?	$ 5.00	?	?	Also uses creek & rain H2O

Summary of Tununak 2010 Sanitary Facility Questionnaire

Number of Household	52
Total Persons Served	226
Average Water Use Per Person Per Day (gal/cap/day)	2.3
Total Water Use Per Day (gal/day)	395
Well	100%
Total Honeybucket Users	40
Total Flush Tank Haul Users	11
% Desires Honeybucket	8%
% Desires Flush Tank Haul	8%
% Desires Sewer Lines	81%
% Desires New Washeteria	52%
% Desires Piped Water	33%
% Desires New Water Point	13%
% Users of Washeteria	75%
Average Monthly Cost for Willing to pay for piped water & sewer	$ 42.30
Average Cost for Willing to pay for washer load at washeteria	$ 4.68
Average Cost for Willing to pay for shower at washeteria	$ 1.69
Average Cost for Willing to pay for new watering point	$ 22.18
Adjusted % Favor New Washeteria based on lack of willingness to pay at least $100 per month for piped water system	77%



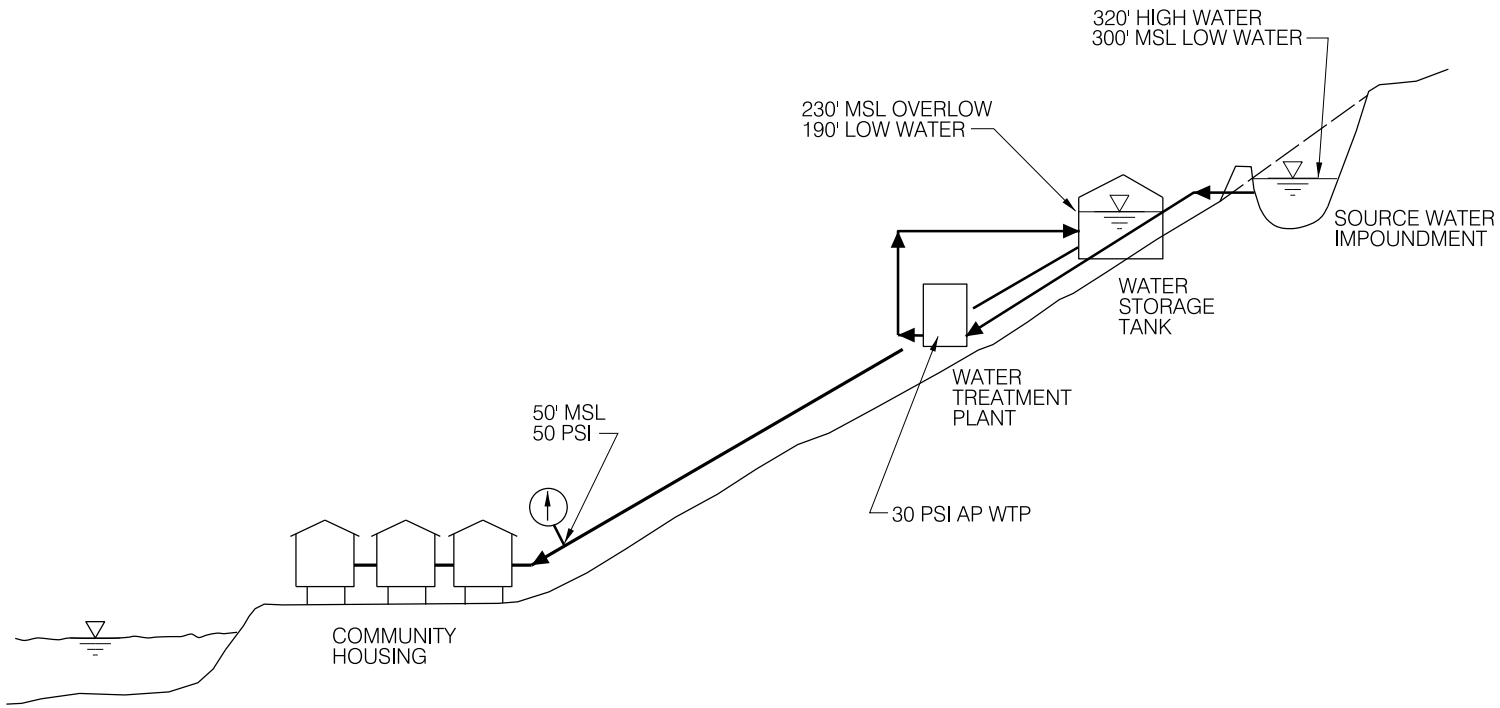
APPENDIX D2.1

PER TUNUNAK, AK
STANTEC 2020

APPENDIX D

Figures

APPENDIX D.2.1



PER TUNUNAK, AK
STANTEC 2020

MWH
Anchorage, Alaska

FIGURE D-1

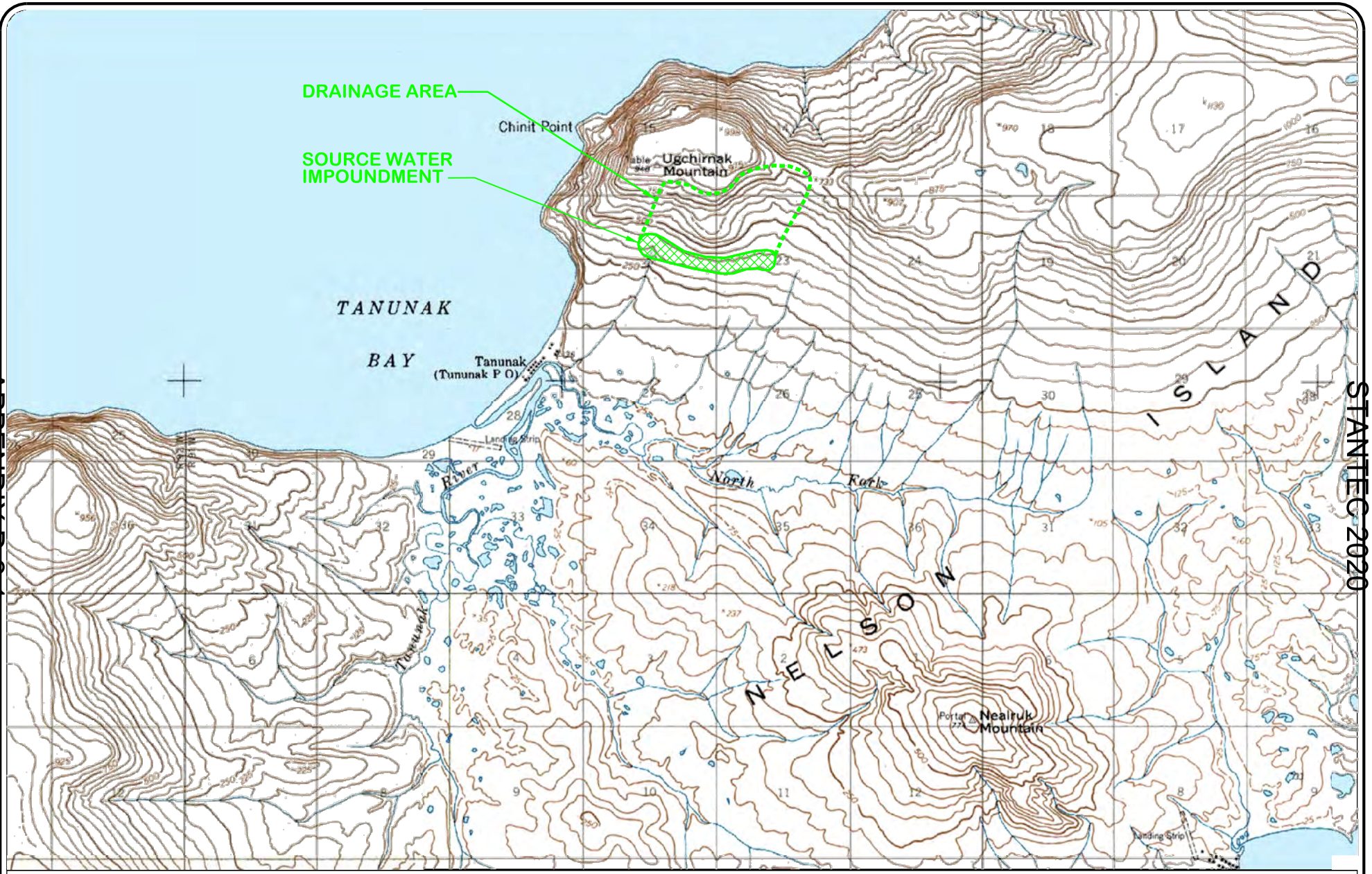
VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

PROPOSED SURFACE WATER IMPOUNDMENT AT 300 FEET MSL

JOB No. 1008675.040101 TIME: 11-NOV-2010 14:30 FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG D-2_topographic map.dgn

APPENDIX D.2.1

PER TUNUNAK, AK STANTEC 2020

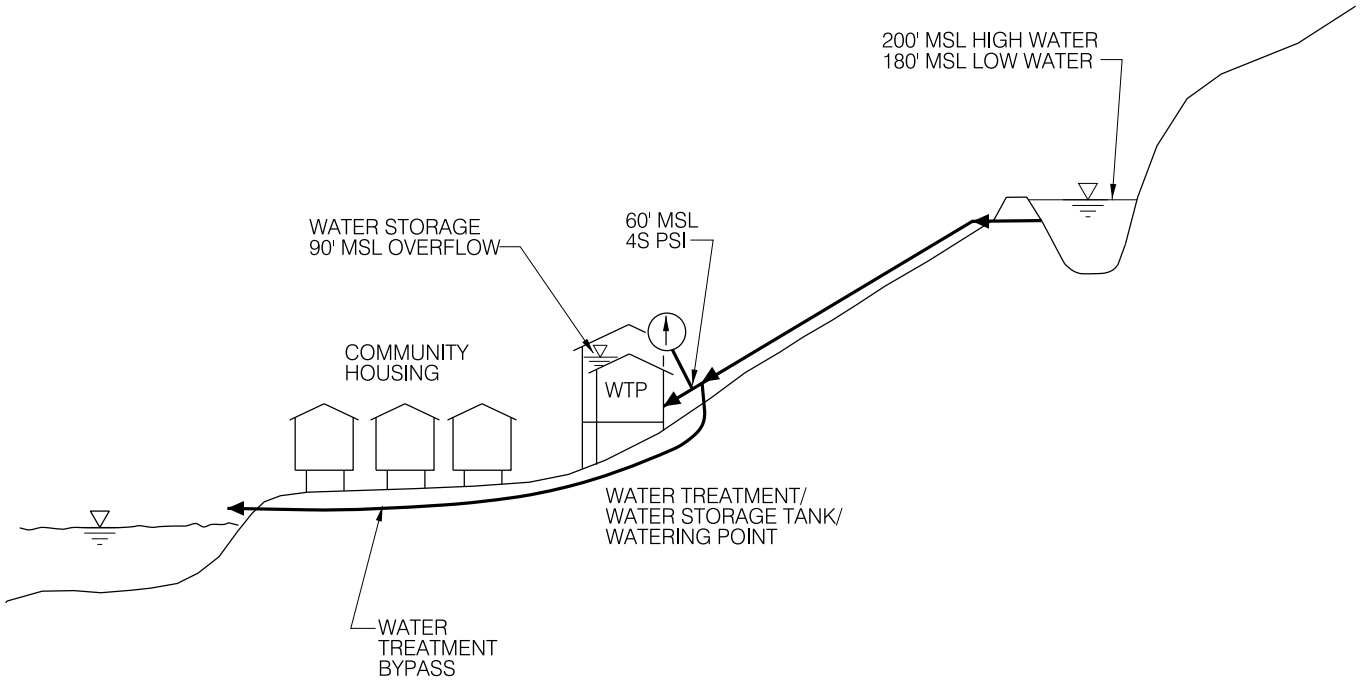


MWH
Anchorage, Alaska

FIGURE D-2

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

TOPOGRAPHIC MAP OF PROPOSED SURFACE WATER IMPOUNDMENT

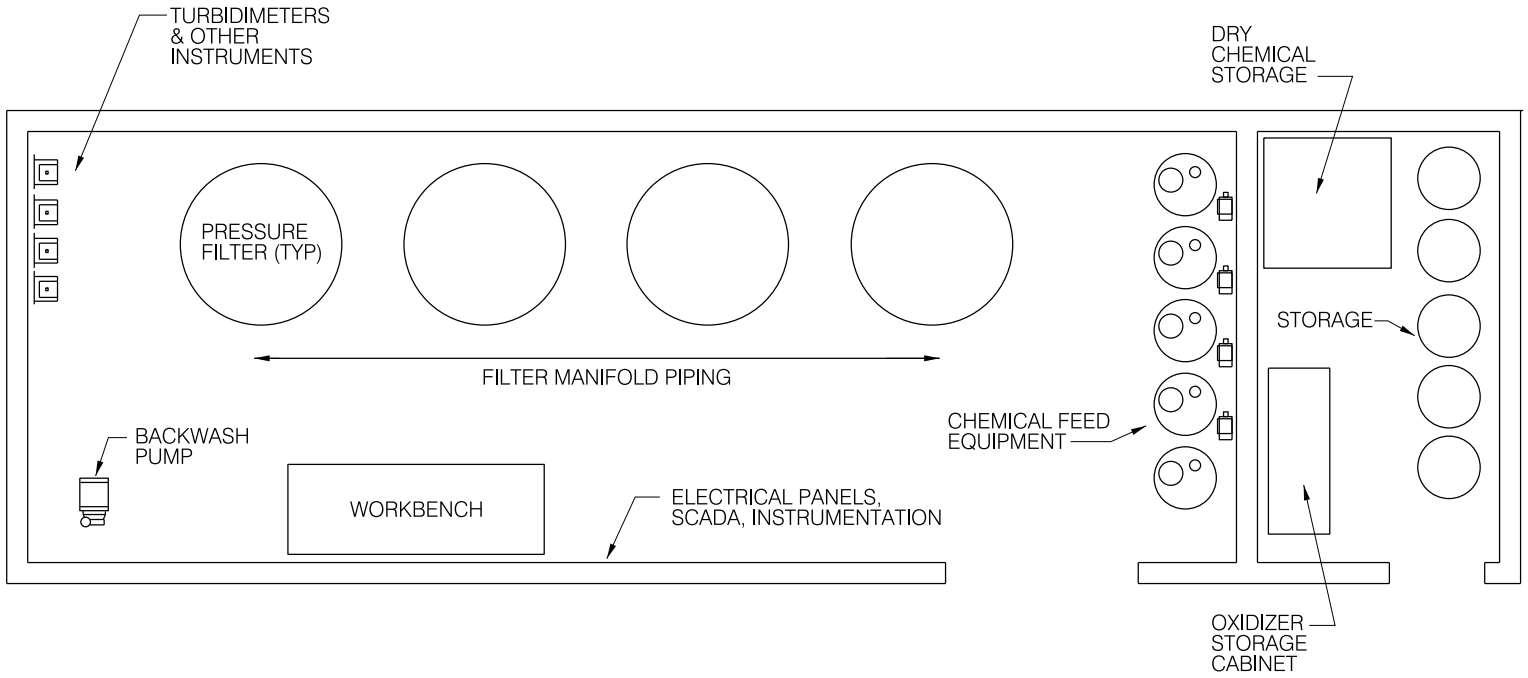


MWH
Anchorage, Alaska

FIGURE D-3

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

PROPOSED SURFACE WATER SOURCE UPSTREAM ON UN–NAMED CREEK



SCALE IN FEET

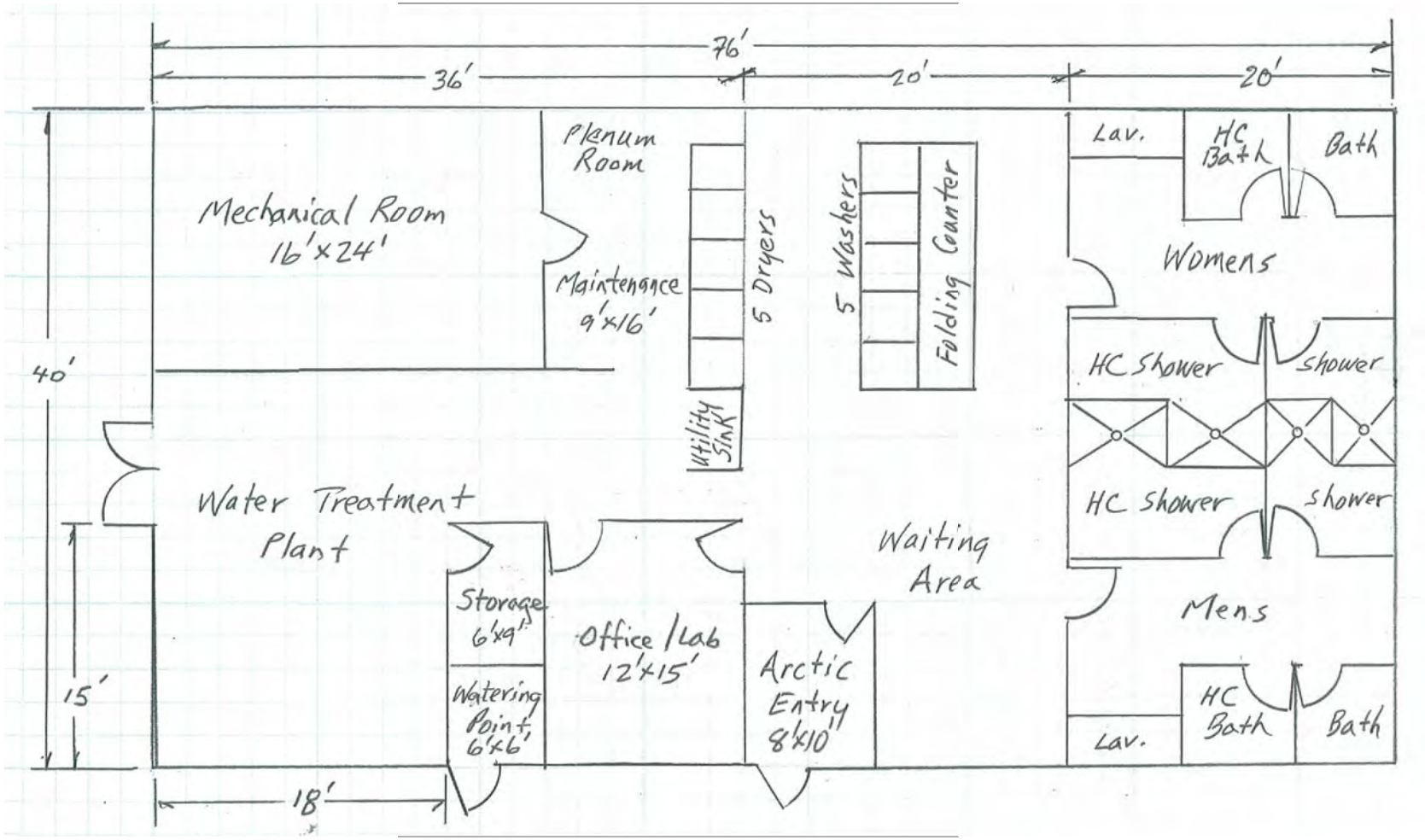
0 5 10

MWH
Anchorage, Alaska

FIGURE D-4

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

CONCEPTUAL LAYOUT OF DIRECT FILTRATION TREATMENT SYSTEM



WASHETERIA = 3,040 SF

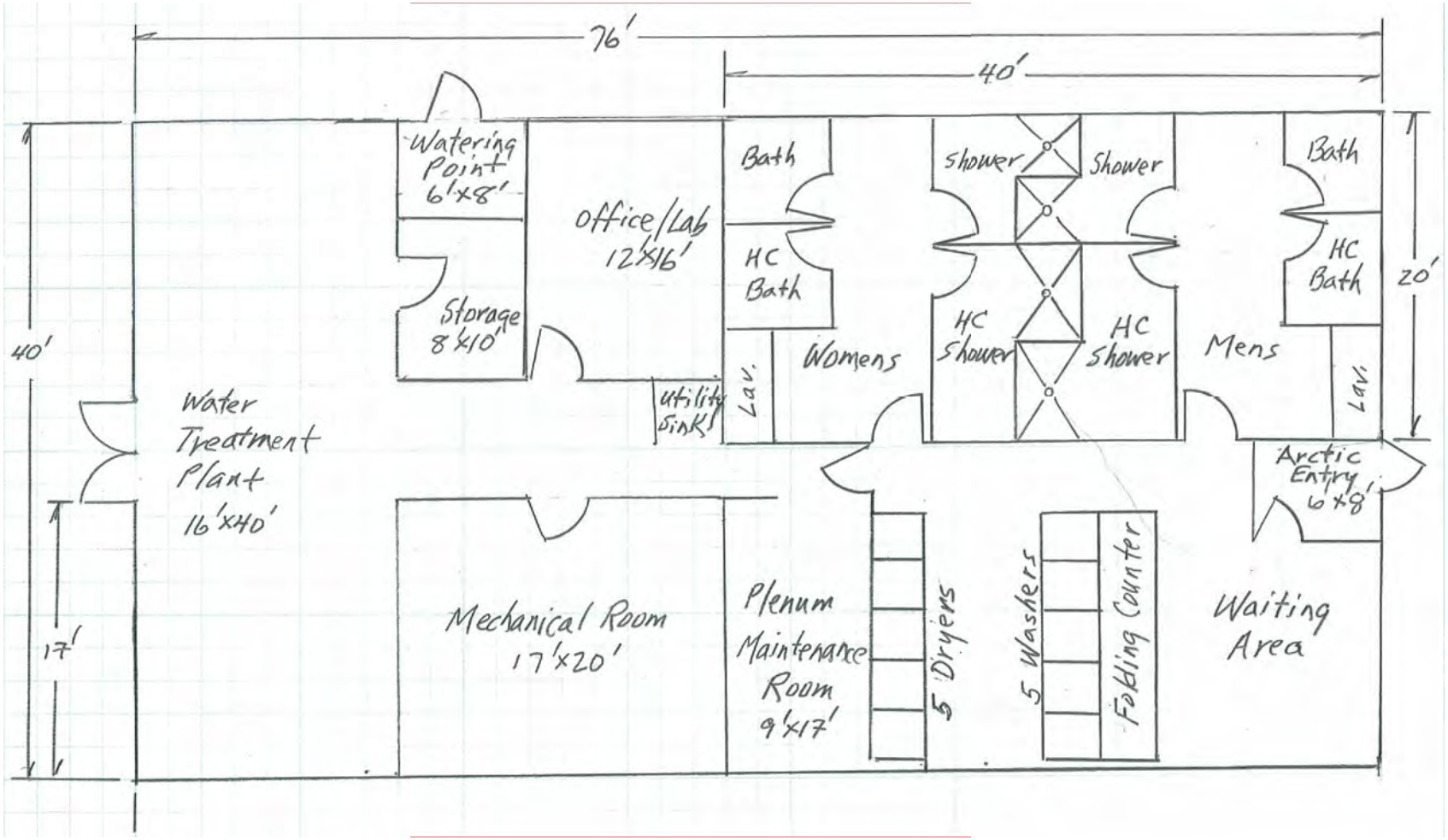
SCALE IN FEET
0 10

MWH
Anchorage, Alaska

FIGURE D-5

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

WATER TREATMENT PLANT & WASHETERIA (ALTERNATIVE #1)



WASHETERIA = 3,040 SF

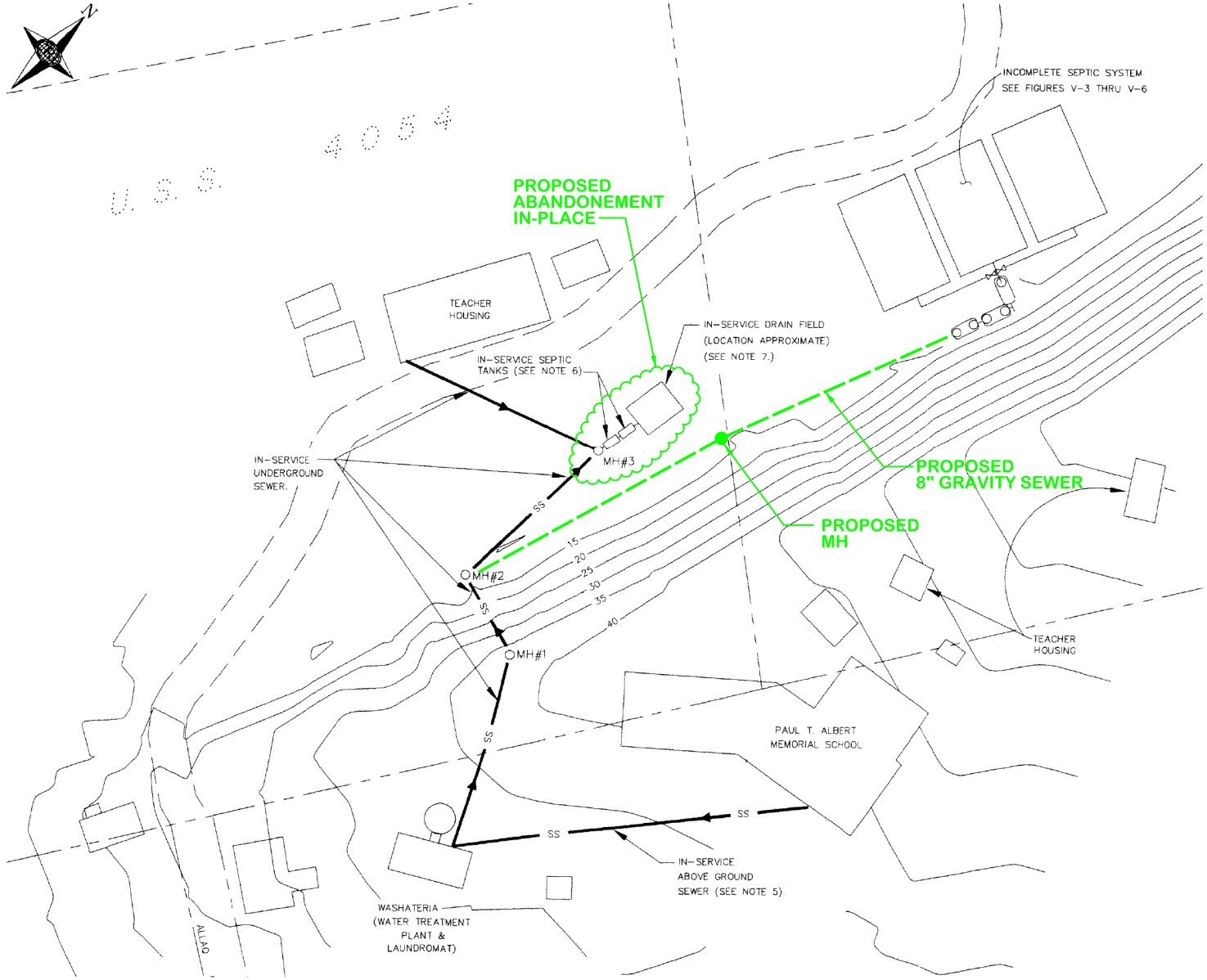
SCALE IN FEET
0 10

MWH
Anchorage, Alaska

FIGURE D-6

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

WATER TREATMENT PLANT & WASHETERIA (ALTERNATIVE #2)



NOT TO SCALE

MWH
Anchorage, Alaska

FIGURE D-7

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

PROPOSED SEWER IMPROVEMENTS FOR ON-SITE SEPTIC SYSTEM

D.2.2 Stantec Technical Memos 2018

D.2.2.1 Technical Memorandum 1

Technical Memorandum 1 – *Assessment of the Existing Wastewater Disposal System (Septic Tank/Drainfield) Length 22 pages.*

Technical Memorandum 1

Assessment of the Existing Wastewater Disposal System (Septic Tank/Drainfield) For Tununak, Alaska

August 8, 2018

Technical Memorandum #1

To:	Native Village of Tununak IRA Council	From:	Bob Gilfilian, PE
	Tununak, Alaska		Stantec Consulting Services, Inc.
File:	**Technical Memorandum 1 – Assessment of the Existing Wastewater Disposal System (Septic Tank/Drainfield)**	Date:	August 6, 2018

Section 1.0 Introduction

The Native Village of Tununak a.k.a. Tununak IRA Council (herein referred to as Tununak), in cooperation with the Alaska Department of Environmental Conservation (ADEC) Village Safe Water (VSW) has retained Stantec Consulting Services, Inc. (Stantec) to prepare this Technical Memorandum (Tech Memo) with funding from the U.S. Department of Agriculture Rural Development (USDA-RD).

The purpose of this Tech Memo is to provide a summary of the assessment of the existing septic tank and drainfield system serving the Tununak Washeteria/Water Treatment Plant (WTP). Also, this Tech Memo provides recommendations for future use and/or corrective action for the septic tank system, if determined to be needed based on the findings of the field assessment (adequacy flow test).

Section 2.0 Methodology

The assessment of the existing septic tank system was based on conducting an adequacy flow test in accordance with the standards and procedures outlined in the Anchorage Municipality Code, Chapter 15.65 (Attachment 1). The Alaska Department of Environmental Conservation (ADEC) uses the same methodology for testing septic systems as that required by the Anchorage Municipality. The adequacy test, initially referred to as *In-Situ Testing of On-Site Sewer Systems,* was developed by the Anchorage Municipality in the 1970s and has been successfully used since that time to test an existing septic tank and drainfield system to determine if it was adequate for a specific use building or facility that discharges sewage to a septic system.

An adequacy test involves the dose of a predetermined amount of water into the septic tank system and monitoring the hydraulic heads (liquid levels) in the septic tank and drainfield as the water flows through the system. Basically, the adequacy test is used to determine if a typical daily hydraulic load on the septic system is adequately absorbed by the drainfield without resulting in a backup of liquid into the incoming sewer line from the building to the septic tank. A measured quantity of water, based on the number of water use fixtures in the structure, is introduced into the septic tank system for monitoring the fluid levels in the septic tank and drainfield before, during, and after the addition of water. Based on these measurements, the engineer can make a determination as to whether the system is capable of absorbing the required minimum amount of daily flow.

The following describes the procedures used to conduct an adequacy test:

- Step 1 – All liquid levels in the septic tank system pump-out/clean-out pipes are probed to establish the elevations of the liquid levels in the septic tank prior to starting the adequacy test.
- Step 2 – To start the test, flow is initiated in the structure by running a spigot/faucet fully open. The rate of flow is measured frequently during the adequacy test.
- Step 3 – The liquid levels in the septic tank are measured, typically on a quarterly-hour basis, to determine the hydraulic impact of the flow into the septic system.
- Step 4 – The adequacy test is terminated (flow turned off) if it becomes obvious that the liquid levels in the septic tank and drainfield are rising appreciably above the inlet to the septic tank and/or daylights on the ground surface, both of which are an indication of a failed septic system. However, in cases where the liquid levels rise very slowly (less than 1 inch per measurement), the flow into the tank system continues until the daily total hydraulic load is reached; these observations/measurements are an indication the septic system is functioning adequately.
- Step 5 – The adequacy test is completed when the predetermined amount of total flow enters the septic tank.
- Step 6 – Depending on site conditions observed during the adequacy test, a 24-hour rebound test is conducted. The rebound test typically restricts the volume of water entering the septic system upon completion of the adequacy test and involves measurement of all liquid levels in the septic tank system at 24 hours after the adequacy test is completed. The 24-hour rebound test provides a means to make a final determination on the adequacy of the septic system. As a rule, if liquid levels are found to be near the pretest elevations, then the test results designate a passing septic system.

An adequacy test was conducted on the existing septic tank system serving the Tununak Washeteria/WTP on June 6 and 7, 2018, by Bob Gilfilian, P.E., Senior Principal Civil Engineer with Stantec. Mr. Gilfilian was assisted in the field by the Tununak WTP operators, Vincent Billy and Joseph (Joe) James. Field notes are provided in Attachment 1 and a photo log is provided in Attachment 3 – showing the site conditions of the washeteria and the existing septic tank manholes, sewage lift station, and observation pipes in the drainfield system.

Prior to the start of the adequacy test, Mr. Gilfilian inspected the operation of the WTP and the use of the washeteria. It was noted that water was not being produced at this time in the WTP, but the washeteria was in constant use during all hours of operation – which typically ran from 9 AM to 5 PM daily. Also, he observed there was only one washer in operation, because the other washers were broken. Because of the high demand for the use of the single washing machine, the washeteria users were observed inserting a water hose directly into the washing machine (see Photo 4) to add more water, since the users were over-packing the washer with clothes.

Joe James set up a discharge water hose in the laundry room that allowed for frequent measurement of flow going into the septic system. A calibrated 5-gallon bucket was used to

measure the flow rate at a frequent basis throughout the duration of the adequacy test. (Photo 5). Before the water was discharged to the septic system, Mr. Gilfilian inspected the condition of the existing septic tank and drainfield used by the washeteria/WTP. The manholes on the 4,000- and 2,000-gallon septic tanks (arranged in series flow) were uncovered and inspected. Their locations and configuration matched the 1980s as-built/record drawings prepared by the U.S. Public Health Service.

However, Mr. Gilfilian noted that there were eight new 4-inch diameter polyvinyl chloride (PVC) observation pipes installed in the drainfield area (Photo 7). Four of the pipes were on the north end of the drainfield area and the remaining four pipes were aligned on the south end. These new observation pipes indicated there were four parallel laterals with an observation pipe on each end. According to Joe James, a couple of years ago the Lower Kuskokwim School District constructed a new replacement drainfield system that consisted of several buried Infiltrators™. Also, a sewage lift station was connected to the outlet of the 2,000-gallon septic tank (Photo 10). The lift station pumps effluent into the buried header pipe on the south end of the drainfield system. Mr. Gilfilian observed a pipe in the lift station that appeared to be connected to the school's new wastewater treatment plant located to the west of the septic system. Apparently, the sewer line connection could be used as a backup system in the event the school district's wastewater treatment plant had operational problems.

The covers/caps on the observation pipes were removed and the depths to liquid in the drainfield (four Infiltrator™ lines) were measured with a staff. The length of the Infiltrator™ lines were measured to be approximately 125 feet long. The depth to the liquid level in each Infiltrator™ line was measured with respect to the top of the observation pipe. In addition, the depth of the liquid in the Infiltrator™ was measured.

At 3:08 PM on June 6, the adequacy test was started. The flow entering the septic tank system from the washeteria was measured at 7.6 gallons per minute (gpm). It was noted that the one washer in the washeteria was in constant use during the adequacy test. Prior to starting the test, Mr. Gilfilian calculated the discharge load for the proposed new replacement washeteria and WTP to be approximately 900 gallons per day. The adequacy test was conducted for a 3-hour period (180 minutes), with an average discharge flow rate of 6.6 gpm. During the 3-hour adequacy test, the liquid levels in the two septic tanks and eight observation pipes in the drainfield were measured and observed multiple times. At the completion of the test at 6:08 PM, the total flow that was discharged to the septic system was estimated to be 1,400 gallons. The total flow included an estimate of the wastewater discharged from the constant use of the washeteria's single operating washing machine.

On the following day (June 7) at 9 AM, Mr. Gilfilian met with Joe James to measure the liquid levels in the septic tanks and drainfield observation pipes. Mr. James informed Mr. Gilfilian that the washeteria had been open for the past hour and at least two loads of laundry wash water was discharged to the septic tank system. Shortly thereafter, Vincent Billy arrived and assisted Mr. Gilfilian in conducting a vertical control survey of all the drainfield's observation pipes to establish elevations of liquid level in each Infiltrator™ trench and the septic tanks.

On June 7 at 6:08 PM, the 24-hour rebound test was conducted. The liquid levels were remeasured in the observation pipes on the drainfield system, including the septic tanks. It was noted that the washeteria had been in continuous use for the entire day. The drainfield liquid levels measured at the completion of the 24-hour rebound period were found to be within ½ inch of the original liquid levels recorded prior to the start of the adequacy test.

Section 3.0 Discussion of Findings

Table 1 shows the depth to the liquid level in the septic tank and drainfield observation pipes with respect to time and amount of flow entering the septic system.

Table 1 Adequacy Test Field Measurements

Time[1]	Flow Rate[2] (gpm)	Cumulative Volume (gallons)	ST CO	Observation Pipe[3]						NW CO
				S-2	S-3	S-4	N-2	N-3	N-4	
June 6, 2018										
14:30	7.6	0	99.5”	55.75”	51.5”	36.0”	99.5”	48.0”	54.0”	NM
15:23	7.6	175	100.0”	55.0”	52.0”	45.5”	99.5”	48.5”	Damp	NM
16:10	7.0	504	99.5”	54.25”	52.0”	Damp	99.5”	48.0”	Damp	72.5”
17:00	5.8	854	99.5”	54.5”	52.0”	Damp	99.5”	47.5”	Damp	72.5”
18:15	6.0	1,289	99.5”	54.75”	52.0“	Damp	99.75”	47.25”	Dry	72.5”
June 7, 2018										
09:15	NM	Recovery	99.5”	55.5”	52.25	Dry	99.5”	48.5“	Dry	73.0”
18:00	NM	Rebound	NC	NC	NC	NC	NC	NC	NC	NC

Key:
1 – Adequacy flow test started at 15:08 on June 6 and ended at 18:08 on June 6 (180 minutes).
2 – Average flow rate entering the septic tank system estimated at 7.7 gpm (includes washing).
3 – Represents an observation pipe on designated lateral on Infiltrator.
“ – inch(es)
NW CO – Clean out pipe found on the north west corner of drainfield system
ST CO –Septic Tank Clean Out (8” diameter pipe on 4,000-gallon septic tank).
NM – not measured
NC – no change (less than 0.5” from measurements at the start of the adequacy test)

In review of the test data in Table 1, it is apparent that the liquid levels during the 3-hour adequacy test that were monitored during the introduction of flow of approximately 1,400 gallons from the washeteria did not change appreciably. In fact, the measurements taken at the 24-hour rebound flow test were nearly the same as those collected prior to the start of the adequacy test. It is important to note that the liquid level measurements taken at the conclusion of the 24-hour rebound flow test had experienced the additional flow to the septic system from constant use of the washing machine in the washeteria on June 7 from the hours of 8 AM until 6 PM.

Section 4.0 Conclusion and Recommendations

Based on the findings of the adequacy test reported herein, the existing septic tank and drainfield system serving the Tununak Washeteria/WTP appeared to be functioning properly and is determined to be adequate to serve the facility for many years. With the understanding that the existing 4,000- and 2,000-gallon septic tanks are properly maintained (periodically cleaned out to remove septage by vacuum tanker at least once every 3 years), the existing drainfield system consisting of the four 125-foot long laterals of Infiltrators™ should be capable of handling the discharge of at least 1,400 gallons of wastewater effluent per day.

Section 5.0 Limitations

This Tech Memo was prepared by Stantec for the account of Native Village of Tununak IRA Council at the request of ADEC VSW Program. The findings and recommendations presented herein reflects Stantec's professional judgment in light of the scope, schedule, and other limitations stated in this document and in the contract between Stantec and the Client. The opinions in this document are based on conditions and information existing at the time the document was prepared and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party.

Stantec Consulting Services, Inc.

Robert (Bob) Gilfilian, PE
Principal, Civil Engineer

Cell Phone: 907-227-9883
Email: bob.gilfilian@stantec.com

Attachments: Attachment 1 – Anchorage Municipality Code, Chapter 15.65
Attachment 2 – Bob Gilfilian Tununak Field Notes for June 5-8, 2018
Attachment 3 – Photo Log of Tununak Washeteria and Septic Tank/Drainfield

ATTACHMENT 1

ANCHORAGE MUNICIPALITY CODE

CHAPTER 15.65

"ADEQUACY TEST"

b. Drainfield monitoring tubes are set to a depth which allows for an accurate determination of the liquid depth in the disposal field. If monitoring tube is not set to designed depth stated on the inspection report, engineer shall note actual depth.

5. **Disposal field adequacy test.** A wastewater disposal field shall pass an adequacy test. The operating liquid level in the disposal field shall not be at or above the distribution pipe invert prior to commencing the adequacy test. The adequacy test shall be conducted in accordance with the following procedure:

a. **Presoaking.** Disposal fields not in use for thirty days or longer shall be presoaked with clean water prior to commencement of the adequacy test. The adequacy test shall be conducted within forty-eight hours of completing the presoak. The volume of clear water required for presoaking the disposal field shall be the lesser of the following:

i. 2,000 gallons.

ii. The gallons of water equal to the volume of the drainfield below the distribution pipe invert multiplied by 0.4.

iii. The maximum gallons of water the disposal field accepted without the liquid level raising above the top of the distribution pipe during the presoak.

b. **Adequacy test.** A measured quantity of water, consisting of 150 gallons per bedroom, shall be introduced into the disposal field while monitoring fluid levels in the septic tank and disposal field monitor tubes before, during, and after the addition of water. The quantity of water introduced shall be sufficient to cause the fluid depth in the monitor tubes to increase enough to allow accurate measurement of the subsequent re-absorption. At no time during the course of the adequacy test shall the system be surcharged with a fluid depth greater than the top of the distribution pipe. Based on these measurements the engineer shall make a determination as to whether or not the system is capable of absorbing 150 gallons of water per bedroom per day. Systems that fail an adequacy test shall be reported to the department.

Exception: A disposal field installed or adequacy tested within twenty-four months of the COSA issuance date does not require an adequacy test.

C. **Waivers for horizontal separation distances.** If a horizontal separation distance noted on the COSA form does not comply with this code or the code in force when the final inspection report and record drawings were approved, a waiver shall be obtained prior to issuance of the COSA.

D. **Engineer's certification.** The engineer shall certify on department provided COSA forms that the wastewater disposal system appears to comply with the system's approved final inspection report and record drawings.

E. **COSA issuance.** Upon request, and subject to the provisions of this section, the department may issue or deny the issuance of a COSA.

1. **Unconditional approval.** The department shall issue a COSA if the department finds information provided by the engineer demonstrates the system for which the certificate is sought is in compliance with this section, the system's approved final inspection report and record drawings, and does not presently create a health hazard.

2. **Conditional approval.** When an on-site wastewater disposal system is not in compliance with the applicable codes, but no health hazard is posed by temporarily postponing correction of the wastewater disposal system's defects, the department may issue a conditional COSA to extend the period of time for corrective action. The COSA may be approved with conditions necessary to ensure that the public health and safety are not endangered. The specific requirements for a conditional COSA approval shall be:

   a. The conditional COSA fee has been paid.

   b. If required, an approved design and permit for the required upgrades and/or repairs has been issued.

   c. Three estimates for the related construction shall be submitted to the department.

   d. A letter from an established escrow agency, stating 1.5 times the highest construction estimate is being held in escrow for the specific purpose of funding the proposed construction, shall be submitted to the department.

ATTACHMENT 2

BOB GILFILIAN FIELD NOTES

TUNUNAK SITE VISIT

JUNE 5-8, 2018

(107) June 5, 2018
Tues

Tununak, AK
Tech Memo Field Trip

@ 0800 arrived at ANC Airport - Ravn Air for flight to Tununak (via Bethel, Nightmute, Toksook Bay)

@ ~~11~~ left ANC for Bethel
@ 1130 arrived Bethel
@ 1250 left Bethel on Magellan Air/Ravn
@ 1330 arrived in Tununak
met Ira at Airport (Airfield) & Teddy
@ 1345 went to School to check in w/ Teddy
@ 1400 met Kavers at his house
Joseph James, operator H2O plant (652-2670)
Vincent Billie " " (652-2630)
IRA #617-2021 (not
@ called Brandi for school internet password
Amy 543-4827
- Ira took me on 4-Wheeler to Village office - everything in Village was shut down due to no power except School.

@ 3 pm took walking tour of Village to check out layout w/ photos.
Check Washeteria/WTP to set up for test
- Elizabeth secretary at School

Bob Gilfilian - Tununak AK
Field Trip Notes, June 5-8, 2018 (6 pages)

Tununak, AK

6/5/18 (128)
Tues
~50°F, clear, Sun

@ 4 pm walked along western beach to the north end where bluff (5-6' high) meets the beach. Took photos to show exposed rock formation. Collected sample of gray and brown sandstone/siltstone horizontally fractured

✓ Walked south on beach to School's sewer outfall daylighted on upper beach
✓ Took photos of School's exterior water treatment plant and W/W plant.
✓ Went to Washeteria - closed due to power out, took exterior photos and pipeline to Clinic
✓ Checked west leg of water line to Wash WTP - noted repair work on arctic pipe

@ 6 pm contacted Vincent Billie who agreed to meet me tomorrow at 10 am to start adequacy test on ST/SAS.
- Returned to school to organize files and field gear for tomorrow's projects.
- Reviewed project files until 8 pm

End Day 6/5/18

D.2.2.1

PER TUNUNAK, AK
STANTEC 2020

(109) Tununak, AK
June 6, 2018 (Wed)
~40°F
Part Sun
~5mph Wind

@ 8 AM prepared draft proposal letter to VSW for deep well Geophysical Survey.
@ 9 AM called Collin Markel on survey dates

Prepared field maps/docs to meet w/ Vincent Billie, Tununak WPO, to go over items needed to complete the following tasks:
1- Inspect WST (need ladder to ck tank)
2- Inspect Well House on Unnamed Creek
3- Inspect Water transmission line
4- Conduct Adequacy Test on ST/SAS.
Also prepared form RMS-2 and other Stantec safety forms to review w/ Vincent

@ 1000 met Vincent Billy at School. Check WTP but it was locked. Went to Village Office
@ 1030 held mtg. w/ Jamer James, Xavier, Joe James, and Vincent Billy
- Discussed purpose of my visit and scope of work (tasks)
- Went over well drill sites, noted Village owned corner of site south of Unnamed Creek along Muskox Cr Water transmission line
- Decided to walk sites tomorrow

Note: Meas cold water discharge in Washteria
5 gal = 35 sec

~45°F
Cloudy
~15mph Wind

Tununak (110)
June 6 '18

@ 1100 went to Washteria / WTP w/ Vincent Billy and Joe James.
✓ Checked over Wash (in use) only 1 washer and 2 dryers (Vincent est 4 gal/wash)
✓ made arrangements for discharging water in to Wash sewer drain for adequacy test Meas flow at 8.3 gpm
✓ Checked over equipment conditions in WTP - took photos - barely operating.
✓ Noted WST had ~114" water level
✓ Found one shower & one toilet working.
✓ Went to WST w/ ladder, climbed on top to check tank condition. Took photos and videos. Opened top access cover Observed rust debris floating in tank plus an empty soda can floating
✓ Went to sewer system to check manholes and then opened access to 4th and 2nd ST Found monitor tubes (8) that were installed by LKSD a couple of years ago when they installed several new Infiltrator lines in the area of the former WSPH Soil Absorption System (SAS). *Need Record Drawing.
@ 1230 I informed Vincent & Joe that I would complete Adequacy Test and we will meet tomorrow at 9 AM to inspect Well House Unnamed Ck.

D.2.2.1

PER TUNUNAK, AK
STANTEC 2020

(111) Tununak
June 6, 2018

~~55°F~~ 53°F
Cloudy, Windy
25 mph

@1245 returned to school to prepare forms for adequacy test. Organized notes & equipment
Lay out map of ST/SAS for Adequacy Test
@ 2 pm went to ST/SAS to take startup meas.
@ 2:30 meas liquid level in ST/SAS meas.
ST CO 99.5" btop (6" ϕ HDPE) (4K ST)
S-1 60.0" btop (4" ϕ ow) (Inlet)
S-2 55½" " (4" ϕ ow)
S-3 51½ " (Heaters) (4" ϕ wet
S-4 36" " (header pipe invert)
N-1 (8" ow) (filled w/ rocks & debris) (4" ϕ)
N-2 99.5" btop (8" ow)
N-3 48" " (4" ϕ ow)
N-4 54" " damp bottom gravel (4" ϕ)

@1508 started flow into washteria drain
meas flow in 5 gal bucket in 40 seconds
calc flow = 7.6 gpm plus 1 load washer.

@1527 (15 min) meas SAS & ST
ST CO 100.0" btop
S-1 59.5" btop (feels like header pipe)
S-2 55.0" "
S-3 52" "
S-4 45½" " able to clear header
wet bottom soil

Sunny 55°F
25 mph Wind

Tununak (112)
6/6/2018

N-2 99½" btop
N-3 48½" btop
N-4 damp soil

@1545 pm meas flow in Washteria = 7 gpm

@1610 meas ST & SAS Obs Wells (ows)
ST CO 99.5" btop
S-1 59.5" btop (This is header pipe w/ 4" ϕ
S-2 54¼" " coming from 2K ST)
S-3 52" "
S-4 damp
N-2 99½" "
N-3 48" "
N-4 damp.
Found 4" ϕ ABS ob pipe in NW corner of SAS
meas liquid = 72½" btop (flush w/ GS)
~15' SW of N-2

@1650 meas flow = 5.75 gpm at washteria
4 loads of washer used during test

@1700 meas levels in ST & SAS
ST-CO 99½" btop Stickup = 22" AGS
S1 57" btop stickup = 7" ags
S2 54½" btop " = 12" "

D.2.2.1

PER TUNUNAK, AK
STANTEC 2020

(113) Tununak 6/6/2018

Continue meas SAS

S3	52" btop	stickup = 7"	ags
S4	damp	" = 8"	ags
N1	NA	"	
N2	99½"	btop " = 27"	"
N3	47½"	btop " = 4"	ags
N4	damp	top of casing at GS.	
NW corner OW = 72½" btop, No stickup flush GS			

@1752 meas flow = 60 gpm in Washeteria
@1808 Shut off flow for Adequacy Test
Ave flow 616 gpm, Total flow = 1,185 gal
Plus 4 wash load yields 1300 g in 180 min
Note: laundry being used all day - 1 washer

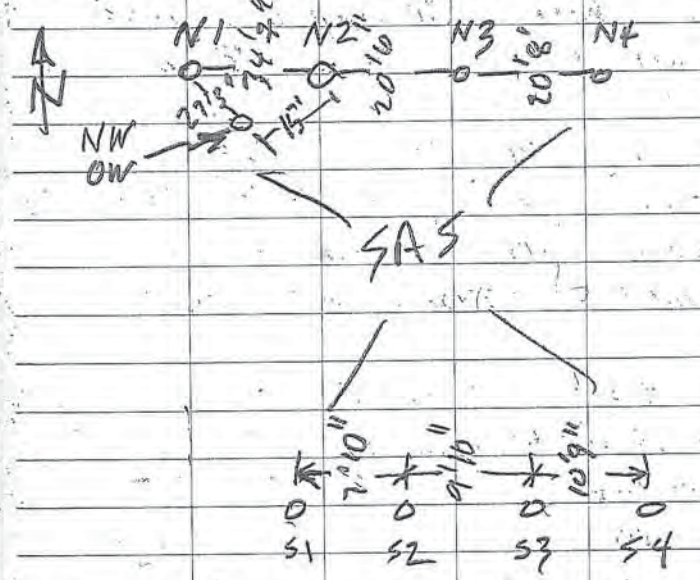
@1815 meas SWLs in ST/SAS OWs:

ST CO	99½"	btop
S1	~~55 3/4~~	" (very difficult to meas headed)
S2	54¾"	"
S3	52"	"
S4	damp	"
N2	99¾"	"
N3	47¼"	"
N4	dry 30'	"
NW OW	72½"	"

55°F / Wind Sunny / 20mph

Tununak (114) 6/6/2018

Layout of ST/SAS measured at 18



@7:10 pm returned to school to review notes
Sent proposal for Geophysical Survey to Susan via email

BR Stapleton 6/6/18

End Day 2

D.2.2.1

PER TUNUNAK, AK
STANTEC 2020

(115) Tununak
June 7, 2018
(Thursday)

Cloudy, 42°F
15 mph Wind

@ 0800 organized notes for field work today schedule to complete Adequacy Test and inspect Unnamed Creek well.

@ 0915 met Joe James went to ST/SAS
Joe informed me that ~2 loads wash so far this morning at Washeteria
Meas SWL in ST/SAS at 0930

ST-CO	99½"	btop
S1	59"	"
S2	55½"	"
S3	52¼"	"
S4	dry	"
N1	NA	"
N2	99½"	"
N3	48½"	"
N4	~~99½~~ dry	
NW-CO	73"	"

Note: lift sta discharge 2" @ HDPE is ~4'8" bags

Top (1")

T 27" HI above S1 to ST-CO top ring
30" HI " " to 1.7' to S2 top
30" HI " " 2.4' to S3 top
30" HI " " 2.9' to S4 top
25" HI " " to N1 Top
7" HI " N2 to N1 Top

Cloudy, 25 mph wind
40°F

Tununak
6/7/18

(116)

7" HI above N2 to 2.3', NW-CO Top
7" HI " " to 1.9' N3 Top
7" HI " " to 1.8' N4 Top
- Check w/ Bob Miller, LKSD Bethel
@ 1020 went to WTP w/ Joe & Vincent
@ 1100 inspected Unnamed Creek Pump House.
1 SAP pump - 2 of them
H2O level in well was 18" below floor
H2O depth in well was 24"
Creek flow ~ 6" deep x 3' wide channel 2' wide ~ 9" deep
Velocity = 5 sec / 8 ft in channel 30" x 6"
✓ Walked along water trans line
@ 1200 drove in ATV w/ Vincent to walk over proposed drill sites. Took photos & videos
@ 1230 drove up to gravel pit on top mountain in cloud layer a couple miles up haul road - filled w/ snow - developed by BIA
@ 1300 went to IRA office to meet w/ staff
Met w/ James James & Yaaret Post
@ 1400 rode back to school w/ Vincent, stopped to photo barge site south of BIA school & horses bucked
@ 1500 held 1 hr. tele conf w/ Susan Radle & Beth Dimmick
Worked rest of day on notes & records
Break
End Day 3

Note: 24 hr. ST SAS Rebound @ 1815 - ST CO = All same ½"

D.2.2.1

PER TUNUNAK, AK
STANTEC 2020

(117) Tununak, AK
June 8, 2018
(Friday)

45°F Cloudy
Calm

@ 0800 organized field notes and photos on laptop

@ 0930 walked to Tribal office. (No Vincent.) Approx 1.25 miles school to office

@ 1000 held telecon w/ Susan Randlett, James James and Xavier Post. Discussed approach to drilling exploratory deep wells.

- Need SHPO and wetland - maybe CRW
- ✓ Best Practices waiver
- ✓ Need cost est. for drilling wells
- ✓ Possible funding from RD by July 15
- ✓ Possible sole source d
- ✓ Grant period up to 5 years
- ✓ Discussed was Coterra
- ✓ Susan recommended include water line w/ well

@ 1100 mtg ended

- Xavier said most folks take steam baths & took several photos of steam huts.
- Means distance from ST Lift Sta to SI ≈ 25'

@ 1130 returned to school for packing met Vincent Billy and Teddy on flight standby. Found out Hageland Air could not fly from Bethel due to weather delay

53°F Partly Sun
~10 mph wind

(118) Tununak
June 8 '18

Next several hours kept calling Hageland in Tununak & Bethel with negative responses

@ 1600 found out Grant Air was coming to Tununak so Teddy rushed me out to the airport as the plane was landing - able to get a seat!

Flew to Toksook Bay and then to Bethel.

Arrived at 1735 as my Rava flight was departing Bethel

Went to AK Air and able to get a seat for 9 pm flight to ANC

@ 2015 pm boarded Alaska Air Flt. #46 for ANC for ANC

@ 2100 arrived at ANC Airport

@ 2130 arrived at Greg Magee's for the night

End Day 4
Bob Burgett 6/18/18

D.2.2.1

PER TUNUNAK, AK
STANTEC 2020

ATTACHMENT 3

PHOTO LOG

TUNUNAK SEPTIC SYSTEM



Photo 1 - Looking West from Tununak School Towards Septic Tank and Drainfield System in foreground with the septic tanks on the left side and drainfield on the right side of the open field.



Photo 2 - Manholes and Clean-Out on 4,000-gallon Septic Tank. Photo 1 was taken from the hill in the background.



Photo 3 - Interior of Washeteria. Laundry user sitting on folding table and Joe James to the left setting up discharge hose for adequacy test.



Photo 4 – Water hose inserted into washer to provide additional wash water for overloaded washer.



Photo 5 – Discharge hose in 5-gallon bucket used during adequacy test to measure rate of flow.



Photo 6 – Looking north from Washeteria towards the septic tank and drainfield system located in the open field. The septic tanks are on the left side and the drainfield on the right side of field.



Photo 7 – Looking southwest towards observation pipes on the south end of the drainfield with septic tank covers in the background.



Photo 8 – Looking west toward observation pipe on north end of drainfield.



Photo 9 – Looking north towards septic tanks manholes and clean-outs with observation pipes on south end of drainfield in the background.



Photo 10 – Lift station located at outlet end on the 2,000-gallon septic tank

D.2.2.2 Technical Memorandum 2

Technical Memorandum 2 – *Assessment of Existing Water Transmission Line. Length 43 pages.*

Technical Memorandum 2

Assessment of Existing Water Transmission Line

For

Tununak, Alaska

August 8, 2018

Stantec

Technical Memorandum #2

To:	95% Draft Tech Memo #2 Tununak Water Line Assessment	From:	Bob Gilfilian, PE Principal Civil Engineer
	Tununak, Alaska		Stantec Consulting Services, Inc.
File:	**Technical Memorandum 2 – Assessment of Existing Water Transmission Line**	Date:	August 6, 2018

Section 1.0 Introduction

The Native Village of Tununak a.k.a. Tununak IRA Council (herein referred to as Tununak), in cooperation with the Alaska Department of Environmental Conservation (ADEC) Village Safe Water (VSW) has retained Stantec Consulting Service, Inc. (Stantec) to prepare this Technical Memorandum (Tech Memo) with funding from the U.S. Department of Agriculture Rural Development (USDA-RD).

The purpose of this Tech Memo is to provide a summary of the findings of a field investigation to assess the condition of the existing water transmission line (WTL). This Tech Memo provides recommendations for future use and/or corrective action for the WTL, if determined to be needed based on the findings of the field assessment.

The original WTL was installed approximately 40 years ago by the U.S. Public Health Service (USPHS) for the purpose of suppling raw water from the water source (infiltration gallery on Unnamed Creek) to the water treatment plant (WTP) and Washeteria. Approximately 23 years ago (1995) the WTL was replaced as part of a VSW sanitation improvement project that was designed and constructed under the direction of Phukan Consulting Engineers & Associates, Inc. (PCA). The water line replacement from Unnamed Creek to the Washeteria/WTP was part of a larger project that extended the water line approximately 3,000 feet to connect to a new infiltration gallery located at Muskox Creek. The Muskox Creek water source failed over 10 years ago and has been abandoned ever since, Unnamed Creek is the current water source.

The original WTL installed by USPHS was approximately 1,153 feet in length and consisted of a 2-inch diameter PE pipe with a heat trace line that was located within a 4-inch diameter insulated Arctic pipe. This WTL ran from the Unnamed Creek infiltration gallery pump house to the Washeteria/WTP building. The 1995 replacement WTL installed by PCA is the current water line that was assessed for the preparation of this Tech Memo. A copy of the engineering plans for the PCA water line is provided in Attachment 1.

The 1995 WTL consists of two 2-inch diameter high density polyethylene (HDPE) water lines and a ¾-inch copper tubing heat trace line enclosed in an Arctic pipe that consists of a 6-inch diameter polyvinyl chloride (PVC) pipe (carrier) located within a high density insulated outer wall, 15-inch diameter aluminum jacket. Except for a short section of buried water line between Access Box #1 and the Washeteria/WTP, the WTL traverses above the ground surface supported by two types of

foundation system. Most of the WTL is supported on a timber foundation system and a small portion near the Unnamed Creek pump house is held on a wire rope suspension that is connected to steel screw-piles. The WTL has three insulated wooden access boxes for maintenance access to the water line which are located on 90 degree turns in the alignment of the pipeline.

Section 2.0 Methodology

The structural integrity and usability/functionality of the WTL and the foundation support system, including the water line turn boxes, was assessed during a field trip conducted on June 5 through 8, 2018, by Bob Gilfilian, P.E., Senior Principal Civil Engineer with Stantec. The assessment involved a physical inspection of the visible components of the WTL. The purpose of the assessment is to determine the usefulness of the WTL for serving the long-term needs of the Tununak's water supply system. During the site investigation, Mr. Gilfilian interviewed the Tununak water system operators and key administrative staff to obtain information on the operation of the WTL during all seasons of the year.

As an additional task, VSW requested Stantec to include an inspection of the existing infiltration gallery pump house on Unnamed Creek as part of the scope of work for the WTL assessment. The inspection of the pump house, conducted by Mr. Gilfilian, focused on: assessing the structural integrity of the 40-year old building, checking the control systems for the operation of the water system's submersible pump, and evaluating the overall sanitary conditions of the pump house.

Inspection of the Water Transmission Line

Shortly after arriving in the village of Tununak on June 5, 2018, Mr. Gilfilian took a walking tour of the west end of the WTL located between the Washeteria/WTP and Access Box #2 that is shown on the PCA design plans (Attachment 1). This section of the WTL is in a north/south alignment located to the east of the Tununak School and the Tununak Washeteria/WTP.

Field inspection notes prepared by Mr. Gilfilian are provided in Attachment 2. Photographs were taken to document the condition of the WTL, water line access boxes, and timber foundation system for the Arctic carrier pipe. These photographs, with brief captions, are provided in the Photo Log (Attachment 3).

The photographs described in the following sections provide a pictorial perspective and documentation of the deteriorated condition of the WTL and the Unnamed Creek infiltration gallery pump house (discussed below). These photos, with the descriptive narratives, are provided to give a comprehensive understanding and appreciation of the condition of the existing infrastructures. The following provides a detailed description of Mr. Gilfilian's inspection findings as related to each photo:

Reference: Tech Memo 2 – Assessment of Existing Water Transmission Line

- Photo 1: WTL (Arctic pipe) entering the east side of the Washeteria/ WTP. The second Arctic pipe shown in the photo located below the WTL is the water service line to the nearby clinic.
- Photo 2: WTL looking south towards Access Box #1 located near the left corner of the clinic building. The timber foundation system, originally spaced on 10-foot centers for the Arctic pipe, has moved/shifted over the years due to unstable ground conditions and was found not to be level at many crossings At many locations, the timber foundation system has failed and currently provides little to no structural support for the WTL.
- Photo 3: WTL looking north towards Access Box #2 located at the far end of the water line before making the 90-degree turn to the right. Tununak School is located to the left (west) of the WTL. Note the variation in the alignment of the WTL and poor structural support from the timber foundation system for the Arctic pipe.
- Photo 4: WTL Access Box #1 was found exposed/open with the cover partially removed. It appeared maintenance work was being made on repairs to the water line. Subsequent discussions with the WTP operator confirmed they were working on repairs to the WTL, which occurs on an annual basis due to multiple operational problems with the water line freezing.
- Photo 5: Uncovered section of Arctic pipe that provided access for the operators to repair the WTL.
- Photo 6: This photo shows the same section of the WTL that was discussed in Photo 5 and shows the deteriorated foundation system.
- Photo 7: A section of Arctic pipe that was previously repaired, the exterior of the pipe was wrapped with plastic sheeting held together with rope.
- Photo 8: Another section of repaired WTL wrapped in plastic and pieces of loose fiberglass insultation.
- Photo 9: A typical section of the Arctic pipe that has a significant sag due to the deteriorating structural conditions of the timber foundation system.
- Photo 10: WTL Access Box #2 that is not level due to significant deterioration of the box foundation. Note the Arctic pipe to the right of the turn box is pulling the box to the right due to the failing structural support system under the Arctic pipe. It is expected that, over time, the Arctic pipe would probably separate from the access box.
- Photo 11: Timber foundation system that was separated from its base. This failure of support may, over time, lead to a significant sag in the Arctic pipe. Likewise, the timber support on the left side is failing with a downhill slope that may result in a failed section of the WTL.

- Photo 12: Elevated section of the WTL built many feet above the ground surface that causes major issues for the operators to repair the water line. Several of the timber supports have moved due to unstable ground conditions and are not providing structural support to the Arctic pipe.
- Photo 13: Exposed section of Arctic pipe shows recent attempts to repair the WTL. The line has been retrofitted with recirculating glycol heat trace lines that barely squeeze through the 6-inch diameter carrier pipe. This photo shows two repaired connections to the 2-inch HDPE water line with a cut section on the parallel line that requires additional repair work. It was later learned from the operator that this type of repair work is done on a routine annual basis.

On June 7, 2018, Mr. Gilfilian met with Mr. Vincent Billy, Tununak WTP Operator, and discussed the operational problems the IRA Council have encountered over the years in maintaining the WTL. Following the interview, Mr. Billy provided valuable assistance to Mr. Gilfilian during the site visit that included a thorough inspection of the Unnamed Creek pump house. They took a walking tour of the WTL from the pump house to the northern portion of the water line. The following photographs (Attachment 3) were taken by Mr. Gilfilian to document the condition of the WTL:

- Photo 14: WTL from the Unnamed Creek pump house to the Access Box #3, located just below the house in the background. Note the sagging WTL to the left of the access box. This section of the WTL is suspended on the buried anchors (helical pile support system) that have apparently moved due to unstable ground conditions.
- Photo 15: Shows Access Box #3 that has a slightly sagging Arctic pipe exiting the access box.
- Photo 16: The Arctic pipe from Access Box #3 that was apparently re-leveled with a helical pile support system. In the far background of the photo is the abandoned section of the Arctic pipe coming from the former Muskox Creek infiltration gallery.
- Photo 17: Northern section of the WTL that is elevated on a very unstable timber support system which has shifted significantly due to unstable ground conditions. As shown in the photo, the Arctic pipe is several feet above the ground surface and has several sections that have sagged. It was clear that the height of the Arctic pipe above the ground surface poses a significant danger for the workers to provide repair services on the WTL.
- Photo 18: Shows uneven sections along the northern portion of the WTL that result in difficulty for the operators to extract or blow out the trapped water held between the sagged sections of pipe.

Inspection of the Unnamed Creek Infiltration Gallery

The findings of Mr. Gilfilian's inspection of the existing pump house on Unnamed Creek is described in this section. Attachment #4 provides an as-built drawing of the infiltration gallery that was

prepared by the USPHS. Mr. Billy assisted in this inspection and explained the operational issues associated with the pumping of the infiltration gallery. The following photographs, with detailed photo explanations (see Photo Log, Attachment #3), were taken by Mr. Gilfilian when he was accompanied by Mr. Billy during the inspection of the infiltration gallery pump house:

- Photo 19: WTL exiting the Unnamed Creek pump house. The pump house straddles a narrow shallow section of Unnamed Creek.
- Photo 20: This photo was taken on the downstream section of Unnamed Creek looking east towards the pump house. The Arctic pipe to the right of the pump house shows the abandoned section of WTL coming from the former Muskox Creek infiltration gallery. The Arctic pipe to the left of the pump house is the current WTL flowing towards the Washeteria/WTP. Note the litter and debris in the surface water source of Unnamed Creek.
- Photo 21: This photo shows the entrance to the Unnamed Creek pump house. This doorway is often blocked by high drifts of dense snowpack that prevents the operators from entering the pump house in the winter; therefore, they have to enter the pump house through an opening in the roof. The 24-inch diameter corrugated metal pipe (CMP) infiltration gallery is visible just inside the pump house.
- Photo 22: Interior of the Unnamed Creek pump house showing the debris of clutter and unsanitary condition surrounding the open top/exposed infiltration gallery. The 6-inch diameter stainless steel screen pipe leaning against the back corner had been used in the past to protect the submersible pump when it was placed inside the infiltration gallery. Due to the deteriorated condition of the infiltration gallery, the slotted screen is no longer used during the operation of the submersible pump.
- Photo 23: Photo taken above the open infiltration gallery that shows the pipe line hook up to the submersible pump that is on the ground surface in the upper right corner of the photo. Also, the photo shows the WTL (two 2-inch diameter HDPE pipes) exiting the pump house. During the inspection, a field mouse exited from the Arctic pipe into the pump house.
- Photo 24: Dangerously exposed electrical wiring and open/damaged electrical control boxes and pump relay switch for the submersible pump used to pump raw water from the infiltration gallery.
- Photo 25: Photo taken looking down the interior of the 24-inch diameter CMP used for the Unnamed Creek infiltration gallery. It was observed that the raw water in the infiltration gallery had floating scum and that there were several open sections in the wall of the pipe. Also, the unsafe condition of the exposed electrical wiring for the submersible pump was noted. According to the operator, the original 10-foot-deep infiltration gallery has, over the years, filled in with mud and debris from seasonal flooding and is currently only about 2 feet deep. The operators reported they have attempted in vain to remove the mud, but it has continued to fill in – resulting in reduced flow of raw water available for pumping, especially during the winter months when the water level in the creek is very low.

- Photo 26: Deteriorated horizontal support beam used to suspend the pump house above Unnamed Creek. During certain high-water flow conditions in the creek, particularly during spring break up, the entire floor of the pump house is covered with water and mud – which also inundates the infiltration gallery.
- Photo 27: The rear (south facing) section of the Unnamed Creek pump house. The Arctic pipe on the left side of the pump house is from the former Muskox Creek infiltration gallery. The Arctic pipe to the right of the pump house is the existing WTL to the Washeteria\WTP. The pump house is structurally unsound and is leaning to the rear of the building due to deteriorating support beams beneath the building. The roof of the pump house has a covered opening that is used during the winter for access to the pump house when the door is blocked with drifted snow. The operators must enter the pump house through the roof in order to operate the submersible pump in the infiltration gallery to refill their 50,000-gallon water storage tank.

Section 3.0 Discussion of Findings

Section 2 presented the findings of the field inspection associated with the assessment of the WTL and the Unnamed Creek infiltration gallery. The photographs taken during the site visit clearly show the deteriorated condition of both the WTL and the infiltration gallery. Valuable information on the operation and maintenance (O&M) of these infrastructures was obtained during the interview with Tununak's WTP operator including subsequent discussions with the IRA Council administrators.

The following provides a summary of the findings of the site assessment conducted by Mr. Gilfilian:

1. The WTL was found to be barely functional as reported by the operator. Because of operational problems with the circulating glycol heat trace system, the water line often will freeze up and requires considerable effort to get the water line thawed. On many past occasions, the operators had to wait over a week or two until they could receive assistance from Alaska's remote maintenance workers. Consequently, the community is often unable to use the Washeteria due to the lack of available water.
2. The operators typically attempt to treat and fill the community 50,000-gallon water storage tank prior to the onset of winter. Most winters, the Washeteria runs out of water which requires the operators to refill the tank with the WTL from the infiltration gallery. During the winter months, Tununak experiences severe windstorms that cause very dense and deep snowdrifts around the pump house and block the entrance. The operators often have to gain entry into the pump house via the opening in the building's roof.
3. Hooking up the submersible pump to pump raw water from the infiltration gallery is dangerous due to the exposed electrical wiring and the deteriorated pump control.
4. The water level available for pumping in the infiltration gallery is nearly depleted in spite of the efforts of the operators to remove debris and mud accumulated from seasonal flooding.

5. As shown in the photographs, there are many sections on the WTL that have been repaired in the past due to line blockage or freeze up. Attempts have been made to squeeze additional glycol heat trace lines inside the Arctic pipe, which has required a considerable amount of work on the part of the operators.
6. Due to the failing condition of the timber foundation system on many sections of the WTL, the water line has developed sags in the profile where water can be trapped – resulting in difficulty for the operators to extract the trapped water. Normally, the flushing of the lines can only occur during the times of the year when temperatures are above freezing. It is understood, based on operator testimony, that this effort requires a lot of time and work.
7. The infiltration gallery pump house building is in a deteriorated condition that appears to have a very limited life remaining. This building and is foundation needs to be replaced. Also, the infiltration gallery is in very bad condition and likewise needs to be replaced in order to continue using the surface water from Unnamed Creek.

Section 4.0 Conclusion and Recommendations

Based on the findings of the assessment reported herein, it is recommended the following course of action be taken to correct the deficiencies noted on the WTL and the Unnamed Creek infiltration gallery pump house:

1. Although the site assessment was not intended to be a comprehensive, detailed inspection of the entire WTL, it appears justified based on the limited site observations and discussions with the operator that the entire WTL should be replaced. In addition, the WTL access boxes also should be replaced with new boxes that are more functional for use by the operators. The foundation system for the replacement Arctic pipe should consist of the same type used on the abandoned section of the former Muskox Creek infiltration gallery. The elevated WTL along the northern section of the current alignment from Access Box #2 to Access Box #3, should follow the contour of the ground surface and include another access box to provide a means at the lowest point for flushing the WTL. However, the length and alignment of the WTL may be altered if it proves that a deep water could be installed to serve as the future water source for the community.
2. The infiltration gallery pump house on Unnamed Creek should be replaced in its entirety. The pump house and infiltration gallery have deteriorated to such a condition that they are barely functional. In addition, the existing building poses risk to the operators with the use of the current electrical wiring for the operation of the submersible pump, as well as getting access to the pump house during the winter months when the building entrance is blocked by dense snowdrifts. This recommendation may not be necessary if a deep water well could be installed to serve as the future water source for the community.

Reference: Tech Memo 2 – Assessment of Existing Water Transmission Line

Table 1 provides and estimated cost to construct a replacement WTL and access boxes along the same alignment currently used from the Unnamed Creek infiltration gallery to the existing Washeteria/WTP.

Table 1 Estimated Cost for a Replacement WTL and Access Boxes

Item Description	Unit	Estimated Quantity	Unit Cost	Total Cost
WTL	Linear Feet	1,153	$350	$403,550
			Total Estimated Cost	$403,550
15% Construction Contingency				$60,532
Subtotal with Contingency				$464,083
Design & Construction Administration Services (20%)				$92,816
Agency Administration (8%)				$37,127
			Estimated Total Capital Cost	**$594,026**

Key:
% – percent
WTL – Water Transmission Line

Table 2 provides an estimated cost to construct a replacement infiltration gallery with pump house on Unnamed Creek

Table 2 Estimated Cost for a Replacement Infiltration Gallery/Pump House

Item Description	Unit	Estimated Quantity	Unit Cost	Total Cost
Infiltration Gallery with Pump House	LS	1	LS	$300,000
			Total Estimated Cost	$300,000
15% Construction Contingency				$45,000
Subtotal with Contingency				$345,000
Design & Construction Administration Services (20%)				$69,000
Agency Administration (8%)				$27,600
			Estimated Total Capital Cost	**$441,600**

Key:
% – percent

Section 5.0 Limitations

This Tech Memo was prepared by Stantec Consulting Services, Inc. (Stantec) for the account of Native Village of Tununak IRA Council at the request of ADEC VSW Program. The findings and

Reference: **Tech Memo 2 – Assessment of Existing Water Transmission Line**

recommendations presented herein reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in this document and in the contract between Stantec and the Client. The opinions in this document are based on conditions and information existing at the time the document was prepared and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party.

Stantec Consulting Services, Inc.

Robert (Bob) Gilfilian, PE
Principal, Civil Engineer

Cell Phone: 907-227-9883
Email: bob.gilfilian@stantec.com

Attachment: Attachment 1 – Phukan Consulting Engineers & Associates, Inc. (PCA) Plan Sheets for the Tununak Water Transmission Line, dated 1995

Attachment 2 – Bob Gilfilian's Tununak Field Notes for June 5-8, 2018

Attachment 3 – Photo Log

Attachment 4 – USPHS As-Built of Unnamed Creek Infiltration Gallery

c. Susan Randlett, PE
ADEC Village Safe Water Program

Attachment 1

Phukan Consulting Engineers & Associates, Inc. parenthesis(PCA)

Plan Sheets for the

Tununak Water Transmission Line

1995

VILLAGE OF TUNUNAK, ALASKA

PHASE III SANITATION IMPROVEMENTS 1995

Prepared for:

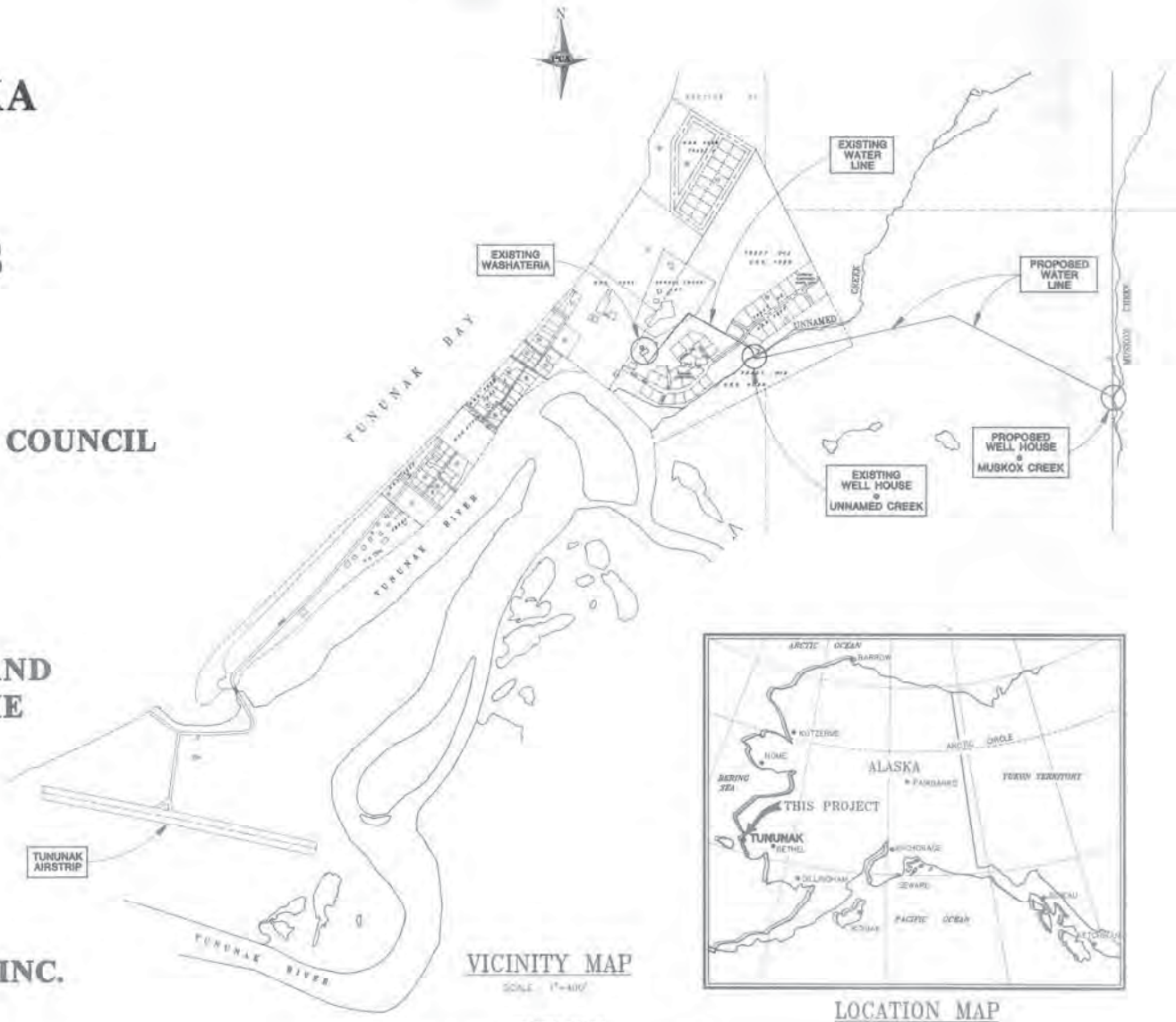
TUNUNAK TRADITION ELDERS COUNCIL
P.O. BOX 50
TUNUNAK, ALASKA

Grants thru:

STATE OF ALASKA,
VILLAGE SAFE WATER AND
U.S.D.A. FARMERS HOME
ADMINISTRATION

Prepared by:

PHUKAN CONSULTING
ENGINEERS & ASSOCIATES, INC.



D.2.2.2

PER TUNUNAK, AK
STANTEC 2020

D.2.2.2

PER TUNUNAK, AK
STANTEC 2020

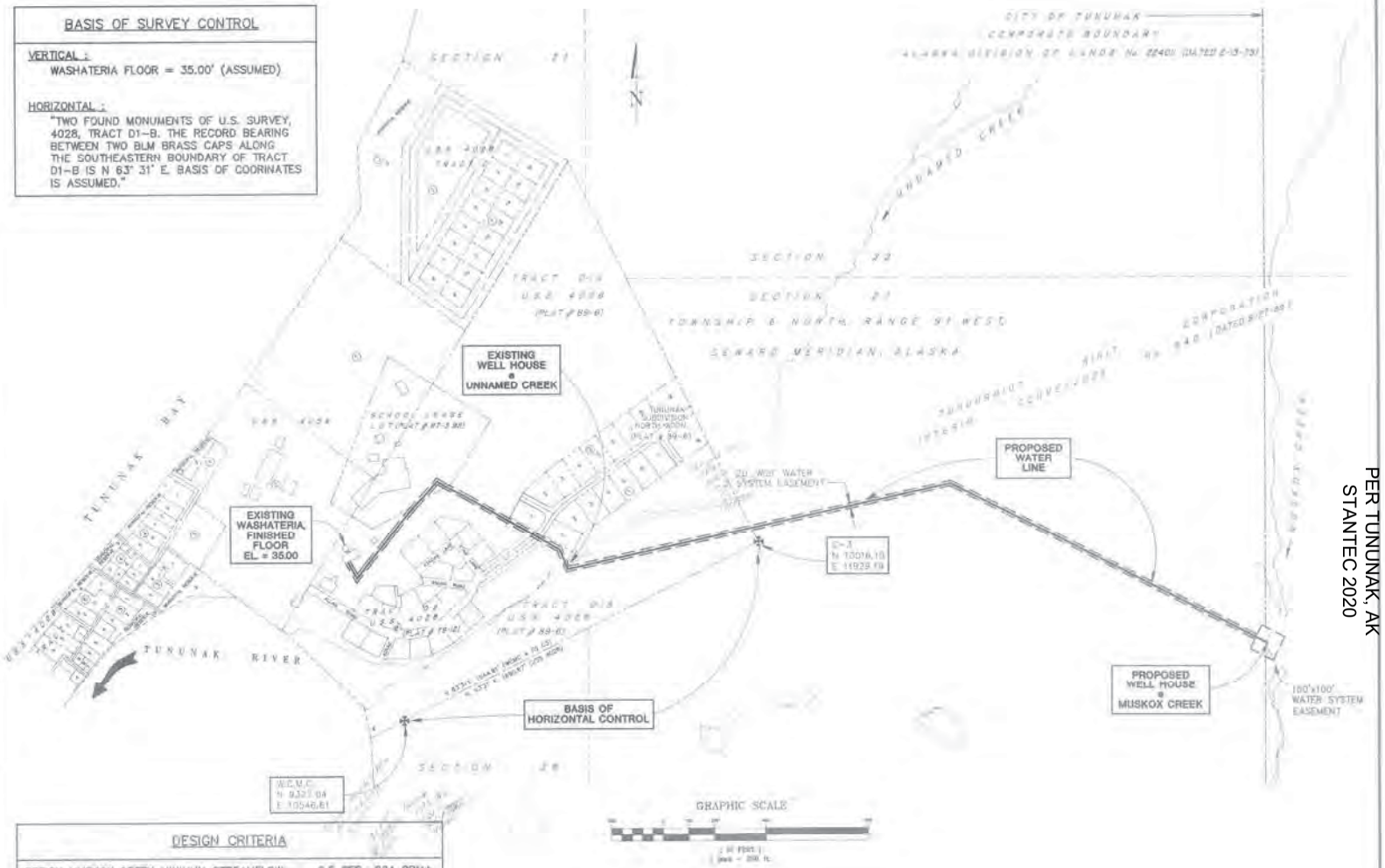
INDEX TO SHEETS

COVER SHEET	–
INDEX TO SHEETS, SCHEDULE OF PROJECT PHASES, DESIGN CRITERIA, AND BASIS OF SURVEY CONTROL	C-1
WATER LINE IMPROVEMENTS WASHATERIA TO UNNAMED CREEK WELLHOUSE	C-2
WATER LINE IMPROVEMENTS UNNAMED CREEK WELLHOUSE TO STA. 16+00.00	C-3
WATER LINE IMPROVEMENTS STA. 16+00.00 TO MUSKOX CREEK WELLHOUSE	C-4
UNNAMED CREEK WELLHOUSE SITE MUSKOX CREEK WELLHOUSE SITE	C-5
WATER LINE IMPROVEMENTS WATER SYSTEM DETAILS	C-6
GENERAL STRUCTURAL NOTES AND WASHATERIA AND UNNAMED CREEK WELLHOUSE STRUCTURAL DETAILS	S-1
MUSKOX CREEK WELLHOUSE PLANS, SECTIONS AND DETAILS	S-2
MUSKOX CREEK WELLHOUSE STRUCTURAL DETAILS	S-3
INSULATED BOXES PLANS, SECTION AND DETAILS	S-4
INSULATED BOXES PLANS, SECTIONS, DETAILS AND NOTES	S-5
INSULATED BOX DETAILS	S-6
WASHATERIA PIPING UNNAMED CREEK WELLHOUSE PIPING	M-1
MUSKOX CREEK WELL HOUSE PIPING	M-2
INSULATED BOXES MECHANICAL PIPING LAYOUT	M-3
WATER LINE IMPROVEMENTS FABRICATION DETAILS	M-4
WATER LINE IMPROVEMENTS FABRICATION DETAILS	M-5

BASIS OF SURVEY CONTROL

VERTICAL :
WASHATERIA FLOOR = 35.00' (ASSUMED)

HORIZONTAL :
"TWO FOUND MONUMENTS OF U.S. SURVEY, 4028, TRACT D1-B. THE RECORD BEARING BETWEEN TWO BLM BRASS CAPS ALONG THE SOUTHEASTERN BOUNDARY OF TRACT D1-B IS N 63° 31' E. BASIS OF COORINATES IS ASSUMED."



SCHEDULE OF PROJECT PHASES

PHASE I
WASTEWATER DISPOSAL IMPROVEMENTS AND DEMONSTRATION FLUSH/HAUL UNITS

PHASE II
ADDITIONAL FLUSH/HAUL UNITS

PHASE III
ADDITIONAL FLUSH/HAUL UNITS, MUSKOX CREEK WATER LINE AND HONEY BUCKET BUNKER DECOMMISSIONING

PHASE IV (FUTURE)
ADDITIONAL FLUSH/HAUL UNITS AND WASTEWATER DISPOSAL IMPROVEMENTS HONEY BUCKET BUNKER DECOMMISSIONING

DESIGN CRITERIA

DESIGN MUSKOX CREEK MINIMUM STREAMFLOW:	0.5 CFS = 224 GPM±
DESIGN FLOW RATE, MUSKOX CREEK WELL PUMP:	26 GPM@ 78'TDH
DESIGN MINIMUM OPERATING TEMPERATURE:	-20°F
DESIGN WIND LOADING CRITERIA: BASIC WIND SPEED: EXPOSURE:	110 MPH "C"
DESIGN SNOW LOAD:	30 PSF
DESIGN LIVE LOAD, MUSKOX CREEK WELL HOUSE:	125 PSF

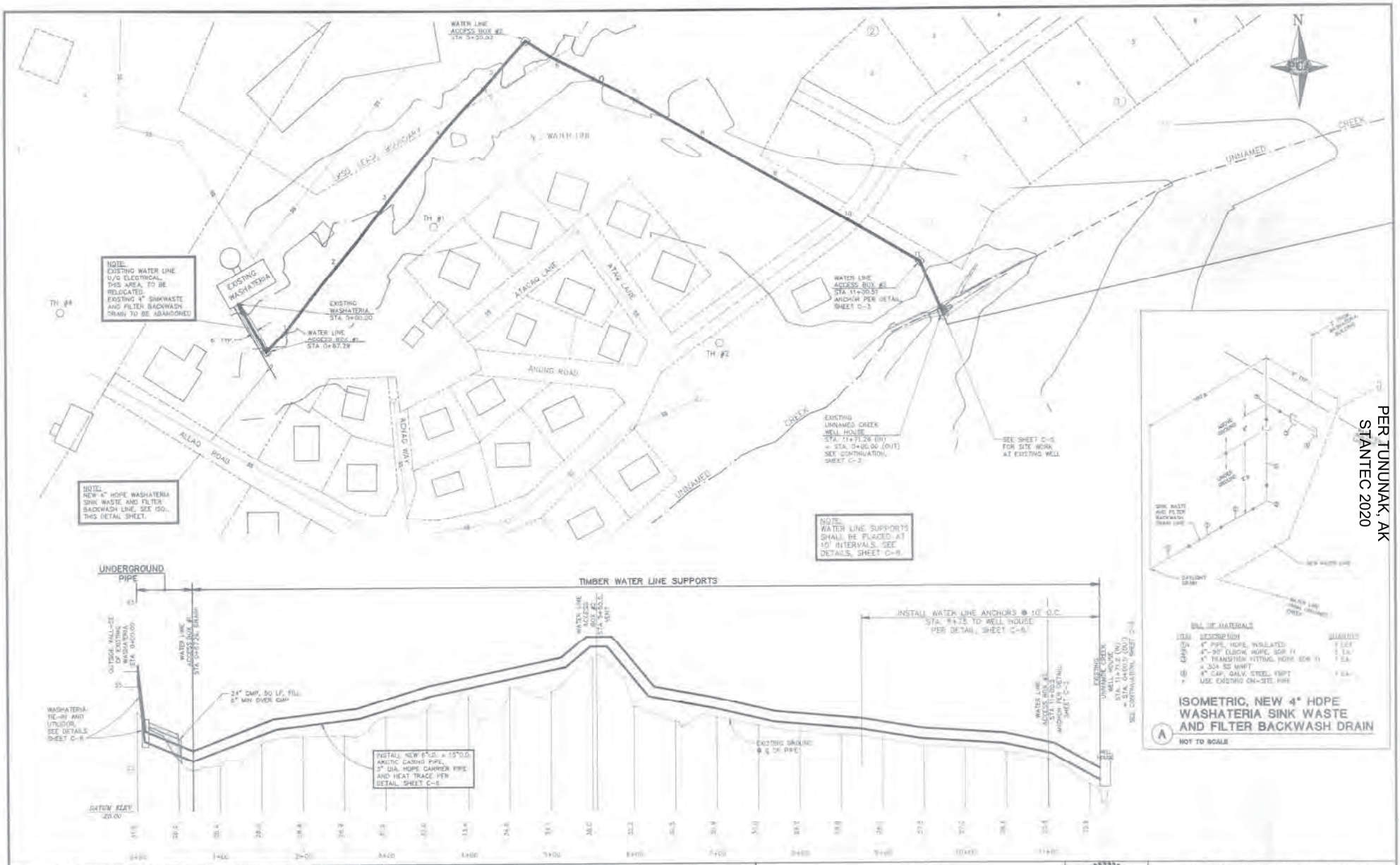
DATE	BY	DATUM	BY	DATE	REVISIONS	BY

PHUKAN CONSULTING ENGINEERS & ASSOCIATES, INC.
Civil • Geotechnical • Surveying • Environmental
2702 Gambell St., Suite 201, Anchorage, AK, 99503
Tele: (907) 272-7111 Fax: (907) 277-3177

VILLAGE OF
TUNUNAK, ALASKA
PHASE III
SANITATION IMPROVEMENTS
1995

INDEX TO SHEETS, SCHEDULE OF PROJECT PHASES, DESIGN CRITERIA, AND BASIS OF SURVEY CONTROL

SCALE: 1"=200'	DATE: 5/23/95	CORP FILE NO: 730-01.01(1)	SHEET NO: C-1
DESIGN: JPC	DRN: BAT	CHK: 94730.7	PVE PROJECT NO:



DATE	BY	DATA:	BY	DATE	REVISIONS	BY
12/94	SMA					
12/94	J.A.					

PHUKAN CONSULTING ENGINEERS & ASSOCIATES, INC.
Civil • Geotechnical • Surveying • Environmental
2702 Gambell St., Suite 201, Anchorage, AK, 99503
Tele: (907) 272-7111 Fax: (907) 277-3177

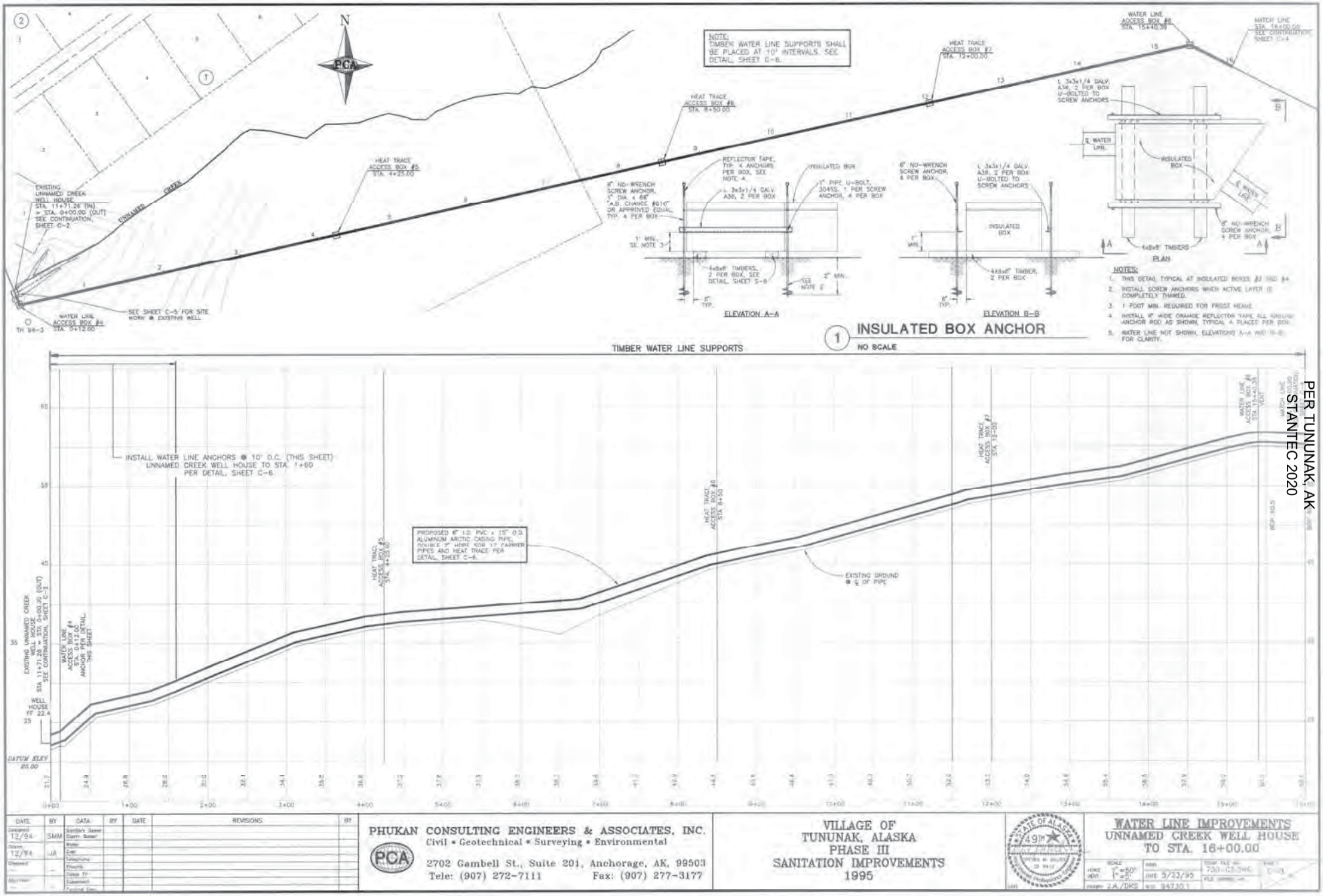
VILLAGE OF
TUNUNAK, ALASKA
PHASE III
SANITATION IMPROVEMENTS
1995

WATER LINE IMPROVEMENTS
WASHATERIA TO
UNNAMED CREEK WELLHOUSE

SCALE: 1"=50' / 1"=5' | DATE: JUN 5/23/95 | DRAWING NO. 733-22.DWG | SHEET NO. C-4 | DRAWN: JA/DKS | JOB NO. 943301

PER TUNUNAK, AK
STANTEC 2020

D.2.2.2



DATE	BY	DATA	BY	DATE	REVISIONS	BY
Designed 12/94	SMM	Sanitary Sewer				
Drawn 12/94	JA	Storm Sewer				
Checked		Water				
		Gas				
		Telephone				
		Electric				
		Cable TV				
		Pavement				
		Parking Lots				

PHUKAN CONSULTING ENGINEERS & ASSOCIATES, INC.
Civil • Geotechnical • Surveying • Environmental
2702 Gambell St., Suite 201, Anchorage, AK, 99503
Tele: (907) 272-7111 Fax: (907) 277-3177

VILLAGE OF
TUNUNAK, ALASKA
PHASE III
SANITATION IMPROVEMENTS
1995

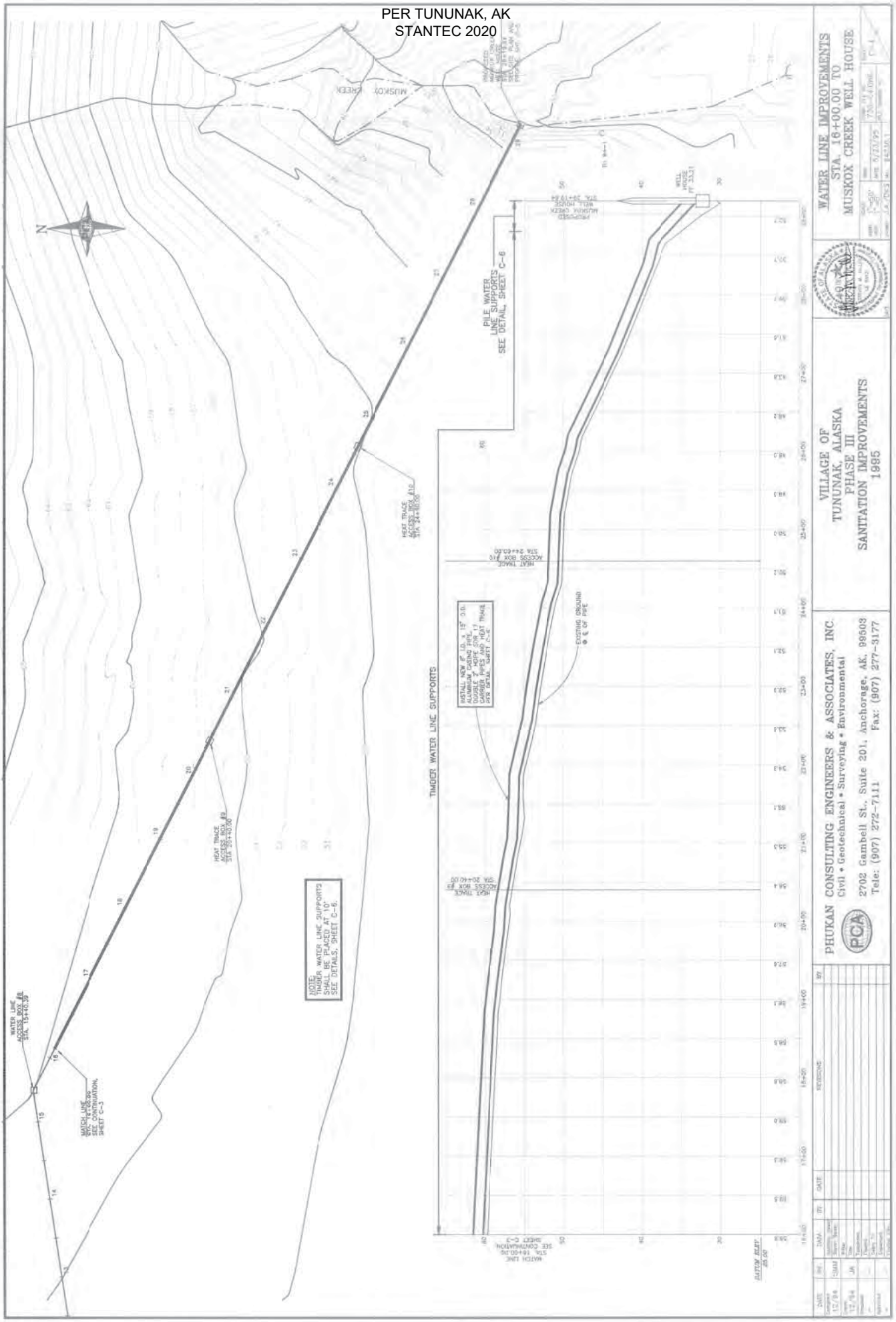
STATE OF ALASKA 49TH

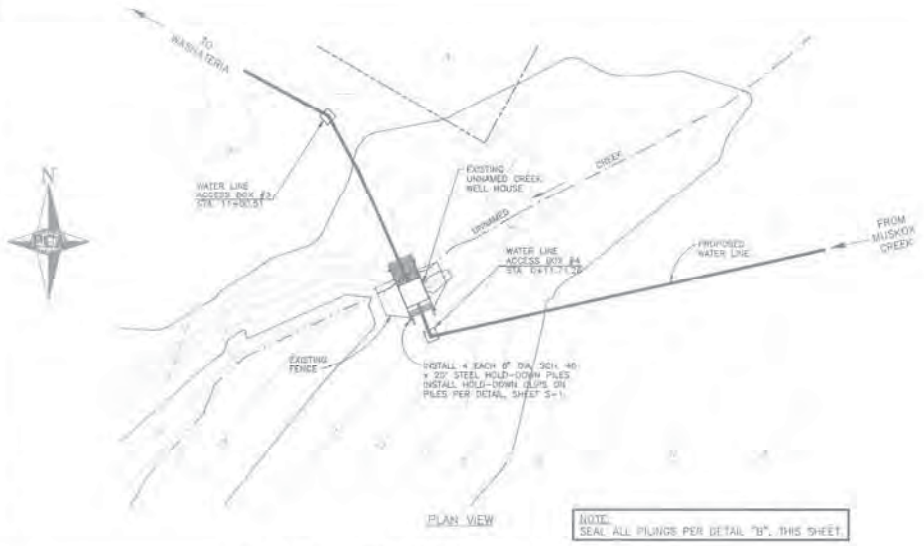
WATER LINE IMPROVEMENTS
UNNAMED CREEK WELL HOUSE TO STA. 16+00.00

HORZ 1"=50' VERT 1"=5' DATE 5/23/95 DRAWN J.A./DKS JOB 94730.1 TEMP FILE 730-125.DWG

D.2.2.2

PER TUNUNAK, AK
STANTEC 2020

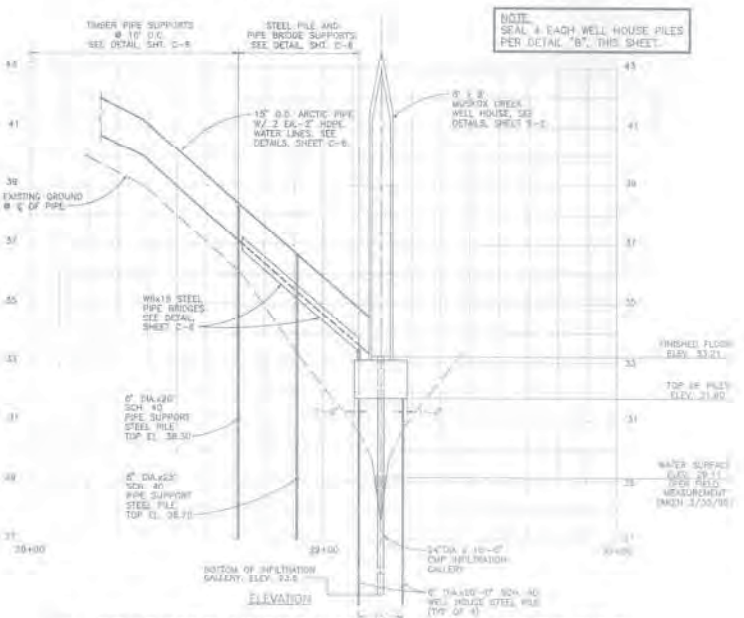

WATER LINE IMPROVEMENTS
STA. 16+00.00 TO
MUSKOX CREEK WELL HOUSE
VILLAGE OF
TUNUNAK, ALASKA
PHASE III
SANITATION IMPROVEMENTS
1995
PHUKAN CONSULTING ENGINEERS & ASSOCIATES, INC.
Civil • Geotechnical • Surveying • Environmental
2702 Gambell St., Suite 201, Anchorage, AK. 99503
Tele: (907) 272-7111 Fax: (907) 277-3177
PILE WATER LINE SUPPORTS SEE DETAIL, SHEET C-6
TIMBER WATER LINE SUPPORTS
NOTE: TIMBER WATER LINE SUPPORTS SHALL BE PLACED AT 10' SEE DETAILS, SHEET C-6.
HEAT TRACE ACCESS BOX #19 STA 19+40.00
HEAT TRACE ACCESS BOX #18 STA 24+60.00
HEAT TRACE ACCESS BOX #17 STA 20+40.00
EXISTING GROUND
℄ OF PIPE
MUSKOX CREEK
WATER LINE ACCESS BOX #8 STA 15+40.39
MATCH LINE STA 16+00.00 SEE CONTINUATION, SHEET C-3
MATCH LINE STA 16+00.00 SEE CONTINUATION, SHEET C-3
DATUM ELEV. 65.00



1 UNNAMED CREEK WELL HOUSE SITE

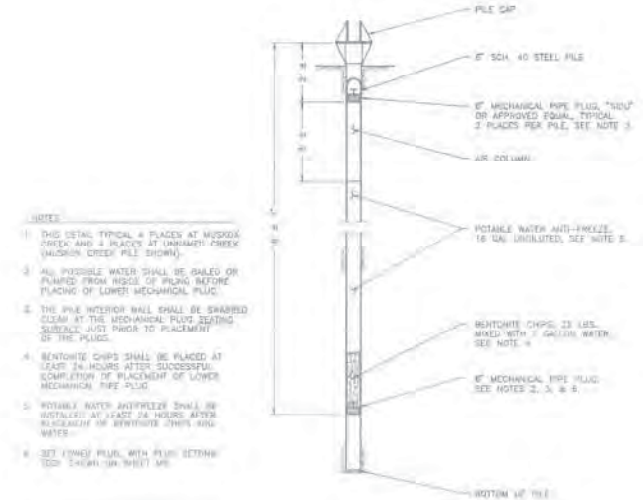
SCALE: HORIZ. 1" = 20'





3 PROPOSED MUSKOX CREEK WELL HOUSE SITE

SCALE: HORIZ. 1" = 20'
VERT. 1" = 2'



2 PILE SEALING DETAIL

SCALE: 1/2" = 1'-0"

UNIT	BY	DATA	BY	DATE	REVISIONS	BY
Compass	—	Sanitary Sewer				
—	—	Storm Sewer				
Water	—	Water				
—	—	Gas				
Telephone	—	Telephone				
—	—	Electric				
Cable TV	—	Cable TV				
Easement	—	Easement				
Property Line	—	Property Line				

PHUKAN CONSULTING ENGINEERS & ASSOCIATES, INC.
Civil • Geotechnical • Surveying • Environmental
2702 Gambell St., Suite 201, Anchorage, AK, 99503
Tele: (907) 272-7111 Fax: (907) 277-3177

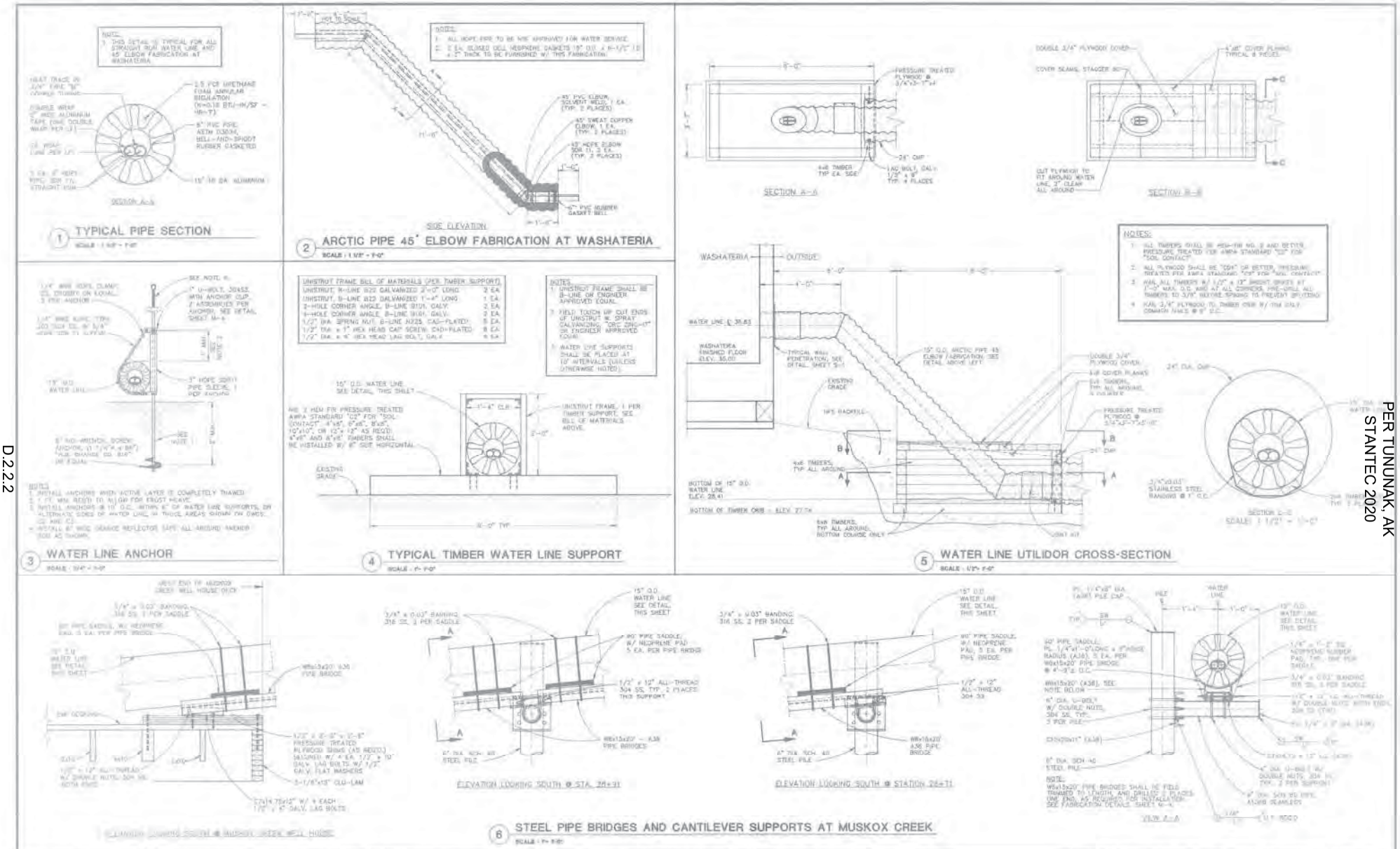
VILLAGE OF
TUNUNAK, ALASKA
PHASE III
SANITATION IMPROVEMENTS
1995

UNNAMED CREEK WELL HOUSE SITE
MUSKOX CREEK WELL HOUSE SITE

HOR. SCALE	1"=20'	DATE	FIELD BOOK NO.	SHEET
VERT. SCALE	1"=2'	Date 5/31/95	FIELD BOOKS NO.	C-5
DRAWN J.A.		JOB 94220.1		

PER TUNUNAK, AK
STANTEC 2020

D.2.2.2



PHUKAN CONSULTING ENGINEERS & ASSOCIATES, INC.
Civil • Geotechnical • Surveying • Environmental
2702 Gambell St., Suite 201, Anchorage, AK, 99503
Tele: (907) 272-7111 Fax: (907) 277-3177

VILLAGE OF
TUNUNAK, ALASKA
PHASE III
SANITATION IMPROVEMENTS
1995

WATER LINE IMPROVEMENTS
WATER SYSTEM DETAILS

PER TUNUNAK, AK
STANTEC 2020

Attachment 2

Bob Gilfilian's Tununak Field Notes

For

June 5-8, 2018

(107) June 5, 2018
Tues

Tununak, AK
Tech Memo Field Trip

@ 0800 arrived at ANC Airport - Ravn Air for flight to Tununak (via Bethel, Nightmute, Toksook Bay)

@ 1100 left ANC for Bethel
@ 1130 arrived Bethel
@ 1250 left Bethel on Magellan Air/Ravn
@ 1330 arrived in Tununak
met Ira at Airport (Airfield) & Teddy
@ 1345 went to School to check in w/ Teddy
@ 1400 met Kavers at his house
Joseph James, operator H2O plant (652-2670)
Vincent Billie " " " (652-2630)
IRA #617-2021 (not
@ called Brandi for school internet password
Amy 543-4827
- Ira took me in 4-Wheeler to Village office - everything in Village was shut down due to no power except School.

@ 3 pm took walking tour of Village to check out layout w/ photos.
Check Washeteria/WTP to set up for test
- Elizabeth secretary at School

Bob Gilfilian - Tununak AK
Field Trip Notes, June 5-8, 2018 (6 pages)

Tununak, AK

6/5/18
Tues
~50°F, clear, Sun

(108)

@ 4 pm walked along western beach to the north end where bluff (5-6' high) meets the beach. Took photos to show exposed rock formation. Collected sample of gray and brown sandstone/siltstone horizontally fractured

✓ Walked south on beach to School's sewer outfall daylighted on upper beach
✓ Took photos of School's exterior water treatment plant and W/W plant.
✓ Went to Washeteria - closed due to power out, took exterior photos and pipeline to Clinic
✓ Checked west leg of raw waterline to Wash WTP - noted repair work on arctic pipe

@ 6 pm contacted Vincent Billie who agreed to meet me tomorrow at 10 am to start adequacy test on ST/SAS.
- Returned to school to organize files and field gear for tomorrow's projects.
- Reviewed project files until 8 pm

End Day 6/5/18

D.2.2.2

PER TUNUNAK, AK
STANTEC 2020

(109) Tununak, AK
June 6, 2018 (Wed)
~40°F
Part Sun
~5mph Wind

@ 8 AM prepared draft proposal letter to VSW for deep well Geophysical Survey.
@ 9 AM called Collin Markel on survey dates.

Prepared field maps/docs to meet w/ Vincent Billie, Tununak WPO, to go over items needed to complete the following tasks:
1- Inspect WST (need ladder to ck tank)
2- Inspect Well House on Unnamed Creek
3- Inspect Water transmission line
4- Conduct Adequacy Test on ST/SAS.
Also prepared form RMS-2 and other standard safety forms to review w/ Vincent

@ 1000 met Vincent Billy at School. Check WTP but it was locked. Went to Village Office
@ 1030 hold mtg. w/ Jamer James, Xavier, Joe James, and Vincent Billy
- Discussed purpose of my visit and scope of work (tasks)
- Went over well drill sites, noted Village owned corner of site south of Unnamed Creek along Muskox Cr Water transmission line
- Decided to walk sites tomorrow

Note: Meas cold water discharge in Washeteria
5 gal = 35 sec

~45°F
Cloudy
~15mph Wind

Tununak (110)
June 6 '18

@ 1100 went to Washeteria / WTP w/ Vincent Billy and Joe James.
✓ Checked over Wash (in use) only 1 washer and 2 dryers (Vincent est 4 gal/wash)
✓ made arrangements for discharging water in to Wash sewer drain for adequacy test Meas flow at 8.3 gpm
✓ Checked over equipment conditions in WTP - took photos - barely operating.
✓ Noted WST had ~114" water level
✓ Found one shower & one toilet working.
✓ Went to WST w/ ladder, climbed on top to check tank condition. Took photos and videos. Opened top access cover Observed rust debris floating in tank plus an empty soda can floating
✓ Went to sewer system to check manholes and then opened access to 4th and 2nd ST Found monitor tubes (8) that were installed by LKSD a couple of years ago when they installed several new Infiltrator lines in the area of the former WSPH Soil Absorption System (SAS). *Need Record Drawing.
@ 1230 I informed Vincent & Joe that I would complete Adequacy Test and we will meet tomorrow at 9 AM to inspect Well House Unnamed Ck.

D.2.2.2

PER TUNUNAK, AK
STANTEC 2020

(111) Tununak
June 6, 2018

~~5°C~~ 53°F
Cloudy, Windy
25 mph

@1245 returned to school to prepare forms for adequacy test. Organized notes & equipment. Layout map of ST/SAS for Adequacy Test

@ 2 pm went to ST/SAS to take startup meas.

@ 2:30 meas liquid level in ST/SAS meas.

STCO	99.5"	btop	(6" ϕ HDPE) (4K ST) (Inlet)
S-1	60.0"	btop	(4" ϕ ow)
S-2	55½"	"	(4" ϕ ow)
S-3	51½	"	(Heaters) (4" ϕ wet
S-4	36"	"	(header pipe invert)
N-1			(8" ow) (filled w/ rocks & debris) (4" ϕ)
N-2	99.5"	btop	(8" ow)
N-3	48"	"	(4" ϕ ow)
N-4	54"	"	damp bottom gravel (4" ϕ)

@ 1508 started flow into washteria drain meas flow in 5 gal bucket in 40 seconds. calc flow = 7.6 gpm plus 1 load washer.

@ 1527 (15 min) meas SAS & ST

STCO	100.0"	btop	
S-1	59.5"	btop	(feels like header pipe)
S-2	55.0"	"	
S-3	52"	"	
S-4	45½"	"	able to clear header wet bottom soil

Sunny 55°F
25 mph Wind

Tununak (112)
6/6/2018

N-2	99½"	btop
N-3	48½"	btop
N-4	damp soil	

@1545 pm meas flow in Washteria = 7 gpm

@1610 meas ST & SAS Obs Wells (ows)

STCO	99.5"	btop
S-1	59.5"	btop (This is header pipe w/ 4" ϕ
S-2	54¼"	" coming from 2K ST)
S-3	52"	"
S-4	damp	
N-2	99½"	"
N-3	48"	"
N-4	damp.	

Found 4" ϕ ABS ob pipe in NW corner of SAS meas liquid = 72½" btop (flush w/ GS) ~15' SW of N-2

@1650 meas flow = 5.75 gpm at washteria 4 loads of washer used during test

@1700 meas levels in ST & SAS

ST-CO	99½"	btop	Stickup = 22" AGS
S1	57"	btop	Stickup = 7" ags
S2	54½"	btop	" = 12" "

D.2.2.2

PER TUNUNAK, AK
STANTEC 2020

(113) Tununak 6/6/2018

Continue meas SAS

S3	52" btop	stickup = 7"	ags
S4	damp	" = 8"	ags
N1	NA	"	
N2	99½"	btop " = 27"	"
N3	47½"	btop " = 4"	ags
N4	damp	top of casing at GS.	
NW corner OW = 72½" btop, No stickup flush GS			

@1752 meas flow = 60 gpm in Washeteria
@1808 Shut off flow for Adequacy Test
Ave flow 616 gpm, Total flow = 1,185 gal
Plus 4 Wash load yields 1300 g in 180 min
Note: laundry being used all day - 1 washer

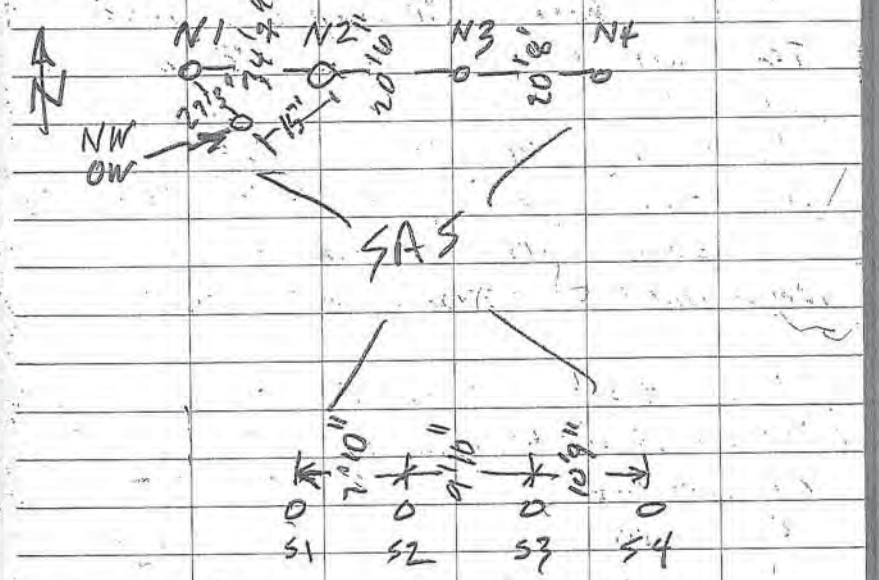
@1815 meas SWLs in ST/SAS OWs:

ST CO	99½"	btop
S1	~~55 3/4~~	" (very difficult to meas headed)
S2	54¾"	"
S3	52"	"
S4	damp	"
N2	99¾"	"
N3	47¼"	"
N4	dry 30'	"
NW OW	72½"	"

55°F / Wind Sunny / 20mph

Tununak (114) 6/6/2018

Layout of ST/SAS measured at 18



@7:10 pm returned to school to review notes
Sent proposal for Geophysical Survey to Susan via email

BR Stapleton 6/6/18

End Day 2

PER TUNUNAK, AK
STANTEC 2020

(115) Tununak
June 7, 2018
(Thursday)

Cloudy, 42°F
15 mph Wind

@ 0800 organized notes for field work today schedule to complete Adequacy Test and inspect Unnamed Creek well.

@ 0915 met Joe James went to ST/SAS
Joe informed me that ~2 loads wash so far this morning at Washeteria
Meas SWL in ST/SAS at 0930

ST-CO	99½"	btop
S1	59"	"
S2	55½"	"
S3	52¼"	"
S4	dry	"
N1	NA	"
N2	99½"	"
N3	48½"	"
N4	~~99½~~ dry	"
NW-CO	73"	"

Note: lift sta discharge 2" @ HDPE is ~4'8" bags

				Top (1")
π	27" HI	above	S1	to ST-CO top ring
	30" HI	"	"	to 1.7' to S2 top
	30" HI	"	"	2.4' to S3 top
	30" HI	"	"	2.9' to S4 top
	25" HI	"	"	to N1 Top
	7" HI	"	N2	to N1 Top

Cloudy, 25 mph wind
40°F

Tununak
6/7/18

(116)

7" HI above N2 to 2.3', NW-CO Top
7" HI " " to 1.9' N3 Top
7" HI " " to 1.8' N4 Top
- Check w/ Bob Miller, LKSD Bethel
@ 1020 went to WTP w/ Joe & Vincent
@ 1100 inspected Unnamed Creek Pump House.
1 SAP pump - 2 of them
H2O level in well was 18" below floor
H2O depth in well was 24"
Creek flow ~ 6" deep x 3' wide channel 2' wide ~ 9" deep
Velocity = 5 sec/8 ft in channel 30" x 6"
✓ Walked along water trans line
@ 1200 drove in ATV w/ Vincent to walk over proposed drill sites. Took photos & videos
@ 1230 drove up to gravel pit on top mountain in cloud layer a couple miles up haul road - filled w/ snow - developed by QAP
@ 1300 went to IRA office to meet w/ staff
Met w/ James James & Yaaret Post
@ 1400 rode back to school w/ Vincent, stopped to photo barge site south of BIA school & horses bucked
@ 1500 held 1 hr. tele conf w/ Susan Radle & Beth Burnside & Dave Corwin
Worked rest of day on notes & records
End Day 3

Note: 24 hr. ST SAS Rebound @ 1815 - ST CO = All same ½"

PER TUNUNAK, AK
STANTEC 2020

D.2.2.2

(117) Tununak, AK
June 8, 2018
(Friday)

45°F Cloudy
Calm

@ 0800 organized field notes and photos on laptop

@ 0930 walked to Tribal office. (No Vincent.) Approx 1.25 miles school to office

@ 1000 held telecon w/ Susan Randlett, James James and Xavier Post. Discussed approach to drilling exploratory deep wells.

- Need SHPO and wetland - maybe CRW
- ✓ Best Practices waiver
- ✓ Need cost est for drilling wells
- ✓ Possible funding from RD by July 15
- ✓ Possible sole source d
- ✓ Grant period up to 5 years
- ✓ Discussed waste tetra
- ✓ Susan recommended include water line w/ well

@ 1100 mtg ended

- Xavier said most folks take steam baths & took several photos of steam huts.
- Means distance from ST Lift Sta to S1 ≈ 25'

@ 1130 returned to school for packing met Vincent Billy and Teddy on flight standby. Found out Hageland Air could not fly from Bethel due to weather delay

53°F Partly Sun
~10 mph wind

Tununak
June 8 '18

(118)

Next several hours kept calling Hageland in Tununak & Bethel with negative responses

@ 1600 found out Grant Air was coming to Tununak so Teddy rushed me out to the airport as the plane was landing - able to get a seat!

Flew to Toksook Bay and then to Bethel.

Arrived at 1735 as my Rava flight was departing Bethel

Went to AK Air and able to get a seat for 9 pm flight to ANC

@ 2015 pm boarded Alaska Air Flt #46 for ANC for ANC

@ 2100 arrived at ANC Airport

@ 2130 arrived at Greg Magee's for the night

End Day 4
Bob Burnett 6/18/18

D.2.2.2

PER TUNUNAK, AK
STANTEC 2020

Attachment 3

Photo Log



Photo 1 – Water transmission line entering the east side of Washeteria/WTP



Photo 2 - Looking south along water transmission line towards the turn box #1 at clinic. Note the condition of the Arctic pipe foundation system.



Photo 3 - Looking north along west portion of the water transmission line with Tununak School shown in the upper left corner.



Photo 4 – Uncovered water line turn box #1 located next to clinic.



Photo 5 – Exposed section of Arctic Pipe on water transmission line.



Photo 6 – Looking southeast at exposed section of Arctic Pipe shown in Photo 5.



Photo 7 – Temporary repair of an exposed section on the Arctic pipe.



Photo 8 – Looking east towards temporary repair on another section of the Arctic pipe.



Photo 9 – Looking east along west portion of the water transmission line with timber supports.



Photo 10 – Looking east towards water line turn box #2.



Photo 11 – Looking east on western portion of the water transmission line with foundation issues.



Photo 12 – Looking east along the northern portion of the water transmission line.



Photo 13 - Uncovered section of water transmission line showing repair work.



Photo 14 – Looking north from the Unnamed Creek pump house along eastern portion of the water transmission towards the waterline turn box #3 shown just below house in background.



Photo 15 - Looking east towards the waterline turn box #3.



Photo 16 – Looking east towards the water line turn box#3 and Unnamed Creek pump house with water transmission line in background from former Muskox infiltration gallery.



Photo 17 - Looking north towards northern portion of the water transmission line set on elevated foundation system.



Photo 18 - Looking north towards the northern portion of the water transmission line.



Photo 19 - Looking south at water transmission line exiting the Unnamed Creek pump house. In the background is the water transmission line from the former Muskox Creek infiltration gallery.



Photo 20 - Looking east from the down gradient side of Unknown Creek towards the Unknown Creek pump house. Arctic pipe on right side is the water transmission line from the former Muskox Creek infiltration gallery. The Arctic pipe to the left of the Unnamed Creek pump house is the existing water transmission line to the Tununak washeteria/WTP.



Photo 21 - Looking into the Unnamed Creek pump house with the infiltration gallery consisting of the 24 inch diameter corrugated pipe shown in the center of the door opening.



Photo 22 - Looking inside the Unnamed Creek pump house with the infiltration gallery in foreground.



Photo 23 - Looking down on the infiltration gallery consisting of the 24 inch diameter corrugated pipe. Electrical wiring hooked up for temporary use of the submersible pump that is plumbed into the water transmission line shown to the right of the well.



Photo 24 - Electrical control boxes and pump relay for the submersible pump.



Photo 25 - Looking down inside 24 inch diameter corrugated pipe used for the infiltration gallery.



Photo 26 - Foundation support beam for the Unknown Creek pump house suspended over Unnamed Creek.



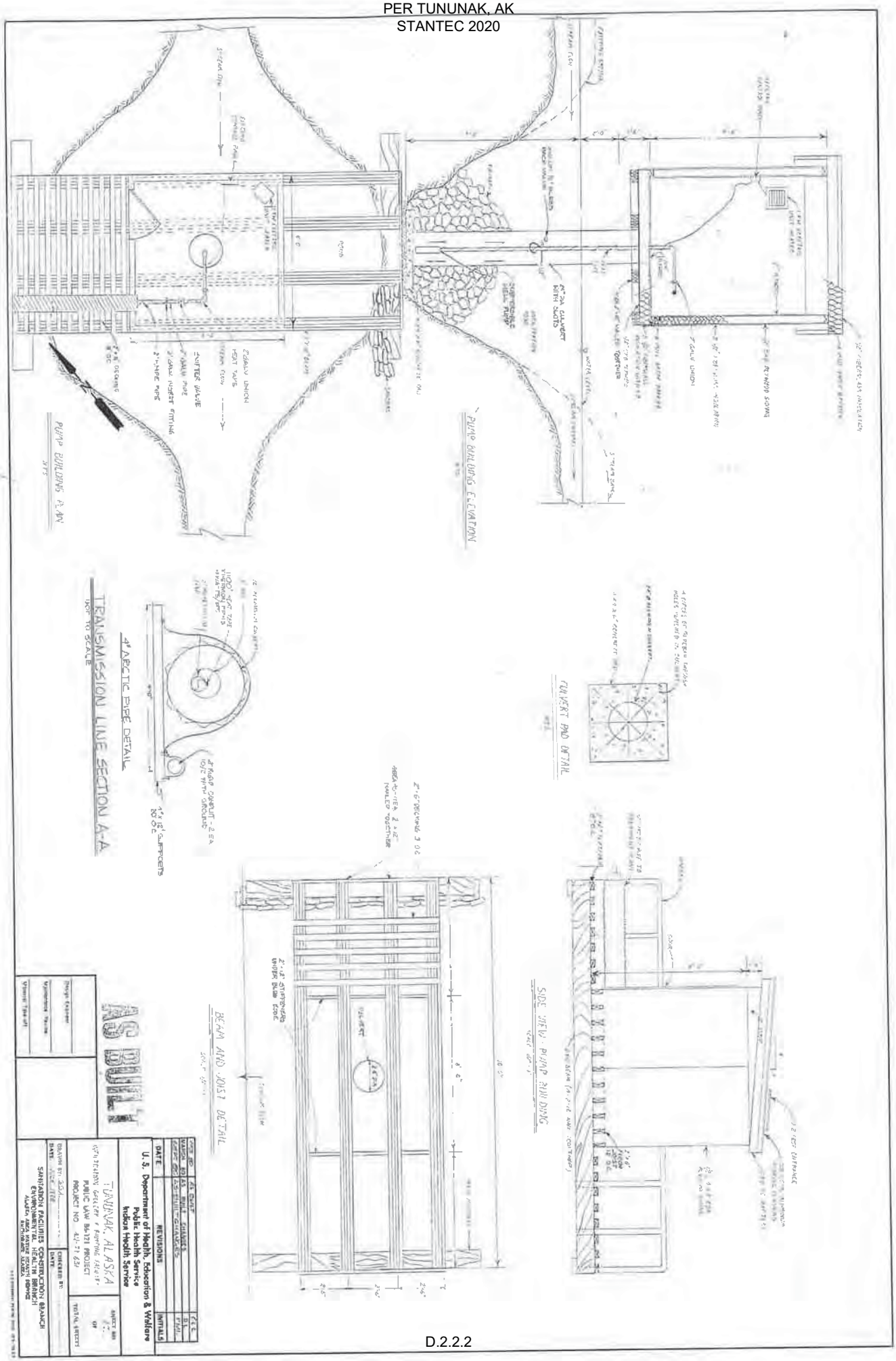
Photo 27 - looking north at the rear side of the Unnamed Creek pump house suspended over Unnamed Creek. The Arctic pipe on the left side of the building is the water transmission line from the former Muskox Creek infiltration gallery. The Arctic pipe on the right side is the existing water transmission line from Unnamed Creek infiltration gallery to the Tununak Washeteria/WTP. On the roof of the pump house is an entrance use during the winter time when snowdrifts prevent access to the pump house where the operator must climb on the roof and enter the pump house through the roof opening.

Attachment 4

USPHS As-Built

of

Unnamed Creek Infiltration Gallery


PUMP BUILDING PLAN
PUMP BUILDING ELEVATION
CULVERT END DETAIL
4" ARCTIC PIPE DETAIL
TRANSMISSION LINE SECTION A-A
NOT TO SCALE
BEAM AND JOIST DETAIL
SIDE VIEW PUMP BUILDING
AS BUILT
TUNUNAK, ALASKA
PUBLIC LAW 86-121 PROJECT
U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service
SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE

D.2.2.3 Technical Memorandum 3

Technical Memorandum 3 – *Structural Assessment of the Existing 50,000-Gallon Water Storage Tank. Lenght 33 pages.*

Technical Memorandum 3

Structural Assessment of the Existing 50,000-Gallon Water Storage Tank

For

Tununak, Alaska

August 8, 2018

Stantec

Technical Memorandum #3

To:	Native Village of Tununak IRA Council Tununak, Alaska	From:	Bob Gilfilian, PE Principal Civil Engineer Stantec Consulting Services, Inc.
File:	**Technical Memorandum 3 – Structural Assessment of the Existing 50,000-Gallon Water Storage Tank**	Date:	August 1, 2018

Section 1.0 Introduction

The Native Village of Tununak a.k.a. Tununak IRA Council (herein referred to as Tununak) in cooperation with the Alaska Department of Environmental Conservation (ADEC) Village Safe Water (VSW) has retained Stantec Consulting Services Inc. (Stantec) to prepare this Technical Memorandum (Tech Memo) with funding from the U.S. Department of Agriculture Rural Development (USDA-RD).

The purpose of this Tech Memo is to provide a summary of the findings of an assessment of the structural condition and usability of the existing 50,000-gallon water storage tank (WST). This Tech Memo provides recommendations for future use if the tank is found to be in satisfactory condition, or corrective action if it is determined that the tank needs to be repaired or upgraded.

The WST is located adjacent to the Water Treatment Plant (WTP)/Washeteria building with an attached corridor between the tank and the WTP. The corridor houses the treated water inlet line to the tank and the outlet service line from the tank. The WST was constructed approximately 40 years ago by the U.S. Public Health Service (USPHS). Attachment 1 provides an as-built plan sheet titled “50,000 Gallon AWWA Water Tank & Details” prepared by USPHS for the Construction Plans for Sanitation Facilities, Tununak, Alaska, dated February 1980.

Based on a 2007 sanitary survey inspection, the interior of WST has noticeable corrosion with a poor interior coating condition and the survey recommended the interior of the tank should be inspected. The purpose of the inspection is to determine if the WST is structurally sound and assess the interior coating to determine if it needs to be recoated to prevent further corrosion. It is also understood, per discussion with the WTP operators, that the interior of the tank has never been cleaned.

According to the findings of a Sanitary Survey of the Tununak WTP that was completed for ADEC on August 17, 2010, there were several deficiencies noted with the WST. The tank’s water overflow line and air vent at the top of the tank were not properly screened. Also, the air vent needed to be turned downward a minimum distance of 2.5 times the line diameter above the tank surface.

Reference: 95% Draft Tech Memo #3 – Structural Assessment of the Existing 50,000-Gallon Water Storage Tank

Section 2.0 Methodology

The structural integrity and usability/functionality of the WST and its foundation system was inspected during a field trip conducted on June 5 through 8, 2018, by Bob Gilfilian, P.E., Senior Principal Civil Engineer with Stantec. During the site investigation, Mr. Gilfilian interviewed the Tununak WTP operators and key administrative staff to obtain information on the operation of the WST during all seasons of the year. According to the operators, the tank is filled on an as needed basis dependent on the water usage in the Washeteria and supply to the nearby clinic. The operators typically pump raw water from the Unnamed Creek infiltration gallery and treat the water prior to filling the tank. It is understood the tank is normally filled approximately four times a year.

The field assessment for the preparation of this Tech Memo involved a field trip to visually inspect the exterior condition of the WST roof, walls, bottom, and foundation. In addition, the interior of the tank was checked from the roof hatch to assess the tank's interior condition above the tank's water level. The observable portion of the tank foundation was assessed to the greatest extent possible. The inspection of the WST did not involve intrusive measurements of the tank material nor the foundation.

Shortly after arriving in Tununak on June 5, 2018, Mr. Gilfilian inspected the exterior condition of the WST from the ground surface. On the following day (June 6), Mr. Gilfilian met with the two water systems operators, Mr. Joe James and Mr. Vincent Billy. The operators accompanied Mr. Gilfilian during a brief inspection of the WTP. Mr. James provided a ladder that allowed access to the exterior ladder on the WST. Mr. Billy assisted Mr. Gilfilian during the inspection of the top of the tank. Access to the interior of the tank was provided via the tank's roof hatch. Upon opening the hatch, it was noted that there was considerable amount of floating debris on the water surface which was at a level near its maximum height.

The field inspection notes prepared by Mr. Gilfilian are provided in Attachment 2. Several photographs were taken to document the condition of the WST. These photographs, with brief captions, are provided in the Photo Log (Attachment 3).

Section 3.0 Discussion of Findings

The photographs taken during the site visit conducted on June 5 through 8, 2018, show the exterior and interior condition of the WST and its foundation system. Information on the operation and maintenance (O&M) of this infrastructure was obtained from interviews with Tununak' s WTP operators, including subsequent discussions with the IRA Council administrators.

A summary of the findings of the site assessment conducted by Mr. Gilfilian is provided below.

Reference: 95% Draft Tech Memo #3 – Structural Assessment of the Existing 50,000-Gallon Water Storage Tank

Tank Exterior Walls

As shown in Photos 1 and 2, the exterior of the WST appears to be in reasonable condition considering the tank is 40 years old and had experienced adverse weather conditions from being located along the coast of the Bering Sea. Photo 1 shows the northwest side of the tank with apparent typical rust stains on the aluminum siding. Photo 2 shows the ladder access to the tank and a missing section of siding located just below the top of the tank. Photo 6 shows a torn portion of the exterior beneath the tank ladder which was probably damaged in the past when operators tried to use the ladder. A close-up view of the missing panel of the aluminum siding that exposed the foam installation near the top of the tank is shown in Photo 7. This is the only area that had missing siding, the remainder of the exterior appeared to still be intact and completely covered the underlying foam insulation. Photos 9 and 10 show the tank's overflow line that appears to be in satisfactory condition with the weather beaten exterior siding. The overflow drain needs to be screened.

Tank Timber Foundation

Photo 3 shows the southwest corner of the WST's foundation. Overall, the timber and high density-foam insulation board appeared to be in fair condition. The condition of the timber foundation beneath the tank, between vertical sections of floor joists/supports, is shown in Photos 4 and 5. The lumber members appeared to be in good condition with no signs of deterioration; however, some minor weather-worn sections of the exterior side panels on the lumber foundation were noted as shown in Photos 3, 10, 12, and 20.

Exterior Tank Cover

The exterior of WST cover was checked for deficiencies and was found to be in fair condition, with small sections of foam insulation missing. Photos 1 and 20 show the insulated edge of the tank cover, which appeared be in good condition with no apparent damaged sections. Photos 13 and 14 show the overall condition of the exterior surface of the foam insulation on the tank cover. The photos show a missing section of insulation over the roof hatch. Photo 13 shows the condition of the ladder cage at the tank top, which appeared to be intact and functional. Photo 14 shows the tank vent pipe that needs to have a 90-degree extension installed on the pipe.

Tank Interior

The interior of the WST was visually checked via access through the roof hatch. Several photographs were taken of the water surface and the tank's interior wall and roof section above the water surface. Photo's 15 and 16 show the water surface in the tank, with a considerable amount of floating debris that included an empty soda pop can, fragments of foam insulation, and rust particles. Photos 17 and 18 show sections of the tank side wall panels. Photo 17 shows the tank's north side interior wall that appeared to be in good condition above the water surface; however, the

adjacent wall shown in Photo 18 shows obvious signs of surficial deterioration. Also, Photo #18 shows the underside of the WST cover that appeared to be in fair to good condition.

Section 4.0 Conclusions and Recommendations

Overall, the exterior of the WST appeared to be in fairly good condition considering the age of the structure. As shown in many of the photographs provided in the Photo Log (Attachment 3), the tank appears to be vertical and the foundation system is still functional and provides a stable base for the tank. It is recommended that a small amount of minor improvements and cosmetic repair work should be done. These improvements include: replacing small sections of the tank's aluminum siding; extending the tank vent line with a 90-degree bend so it is placed downward a minimum distance of 2.5 times the line diameter above the tank roof surface, and screening the tank overflow line. It is estimated that the cost for this repair work would be less than $25,000.

However, there are some noteworthy issues and concerns about the interior of the WST. Based on conversations with the WTP operators, it is understood the tank has not been cleaned since it was originally placed in operation nearly 40 years ago. In addition, the photographs described in Section 3 clearly show a portion of the tank interior walls has experienced deteriorating surficial damage. It is recommended the WST be emptied and cleaned thoroughly. In addition, the interior tank lining/coating should be tested and determined if recoating the tank is needed. Attachment 4 provides a cost estimate for cleaning and recoating the tank interior. This cost estimate was prepared by Estimation and provides the estimated cost with contingencies for this work for a total of $534,898.

As an alternative cost saving approach considering the old age of the tank and its expectant limited remaining useful life, the tank could continue to be used as is for a few more years provided the tank is thoroughly cleaned and its interior coating tested by a professional quality testing firm. Also, the recommended repairs/modifications to the tank's overflow pipe and vent should be made. This interim corrective action would probably cost less than $100,000 dependent on the resources available to the community and assistance provided by the State's Rural Maintenance Worker Program.

Section 5.0 Limitations

This Tech Memo was prepared by Stantec for the account of Native Village of Tununak IRA Council at the request of ADEC VSW Program. The findings and recommendations presented herein reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in this document and in the contract between Stantec and the Client. The opinions in this document are based on conditions and information existing at the time the document was prepared and do not take into account any subsequent changes. In preparing the document, Stantec did not verify

information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party.

Stantec Consulting Services, Inc.

Robert (Bob) Gilfilian, PE
Principal, Civil Engineer

Cell Phone: 907-227-9883
Email: bob.gilfilian@stantec.com

Attachment: Attachment 1 – USPHS As-Built Plan Sheet titled “50,000 Gallon AWWA Water Tank & Details” for Tununak

Attachment 2 – Bob Gilfilian’s Tununak Field Notes for June 5-8, 2018

Attachment 3 – Photo Log

Attachment 4 – Cost Estimate for Tank Cleaning and Recoating by Estimations

c. Susan Randlett, PE
ADEC Village Safe Water Program

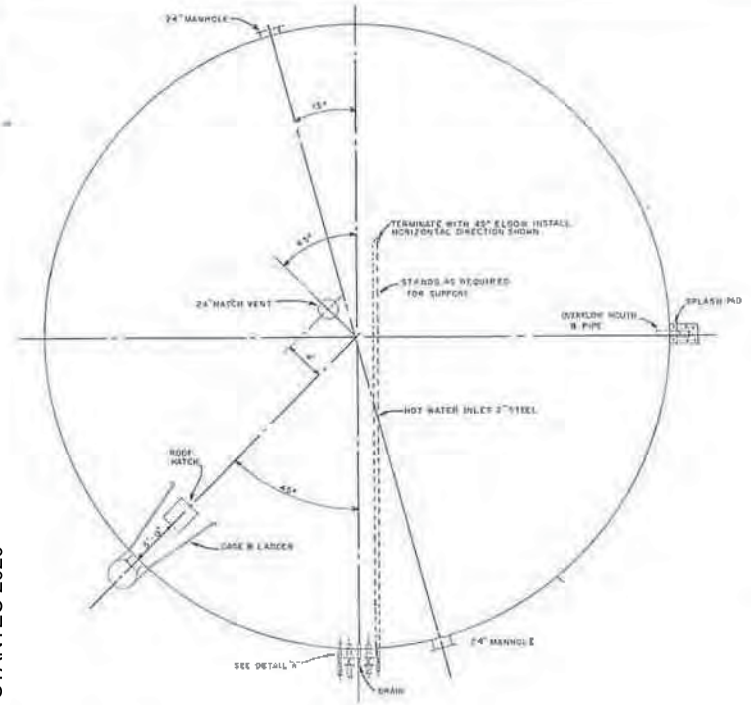
ATTACHMENT 1

USPHS As-Built Plan Sheet

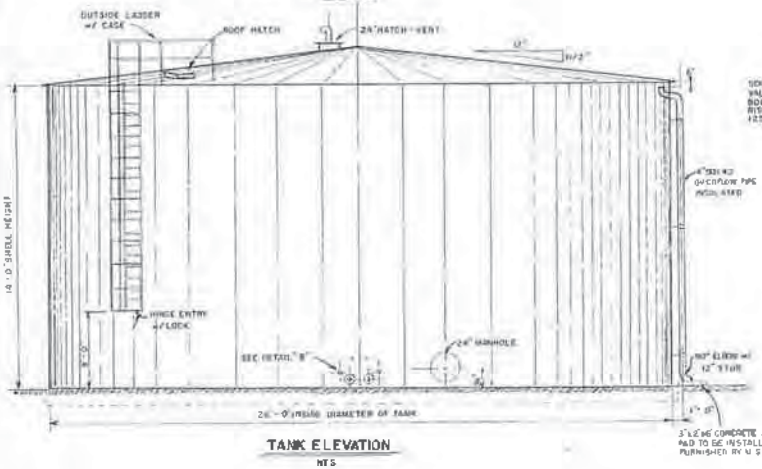
“50,000 Gallon AWWA Water Tank and Details”

PER TUNUNAK, AK
STANTEC 2020

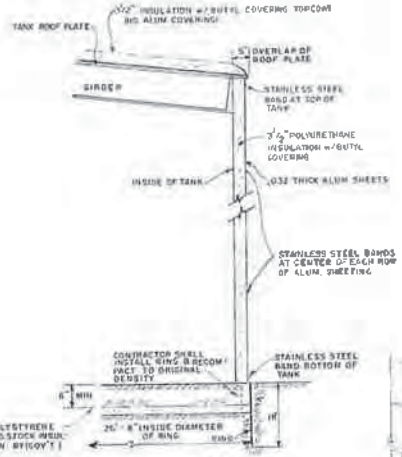
D.2.2.3



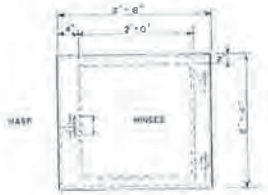
PLAN



TANK ELEVATION
NTS



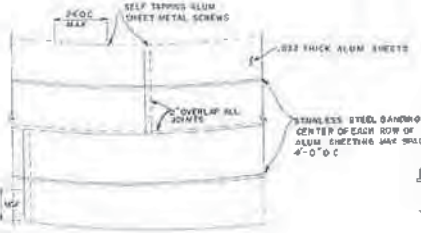
RING INSTALL & INSULATION DETAIL
NTS



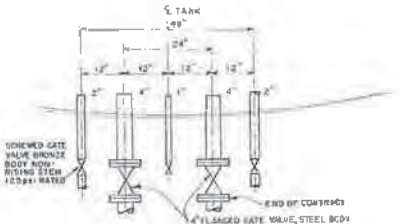
PLAN



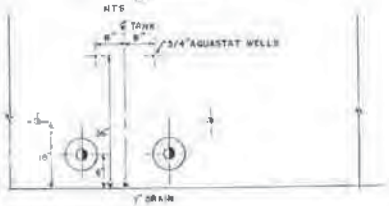
ROOF HATCH DETAIL
NTS



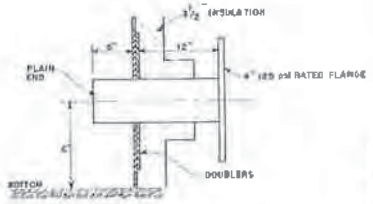
ALUMINUM COVERING DETAIL



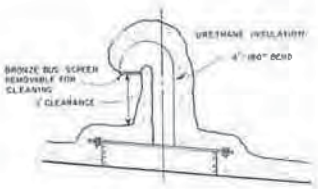
DETAIL "A"
NTS



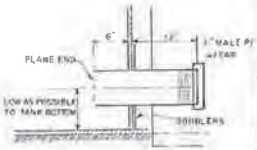
DETAIL "B"
NTS



INLET & OUTLET DETAIL
NTS



COMBINATION ROOF HATCH & VENT DETAIL
NTS



DRAIN DETAIL
NTS

NOTES:

1 ROOF, SHELL, & BOTTOM PLATES A-36 STEEL
2 ALL 4" PIPING TO BE SCHEDULE 40 STEEL PIPE
3 ALL 2" PIPING TO BE SCHEDULE 40 STEEL PIPE
4 ALL BOLTS & NUTS TO BE A-307
5 SHELL DOUBLERS A-36 STEEL
6 ENTIRE TANK (ROOF & SHELL) SHALL BE INSULATED w/ 3½" POLYURETHANE SPRAY FOAM
7 MANHOLE BOLTS & NUTS, LADDER & CAGE (NOT INSULATED)
8 MANHOLE SURFACE, HATCHES, VENT, OVERFLOW PIPE INSULATED w/ 3½" POLYURETHANE
9 CONTRACTOR TO PROVIDE ALL VALVES
10 TANK CONSTRUCTION TO LATEST AWWA STANDARDS OR AS SPECIFIED
11 DRAIN PIPE SHALL BE GALV STEEL PIPE
12 RING SHALL BE ROUND WITHIN 1" & SHALL BE PLACED SO THAT TOP IS AT SAME ELEVATION ALONG RING PER
13 TANK SIDEWALL SHALL BE COVERED w/ .032 THICK ALUM COVERING OVER THE 3½" INSULATION w/ 2" OVERLAP AT EACH JOINT AS SHOWN IN DETAILS

AS BUILT

DATE	REVISIONS	INITIALS
	TYP. NO AS-BUILT	CAC

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
50,000 GALLON AWWA WATER TANK & DETAILS
PUBLIC LAW 86-121 PROJECT
PROJECT NO AN 77-831

SHEET NO 18 OF 23 TOTAL SHEETS

DRAWN BY: SEE
DATE: 12-8-77
CHECKED BY:
DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

Design Engineer
Maintenance Review
Water Technician

STATE OF ALASKA
JOHN T. LOVETT
No. 3007
REGISTERED PROFESSIONAL ENGINEER

ATTACHMENT 2

Bob Gilfilian's Tununak Field Notes

For June 5-8, 2018

(107) June 5, 2018
Tues

Tununak, AK
Tech Memo Field Trip

@ 0800 arrived at ANC Airport - Ravn Air for flight to Tununak (via Bethel, Nightmute, Toksook Bay)

@ ~~11~~ left ANC for Bethel
@ 1130 arrived Bethel
@ 1250 left Bethel on Magellan Air/Ravn
@ 1330 arrived in Tununak
met Ira at Airport (Airfield) & Teddy
@ 1345 went to School to check in w/ Teddy
@ 1400 met Kavers at his house
Joseph James, operator H2O plant (652-2670)
Vincent Billie " " (652-2630)
IRA #617-2021 (not
@ called Brandi for school internet password
Amy 543-4827
- Ira took me in 4-Wheeler to Village office - everything in Village was shut down due to no power except School.

@ 3 pm took walking tour of Village to check out layout w/ photos.
Check Washeteria/WTP to set up for test
- Elizabeth secretary at School

Bob Gilfilian - Tununak AK
Field Trip Notes, June 5-8, 2018 (6 pages)

Tununak, AK

6/5/18 (108)
Tues
~50°F, Clear, Sun

@ 4 pm walked along western beach to the north end where bluff (5-6' high) meets the beach. Took photos to show exposed rock formation. Collected sample of gray and brown sandstone/siltstone horizontally fractured

✓ Walked south on beach to School's sewer outfall daylighted on upper beach
✓ Took photos of School's exterior water treatment plant and W/W plant.
✓ Went to Washeteria - closed due to power out, took exterior photos and pipeline to Clinic
✓ Checked west leg of water line to Wash WTP - noted repair work on arctic pipe

@ 6 pm contacted Vincent Billie who agreed to meet me tomorrow at 10 am to start adequacy test on ST/SAS.
- Returned to school to organize files and field gear for tomorrow's projects.
- Reviewed project files until 8 pm

End Day 6/5/18

PER TUNUNAK, AK
STANTEC 2020

(109) Tununak, AK
June 6, 2018 (Wed)
~40°F
Part Sun
~5mph Wind

@ 8 AM prepared draft proposal letter to VSW for deep well Geophysical Survey.
@ 9 AM called Collin Markel on survey dates.

Prepared field maps/docs to meet w/ Vincent Billie, Tununak WPO, to go over items needed to complete the following tasks:
1- Inspect WST (need ladder to ck tank)
2- Inspect Well House on Unnamed Creek
3- Inspect Water transmission line
4- Conduct Adequacy Test on ST/SAS.
Also prepared form RMS-2 and other Stantec safety forms to review w/ Vincent

@ 1000 met Vincent Billy at School. Check WTP but it was locked. Went to Village Office
@ 1030 hold mtg. w/ Jamor Jamer, Xavier, Joe James, and Vincent Billy
- Discussed purpose of my visit and scope of work (tasks)
- Went over well drill sites, noted Village owned corner of site south of Unnamed Creek along Muskox Cr Water transmission line
- Decided to walk sites tomorrow

Note: Meas cold water discharge in Washteria
5 gal = 35 sec

~45°F
Cloudy
~15mph Wind

Tununak (110)
June 6 '18

@ 1100 went to Washteria / WTP w/ Vincent Billy and Joe James.
✓ Checked over Wash (in use) only 1 washer and 2 dryers (Vincent est 4 gal/wash)
✓ made arrangements for discharging water in to Wash sewer drain for adequacy test Meas flow at 8.3 gpm
✓ Checked over equipment conditions in WTP - took photos - barely operating.
✓ Noted WST had ~114" water level
✓ Found one shower & one toilet working.
✓ Went to WST w/ ladder, climbed on top to check tank condition. Took photos and videos. Opened top access cover Observed rust debris floating in tank plus an empty soda can floating
✓ Went to sewer system to check manholes and then opened access to 4th and 2nd ST Found monitor tubes (8) that were installed by LKSD a couple of years ago when they installed several new Infiltrator lines in the area of the former WSPH Soil Absorption System (SAS) - *Need Record Drawing.
@ 1230 I informed Vincent & Joe that I would complete Adequacy Test and we will meet tomorrow at 9 AM to inspect Well House Unnamed Ck.

D.2.2.3

PER TUNUNAK, AK
STANTEC 2020

(111) Tununak
June 6, 2018

~~55°F~~ 53°F
Cloudy, Windy
25 mph

@1245 returned to school to prepare forms for adequacy test. Organized notes & equipment. Layout map of ST/SAS for Adequacy Test

@ 2 pm went to ST/SAS to take startup meas.

At @ 2:30 meas liquid level in ST/SAS meas.

STCO	99.5"	btop	(6" ϕ HDPE) (4K ST) (Inlet)
S-1	60.0"	btop	(4" ϕ ow)
S-2	55½"	"	(4" ϕ ow)
S-3	51½	"	(Heaters) (4" ϕ wet
S-4	36"	"	(header pipe invert)
N-1			(8" ow) (filled w/ rocks & debris) (4" ϕ)
N-2	99.5"	btop	(8" ow)
N-3	48"	"	(4" ϕ ow)
N-4	54"	"	damp bottom gravel (4" ϕ)

@ 1508 started flow into washteria drain meas flow in 5 gal bucket in 40 seconds. calc flow = 7.6 gpm plus 1 load washer.

@ 1523 (15 min) meas SAS & ST

STCO	100.0"	btop	
S-1	59.5"	btop	(feels like header pipe)
S-2	55.0"	"	
S-3	52"	"	
S-4	45½"	"	able to clear header wet bottom soil

Sunny 55°F
25 mph Wind

Tununak (112)
6/6/2018

N-2	99½"	btop	
N-3	48½"	btop	
N-4	damp soil		

@ 1545 pm meas flow in Washteria = 7 gpm

@ 1610 meas ST & SAS Obs Wells (ows)

STCO	99.5"	btop	
S-1	59.5"	btop	(This is header pipe w/ 4" ϕ
S-2	54¼"	"	coming from 2K ST)
S-3	52"	"	
S-4	damp		
N-2	99½"	"	
N-3	48"	"	
N-4	damp.		

Found 4" ϕ ABS ob pipe in NW corner of SAS meas liquid = 72½" btop (flush w/ GS) ~15' SW of N-2

@ 1650 meas flow = 5.75 gpm at washteria 4 loads of washer used during test

@ 1700 meas levels in ST & SAS

ST-CO	99½"	btop	Stickup = 22" AGS
S1	57"	btop	Stickup = 7" ags
S2	54½"	btop	" = 12" "

PER TUNUNAK, AK
STANTEC 2020

(113) Tununak 6/6/2018

Continue meas SAS

S3	52" btop	stickup = 7"	ags
S4	damp	" = 8"	ags
N1	NA	"	
N2	99½"	btop " = 27"	"
N3	47½"	btop " = 4"	ags
N4	damp	top of casing at GS.	
NW corner OW = 72½" btop, No stickup flush GS			

@1752 meas flow = 60 gpm in Washeteria
@1808 Shut off flow for Adequacy Test
Ave flow 616 gpm, Total flow = 1,185 gal
Plus 4 wash load yields 1300 g in 180 min
Note: laundry being used all day - 1 washer

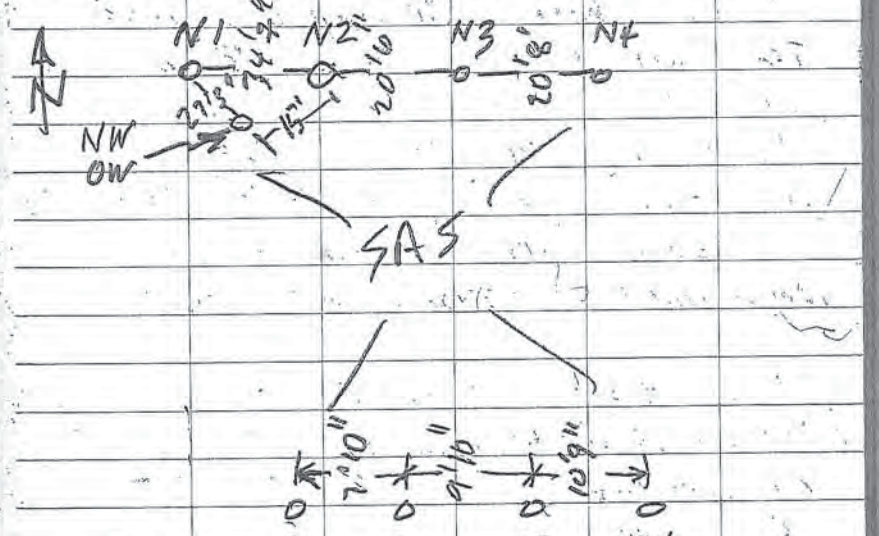
@1815 meas SWLs in ST/SAS OWs:

ST CO	99½"	btop
S1	~~55 3/4~~	" (very difficult to meas headed)
S2	54 3/4"	"
S3	52"	"
S4	damp	"
N2	99 3/4"	"
N3	47 1/4"	"
N4	dry 30'	"
NW OW	72½"	"

55°F / Wind Sunny / 20mph

Tununak (114) 6/6/2018

Layout of ST/SAS measured at 18



@ 7:10 pm returned to school to review notes
Sent proposal for Geophysical Survey to Susan via email

BR Stapleton 6/6/18

End Day 2

D.2.2.3

PER TUNUNAK, AK
STANTEC 2020

(115) Tununak
June 7, 2018
(Thursday)

Cloudy, 42°F
15 mph Wind

@ 0800 organized notes for field work today schedule to complete Adequacy Test and inspect Unnamed Creek well.

@ 0915 met Joe James went to ST/SAS
Joe informed me that ~2 loads wash so far this morning at Washeteria
Meas SWL in ST/SAS at 0930

ST-CO	99½"	btop
S1	59"	"
S2	55½"	"
S3	52¼"	"
S4	dry	"
N1	NA	"
N2	99½"	"
N3	48½"	"
N4	~~93½~~ dry	
NW-CO	73"	"

Note: lift sta discharge 2" Ø HDPE is ~4'8" bgs

				Top (1")
T	27"	HI above	S1	to ST-CO top ring
	30"	HI "	"	to 1.7' to S2 top
	30"	HI "	"	2.4' to S3 top
	30"	HI "	"	2.9' to S4 top
	25"	HI "	"	to N1 Top
	7"	HI "	N2	to N1 Top

Cloudy, 25 mph wind
40°F

Tununak
6/7/18

(116)

7"	HI above	N2	to 2.3', NW-CO Top
7"	HI "	"	to 1.9' N3 Top
7"	HI "	"	to 1.8' N4 Top

- Check w/ Bob Miller, LKSD Bethel
@ 1020 went to WTP w/ Joe & Vincent
@ 1100 inspected Unnamed Creek Pump House.
1 ½ AP pump - 2 of them
H2O level in well was 18" below floor
H2O depth in well was 24"
Creek flow ~ 6" deep x 3' wide channel 2' wide ~ 9" deep
Velocity = 5 sec/8 ft in channel 30" x 6"
✓ Walked along water trans line
@ 1200 drove in ATV w/ Vincent to walk over proposed drill sites. Took photos & videos
@ 1230 drove up to gravel pit on top mountain in cloud layer a couple miles up haul road - filled w/ snow - developed by QAP
@ 1300 went to IRA office to meet w/ staff
Met w/ James James & Yaari Post
@ 1400 rode back to school w/ Vincent, stopped to photo barge site south of BIA school & horses bucked
@ 1500 held 1 hr. tele conf w/ Susan Radtke & Beth Wurtz & rest of day on notes & reports
Note: 24 hr. ST SAS Rebound @ 1815. ST CO = All Same ½"

End Day 3

D.2.2.3

PER TUNUNAK, AK
STANTEC 2020

(117) Tununak, AK June 8, 2018 (Friday) 45°F Cloudy Calm

@ 0800 organized field notes and photos on laptop

@ 0930 walked to Tribal office. (No Vincent.) Approx 1.25 miles school to office

@ 1000 held telecon w/ Susan Randlett, James James and Xavier Post. Discussed approach to drilling exploratory deep wells.

✓ Need SHPO and wetland - maybe CRW
✓ Best Practices waiver
✓ Need cost est. for drilling wells
✓ Possible funding from RD by July 15
✓ Possible sole source d
✓ Grant period up to 5 years
✓ Discussed was Interim
✓ Susan recommended include water line w/ well

@ 1100 mtg ended

- Xavier said most folks take steam baths & took several photos of steam huts.
- Means distance from ST Lift Sta to S1 ≈ 25'

@ 1130 returned to school for packing met Vincent Billy and Teddy on flight standby. Found out Hageland Air could not fly from Bethel due to weather delay

(118) Tununak June 8 '18 53°F Partly Sun ~10 mph wind

Next several hours kept calling Hageland in Tununak & Bethel with negative responses

@ 1600 found out Grant Air was coming to Tununak so Teddy rushed me out to the airport as the plane was landing - able to get a seat!

Flew to Toksook Bay and then to Bethel.

Arrived at 1735 as my Rava flight was departing Bethel

Went to AK Air and able to get a seat for 9 pm flight to ANC

@ 2015 pm boarded Alaska Air Flt. #46 for ANC for ANC

@ 2100 arrived at ANC Airport

@ 2130 arrived at Greg Magee's for the night

End Day 4
Bob Burgett 6/18/18

D.2.2.3

PER TUNUNAK, AK
STANTEC 2020

ATTACHMENT 3

Photo Log



Photo 1- Looking south at the northwest side of the 50,000 gallon WST with Washeteria/WTP in background to the right.



Photo 2 - West side of the WST and roof access ladder with the Washeteria/WTP to the right.



Photo 3 - Foundation at the southwest side of the WST

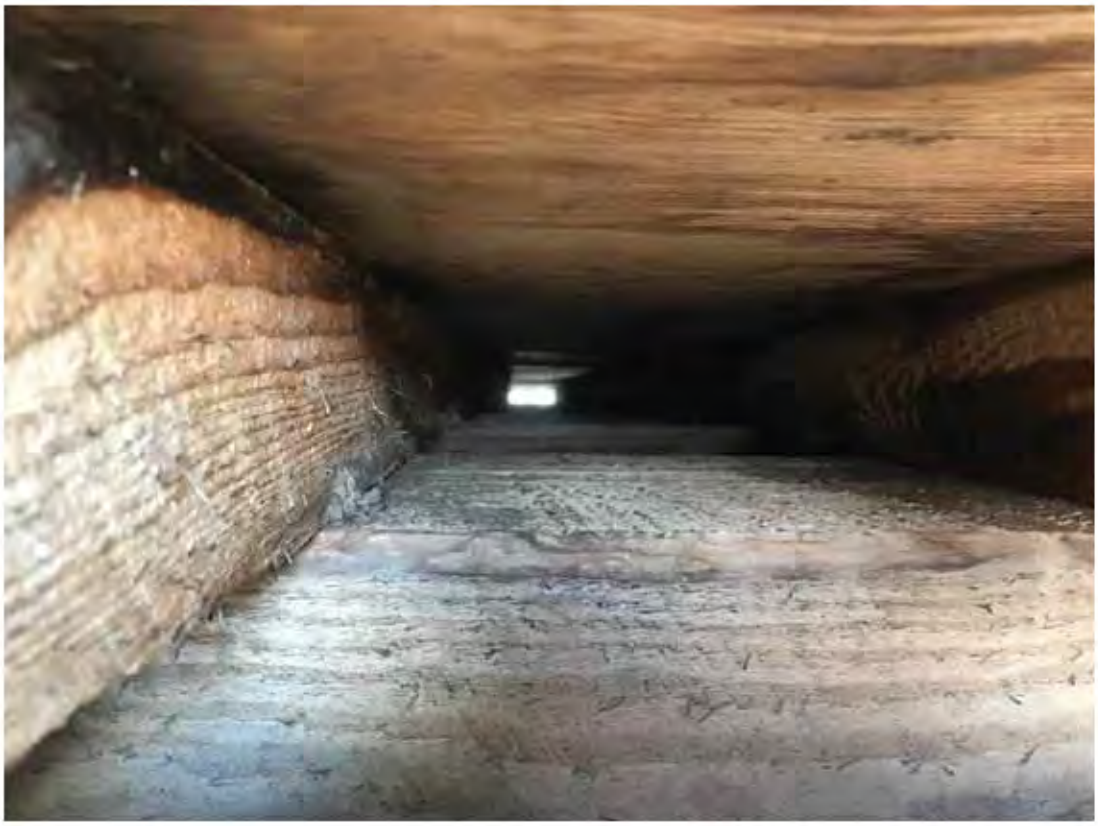


Photo 4 - Looking east through spacing of WST timber foundation.



Photo 5 – Looking West through spacing in W ST foundation.



Photo 6 - Horn aluminum exterior skin covering on Southwest side of WST beneath the roof access ladder.



Photo 7 - Missing aluminum skin on WST surface exposing foam insulation on South side of tank.



Photo 8 - Looking north at WST with Washeteria/WTP on the right and Tununak school to the left.



Photo 9 - North side of WST looking at tank overflow pipe.



Photo 10 - Tank overflow drain with deteriorated section on exterior of tank timber foundation



Photo 11` - Looking at East side of building connecting the WST and the water treatment plant.



Photo 12 - Manway to access the bottom of WST and foundation at the Northwest corner of tank



Photo 13 - Looking southeast at roof hatch and ladder cage at the top of the WST.



Photo 14 - looking north at WST hatch vent and insulated roof.



Photo 15 - Looking down inside the WST, observed floating debris including flakes of insulation, rust and an empty soda pop can.



Photo 16 - Looking down inside the WST, observe floating chunks of insulation and rust.



Photo 17 – Looking down inside the WST towards the north side of tank.



Photo 18 – Looking inside the WST towards the east side of tank – note deteriorated side wall.



Photo 19 – Looking east at west side of WST and back of washeteria/WTP building.



Photo 20 – Looking at the northeast corner of the WST that shows the tank foundation.

ATTACHMENT 4

Cost Estimate for Tank Cleaning
And Recoating
For Tununak Water Storage Tank

Prepared by Estimations
Dated July 31, 2018

Tununak Water Storage Tank
Clean and Recoat
Tununak, Alaska

Construction Cost Estimate
Concept Design Submittal
July 31, 2018

ESTIMATIONS
1225 E. International Airport Road, Suite 205
Anchorage, Alaska 99518
907.561.0790

Prepared for:
Stantec
725 E Fireweek Lane #200
Anchorage, AK 99503
888-706-8754

PER TUNUNAK, AK
STANTEC 2020

Documents

Damage Assessment and Schmatic Design Narrat	21-Sep-16
Drawings	21-Sep-16

Notes and Assumptions

1 Based on 2017 procurement/2017 construction.
2 Labor rates based on Davis Bacon, 50 hours/week.
3 Assumes open competitive bid procurement.
4 Materials storage area will be designated near the building.
5 Local contractor.

Tununak Water Storage Tank
Clean and Recoat
Prepared for Stantec by Estimations

Construction Cost Estimate
Concept Design Submittal
July 31, 2018

Description	Estimated Cost	Estimated Cost Plus Contingency & Escalation	Div.
Basic Bid			
01 - GENERAL REQUIREMENTS	$358,161	$426,301	1
33 - UTILITIES	$91,239	$108,597	33
Total Estimated Cost - Basic Bid:	**$449,400**	**$534,898**	**<<<<<**

Estimating Contingency:				15.0%
Escalation For Inflation:	12 Mths	@	3.5%	3.5%

D.2.2.3

PER TUNUNAK, AK
STANTEC 2020

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
1	**01 - GENERAL REQUIREMENTS**										
2											
3	**Project Management**										
4	Project Manager, 8 Hour/Week	8	WEEKS			8.000	64.0	$6,240		$6,240	$6,240
5	Supervisor, 60 Hour/Week	6	WEEKS			60.000	360.0	$30,240		$30,240	$30,240
6											
7	**Subsistence**										
8	Room & Board	183	MANDAY	$250.00	$45,824					$45,824	$45,824
9											
10	**Travel**										
11	Air Fare - Anchorage - Site	10	EA	$700.00	$7,000					$7,000	$7,000
12											
13	**Small Tools & Consumables**										
14	Consumables	1	LS	$300.00	$300					$300	$300
15	Small Tools	1	LS	$900.00	$900					$900	$900
16											
17	**Mobilization**										
18	Mobilization/Demobilization, Misc Labor	1	LS			160.000	160.0	$14,935		$14,935	$14,935
19	Equipment	51	TONS	$1,500.00	$77,100					$77,100	$77,100
20	Freight										
21	Materials	1	TONS	$520.00	$602	2.857	3.3	$308		$910	$910
22	Temp Materials	5	TONS	$520.00	$2,600	2.857	14.3	$1,335		$3,935	$3,935
23	Scaffolding	2	TONS	$520.00	$1,040	2.857	5.7	$532		$1,572	$1,572
24	Connex Storage, Tools	10	TONS	$520.00	$5,200	2.857	28.6	$2,670		$7,870	$7,870
25	Air Freight Anchorage - Job Site	1,300	LBS	$1.20	$1,560					$1,560	$1,560
26											
27	**Equipment (for Duration + 2 months)**										
28	Fourwheeler	15	WEEKS						$3,750	$3,750	$3,750
29	Forklift (1 Ea)	15	WEEKS						$12,750	$12,750	$12,750
30	Manlift (1 Ea)	15	WEEKS						$4,500	$4,500	$4,500
31	Boom Truck (1 Ea)	15	WEEKS						$32,500	$32,500	$32,500
32	Vacuum Pump	15	WEEKS						$3,000	$3,000	$3,000
33	H.Pressure Pumps	15	WEEKS						$2,250	$2,250	$2,250
34											
35											
36											

D.2.2.3

PER TUNUNAK, AK
STANTEC 2020

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
37	**Other Requirements**										
38	Project Meetings, Safety, Misc meetings	6	EA			4.000	24.0	$1,440		$1,440	$1,440
39	Test Lab Services	1	LS	$5,000.00	$5,000					$5,000	$5,000
40	Temporary Facilities										
41	Project Office - Rental House	2	MTHS						$3,750	$3,750	$3,750
42	Office Equipment/Supplies	2	MTHS	$500.00	$750					$750	$750
43	Project Tool Sheds	2	MTHS						$300	$300	$300
44	Project Safety Equipment	1	LS	$450.00	$450					$450	$450
45											
46	Temporary Services										
47	Chemical Toilets	2	MTHS	$690.00	$1,035					$1,035	$1,035
48	Electrical	2	MTHS						$2,550	$2,550	$2,550
49	Lighting	1	LS	$1,000.00	$1,000					$1,000	$1,000
50	Heat Temporary	2	MTHS	$12,000.00	$24,000					$24,000	$24,000
51	Cleaning	1	LS			60.000	60.0	$5,082		$5,082	$5,082
52											
53	Record Documents	1	LS	$1,000.00	$1,000					$1,000	$1,000
54	Contract Closeout and Training	1	LS	$2,500.00	$2,500					$2,500	$2,500
55	Certified Payroll Fee	1	LS	$1,348.82	$1,349					$1,349	$1,349
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66	**General Contractor Profit (Fee)**	10.0%									$39,858
67	**General Contractor Bond & Insurance**	2.5%									$10,961
68											
69	**Subtotal: 01 - GENERAL REQUIREMENTS**				$179,210		719.9	$62,782	$65,350	$307,342	**$358,161**
70											
71											
72											

D.2.2.3

PER TUNUNAK, AK
STANTEC 2020

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
73	**33 - UTILITIES**										
74	**33 16 13.13 Steel Aboveground Water Utility Storage Tanks**										
75	**Ventilation**										
76	Setup Ventilation System	1	EA			20.000	20.0	$1,694		$1,694	$1,694
77	Operate Ventilation System	20	DAYS						$4,000	$4,000	$4,000
78											
79	**Temp Storage**										
80											
81	**Drain Tank**										
82	6 Man Crew	4	DAYS			60.000	240.0	$20,329		$20,329	$20,329
83											
84	**Cleaning**										
85	Area	2,621	SF								
86	Top	531	SF								
87	Framing	416	SF								
88	Bottom	531	SF								
89	Walls	1,144	SF								
90	6 Man Crew	4	DAYS			60.000	240.0	$20,329		$20,329	$20,329
91	Vac Pump	4	DAYS						$800	$800	$800
92	Boom Truck	4	DAYS						$1,400	$1,400	$1,400
93	Manlift	4	DAYS						$800	$800	$800
94	Scaffolding	1,143	SF	$2.00	$2,286	0.071	81.2	$6,878		$9,164	$9,164
95											
96	**Coatings (3 Coat System)**										
97	Paint	2,621	SF	$1.50	$3,932	0.103	270.0	$22,870	$2,621	$29,423	$29,423
98	Top	531	SF								
99	Framing	416	SF								
100	Bottom	531	SF								
101	Walls	1,144	SF								
102	Boom Truck	6	DAYS						$2,100	$2,100	$2,100
103	Manlift	6	DAYS						$1,200	$1,200	$1,200
104											
105											
106	**Subtotal: 33 - UTILITIES**				$6,218		851.2	$72,100	$12,921	$91,239	**$91,239**
107											
108											

D.2.2.3

PER TUNUNAK, AK
STANTEC 2020

D.2.2.4 Technical Memorandum 4

Technical Memorandum 4 – *Task 1 – Desktop Study to Assess the Capacity of the Unnamed Creek Infiltration Gallery*

Technical Memorandum 4 – *Task 2 – Water Source Assessment Deep Water Supply Well*

Length 75 Pages.

Technical Memorandum 4

Task 1

Water Source Assessment
Desktop Study to Assess the Capacity of the Unnamed Creek Infiltration Gallery

For

Tununak, Alaska

August 8, 2018

Technical Memorandum 4 – Task 1

To:	Native Village of Tununak IRA Council Tununak, Alaska	From:	Collin Macheel CPG Bob Gilfilian PE Stantec Consulting Services Inc.
File:	**Technical Memorandum 4 – Water Source Assessment, Task 1 – Desktop Study to Assess the Capacity of the Unnamed Creek Infiltration Gallery**	Date:	August 6, 2018

Section 1.0 Purpose and Scope

The Native Village of Tununak a.k.a. Tununak IRA Council (herein referred to as Tununak), in cooperation with the Alaska Department of Environmental Conservation (ADEC) Village Safe Water (VSW) has retained Stantec Consulting Services Inc. (Stantec) to prepare this Technical Memorandum (Tech Memo) with funding from the U.S. Department of Agriculture Rural Development (USDA-RD). The purpose of this Tech Memo is to provide a summary of the results of a desktop study to estimate the hydraulic capacity of the existing infiltration gallery on Unnamed Creek that serves the Tununak washeteria and water treatment plant (WTP).

Section 2.0 Description of Existing Infiltration Gallery on Unnamed Creek

The water source for the existing washeteria/WTP uses a shallow water well that consists of an infiltration gallery located in Unnamed Creek that was constructed in 1978 by the U.S. Public Health Service (USPHS). The well structure would normally be called an infiltration gallery. The well (infiltration gallery) remains in the same configuration as it did when it was installed in Unnamed Creek nearly 40 years ago. The infiltration gallery consists of a 9-foot deep, 24-inch diameter, perforated (slotted) corrugated metal pipe, that was installed vertically in the middle of the Unnamed Creek. The top of the well's culvert pipe is approximately 3.5 feet above the surface of the creek.

Unnamed Creek flows through a tundra area and has a width that varies from 1 foot to a few feet and has a shallow depth of approximately 1 to 2 feet, as shown in attached photos of the creek (Attachment 1). The flow of the creek varies throughout the year, depending on precipitation and snow accumulation. During the winter, the creek freezes and often develops aufeis (overflow ice conditions), as shown in the photo of the flooded well house (Attachment 1).

The drainage basin for Unnamed Creek is on the south side of Ugchirnak Mountains and has a drainage area of approximately 1 to 1.5 square miles. The infiltration gallery is located inside an 8-by 8-foot wooden well house structure. The well house is located approximately 900 feet east and downhill of the existing washeteria/WTP. The raw water from the well house is pumped via a 2-inch diameter high density polyethylene (HDPE) pipe inside a 4-inch diameter Arctic pipe in an aboveground utilidor to the washeteria/WTP.

Reference: **Technical Memo 4**
Task 1 – Desktop Study to Assess the Capacity of the Unnamed Creek Infiltration Gallery

On June 7, 2018, Bob Gilfilian, PE, inspected the Unnamed Creek Infiltration Gallery pump house. He observed the water in the infiltration gallery had floating scum and that there were several open sections in the wall of the 24-inch corrugated metal pipe. He was informed by the WTP operator that the original 9-foot-deep infiltration gallery has, over the years, filled in with mud and debris from seasonal flooding and is currently only about 2 feet deep. The operators reported they have attempted, in vain, to remove the mud, but it has continued to fill in – resulting in reduced flow of raw water available for pumping, especially during the winter months when the water level in the creek is very low.

Section 3 Methodology

The scope of this desktop study was to provide an approximation of water supply capacity of the Unnamed Creek Infiltration Gallery that is used to supply raw water for the washeteria/WTP located in Tununak, Alaska. Since little to no data has been published on the nature of the water shed or channel flow, a regression model developed by the U.S. Geologic Survey (USGS) for approximating flow for ungaged stream sites was employed[1]. After estimated flows were derived, assumptions were made to further approximate the amount of flow accessible by the infiltration gallery in its current condition. Existing pump specifications are also provided.

Section 4 Unnamed Creek Flow Estimate

The USGS has developed a methodology for approximating monthly low-flow statistics for ungaged streams in Alaska. This method was used to prepare estimations for surface water flow through the Unnamed Creek in consideration of the physical properties of the watershed located upgradient of the existing infiltration gallery.

The surface water source properties of the Unnamed Creek watershed were inferred based on spatial precipitation estimates and regional air temperatures published by the USGS[2]. Additionally, watershed drainage area was approximated based on ADEC's Source Water Assessment for the Tununak Public Water System 270231.001 Zone C Watershed Boundary (Attachment 2). Characteristics of the channel slope and length were approximated by 1:63,360 scale digitized topographic maps and 2015 Lidar elevation dataset.

Table 1 summarizes estimated parameters for the watershed of the Unnamed Creek derived from the above sources.

[1] Wiley, J.B., and Curran, J.H., 2003, Estimating annual high-flow statistics and monthly and seasonal low-flow statistics for ungaged sites on streams in Alaska and conterminous basins in Canada: U.S. Geological Survey Water-Resources Investigations Report 03-4114, 61p.

[2] Jones, S.H., and Fahl, C.B., 1994, Magnitude and frequency of floods in Alaska and conterminous basins of Canada: U.S. Geological Survey Water-Resources Investigations Report 93-4197, 122p.

Reference: **Technical Memo 4**
Task 1 – Desktop Study to Assess the Capacity of the Unnamed Creek Infiltration Gallery

Table 1 Watershed Basin Characteristics Regression Model Inputs

Basin Characteristics	Approximated Value
Drainage area, in square miles	1.1
Main channel length, in miles	1
Main channel slope, in feet per mile	200
Mean basin elevation, in feet	200
Area of lakes and ponds, in percent	0
Area of forests, in percent	0
Area of glaciers, in percent	0
Mean annual precipitation, in inches	15
Mean minimum January temperature, in degrees Fahrenheit	4

Estimated flows by reoccurrence interval for the months of July, August, and September are provided in Table 2. These months are expected to comprise typical summer conditions.

Table 2 Estimated Developable Flow Based on Model Results

Month – Reoccurrence Interval	Modeled Output Flow (gpm)	Estimated Actual Developable Flow (gpm)
July		**12**
90th Percentile	45	
50th Percentile	180	
August		**12**
90th Percentile	45	
50th Percentile	180	
September		**23**
90th Percentile	90	
50th Percentile	180	

Key: gpm – gallons per minute

Results indicate that low flows for the stream could range between 0.1 to 0.4 cubic feet per second (equivalent to 45 to 180 gallons per minute [gpm]) during these summer months. As a conservable measure for long term planning purposes, it is recommended the 90th percentile value (representing the flow conditions that would be available to the infiltration gallery the majority of the time based on modelling assumptions) be used for estimating water resource quantities. The 90th percentile

reoccurrence interval represents the flow condition that would be probable during very dry conditions and exceeded more often than not based on modelling assumptions and limitations.

Actual developable flow from the infiltration gallery would be restricted/reduced by several factors, including flow through the hyporheic zone around Unnamed Creek and inefficiency in the rip rap zone placed around the 24-inch diameter perforated corrugated metal pipe infiltration gallery. A schematic as-built drawing (prepared by the USPHS) of the infiltration gallery is presented in Attachment 3. These physical constraint factors likely account for a significant decrease in flow compared to modeled values.

The hyporheic zone along the Unnamed Creek likely includes highly porous organic mat and fractured bedrock cobbles allowing flow to move freely outside of the main stream channel. This zone, from photographs of the watershed (in Attachment 1) could be substantial in allowing flow bypass the main channel where the infiltration gallery intake is constructed. Secondly, organic material and oxidized iron and/or manganese deposits in the riprap surrounding the culvert could additionally reduce efficiency of the infiltration gallery, resulting in limited recoverable flow. The recoverable flows from the infiltration gallery, estimated at approximately 25 percent of the model flow in the Unnamed Creek drainage, are also provided in Table 2.

The current infiltration gallery is equipped with a submersible pump that is used to pump surface water to the WTP. The pump is a 1.5-horsepower Goulds 5GS15[3] with a 1.2 to 7.5 gpm designed flow capacity (see pump curves in Attachment 4). To potentially increase the flow rate, a larger pump would be required or some application of a raw water storage tank could be considered.

Section 5 Conclusions and Recommendations

As shown in Table 2, the model results for the surface water flow of Unnamed Creek indicate that 12 gpm would be probable during the summer months. The model does not provide a means of estimating typical winter flow conditions, which may be more variable and likely lower through much of the season. However, based on historical use of the infiltration gallery it appears that the well can provide a flow rate of at least 5 gpm based on the size of the submersible pump used to pump water to the WTP. There have been no reported incidents of the community running out of water from the infiltration gallery, including times during the winter when the WTP operators are refilling the 50,000-gallon water storage tank. In summary, the estimated probable developable flow for the infiltration gallery on Unnamed Creek is 12 gpm for July through September.

Another important point to consider is the recent discovery made during the site visit by Mr. Gilfilian on June 7, 2018, when he noted the reduced effective pumping depth in the well caused by decades of mud accumulation during annual flooding events. The available pumping depth in the well has decreased nearly 76% over the past 40 years.

[3] Alaska Native Tribal Health Consortium. 2017. Trip Report, Tununak – Rural Alaska Village Grant Assessment. William Hickey. March 20-21, 2017.

It is recommended a well flow test be performed during the winter months to measure the efficiency of the infiltration gallery, including measurements of the water level in the 24-inch diameter well. The pump test would provide very valuable data on assessing the actual hydraulic capacity of the water source during the winter when upland recharge is expected to be at its minimum.

Section 6 Limitations

This Tech Memo was prepared by Stantec for the Native Village of Tununak IRA Council at the request of ADEC VSW Program. The findings and recommendations presented herein reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in this document and in the contract between Stantec and the Client. The opinions in this document are based on conditions and information existing at the time the document was prepared and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party.

STANTEC CONSULTING SERVICES INC.

Collin Macheel, CPG
Senior Hydrogeologist

Phone: (907) 266-1104
collin.macheel@stantec.com

Bob Gilfilian, PE
Principal Engineer

Phone: (907) 227-9883
bob.gilfilian@stantec.com

Attachments: Attachment 1 – Site Photographs

Attachment 2 – Alaska Department of Environmental Conservation Drinking Water Protection Program. April 2004. Source Water Assessment – A Hydrogeologic Susceptibility and Vulnerability Assessment for Tununak Water System, Tununak Alaska. Report 1081. PWSID 270231.001

Attachment 3 – U.S. Public Health Service. July 1978. Tununak, Alaska Infilitration Gallery and Pumping Facility. Project AN-77-631

Attachment 4 – Goulds Water Technology. March 2015. GS 60HZ Standard Capacity 4" Submersible Pumps. Specification Sheet

c. Susan Randlett, PE
ADEC VSW

ATTACHMENT 1 – SITE PHOTOGRAPHS

Technical Memorandum 4 – Water Source Assessment
Task 1 – Desktop Study to Assess the Capacity of the Unnamed Creek Infiltration Gallery
Attachment 1 – Site Photographs



Photograph 1 - Open stream channel upstream of the Unnamed Creek infiltration gallery at approximately 100 feet above sea level.



Photograph 2 - Open stream channel upstream of the Unnamed Creek infiltration gallery at approximately 150 feet above sea level.



Photograph 3 - Infiltration gallery house on Unnamed Creek at approximately 60 feet above sea level.

ATTACHMENT 2 – ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION DRINKING WATER PROTECTION PROGRAM SOURCE WATER ASSESSMENT FOR PWSID 270231.001

Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Tunanak Water System

Tunanak, Alaska

PWSID #270231.001

April 2004

Drinking Water Protection Program Report #1081

Alaska Department of Environmental Conservation

Source Water Assessment for Tunanak Water System

Tunanak, Alaska

PWSID# 270231.001

April 2004

Drinking Water Protection Program Report #1081

The Drinking Water Protection Program (DWPP) is producing Source Water Assessments in compliance with the Safe Drinking Water Act Amendments of 1996. Each assessment includes a delineation of the source water area, an inventory of potential and existing contaminant sources that may impact the water, a risk ranking for each of these contaminants, and an evaluation of the potential vulnerability of these drinking water sources.

These assessments are intended to provide public water systems owners/operators, communities, and local governments with the best available information that may be used to protect the quality of their drinking water. The assessments combine information obtained from various sources, including the U.S. Environmental Protection Agency (EPA), the Alaska Department of Environmental Conservation (ADEC), public water system owners/operators, and other public information sources. The results of this assessment are subject to change if additional data becomes available. It is anticipated that this assessment will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of public drinking water source. If you have any additional information that may affect the results of this assessment, please contact the Program Coordinator of DWPP, (907) 269-7521.

CONTENTS

		Page
SECTION	Executive Summary	1
	Drinking Water System and Area Overview	1
	Tunanak Drinking Water Protection Area	2
	Inventory of Potential and Existing Contaminant Sources	2
	Ranking of Contaminant Risks	2
	Vulnerability of the Drinking Water System	3
	References	6

TABLES

TABLE	1. Definition of Zones	2
	2. Susceptibility of the Water Source	3
	3. Tunanak Water System Contaminant Risks	3
	4. Tunanak Water System Overall Vulnerability	4

APPENDICES

APPENDIX

A. Tunanak Drinking Water Protection Area (Map 1)

B. Contaminant Source Inventory and Risk Rankings (Tables 1-7)

C. Tunanak Drinking Water Protection Area and Potential and Existing Contaminant Sources (Map 2)

D. Vulnerability Analysis and Contaminant Risks (Charts 1 – 13)

Source Water Assessment for the Tunanak Water System, Tunanak, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for the City of Tunanak, Alaska, is a Class A surface water system that obtains water from First Creek and Muskox Creek, the primary and secondary water sources respectively. The creeks flow southwest from Ugchirnak Mountain towards the community. Water from the creek is filtered, chlorinated, fluorinated, and piped to the school and a 50,000-gallon storage tank located at the Tunanak pumphouse / washeteria.

The Tunanak protection area is approximately 1.5 square miles in size and has received a susceptibility rating of **High**. *A rating of High to Very High is typical for all systems with surface water intakes.* Potential and existing sources of the following contaminants were evaluated for the Source Water Assessment: bacteria and viruses, nitrates and/or nitrites, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, volatile organic chemicals, and other organic chemicals.

Known potential contaminant sources are located within the surface water protection area and include roads and a landfill. These sources may affect drinking water at the source and could potentially influence sampling results. Samples were collected from post-treated water. Contaminant sources identified within the surface water protection area for this public water system have been considered in order to provide the most conservative evaluation.

This evaluation included all available water sampling data submitted to the Alaska Department of Environmental Conservation (ADEC) by the system operator. As stated previously, the samples were collected from post-treated water. Vulnerability ratings for the water system have been determined by combining the susceptibility of the surface water source with the contaminant risks. The system received a vulnerability rating of **Medium** for bacteria and viruses and volatile organic compounds. Nitrates and nitrites received a vulnerability rating of **Very High** and heavy metals, cyanide, other inorganic compounds, synthetic organic compounds, other organic compounds received a vulnerability rating of **High**.

This assessment can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of the community of Tunanak to protect public health.

DRINKING WATER SYSTEM AND AREA OVERVIEW

Tunanak (Sec. 28, T006N, R091W, Seward Meridian) is located in a small bay on the northeast coast of Nelson Island. The Yup'ik Eskimo community lies about 519 miles northwest of Anchorage. Tunanak has a current population of 323 (ADCED, 2003). Average annual precipitation in Tunanak is 17 inches, including approximately 28 inches of snowfall. Tununak has a maritime climate with average summer temperatures ranging from 42 to 59°F and winter temperatures averaging 2 to 19°F. However, temperatures have been as extreme as -35 to 80°F.

The public water system is a Class A surface water system that operates year-round and obtains water from First Creek and Muskox Creek, which run near the village. Water from the intake is treated using filtration, chlorination, and flourination before it is piped to the school and the 50,000-gallon storage tank in the village. Residents haul treated water from six watering points located around the village. Most residents use the honeybucket system for sewage disposal, although a few households are connected to a flush/haul system (ADCED, 2003).

Tunanak receives its electrical power from Alaska Village Electric Cooperative (AVEC) operated by the REA Co-op. The electric company is located near the center of the village. Power generating facilities are fueled by diesel. The Tununak Traditional Council operates sewage and refuse collection services and the local landfill (ADCED, 2003).

Information acquired from a November 1999 sanitary survey for the public water system indicated that the surface water intake is adequately constructed. The average daily production of the system is unknown.

Tunanak is located on the Yukon-Kuskokwim (Y-K) Delta. The Y-K Delta is located on the southwest coast of Alaska and primarily consists of lowlands formed by the deposition of fluvial sediment from the Yukon and Kuskokwim Rivers.

The Y-K Delta topography is relatively flat and approximately 40% to 50% of the delta surface is wet (Alaska Geographic Society). The lower delta area generally receives about 20 inches of precipitation annually. Areas of both discontinuous and continuous permafrost are present on the Y-K Delta. Permafrost is often present within 10 feet of ground surface and varies in thickness from 15 feet to 600 feet thick (R&M, 1979b). Thaw bulbs generally persist around areas of standing and flowing water.

TUNANAK DRINKING WATER PROTECTION AREA

Identifying the pathways most likely for surface contamination to reach water intake areas is the first step in determining the water system's risk. These pathways are initially determined by looking at the drainage area contributing overland water flow to a surface water source intake. The entire drainage area is also known as the "drinking water protection area." Please refer to pages 10-11 of the "Guidance Manual for Class A Public Water Systems" for additional information.

The protection area established for surface water sources by the ADEC is usually separated into three zones. These zones correspond to the overland-flow distance that water travels to get to the source. The ADEC Drinking Water Protection Program's Technical Advisory Committee developed guidelines for derivation of these zones in 1998. The following is a summary of the three protection area zones:

Table 1. Definition of Zones

Zone	Definition
A	Areas within 1000-ft of lakes or streams
B	Areas within 1-mile of lakes or streams
C	The watershed boundary

The protection area for the Tunanak water intake includes each of these Zones (See Map 1 of Appendix A).

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within the Tunanak surface water protection area. This inventory was completed through a search of agency records and other publicly available information. There is a wide array of potential contamination sources to surface water. These contaminants are found within agricultural, residential, commercial, and industrial areas, but can also occur within areas that have little or no development.

For Class A public water system assessments, six categories of drinking water contaminants were inventoried. They include:

- Bacteria and viruses;
- Nitrates and/or nitrites;
- Volatile organic chemicals;
- Heavy metals, cyanide, and other inorganic chemicals;
- Synthetic Organic Chemicals; and
- Other Organic Chemicals.

Several contaminant sources were identified in the Tunanak protection area as displayed on Map 2 of Appendix C and in Table 1 of Appendix B.

RANKING OF CONTAMINANT RISKS

Once potential and existing sources of contamination have been identified, they are assigned a ranking according to what category and level of risk they represent. Ranking of contaminant risks for "potential" or "existing" sources of contamination is a function of the toxicity and the volume of specific contaminants associated with that source. Rankings include:

- Low;
- Medium;
- High; and
- Very High.

The time-of-travel for contaminants within the water is dependent on the physical and chemical characteristics of each contaminant. Bacteria and Viruses are only inventoried in Zone A because of their short life span. Only "Very High" and "High" rankings are inventoried within Zones B and C due to the probability of contaminant dilution by the time the contaminants reach the water intake.

The remaining tables in Appendix B contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals.

VULNERABILITY OF THE DRINKING WATER SYSTEM

Vulnerability of a drinking water source to contamination is a combination of two factors:

- Surface Water Susceptibility and
- Contaminant risks.

Appendix D contains 13 charts, which together form the 'Vulnerability Analysis' for the public drinking water Source Water Assessment. Chart 1 analyzes the 'Susceptibility of the Surface Water Source' to contamination by looking at the climate, terrain, and intake location. Chart 2 analyzes 'Contaminant Risks' for the drinking water source with respect to bacteria and viruses. The 'Contaminant Risks' portion of the analysis considers potential sources of contaminants as well as a review of contamination that has or may have occurred, but has not arrived or been detected at the intake area. Chart 3 contains the 'Vulnerability Analysis for Bacteria and Viruses,' which is a composite score of the Vulnerability Analysis and the overall Susceptibility. Charts 4 through 13 repeat the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals, respectively.

A score for the Surface Water Susceptibility of the source is reached by considering the properties of the water intake and the surrounding area. The derivation of this information is presented below and the data for this source is shown in Chart 1 of Appendix D.

Susceptibility of the Surface Water Source – always considered to be "high" (30 points)

+

Adequate Construction of the Intake (0 – 5 Points)

+

Runoff Potential Within Zone B (0 – 5 Points)

+

Dilution Capacity of the Surface Water (0 – 10 Points)

=

Natural Susceptibility
(0 – 50 Points)

A ranking is assigned for the Surface Water Susceptibility according to the point score:

Surface Water Source Susceptibility Ratings	
40 to 50 pts	Very High
30 to < 40 pts	High

Table 2. Susceptibility of the Water Source

	Score	Rating
Minimum Allowable Susceptibility	30	
Intake Construction Adequate	0	
Runoff Potential	2	
Dilution Capacity	5	
Overall Susceptibility	*37*	*High*

For contaminants, risks to a drinking water source depend on the type, number or density, and distribution of the contaminant sources. The Contaminant Risk score has been derived from an examination of existing, and historical contamination sources that have been detected in the protection area through routine sampling. It also evaluates potential sources of contamination. Flow charts are used to assign a point score, and ratings are assigned in the same way as the susceptibility:

Contaminant Risk Ratings	
40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

Table 3 summarizes the Contaminant Risks for each category of drinking water contaminants.

Table 3. Tunanak Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	12	Low
Nitrates and/or Nitrites	43	Very High
Volatile Organic Chemicals	12	Low
Heavy Metals, Cyanide, and Other Inorganic Chemicals	34	High
Synthetic Organic Chemicals	40	Very High
Other Organic Chemicals	42	Very High

Finally, an overall vulnerability score is assigned for each contaminant type by combining each of the contaminant risk scores with the susceptibility score:

Susceptibility of the Surface Water Source

(0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

Vulnerability of the
Drinking Water Source to Contamination (0 – 100).

Again, rankings are assigned according to a point score:

Overall Vulnerability Ratings	
80 to 100 pts	Very High
60 to < 80 pts	High
40 to < 60 pts	Medium
< 40 pts	Low

Table 4 contains the overall vulnerability scores and ratings for each of the six categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. Tunanak Water System Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	50	Medium
Nitrates and Nitrites	80	Very High
Volatile Organic Chemicals	50	Medium
Heavy Metals, Cyanide, and Other Inorganic Chemicals	70	High
Synthetic Organic Chemicals	75	High
Other Organic Chemicals	75	High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Low**. The contaminant risk for bacteria and viruses is primarily attributed to the presence of the landfill in Zone B and a partially attributed to roads in Zone A.

Coliforms (a bacteria) are found naturally in the environment and although they aren't necessarily a health threat, they are an indicator of other potentially harmful bacteria in the water, more specifically, fecal coliforms and E. coli, which only come from human and animal fecal waste. Harmful bacteria can cause diarrhea, cramps, nausea, headaches, or other symptoms (EPA, 2003). Positive samples increase the overall vulnerability of the drinking water source, indicating that the source is susceptible to bacteria and virus contamination. Typically, coliform detection in raw water samples collected from surface water sources is normal. (See Chart 2 – Contaminant Risks for Bacteria and Viruses in Appendix D).

Two positive bacteria counts were reported in recent (previous 5 years) sampling events. The positive samples were recorded in 2002 and 2003, however, the confirmation sampling results were negative, therefore no risk points were retained.

After combining the contaminant risk for bacteria and viruses with the natural susceptibility of the source, the overall vulnerability of the source to bacteria and virus contamination is considered **Medium**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Very High** (See Chart 4 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D). Two potential contaminant risk sources for nitrates were identified in the protection area for this public water system. The contaminate risk is primary attributed to the presence of the landfill in Zone B and partially attributed to roads in Zone A. Nitrates are very mobile, moving at approximately the same rate as water.

The Maximum Contaminant Level (MCL) for nitrates is 10 milligrams per liter (mg/L). The MCL is the maximum level of contaminant that is allowed to exist in drinking water and still be consumed by humans without harmful health effects (EPA, 2003).

Although low concentrations of nitrates have been reported in recent sampling history, none of the concentrations exceed the MCL of 10 mg/L.

After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the source, the overall vulnerability of the source to contamination is **Very High**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Low** (See Chart 6 – Contaminant Risks for Volatile Organic Chemicals in Appendix D). One potential contaminant source for volatile organic chemicals was identified in the protection area for this public water system (See Table 4 – Appendix B). The contaminate risk is primary attributed to the presence of roads in Zone A.

Detectable concentrations of trihalomethane were reported in sampling events for this public water system. However, the detectible concentration of

trihalomethane reported in 2000 was well below the MCL of 0.08 mg/L. Trihalomethanes are considered byproducts of the water treatment process and are not from the source waters. Since the reported concentration of TTHM's in the most recent sampling did not exceed the applicable MCLs, risk points were not retained.

Aside from being byproducts of the drinking water treatment process, possible sources of volatile organic chemicals include facilities with automobiles, residential areas, fuel tanks, roads, and airports. See Table 4 in Appendix D for a complete listing.

After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the source, the overall vulnerability of the source to contamination is **Medium**.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The contaminant risk for heavy metals is **High**. Two contaminant sources for heavy metals, cyanide, and other inorganic chemicals were identified in the protection area for this public water system. The contaminate risk is primary attributed to the presence of the landfill in Zone B and partially attributed to roads in Zone A.

Based on review of recent sampling records for this public water system, moderate levels of copper and lead have been detected. Copper and lead have been detected in recent sampling history, but have not exceeded their respective MCLs of 1.3 mg/L and 0.015 mg/L (see Chart 8 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

The reported concentrations of copper and lead in recent sampling events are not likely to be representative of source water conditions. These two analytes are likely attributed to either the water treatment process or water distribution network; therefore, no risk points were assigned based on the presence of these analytes.

After combining the contaminant risk for heavy metals with the natural susceptibility of the source, the overall vulnerability of the well to contamination is **High**.

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is **Very High**. One contaminant source for synthetic organic chemicals was identified in the protection area for this public water system. The contaminant risk is primary attributed to the landfill in Zone B.

Review of historical sampling data found no recent sampling results for synthetic organic chemical contaminants.

After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to synthetic organic chemicals of the source is **High** (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

Other Organic Chemicals

The contaminant risk for other organic chemicals is **Very High**. Two contaminant risk sources for other organic chemicals were identified in Zones A and B of the protection area. The contaminate risk is primary attributed to the presence of the landfill in Zone B and partially attributed to roads in Zone A.

Review of the historical sampling data found no recent sampling results for other organic chemicals.

After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to other organic chemicals of the source is **High** (See Chart 13 – Contaminant Risks for Other Organic Chemicals in Appendix D).

Using the Source Water Assessment

This assessment of contaminant risks can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of the community of Tunanak to protect public health. It is anticipated that Source Water Assessments will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of the drinking water source.

REFERENCES

Alaska Department of Community and Economic Development (ADCED), 2003 [WWW document]. URL: http://www.dced.state.ak.us/cbd/commdb/CF_COMDB.htm

Alaska Geographic Society, 1979, The Yukon Kuskokwim Delta. Alaska Geographic, v. 6, no. 1, 95 p.

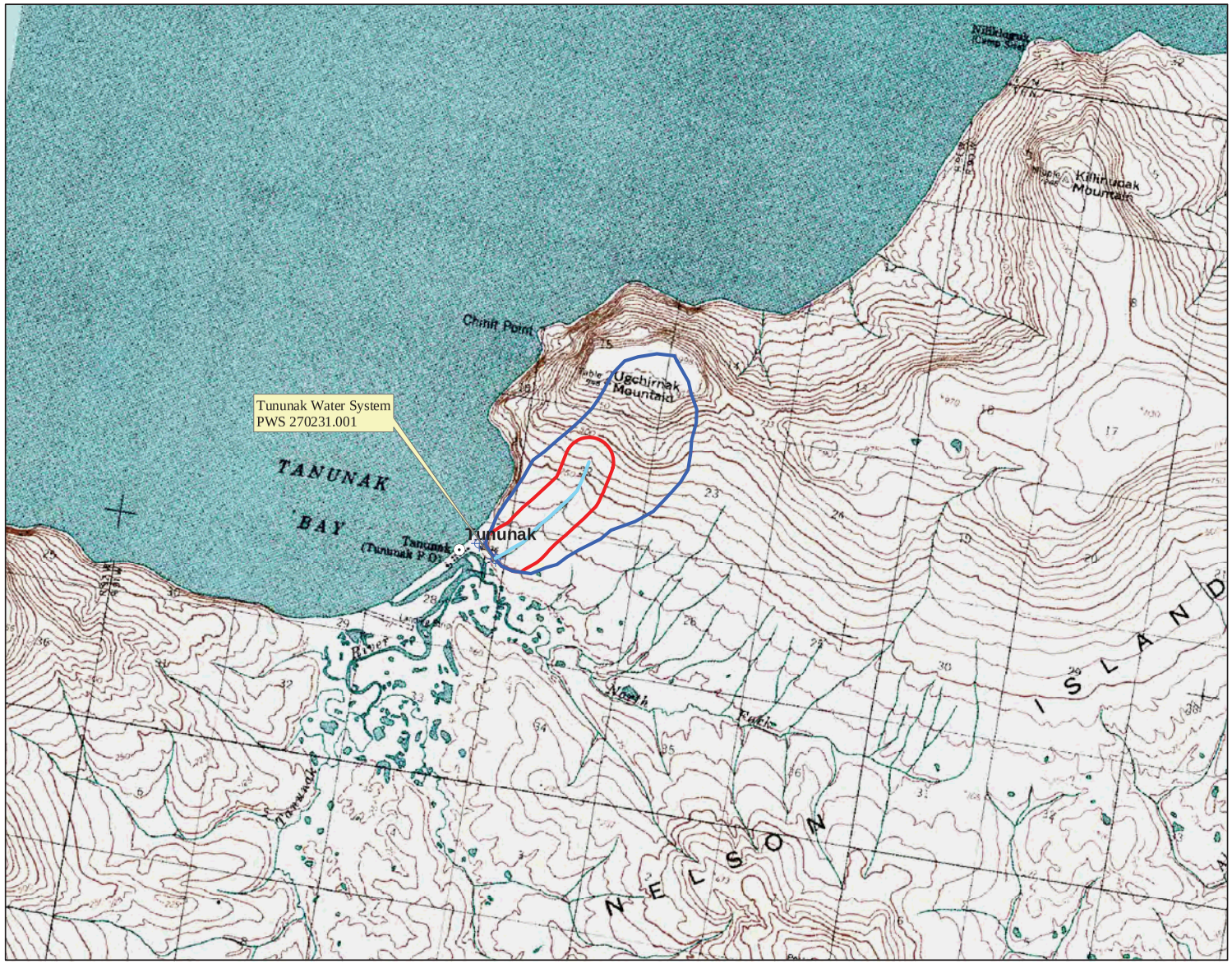
R&M Consultants, Inc., 1979b, Lower Kuskokwim School District School Site Investigation for Tununak, Alaska.

United States Environmental Protection Agency (EPA), 2003 [WWW document]. URL: http://www.epa.gov/safewater/mcl.html.

APPENDIX A

Tunanak Water System
Drinking Water Protection Area Location Map
(Map 1)

Public Water System for PWS #270231.001 Tununak Water System



LEGEND

Public Water System

Surface Water Protection Zones

- Zone A – 1000 Feet from Surface Water
- Zone C – 10 Miles from Surface Water or Watershed Boundary

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours (approx. 50 ft. or as indicated)

Transportation

- Primary Route (Class 1)
- Secondary Route (Class 2)
- Road (Class 3)
- Road (Class 4)
- Road (Class 5, Four-wheel drive)
- Road Ferry Crossing

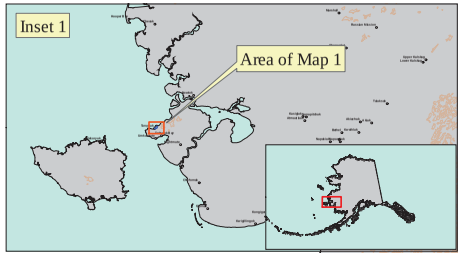
Data Sources:
Contaminant Sources, Public Water System Wells, Contours
Alaska Department of Environmental Conservation (ADEC)

Critical Facilities
Federal Emergency Mangement Agency (FEMA)

All other data
United States Geological Survey (USGS)

Drinking Water Protection Areas based on ADEC published document:
"Alaska Drinking Water Protection Program - Guidance Manual for Class A Public Water Systems"

URS Corporation does not guarantee the accuracy or validity of the data provided.



0 0.45 0.9 1.8 2.7 3.6 Miles

PER TUNUNAK, AK
STANTEC 2020

D.2.2.4

Tununak Water System PWS 270231.001
Appendix A Map 1

APPENDIX B

Contaminant Source Inventory and Risk Rankings (Tables 1-7)

Table 1

Contaminant Source Inventory for ***Tununak Water System***

PWSID 270231.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-01	A	C	Assumed at least 1 unpaved road in Zone A to provide access to Water System intake
Landfills (municipal; Class III)	D51	D51-01	B	C	Tununak Class III Municipal Landfill
Highways and roads, dirt/gravel	X24	X24-02	B	C	Assumed at least 1 unpaved road in Zone B to provide access to landfill

D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Table 2

Contaminant Source Inventory and Risk Ranking for Tununak Water System
Sources of Bacteria and Viruses

PWSID 270231.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assumed at least 1 unpaved road in Zone A to provide access to Water System intake
Landfills (municipal; Class III)	D51	D51-01	B	High	C	Tununak Class III Municipal Landfill

D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Table 3

Contaminant Source Inventory and Risk Ranking for Tununak Water System
Sources of Nitrates/Nitrites

PWSID 270231.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assumed at least 1 unpaved road in Zone A to provide access to Water System intake
Landfills (municipal; Class III)	D51	D51-01	B	Very High	C	Tununak Class III Municipal Landfill

D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Table 4

Contaminant Source Inventory and Risk Ranking for Tununak Water System
Sources of Volatile Organic Chemicals

PWSID 270231.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assumed at least 1 unpaved road in Zone A to provide access to Water System intake

D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Table 5

Contaminant Source Inventory and Risk Ranking for Tununak Water System

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 270231.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assumed at least 1 unpaved road in Zone A to provide access to Water System intake
Landfills (municipal; Class III)	D51	D51-01	B	High	C	Tununak Class III Municipal Landfill

D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Table 6

Contaminant Source Inventory and Risk Ranking for Tununak Water System
Sources of Synthetic Organic Chemicals

PWSID 270231.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Landfills (municipal; Class III)	D51	D51-01	B	Very High	C	Tununak Class III Municipal Landfill

D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Table 7

Contaminant Source Inventory and Risk Ranking for Tununak Water System
Sources of Other Organic Chemicals

PWSID 270231.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assumed at least 1 unpaved road in Zone A to provide access to Water System intake
Landfills (municipal; Class III)	D51	D51-01	B	Very High	C	Tununak Class III Municipal Landfill

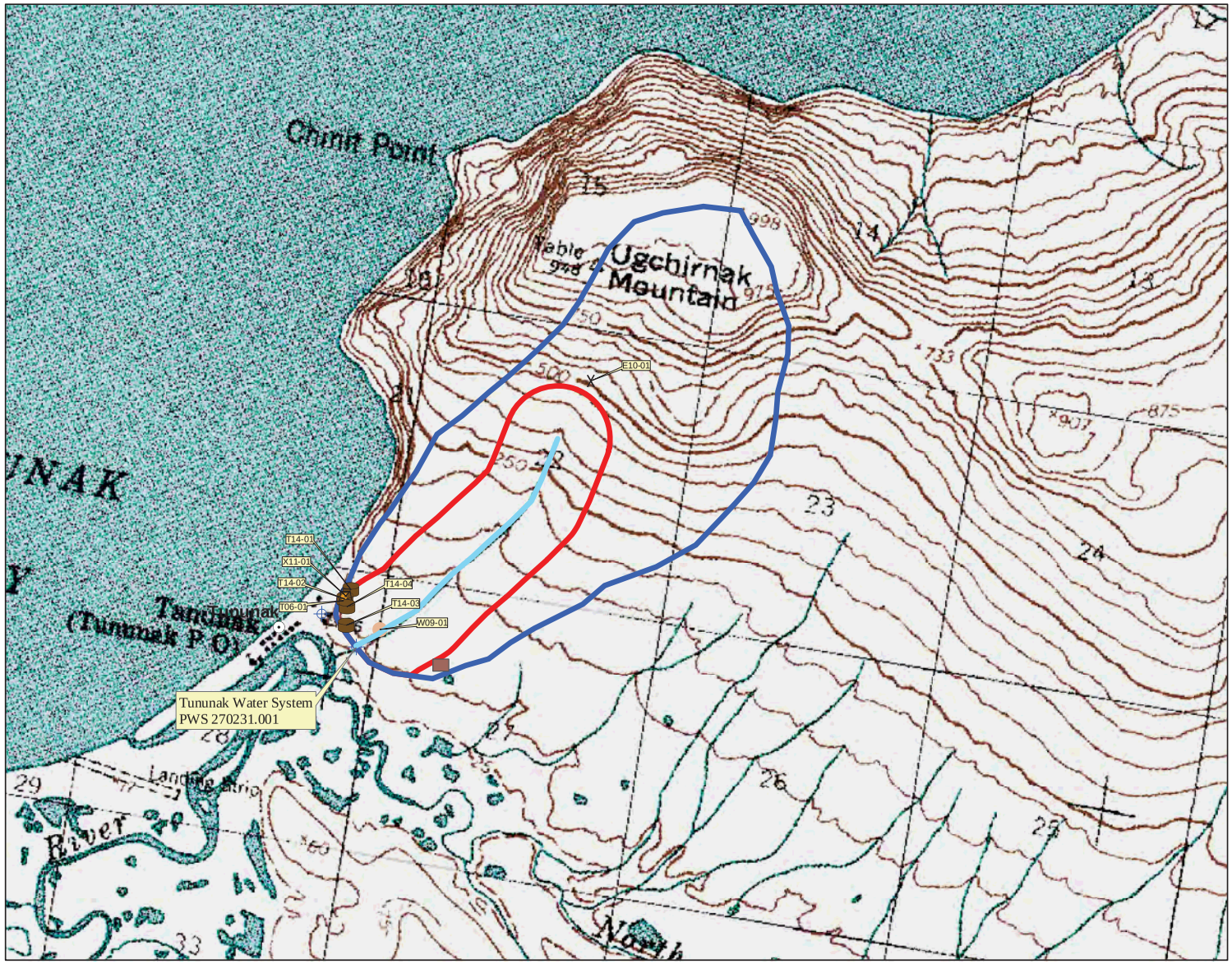
D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

APPENDIX C

Tunanak Water System
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)

Public Water System for PWS #270231.001 Tununak Water System
Showing Potential and Existing Sources of Contamination



LEGEND

- Public Water System

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours (approx. 50 ft. or as indicated)

Transportation

- Primary Route (Class 1)
- Secondary Route (Class 2)
- Road (Class 3)
- Road (Class 4)
- Road (Class 5, Four-wheel drive)
- Road Ferry Crossing

Surface Water Protection Zones

- Zone A – 1000 Feet from Surface Water
- Zone C – 10 Miles from Surface Water or Watershed Boundary

Existing or Potential Contaminant Sources

- Propect mine (E10)
- Aboveground diesel storage tank (T06)
- Tanks, heating oil, nonresidential (aboveground) (T14)
- Fuel storage tank >500 gallon (non-residential) (X11)
- Landfills (Municipal, Class III) (D51)

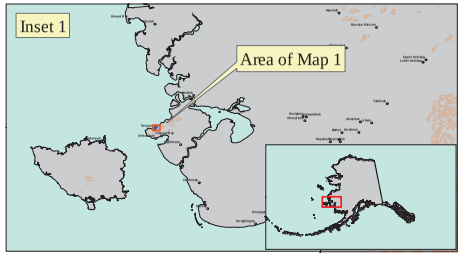
Data Sources:
Contaminant Sources, Public Water System Wells, Contours
Alaska Department of Environmental Conservation (ADEC)

Critical Facilities
Federal Emergency Mangement Agency (FEMA)

All other data
United States Geological Survey (USGS)

Drinking Water Protection Areas based on ADEC published document:
"Alaska Drinking Water Protection Program - Guidance Manual for Class A Public Water Systems"

URS Corporation does not guarantee the accuracy or validity of the data provided.



0 0.2 0.4 0.8 1.2 1.6 Miles

PER TUNUNAK, AK
STANTEC 2020

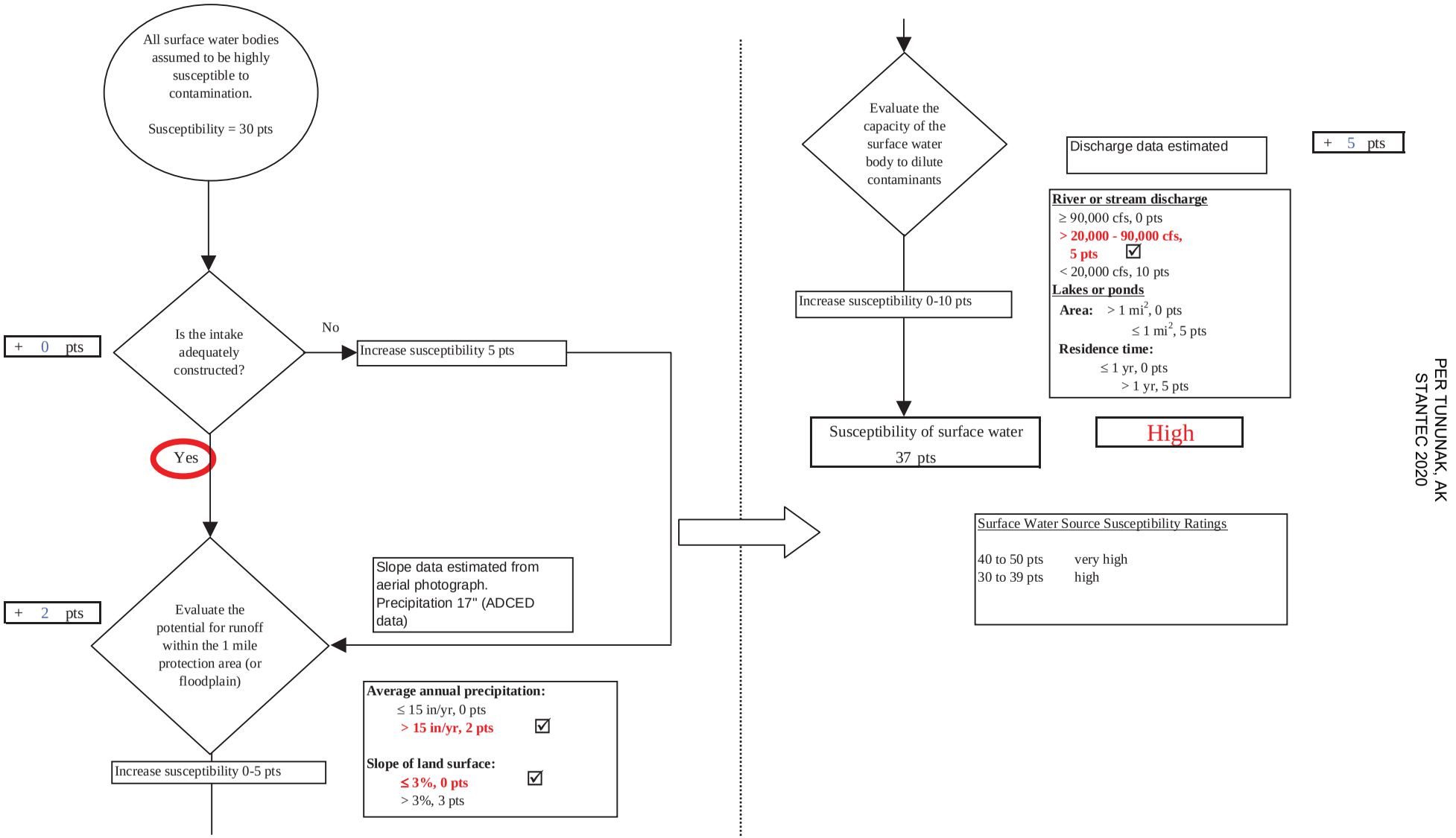
D.2.2.4

Tununak Water System PWS 270231.001
Appendix C Map 2

APPENDIX D

Vulnerability Analysis and Contaminant Risks (Charts 1-13)

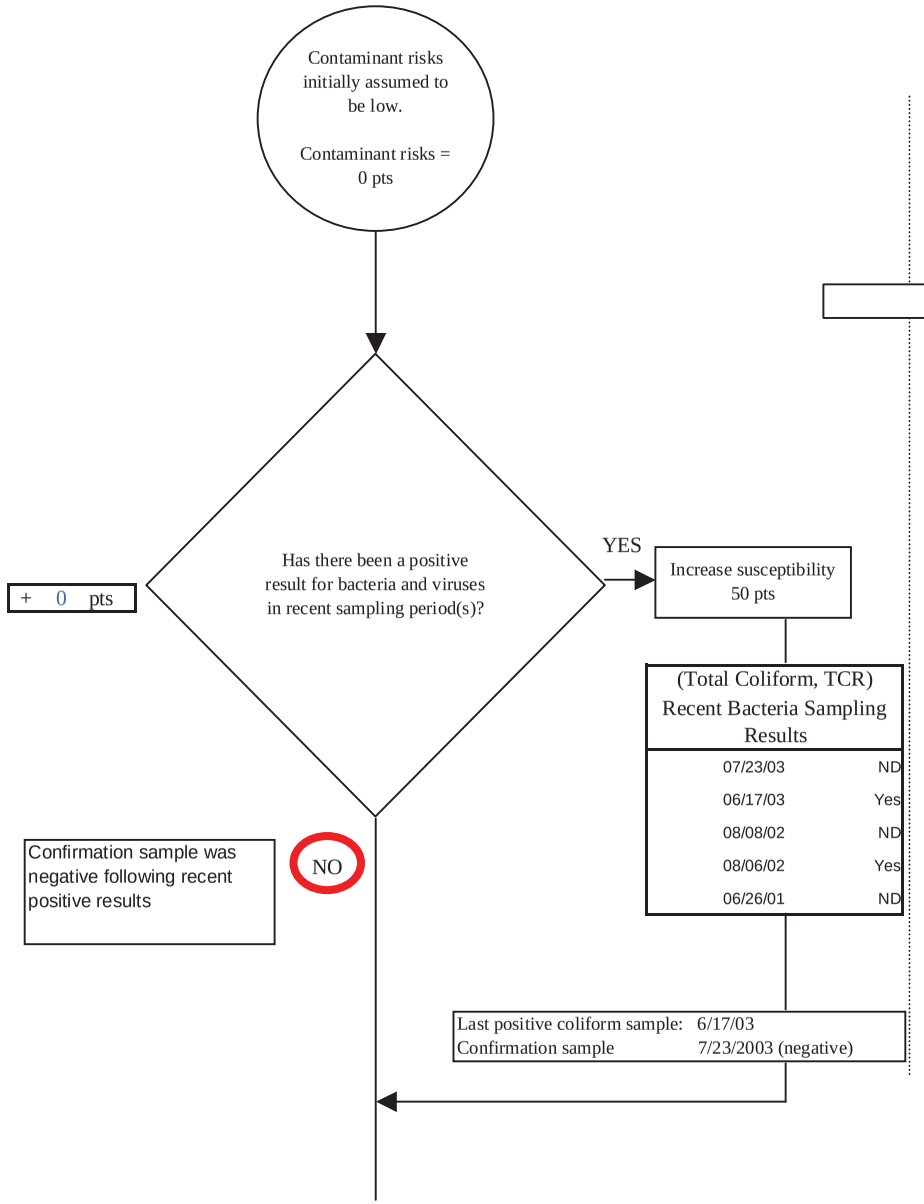
Chart 1. Susceptibility of the Surface Water Source - Tununak Water System (PWS No. 270231.001)

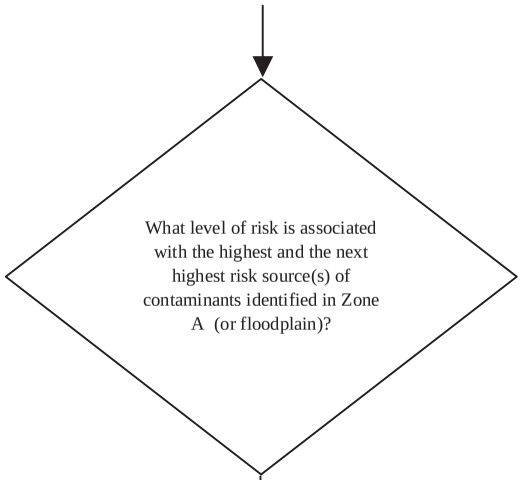


D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Chart 2. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Bacteria & Viruses





+ 10 pts

Risk Rankings for Bacteria/Virus Contaminant Sources Identified

	Zone A	Total
Very Highs(s)	0	0
High(s)	0	0
Medium(s)	0	0
Low(s)	1	1

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

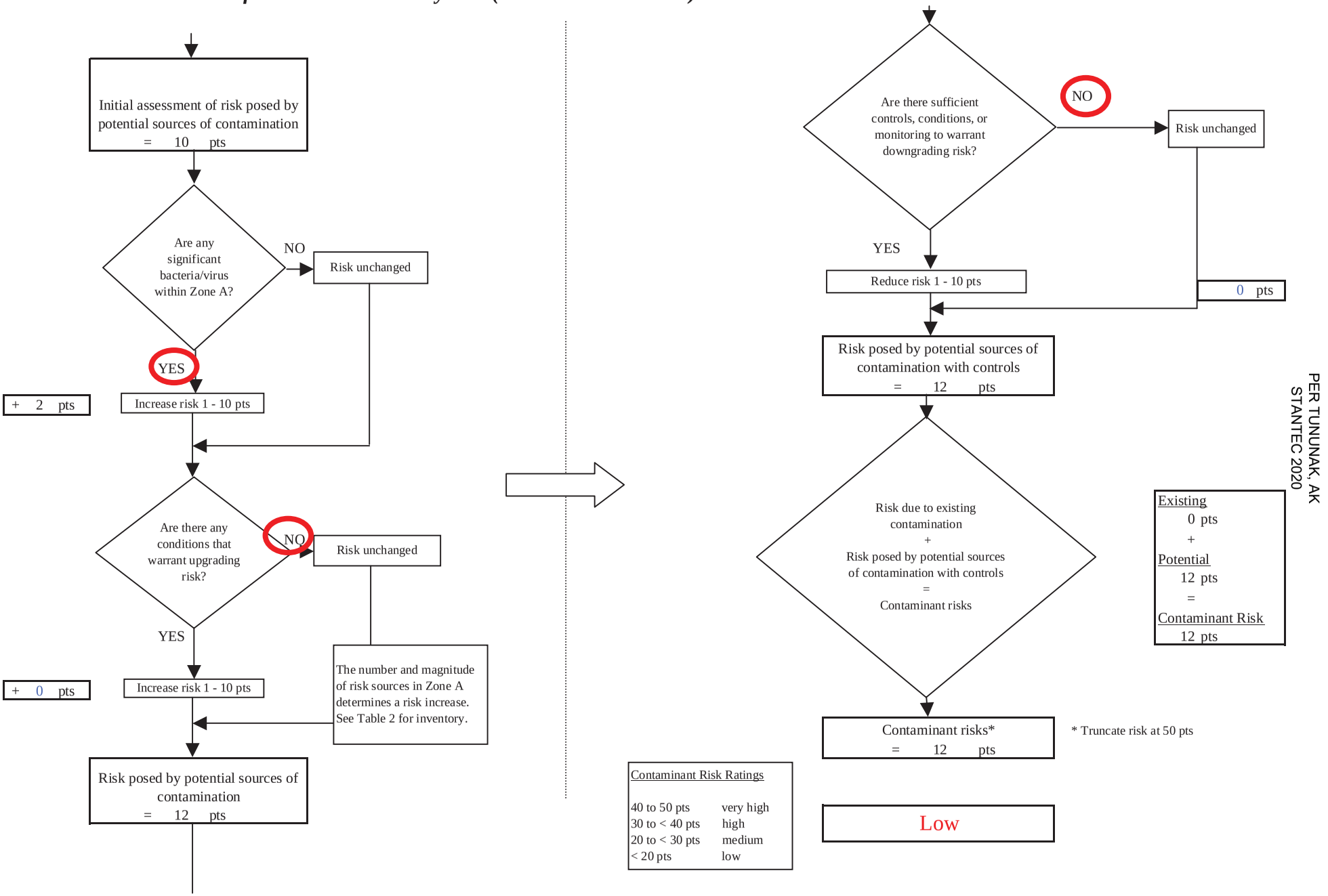
Matrix Score 10

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Chart 2. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Bacteria & Viruses



D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Chart 3. Vulnerability analysis for Tununak Water System (PWS No. 270231.001) - Bacteria & Viruses

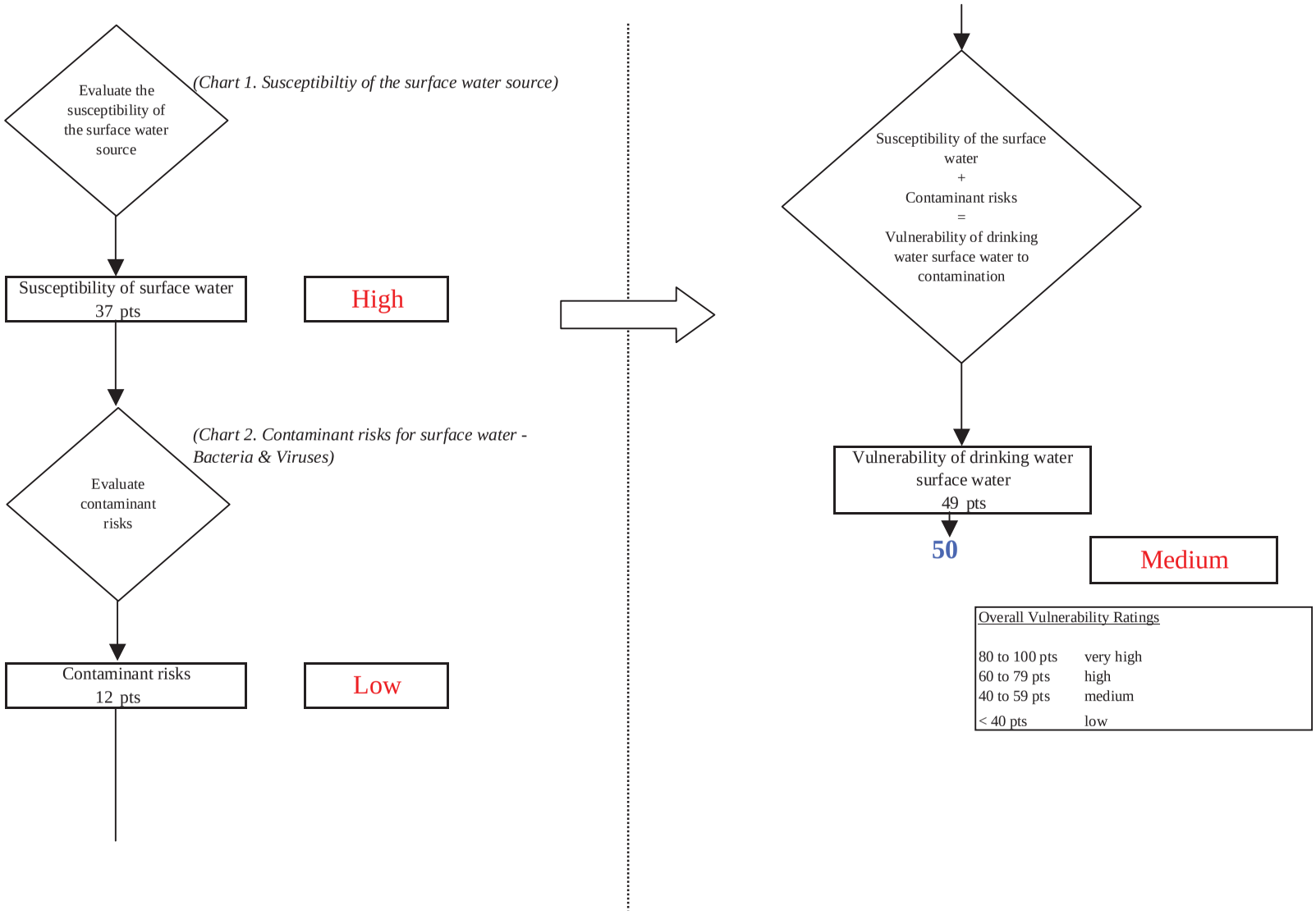
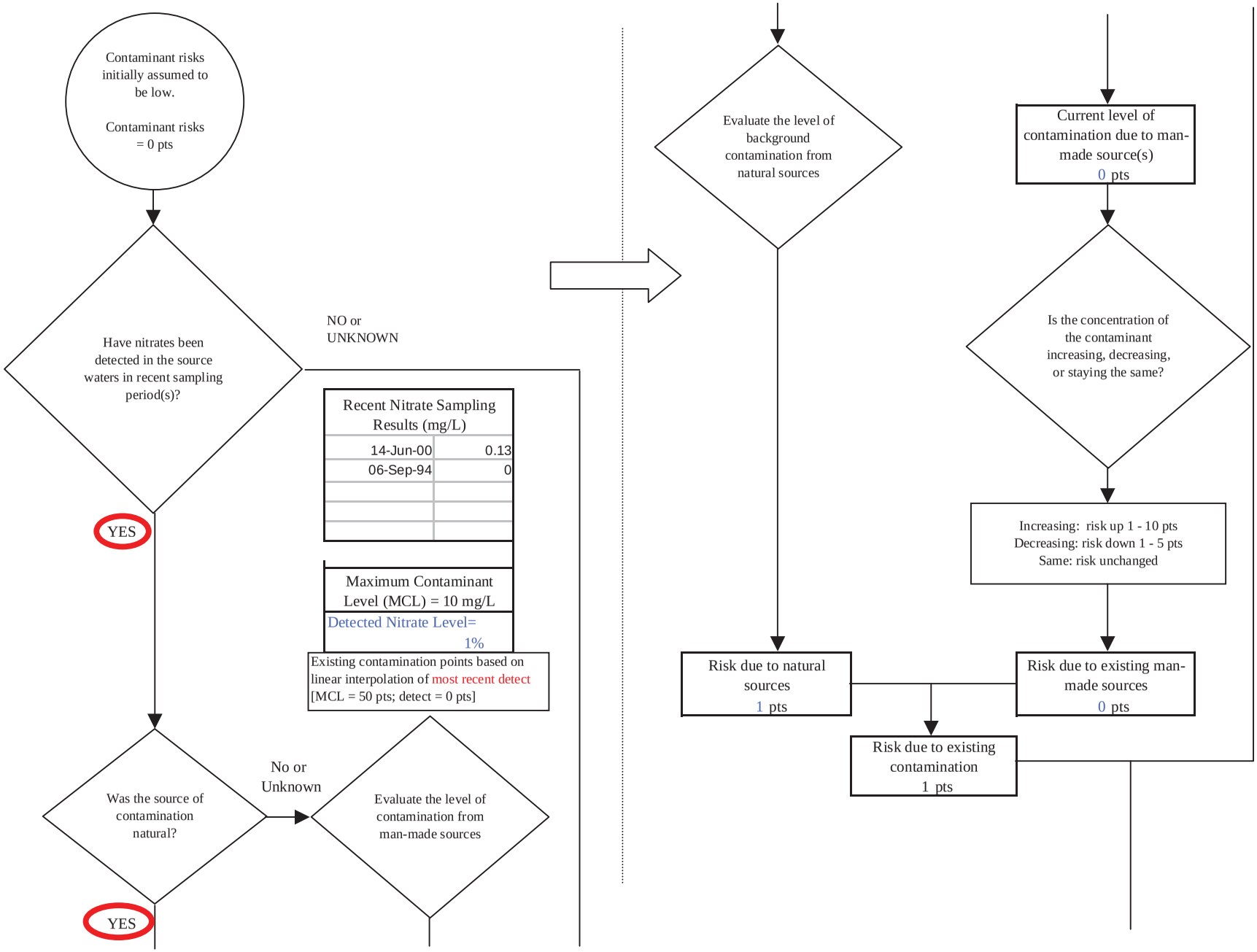


Chart 4. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Nitrates and Nitrites



D.2.2.4

Chart 4. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Nitrates and Nitrites

+ 40 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A and B? (see Risk Matrix below)

Initial assessment of risk posed by potential sources of contamination = 40 pts

Are any significant nitrate/nitrite sources in Zone A?

NO → Risk unchanged

YES

The number and magnitude of risk sources in Zone A determines a risk increase. See Table 3 for inventory

Increase risk 1 - 10 pts

+ 2 pts

Risk Levels for Nitrate/Nitrite Sources identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	1	1
High(s)	0	0	0
Medium(s)	0		0
Low(s)	1		1

	LOW 10 pts	MEDIUM 20 pts	HIGH 30 pts	VERY HIGH 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

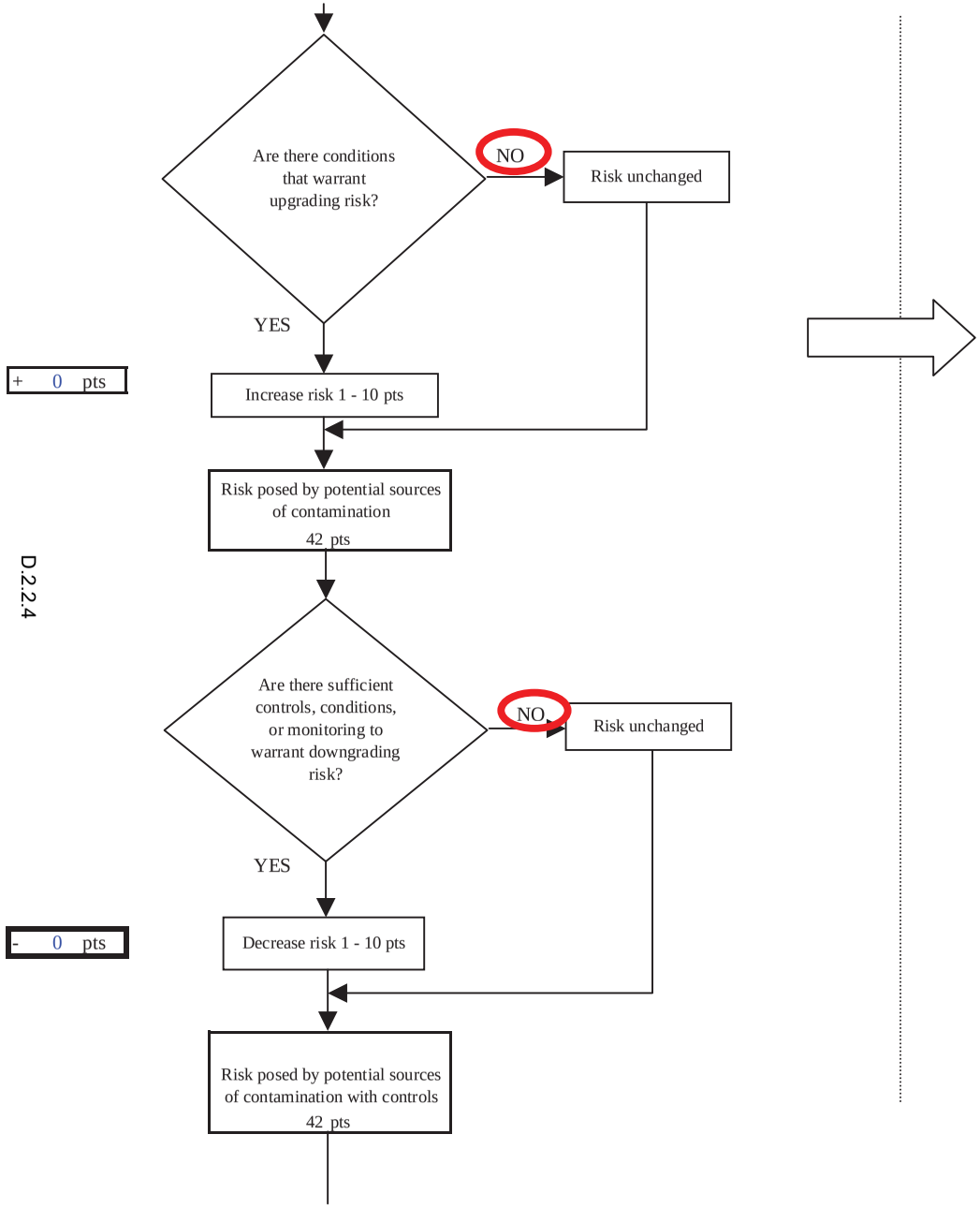
Matrix Score 40

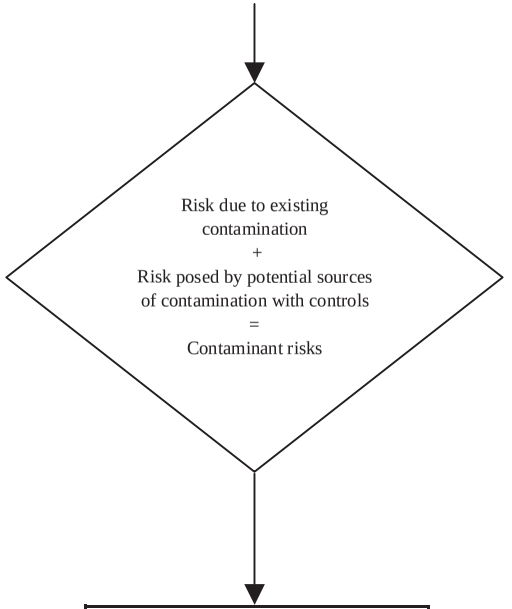
Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

D.2.2.4

PER TUNUNAK, AK STANTEC 2020

Chart 4. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Nitrates and Nitrites





Existing
1 pts
+
Potential
42 pts
=
Contaminant Risk
43 pts

Contaminant risks*
= 43 pts

*Truncate risk at 50 pts

Very High

Contaminant Risk Ratings

40 to 50 pts	very high
30 to < 40 pts	high
20 to < 30 pts	medium
< 20 pts	low

D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Chart 5. Vulnerability analysis for Tununak Water System (PWS No. 270231.001) - Nitrates and Nitrites

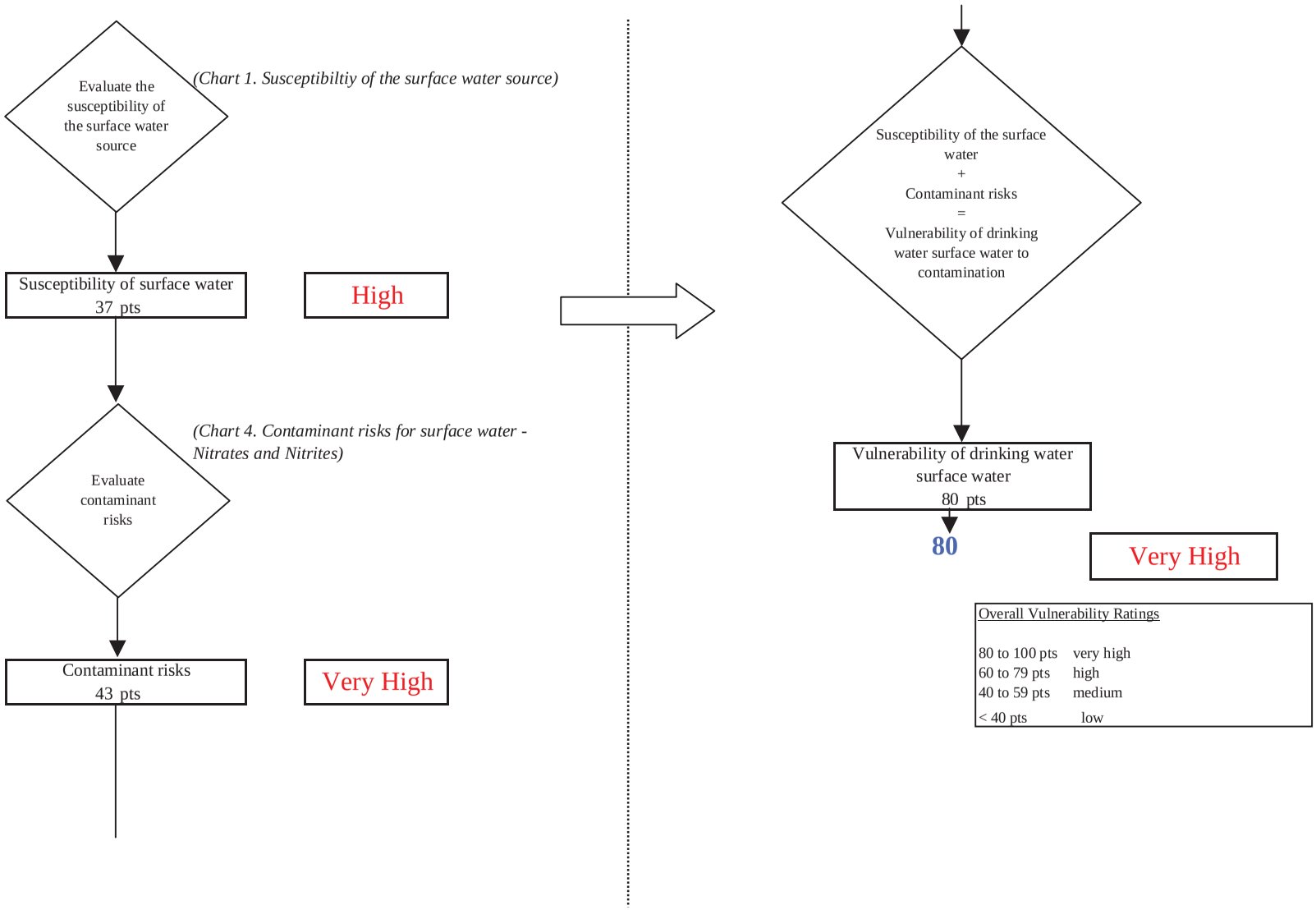


Chart 6. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Volatile Organic Chemicals

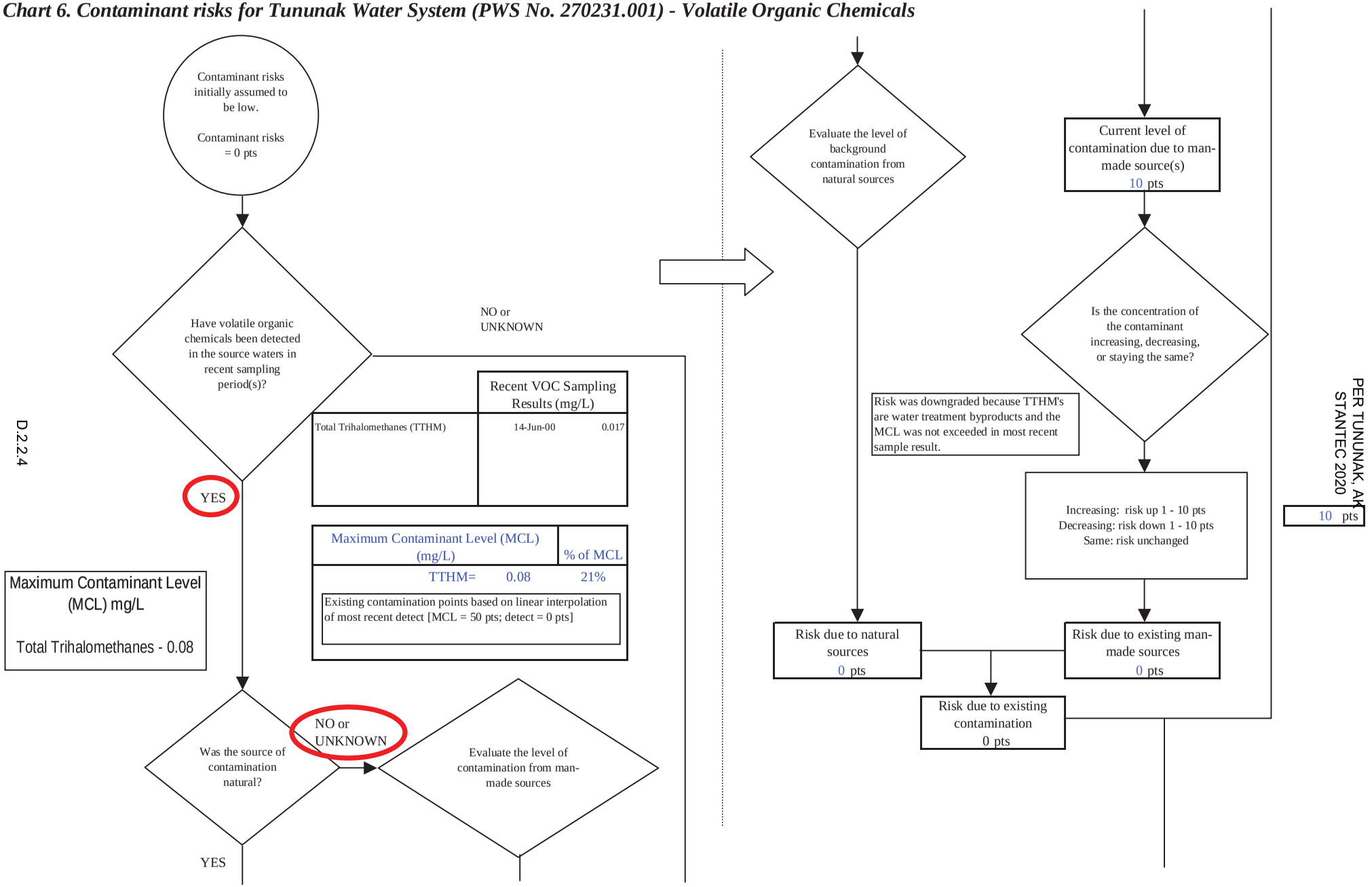


Chart 6. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Volatile Organic Chemicals

+ 10 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A and B? (see Risk Matrix below)

Risk Levels for VOC Sources identified in Zones A and B			
	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0		0
Low(s)	1		1

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Matrix Score	10

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

Initial assessment of risk posed by potential sources of contamination = 10 pts

Are any significant VOC sources in Zone A?

NO → Risk unchanged

The number and magnitude of risk sources in Zone A determines a risk increase. See Table 4 for inventory.

YES

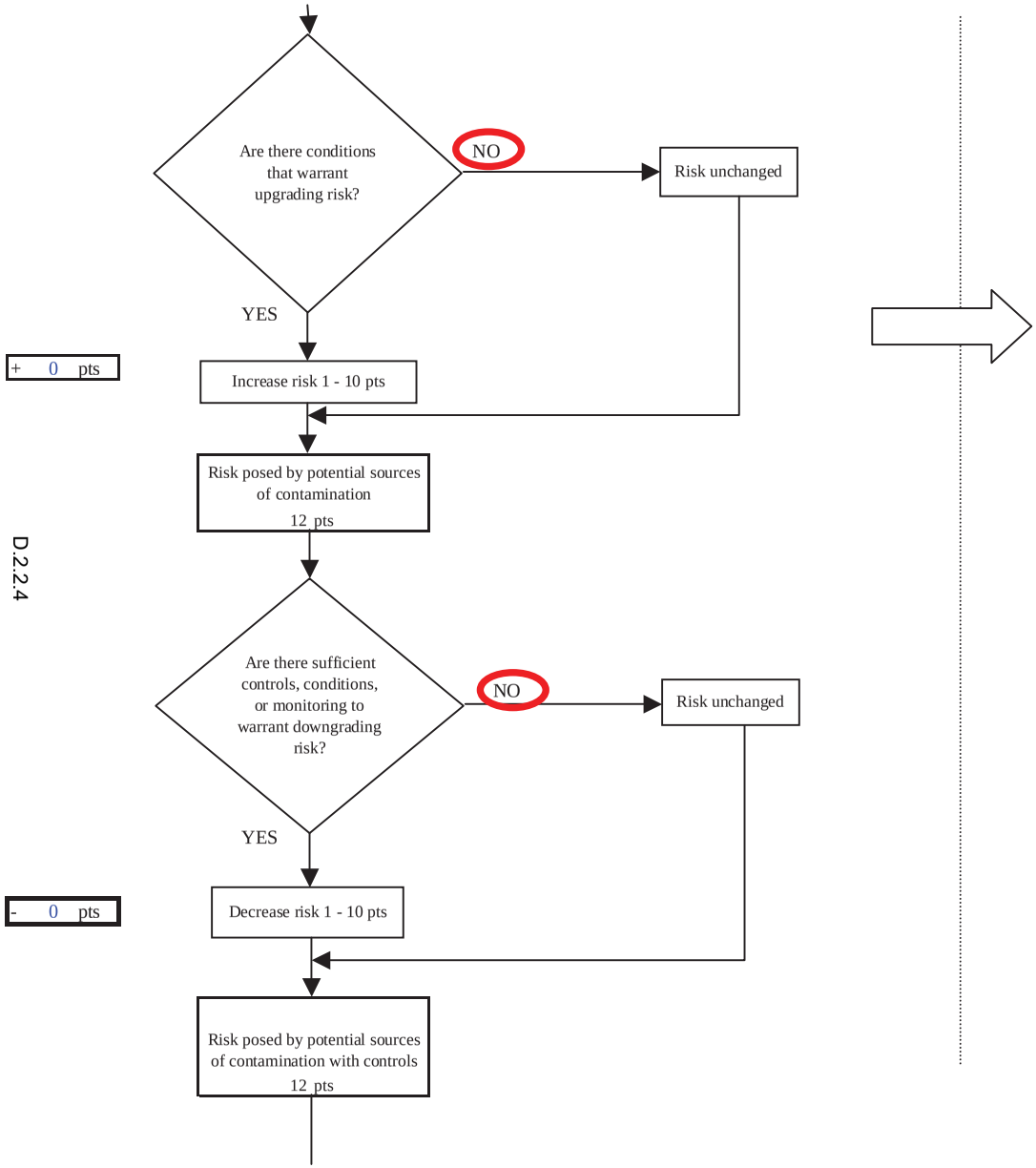
Increase risk 1 - 10 pts

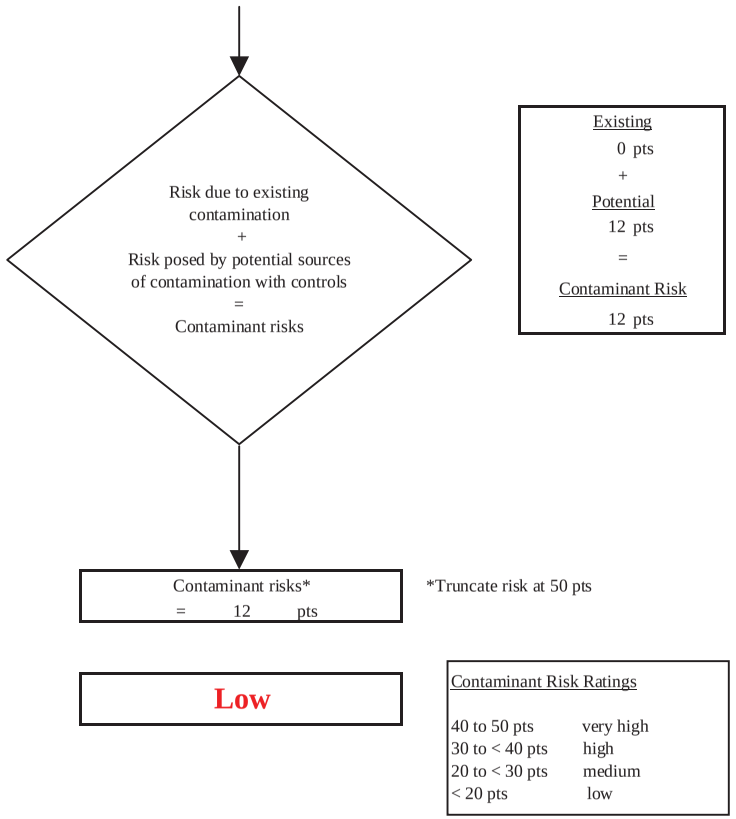
+ 2 pts

D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Chart 6. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Volatile Organic Chemicals





D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Chart 7. Vulnerability analysis for Tununak Water System (PWS No. 270231.001) - Volatile Organic Chemicals

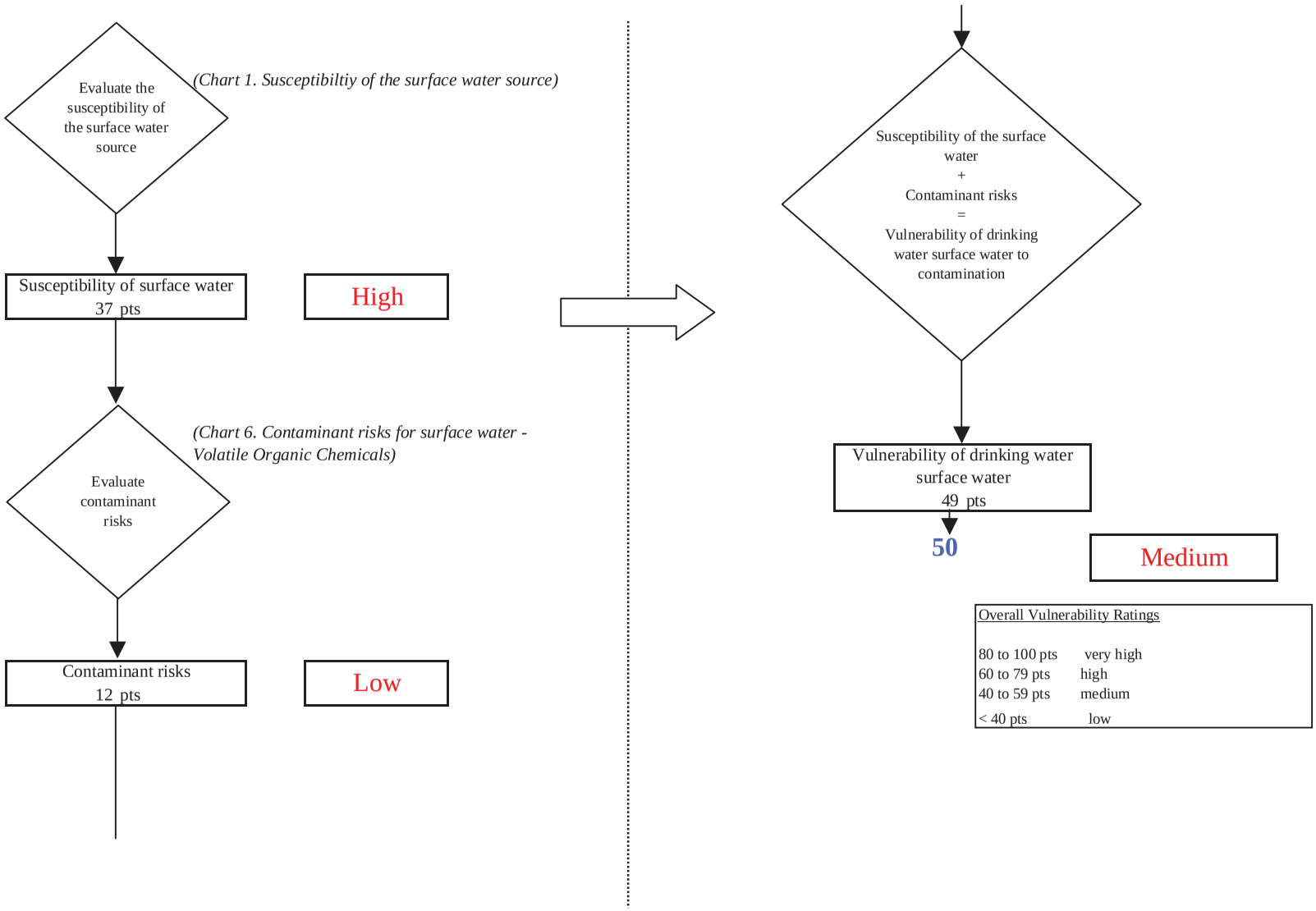


Chart 8. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

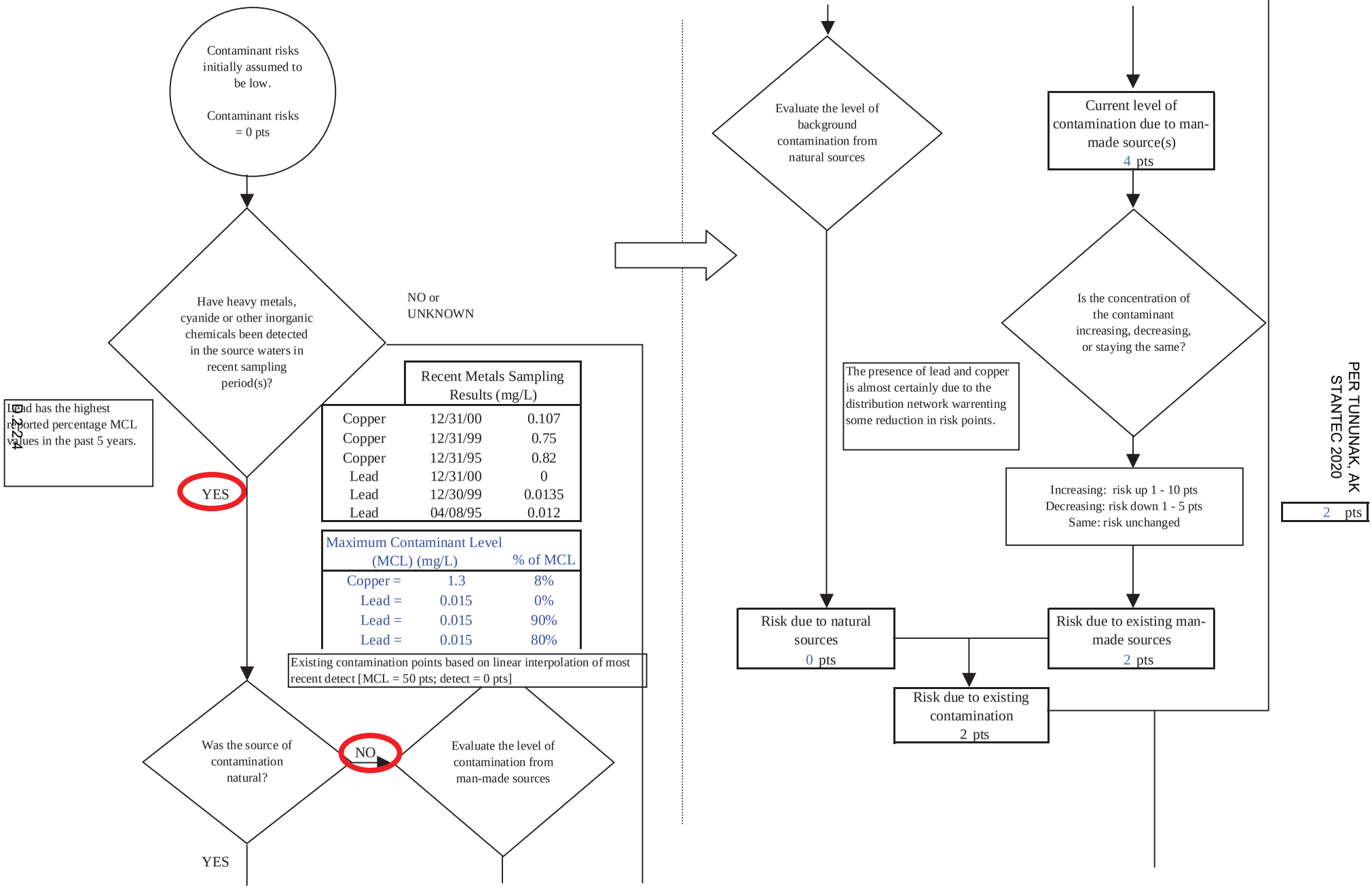


Chart 8. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 30 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A and B? (see Risk Matrix below)

Risk Levels for HM, Cyanide, or OIC Sources identified in Zones A and B			
	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	1	1
Medium(s)	0		0
Low(s)	1		1

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Matrix Score	30

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

Initial assessment of risk posed by potential sources of contamination = 30 pts

Are any significant HM, Cyanide, or OIC sources in Zone A?

NO → Risk unchanged

YES

The number and magnitude of risk sources in Zone A determines a risk increase. See Table 5 for inventory.

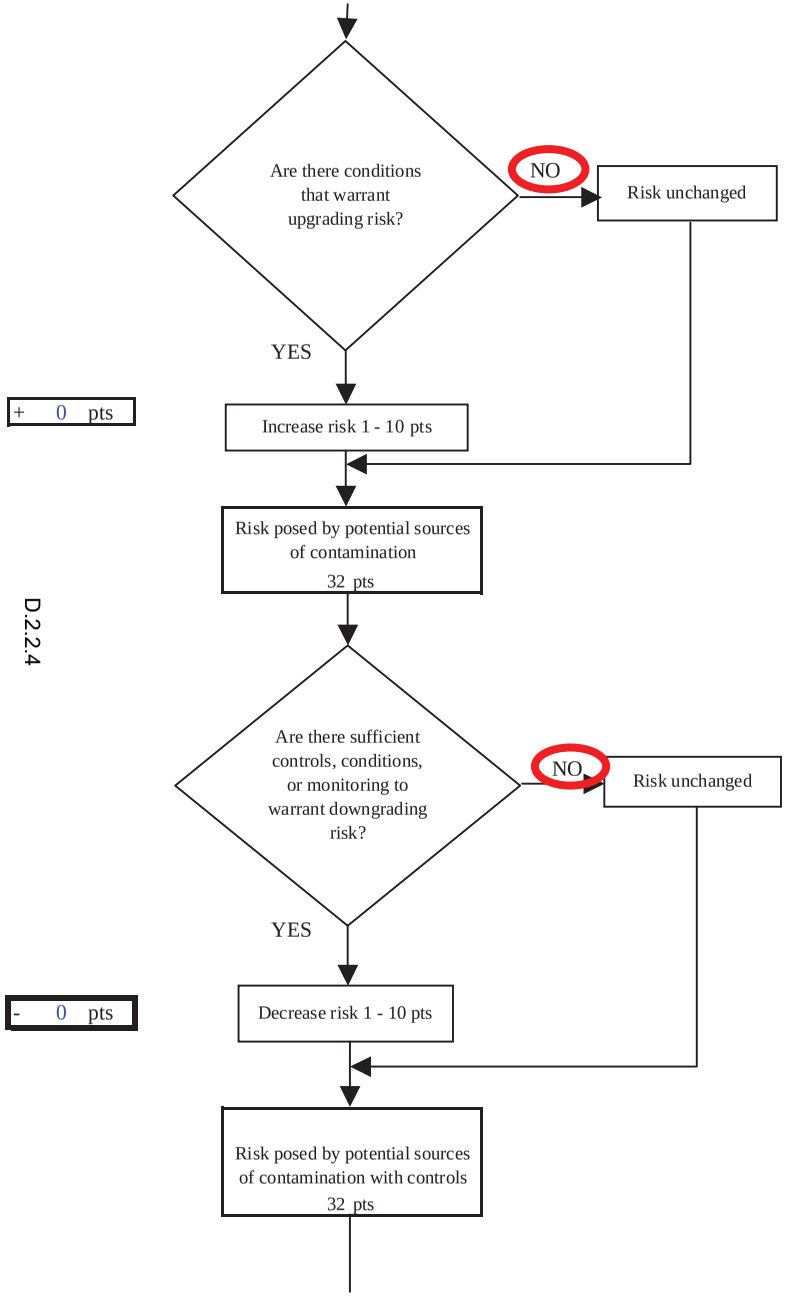
Increase risk 1 - 10 pts

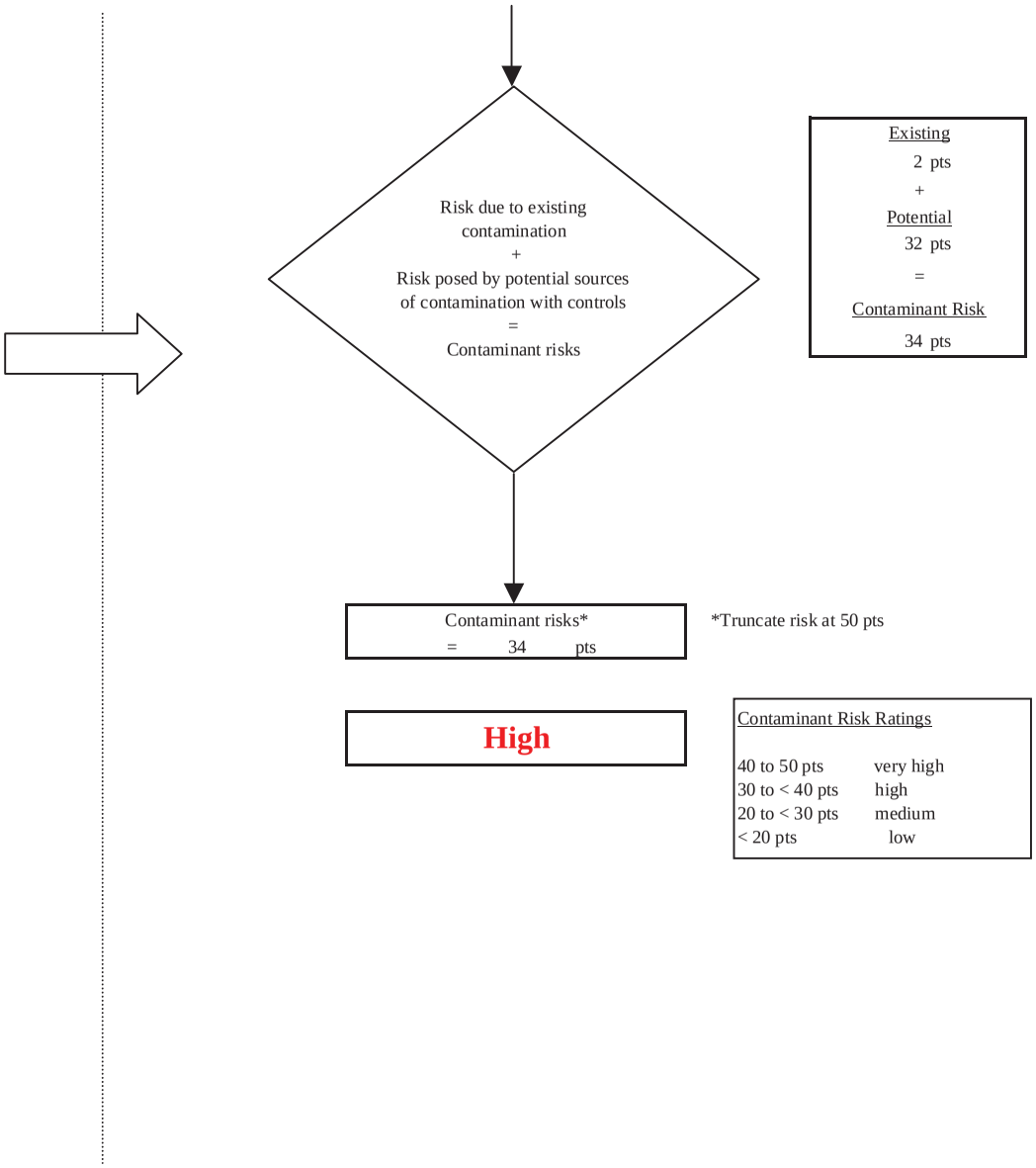
+ 2 pts

D.2.2.4

PER TUNUNAK, AK STANTEC 2020

Chart 8. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals





D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Chart 9. Vulnerability analysis for Tununak Water System (PWS No. 270231.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

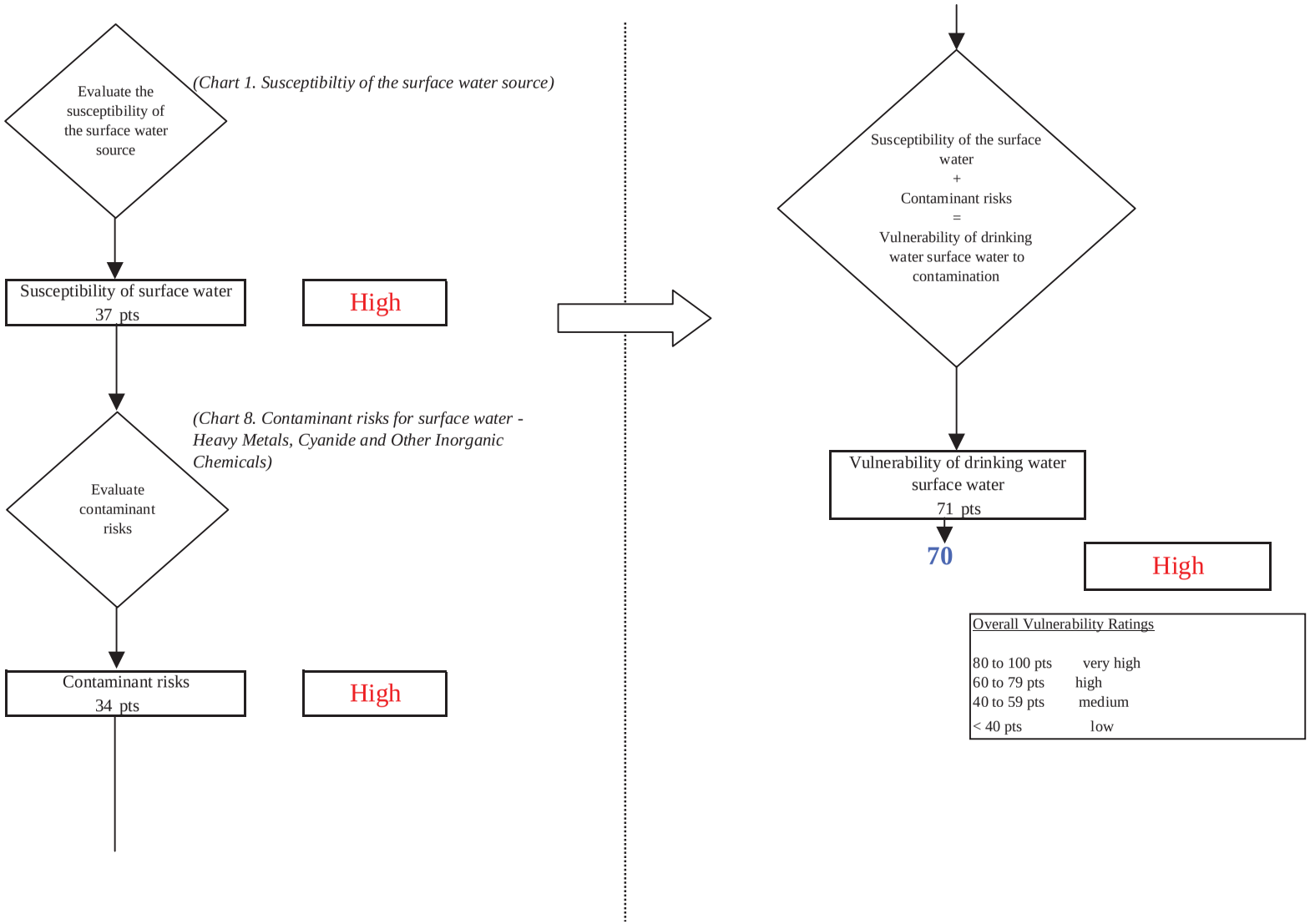
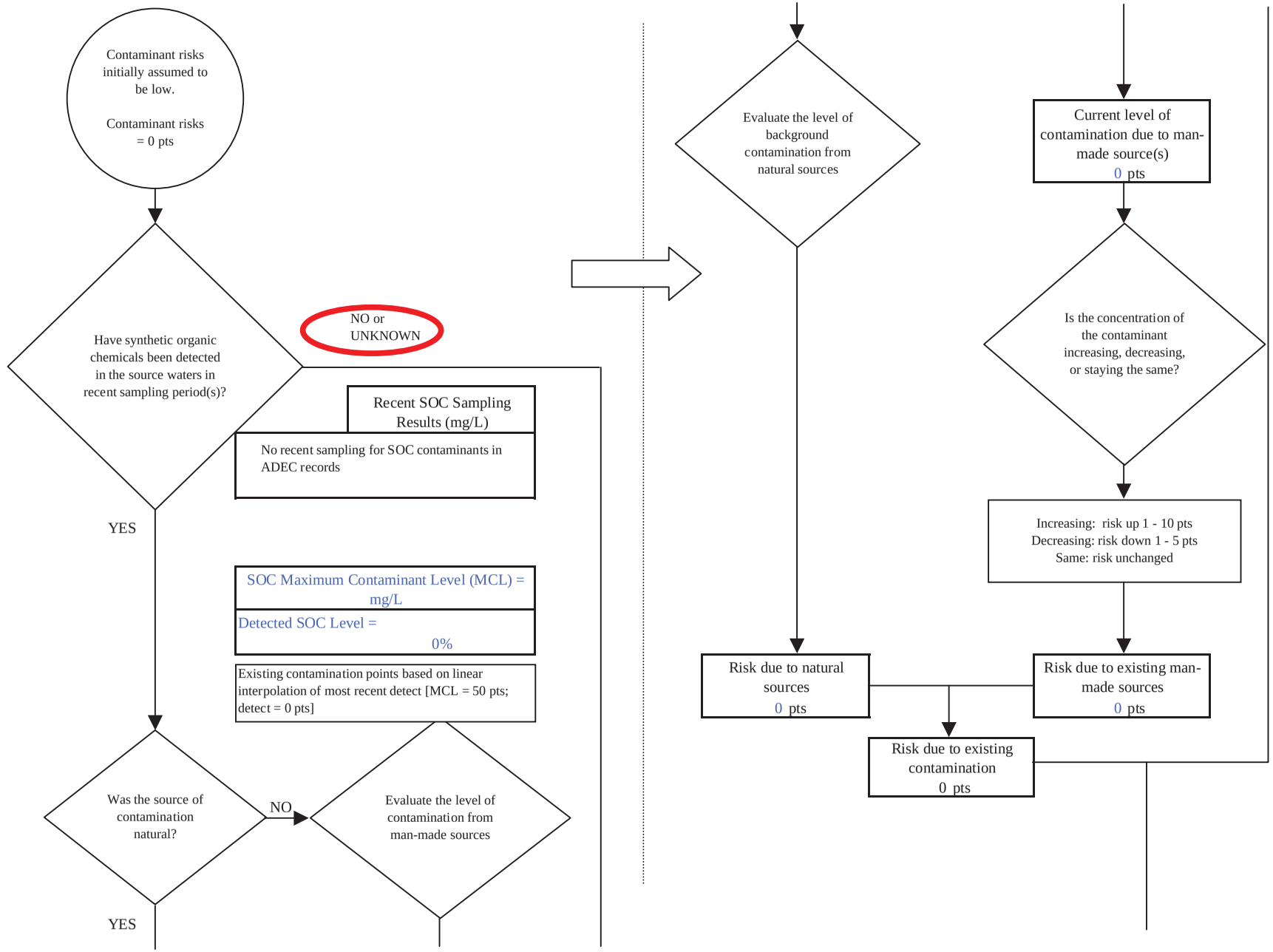


Chart 10. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Synthetic Organic Chemicals



D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Chart 10. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Synthetic Organic Chemicals

+ 40 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A and B? (see Risk Matrix below)

Risk Levels for SOC Sources identified in Zones A and C

	Zone A	Zone B	Total
Very Highs(s)	0	1	1
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	0	0	0

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Matrix Score 40

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

Initial assessment of risk posed by potential sources of contamination = 40 pts

Are any significant SOC sources in Zone A?

NO → Risk unchanged

YES → Increase risk 1 - 10 pts

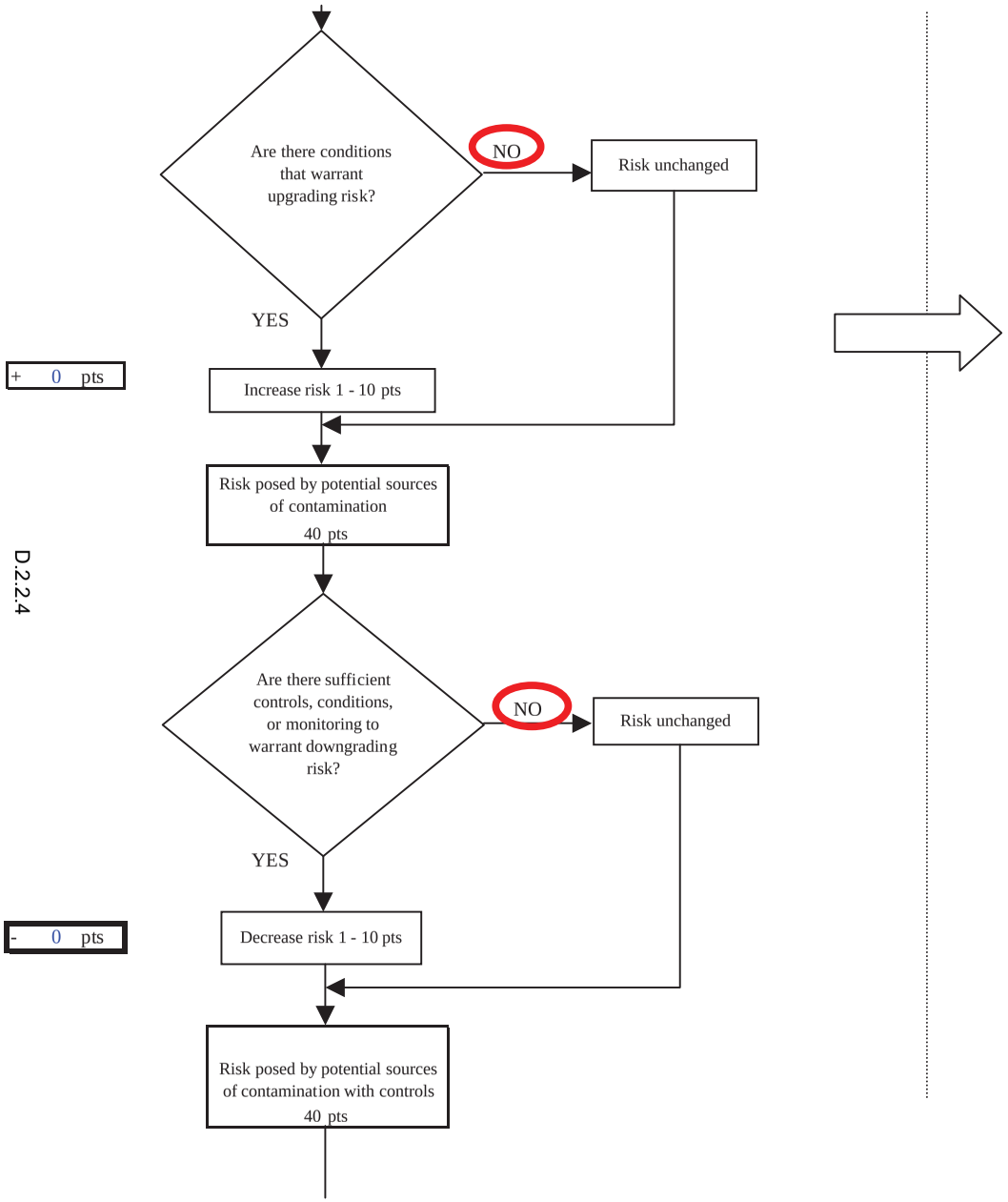
The number and magnitude of risk sources in Zone A determines a risk increase. See Table 6 for inventory.

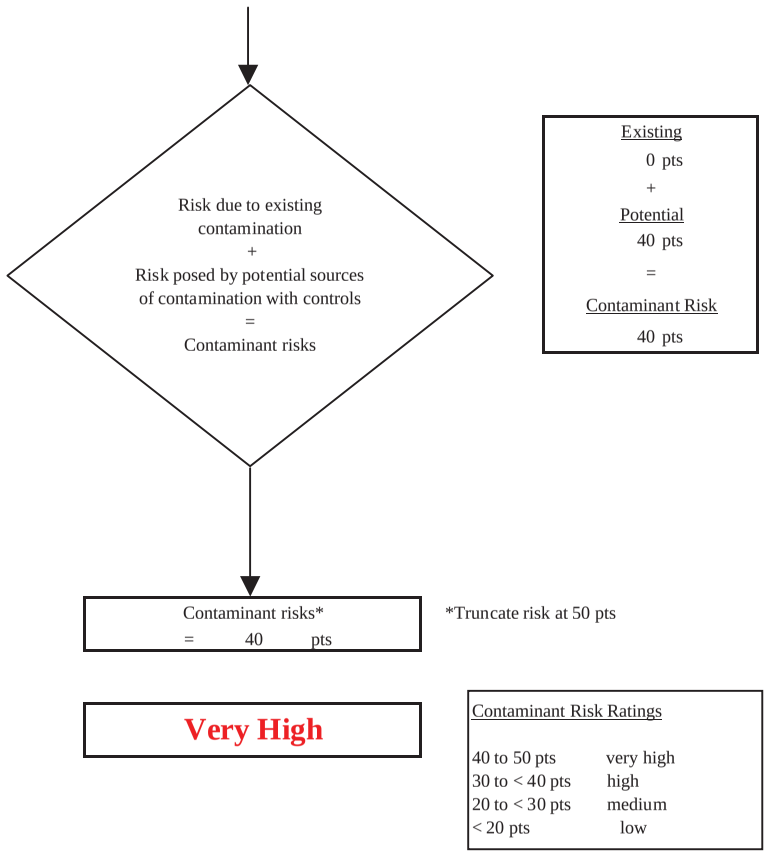
+ 0 pts

D.2.2.4

PER TUNUNAK, AK STANTEC 2020

Chart 10. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Synthetic Organic Chemicals





D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Chart 11. Vulnerability analysis for Tununak Water System (PWS No. 270231.001) - Synthetic Organic Chemicals

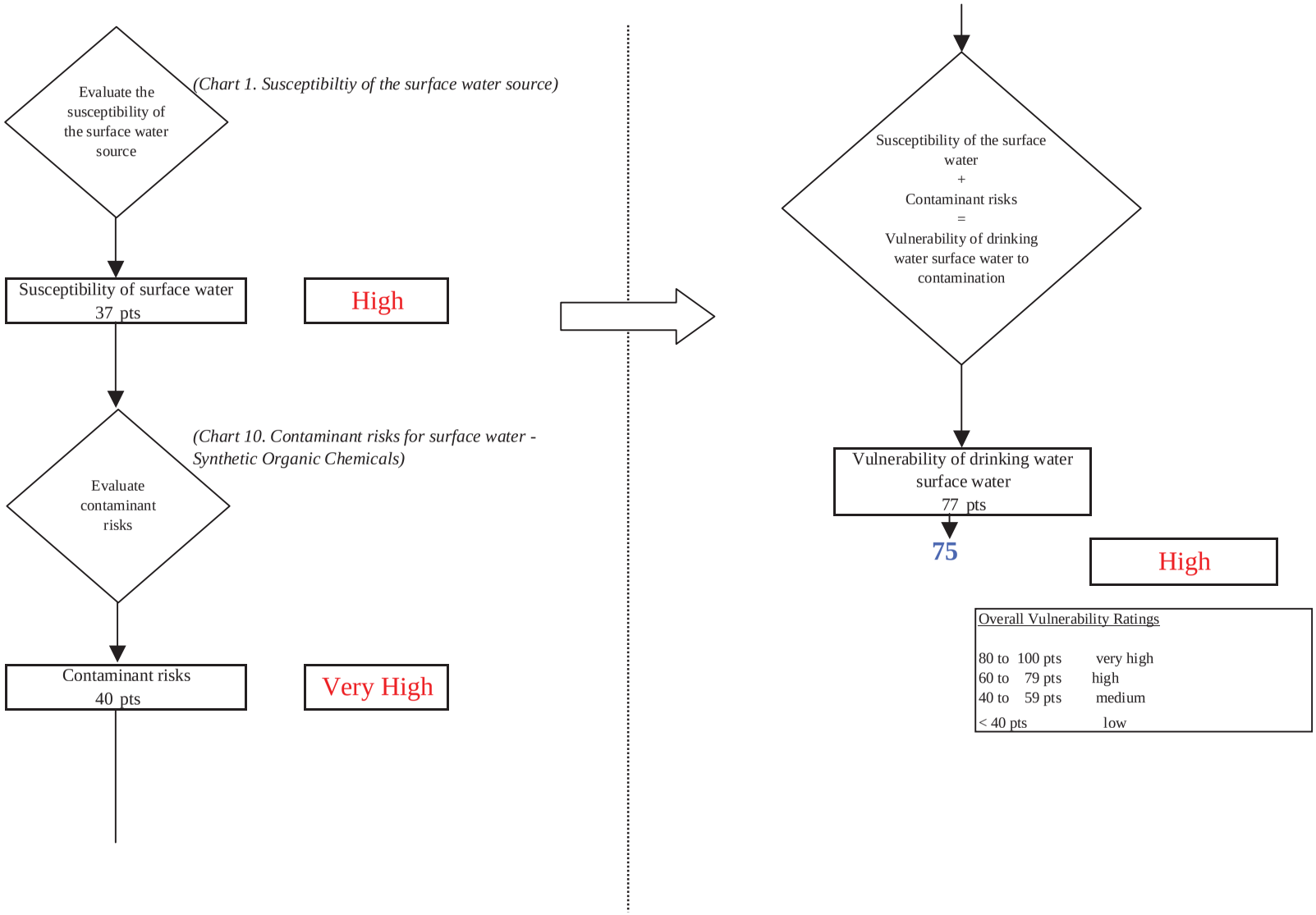
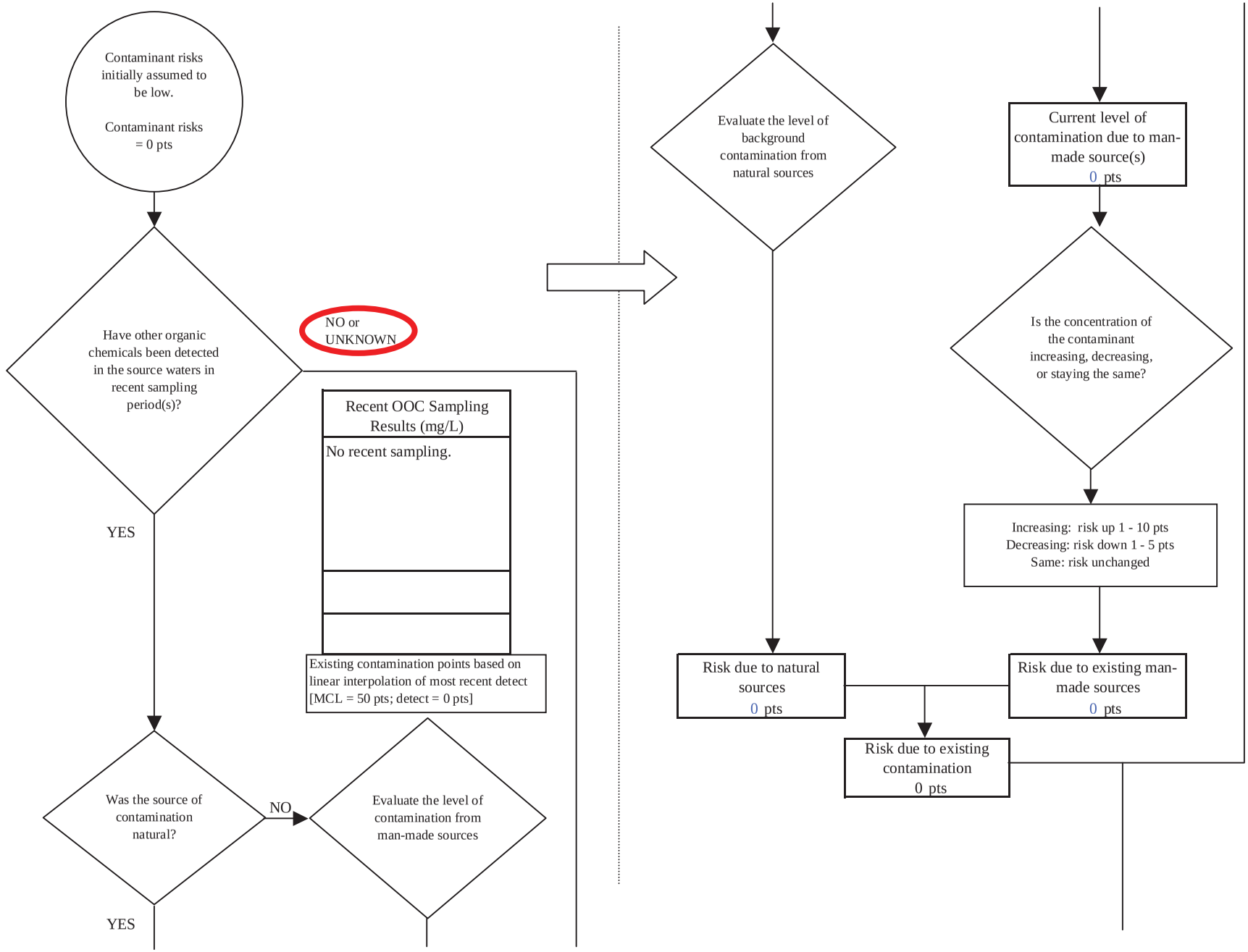


Chart 12. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Other Organic Chemicals



D.2.2.4

Chart 12. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Other Organic Chemicals

+ 40 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones Aand B? (see Risk Matrix below)

Risk Levels for OOC Sources identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	1	1
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	1	0	1

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Matrix Score 40

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

Initial assessment of risk posed by potential sources of contamination = 40 pts

Are any significant sources <1000 ft from the spring, lake, river, or stream, or within the floodplain?

NO → Risk unchanged

The number and magnitude of risk sources in Zone A determines a risk increase. See Table 7 for inventory.

YES

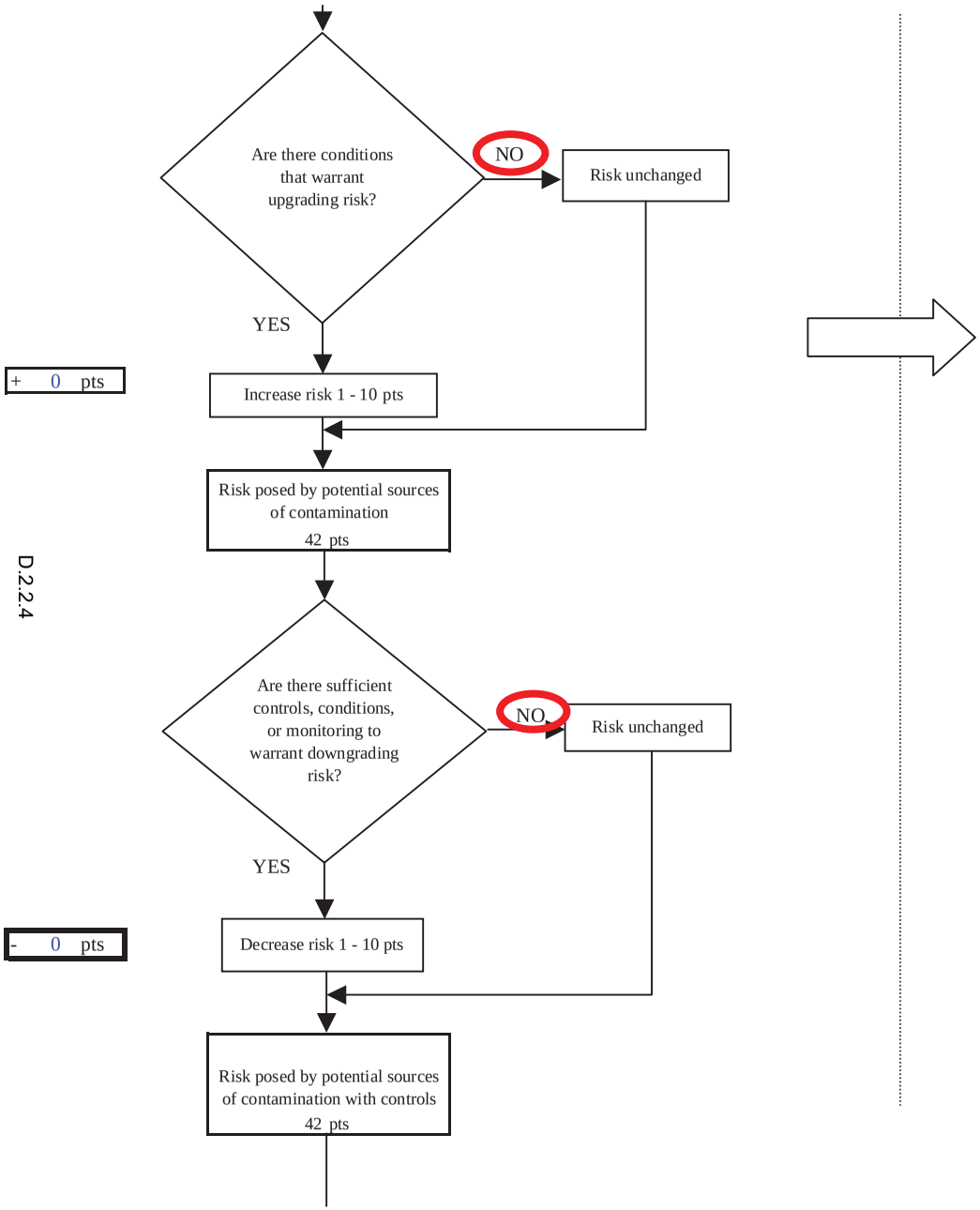
Increase risk 1 - 10 pts

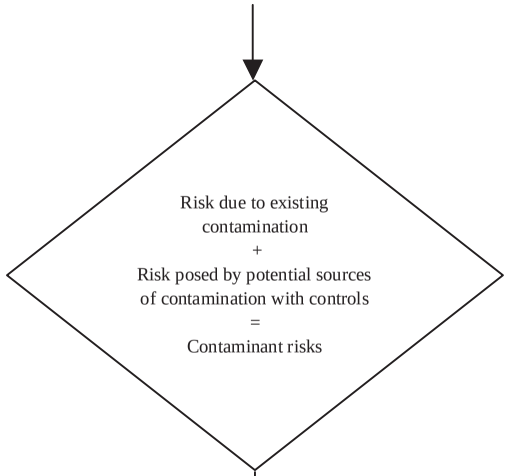
+ 2 pts

D.2.2.4

PER TUNUNAK, AK STANTEC 2020

Chart 12. Contaminant risks for Tununak Water System (PWS No. 270231.001) - Other Organic Chemicals





Existing
0 pts
+
Potential
42 pts
=
Contaminant Risk
42 pts

Contaminant risks*
= 42 pts

*Truncate risk at 50 pts

Very High

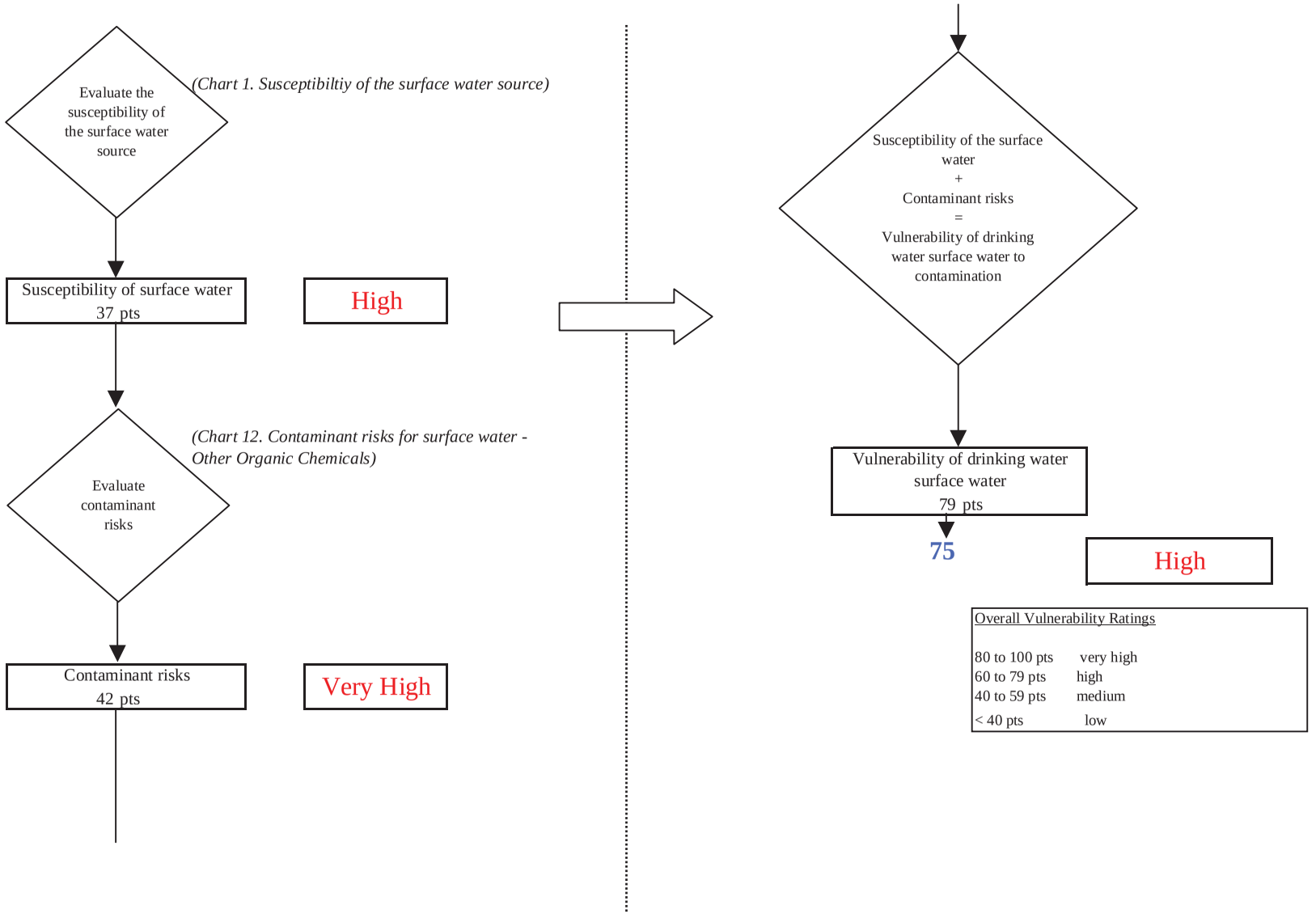
Contaminant Risk Ratings

40 to 50 pts	very high
30 to < 40 pts	high
20 to < 30 pts	medium
< 20 pts	low

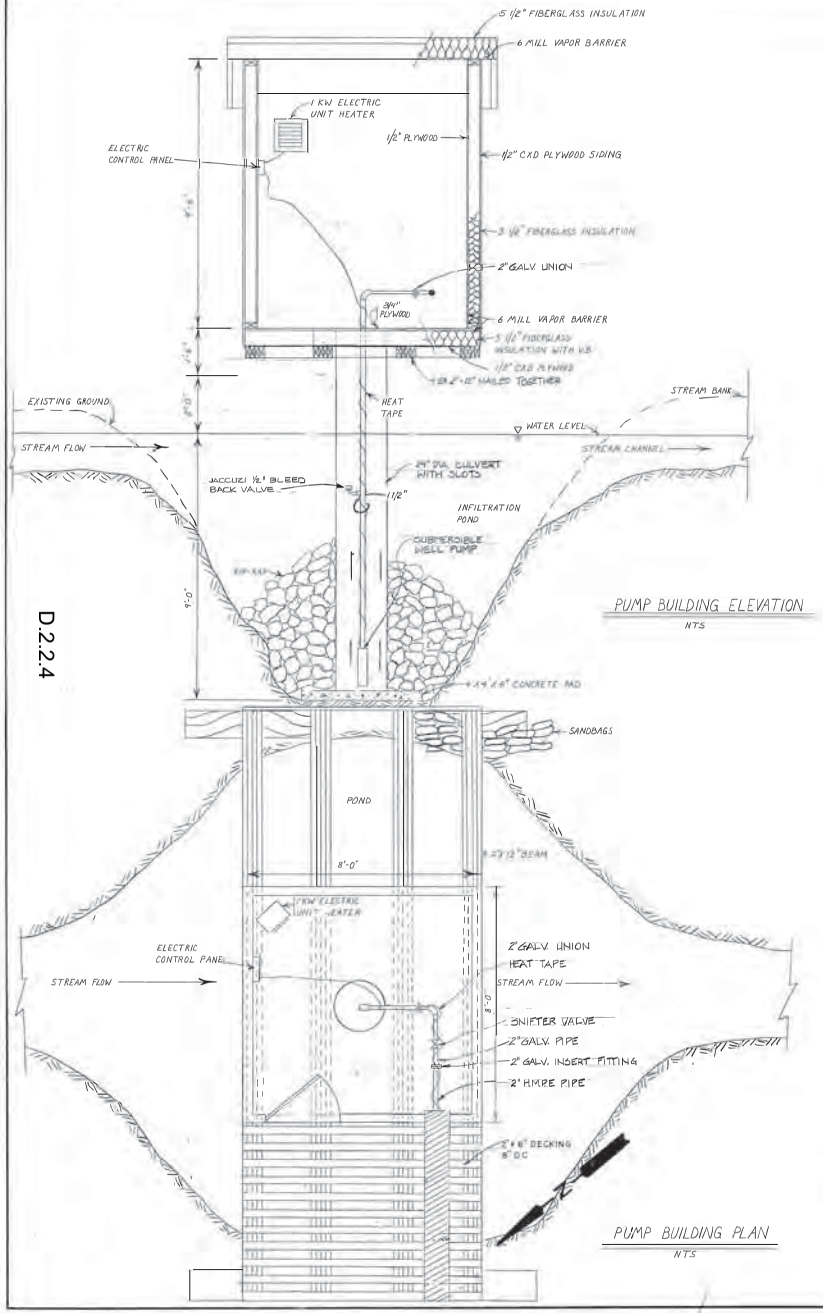
D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

Chart 13. Vulnerability analysis for Tununak Water System (PWS No. 270231.001) - Other Organic Chemicals



ATTACHMENT 3 – U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE PUBLIC HEALTH SERVICE TUNUNAK, ALASKA INFILTRATION GALLERY AND PUMPING FACILITY

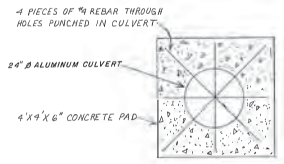


PUMP BUILDING ELEVATION

NTS

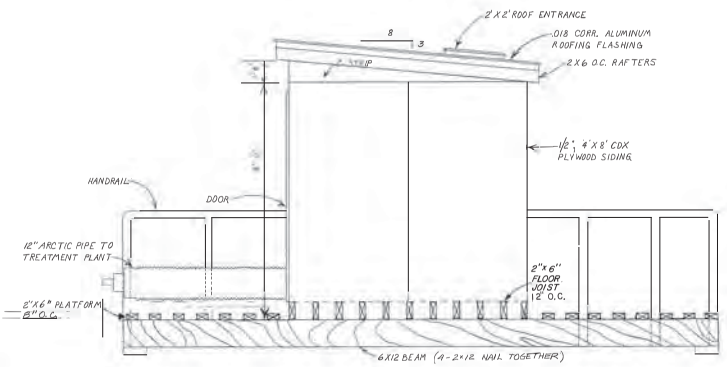
PUMP BUILDING PLAN

NTS



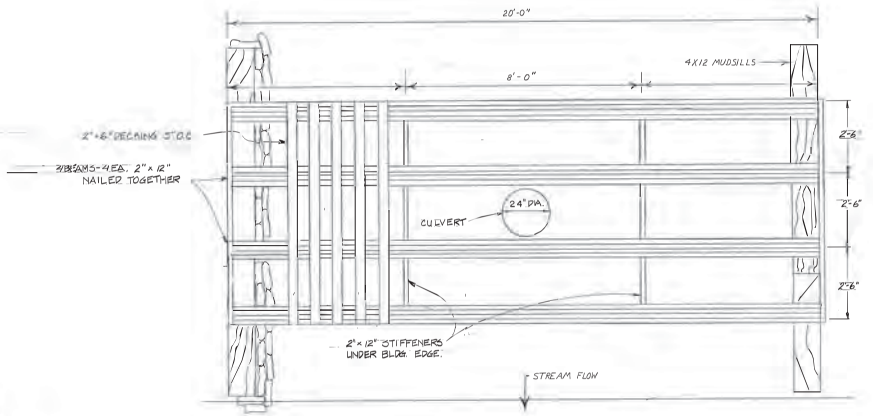
CULVERT PAD DETAIL

NTS



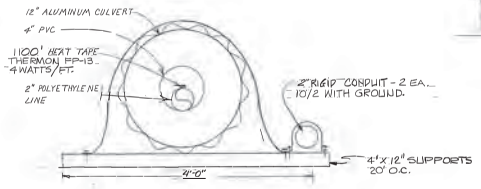
SIDE VIEW - PUMP BUILDING

SCALE: 1/2" = 1'



BEAM AND JOIST DETAIL

SCALE: 1/2" = 1'



4" ARCTIC PIPE DETAIL

TRANSMISSION LINE SECTION A-A

NOT TO SCALE

AS BUILT

DATE	REVISIONS	INITIALS
	As Built	CLC
MARCH 80	AS BUILT CHANGES	D.L.
SEPT 80	AS-BUILT CHANGES	PML

Design Engineer	
Maintenance Review	
Material Take-off	

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
INFILTRATION GALLERY & PUMPING FACILITY
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 19 OF TOTAL SHEETS

DRAWN BY: GGA
DATE: JULY 1978
CHECKED BY:
DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

☆U.S. GOVERNMENT PRINTING OFFICE: 1978-786-319

D.2.2.4

PER TUNUNAK, AK
STANTEC 2020

ATTACHMENT 4 – GOULDS WATER TECHNOLOGY SPECIFICATION SHEET FOR GS 60HZ STANDARD CAPACITY 4” SUBMERSIBLE PUMPS

PER TUNUNAK, AK
STANTEC 2020

GS

60 HZ STANDARD CAPACITY 4” SUBMERSIBLE PUMPS
VFD COMPATIBLE - UP TO 80 HZ

BUILT IN THE USA
ENGINEERED, ASSEMBLED & TESTED



FEATURES

Powered by CentriPro 4” motors for dependable operation and long service life.

Stainless Steel Construction provides strength and corrosion resistance.

Noryl® impellers and Lexan® diffusers deliver excellent abrasion resistance.

Floating Impeller Stack has proven itself for over 50 years as a superior sand handling and durable pump design.

The proprietary engineering polymer bearing is strong and resistant to abrasion and wear.

Cast stainless steel discharge head with built in stainless steel check valve. Two cast-in safety line loops for installer convenience.

MATERIALS OF CONSTRUCTION

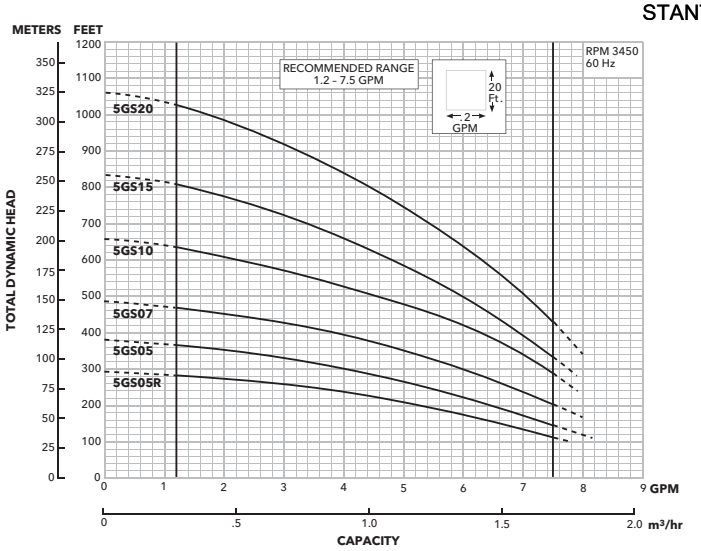
Part Name	Material
Discharge Head	AISI 303 SS
Check Valve Poppet	AISI 304 SS
Check Valve Seal	BUNA, FDA compliant
Check Valve Seat	AISI 304 SS
Check Valve Retaining Ring	AISI 302 SS
Bearing Spider – Upper	Noryl ® GFN2
Bearing (s)	Proprietary Engineered Polymer
Klipring	AISI 301 SS
Diffuser	Lexan®
Impeller	Noryl ®
Bowl	AISI 304 SS
Motor Adapter	AISI 303 SS
Casing	AISI 304 SS
Shaft	AISI 304 SS
Coupling	AISI 304 SS
Cable Guard / Screws	AISI 304 SS
Suction Screen	AISI 304 SS

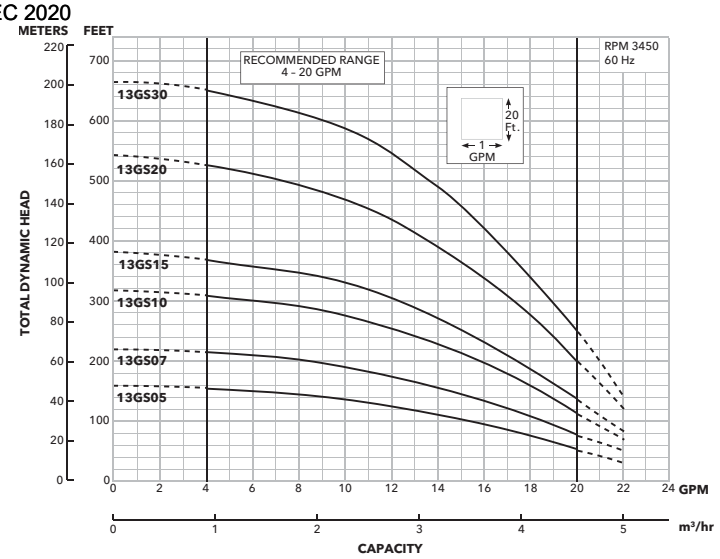
WATER END DATA

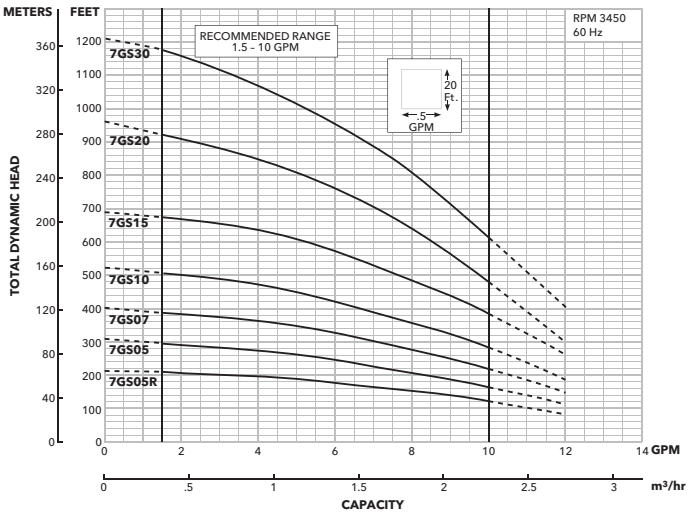
Series	Model	Req. HP	Stages	Length (in)	Weight (lbs)
5GS	5GS05R	0.5	9	12.9	8
	5GS05	0.5	12	15.0	9
	5GS07	0.75	15	17.0	11
	5GS10	1	20	21.7	13
	5GS15	1.5	26	25.8	15
	5GS20	2	33	31.6	19
7GS	7GS05R	0.5	7	11.7	6
	7GS05	0.5	10	13.8	7
	7GS07	0.75	13	16.0	8
	7GS10	1	17	18.8	9
	7GS15	1.5	22	23.6	12
	7GS20	2	27	27.2	13
	7GS30	3	34	33.2	18
10GS	10GS05R	0.5	5	10.1	6
	10GS05	0.5	7	11.5	7
	10GS07	0.75	10	13.6	8
	10GS10	1	12	15.0	9
	10GS15	1.5	17	18.4	12
	10GS20	2	20	21.7	13
	10GS30	3	27	27.5	18
	10GS50R	5	35	33.0	21
	10GS50	5	42	40.2	24
13GS	13GS05	0.5	5	10.1	6
	13GS07	0.75	7	11.5	7
	13GS10	1	10	13.6	8
	13GS15	1.5	12	15.0	9
	13GS20	2	17	18.4	12
	13GS30	3	21	22.3	15
18GS	18GS07	0.75	6	11.8	7
	18GS10	1	8	13.5	8
	18GS15	1.5	11	16.1	10
	18GS20	2	14	18.6	11
	18GS30	3	19	24.1	15
	18GS50R	5	24	28.3	17
	18GS50	5	30	34.4	21
25GS	25GS10	1	7	13.4	8
	25GS15	1.5	9	15.3	9
	25GS20	2	11	17.2	10
	25GS30	3	15	20.9	14
	25GS50R	5	22	28.7	17
	25GS50	5	26	33.4	21

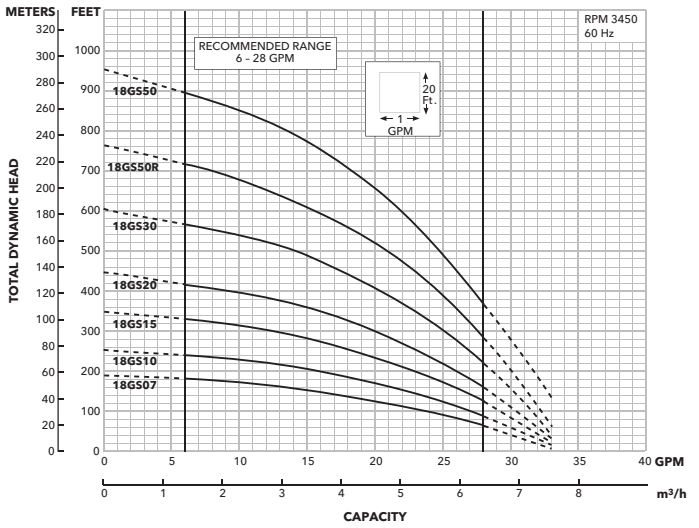
GOULDS WATER TECHNOLOGY
a xylem brand

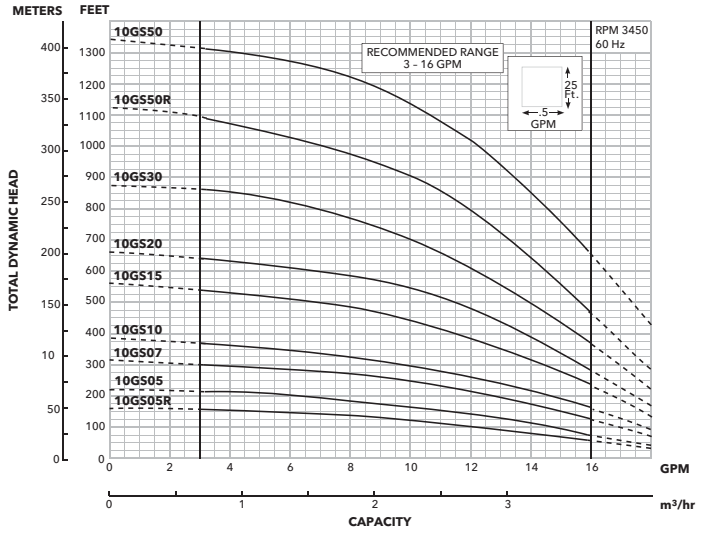
PER TUNUNAK, AK
STANTEC 2020

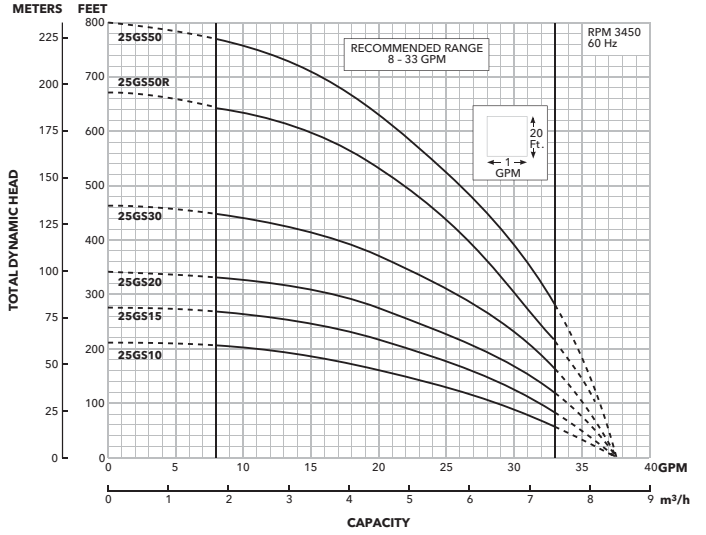












Xylem Inc.
2881 East Bayard Street Ext., Seneca Falls, NY 13148
Phone: (866) 325-4210 • Fax: (888) 322-5877
www.goulds.com

Goulds is a registered trademark of Goulds Pumps, Inc. and is used under license. CentriPro is a trademark of Xylem Inc. or one of its subsidiaries. Noryl and Lexan are trademarks of GE Plastic.
© 2015 Xylem Inc. GSSPEC R1 March 2015

DD22224

Technical Memorandum 4

Task 2

Tununak Water Source Assessment
Deep Water Supply Well

For

Tununak, Alaska

August 8, 2018

Technical Memorandum #4 – Task 2

To:	Native Village of Tununak IRA Council	From:	Collin Macheel, CPG Victor Harris, CPG Bob Gilfilian, PE
	Tununak, Alaska		Stantec Consulting Services Inc.
File:	**Technical Memorandum 4, Task 2 – Tununak Water Source Assessment Deep Water Supply Well**	Date:	August 6, 2018

Section 1.0 Purpose

The Native Village of Tununak a.k.a. Tununak IRA Council (herein referred to as Tununak), in cooperation with the Alaska Department of Environmental Conservation (ADEC) Village Safe Water (VSW) has retained Stantec Consulting Services Inc. (Stantec) to prepare this Technical Memorandum (Tech Memo) with funding from the U.S. Department of Agriculture Rural Development (USDA-RD). The purpose of this Tech Memo is to provide a summary of the results of a desktop study to assess the feasibility of constructing a new deep (greater than 50 feet) groundwater well in Tununak. This Tech Memo provides a qualitative assessment which may or may not support further field investigation to evaluate the development of a deep groundwater source to serve as a production well that will meet the long-term water supply needs of Tununak, including a piped water system for the entire community, and provide a minimum yield of 50 gallons per day per resident.

Section 2.0 Scope and Data Sources

The scope of this study included the compilation of published water resource and subsurface hydrogeologic data. Data sources included the following:

- Alaska Department of Natural Resources
- Alaska Department of Environmental Conservation
- Alaska Department of Transportation & Public Facilities
- VSW
- U.S. Geologic Survey
- Alaska Native Tribal Health Consortium, including consultants.

The data compiled from these sources are referenced throughout this document and summarized in Attachment 1.

To evaluate the possibility of a developing a deep-water supply well in the Tununak, several features were investigated as influencing the likelihood of a developable water well and are discussed in Sections 3 through 6. These features include:

- Local and regional geologic setting.
- Local and regional developed water sources and associated water quality.

Reference: **Technical Memorandum 4,**
Task 2 – Tununak Water Source Assessment Deep Water Supply Well

- Distribution of permafrost.
- Land accessibility including drill rig access, land ownership, and reasonable conveyance distances to Tununak.

Section 3.0 Local and Regional Geologic Setting of the Village of Tununak

Tununak is located on Nelson Island in Southwestern Alaska along the coast of the Bering Sea. Tununak is one of two communities located on Nelson Island. Tununak is separated by approximately 6 miles from the City of Toksook Bay (Figure 1). Tununak lies partially over Quaternary unconsolidated surficial deposits and folded Cretaceous sandstone and shale sedimentary rock. The Cretaceous sandstone and shale sedimentary rock underlie both Tununak and Toksook Bay along the western extent of Nelson Island as shown on Figure 2. Young (Quaternary or Tertiary) basaltic flows cap the Cretaceous folded sedimentary rock on Nelson Island, found on several hill tops around Tununak (Wilson et al., 2015; Coonrad, 1957).

The distribution, occurrence, and nature of sedimentary rock units have been described by coastal outcrops and surficial geologic investigations in and around Tununak (Coonrad, 1957; AKDOT, 1995). Further relevant descriptions of the sedimentary rock were made in the City of Toksook Bay between 1993 and 1994, indicating the occurrence of Cretaceous sedimentary rock in orientation and nature described similar to that observed by surficial and coastal outcrop descriptions in Tununak (HDR, 2005).

The nature and distribution of the Quaternary unconsolidated surficial deposits has been widely investigated in geotechnical evaluations, including those conducted for the: Tununak High School Site; Tununak Airport relocation; Tununak Water Storage Tank Site Geotechnical Investigation; and, to a lesser degree, the Nelson Island Highway Geology Reconnaissance. Geotechnical investigations identified silt rich organic soil in most of the areas, with the occurrence of ice-rich soils. Drilling and geotechnical logs rarely describe bedrock or suspected bedrock assumed by refusal of the drilling rig.

The Tununak High School geotechnical investigation found bedrock at a depth of 16.5 feet below ground surface (bgs), described as siltstone in the location of the current school (RMC, 1979). The Tununak Airport Relocation Geophysical Investigation confirmed the occurrence of sandstone and siltstone in several borings, ranging in depth from 8 to 30 feet bgs in locations south of the Tununak River (AKDOT&PF, 2005a). The geotechnical investigation conducted at the Tununak Water Storage Tank Site found undescribed bedrock at 4.3 feet bgs near the 50,000-gallon water tank and no indication of bedrock in two other borings further to the southwest (USPHS, 1977). The Nelson Island Highway Geology Reconnaissance found sandstone and silt stone at variable depths along the proposed highway corridor between Tununak and Toksook Bay, ranging in depth from 4 feet bgs to greater than 12 feet bgs (AKDOT&PF, 2005b). Because of the relatively thin nature of the unconsolidated surficial deposits, in this context, a new “deep” well means a water supply well screened in the Cretaceous sedimentary rocks.

Reference: **Technical Memorandum 4,**
Task 2 – Tununak Water Source Assessment Deep Water Supply Well

Section 4.0 Local and Regional Developed Water Sources and Associated Water Quality

Water sources for Tununak have been primarily surface water and shallow groundwater wells. Tununak's washeteria and water treatment plant is served by an infiltration gallery as is recorded in the ADEC public water supply database (Palmer, 2018). Records were located for two shallow groundwater wells installed within the Quaternary unconsolidated surficial deposits. The Bureau of Indian Affairs (BIA) groundwater well adjacent to the Tununak School was installed to a depth of 36.5 feet bgs (ADNR, 1964). The well log identifies a limited production rate of 6 gallons per minute (gpm) during the initial well test. The well depth is shallow and vulnerable to contamination, including saltwater intrusion.

The second shallow well was installed approximately 30 feet southeast of the Alaska Village Electric Cooperative (AVEC) power generation building. The well was installed to a depth of 30 feet bgs (USGS, 1978). The AVEC well log indicates bedrock was present at bottom of the boring, and the well was pumped at 40 gpm for 6 hours, with a resultant drawdown of 16+ feet. U.S. Geologic Survey (USGS) documentation of the well indicates that the well was grouted with bentonite and constructed with a 6-foot of casing stickup. No other documentation was found regarding the AVEC well. The location of the well would indicate that it was likely installed near the Tununak River and, therefore, is likely under the influence of surface water.

Water produced from the Tununak School well has be reported to be of good quality; however, the shallow setting and vulnerability to contamination, and low production rates limit the water source. Total coliform results collected between 2002 and 2018 have all been negative (ADEC, 2018). In 1968, iron was detected at 0.05 milligrams per liter (mg/L), manganese at 0.05 mg/L, and nitrates at 0.3 mg/L (ADNR, 1964).

The water level elevation in the Tununak School well (reported at approximately 11.8 feet bgs during pumping) is near average sea level, indicating the salt water intrusion is a potential issue if a well at the location were installed with capability of producing higher flow rates. Conservatively, the Ghyben-Herzberg relates depth to the salt water interface at approximately 40 times greater below sea level for every foot of freshwater elevation head above sea level, by difference in density alone under static conditions (e.g., Freeze and Cherry 1979). The elevation of the ground surface at the Tununak School well is approximately 12 feet above sea level, based on 2015 Alaska Department of Transportation and Public Utilities (ADOT&PF) lidar elevation data. Water level in the well was measured at approximately 11.8 feet bgs during the original pump test for the well (ADNR, 1964). By the Ghyben-Herzberg relation, the salt water interface is a concern at the location. In this regard, it is interesting to note that a study of water quality in Toksook Bay indicated that, as a means to avoid seawater intrusion, a well site should be located at least 1,000 feet away from the coast (HDR, 2005).

The primary water source in Tununak is an infiltration gallery located on Unnamed Creek. Water sourced from the infiltration gallery of Unnamed Creek have been reported to have seasonal color variation (USPHS, 1977). Positive total coliform tests were recorded in August, September, and October 2009 (YKHC, 2010). No significant changes to the system have been made since the

positive total coliform results. Analytical compliance testing of the Tununak water source has been inadequate and inconsistent.

Exploratory drilling at Toksook Bay, 6 miles to the southeast of Tununak, provides insight into the water-producing capabilities of the Cretaceous sedimentary rocks (sandstone units) which are expected to underlie Tununak. At least 13 groundwater wells were installed at Toksook Bay from 1976 to 1994. Toksook Bay's primary production wells used prior to 1994 were found to be effected by salt water intrusion or fuel contamination and spurred new efforts to develop a deep groundwater well source in 1993-1994. Geologic mapping of coastal outcrops and river cuts was conducted, along with surface geophysics (very-low-frequency electromagnetic survey methods), to site locations for new wells. In 1994, seven wells were installed by air rotary drilling methods. Of the seven wells installed, three provided adequate quantity and treatable quality water for supplying water to the city. The wells were screened in the Cretaceous sandstone and production rates of 20 to 50+ gpm were reported (HDR, 2005). A generalized conceptual model of the hydrogeology of the Cretaceous bedrock was provided in the City of Toksook Bay Sanitation Facilities Master Plan, as shown on Figure 3, indicating recharge in the folded Cretaceous sandstone is provided primarily by surface water.

Water quality in the three production wells currently used in Toksook Bay exceeded the secondary maximum contaminant levels (SMCLs) for iron and manganese in all three wells, with concentrations ranging from 0.69 to 1.4 mg/L iron and 0.067 to 0.13 mg/L manganese. The SMCLs for iron and manganese are 0.3 and 0.05 mg/L, respectively. No other constituents were detected above maximum contaminant levels (MCLs) or SMCLs in any of the wells. Total Organic Carbon analytical samples resulted in concentrations below laboratory detection limits (HDR 2005).

Section 5.0 Distribution of Permafrost

The regions surrounding Tununak and Toksook Bay are characterized as having a sporadic distribution of permafrost (10 to 50 percent spatial coverage). Although specific permafrost depth and spatial occurrence data is not available for Nelson Island, permafrost thickness measurements from southwestern Alaska include depths ranging from 40 to 604 feet inland near Bethel. Permafrost thickness measurements from coastal communities of Quinhagak and Goodnews Bay have been published in the range of 20 to 75 feet (Jorgenson, T. et al. 2008). The deepest borings on Nelson Island occurred in 1994 during the water well installations in Toksook Bay. The consultant who performed the geologic logging of the wells did not document the presence of permafrost. It should be noted that permafrost or suspected permafrost, as well as ice-rich soils, in Tununak have been identified in the three geotechnical investigations referenced above but, as noted, have been limited in depth to the surficial Quaternary unconsolidated soil.

Reference: **Technical Memorandum 4,**
Task 2 – Tununak Water Source Assessment Deep Water Supply Well

Section 6.0 Land Accessibility Including Drill Rig Access, Land Ownership, and Conveyance Distance to the Community

Land accessibility has greatly improved since the recent construction of the new, relocated Tununak Airport. The new airport facility included the construction of a new road, with road maintenance located along the east and north periphery of the village, that included new road access to an upland material borrow site. The road system in Tununak now allows for greater accessibility by a truck-mounted drilling rig (e.g., air rotary).

An updated aerial photography from 2015 is shown on Figure 4, along with general land ownership status and ADOT&PF right-of-way's. Land ownership data was obtained from the Alaska Department of Natural Resources (ADNR) Recorders Office, and needs to be evaluated by a formal title search prior to siting a new well location. Potential areas of further investigation for the drilling of deep water supply wells are depicted on Figure 4. These areas appear to be accessible for drilling a well with a truck-mounted drill rig, and are located within a reasonable conveyance distance to the washeteria and water treatment plant in Tununak, while also maintaining separation distance from surface water bodies.

Section 7.0 Conclusions

Limited deep subsurface data are available in the Tununak community boundary. However, the following summarize pertinent observations of available information.

- Regional geologic mapping efforts between Tununak and Toksook Bay indicate similar folded Cretaceous sedimentary rock at both communities, including sandstone and shale.
- The sedimentary rock has been investigated in greater detail in Toksook Bay, where several deep wells were installed and produced adequate quantities of drinking water from Cretaceous sandstone units.
- The quality of groundwater developed in Toksook Bay from the Cretaceous sandstone was acceptable for the community, although iron and manganese were measured above the SMCL.
- Deep borings in Toksook Bay also described permafrost in shallow unconsolidated sediment, but no evidence of permafrost was found in deep well borings.
- Improved roads relating to the relocation of the Tununak Airport have resulted in greater accessibility for a truck-mounted drill rig capable of advancing deep soil borings (for example, depths of 160 to 170 feet bgs were obtained at Toksook Bay with a similar drill rig).

In regard to the observations and findings summarized above, we conclude the following:

- Completion of a water production well in the shallow surficial deposits in Tununak is not recommended, because of anticipated poor production, susceptibility to surface water contamination, and potential for sea water intrusion.
- Based on exploratory drilling at Toksook Bay, completion of a deep well in the Cretaceous sandstone at Tununak has a reasonable probability of producing well flows greater than 20 gpm.
- A deep well in the Cretaceous bedrock has a probability of encountering a water production aquifer with naturally occurring levels of iron and manganese that may exceed the drinking water SMCLs associated with aesthetics (taste and appearance). Water treatment, in addition to disinfection, may be necessary subject to the water quality levels encountered.
- The location of exploratory drilling for a new production well in the Cretaceous bedrock should be based on the anticipated location and depth of relatively permeable sandstone layers (site-specific conceptual hydrogeologic model) similar to that shown on Figure 3, which would benefit from additional field studies of the geology at Tununak.

Section 8.0 Recommendations

Based on the findings of this desktop study, it is recommended the following tasks be considered to further evaluate the possibility of developing a deep groundwater production well to serve the future water needs of Tununak:

- Title search to determine current landownership of potential drilling sites as shown on Figure 4. These drilling sites are shown on the figure in two shaded red areas labeled as “Proposed Deep Water Supply Investigation Areas”. The proposed drilling sites are located along the new airport road that was used to haul material for construction of the Tununak Airport. Although the two drill sites are shown on land owned by Tununrmiut Rinit Corporation, the boundaries of the proposed sites are relatively general and could be adjusted to include the adjoining land that is owned by the Village of Tununak.
- Prepare geologic mapping of the Cretaceous sedimentary bedrock at outcrops along the coast, rivers, and areas of any road cuts or borrow pits. The purpose of this mapping would be to identify the location and orientation of permeable sandstone layers within the bedrock. Geologic mapping of these units could be aided by surface geophysical techniques similar to those used in Toksook Bay to determine favorable/recommended site(s) for drilling of a deep well(s).
- Evaluate the implementation of an exploratory well drilling program to determine the feasibility of drilling a large diameter (6-inch) water supply production well. The exploratory well drilling work would involve the mobilization of a small drilling rig to drill small diameter (2- to 3-inch) soil boring holes to obtain samples of the geologic formations and install a 2-inch diameter well that could be used for water quality sampling and flow measurements of the aquifer.

Reference: **Technical Memorandum 4,**
Task 2 – Tununak Water Source Assessment Deep Water Supply Well

Section 9.0 References

Alaska Department of Environmental Conservation (ADEC). 2018. Drinking Water Watch Coliform/Microbial Sample Results, Lower Kuskokwim School District Tununak Paul Albert High School, website accessed 3/19/2018: https://dec.alaska.gov/DWW/JSP/TcrSampleResults.jsp?tinwsys_is_number=334&tinwsys_st_code=AK&counter=1 ,.

Alaska Department of Natural Resources (ADNR). 1964. Tununak Water Well PD&C. Ralph Donelson. Bureau of Indian Affairs. February 7.

Alaska Department of Transportation (AKDOT). 1995. Engineering Geology Reconnaissance Report Tununak Airport Improvements. October.

Alaska Department of Transportation & Public Facilities (ADOT&PF). 2005a. Geotechnical Data Report, Tununak Airport Improvements, AKSAS #51791.

AKDOT&PF. 2005b. Reconnaissance Geology Report Nelson Island Roads, AKSAS #57176.

Coonrad, W.L. 1957. Geologic Reconnaissance in the Yukon-Kuskokwim Delta Region, Alaska. Miscellaneous Geologic Investigations MAP I-223. U.S. Geologic Survey.

Freeze, R. and Cherry, J. 1979. Groundwater. Prentice-Hall Inc. Englewood Cliffs, N.J.

HDR Alaska Inc. (HDR). 2005. City of Toksook Bay Sanitation Facilities Master Plan, Prepared for City of Toksook Bay.

Jorgenson, T. et al. 2008. Permafrost Characteristics of Alaska. Institute of Northern Engineering, University of Alaska Fairbanks, Ninth International Conference on Permafrost. July.

Palmer, C. 2018. Alaska DEC Drinking Water Protection. Email communication March 02.

R&M Consultants Inc. (RMC). 1979. Geotechnical Investigation and Foundation Recommendations for High School Site, Tununak, Alaska. April.

U.S. Department of Health, Education, and Welfare Public Health Service (USPHS). 1977. Final Report Sanitation Facilities Construction for Tununak, Alaska, Project AN-77-6313.

USPHS. 1978. Construction Plans Sanitation Facilities, Tununak, Alaska. Project AN-77-631.

U.S. Geological Survey (USGS). 1978. Tununak Well Log. Anderson-Appleton. U.S. Public Health Service. May 1. Site ID SB-6-91-28AACC1-2.

Wilson, F.H. et al. 2015. Geologic Map of Alaska. Scientific Investigations Map 3340. U.S. Geologic Survey.

Yukon-Kuskokwim Health Corporation (YJGC). 2010. Sanitary Survey of the Tununak Water System. September.

Reference: **Technical Memorandum 4,**
Task 2 – Tununak Water Source Assessment Deep Water Supply Well

Section 10.0 Limitations

This Tech Memo was prepared by Stantec for the Native Village of Tununak IRA Council at the request of the VSW Program. The findings and recommendations presented herein reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in this document and in the contract between Stantec and the Client. The opinions in this document are based on conditions and information existing at the time the document was prepared and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party.

STANTEC CONSULTING SERVICES INC.

Collin Macheel, CPG
Senior Hydrogeologist
Phone: (907) 266-1104
collin.macheel@stantec.com

Victor Harris, CPG
Vice President/Principal Hydrogeologist
Phone: (626) 568-6024
victor.harris@stantec.com

Bob Gilfilian, PE
Principal Engineer
Phone: (907) 227-9883
bob.gilfilian@stantec.com

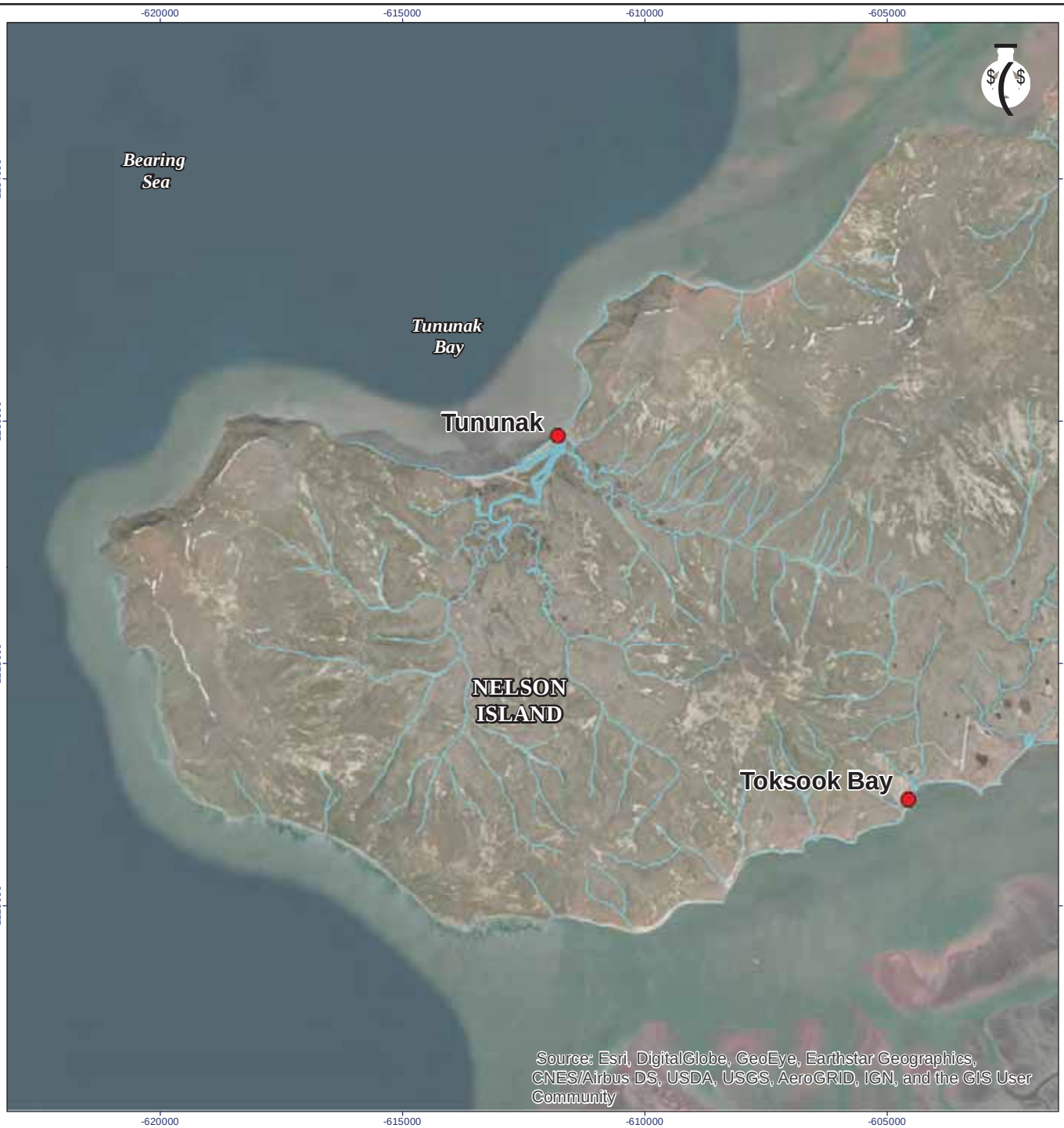
Attachments: Figure 1 – Village of Tununak Location and Vicinity Map

Figure 2 – Village of Tununak Regional Geologic Setting

Figure 3 – Conceptual Groundwater Model of Cretaceous Sandstone in Toksook Bay

Figure 4 – Village of Tununak Site Overview with Proposed Deep Water Supply Investigation Areas

Attachment 1 – Reference Table





Notes
1. Coordinate System: NAD 1983 Alaska Albers
2. Hydrography and parcel features acquired from Alaska State Geo-Spatial Clearing House, Originator:Alaska Department of Natural Resources - Information Resource Management;
3. Orthoimagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

Legend

Hydrography 1:63360

0 4,500 9,000 Feet

1:122,000 (at original document size of 8.5x11)

Stantec

Project Location
T6N, R91W, S28
Village of Tununak, AK

XXXXXXXXX-XXXX REVA
Prepared by CDP on 2018-03-13
Technical Review by ABC on 2018-XX-XX
Independent Review by ABC on 2018-XX-XX

Client/Project
Technical Memorandum 4 - Water Source Assessment
Task 2 Hydrogeologic Desktop Study
Evaluation for Potential Deep Groundwater Supply Well

Figure No.
1

Title
Village of Tununak
Location & Vicinity Map

Figure X-X.X

U:\204705740 1\gis\mxds\204705740 1_Tech_Memo_4_Fig-01_Loc_Vic_Map.mxd Revised: 2018-03-20 By: cpannone





Notes
1. Coordinate System: NAD 1983 Alaska Albers
2. Hydrography and parcel features acquired from Alaska State Geo-Spatioal Clearing House, Originator:Alaska Department of Natural Resources - Information Resource Management;
3. Geologic Base Map Adapted From Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, comps., 2015, Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340,

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

Legend

- Hydrography 1:63360

Geologic Data

- Water
- Qs - Quaternary Unconsoolidated Surfical Deposits
- Ksd - Cretaceous Sandstone, Shale
- QTv - Young Volcanic Rocks, Undifferentiated

0 4,500 9,000 Feet
1:122,000 (at original document size of 8.5x11)

Stantec

Project Location
T6N, R91W, S28
Village of Tununak, AK

XXXXXXXX-XXXX REVA
Prepared by CDP on 2018-03-13
Technical Review by ABC on 2018-XX-XX
Independent Review by ABC on 2018-XX-XX

Client/Project
Technical Memorandum 4 - Water Source Assessment
Task 2 Hydrogeologic Desktop Study
Evaluation for Potential Deep Groundwater Supply Well

Figure No.
2

Title
Regional Geologic Setting of Tununak and Toksook Bay

Figure X-X.X

U:\204705740 1\gis\mxds\204705740 1_Tech_Memo_4_Fig-02_Regional_Setting.mxd Revised: 2018-03-20 By: cpannone

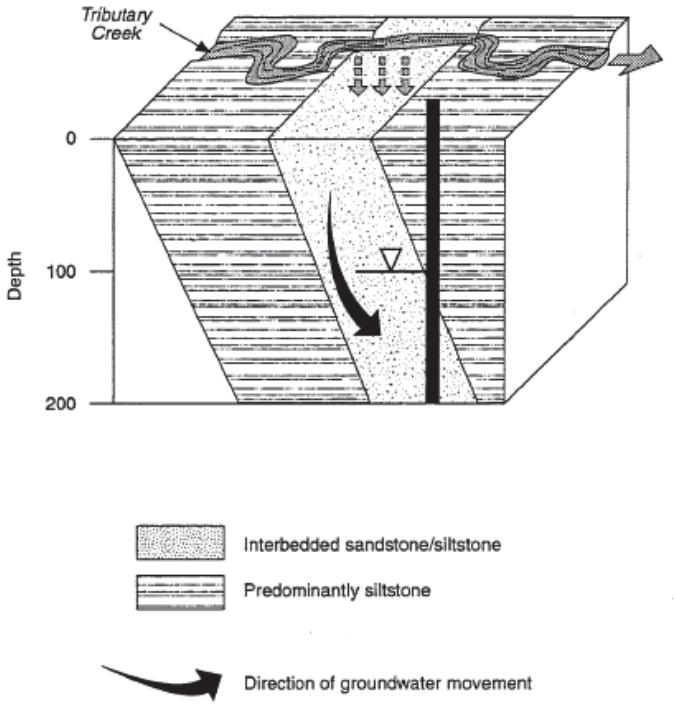


Figure 3- Conceptual groundwater model for deep water production wells in Toksook Bay (adapted from HDR Alaska Inc. 2005. City of Toksook Bay Sanitation Facilities Master Plan, Prepared for City of Toksook Bay.)



Stantec

Legend

- Groundwater Well
- Infiltration Gallery
- Proposed Deep Water Supply Investigation Areas
- Road
- Hydrography 1:63360
- Approximate Geologic Boundary

Qs - Quaternary Unconsolidated Surficial Deposits

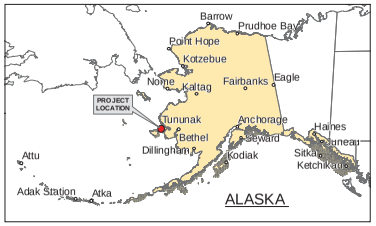
Ksd - Cretaceous Sandstone, Shale

0 1,250 2,500 Feet

1:18,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 Alaska Albers
2. Hydrography and parcel features acquired from Alaska State Geo-Spatial Clearing House, Originator: Alaska Department of Natural Resources - Information Resource Management;
3. Orthoimagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
4. Approximate Geologic Boundary Adapted from Wilson et al. (2015), Geologic map of Alaska, Sm 3340



Project Location
T6N, R91W, S28
Village of Tununak, AK

XXXXXXXX-XXXX REVA
Prepared by CDP on 2018-03-13
Technical Review by ABC on 2018-XX-XX
Independent Review by ABC on 2018-XX-XX

Client/Project
Technical Memorandum 4 - Water Source Assessment
Task 2 Hydrogeologic Desktop Study
Evaluation for Potential Deep Groundwater Supply Well

Figure No.
4

Title
Village of Tununak
Site Overview

Figure X-X.X

PER TUNUNAK, AK
STANTEC 2020

D 2 2 4

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

Source	Reference	Description	Importance
U.S. Geologic Survey	Coonrad, W.L., 1957. Geologic Reconnaissance in the Yukon-Kuskokwim Delta Region, Alaska. Miscellaneous Geologic Investigations MAP I-223. U.S. Geologic Survey.	Group conducted a 10-day reconnaissance of Nelson Island, including interpretation of aerial imagery and foot traverses along most of the coast along and also included helicopter aerial surveys. The publication described Cretaceous age sandstone-siltstone sequences which spanned the majority of the geographic extent of the island. In addition, he described the distribution of basaltic flow rock cap sequence with an aggregate thickness of 200 feet or more indicated by benches in numerous places. The bottom of the basaltic flow rock cap sequence is marked by an angular unconformity where the basaltic flow rock cap meets underlying folded Cretaceous sedimentary unit. Folded sedimentary bedrock is generally folded with a N70°W orientation	Describes the distribution, regional orientation, and character of sedimentary cretaceous bedrock of Nelson Island. Report indicates similar bedrock from the Village of Tununak to Toksook Bay.
	Wilson, F.H. et al., 2015. Geologic Map of Alaska. Scientific Investigations Map 3340. U.S. Geologic Survey.	Most recent review and update of geologic maps state-wide. Revised descriptions of lithology and geographic extents based on synthesizing regional information, new data sets, and updated imagery.	Reaffirms the findings of Coonrad, W.L., 1957 with minimal updates.
	U.S. Geological Survey. 1955. Tununak School Water Well Water Quality Field Sample. R.M. Waller. June 13. Site ID SB-6—91-28AACB1-1. Note, Page 1.	Water quality analyses and static water level measurements collected in 1955.	Provides additional record of water quality and history of construction at the BIA School Drinking Water Well.
	U.S. Geological Survey. 1978. Tununak Well Log. Anderson-Appleton. U.S. Public Health Service. May 1. Site ID SB-6-91-28AACC1-2.	Well log for water well installed and developed in 1978 south east of the AVEC power generation building.	Provides additional record of a drinking water well in Tununak, not present in the Department of Natural Resources database.
	U.S. Geological Survey. 1955. Groundwater Reconnaissance in Five Eskimo Villages in the Lower Kuskokwim-Yukon River Area, Alaska.	Described two wells installed at the time in Tununak, primarily a 14 foot well located in the School of the time. Provides general description of surficial geology and exsisting water sources. Provides general recommendations on avoiding permafrost and salt water intrusion in the town site in the unconsolidated sediment.	
Alaska Department of Natural Resources	AK DNR. 1964. Tununak Water Well PD&C. Ralph Donelson. Bureau of Indian Affairs. February 7.	Well log for the BIA School Well.	Provides most recent information on the construction of the BIA School Well including documented production rates.
Alaska Department of Transportation	Alaska DOT & PF, 2005. Geotechnical Data Report, Tununak Airport Improvements, AKSAS #51791.	Geotechnical data collected in several proposed locations for the new runway, as well as material mining sites.	Limited to quaternary unconsolidated soil south of the Tununak River. Limited information on the nature of permafrost distribution and bedrock encountered.
	Alaska DOT & PF, 2005. Reconnaissance Geology Report Nelson Island Roads, AKSAS #57176.	Geotechnical data collected along the proposed Nelson Highway cooridor, between Villages of Tununak and Toksook Bay.	Describes depth to and types of bedrock encountered in the area between Tunuak and Toksook Bay.
Lower Kuskokwim School District	R&M Consultants, Inc. 1979. Geotechnical Investigation and Foundation Recommendations for High School Site Tununak, Alaska, Prepared for Lower Kuskokwim School District, Bethel, Alaska.	Geotechnical data collected at the Tununak School Site.	Describes shallow soils, permafrost distribution, and depth to bedrock.
City of Toksook Bay	HDR Alaska Inc. 2005. City of Toksook Bay Sanitation Facilities Master Plan, Prepared for City of Toksook Bay.	Sanitation Facilities Master Plan covers revisions to drinking and waste water systems in the nearby Village of Toksook Bay.	Describes groundwater well history, the finding of recent geologic mapping, geophysical investigations for the Village of Toksook Bay. The report also provides water quality data and production rates of the deep wells in the village.
Institute of Northern Engineering, University of Alaska Fairbanks	Jorgenson, Torre. 2008. Permafrost Characteristics of Alaska. Presented at the Ninth Internation Conference on Permafrost, Institute of Northern Engineering, Geophysical Institute.	Describes the updated understanding of permafrost distribution in Alaska, including all available depth information, and regional classifications.	Describes the general distribution of permafrost in southwest Alaska including all nearby thickness measuremnets.
Alaska Department of Environmental Conservation - Drinking Water Protection	Palmer, Charlie. 2018. Email communication March 02, 2018.	Provided current status of drinking water source classification for the Village of Tununak, well logs source from the Department of Natural Resourses for Tununak and Toksook Bay.	

D.2.3 Stantec Environmental Report December 2017

December 31, 2017 *"Final Environmental Report: Tununak Water Treatment Plant and Washeteria Facility"* Length 39 Pages.

Final Environmental Report

Tununak Water Treatment Plant and Washeteria Facility

Prepared for:
Native Village of Tununak IRA Council, P.O. Box 97, Tununak, AK 99681

and

Alaska Department of Environmental Conservation
Village Safe Water
555 Cordova Street
Anchorage, AK 99501

Prepared by:
Stantec Consulting Services Inc.
725 East Fireweed Lane, Suite 200
Anchorage, AK 99503

December 31, 2017

Table of Contents

SUMMARY III

1.0 PURPOSE AND NEED FOR THE PROPOSAL 1.1
1.1 PROJECT DESCRIPTION (PROPOSED ACTION) 1.1
1.2 PURPOSE AND NEED OF THE PROPOSAL 1.2

2.0 ALTERNATIVES TO THE PROPOSED ACTION 2.1
2.1 ALTERNATIVE 1 - NO BUILD 2.1
2.2 ALTERNATIVE 2 - REHABILITATE EXISTING WASHETERIA/WATER TREATMENT PLANT IN THE EXISTING LOCATION AND REPLACE FOUNDATION 2.1
2.3 ALTERNATIVE 3 - NEW MODULAR WASHETERIA WITH VACANT FLOOR SPACE FOR FUTURE WATER PLANT EQUIPMENT AND REHABILITATE THE EXISTING WATER TREATMENT PLANT 2.2

3.0 AFFECTED ENVIRONMENT/ENVIRONMENTAL CONSEQUENCES 3.1
3.1 LAND USE/ IMPORTANT FARMLAND/ FORMALLY CLASSIFIED LAND 3.1
3.1.1 Affected Environment 3.1
3.1.2 Environmental Consequences 3.2
3.1.3 Mitigation 3.2
3.2 FLOODPLAINS 3.2
3.2.1 Affected Environment 3.2
3.2.2 Environmental Consequences 3.2
3.2.3 Mitigation 3.3
3.3 WETLANDS 3.3
3.3.1 Affected Environment 3.3
3.3.2 Environmental Consequences 3.3
3.3.3 Mitigation 3.3
3.4 HISTORIC PROPERTIES 3.3
3.4.1 Affected Environment 3.3
3.4.2 Environmental Consequences 3.4
3.4.3 Mitigation 3.4
3.5 BIOLOGICAL RESOURCES 3.6
3.5.1 Affected Environment 3.6
3.5.2 Environmental Consequences 3.6
3.5.3 Mitigation 3.7
3.6 WATER QUALITY 3.7
3.6.1 Affected Environment 3.7
3.6.2 Environmental Consequences 3.7
3.6.3 Mitigation 3.7
3.7 COASTAL RESOURCES 3.7
3.7.1 Affected Environment 3.7

3.7.2 Environmental Consequences 3.7
3.7.3 Mitigation 3.8
3.8 SOCIO-ECONOMIC/ ENVIRONMENTAL JUSTICE ISSUES 3.8
3.8.1 Affected Environment 3.8
3.8.2 Environmental Consequences 3.8
3.8.3 Mitigation 3.8

4.0 SUMMARY OF MITIGATION 4.1

5.0 CORRESPONDENCE 5.1
5.1 RESPONSES 5.2
5.2 ISSUES IDENTIFIED 5.2

6.0 EXHIBITS 6.1

7.0 LIST OF PREPARERS A.1

LIST OF TABLES

Table 1 – Mitigation Summary 4.1
Table 2 – Agencies Contacted 5.2
Table 3 – ER Preparers A.1

LIST OF FIGURES

Figure 1 - Vicinity and Location Map 6.2
Figure 2 – Existing Facilities 6.3
Figure 3 - Existing Layout 6.4
Figure 4 – Preferred Alternative Location Options 6.5

LIST OF APPENDICES

APPENDIX A AGENCY CORRESPONDENCE A.1

Summary

This Environmental Report (ER) has been completed for the Native Village of Tununak IRA council and the Alaska Department of Environmental Conservation (ADEC) Village Safe Water (VSW) program, as part of an application for financial assistance from the U.S. Department of Agriculture (USDA), Rural Development, Rural Utilities Service (RUS) water and environmental loan and grant program. The ER includes evaluation of environmental issues that must be considered during the planning and design process and has been completed in tandem with the Preliminary Engineering Report (PER). This ER is meant to support the USDA's environmental review process as required by the National Environmental Policy Act (NEPA) as well as USDA environmental policies and procedures. This ER was prepared in accordance with the March, 2008 USDA RUS Bulletin 1794A-602 Version 1.2.

The purpose of this proposal is to provide a safe and functional washeteria and water treatment plant (WTP) to the community of Tununak. The condition of the existing WTP and washeteria is substandard and do not contribute to the continued health of the community. The treatment plant is in poor physical condition and disrepair. Several alternatives were evaluated as part of the PER process. The PER considered system capacities, reasonable growth, available funding, location options, and community input.

The Proposed Action (Alternative 4) would provide the community of Tununak with a new washeteria and WTP that would allow the Tununak Native Council to provide adequate volumes of treated water and washeteria facilities to the community. The preferred alternative would abandon the existing washeteria/WTP in-place and construct a new modular building that would house a combined washeteria and WTP. The modular building would be erected in a location immediately adjacent to the existing washeteria/WTP. Preliminary feedback from the community shows the preferred location for the new washeteria and WTP is Location B. The existing washeteria/WTP would remain in operation until the new modular building is fully on-line and operational.

Environmental, social, and economic effects were evaluated as part of the ER process. Community and agency outreach activities occurred to assist with alternatives evaluation, as well as identify avoidance and minimization measures, and permit requirements, if any.

Feedback from the agencies is still pending, however, no environmental issues have been identified or are anticipated. Impacts from construction of the Proposed Action are limited to a temporary increase in traffic, noise, and potential for erosion and sedimentation of disturbed areas during construction. The contractor will be required to comply with the State of Alaska Stormwater regulations, and coordinate with the community to reduce noise and reroute traffic in a manner that is least impactful to the community as practicable.

1.0 PURPOSE AND NEED FOR THE PROPOSAL

1.1 PROJECT DESCRIPTION (PROPOSED ACTION)

The Proposed Action (Alternative 4) would provide the community of Tununak with a new washeteria and wastewater treatment plant (WTP). The new facilities would allow the Tununak Native Council to provide adequate volumes of treated water and washeteria facilities to the community. The preferred alternative would abandon the existing washeteria/WTP in-place and construct a new modular building that would house a combined washeteria and WTP. The modular building would be erected in a location selected by the community. Preliminary feedback from the community shows the preferred location for the new washeteria and WTP is immediately adjacent to the existing washeteria/WTP (Location B). The existing washeteria/WTP would remain in operation until the new modular building is fully on-line and operational.

The Proposed Action consists of the following components:

- The new modular combined washeteria/WTP would be shipped by barge to Tununak, transported in sections overland from the barge site, and erected on a new multipoint steel frame foundation system.
- The modular building would consist of a 3,040 square foot (40’ by 76’) structure that would include a 1,600 square foot fully functional washeteria and a 1,440 square foot new WTP.
- The WTP would use a surface water treatment process similar to the process used in the existing WTP for the production of potable water, with added treatment to drinking water standards with an additional filtration system. The WTP would produce the equivalent flow as originally designed, but be capable of increase to match community growth.
- The new WTP would be plumbed via an aboveground utilidor to the existing 50,000-gallon water storage tank and water service connections to the clinic.
- The modular washeteria would be designed to accommodate 5 commercial grade washers and dryers, and 2 bathrooms (separate men and women) equipped with 4 toilets, 2 sinks, and 4 showers that are designed for handicap access.
- The wastewater from the modular washeteria would be plumbed to discharge into the existing sewer drain that flows to the existing off-site tank system (which serves only the washeteria and WTP).
- Backwash water from the water treatment pressure granular filter would be plumbed, if approved by Alaska Department of Environmental Conservation (ADEC), to discharge to the existing sewer drain line that flows to the community septic tank system (rather than discharging to the ground as currently).

1.2 PURPOSE AND NEED OF THE PROPOSAL

The purpose of this proposal is to provide a safe and functional washeteria and WTP to the community of Tununak.

The community of Tununak needs safe and functional washeteria and water treatment facilities. The condition of the existing WTP and washeteria is substandard and does not contribute to the continued health of the community. The treatment plant is in poor physical condition and disrepair. The majority of electrical equipment within the building has deteriorated past its useful life. The power distribution and associated equipment shows signs of significant deterioration due to corrosion. Numerous building code violations were found throughout the facility in the power distribution and lighting systems. These code violations include:

- An exit door from the boiler room that has been sealed shut
- Heating fuel oil tank is located within 5 feet of the building.
- The standby heater stack is located too close to combustible materials. It is unknown whether the heater is operational.
- The heat exchanger for the WTP is a single-wall design, which is not allowed by current codes due to the possibility of contamination of the water from the glycol heating fluid in the event of leakage.

The equipment within the building has deteriorated to a point that the facility can no longer serve its intended purpose with any reliability. Only two working washers and two dryers are available. The toilet/shower rooms have missing fixtures and are no longer usable. Control systems for the water storage tank and washeteria mechanical equipment appear to be non-functioning.

2.0 ALTERNATIVES TO THE PROPOSED ACTION

Several alternatives were evaluated as part of the Preliminary Engineering Report (PER) process. The PER considered system capacities, reasonable growth, available funding, location options, and community input. Alternatives evaluated included:

1. No build alternative.
2. Rehabilitate the existing washeteria and WTP.
3. Construct a new washeteria and WTP without new WTP equipment.
4. Construct new washeteria and WTP with new WTP equipment

This Section describes alternatives considered but ultimately dismissed as part of the PER process.

2.1 ALTERNATIVE 1 - NO BUILD

This No Build (No Action) Alternative would result in the continued use of the existing 40-year old, inadequate, deteriorated, washeteria/WTP facility. The WTP would continue to operate to supply non-potable (suitable for laundry and flushing use but not for drinking, showering, hand washing, or consumption) water to the existing washeteria, and health clinic. The existing washeteria is deficient in its current condition and would continue to be used (as is) without upgrades. Backwash water from the existing water filtration process would continue to be discharged directly onto the ground surface along the exterior of the building. This alternative would not mitigate current risk to the operators and users (public) resulting from the building code violations that were identified at the existing facility. This alternative does not meet the purpose and need of the project, to provide safe and functional washeteria and WTP facilities for the community.

2.2 ALTERNATIVE 2 - REHABILITATE EXISTING WASHETERIA/WATER TREATMENT PLANT IN THE EXISTING LOCATION AND REPLACE FOUNDATION

This alternative would rehabilitate the existing washeteria/WTP facility and replace its foundation system at its current location. This alternative provides for the upgrade of the existing WTP facility to treat the current water source from Unnamed Creek and provide drinking water for the washeteria and health clinic. This building rehabilitation alternative would mitigate current risk to the operators and users (public) resulting from the building code violations that were identified at the existing facility. However, rehabilitating the existing washeteria and WTP does not accommodate future community needs, is less sustainable than Alternative 4, and poses

much greater risk of capital cost overruns and potential construction challenges than a modular building. For these reasons, this alternative was removed from consideration.

2.3 ALTERNATIVE 3 - NEW MODULAR WASHETERIA WITH VACANT FLOOR SPACE FOR FUTURE WATER PLANT EQUIPMENT AND REHABILITATE THE EXISTING WATER TREATMENT PLANT

This alternative would rehabilitate the existing water treatment plant and install a new modular washeteria building in a location selected by the community. The existing washeteria/water treatment building would have its foundation system (post and pad) replaced at its current location. This alternative also provides for the upgrade of the existing WTP facility to treat the current water source from Unnamed Creek and provide drinking water for the washeteria and health clinic. The rehabilitation of the water treatment plant would mitigate current water treatment operator risk resulting from the numerous building code violations that have been identified at the current facility, however, the cost of rehabilitating the existing WTP in addition to providing a new modular washeteria is excessive, requiring an additional $1.27 million in funding. Rehabilitating the existing WTP poses much greater capital cost expenditures, risk of capital cost overruns, and potential construction challenges. In addition, heat would have to be supplied to both buildings, which negatively affects the sustainability of this alternative. For these reasons this alternative was removed from consideration.

3.0 AFFECTED ENVIRONMENT/ENVIRONMENTAL CONSEQUENCES

This section describes the existing environmental, social, and economic setting that would be affected by the Proposed Action and establishes a baseline for evaluation of environmental consequences and mitigation organized by resource categories identified in the March, 2008 USDA RUS Bulletin 1794A-602 Version 1.2.

3.1 LAND USE/ IMPORTANT FARMLAND/ FORMALLY CLASSIFIED LAND

3.1.1 Affected Environment

3.1.1.1 General Land Use

The existing Washeteria and WTP lies on Tract D-1A as shown on U.S. Survey 4028, Tununak Townsite in the Village of Tununak. This property is currently owned by the Native Village of Tununak IRA Council as conveyed in 2016 in the Quickclaim Deed from the Tununak Traditional Council.

The area surrounding the Proposed Action is mostly residential, except for the clinic, store, and school property. The immediate project vicinity adjacent to the existing washeteria and WTP consists of roads, trails, and two utilidor corridors from the washeteria, one to the school, and one to the clinic. (Figure 2).

3.1.1.2 Important Farmland

The Farmland Protection Policy Act (FPPA), requires consideration of the potential effects a USDA action may have on important farmland. There is no designated prime or unique farmland in Alaska, or farmland of statewide importance[1], therefore FPPA does not apply.

3.1.1.3 Formally Classified Lands

No formally classified lands are present within the proposed project area. There are certain properties that are either administered by federal, state, or local agencies or have been accorded special protection through formal legislative designations. Formally classified lands include, but are not limited to, monuments, landmarks, wild and scenic rivers, wilderness areas, state or national parks, reservations, and recreational areas.

[1] USDA, NRCS. Accessed online March 30, 2017 at https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ak/soils/surveys/?cid=nrcs142p2_035988.

3.1.2 Environmental Consequences

No environmental consequences have been identified based on land use. No land use changes are anticipated with the projects under consideration. Impacts to the surrounding community are expected to be those typically experienced during construction projects: noise, traffic limitations, and increased employment.

3.1.3 Mitigation

No mitigation beyond use of construction best management practices (BMPs) has been identified. Contractors will be required to provide traffic control plans, limit operations and noise producing activities to standard business hours, and generally minimize community impacts to the extent practicable.

3.2 FLOODPLAINS

3.2.1 Affected Environment

The United States Army Corps of Engineers (USACE) rates the flood hazard at Tununak as low average[2]. No Flood Insurance Studies or Flood Insurance Rate Maps exist for Tununak. Longtime residents indicate that flooding only occurs in the main village due to storm-driven waves in combination with high tides to a maximum height of approximately 6 inches[3]. The project area is approximately 400 feet away from the north fork of the Tununak River and according to local residents, has not been susceptible to flooding in the past.

Executive Order 11988, *"Floodplain Management"* requires federal agencies to avoid actions, to the extent practicable, which will result in the location of facilities in floodplains and/or affect floodplain values. Facilities located in a floodplain may be damaged or destroyed by a flood or may change the flood-handling capability of the floodplain or the pattern or magnitude of the flood flow.

3.2.2 Environmental Consequences

No environmental consequences have been identified to the floodplain. The Proposed Action will not place new facilities in the floodplain, change floodplain values, or influence additional floodplain development. Impacts to the surrounding community are expected to be those typically experienced during construction projects: noise, traffic limitations, and increased employment.

[2] United States Army Corps of Engineers, Alaskan Community Flood Hazard Pertinent Data, 1977
[3] Phukan Consulting Engineers and Associates Inc, *Sanitation Feasibility Study and Environmental Review*,1993

3.2.3 Mitigation

No mitigation for floodplain impacts is proposed.

3.3 WETLANDS

3.3.1 Affected Environment

No U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory mapping exists for the Tununak area. However, based on available aerial and ground photography provided by community members, the ground surrounding the existing washeteria appears to be disturbed, and evidence of saturated soil, hydrophytic vegetation, and hydrology are not visible. In lower areas outside and further west of the washeteria, outside the project area, vegetation appears to grow on tussocks, and snow machine tracks have left scars in undisturbed tundra, showing evidence of darker, possibly wet soils underneath. Therefore, it is likely wetlands occur within undisturbed tundra outside the project area, but areas immediately adjacent to the existing washeteria and WTP are highly disturbed, and appear better drained. The USACE will be consulted in the event the Proposed Action design includes activities that would occur outside of the current project area within previously undisturbed tundra.

3.3.2 Environmental Consequences

No environmental consequences have been identified to area wetlands.

3.3.3 Mitigation

The Proposed Action would not construct new facilities in wetlands. However, any work, even maintenance to existing facilities within a wetland, stream, or other Water of the US, requires a USACE permit. Correspondence with the USACE is provided in Appendix A and agency comments are still pending. The USACE should be consulted prior to any work in and around streams, wetlands, or other Waters of the U.S., to verify permit applicability. As no impacts to wetlands are anticipated in order to construct the Proposed Action, no mitigation for wetland impacts is proposed.

3.4 HISTORIC PROPERTIES

3.4.1 Affected Environment

There is little available information in the Alaska Department of Natural Resources (ADNR) Office of History and Archaeology (OHA) Alaska Heritage Resource Survey (AHRS) database or Publicly available references regarding potential cultural and historic resources present within or adjacent to the Proposed Action. The preferred Location B is within the recorded boundary of the Historic Village of Tununak (assigned AHRS site number XNI-048). While no visible surface resources were reported during three cultural resources surveys conducted immediately

north of the Proposed Action area in 2010, 2011, and 2013, there are no available records that any subsurface investigations were completed within or adjacent to the Proposed Action Location B[4].

The National Historic Preservation Act of 1966, as amended (16 U.S.C. § 470 et seq.) and the Advisory Council on Historic Preservation's implementing regulations, 36 CFR Part 800 (Section 106 regulations), require federal agencies to take into account the effect their actions may have on historic properties that are within a proposal's *"area of potential effect."* The area of potential effect is the geographic area or areas within which a proposal may cause changes in the character or use of historic properties.

3.4.2 Environmental Consequences

The Proposed Action may require minimal grading of the existing ground surface and may involve boring of helical piles below the existing ground surface for utilidor support posts. Since the Proposed Action Location B is within the boundaries of an archaeological site, the ADNR OHA has been consulted to determine measures to avoid impacts to cultural resources from construction of the preferred alternative, and determine whether a survey is required. In addition, the Bureau of Indian Affairs (BIA) has been consulted to determine whether their agency has any additional documentation in their archives describing cultural resource investigations conducted in the area in the past that may inform determination of environmental consequences.

3.4.3 Mitigation

Consultation with OHA confirmed that Location B for the proposed new washeteria and WTP are within the boundary of the Historic Village of Tununak. There is a potential for effects to cultural and historic resources as a result of this project, depending on the nature of the project and scope of disturbance. The USDA RUS will need to conduct Section 106 consultation for this project to obtain a formal determination of effect.

During the Section 106 process, USDA will define the area of potential effect (APE) and propose a determination of effect for the project. As there is no documentation of subsurface investigations within the proposed building sites, justification will need to be made as to whether the nature of the project and scope of disturbance warrants completing a cultural resource survey. Our knowledge of the project and current design does not show any disturbance proposed for the new building foundation. Depending on the location of the proposed building site, and the

[4] *Boatwright, Mark A, 2000. Letter regarding Notification of Agency Findings per Section 106 (16 USC 470f) for the National Historic Preservation Act for BIA Proposed Undertaking in Tununak, Alaska. BIA, Alaska Region, Juneau, Alaska. On file at the OHA, Anchorage, Alaska; Sanka, Jennifer M. and M. Kelley Russell, 2013. Final Cultural Resources Report: Tununak Community Streets Project - AK DEN 2010(3). Atkins Project No. 100029585. Atkins. On file at the OHA, Anchorage, Alaska; Thompson, Daniel R. and Nicole Tozzi, 2011. Cultural Resources Survey of Proposed Airport Improvements in Tununak, Alaska: DOT&PF Project No. 51791. OHA Report Number 139. OHA, Division of Parks and Outdoor Recreation, ANR, Anchorage, Alaska.*

length of new utilidor that will be needed to connect the building to the water tank, a small number of helical piles may be needed for support. However, due to the very minimal disturbance associated with such work, we believe a justification of no historic properties affected is reasonable for this project. In addition, OHA requested the construction contract contain the following provision:

- *Should cultural or paleontological resources be discovered as a result of this activity, all work that could impact these resources will halt and the VSW Project Engineer and SHPO will be notified immediately. Work will not resume at these sites until Section 106 consultation is conducted with USDA and SHPO.*

3.5 BIOLOGICAL RESOURCES

3.5.1 Affected Environment

Biological resources within the project area are limited. Development surrounds the immediate project vicinity, and there are no wetlands or water bodies present (Figure 4). Habitats within the project area consist of disturbed ground with low shrubs and grasses that may provide shelter and/or travel corridors for small bird and mammal species. However, larger mammals and birds are likely to avoid the area due to the high human presence in the immediate project vicinity, and the abundance of undisturbed habitat in nearby areas. Therefore, biological resources included for evaluation in this ER are limited to federally protected species that may occur in the project area, as discussed in this section.

3.5.1.1 Threatened and Endangered Species

The community of Tununak and the project area are within the potential breeding range of the threatened Spectacled Eider, although no critical habitat for this species has been designated in the area[5].

The Endangered Species Act of 1973 establishes a national program for the conservation and protection of threatened and endangered species of plants and animals and the preservation of habitats upon which they depend. These programs are managed by the USFWS and/or the National Marine Fisheries Service for all threatened and endangered species.

Consultation with the USFWS has been initiated to determine construction measures that may be implemented, if any, to avoid accidental takes of Eiders. Given the project area is surrounded by development and is actively used by the community on a daily basis, it is unlikely this species would use the area for nesting.

3.5.2 Environmental Consequences

No environmental consequences have been identified to biological resources. No land use changes are anticipated and impacts will not extend to previously undisturbed areas. Disturbance of vegetation will be limited to areas underneath the new building foundation and would be less than an acre. Impacts are expected to be limited to those typically experienced during construction projects, primarily noise and temporary changes to traffic patterns, which are not anticipated to impact area wildlife or habitat.

At this time, no impacts to Threatened or Endangered species have been identified for the Proposed Action. Results of consultation with the USFWS regarding Spectacled Eiders is still pending.

[5] USFWS IPaC Information for Planning and Conservation website https://ecos.fws.gov/ipac/

3.5.3 Mitigation

No mitigation specific to biological resources have been identified at this time. Contractor specifications will include "no clearing" windows to prevent impacts to nesting migratory birds and other limits on scheduling or activities as required to accommodate wildlife.

3.6 WATER QUALITY

3.6.1 Affected Environment

The current washeteria and WTP use well water from a surface source approximately 900 feet east of the washeteria. The well is placed in an Unnamed Creek as shown on Figure 2. Community interviews show that residents do not trust the purity of treated water from Unnamed Creek. Multiple Boil Water notices are issued every year, because of indications of bacteriological contamination.

3.6.2 Environmental Consequences

The Proposed Action will not change the washeteria and WTP well water source. The community's raw water source will not be impacted. Water quality at the washeteria will be improved with the proposed additional filtration in the new WTP that will bring the water up to drinking water standards.

Other impacts are those typical of construction projects, namely erosion, sediment, and dust, which may reach area waterways.

3.6.3 Mitigation

No mitigation measures specific to water quality have been identified.

Because there is always the potential for construction sediments to reach area waterbodies, contractors will be required to implement BMPs for sedimentation control. This may include coverage under the Alaska Pollutant Discharge Elimination System Construction General Permit.

3.7 COASTAL RESOURCES

3.7.1 Affected Environment

The Alaska Coastal Management Program expired on June 11, 2011 and is no longer in effect. The Yukon-Kuskokwim Coastal Association Strategic Plan and Annual Operating Plan (2016) was evaluated to ensure no conflict with the proposed project.

3.7.2 Environmental Consequences

No environmental consequences have been identified with respect to coastal resources.

3.7.3 Mitigation

No mitigation for impacts to coastal resources is proposed.

3.8 SOCIO-ECONOMIC/ ENVIRONMENTAL JUSTICE ISSUES

3.8.1 Affected Environment

Tununak, a community of 387 residents (according to a 2016 Department of Labor Estimate), is located 115 miles northwest of Bethel, in a small bay on the northeast coast of Nelson Island. Tununak is a traditional Yup'ik Eskimo Village, with fishing and subsistence activities an integral part of the lifestyle[6].

There are no roads connecting Tununak with other communities; therefore, major means of transportation to or from the community are plane, small boat, and snow machine. Within the community, numerous residents have vehicles including snow machines, boats, and all-terrain vehicles. Nearly all local residents are dependent on varying degrees of fish and game resources.

3.8.2 Environmental Consequences

Impacts to the surrounding community are expected to be those typically experienced during construction projects: noise and traffic limitations. No changes to the socio-economic makeup of the area are anticipated beyond a slight employment increase during construction activities. The Proposed Action is not anticipated to change land use patterns. Like the rest of the community, minority and low-income populations will benefit from safe and functional washeteria and water treatment facilities.

3.8.3 Mitigation

No mitigation related to socio-economic or environmental justice issues is proposed.

[6] Alaska Department of Commerce, Community, and Economic Development website https://www.commerce.alaska.gov/dcra/DCRAExternal/community/Details/b3b97917-176e-4ace-9b18-8d5760bfd5bb

4.0 SUMMARY OF MITIGATION

This section summarizes all proposed mitigation measures described in Section 3.0. Mitigation measures by environmental resource category are compiled in the table below. All mitigation measures indicated will be implemented as part of standard construction methods and/or permitting requirements.

Table 1 – Mitigation Summary

Category	Mitigation
Land Use	The contractor will be required to provide traffic control plans, limit operations and noise producing activities to standard business hours, and generally minimize community impacts to the extent practicable.
Floodplains	None
Wetlands	To be included when agency comments are received. None anticipated.
Historic Properties	USDA will conduct Section 106 consultation. The construction contract will contain the following provision: *Should cultural or paleontological resources be discovered as a result of this activity, all work that could impact these resources will halt and the VSW Project Engineer and SHPO will be notified immediately. Work will not resume at these sites until Section 106 consultation is conducted with USDA and SHPO.*
Biological Resources	Contractor specifications will include "no clearing" windows to prevent impacts to nesting migratory birds and other limits on scheduling or activities as required to accommodate wildlife. Additional measures will be included when agency comments are received. None anticipated.
Water Quality	The contractor will be required to implement BMPs for erosion and sedimentation control, including measures to control dust.

FINAL ENVIRONMENTAL REPORT

Summary of Mitigation December 31, 2017

Category	Mitigation
Coastal Resources	None
Socio-Economic/Environmental Justice Issues	None

5.0 CORRESPONDENCE

5.1 COMMUNITY INVOLVEMENT

Community involvement on this project has been ongoing since 2010. As part of an on-site assessment of sanitation facilities in Tununak, VSW engaged with the community and conducted a public meeting in May 2010. The meeting was attended by 56 residents and was considered by the Tununak Tribal Council to be one of the largest turnouts for a community meeting recorded in Tununak. A considerable amount of information concerning the resident's desires, experiences, and frustrations with the existing sanitation facilities was gathered from the public meeting. Much of that feedback went into the alternatives evaluation process and purpose and need development for this project.

Since 2010 the VSW staff have maintained close communication with the Native Village of Tununak and its predecessor the Tununak Traditional Council. In 2016, the Tununak Traditional Council signed a quickclaim deed that conveyed all its assets and liabilities with rights and titles to the Native Village of Tununak IRA Council.

During preparation of the PER document, VSW participated in several teleconferences with key personnel from the Native Village of Tununak IRA Council including James James (Administrator), Xavier Post (Administrative Assistant), and Josephine Hooper (resident of Tununak) to obtain information on the current conditions of the washeteria and WTP. As part of this information gathering process, the Native Village of Tununak provided copies of their records on the cost of operating the washeteria and WTP from 2014-2016, and income from the washeteria from 2009-2016. In addition, site plans were faxed to the Native Village of Tununak for their review and comment on three alternative locations in the immediate vicinity of the existing washeteria/WTP for the placement of a new replacement washeteria and WTP. Preliminary discussions with Tununak residents has shown that the current preferred location for the new washeteria and WTP is Location B.

5.2 AGENCY CORRESPONDENCE

Due to the previously developed nature of the site, and minimal environmental impacts anticipated, a focused agency coordination effort was conducted for this project. Three agencies were contacted regarding potential for resource impacts within the project area. Table 2 lists the agency representatives contact for the purposes of this ER. Copies of email correspondence is included in Appendix A.

Table 2 – Agencies Contacted

Agency	Individual Addressee
Alaska Department of Natural Resource, Office of History and Archaeology	Shina Duval, Archaeologist
Bureau of Indian Affairs	Sean Mack, Archaeologist
U.S. Fish and Wildlife Service	Catherine Yeargan, Biologist, Ecological Services
U.S. Army Corps of Engineers, Alaska District, Regulatory Division	Ryan Winn, Chief, North Section

5.3 RESPONSES

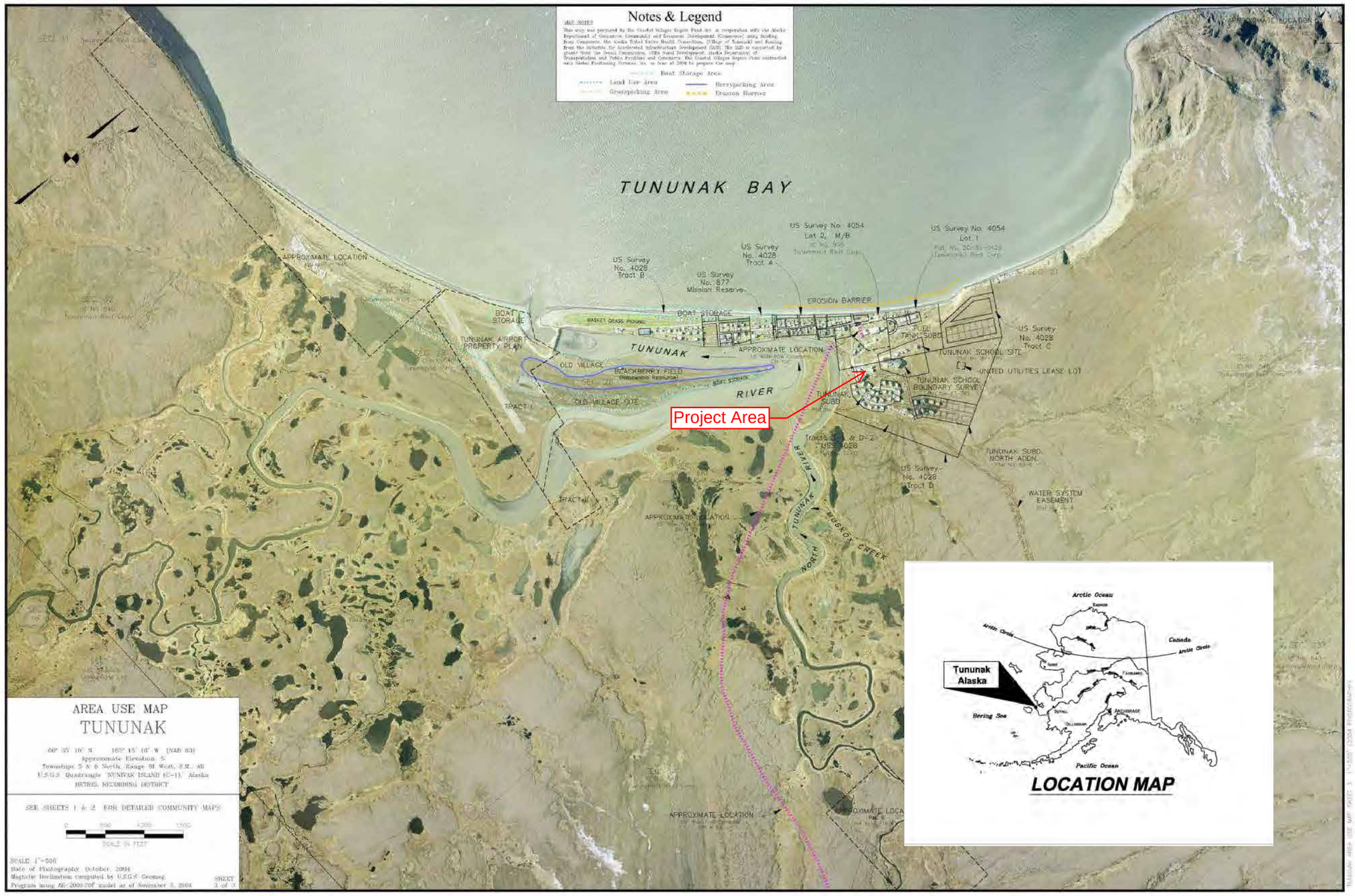
The response from OHA is included in Appendix A. Responses from the remaining agencies are still pending.

5.4 ISSUES IDENTIFIED

Feedback from the agencies is still pending, however, no environmental issues have been identified or are anticipated. Impacts from construction of the Proposed Action are limited to a potential increase in traffic and noise, potential for erosion and sedimentation of disturbed areas, and potential impacts to nesting migratory birds during construction. The contractor will be required to comply with the State of Alaska Stormwater regulations, adhere to USFWS recommended “no clearing” windows, and coordinate with the community to reduce noise and reroute traffic in a manner that is least impactful to the community as practicable. In addition, a provision for actions required in the event cultural resources are discovered during project activities will be added to the contract provisions.

6.0 EXHIBITS

Figure 1 - Vicinity and Location Map

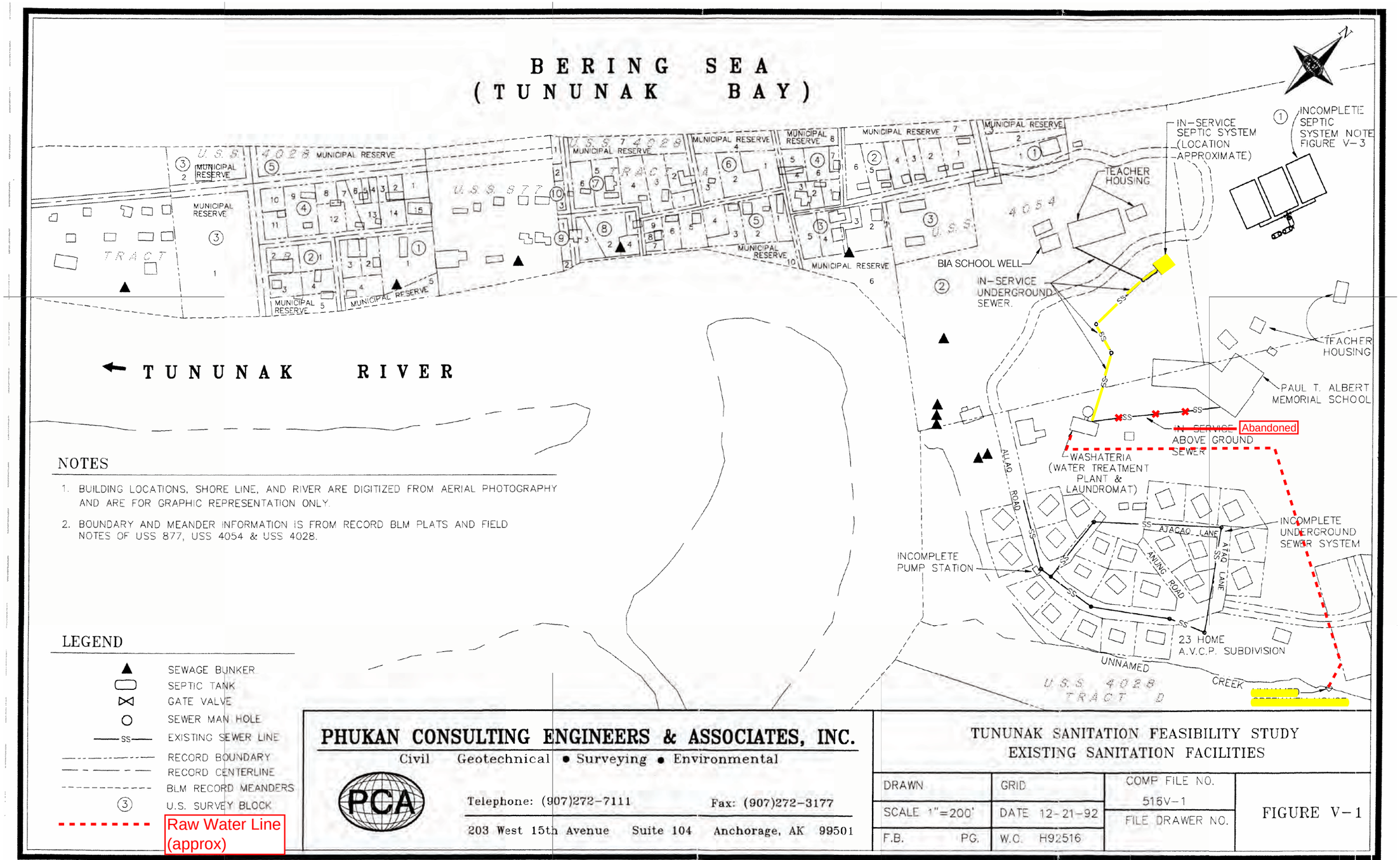


FILE: D:\CAD\Proj\WSW - village safe water\TUNUNAK\Washoteria-Water Treatment Facility\draft\FIG A-1 ADCRA Tununak area map.dgn
TIME: 09-DEC-2010 12:06
JOB No. 1008675.040101

Stantec
Stantec Consulting Services Inc.
725 East Fireweed Lane Suite 200
Anchorage, AK 99503-2245
Tel (907) 276-4245 • www.stantec.com

Figure 1
ADCRA Tununak Area Map and Location (Inset)

Figure 2 – Existing Facilities



PHUKAN CONSULTING ENGINEERS & ASSOCIATES, INC.
Civil Geotechnical • Surveying • Environmental
PCA
Telephone: (907)272-7111 Fax: (907)272-3177
203 West 15th Avenue Suite 104 Anchorage, AK 99501

TUNUNAK SANITATION FEASIBILITY STUDY
EXISTING SANITATION FACILITIES

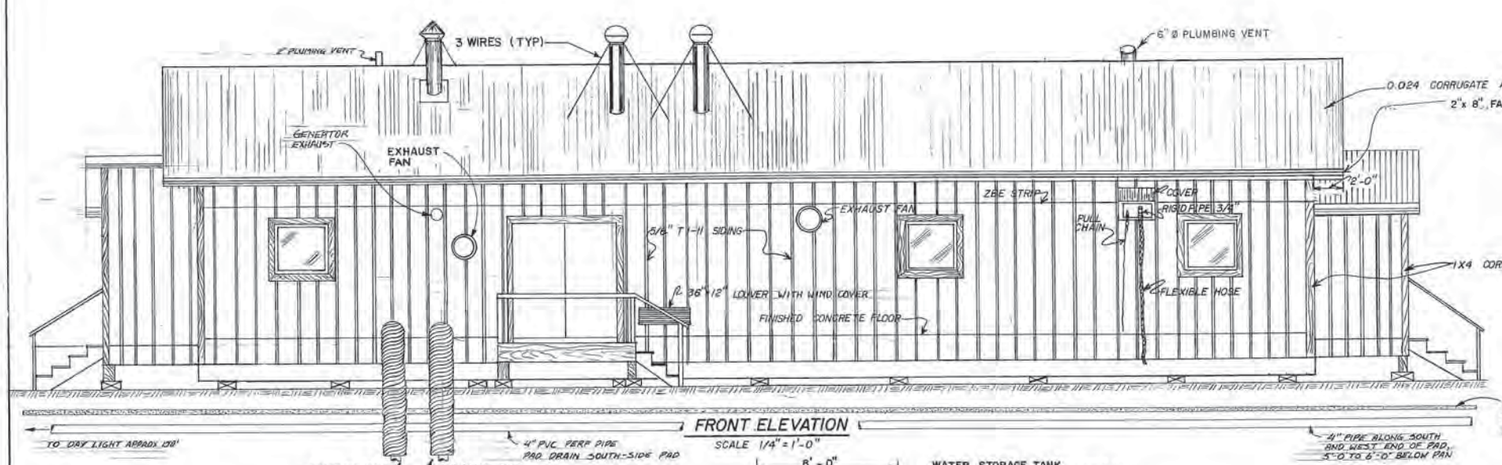
DRAWN	GRID	COMP FILE NO. 516V-1	FIGURE V-1
SCALE 1"=200'	DATE 12-21-92	FILE DRAWER NO.	
F.B. PG.	W.O. H92516		

FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washateria-Water Treatment Facility\draft\FIG A-3.dgn
TIME: 09-DEC-2010 11:52
JOB No. 1006675.040101

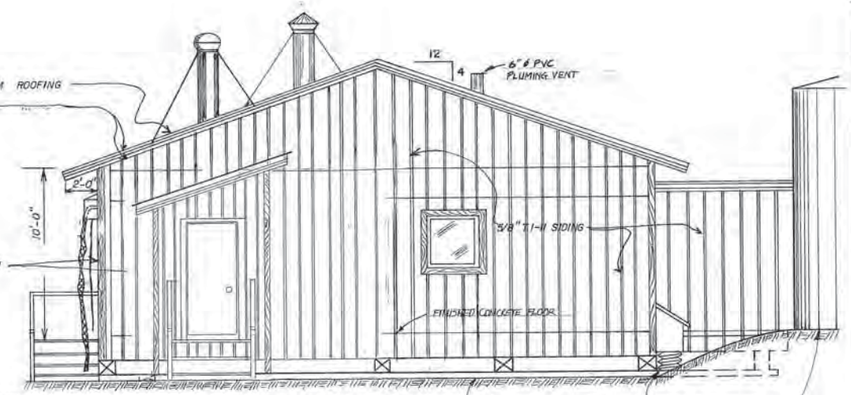
Stantec
Stantec Consulting Services Inc.
725 East Fireweed Lane Suite 200
Anchorage, AK 99503-2245
Tel (907) 276-4245 • www.stantec.com

Figure 2
Site Plan

Figure 3 - Existing Layout

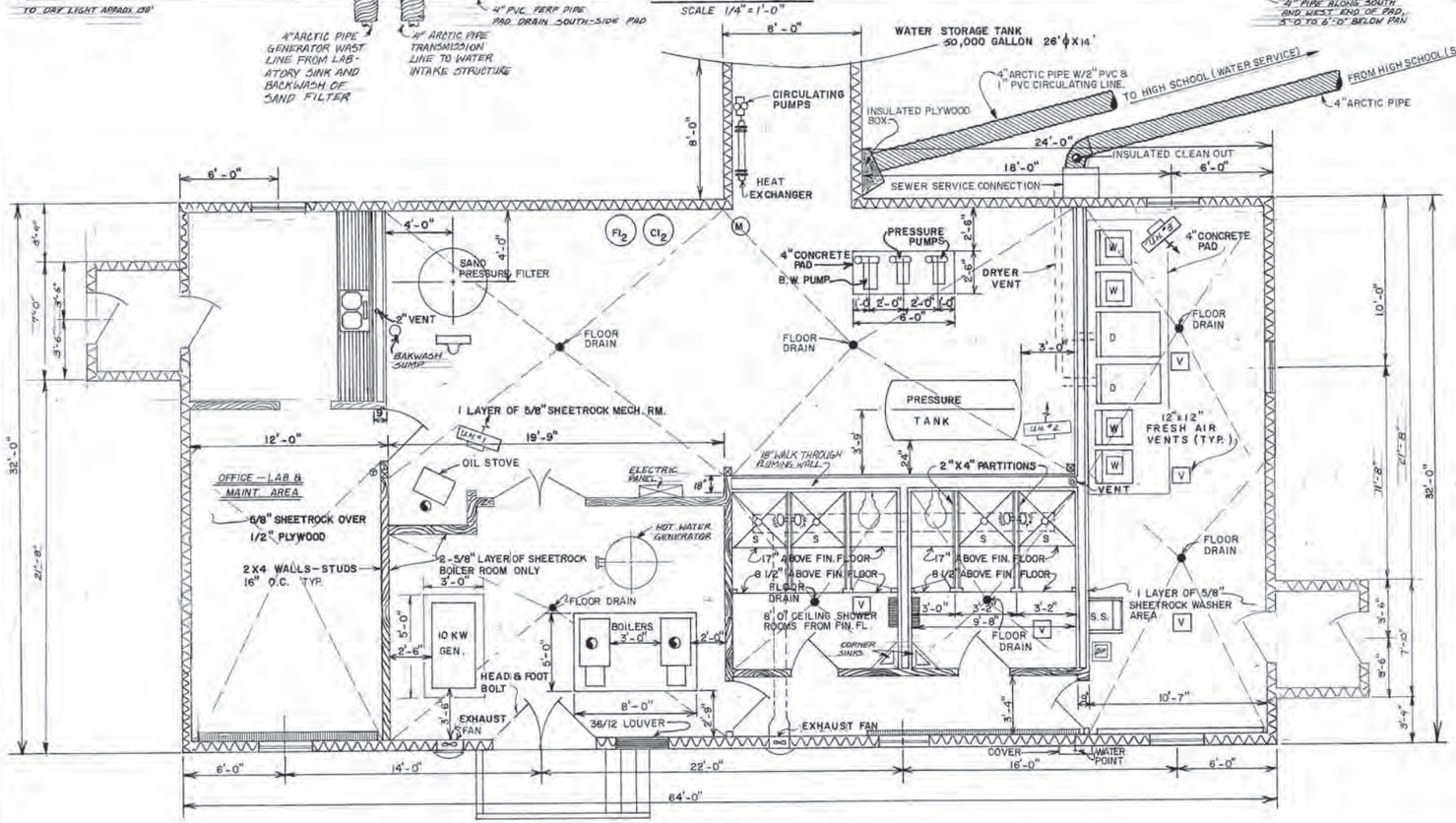


FRONT ELEVATION
SCALE 1/4" = 1'-0"



RIGHT END ELEVATION
SCALE 1/4"=1'-0"

BUILDING PAD ELEVATION ASSUMED AT 100.0'
TO SEPTIC TANK
TANK ELEVATION ASSUMED AT 102.64'



FLOOR PLAN
SCALE 1/4"=1'-0"

NOTES

1. SLOPE CONCRETE FLOOR TO FLOOR DRAIN, MINIMUM SLOPE 1/16" PER FOOT.
2. BOILER ROOM TO RECEIVE 2 LAYER OF 5/8" SHEET ROCK.
3. INTERIOR SIDE OF ALL BUILDING PANELS TO BE COVERED BY 5/8" SHEET ROCK INTERIOR PARTITIONS SHALL BE COVERED AS NOTED.
4. TAPE ALL JOINTS
5. EXTERIOR LATEX PAINT SYSTEM FOR BUILDING
6. PLACE 4 MIL VAPOR BARRIER BETWEEN 5/8" SHEET ROCK AND 1/2" PLYWOOD INTERIOR OF ALL BUILDING PANELS.

AS BUILT

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	GLR
SEPT 80	AS-BUILT CHANGES	PML

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
WATER TREATMENT AND WASHETERIA
FLOOR PLAN AND ELEVATIONS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 7 OF 23 TOTAL SHEETS

DRAWN BY: georgia a. greatreaks
DATE: december 07, 1977
CHECKED BY: T.T.L.
DATE: 9/6/78

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

T.T.L. Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA 49TH JOHN T. LOVETT No. 3312-E REGISTERED PROFESSIONAL ENGINEER

U.S. GOVERNMENT PRINTING OFFICE: 1977-789-789

Figure 3: Existing Facilities Drawing

Figure 4 – Preferred Alternative Location Options

PER TUNUNAK STANTEC 2020

APPROXIMATE LOCATION
10' Wide ROW Easement
EIN 10C

US Survey No. 4054
Lots 2 & 3

SCHOOL

B

X

A

20' Utility Easement

C

ALLAQ RD.

ATACAQ LN.

NUNG RD.

ALLAQ ROAD

15' Utility Easement

15' Utility Easement

ALLAQ ROAD

LEGEND:

X =
LOCATION OF EXISTING WASHETERIA AND WATER TREATMENT PLANT

OPTIONS A, B, OR C:
POTENTIAL LOCATION OF NEW WASHETERIA AND WATER TREATMENT PLANT.

SCALE: 1"=50'

<Pick location in Project Information>
3/16/2017 4:37:23 PM

ORIGINAL SHEET - ANSI D

D.2.3

Stantec
Stantec Consulting Services Inc.
725 East Fireweed Lane, Suite 200
Anchorage, AK 99503-2245
Tel: (907) 276-4245 • www.stantec.com

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing. Any discrepancies must be reported to the Consultant immediately. The Copyright to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other than that authorized by Stantec is forbidden.

Consultant

Issued/Revision	By	Appd	YYYY.MM.DD

Permit/Seal

PRELIMINARY NOT FOR CONSTRUCTION
Not for permits, pricing or other official purposes. This document has not been completed or checked and is for general information or comment only.

Figure 4 -
Location Options

Client/Project
Alaska DEC, Village Safe Water Program
VSW Tununak PER and ER

Project No.:2047057401
File Name: N/A
Scale:

Dwn.	Dsgn.	Chkd.	03/17/17 YYYY.MM.DD

Title
WASHETERIA OPTIONAL LOCATIONS PLAN

Revision:
Drawing No.
G1

7.0 LIST OF PREPARERS

Table 3 provides the list of personnel involved in the preparation of this ER.

Table 3 – ER Preparers

Name/Title	Affiliation	Area of Input
Susan Randlett, P.E., VSW Engineer	ADEC, VSW	Document review, and project and grant management for VSW
James James, Tununak Tribal Administrator	City of Tununak	Alternatives evaluation
Sara Lindberg, Environmental Lead	Stantec	ER development
Bob Gilfilian, P.E., Senior Civil Engineer	Stantec	PER development and review
Owen Haskell, Water Resources EIT	Stantec	PER and ER development and research
Ursula Dickeson, CDT, Technical Editor	Stantec	Technical editing, formatting, and review

Appendix A AGENCY CORRESPONDENCE

From: Lindberg, Sara
To: "catherine_yeargan@fws.gov"
Subject: Comments requested- Tununak Water Treatment Plant and Washeteria
Date: Tuesday, April 11, 2017 1:54:00 PM
Attachments: Fig4_LocationOptionsA.pdf
Location B- Tununak school (blue bldg) water storage tank and washeteria (red bldg) (002).JPG
Location C- Water line to Clinic Tununak (002).JPG
Location A vicinity- Tununak School Utilidor from Washeteria (002).JPG

Hello Catherine
I left you a voicemail as well, but I thought I would follow up with an email for additional background.
Stantec, on behalf of Village Safe Water is requesting your comments on the proposed new Water treatment Plant (WTP) and Washeteria in Tununak. The purpose of the project is to provide a safe and functional washeteria and WTP to the community. The condition of the existing WTP and washeteria is substandard and the facility is in poor physical condition and disrepair.

The Proposed Action would provide Tununak with a new washeteria and WTP within a modular building placed at a location selected by the community. The building would be placed on a triodetic foundation system which requires no fill or excavation, and very little disturbance. Three locations are being considered and are shown on the attached Figure 4. Initial comments from the community show they prefer location B. I have also attached ground photos of all three potential building locations for your review. VSW is in the process of applying for a USDA RUS grant for the design of this project, and Stantec is completing an Environmental Review to comply with the USDA NEPA process.

The IPaC website shows the project area is within the range of the Spectacled Eider. Given the disturbed nature of the project site and the concentration of human activity, we do not believe the project would affect their migration in this region.
Please provide your comments about requirements for Section 7 consultation for this project. It is our hope that we can incorporate any avoidance and minimization measures for the Spectacled Eider into the construction documents and be able to complete informal Section 7 consultation for via this email correspondence.
Thank you
Sara

Sara Lindberg
Manager, Environmental Services
Stantec
725 East Fireweed Lane, Suite 200
Anchorage, AK 99503-2245
Phone: (907) 343-5250
Cell: (907) 328-9622
Fax: (907) 258-4653
sara.lindberg@stantec.com

The content of this email is the confidential property of Stantec and should not be copied, modified, retransmitted, or used for any purpose except with Stantec's written authorization. If you are not the intended recipient, please delete all copies and notify us immediately.

Please consider the environment before printing this email.

From: Lindberg, Sara
To: "Duvall, Shina A (DNR)"
Cc: Smith, Ross
Subject: Comments requested- Tununak Water Treatment Plant and Washeteria
Date: Tuesday, April 11, 2017 11:44:00 AM
Attachments: Fig4_LocationOptionsA.PDF
Location B- Tununak school (blue bldg) water storage tank and washeteria....jpg
Location C- Water line to Clinic Tununak (002).jpg
Location A vicinity- Tununak School Utilidor from Washeteria (002).jpg
conditions surrounding washeteria- washeteria and storage tank (002).jpg

---

Hi Shina
Stantec, on behalf of Village Safe Water is requesting your comments on the proposed new Water treatment Plant (WTP) and Washeteria in Tununak. The purpose of the project is to provide a safe and functional washeteria and WTP to the community. The condition of the existing WTP and washeteria is substandard and the facility is in poor physical condition and disrepair.

The Proposed Action would provide Tununak with a new washeteria and WTP within a modular building placed at a location selected by the community. The building would be placed on a triodetic foundation system which requires no fill or excavation, and very little disturbance. In addition to a new building, a new utilidor will be needed connecting the existing water tank to the new building. Depending on the building location selected, there may not be any ground disturbance associated with the utilidor. If new utilidor supports are needed, they would consist of helical piles that would be bored into the ground, and no excavation or backfill would be involved. Helical piles, if needed would be bored to an approximate depth of 4 feet below the ground surface. Three locations are being considered for the new building and are shown on the attached Figure 4. Initial comments from the community show they prefer location B. I have also attached ground photos of all three potential building locations for your review. VSW is in the process of applying for a USDA RUS grant for the design of this project, and Stantec is completing an Environmental Review to comply with the USDA NEPA process.

Ross Smith completed a literature review of available cultural and historic information for the project site. There is little available information in the AHRS database or other Publicly available references regarding potential cultural and historic resources present within or adjacent to the project site. The preferred Location B is within the recorded boundary of the Historic Village of Tununak (assigned AHRS site number XNI-048). While no visible surface resources were reported during three cultural resources surveys conducted immediately north of the Proposed Action area in 2010, 2011, and 2013, there are no available records that any subsurface investigations were completed within or adjacent to Location B.

Please let us know if you have any comments or concerns about the proposed work. I will follow up with a phone call to you this afternoon.
Thank you
Sara

Sara Lindberg
Manager, Environmental Services
Stantec
725 East Fireweed Lane, Suite 200
Anchorage, AK 99503-2245
Phone: (907) 343-5250
Cell: (907) 328-9622
Fax: (907) 258-4653
sara.lindberg@stantec.com

The content of this email is the confidential property of Stantec and should not be copied, modified, retransmitted, or used for any purpose except with Stantec's written authorization. If you are not the intended recipient, please delete all copies and notify us immediately.

Please consider the environment before printing this email.

Lindberg, Sara

From: Lindberg, Sara
Sent: Thursday, April 13, 2017 2:38 PM
To: 'Duvall, Shina A (DNR)'
Cc: Smith, Ross
Subject: RE: Comments requested- Tununak Water Treatment Plant and Washeteria

Hi Shina
Thanks for speaking with me this morning.
I wanted to send you a summary of our conversation. I plan to add your feedback into the Environmental Report as discussed, and I'll put this email in the Appendix for the record. Please let me know if what I have captured here is accurate, or if you have any additions or changes.

It appears (and Ross double checked) that Location B for the proposed new washeteria and WTP are within the boundary of the Historic Village of Tununak. That designation does include some archaeological resources associated with it. There is a potential for effects to cultural and historic resources as a result of this project, depending on the nature of the project and scope of disturbance. USDA RUS will need to conduct Section 106 consultation for this project. During that process, the area of potential effect (APE) will be defined, and a determination of effect will be proposed.

As we found during our desktop review of the AHRS database and publicly available resources, there is no documenting of subsurface investigations within the proposed building sites. Therefore, justification will need to be made during the Section 106 process as to whether the nature of the project and scope of disturbance warrants completing a cultural resource survey. Our knowledge of the project and current design does not show any disturbance proposed for the new building foundation. Depending on the location of the proposed building site, and the length of new utilidor that will be needed to connect the building to the existing water tank, a small number of helical piles may be needed for support. However, due to the very minimal disturbance associated with such work, we believe a justification of no historic properties affected is reasonable for this project. In addition, the construction contract will contain the following provision:

- Should cultural or paleontological resources be discovered as a result of this activity, all work that could impact these resources will halt and the VSW Project Engineer and SHPO will be notified immediately. Work will not resume at these sites until Section 106 consultation is conducted with USDA and SHPO.

Thank you, let me know if you'd like to see anything else.
Sara

Sara Lindberg
Manager, Environmental Services
Stantec
725 East Fireweed Lane, Suite 200
Anchorage, AK 99503-2245
Phone: (907) 343-5250
Cell: (907) 328-9622
Fax: (907) 258-4653
sara.lindberg@stantec.com



The content of this email is the confidential property of Stantec and should not be copied, modified, retransmitted, or used for any purpose except with Stantec's written authorization. If you are not the intended recipient, please delete all copies and notify us immediately.

Please consider the environment before printing this email.

From:	Lindberg, Sara
To:	"ryan.h.winn@usace.army.mil"
Subject:	Comments requested- Tununak Water Treatment Plant and Washeteria
Date:	Tuesday, April 11, 2017 11:44:00 AM
Attachments:	Fig4_LocationOptionsA.PDF Location B- Tununak school (blue bldg) water storage tank and washeteria....jpg Location C- Water line to Clinic Tununak (002).jpg Location A vicinity- Tununak School Utilidor from Washeteria (002).jpg conditions surrounding washeteria- washeteria and storage tank (002).jpg

---

Hello Ryan,
I left you a voicemail as well, but thought I would follow up with an email to give you some further background.
Stantec, on behalf of Village Safe Water is requesting your comments on the proposed new Water Treatment Plant (WTP) and Washeteria in Tununak. The purpose of the project is to provide a safe and functional washeteria and WTP to the community. The condition of the existing WTP and washeteria is substandard and the facility is in poor physical condition and disrepair.

The Proposed Action would provide Tununak with a new washeteria and WTP within a modular building placed at a location selected by the community. The building would be placed on a triodetic foundation system which requires no fill or excavation, and very little disturbance. Three locations are being considered and are shown on the attached Figure 4. Initial comments from the community show they prefer location B. I have also attached ground photos of all three potential building locations for your review. VSW is in the process of applying for a USDA RUS grant for the design of this project, and Stantec is completing an Environmental Review for them to comply with the USDA NEPA process.

No NWI mapping exists for the Tununak area. However, based on available aerial and ground photography provided by community members (see attached), the ground surrounding the existing washeteria appears to be disturbed, and evidence of saturated soil, hydrophytic vegetation, and hydrology are not visible. In fact, some footpaths through the project site show rocky and apparently well drained soils. In lower areas outside and further west of the washeteria, outside the project area, vegetation appears to grow on tussocks, and snow machine tracks have left scars in undisturbed tundra, showing evidence of darker, possibly wet soils underneath. Therefore, we believe it is likely wetlands occur within undisturbed tundra outside the project area, but areas immediately adjacent to the existing washeteria and WTP are highly disturbed, and appear better drained. VSW requests your comments on the project. Should any proposed activities occur outside of previously disturbed lands adjacent to existing structures within the project area, we will recommend that the USACE be consulted again and that a Section 404 permit may be required. Please let us know if you have any comments or have any best management practices you would like to see incorporated into project documents.

Thank you
Sara

Sara Lindberg
Manager, Environmental Services
Stantec
725 East Fireweed Lane, Suite 200
Anchorage, AK 99503-2245
Phone: (907) 343-5250
Cell: (907) 328-9622
Fax: (907) 258-4653
sara.lindberg@stantec.com

The content of this email is the confidential property of Stantec and should not be copied, modified, retransmitted, or used for any purpose except with Stantec's written authorization. If you are not the intended recipient, please delete all copies and notify us immediately.

PER TUNUNAK STANTEC 2020

APPROXIMATE LOCATION
10' Wide ROW Easement
EIN 10C

US Survey No. 4054
Lots 2 & 3

SCHOOL

B

X

A

20' Utility Easement

C

ALLAQ RD.

ATACAQ LN.

NUNG RD.

ALLAQ ROAD

15' Utility Easement

15' Utility Easement

ALLAQ ROAD

LEGEND:

X =
LOCATION OF EXISTING WASHETERIA AND WATER TREATMENT PLANT

OPTIONS A, B, OR C:
POTENTIAL LOCATION OF NEW WASHETERIA AND WATER TREATMENT PLANT.

SCALE: 1"=50'

<Pick location in Project Information>
3/16/2017 4:37:23 PM

ORIGINAL SHEET - ANSI D

D.2.3

Stantec
Stantec Consulting Services Inc.
725 East Fireweed Lane, Suite 200
Anchorage, AK 99503-2245
Tel: (907) 276-4245 • www.stantec.com

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing. Any discrepancies must be reported to the Consultant immediately. The Copyright to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other than that authorized by Stantec is forbidden.

Consultant

Issued/Revision	By	Appd	YYYY.MM.DD

Permit/Seal

PRELIMINARY NOT FOR CONSTRUCTION
Not for permits, pricing or other official purposes. This document has not been completed or checked and is for general information or comment only.

Figure 4 -
Location Options

Client/Project
Alaska DEC, Village Safe Water Program
VSW Tununak PER and ER

Project No.:2047057401
File Name: N/A
Scale:

Dwn.	Dsgn.	Chkd.	03/17/17 YYYY.MM.DD

Title
WASHETERIA OPTIONAL LOCATIONS PLAN

Revision:
Drawing No.
G1


PAUL T. ALBERT
MEMORIAL SCHOOL

PER TUNUNAK
STANTEC 2020





95%
PER

D.3 As-Built Records

D.3.1 1980 As-builts for Tununak Sanitation Project

1980 Record Drawings, *"Construction Plans Sanitation Facilities Tununak, AK"* The signed As-Built record for the original Tununak Water, Septic, and Washeteria project completed between 1978-1980. Referenced in text as "1980 As-Builts." Length 28 Pages.

CONSTRUCTION PLANS

SANITATION FACILITIES

TUNUNAK, ALASKA

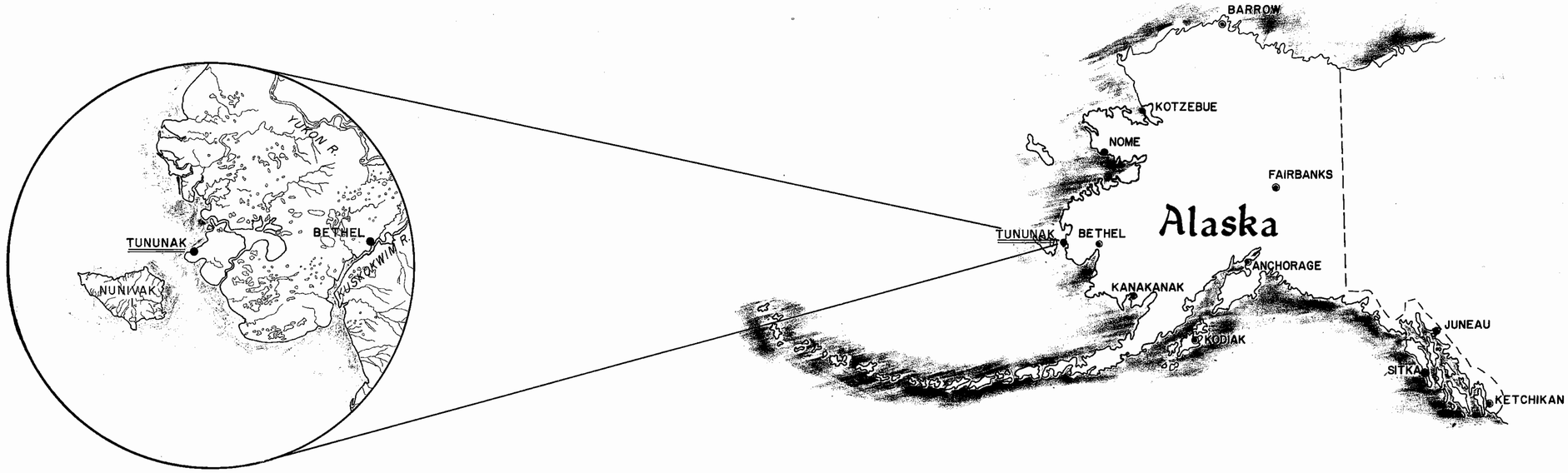


TABLE OF CONTENTS

SHEET NO.	ITEM
1	TITLE SHEET
2	SITE PLAN -OVERALL
3	SITE PLAN- WATER TREATMENT PLANT
4	WATER TREATMENT PLANT- FLOOR PLAN
5	DOOR AND WINDOW DETAILS
6	FOUNDATION PLAN
7	FLOOR PLAN AND ELEVATIONS
8	WASHETERIA ELEVATION AND CROSS SECTION
9	SHOWER ROOM DETAILS
10	TANK CONNECTION DETAIL
11	PLUMBING SCHEMATIC
12	BOILER, SHOWER AND WASHER ROOM SCHEMATIC
13	SUMMER DISTRIBUTION WATERING POINT DETAILS
14	SEPTIC TANK AND DRAINFIELD
15	HOT WATER GENERATOR & WATER PRESSURE TANK
16	48" PRESSURE FILTER DETAIL
17	STANDARD DETAILS
18	50,000 GALLON AWWA WATER TANK AND DETAILS
19	DAM AND INFILTRATION GALLERY DETAILS
20	W.T. BUILDING ELECTRICAL AND MECHANICAL PLAN
21	ALARM PANEL AND LOAD CENTER
22	SPECIFICATION SHEET
23	FUEL STORAGE AND TRANSFER

ALASKA AREA NATIVE HEALTH SERVICE
OFFICE OF ENVIRONMENTAL HEALTH
P.O. BOX 7-741
ANCHORAGE, ALASKA 99510

PUBLIC LAW 86-121 PROJECT

PROJECT NO. AN-77-631

U. S. DEPT. OF HEALTH EDUCATION & WELFARE

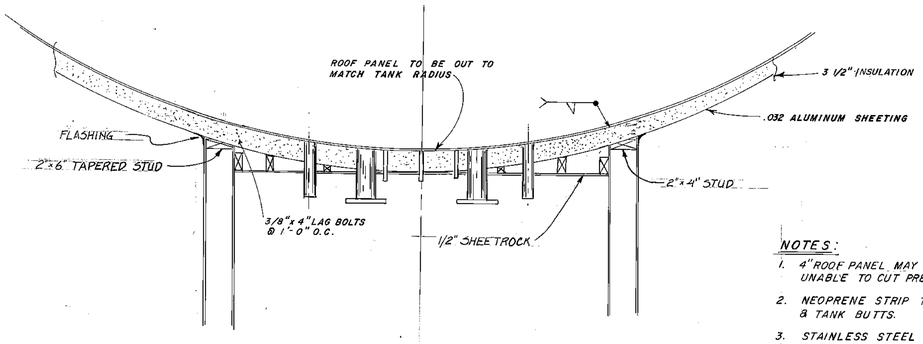
PUBLIC HEALTH SERVICE

INDIAN HEALTH SERVICE

AS BUILT

STATE OF ALASKA
JOHN T. LOVETT
No. 3512E
REGISTERED PROFESSIONAL ENGINEER

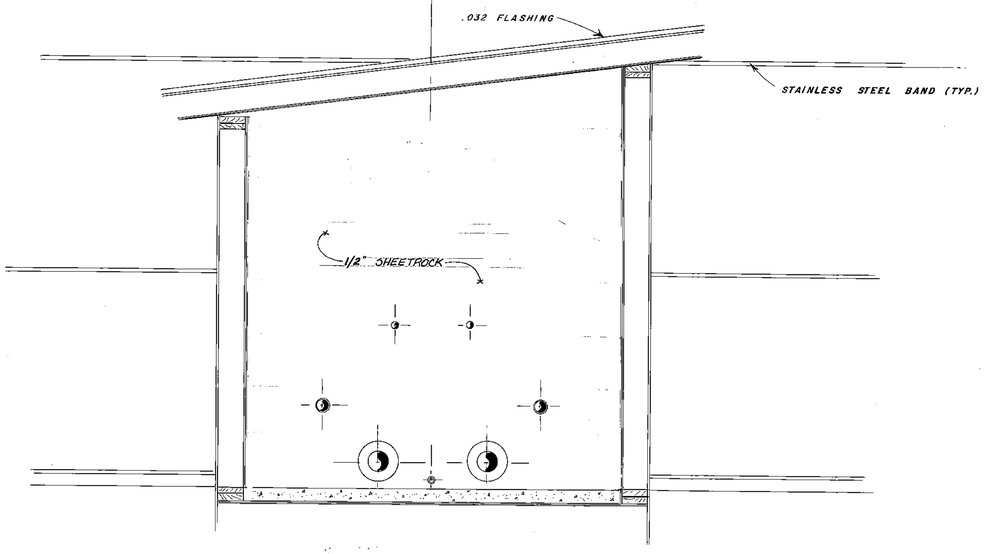
☆ U. S. GOVERNMENT PRINTING OFFICE: 1977—797-787



PLAN

NOTES:

1. 4" ROOF PANEL MAY BE CONSTRUCTED IN FIELD IF UNABLE TO CUT PREFAB PANEL.
2. NEOPRENE STRIP TO BE PLACED WHERE PANELS & TANK BUTTS.
3. STAINLESS STEEL BAND TO BE SECURED TO PLATE AT UTILADOR.
4. FLASHING TO BE PLACED ON ROOF & WALLS CONNECTION AT TANK AS SHOWN.



ELEVATION

TANK CONNECTION DETAIL

SCALE 3/4" = 1'-0"

AS BUILT

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	CLC

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA

TANK CONNECTION DETAIL

PUBLIC LAW 86-121 PROJECT

PROJECT NO AN-77-631

SHEET NO. 10 OF 23 TOTAL SHEETS

DRAWN BY: LEE DATE: 2-21-78

CHECKED BY: TTL DATE: 6/4/80

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

T.T.L. Design Engineer

Maintenance Review

Material Take-off

STATE OF ALASKA 49TH JOHN T. LOVETT No. 3512-E REGISTERED PROFESSIONAL ENGINEER

☆U.S.GOVERNMENT PRINTING OFFICE: 1977—736-296

DETAIL WATER STORAGE TANK HEAT EXCHANGER

NOTES

1. ALL PIPING TO BE COPPER UNLESS OTHERWISE NOTED.
2. ALL EXPOSED PIPING WILL BE PAINTED USING THE FOLLOWING COLOR CODE:
   - GREEN – RAW WATER
   - BLUE – POTABLE WATER
   - BLACK – HEATING
   - RED – FIRE
   - BROWN – SEWAGE
   - GREY – COMPRESSED AIR
   - ORANGE – FUEL
3. TYPE OF PAINT TO BE USED GARLOCK, OR EQUAL.
4. DIRECTION OF FLOW WILL BE INDICATED BY ARROWS AND NAME PLATES FOR MATERIAL BEING CARRIED.

∘ LEGEND ∘

H	HOT WATER LINE PRIMARY SYSTEM
HW	HOT WATER HEAT LINES
HR	HEAT RETURN LINES
D	DRAIN & OVERFLOW LINE
CWM	COLD WATER MAKEUP LINES
BP	BYPASS LINE
BW	BACK WASH LINES
C	COLD WATER
LWC	LOW WATER CUT OFF
CP	CHEMICAL PUMP
C	CIRCULATING PUMP
	BALANCING VALVE
	MOTOR OPERATED VALVE (ZONE VALVE)
	QUICK CLOSING VALVE
	PRESSURE GAUGE
LL	LIQUID LEVEL INDICATOR
M	WATER METER
	GATE VALVE
	CHECK VALVE
	UNION
	AUTOMATIC AIR RELIEF
	PRESSURE RELIEF VALVE
	ADAPTOR
	FLEX COUPLING
	AIR ELIMINATING
A	AQUASTAT
FS	FLOW SWITCH
T	THERMOMETER
	PRESSURE REDUCING VALVE

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	CJC
SEPT 80	AS-BUILT CHANGES	PML
8-15-79	REPLACE PRESSURE PUMPS; ADDED LOOP TO SCHOOL	MD

AS BUILT

Design Engineer J.T.L.

Maintenance Review

Material Take-off

STATE OF ALASKA 49TH JOHN T. LOVETT No. 3512 S REGISTERED PROFESSIONAL ENGINEER

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

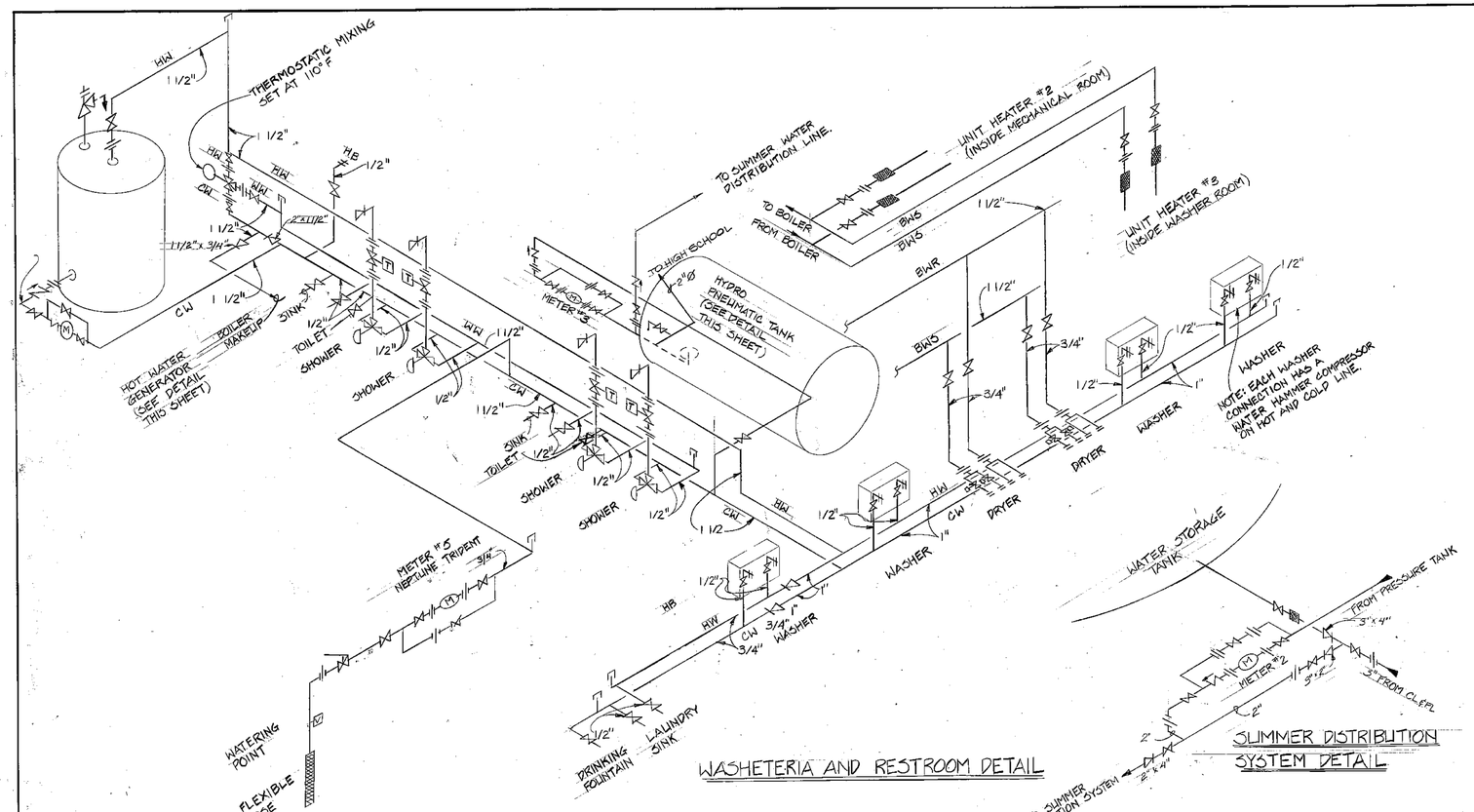
TUNUNAK, ALASKA
PLUMBING SCHEMATIC
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

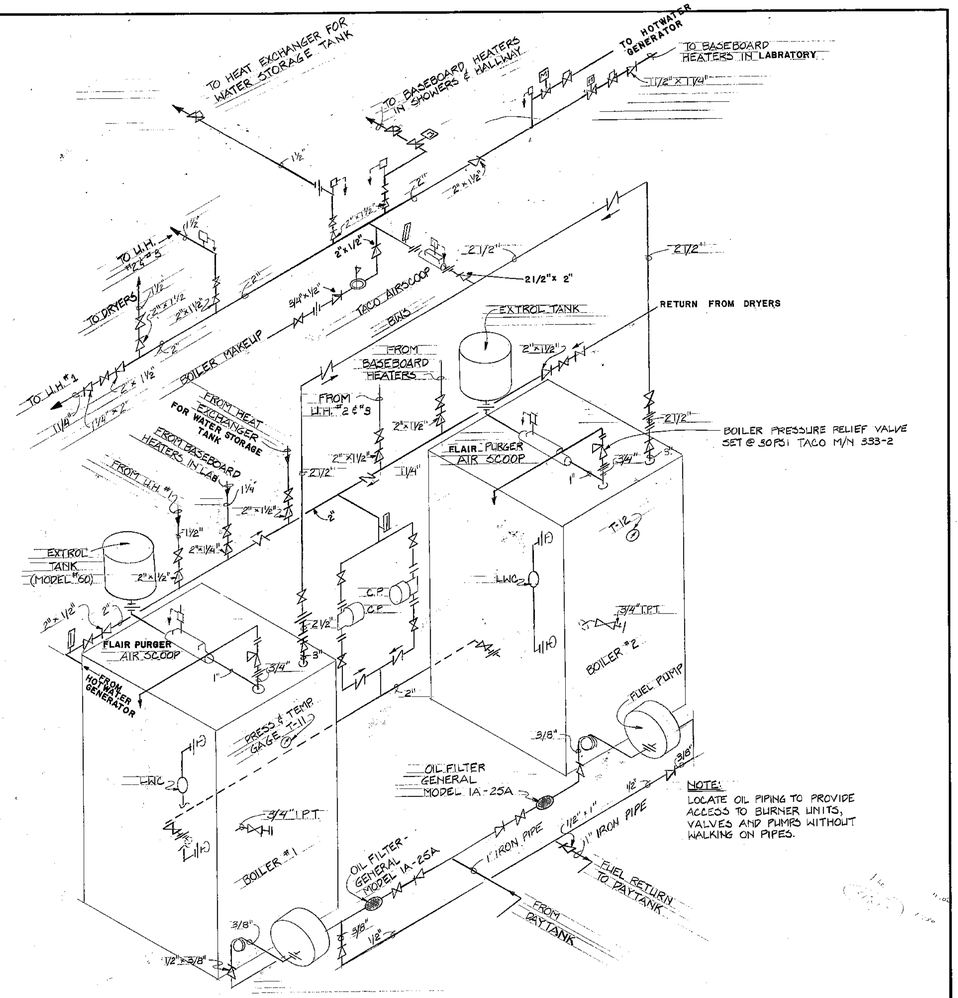
SHEET NO. 11 OF 23 TOTAL SHEETS

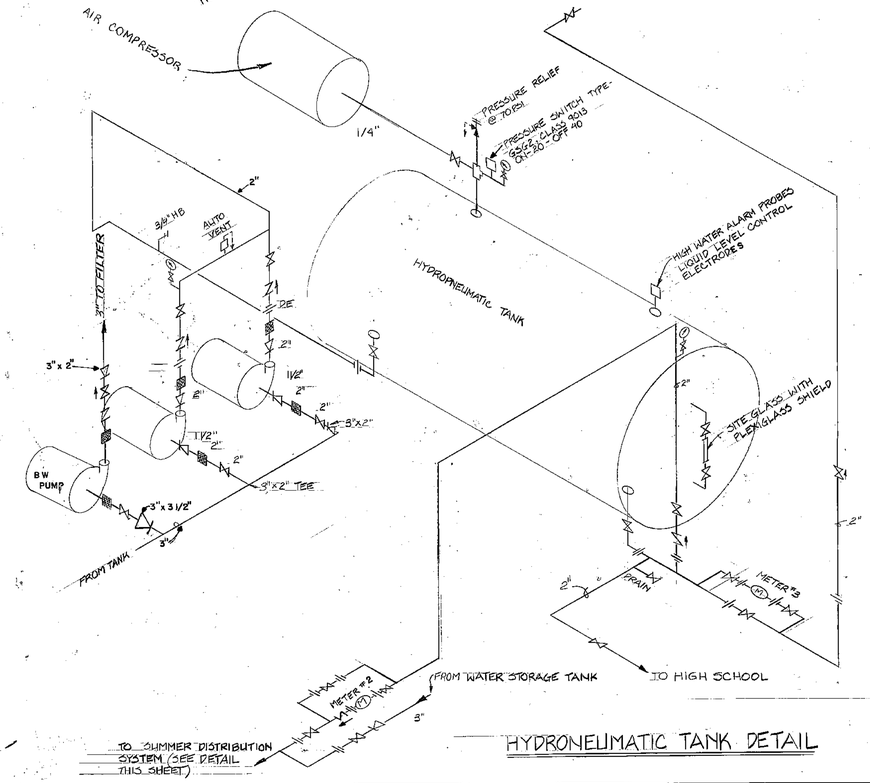
DRAWN BY: LAVELL DATE: DEC. 1977
CHECKED BY: J.T.L. DATE: 6/6/78

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

☆U.S.GOVERNMENT PRINTING OFFICE: 1977—730-286

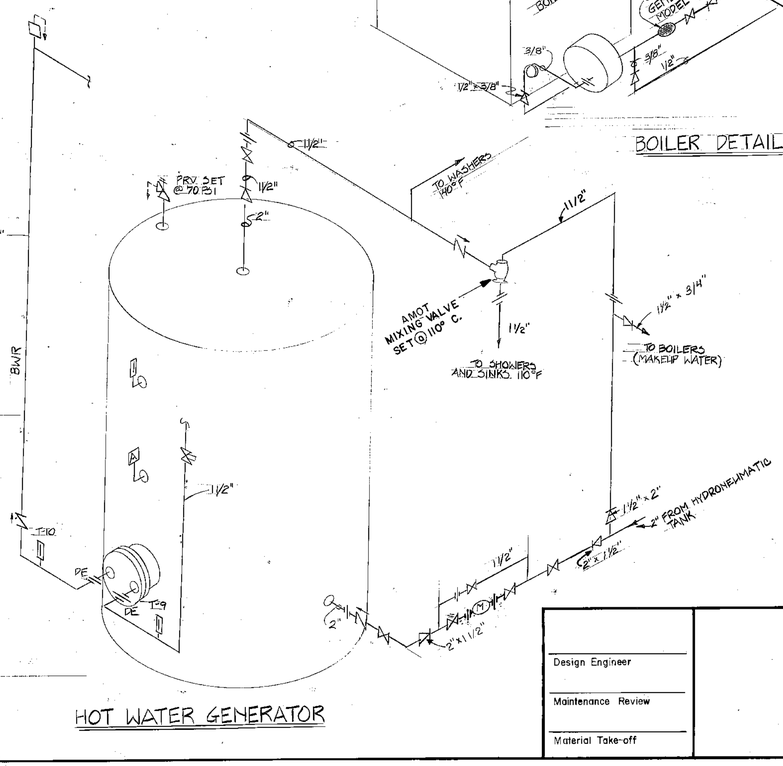






LEGEND

- GATE VALVE
- CHECK VALVE
- FLEX PIPE
- UNION
- AQUASTAT
- FLOW SWITCH
- THERMOMETER
- PRESSURE REDUCE VALVE
- PRESSURE GAUGE
- PRESSURE RELIEF VALVE
- AUTOMATIC AIR RELIEF
- MOTOR OPERATED ZONE VALVE
- SOLENOID VALVE
- SOLENOID VALVE WITH TIMER
- WHISTLE VALVE
- BALANCING VALVE
- VACUME BREAKER



FEB 80	AS-BUILT	CLC
MARCH 80	AS BUILT CHANGES	D.L.
SEPT 80	AS-BUILT CHANGES	PML
DATE	REVISIONS	INITIALS

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
BOILER ROOM PIPING SCHEMATIC
SHOWER & WASH ROOM SCHEMATIC
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-639

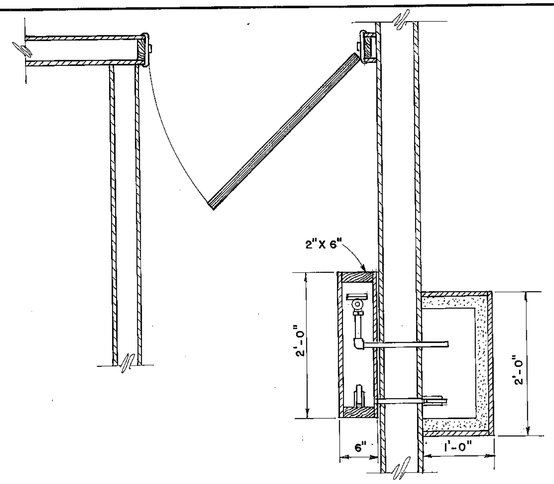
SHEET NO. 12 OF 23 TOTAL SHEETS

Design Engineer
Maintenance Review
Material Take-off

DRAWN BY: CLC DATE: FEB 80
CHECKED BY: DATE:

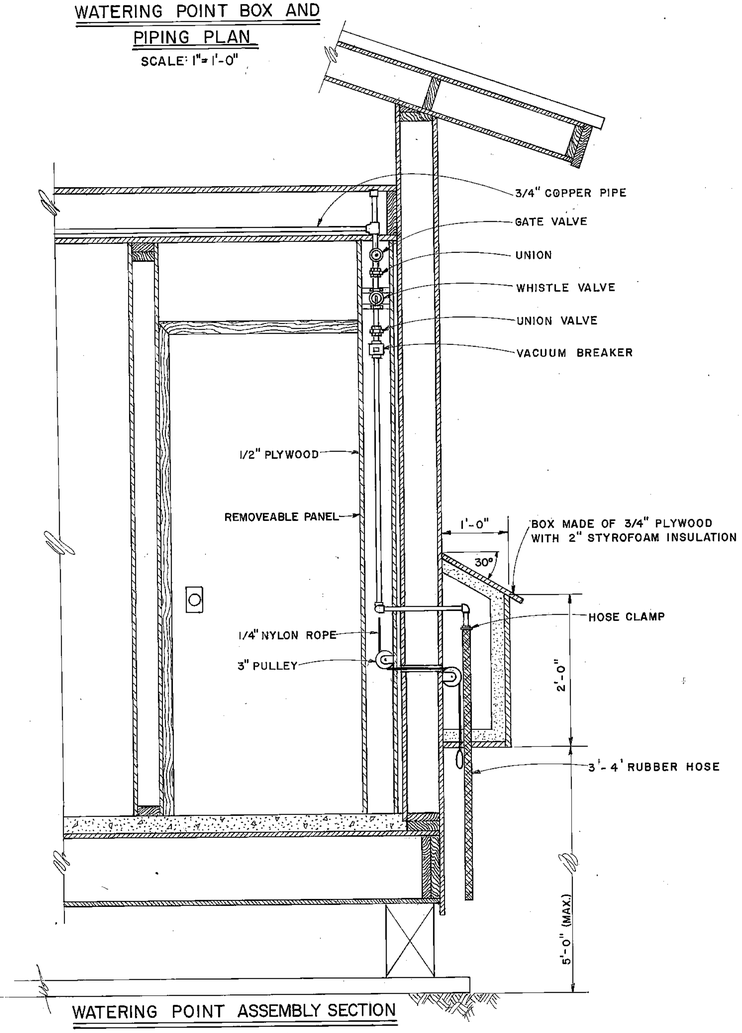
SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

☆U.S.GOVERNMENT PRINTING OFFICE: 1978—796-319



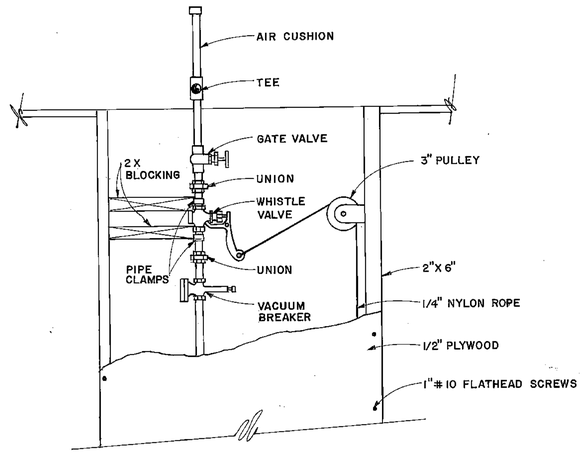
WATERING POINT BOX AND PIPING PLAN

SCALE: 1"= 1'-0"



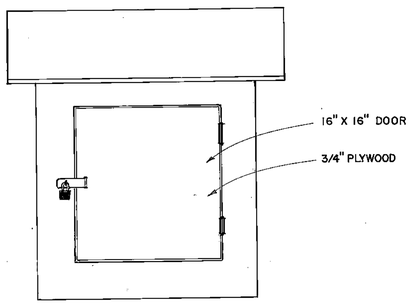
WATERING POINT ASSEMBLY SECTION

SCALE: 1"= 1'-0"



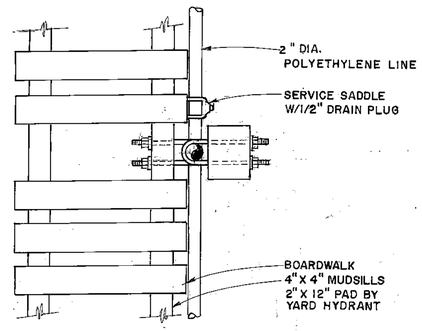
FRONT ELEVATION

NTS



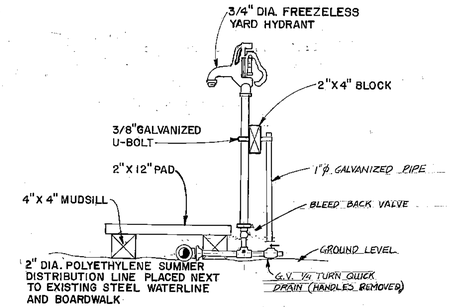
WATERING POINT BOX ELEVATION

NTS



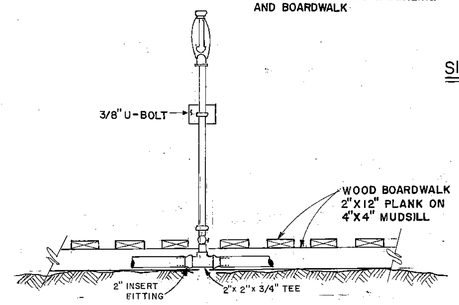
TOP VIEW

NTS



SIDE VIEW

NTS



ELEVATION

NTS

SUMMER DISTRIBUTION WATERING POINT

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	CLC
MARCH 80	AS BUILT CHANGES	D.L.

AS BUILT

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
SUMMER DISTRIBUTION WATERING POINT DETAILS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-639

SHEET NO. 13 OF 23 TOTAL SHEETS

DRAWN BY: B. KIRSCHBAUM
DATE: MARCH, 1978

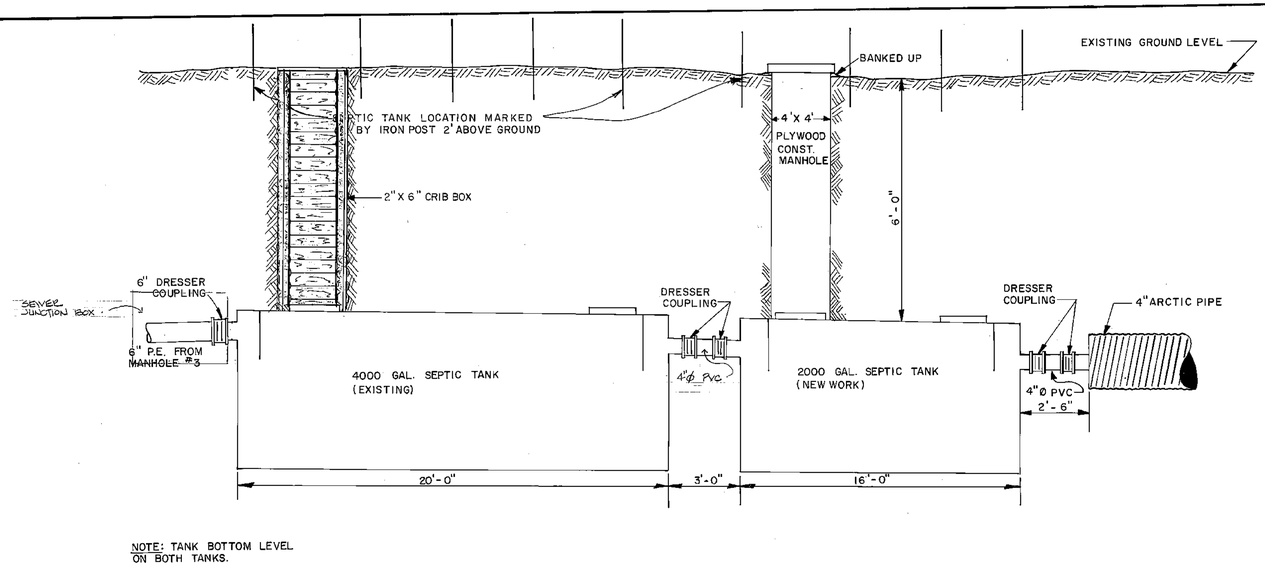
CHECKED BY: JTL
DATE: 6/27/78

JTL
Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA 49TH
JOHN T. LOVETT No. 3512-E
REGISTERED PROFESSIONAL ENGINEER

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

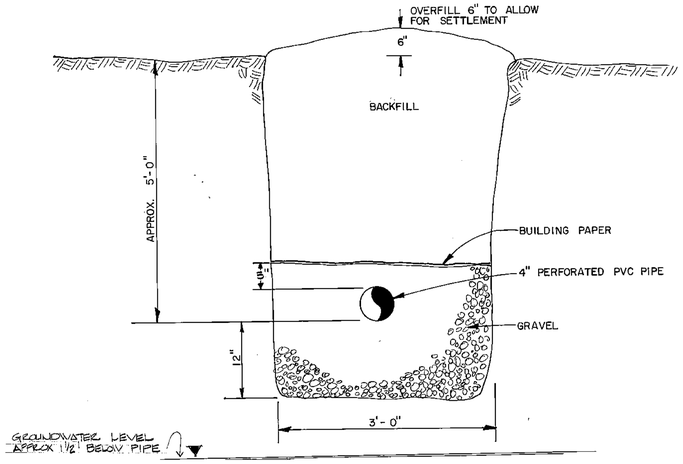
☆U.S.GOVERNMENT PRINTING OFFICE: 1977—759-265



NOTE: TANK BOTTOM LEVEL ON BOTH TANKS.

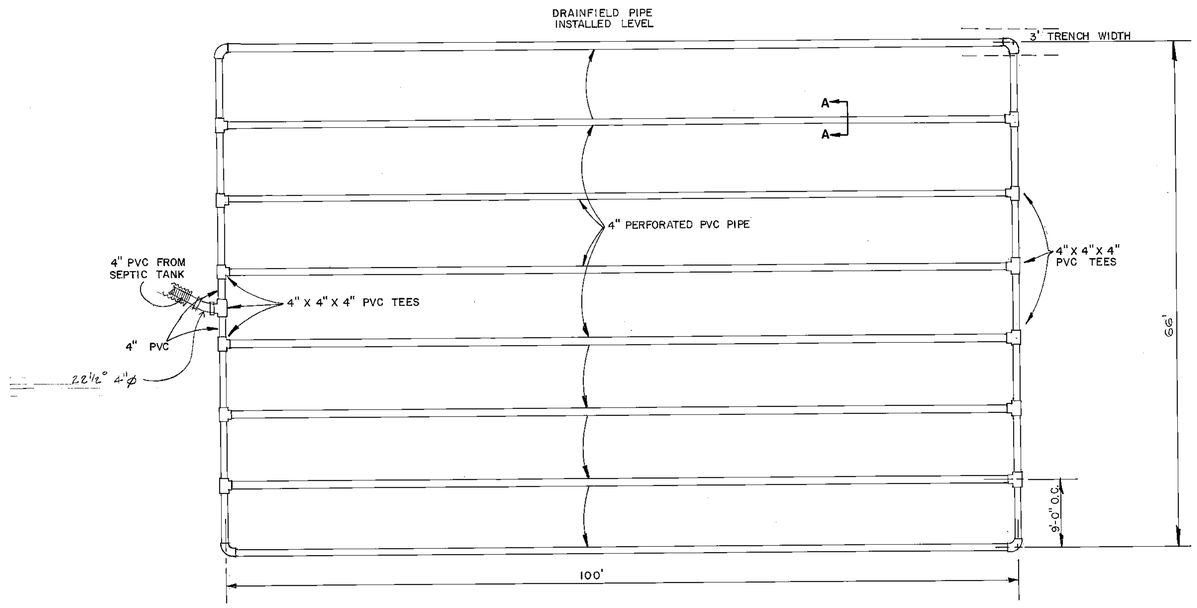
SEPTIC TANK INSTALLATION

NTS



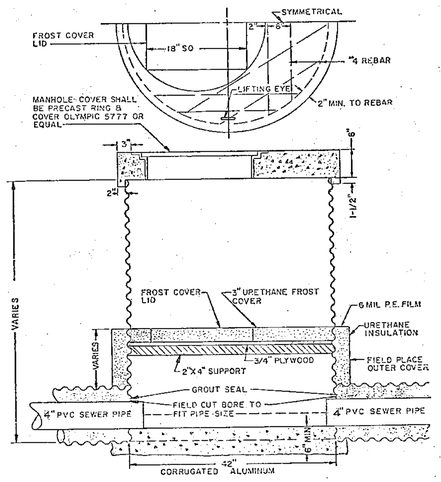
DRAINFIELD CROSS-SECTION A-A

NTS



DRAINFIELD - PLAN VIEW

NTS



STANDARD ARCTIC MANHOLE

NO SCALE

AS BUILT

DATE	REVISIONS	INITIALS
SEPT 80	AS-BUILT CHANGES	PML

Design Engineer

Maintenance Review

Material Take-off

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA

SEPTIC TANK & DRAINFIELD DETAILS

PUBLIC LAW 86-121 PROJECT

PROJECT NO. AN-77-631

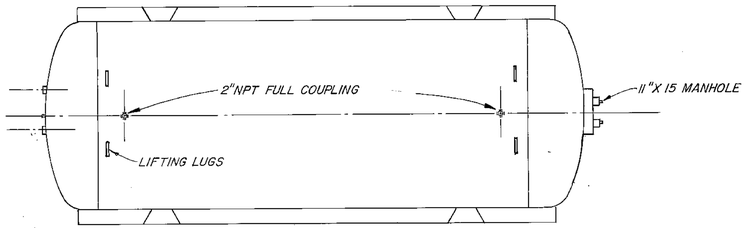
SHEET NO. ..... OF ..... TOTAL SHEETS

DRAWN BY: K. GROFF
DATE: SEPTEMBER 1979

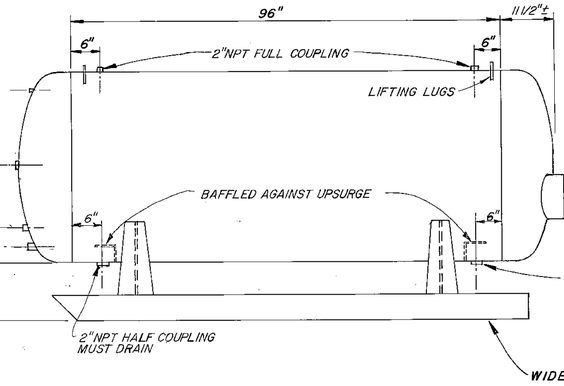
CHECKED BY: .....
DATE: .....

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

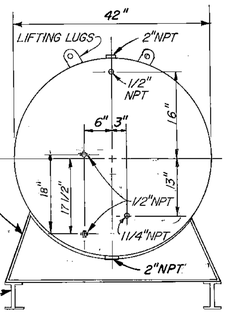
☆U.S. GOVERNMENT PRINTING OFFICE: 1978—785-319



TOP VIEW



SIDE VIEW



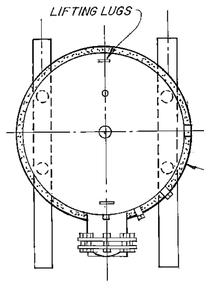
END VIEW

WATER PRESSURE TANK DETAIL

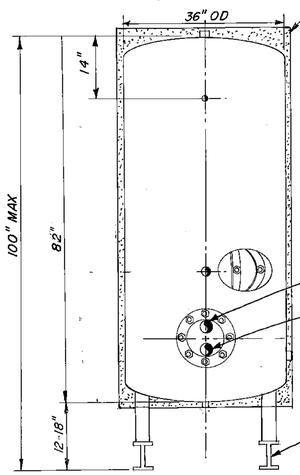
SCALE 3/4" =1'-0"

NOTE:

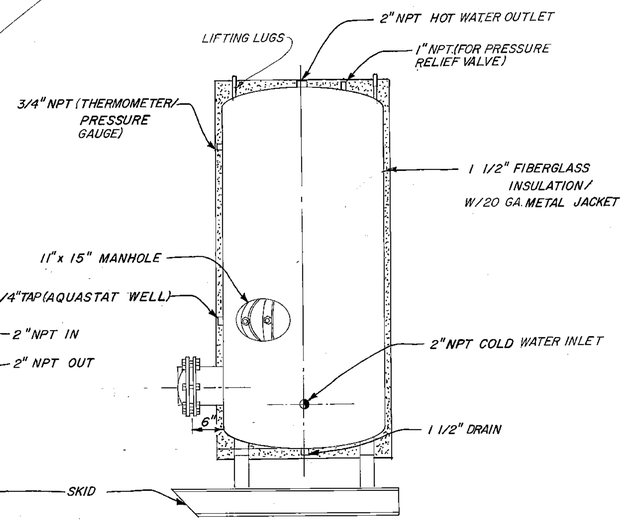
1. A.S.M.E. PRESSURE RATED TO 100 P.S.I.
2. APPROXIMATE STORAGE CAPACITY 620 GALLONS.
3. 2 MIL DRY FILM THICKNESS PRIME COAT ON EXTERIOR.
4. INTERIOR OF TANK TO HAVE 2 COATS OF 2-PART COAL TAR EPOXY APPLIED TO BARE METAL, 8 TO 10 MIL DRY FILM THICKNESS MINIMUM OF 16 MIL TOTAL DRY FILM THICKNESS.
5. ALL TAPS TO BE EXTRA STRONG FULL OR HALF COUPLING, AS INDICATED



TOP VIEW



FRONT VIEW



SIDE VIEW

HOT WATER GENERATOR DETAIL

SCALE 3/4"= 1'-0"

NOTE:

1. ASME PRESSURE RATED TO 125 PSI
2. APPROXIMATE STORAGE CAPACITY 325 GALLONS
3. ALL TAPS TO BE EXTRA STRONG COUPLINGS
4. EXTERIOR OF TANK TO BE PAINTED WITH ZINC PRIMER, MINIMUM DRY FILM THICKNESS 2 MIL.
5. TANK INTERIOR SHALL HAVE CATALYTIC SET PHENOLIC COATING, MINIMUM DRY FILM THICKNESS 6 MIL.

AS BUILT

DATE	REVISIONS	INITIALS

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
WATER TREATMENT PLANT
HOT WATER GENERATOR &
WATER PRESSURE TANK
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN - 77 - 631

SHEET NO. 15 OF 23 TOTAL SHEETS

DRAWN BY: LAVELL DATE: DEC, 1977
CHECKED BY: JTL DATE: 6/6/78

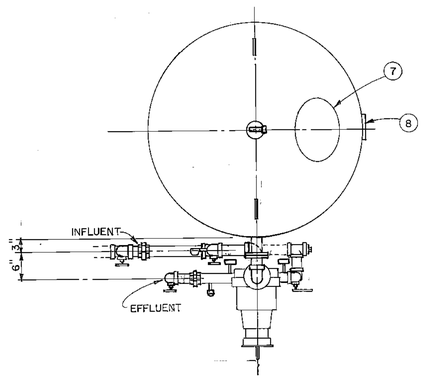
Design Engineer: JTL
Maintenance Review
Material Take-off

STATE OF ALASKA 49TH — JOHN T. LOVETT No. 3512-E REGISTERED PROFESSIONAL ENGINEER

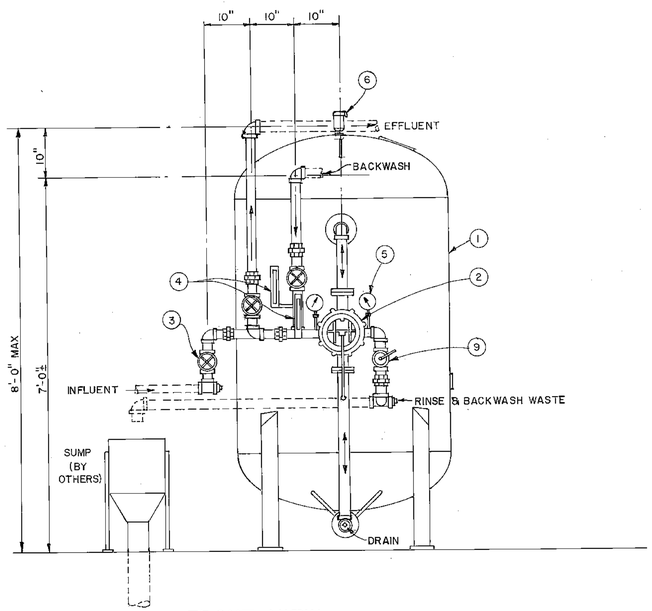
SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

☆U.S. GOVERNMENT PRINTING OFFICE: 1977—798-286

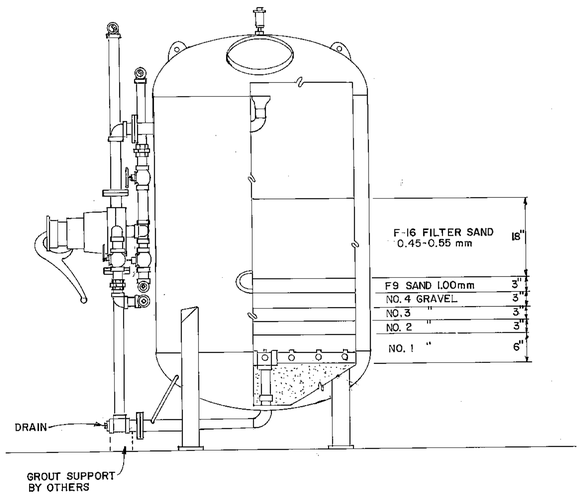
ITEM NO.	DESCRIPTION
1	FILTER TANK 48" X 60", 100 PSI ASME CODE-STAMPED
2	2" MULTIPORT VALVE - AQUAMATIC SOLO VALVE SERIES 105 DR
3	2" GATE VALVE - 125 LB. BRONZE SCRD NRS, 3 EACH
4	IMPACT FLOW METER, 2 EACH
5	PRESSURE GAUGE/SAMPLE COCK, 2 EACH
6	AIR RELEASE
7	11" X 15" MANHOLE
8	4"X 6" HANDHOLE
9	2" BALLCENTRIC VALVE-BACKWASH WASTE CONTROL, 1 EACH



PLAN VIEW



FRONT VIEW



SIDE VIEW

NOTES

A. INTERIOR SURFACES - SANDBLASTED AND COATED WITH COAL TAR EPOXY 2 COATS, 8-10 MIL EACH, 16 MIL MINIMUM TOTAL.

B. EXTERIOR SURFACES-SANDBLASTED AND COATED WITH ONE COAT ZINC PRIMER 2.5 MIL MINIMUM THICKNESS.

C. FRONT PIPING - SCHEDULE 40 BLACK STEEL WITH 150 PSI FITTINGS, 2".

D. DASH LINE PIPING BY OTHERS.

SCALE 3/4"=1'-0"

AS BUILT

DATE	REVISIONS	INITIALS

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
48" PRESSURE FILTER DETAIL
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 16 OF 23 TOTAL SHEETS

Design Engineer

Maintenance Review

Material Take-off

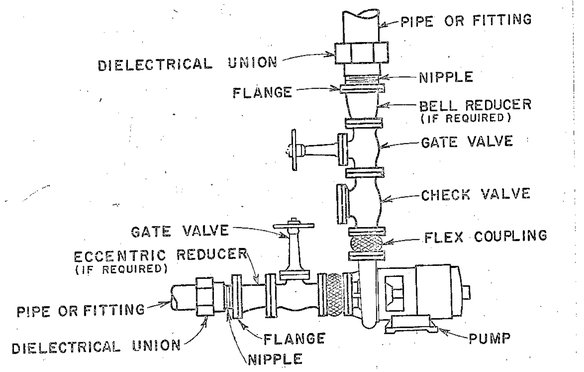
STATE OF ALASKA 49TH JOHN T. LOVETT No. 3310-E REGISTERED PROFESSIONAL ENGINEER

DRAWN BY: JAQ DATE: FEB 78

CHECKED BY: JTL DATE: 6/6/78

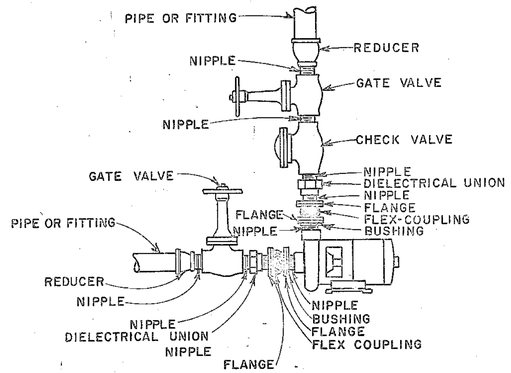
SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

☆U.S. GOVERNMENT PRINTING OFFICE: 1977—786-256



TYPICAL PUMP CONNECTION - FLANGE

NTS



TYPICAL PUMP CONNECTIONS

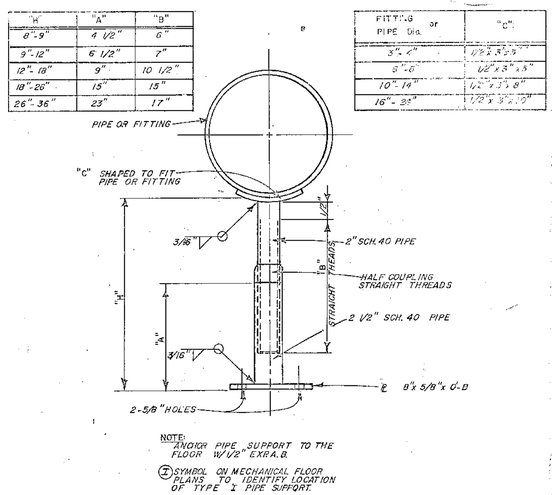
NTS

-NOTE-

WHEN USING COPPER & BRONZE FITTING & VALVES, DIELECTRICAL UNION MAY BE OMITTED.

H	"A"	"B"
6"-9"	4 1/2"	6"
9"-12"	6 1/2"	7"
12"-18"	9"	10 1/2"
18"-26"	15"	15"
26"-36"	23"	17"

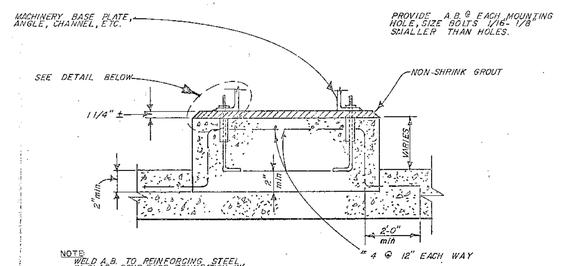
FITTING or PIPE DIA.	"C"
3"-4"	1/2" x 3"-9"
5"-6"	1/2" x 3"-6"
10"-14"	1/2" x 3"-9"
16"-32"	1/2" x 3"-10"



NOTE:
ANCHOR PIPE SUPPORT TO THE FLOOR W/1/2" EXP. A.B.

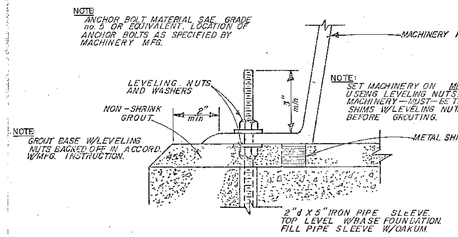
(I) SYMBOL ON MECHANICAL FLOOR PLANS TO IDENTIFY LOCATION OF TYPE I PIPE SUPPORT.

PIPE SUPPORT-TYPE I



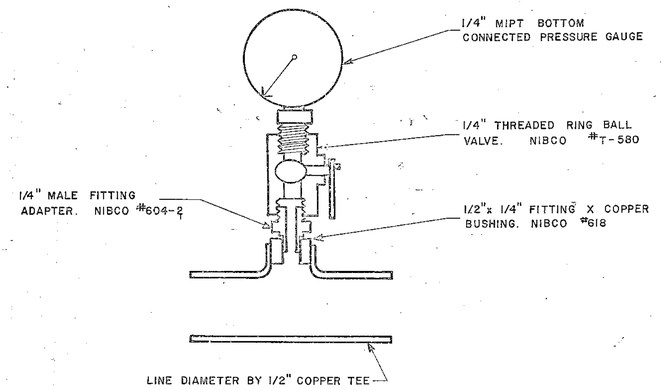
NOTE:
WELD A.B. TO REINFORCING STEEL IN SLAB. POUR BASE FOUNDATION W/ ANCHOR BOLT AND PIPE SLEEVE SET.

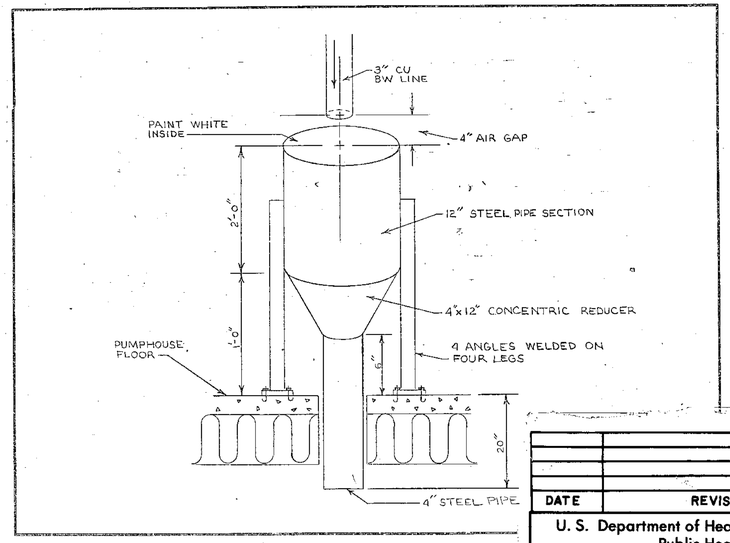
USE FOR PUMPS, MOTORES, ENGINES & OTHER EQUIPMENT (ABOVE 2 hp.)



MACHINERY FOUNDATION DETAIL

PRESSURE GAUGE INSTALLATION (TYPICAL)





BACKWASH SUMP

AS BUILT

DATE	REVISIONS	INITIALS

JTL
Design Engineer

Maintenance Review

Material Take-off

STATE OF ALASKA 49TH
JOHN T. LOVETT No. 3512-E
REGISTERED PROFESSIONAL ENGINEER

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
STANDARD DETAILS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN 77-631

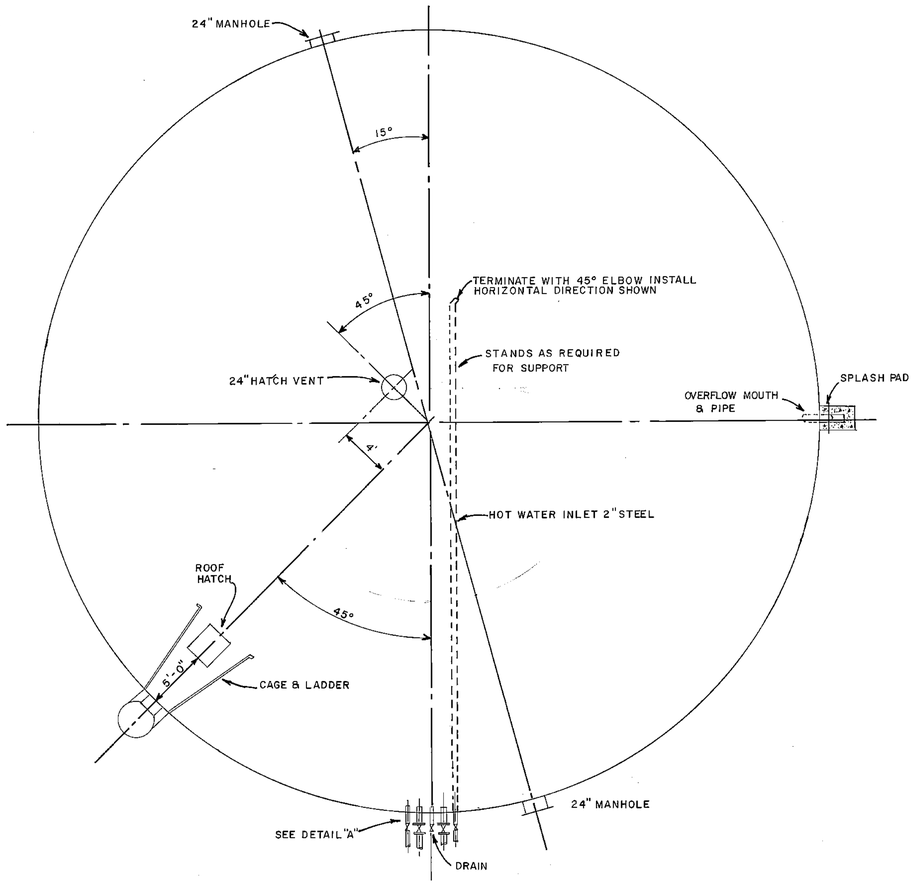
SHEET NO. 17 OF 23 TOTAL SHEETS

DRAWN BY: LEE
DATE: 2-16

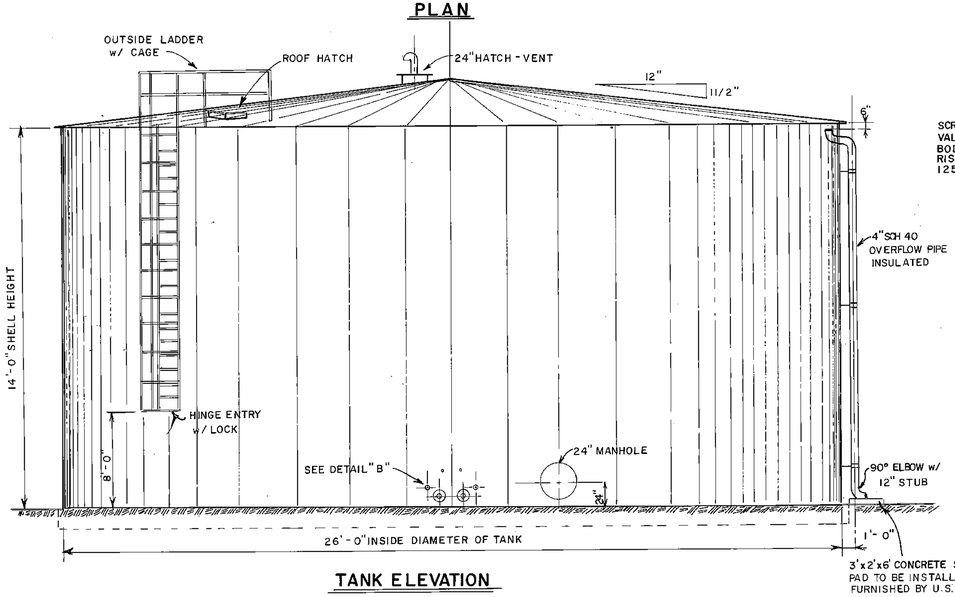
CHECKED BY: JTL
DATE: 2/16

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

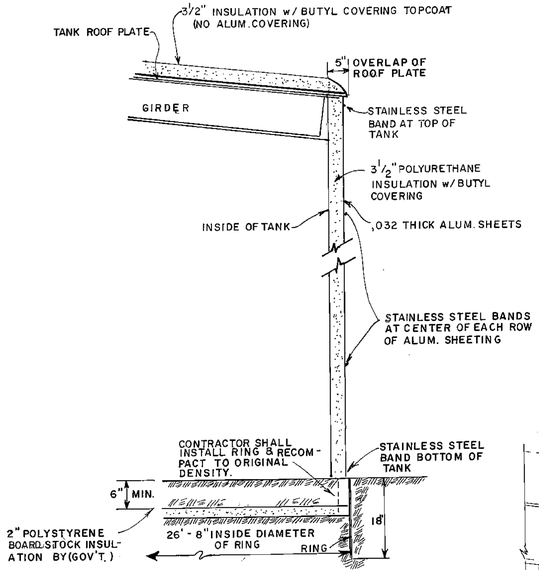
☆U.S. GOVERNMENT PRINTING OFFICE: 1977—769-295



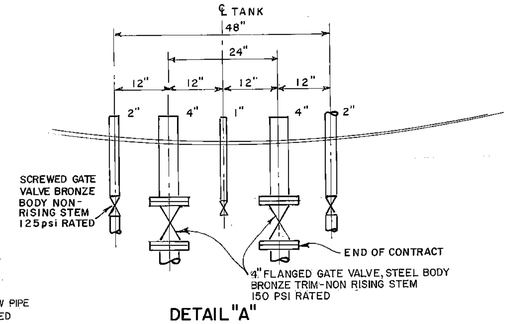
PLAN



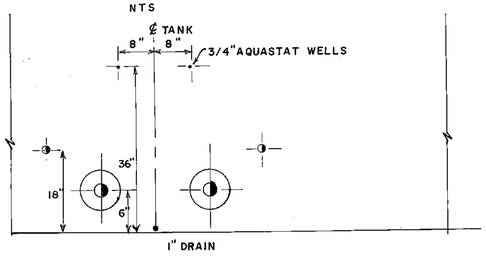
TANK ELEVATION
NTS



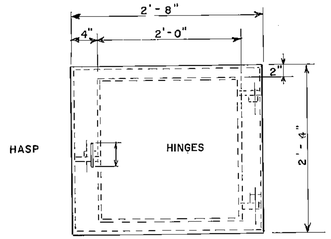
RING INSTALL & INSULATION DETAIL
NTS



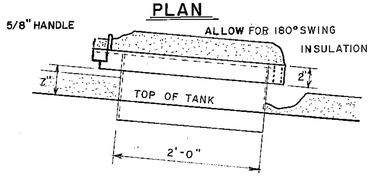
DETAIL "A"
NTS



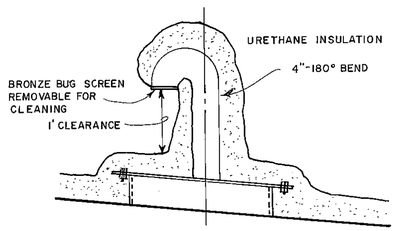
DETAIL "B"
NTS



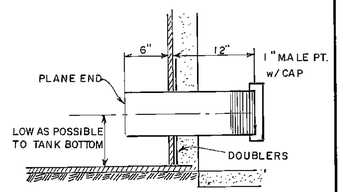
PLAN



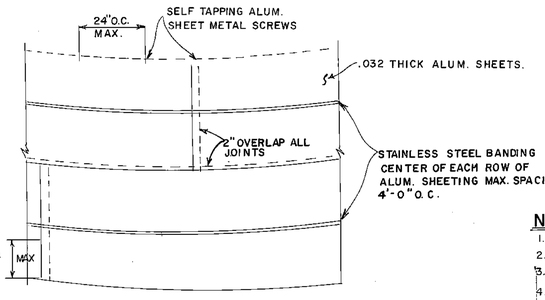
ROOF HATCH DETAIL
NTS



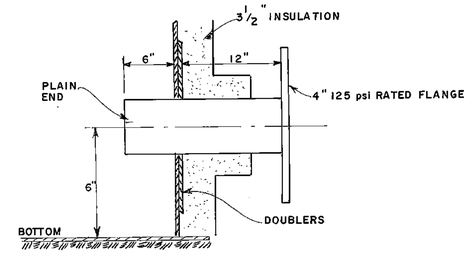
COMBINATION ROOF HATCH & VENT DETAIL
NTS



DRAIN DETAIL
NTS



ALUMINUM COVERING DETAIL



INLET & OUTLET DETAIL
NTS

NOTES :

1. ROOF, SHELL, & BOTTOM PLATES A-36 STEEL.
2. ALL 4" PIPING TO BE SCHEDULE 40 STEEL PIPE.
3. ALL 2" PIPING TO BE SCHEDULE 40 STEEL PIPE
4. ALL BOLTS & NUTS TO BE A-307
5. SHELL DOUBLERS A-36 STEEL.
6. ENTIRE TANK (ROOF & SHELL) SHALL BE INSULATED w/ 3 1/2" POLYURETHANE SPRAY FOAM.
7. MANHOLE BOLTS & NUTS, LADDER & CAGE (NOT INSULATED)
8. MANHOLE SURFACE, HATCHES, VENT, OVERFLOW PIPE INSULATED w/ 3 1/2" POLYURETHANE
9. CONTRACTOR TO PROVIDE ALL VALVES
10. TANK CONSTRUCTION TO LATEST AWWA STANDARDS OR AS SPECIFIED.
11. DRAIN PIPE SHALL BE GALV. STEEL PIPE.
12. RING SHALL BE ROUND WITHIN 1" & SHALL BE PLACED SO THAT TOP IS AT SAME ELEVATION ALONG RING PER.
13. TANK SIDEWALL SHALL BE COVERED w/ .032 THICK ALUM. COVERING OVER THE 3 1/2" INSULATION w/ 2" OVERLAP AT EACH JOINT AS SHOWN IN DETAILS.

AS BUILT

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	CLC

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
50,000 GALLON AWWA WATER TANK & DETAILS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN 77-631

SHEET NO. 18 OF 23 TOTAL SHEETS

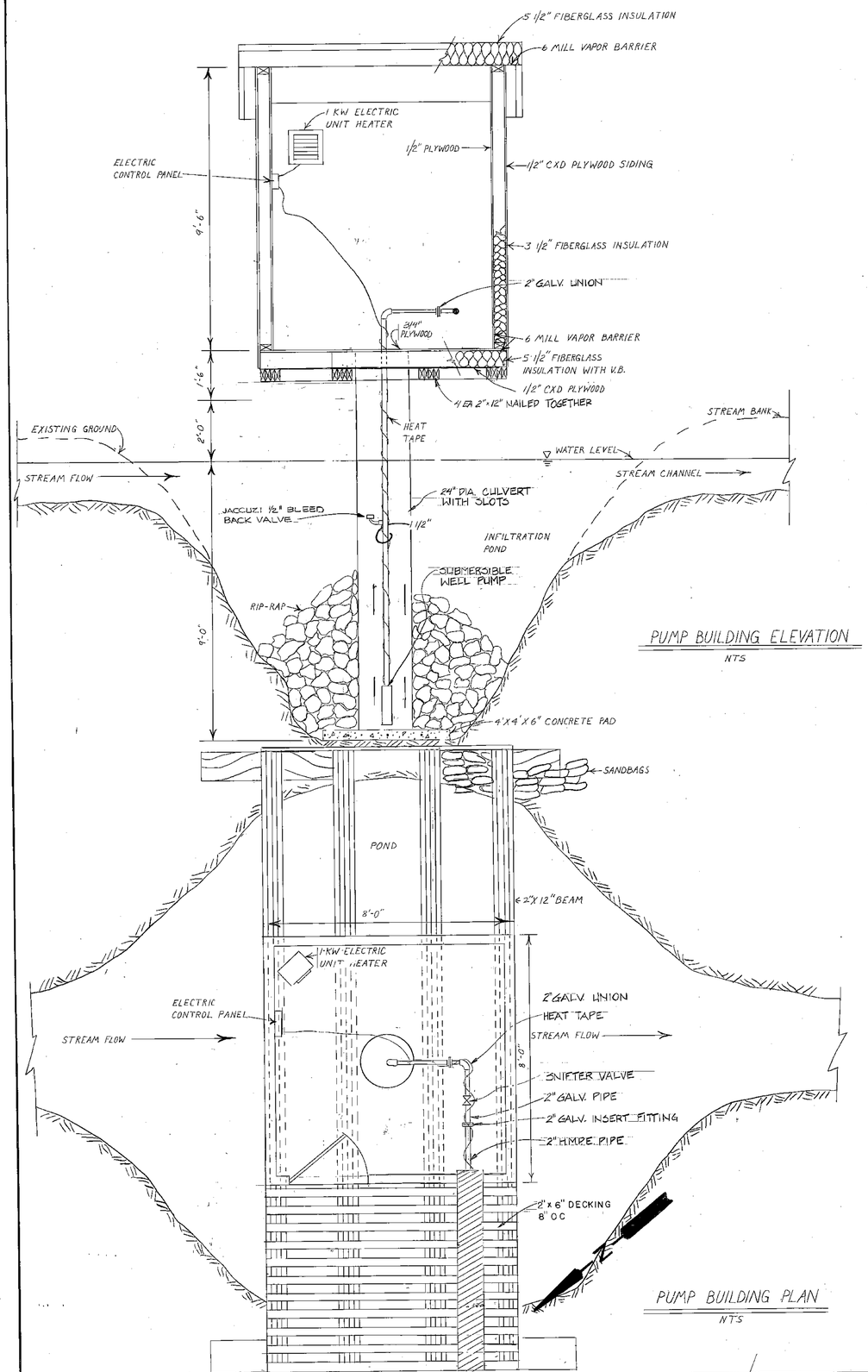
DRAWN BY: LEE DATE: 12-6-77
CHECKED BY: TTL DATE: 2-1-78

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

TTL
Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA 49TH
JOHN T. LOVETT No. 3512-E
REGISTERED PROFESSIONAL ENGINEER

☆ U.S. GOVERNMENT PRINTING OFFICE: 1977—788-296

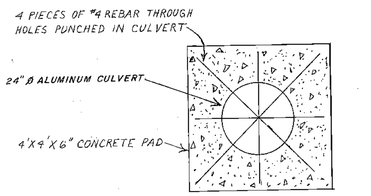


PUMP BUILDING ELEVATION

NTS

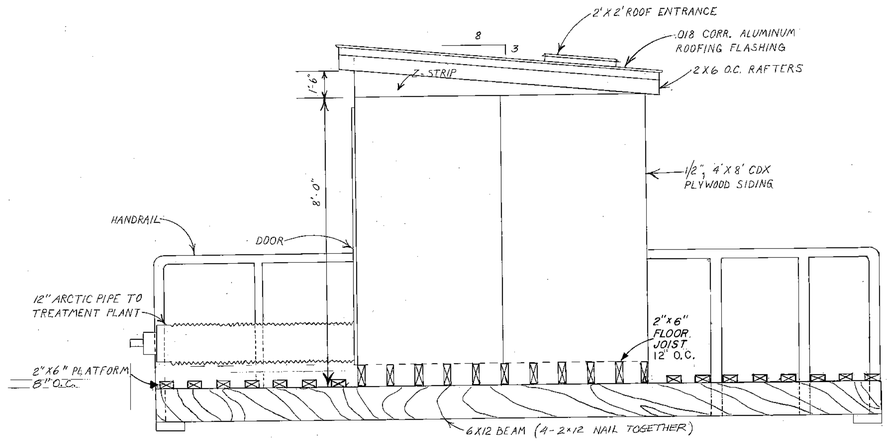
PUMP BUILDING PLAN

NTS



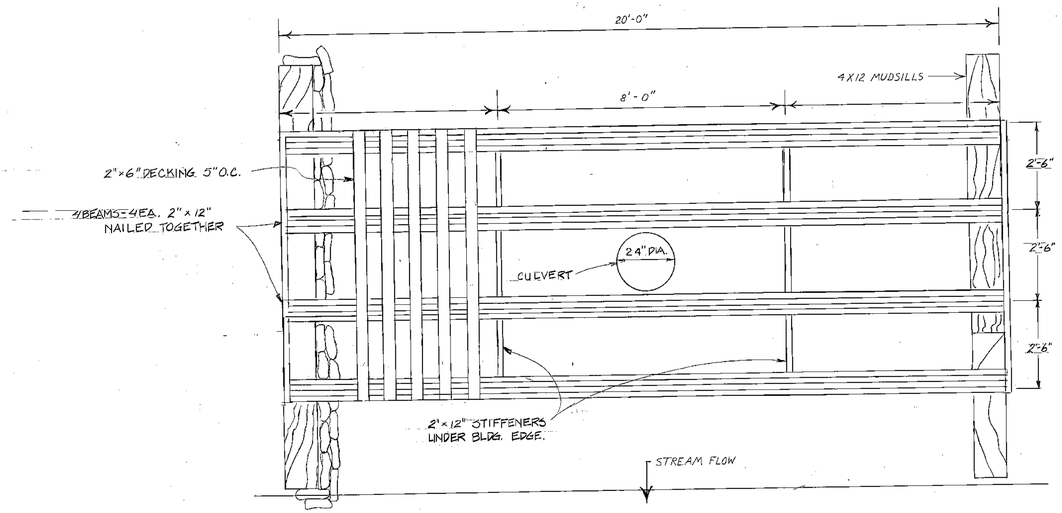
CULVERT PAD DETAIL

NTS



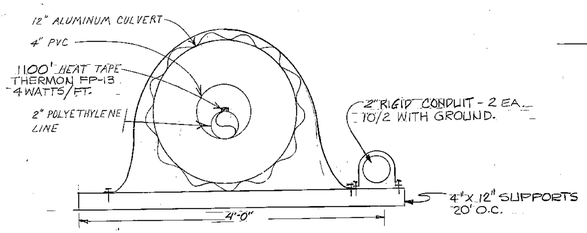
SIDE VIEW - PUMP BUILDING

SCALE: 1/2" = 1'



BEAM AND JOIST DETAIL

SCALE: 1/2" = 1'



4" ARCTIC PIPE DETAIL

TRANSMISSION LINE SECTION A-A

NOT TO SCALE

AS BUILT

FEB 80	AS BUILT	CLC
MARCH 80	AS BUILT CHANGES	D.L.
SEPT 80	AS-BUILT CHANGES	PML
DATE	REVISIONS	INITIALS

Design Engineer

Maintenance Review

Material Take-off

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA

INFILTRATION GALLERY & PUMPING FACILITY

PUBLIC LAW 86-121 PROJECT

PROJECT NO. AN-77-631

SHEET NO. 19 OF TOTAL SHEETS

DRAWN BY: GGA DATE: JULY 1978

CHECKED BY: DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

☆U.S.GOVERNMENT PRINTING OFFICE: 1978—796-316

EXISTING PLYWOOD DAM

WATER INTAKE STRUCTURE

EXISTING 3" STEEL SUMMER DISTRIBUTION LINE

NEW 2" POLOYETHYLENE IN 4" ARCTIC PIPE TRANSMISSION LINE

TRANSMISSION LINE

WATER TREATMENT

WATER & SEWER LINE TO HIGH SCHOOL

50,000 GAL. WATER TANK

4" P.E. PIPE SUMMER DISTRIBUTION LINE

AVEC

FUEL STORAGE TANKS

SEPTIC TANKS

LEACH FIELD

2000 GAL.
4000 GAL.

BIA SCHOOL

5 DRAIN

2" SUMMER DISTRIBUTION LINE

2"x4" REDUCER

ARMORY

Tununak River

AIRPORT

BRIDGE COMPLETED 11/77

X-APPROXIMATE LOCATIONS OF SUMMER WATER HYDRANTS

■- SEWAGE BUNKERS

TUNUNAK BAY

N

AS BUILT

SCALE 1"=200'
DATE OF PHOTO 6-27-74

U. S. Department of Health, Education & Welfare
Public Health Service
DIVISION OF INDIAN HEALTH

TUNUNAK, ALASKA
SITE PLAN

PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 2 OF 23 TOTAL SHEETS

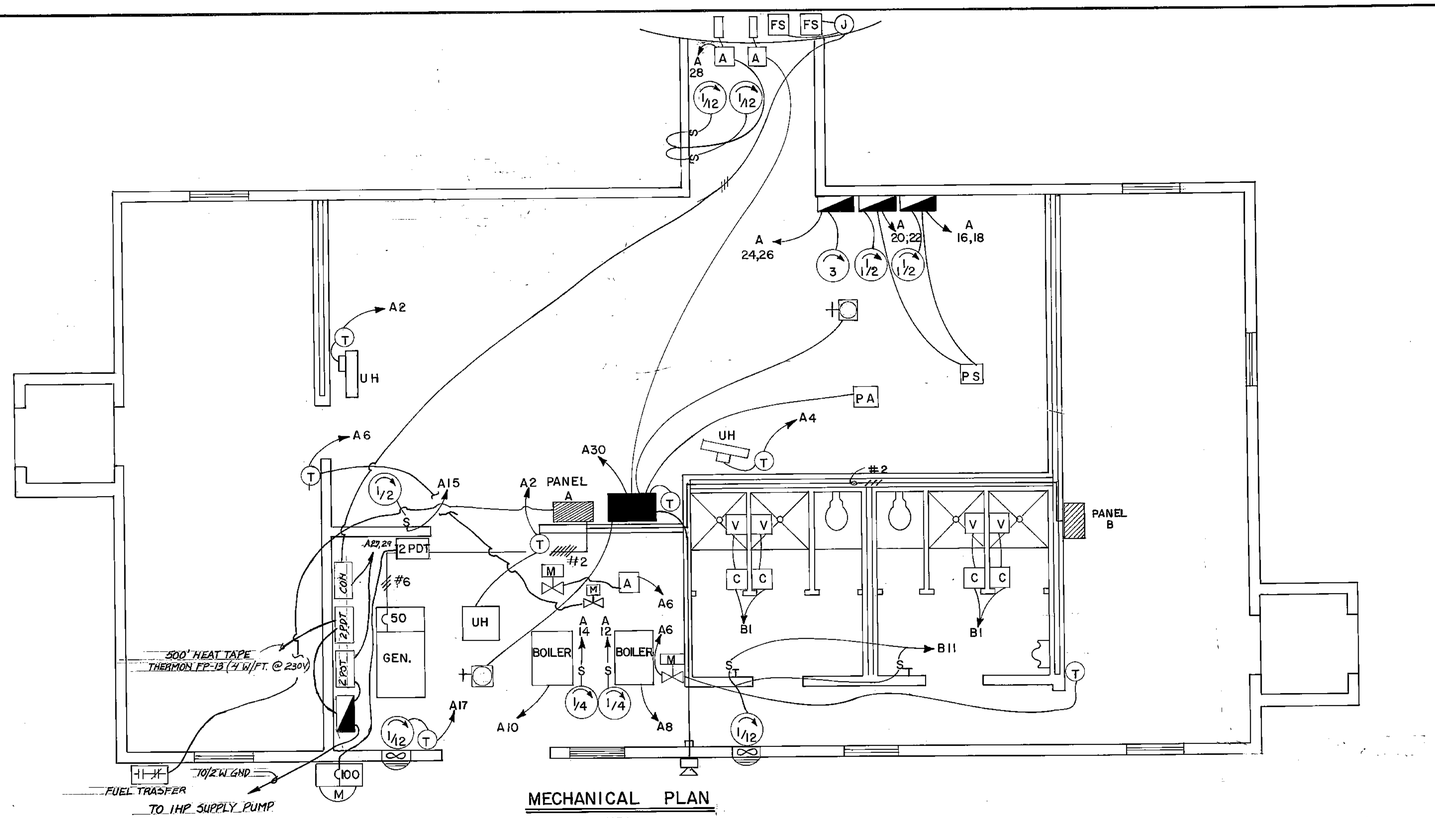
DRAWN BY LEE
DATE 12-6-77

CHECKED BY TTL
DATE 6/6/78

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

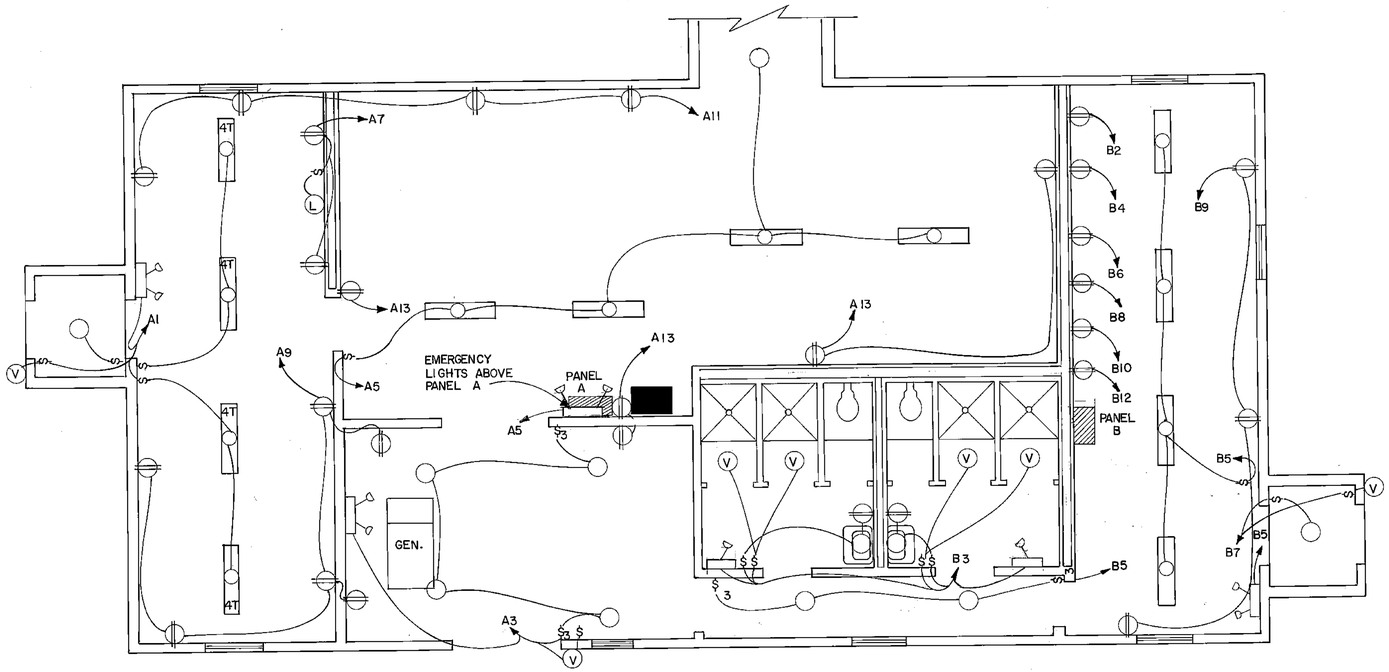
STATE OF ALASKA
JOHN T. LOVETT
No. 3512-E
REGISTERED PROFESSIONAL ENGINEER

Prepared by: NORTH PACIFIC AERIAL SURVEYS, INC.
Anchorage Alaska



MECHANICAL PLAN

NTS

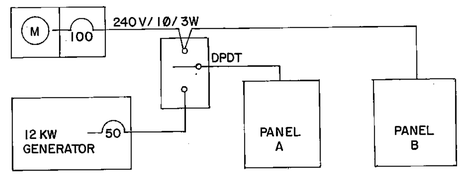


ELECTRICAL PLAN

NTS

LEGEND

M	MOTOR OPERATED VALVE (ZONE VALVE)	FS	FLOAT SWITCH
T	THERMOSTAT	CON	CONTACTOR
	LIGHT INCANDESCENT	2PST	SWITCH 2 POLE, 1 THROW
	FLORESCENT FIXTURE	2PDT	SWITCH 2 POLE, 2 THROW
	DUPLEX RECEPTACLE		
	POWER PANEL		
	MOTOR START		
A	AQUASTAT		
PS	PRESSURE SWITCH		
S	SWITCH SINGLE		
S_T	SWITCH (TIMER)		
S_3	SWITCH 3 WAY		
3	ELECTRIC MOTOR & H.P.		
L	FIXTURE WALL MOUNTED		
	FIRE ALARM DEVICE		
C	COIN BOX		
V	SOLENOID VALVE		
J	JUNCTION BOX		
PA	PROBE (ALARM)		
	EMERGENCY LIGHT		
	ALARM PANEL		
M	METER BASE		
V	VAPOR TIGHT INCANDESCENT		
	ALARM HORN		



POWER SINGLE LINE

AS BUILT

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	CLC

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
WATER TREATMENT BUILDING
ELECTRICAL & MECHANICAL PLAN
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 20 OF 23 TOTAL SHEETS

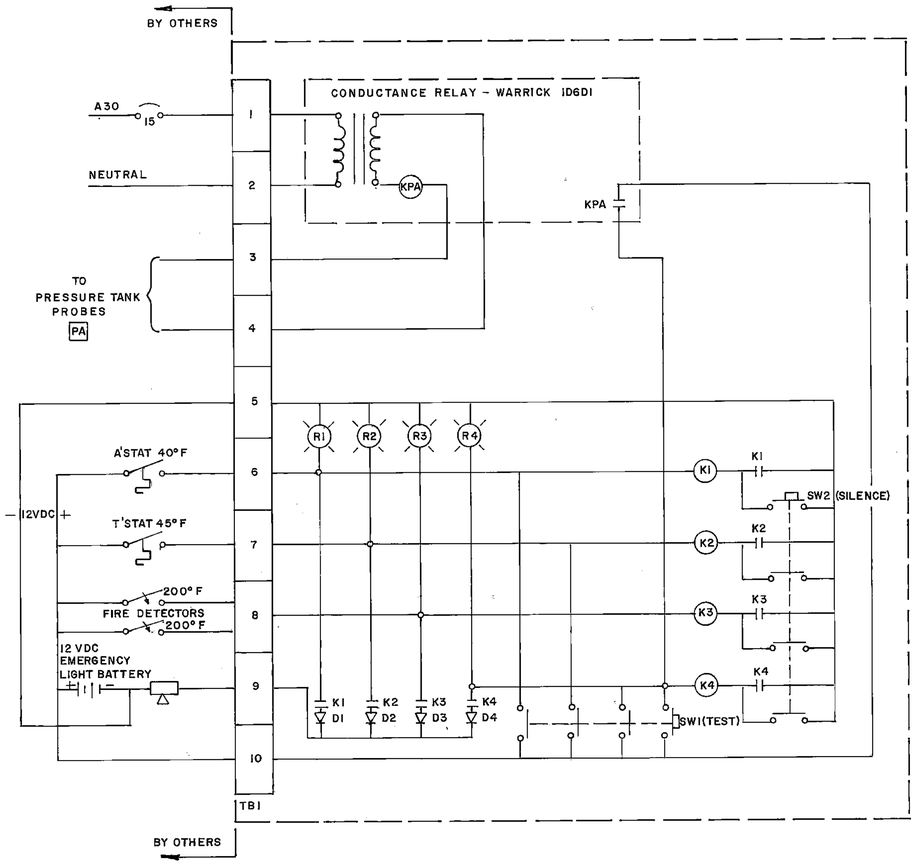
DRAWN BY: LAVELL DATE: JAN. 1978
CHECKED BY: JTL DATE: 6/6/78

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

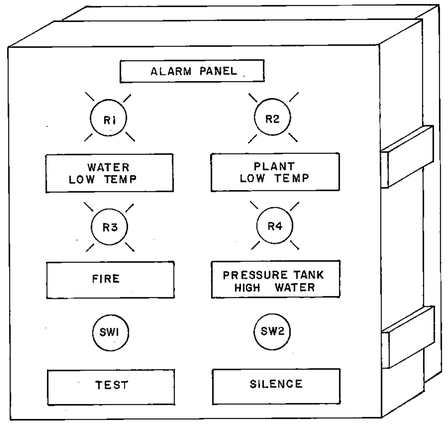
JTL
Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA 49TH
JOHN T. LOVETT No. 3512-E
REGISTERED PROFESSIONAL ENGINEER

☆ U.S. GOVERNMENT PRINTING OFFICE: 1977—765-206



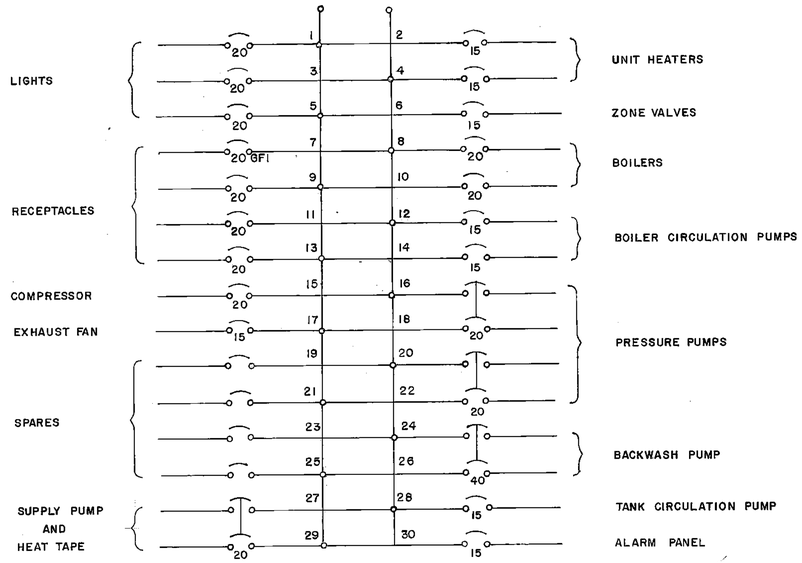
ALARM PANEL CIRCUIT



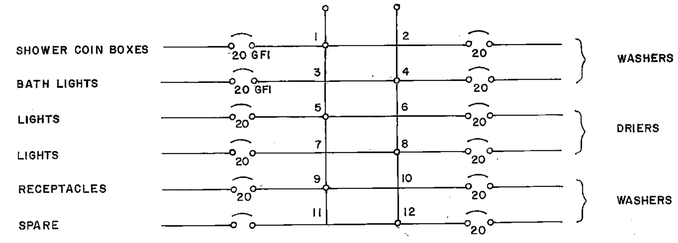
ENCLOSURE LAYOUT

NOTES:

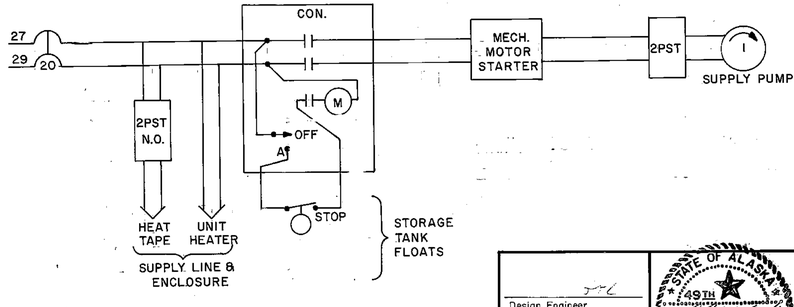
1. ENCLOSURE, NEMA 12 WITH HINGED DOOR.
2. ALL WIRE NO. 14 CU, STRANDED.
3. NAME PLATES; LAMINATED PLASTIC, BLUE WITH WHITE CORE, 3/16" LETTER HEIGHT.
4. R1-R4, [D] 9001 KP 32R6.
5. SW1 AND SW2; [D] 9001 KR1U W/4 EA. 9001 KA2 BLOCKS.
6. K1-K4; POTTER & BRUMFIELD KRPIIDG12.
7. SOCKETS; 4 EA. POTTER & BRUMFIELD 27E122.
8. D1-D4; SYLVANIA ECG5800.
9. TB1; [D] 9080C10.
10. KPA; WARRICK ID6DI.



PANEL A DETAIL



PANEL B DETAIL



WELL & SUPPLY PUMP DETAIL

AS BUILT

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	CLC

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
ALARM PANEL AND LOAD CENTERS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN- 77- 631

SHEET NO. 21 OF 23 TOTAL SHEETS

DRAWN BY: B KIRSCHBAUM
DATE: MARCH, 1978

CHECKED BY: JTL
DATE: 6/1/78

Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA
49TH
JOHN T. LOVETT
No. 3512-E
REGISTERED PROFESSIONAL ENGINEER

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

☆U.S. GOVERNMENT PRINTING OFFICE: 1977—798-296

WASTEWATER TREATMENT PLANT

MANUFACTURER _____ CAPACITY _____ MGD YEAR BUILT _____

TYPE _____ SERVICE VOLTAGE _____ PHASE _____

PUMPS — BLOWERS

ITEM	QNTY. No.	MAKE	MODEL	SERIAL / SERIES	SIZES SUC.	DIS.	IMP.	OTHER

MOTORS

EQUIPMENT DRIVEN	QNTY. No.	MAKE	MODEL	TYPE	SERIAL / SERIES	H.P.	PH.	VOLT.	AMP.	FRAME	R.P.M.

WATER PUMPS — COMPRESSORS — BLOWERS

ITEM	QNTY. No.	MAKE	MODEL	SERIAL / SERIES	SIZES SUC.	DIS.	IMP.	DRIVE
BACKWASH	1	PACO	LEOCR8 2050-1	P386998 TYPE-L	3 1/2"	2"	4.25"	3 H.P
PRESSURE	2	PACO	10125051 1250-1	C0061291 TYPE-L	1 1/2"	1 1/4"	5.11"	1 1/2 H.P.
AIR COMPRESSOR	1	QUINCY	D x 2					1/2 H.P.
WATER STORAGE TANK CIRCULATION PUMP	2	B & G	100 AV		1"	1"		1/12 H.P.
WATER SUPPLY PUMP	1	JACUZZI	7S40B-S2	230V 1 Ø				3/4 H.P.

PUMPS

LIFT STATION	No.	MAKE	MODEL	SERIAL / SERIES	SIZES SUC.	DIS.	IMP.	OTHER

OTHER PUMP OR MOTOR COMPONENTS

ITEM	QNTY.	PUMP / MOTOR	DATA

ELECTRICAL EQUIPMENT

ITEM	QNTY.	MAKE	MODEL	CLASS / TYPE	SERVICE VOLT.	COIL VOLT.	PH.	AMP.	FUNCTION
PRESSURE SWITCH	1		G562	9613					ON 20 OFF 40
ZONE VALVE	3"								
AQUASTAT	3"								
THERMOSTAT	6								
PROBE (ALARM)	1								

OTHER EQUIPMENT

ITEM	QNTY.	MAKE	MODEL	SERIAL	OTHER

BOILER — WATER HEATER Nos. 1, 2, 3, 4

LOCATION _____

MANUFACTURER AMERICAN BURNHAM-POTRICK MODEL / SERIES PF-35 NET BTU 375 MBH

BURNER: MANUFACTURER _____ MODEL _____ SERIAL No. _____

BOILER SERIAL (No.1) _____, (No.2) _____, (No.3) _____, (No.4) _____

PUMPS

ITEM	MAKE	MODEL No.	SERIAL / SERIES	SIZES SUC.	DIS.	OTHER
BOILER CIRC. PUMP	B & G		2 1/2	2 1/2"	2 1/2"	1/4 HP 30 GPM 14 THD

HEATER — BOILER COMPONENTS

ELECTRICAL

ITEM	MAKE	MODEL / TYPE	VOLT.	AMP.
TRANSFORMER				
CONTR. RELAY				
LOW H^2O CONTR.				
AQUASTAT				
PHOTO CELL				
SEL. FUEL VALVE				

MECHANICAL

ITEM	MAKE	SIZE	TYPE
NOZZLE			
ELECTRODE			
REL. VALVE			
REL. VALVE			
REGULATOR			

OTHER HEATING EQUIPMENT

ITEM	MAKE	MODEL	SERIAL / SERIES	OTHER
HEAT EXCHANGER	B & G	WU 44-2	4180615	340 - 44° F 9 GPM
BASEBOARD	SLANT/FIN	FIN LINE 30-75	E-75 ELEMENTS	
UNIT HEATER #1	TRANE	UH3A-0385-BA-ACC	TYPE "13" 6-0103-1	378K-15732
UNIT HEATER #2	TRANE	UH3A-0185-BA-AAA	TYPE "13" 6-0101-1	378M-19143
UNIT HEATER #3	SAME AS U.H. #1			

CHEMICAL , EQUIPMENT

EQUIPMENT	QNTY.	MAKE	MODEL / SERIES	SERIAL No.	TYPE	OTHER
CHEMICAL PUMPS	2	W & T	94-160			

STANDBY GENERATOR

EQUIPMENT	MAKE	MODEL / TYPE	SERIAL No.	VOLT.	PH.	KW.	FRAME	OTHER
GEN. UNIT	ONAN	175RO 1E-4	R/12680AA		1	12		
GENERATOR		S/N G677025	1720	240	1		10	
MOTOR								
EXCITER								

FLOW METERS

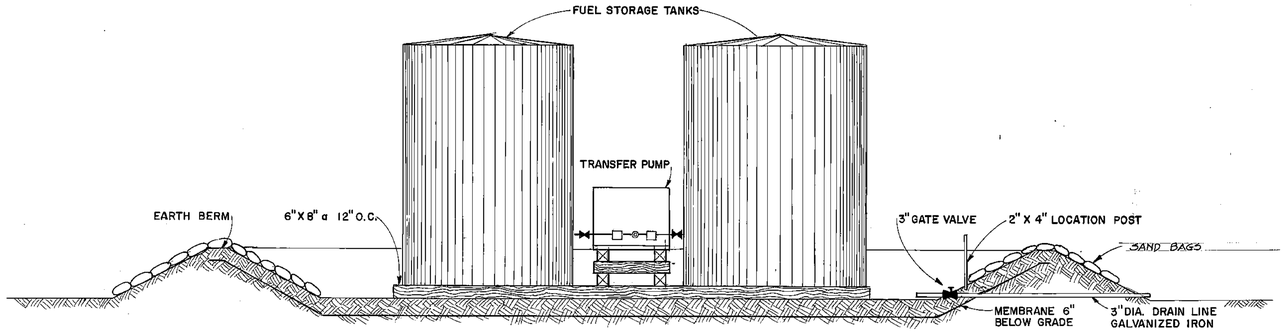
METER No.	QNTY.	MAKE	MODEL	TYPE	SIZE	OTHER
# 1	1	GAMMON	TURBINE		3"	8119477 TREATED WATER
# 2	1	"	TURBINE			8119477 SUMMER DISTRIBUTION
# 3	1	"	TURBINE		1 1/2"	8119480 COLD WATER SUPPLY
# 4		"	DSC	1/2 MWD		8119493 HOT WATER SUPPLY
# 5	1	NEPTUNE	TRIDENT 8		3/4"	25082903 WATERING POINT

MISCELLANEOUS EQUIPMENT

EQUIPMENT	INFORMATION
SAND FILTER	48" PRESSURE SAND FILTER
PRESSURE TANK	NATIONAL TANK - 620 GALLONS
HOT WATER GENERATOR	ACE PVG 325 GALLONS
WALL FAN 2 EACH	ILG TYPE LHQ 440 CFM @ 1/10 SP 1/12 H.P. w/ BACK DRAFT DAMPER
WALL LOUVER 1 EACH	AMERICAN WARMING & VENTILATING # 401 w/ CHANNEL FRAME 36"w x 12"h.
CEILING REGISTERS	TUTTLE & BAILY # CRE 508 ALUM. 1/2" GRID w/ OPPOSED BLADE DAMPER.
	STEAM & COIL MODEL.
WASHER 4 EACH	MAYTAG CS 21
WATER CLOSET 2 EACH	ANGLE ELONGATED BOWL BLOWOUT BACK FLUSH
SHOWER 4 EACH	36"x 36" NATIONAL FIBERGLASS CORP. MODEL 36-3 WALL
FRESH AIR LOUVER 5 EA.	12"x 12" PANE LOUVER SERIES. 103 "2" BLADE FIXED.
AIR RELEASE (FROM WATER INTAKE)	VALMATIC 150 PSI M/N 102
FLOW SWITCH	ITT MCDONNELL & MILLER 1 1/2" THREADED
WASHING MACHINE	WHIRLPOOL, COMMERCIAL, 2 SPEED, PERMANENT PRESS COOL DOWN CARE — 9.8 AMPS 120 VOLTS 60 CYCLE STOCK CFA 250
DRYERS	HUEBSCH "LOADSTAR" M/N 30C3L SIZE 30 x 30 1 Ø 60 CYCLE 115 VOLTS SERIAL - TTKC-19984B JF

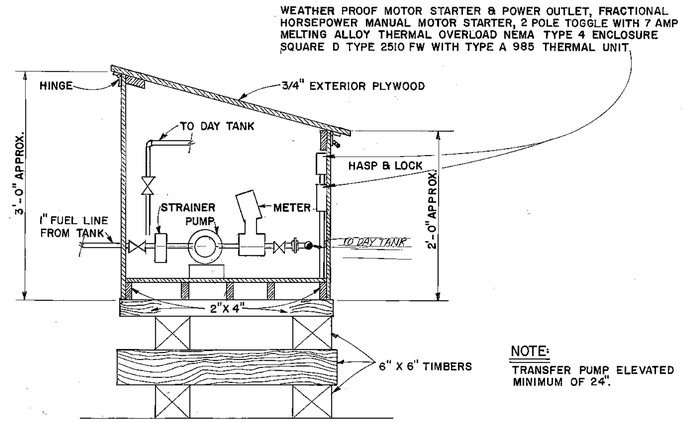
ELECTRICAL EQUIPMENT

EQUIPMENT	QNTY.	MAKE	MODEL / TYPE	VOLT.	COIL VOLT.	POLE	AMP.	LOCATION — FUNCTION



ELEVATION

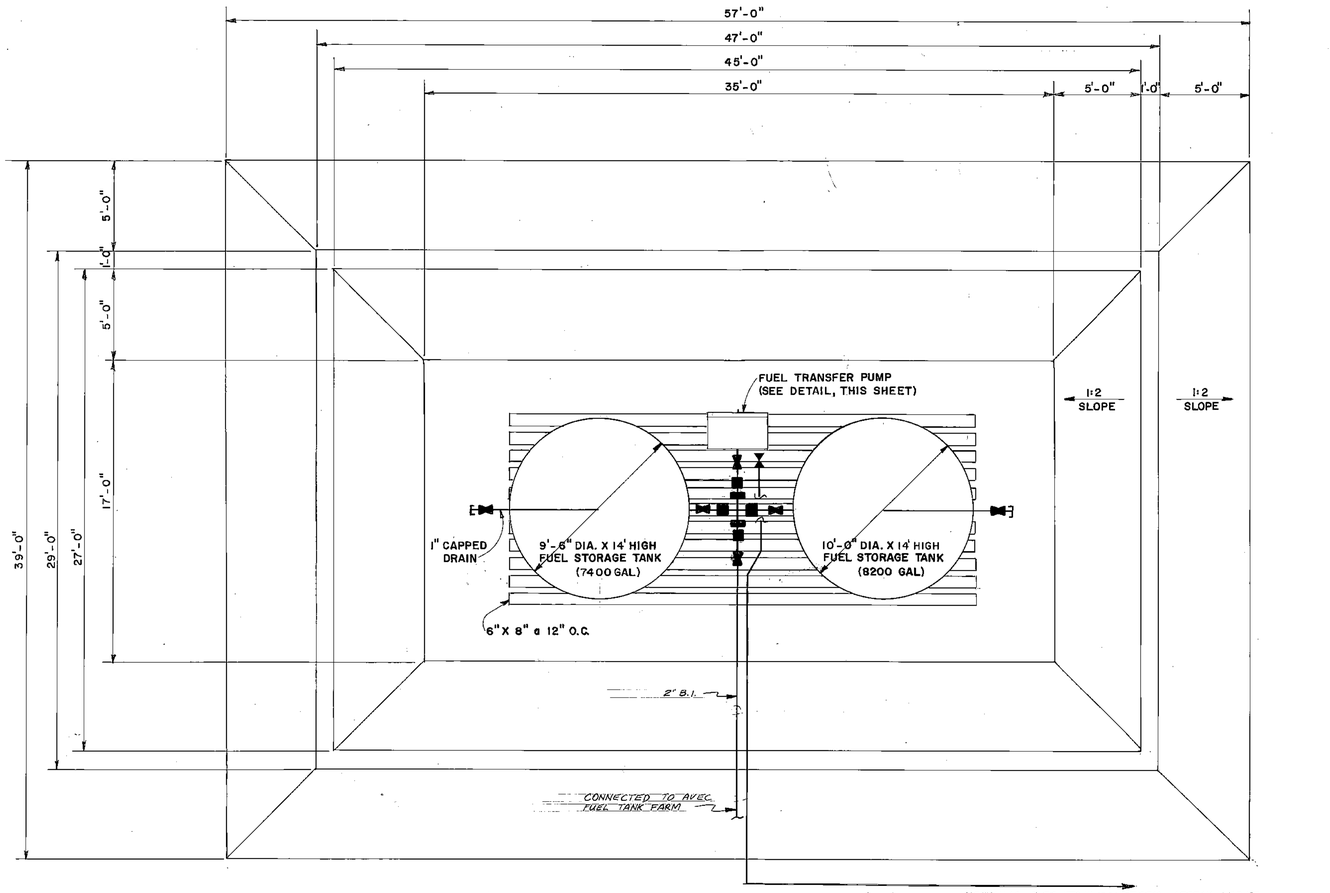
SCALE: 1/4"=1'-0"



NOTE:
TRANSFER PUMP ELEVATED MINIMUM OF 24".

SECTION THRU PUMP BOX

NTS



FUEL STORAGE TANK PLAN

SCALE: 1/4"=1'-0"

AS BUILT

FAS 30	AS-BUILT	GLC
DATE	REVISIONS	INITIALS

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA

FUEL STORAGE AND TRANSFER
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 23 OF 23 TOTAL SHEETS

DRAWN BY: B. KIRSCHBAUM DATE: MAY, 1978
CHECKED BY: TTL DATE: 6/6/78

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

TTL
Design Engineer

Maintenance Review

Material Take-off

STATE OF ALASKA 49TH
JOHN T. LOVETT No. 3512-E
REGISTERED PROFESSIONAL ENGINEER

☆U.S. GOVERNMENT PRINTING OFFICE: 1978—786-319

TUNUNAK WATER STORAGE TANK SITE

LOGS-1978

SILT (ICE RICH)

SILTY SAND AND GRAVEL

BEDROCK

SOIL BORINGS



AS BUILT

SCALE 1" = 40'

DATE OF PHOTO 6-27-74

U. S. Department of Health, Education & Welfare
Public Health Service
DIVISION OF INDIAN HEALTH

TUNUNAK, ALASKA
WATER TREATMENT AND WASHETERIA BUILDING
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 3 OF 23 TOTAL SHEETS

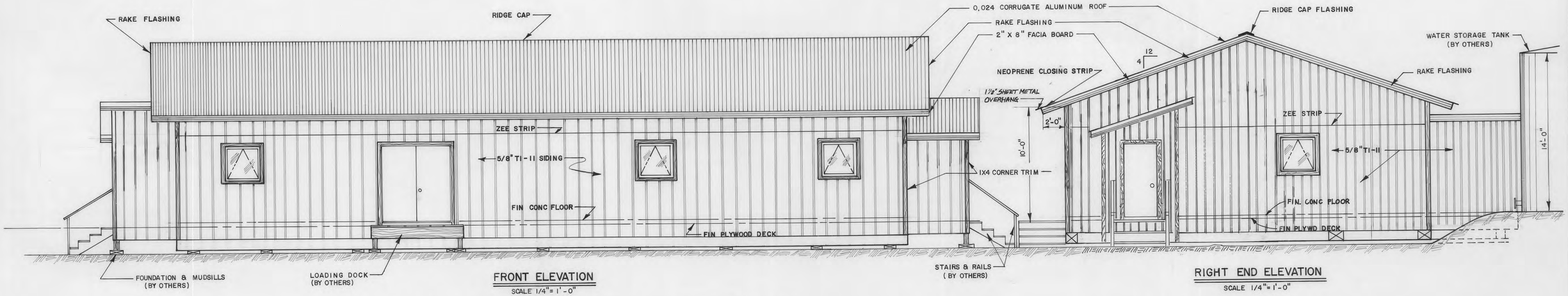
DRAWN BY B. KIRSCHBAUM
DATE MAY, 1978

CHECKED BY TJL
DATE 6/6/78

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

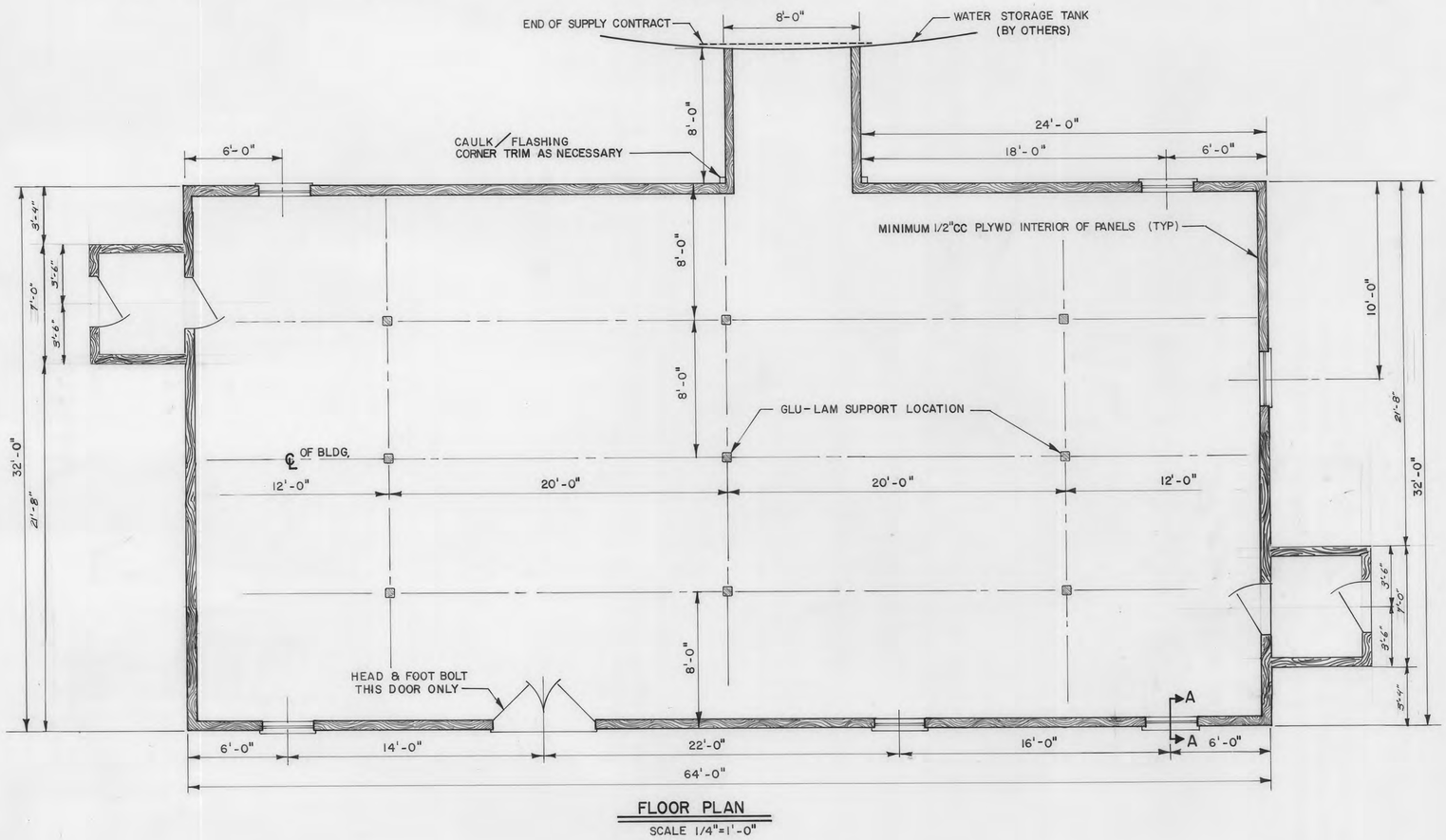
ALASKA — JOHN T. LOVETT No. 3812E — REGISTERED PROFESSIONAL ENGINEER

Prepared by: NORTH PACIFIC AERIAL SURVEYS, INC. Anchorage Alaska



FRONT ELEVATION
SCALE 1/4"= 1'-0"

RIGHT END ELEVATION
SCALE 1/4"= 1'-0"



FLOOR PLAN
SCALE 1/4"=1'-0"

NOTES

1. ROOF SLOPE 4" RISE TO 12" RUN.
2. THERMAL CHARACTERISTICS OF POLYURETHANE CORE MATERIAL-MINIMUM THERMAL CONDUCTIVITY OF .17 BTU - IN/ HR FT²-F°, @ 2 LB./ FT³: MINIMUM DENSITY.
3. ALL WINDOWS ARE 3'-0" X 2'-6" WOOD FRAME, DOUBLE LEXAN GLAZED, ROTO OPERATED W/SCREEN, CLEAR SEALER FINISH LEXAN 3/16", NR - 4000 OR EQUAL.
4. ALL DOORS TO BE 3'-0" WIDE X 6'-8" HIGH METAL - CLAD URETHANE CORE, PREHUNG WOOD FRAME, WEATHER STRIPPING & LOCKING HARDWARE, 5" BACKSET, MAGNETIC WEATHER STRIPPING.
5. ZEE STRIP AS NECESSARY FOR EXTERIOR SHEATHING.
6. ALL DOORS AND WINDOWS, SHALL BE IN LOCATION AS SHOWN.
7. COLUMNS MAY BE LOCATED ONLY WHERE SHOWN ON PLANS.
8. ROOFING MATERIAL TO BE PACKED SEPARATE FROM PANELS.

AS BUILT

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	CLC

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
WATER TREATMENT PLANT
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN - 77 - 631

SHEET NO. 4 OF 23 TOTAL SHEETS

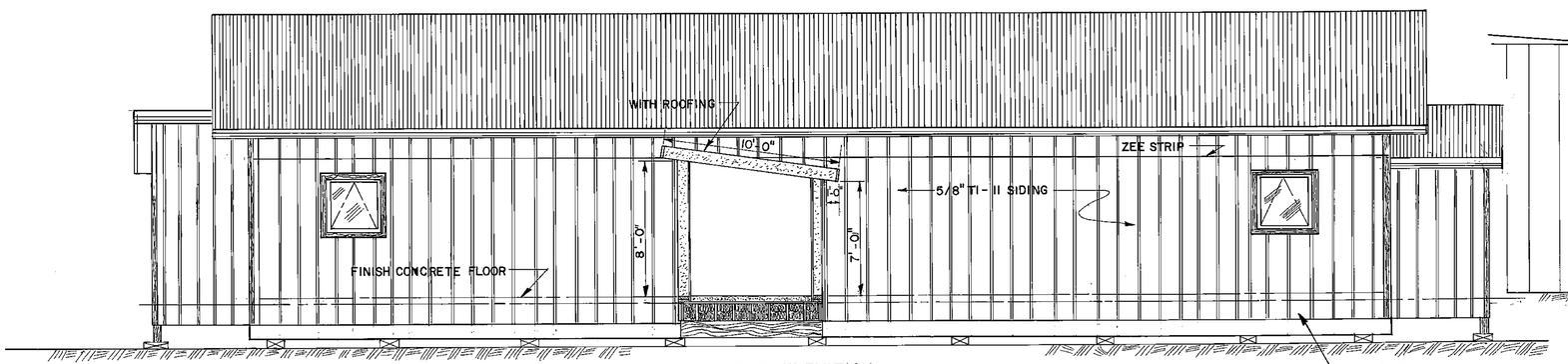
Design Engineer	J.T.L.
Maintenance Review	
Material Take-off	

DRAWN BY: LAVELL DATE: DEC. 1977
CHECKED BY: J.T.L. DATE: 6/6/78

STATE OF ALASKA 49TH JOHN T. LOVETT No. 3312-E REGISTERED PROFESSIONAL ENGINEER

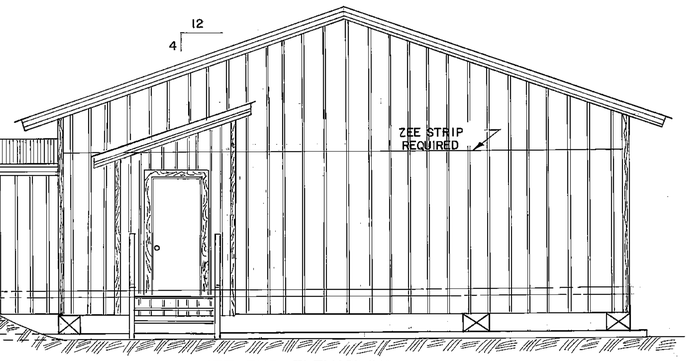
SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

☆U.S. GOVERNMENT PRINTING OFFICE: 1977—788-286



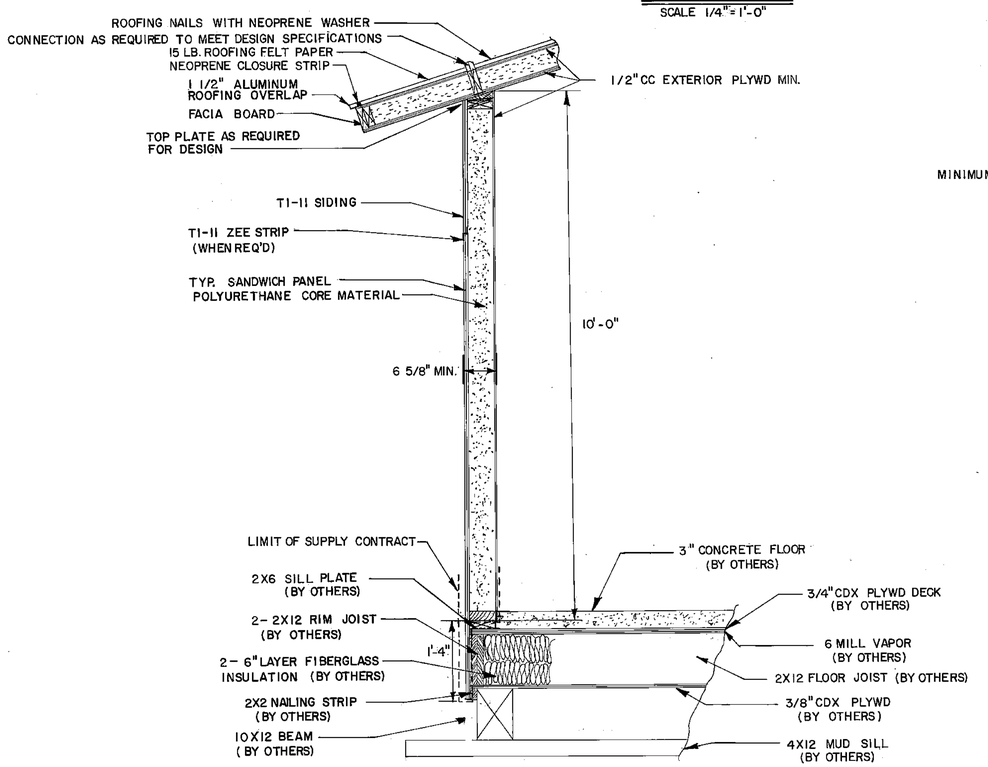
REAR ELEVATION

SCALE 1/4"=1'-0"



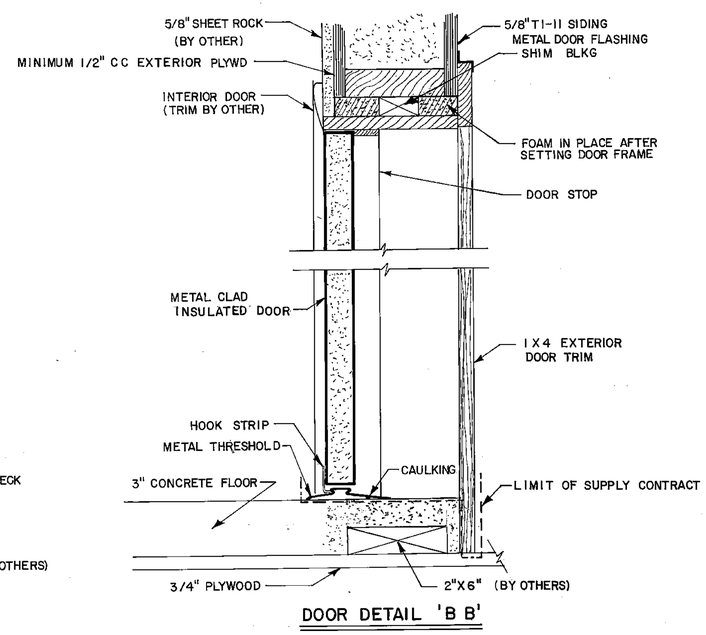
LEFT END ELEVATION

SCALE 1/4"=1'-0"



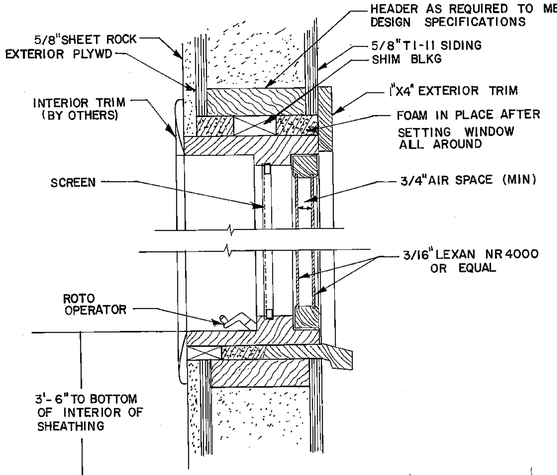
TYPICAL PANEL DETAIL IN PLACE

SCALE 3/4"=1'-0"



DOOR DETAIL 'B B'

NTS



WINDOW DETAIL 'A A'

NTS

AS BUILT

FEB 80	AS-BUILT	CLC
DATE	REVISIONS	INITIALS

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
WATER TREATMENT PLANT
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 5 OF 23 TOTAL SHEETS

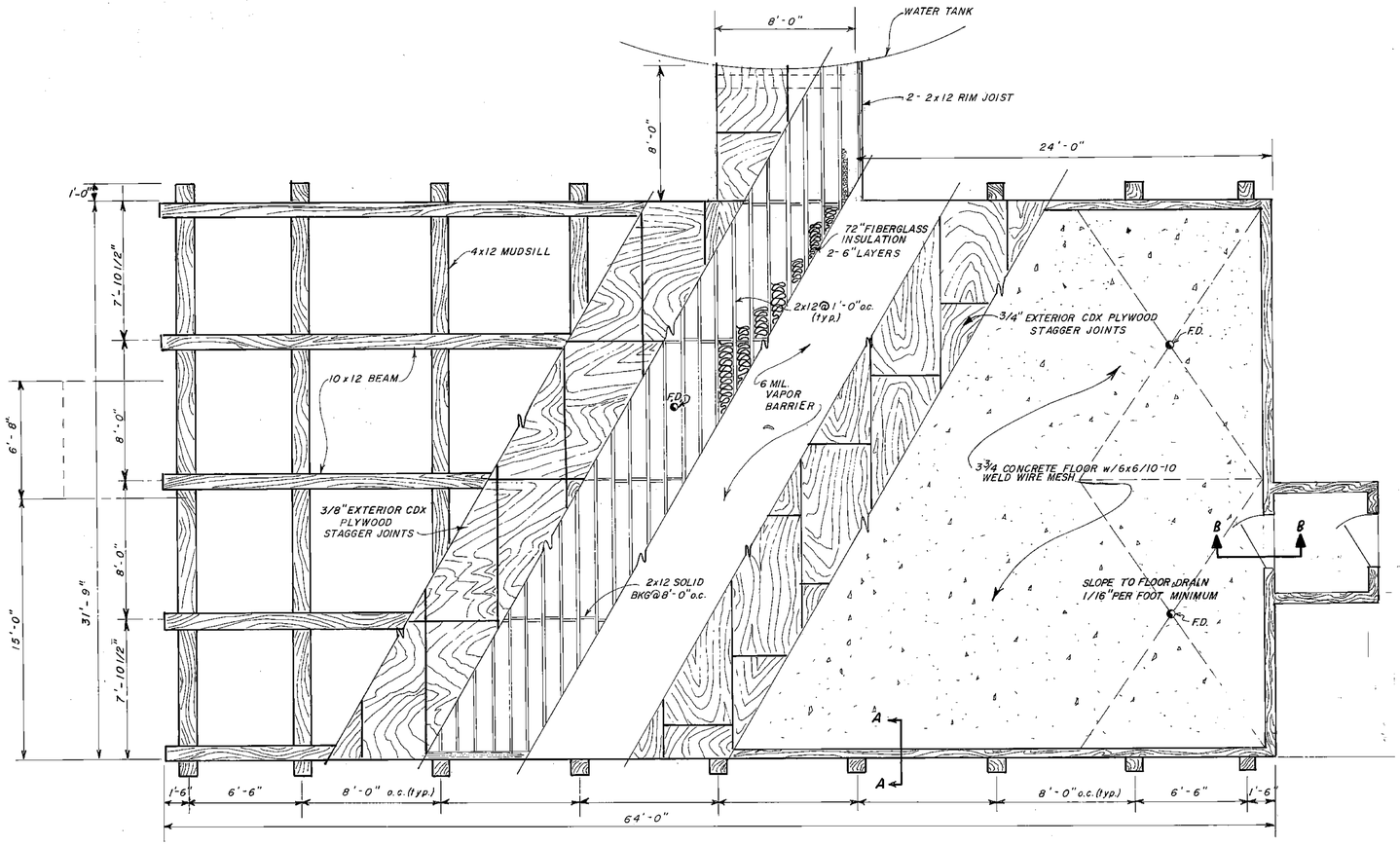
DRAWN BY: LAVELL DATE: DEC. 1977
CHECKED BY: J.T.L. DATE: 6/1/78

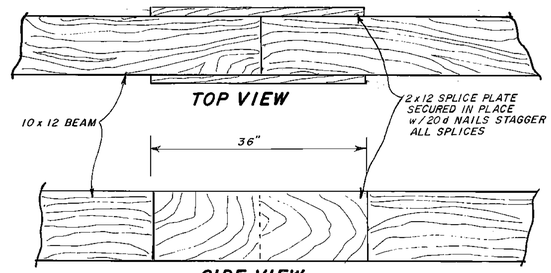
J.T.L.
Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA 49TH JOHN T. LOVETT No. 3512-E REGISTERED PROFESSIONAL ENGINEER

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

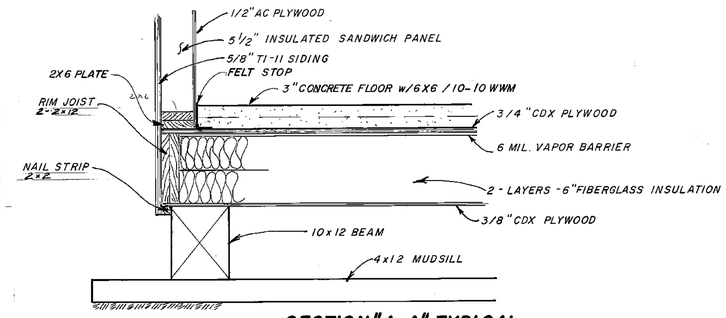
☆U.S. GOVERNMENT PRINTING OFFICE: 1977—798-286





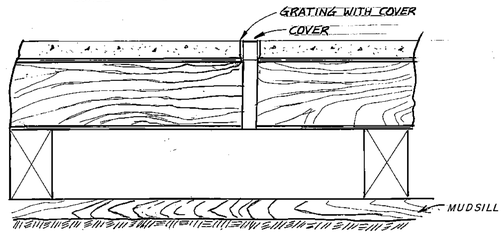
BEAM SPLICE JOINT DETAIL

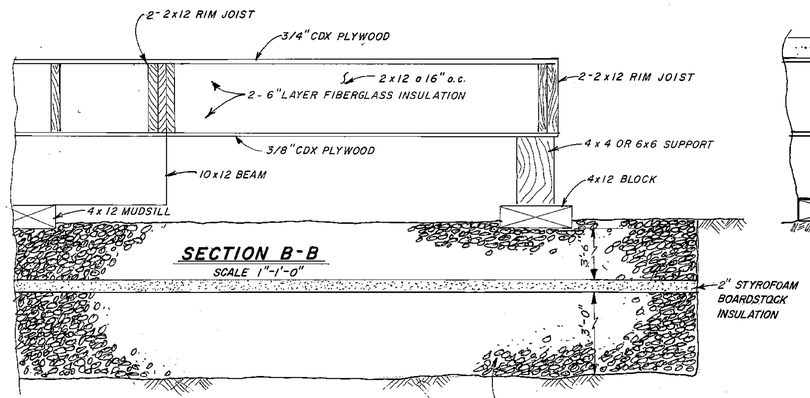
SCALE 1" = 1'-0"



SECTION "A-A" TYPICAL

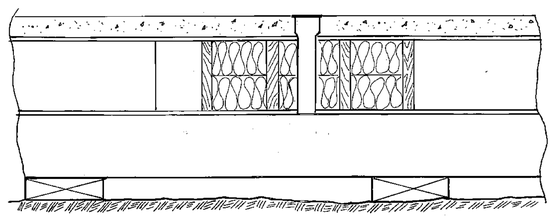
SCALE 1"-1'-0"





SECTION B-B

SCALE 1"-1'-0"



TYPICAL FLOOR DRAIN

NTS

TYPICAL FLOOR DRAIN

NTS

AS BUILT

DATE	REVISIONS	INITIALS
23 Jul 78	Add 2" Styrofoam under Bldg	LEE

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
FOUNDATION PLAN
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN 77-631

SHEET NO. 6 OF 23 TOTAL SHEETS

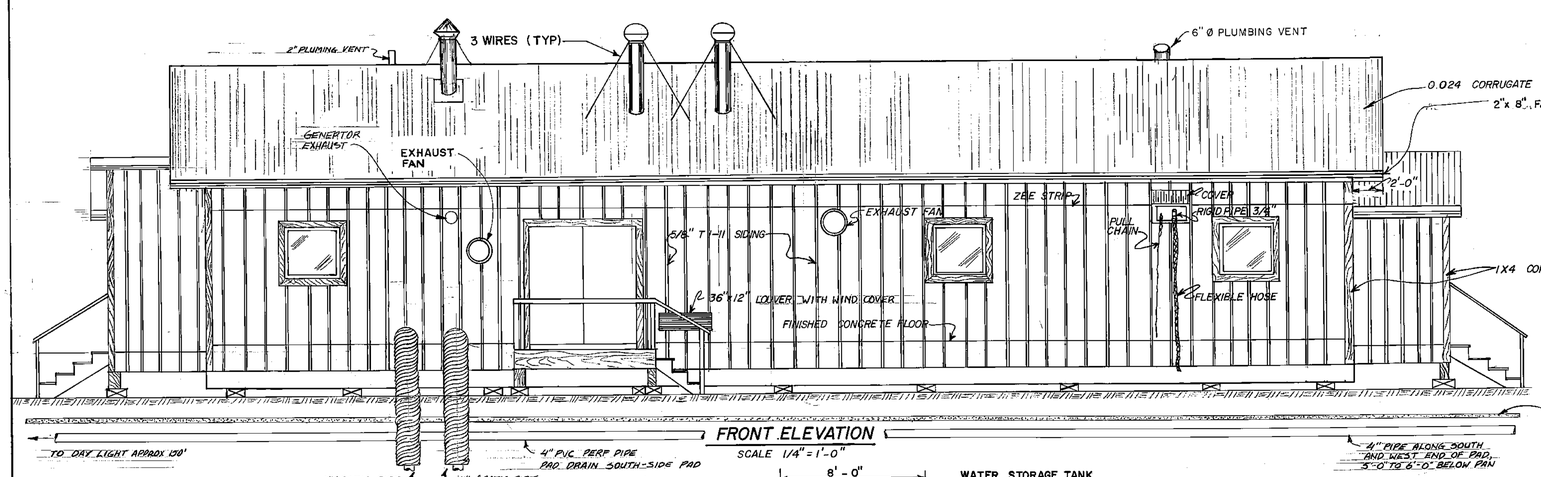
DRAWN BY: LEE DATE: 12-8-77
CHECKED BY: J.T.L. DATE: 6/6/78

J.T.L.	Design Engineer
	Maintenance Review
	Material Take-off

STATE OF ALASKA 49TH — JOHN T. LOVETT No. 3512-E — REGISTERED PROFESSIONAL ENGINEER

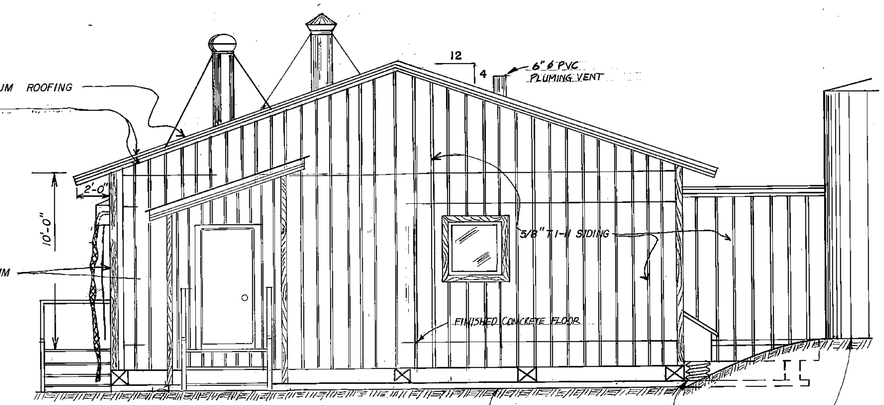
SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

☆U.S. GOVERNMENT PRINTING OFFICE: 1977—755-255



FRONT ELEVATION

SCALE 1/4" = 1'-0"



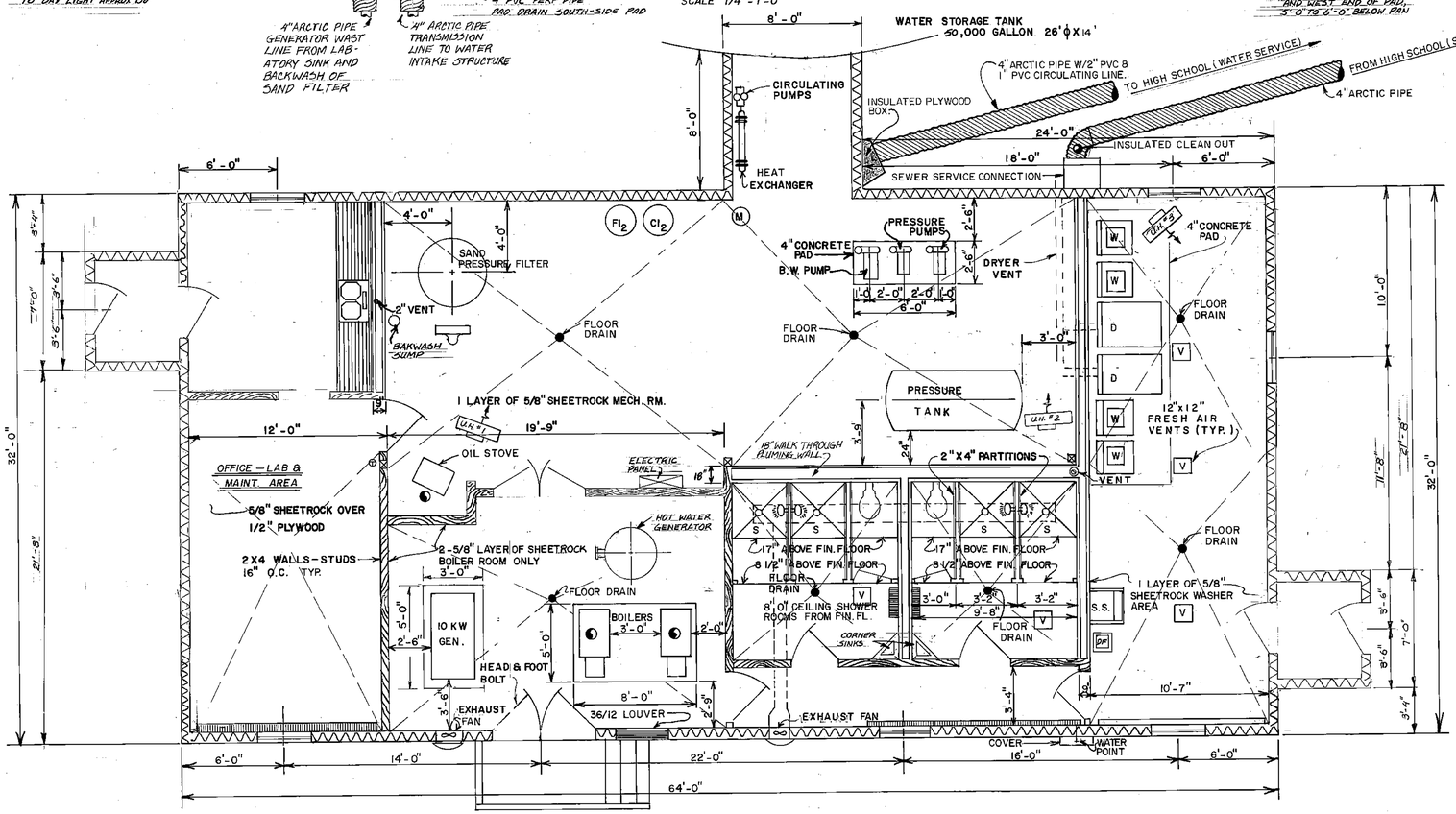
RIGHT END ELEVATION

SCALE 1/4" = 1'-0"

BUILDING PAD ELEVATION ASSUMED AT 100.0'

TO SEPTIC TANK

TANK ELEVATION ASSUMED AT 102.64'



FLOOR PLAN

SCALE 1/4" = 1'-0"

NOTES

1. SLOPE CONCRETE FLOOR TO FLOOR DRAIN. MINIMUM SLOPE 1/16" PER FOOT.
2. BOILER ROOM TO RECEIVE 2 LAYER OF 5/8" SHEET ROCK.
3. INTERIOR SIDE OF ALL BUILDING PANELS TO BE COVERED BY 5/8" SHEET ROCK. INTERIOR PARTITIONS SHALL BE COVERED AS NOTED.
4. TAPE ALL JOINTS
5. EXTERIOR LATEX PAINT SYSTEM FOR BUILDING
6. PLACE 4 MIL VAPOR BARRIER BETWEEN 5/8" SHEET ROCK AND 1/2" PLYWOOD INTERIOR OF ALL BUILDING PANELS.

AS BUILT

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	CLE
SEPT 80	AS-BUILT CHANGES	PML

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
WATER TREATMENT AND WASHETERIA
FLOOR PLAN AND ELEVATIONS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN—77—631

SHEET NO. 7 OF 23 TOTAL SHEETS

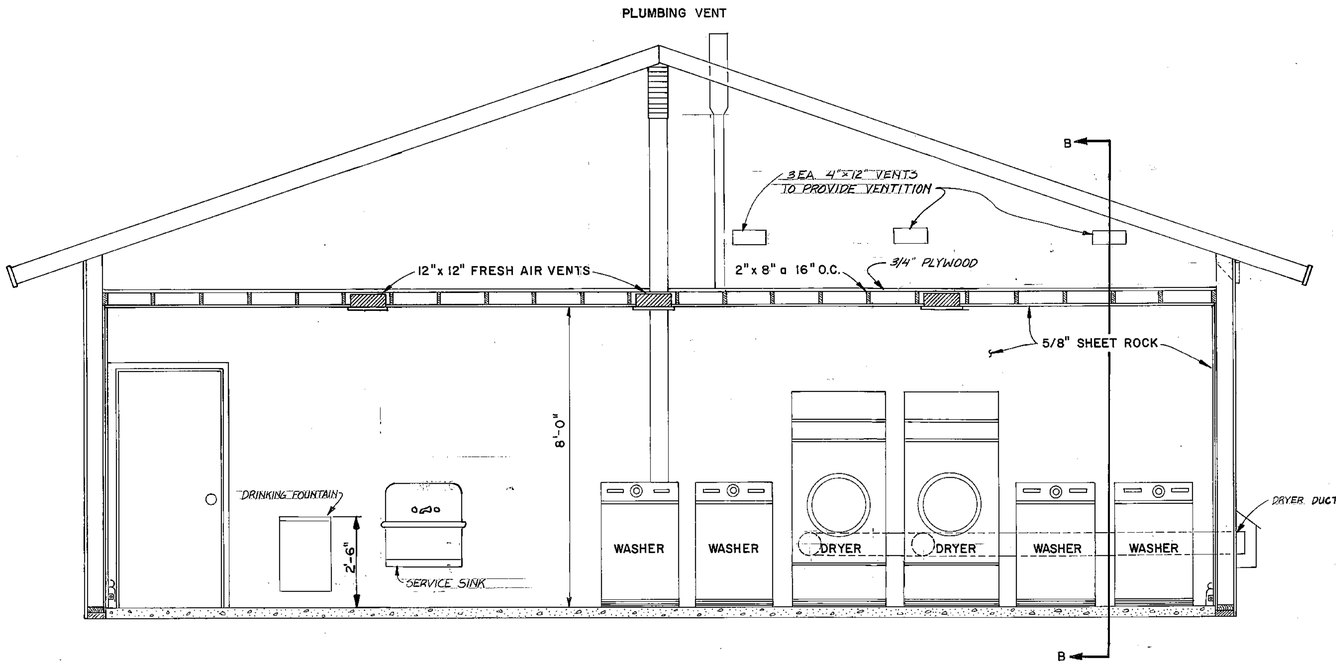
DRAWN BY: georgia a. greatreaks DATE: december 07, 1977
CHECKED BY: J T L DATE: 6-6-78

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

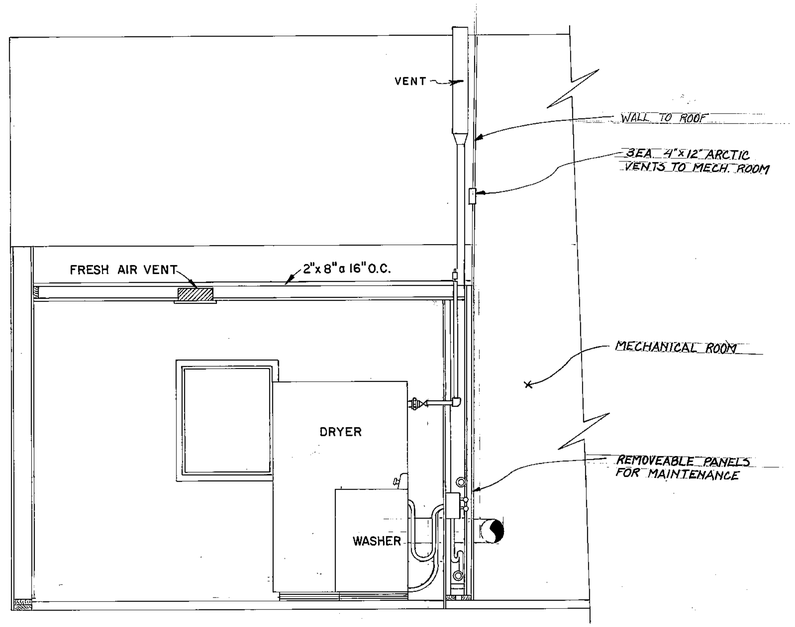
JTL
Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA 49TH
JOHN T. LOVETT No. 3512-E
REGISTERED PROFESSIONAL ENGINEER

☆U.S. GOVERNMENT PRINTING OFFICE: 1977—755-295



WASHETERIA
ELEVATION
SCALE: 1/2"= 1'-0"



WASHETERIA
CROSS SECTION B-B
SCALE: 1/2 = 1'-0"

AS BUILT

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	GLC

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
WASHETERIA
ELEVATION AND CROSS SECTION
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 8 OF 23 TOTAL SHEETS

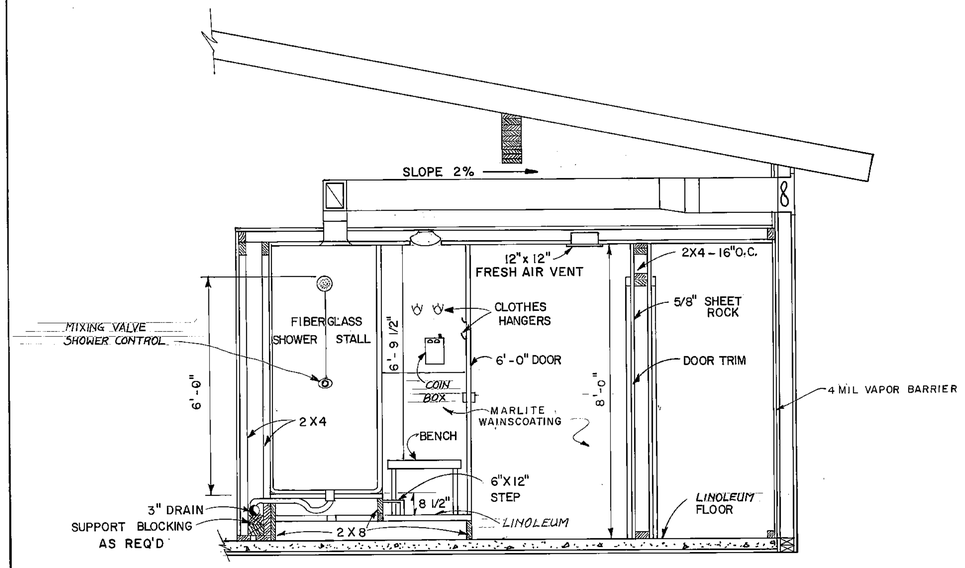
DRAWN BY: G.E. KANGAS DATE: JANUARY, 1978
CHECKED BY: J.T.L. DATE: 6/5/78

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

J.T.L.
Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA 49TH
JOHN T. LOVETT No. 3512-E
REGISTERED PROFESSIONAL ENGINEER

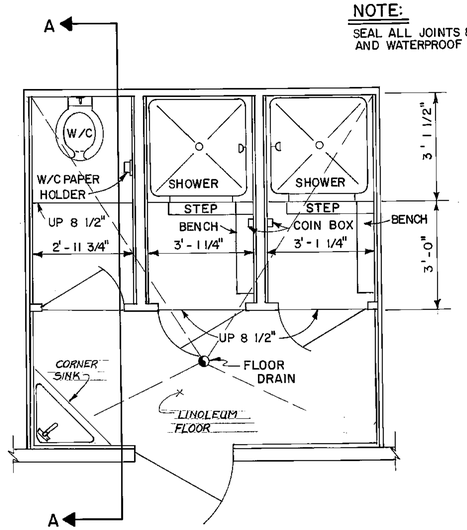
☆U.S. GOVERNMENT PRINTING OFFICE: 1977—769-256



SHOWER ROOM CROSS SECTION

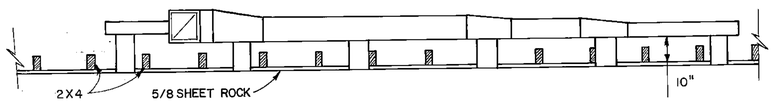
SCALE: 1/2"=1'-0"

NOTE:
SEAL ALL JOINTS & CRACKS AND WATERPROOF



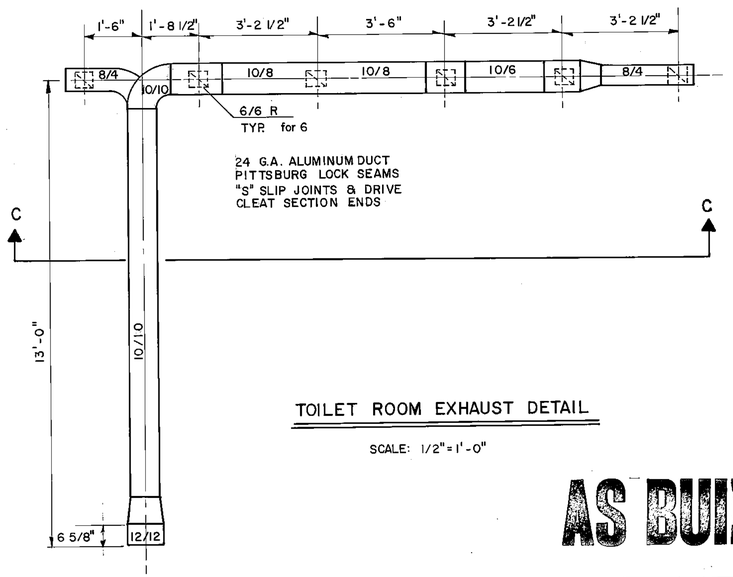
TYPICAL SHOWER ROOM PLAN VIEW

SCALE: 1/2"=1'-0"



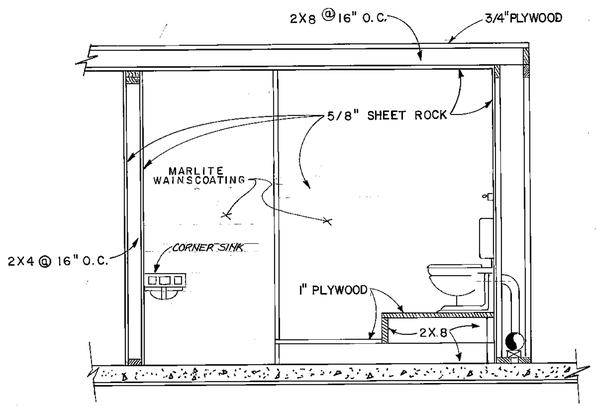
C-C DETAIL PLAN OF EXHAUST SYSTEM

SCALE: 1/2"= 1'-0"



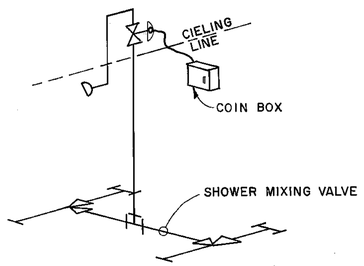
TOILET ROOM EXHAUST DETAIL

SCALE: 1/2"=1'-0"



A-A DETAIL ELEVATION

SCALE: 1/2"= 1'-0"



COIN BOX SCHEMATIC

NTS

AS BUILT

DATE	REVISIONS	INITIALS
FEB 80	AS-BUILT	CLC

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
SHOWER ROOM DETAILS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 9 OF 23 TOTAL SHEETS

DRAWN BY: LAVELL DATE: JAN. 1978
CHECKED BY: JTL DATE: 4/78

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

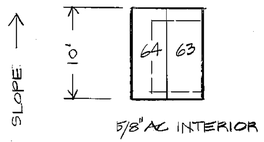
JTL
Design Engineer

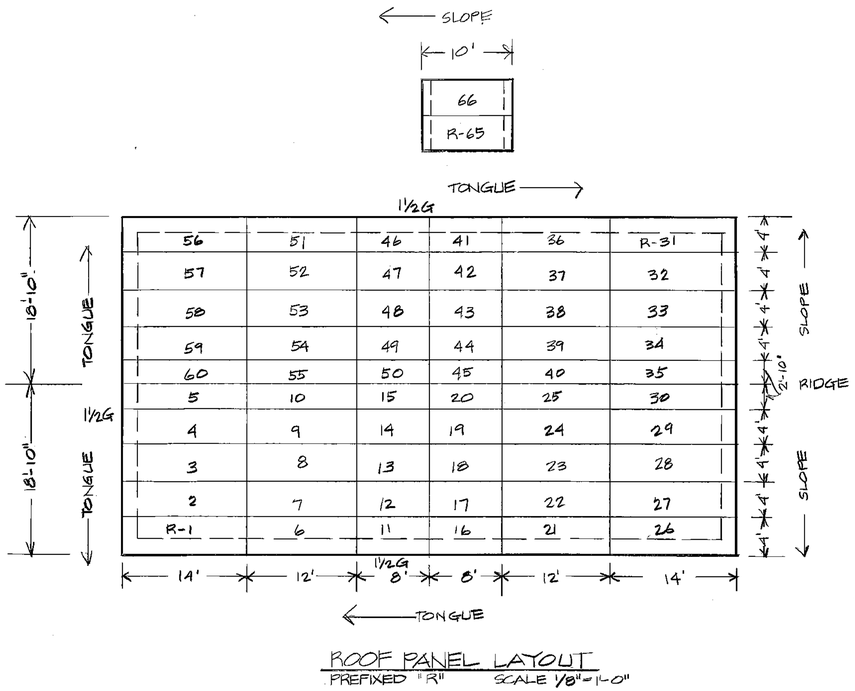
Maintenance Review

Material Take-off

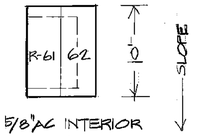
STATE OF ALASKA 749TH JOHN T. LOVETT No. 3512-E REGISTERED PROFESSIONAL ENGINEER

U.S. GOVERNMENT PRINTING OFFICE: 1977-738-286

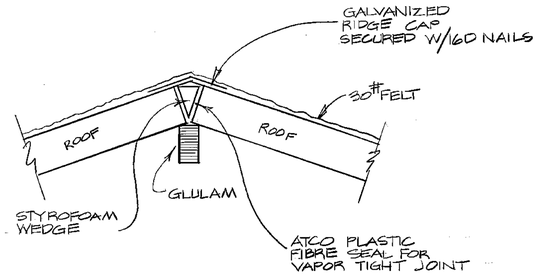




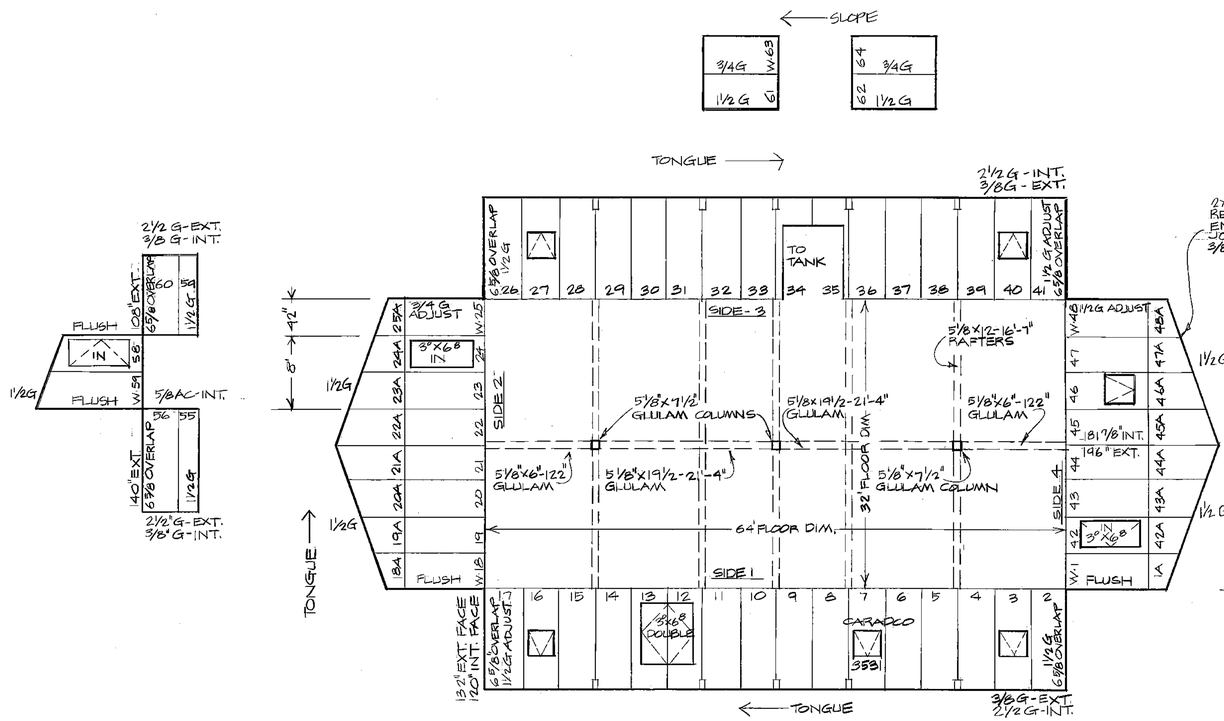
ROOF PANEL LAYOUT
PREFIXED "R" SCALE 1/8"=1'-0"



½" CDX - EXTERIOR
2"x6" – 24" O.C.
½" CDX - INTERIOR (EXCEPT AS NOTED)

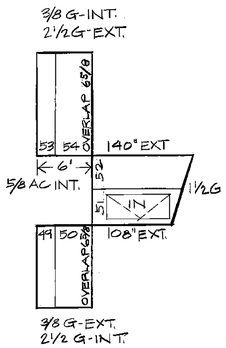


RIDGE DETAIL

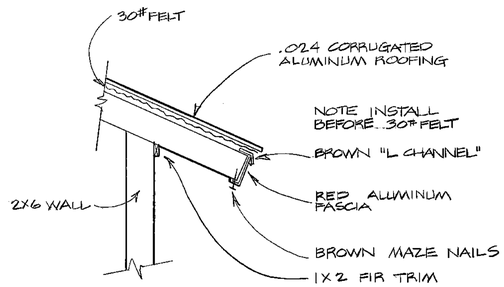


WALL PANEL LAYOUT
PREFIXED "W" SCALE: 1/8"=1'-0"

2"x6 SPLINES FROM 14' STOCK REQUIRED FOR BOTH GABLE END WALLS FOR VERTICAL JOINTS - PANELS HAVE 3/8" G BOTH SIDES



4/12 SLOPE
5/8" T-11 EXTERIOR SIDING
2x6 STUDS - 24" O.C.
½" CDX - INTERIOR (EXCEPT AS NOTED)



FASCIA DETAIL

DOORS - THERMA-TRU METAL CLAD-URETHANE INSULATED
WINDOWS - CARADCO 3531 WITH ½" LEXAN PANES

DATE	REVISIONS	INITIALS

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

WATER TREATMENT FACILITY
TUNUNAK PROJECT 7-631
PUBLIC LAW 86-121 PROJECT
PROJECT NO.

SHEET NO. ..... OF ..... TOTAL SHEETS

DRAWN BY: D. BISSETT DATE: 7-14-78
CHECKED BY: DATE:

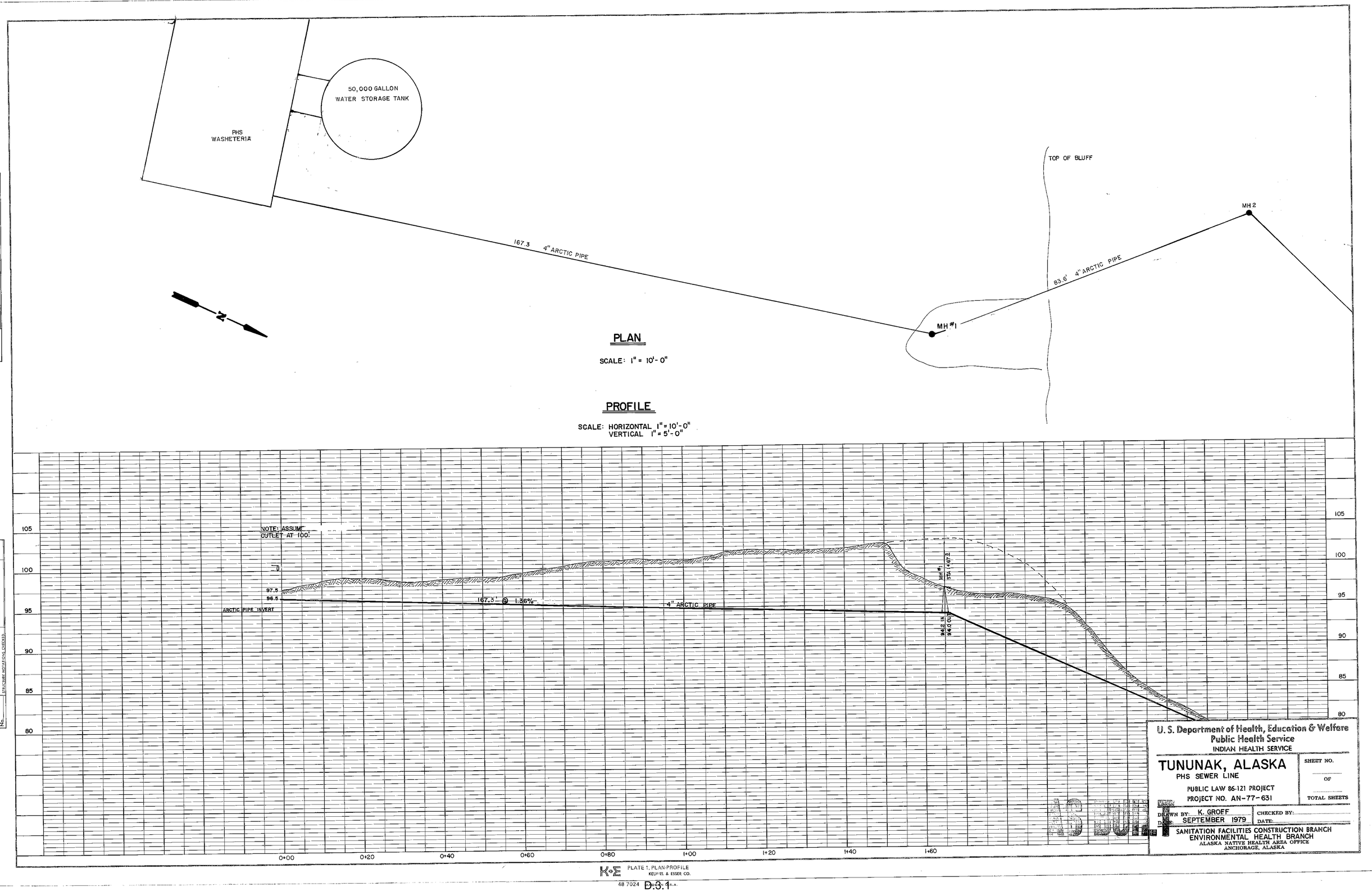
SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

Design Engineer
Maintenance Review
Material Take-off

☆U.S. GOVERNMENT PRINTING OFFICE: 1978—736-316

PLAN
NOTE BOOK
No.
SURVEYED
PLOTTED
ALIGNMENT CHECKED
RT. OF WAY CHECKED
BY
DATE

PROFILE
NOTE BOOK
No.
SURVEYED
PLOTTED
GRADES CHECKED
R. W. L. NOTED
STRUCTURES LOCATIONS CHECKED
BY
DATE



PLAN

SCALE: 1" = 10'- 0"

PROFILE

SCALE: HORIZONTAL 1" = 10'-0"
VERTICAL 1" = 5'-0"

U. S. Department of Health, Education & Welfare
Public Health Service
INDIAN HEALTH SERVICE

TUNUNAK, ALASKA

PHS SEWER LINE

PUBLIC LAW 86-121 PROJECT

PROJECT NO. AN-77-631

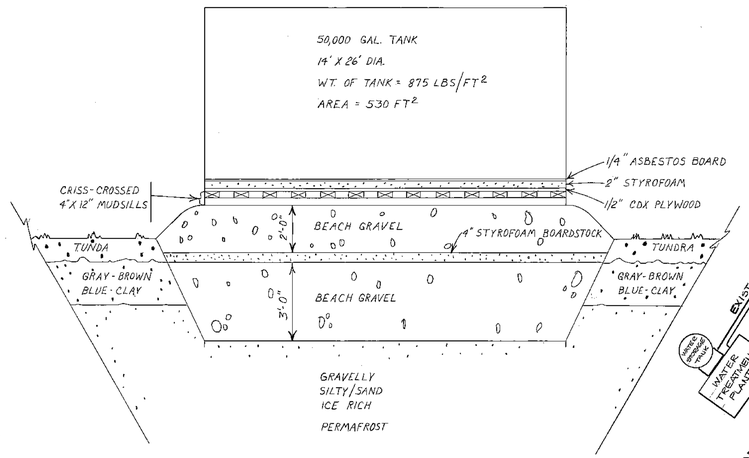
SHEET NO. ..... OF ..... TOTAL SHEETS

DRAWN BY: K. GROFF
DATE: SEPTEMBER 1979
CHECKED BY:
DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA NATIVE HEALTH AREA OFFICE
ANCHORAGE, ALASKA

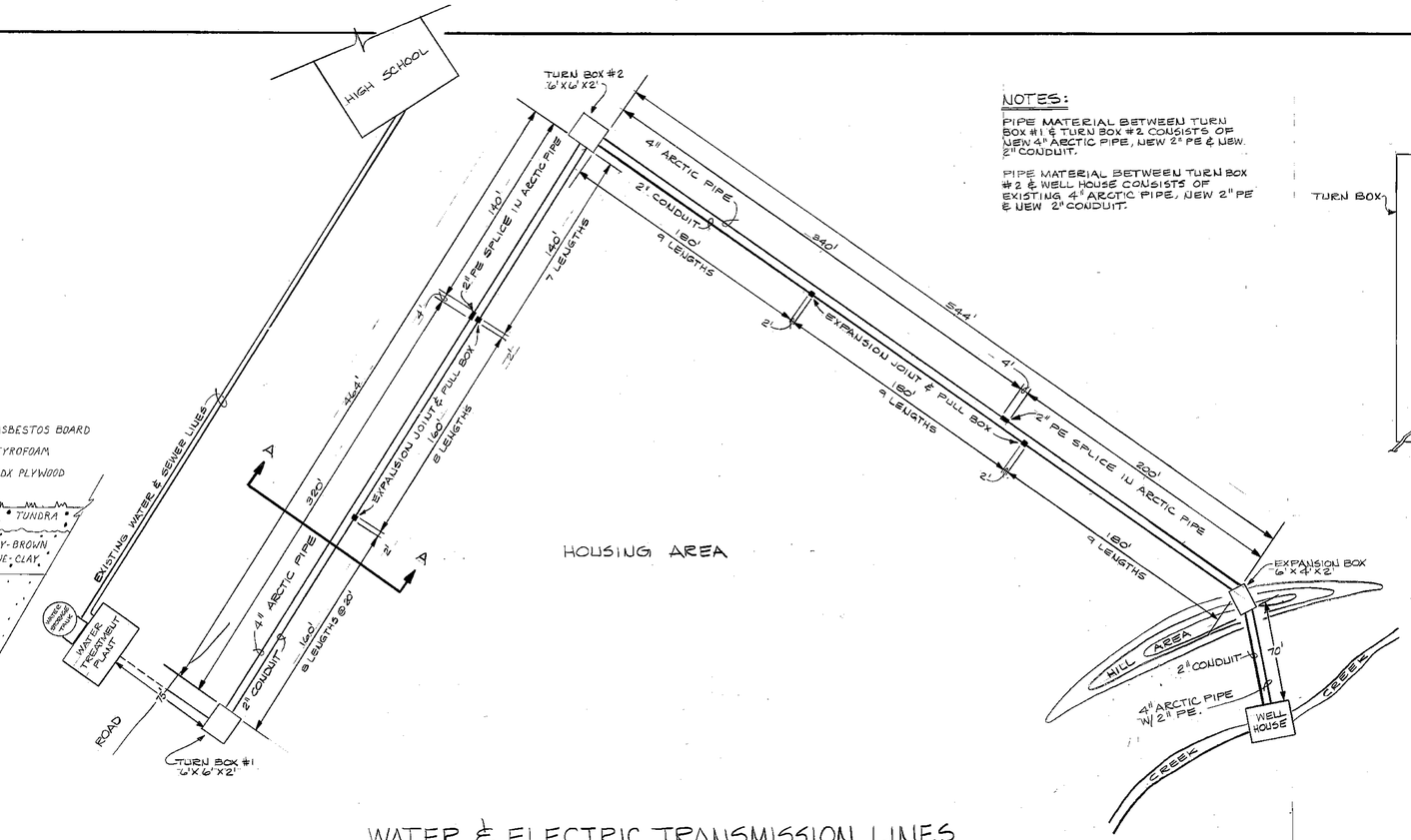
K+E PLATE 1. PLAN-PROFILE
KEUFFEL & ESSER CO.
48 7024 Made in U.S.A.

D.3.1



WATER TANK FONDATION PAD DETAIL

NTS



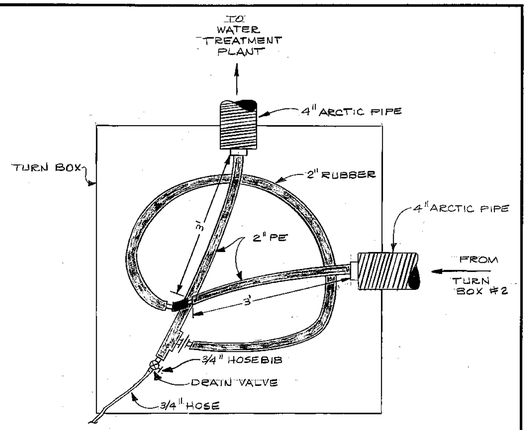
WATER & ELECTRIC TRANSMISSION LINES

NOT TO SCALE

NOTES:

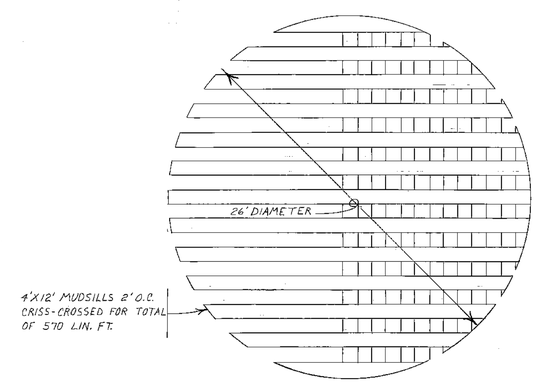
PIPE MATERIAL BETWEEN TURN BOX #1 & TURN BOX #2 CONSISTS OF NEW 4" ARCTIC PIPE, NEW 2" PE & NEW 2" CONDUIT.

PIPE MATERIAL BETWEEN TURN BOX #2 & WELL HOUSE CONSISTS OF EXISTING 4" ARCTIC PIPE, NEW 2" PE & NEW 2" CONDUIT.



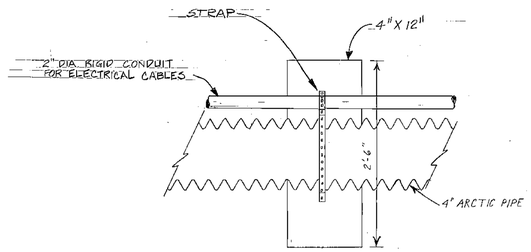
TURN BOX #1

NOT TO SCALE



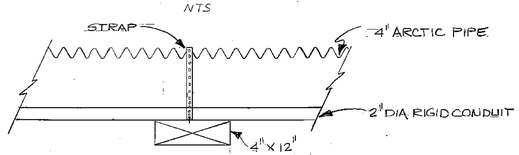
MUDSILL LAYOUT FOR TANK FONDATION

NTS



TRANSMISSION LINE SUPPORT PAD PLAN

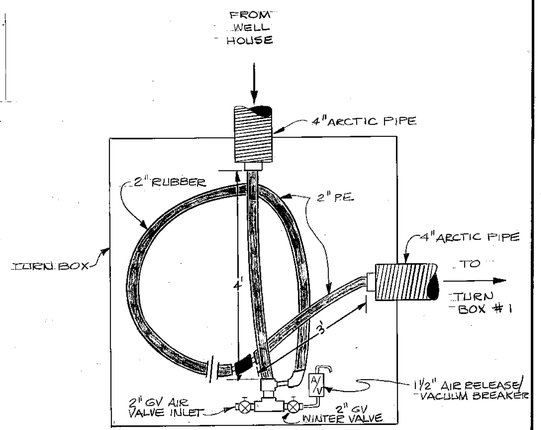
NTS



LUMBER SUPPORTS FOR TRANSMISSION LINE SPACED 10 FT. O.C.

TRANSMISSION LINE SUPPORT PAD ELEVATION

NTS



TURN BOX #2

NOT TO SCALE

AS BUILT

DATE	REVISIONS	INITIALS
SEPT 80	AS-BUILT	CLC
SEPT 80	AS-BUILT CHANGES	PML

Design Engineer

Maintenance Review

Material Take-off

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
WATER TRANSMISSION LINE & TANK FOUNDATION
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. ..... OF ..... TOTAL SHEETS

DRAWN BY: G.G.A.
DATE: JULY 1978

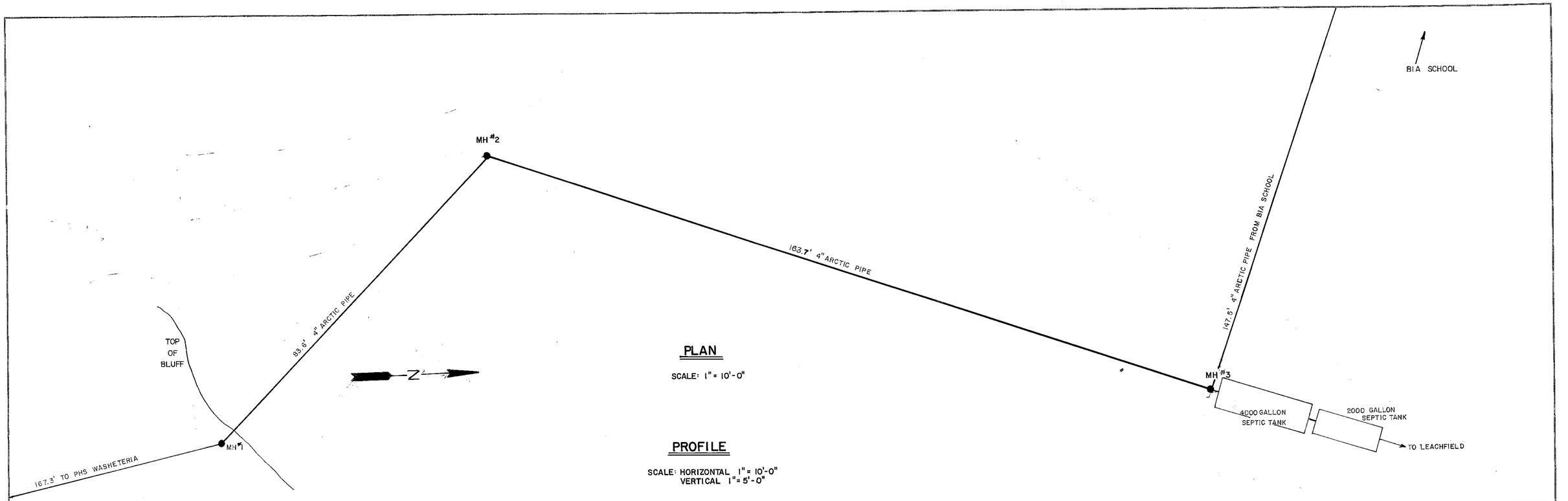
CHECKED BY: .....
DATE: .....

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

☆U.S.GOVERNMENT PRINTING OFFICE: 1978—786-318

PLAN
NOTE BOOK
No.
SURVEYED
PLOTTED
ALIGNMENT CHECKED
RT. OF WAY CHECKED
BY
DATE

PROFILE
NOTE BOOK
No.
SURVEYED
PLOTTED
GRADES CHECKED
ALIGNMENT CHECKED
STRUCTURE EXCAVATIONS CHECKED
BY
DATE



U.S. Department of Health, Education & Welfare
Public Health Service
INDIAN HEALTH SERVICE

TUNUNAK, ALASKA

SEWER LINE

PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. ..... OF ..... TOTAL SHEETS

DRAWN BY: K. GROFF
DATE: SEPTEMBER 1979
CHECKED BY:
DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA NATIVE HEALTH AREA OFFICE
ANCHORAGE, ALASKA

AS BUILT

K&E PLATE 1, PLAN-PROFILE
KEUFFEL & ESSER CO.
48 7024

PLAN
NOTE BOOK
No.
SURVEYED
PLOTTED
ALIGNMENT CHECKED
RT. OF WAY CHECKED
BY
DATE

BIA SCHOOL

1475' 4" ARCTIC PIPE

N

LEACHFIELD SEE DETAILS

48'

22 1/2° BEND

2000 GALLON SEPTIC TANK

4000 GALLON SEPTIC TANK

MH 3

FROM MH 2

SCALE
VERT 1"=10'
HORIZ 1"=5'

PROFILE
NOTE BOOK
No.
SURVEYED
PLOTTED
GROUND CHECKED
R. W.'s NOTED
STRUCTURE LOCATIONS CHECKED
BY
DATE

85
80
75
70
65

GROUND LEVEL AT BIA SCHOOL

1.0' MINIMUM GRAVEL FILL OVER PIPE

147.5' 2.24% 4" ARCTIC PIPE

MH 3 STA 1+47.5

INV IN 71.7

INV OUT 71.5

4000 GALLON SEPTIC TANK

INV EL 71.4'

2000 GAL SEPTIC TANK

4" TEE

ELEV OF LEACHFIELD 70.7'

AS BUILT

U. S. Department of Health, Education & Welfare
Public Health Service
INDIAN HEALTH SERVICE

TUNUNAK, ALASKA
BIA SCHOOL LINE
PLAN & PROFILE
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. ..... OF ..... TOTAL SHEETS

DRAWN BY: JAR CHECKED BY:
DATE: OCT. 79 DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA NATIVE HEALTH AREA OFFICE
ANCHORAGE, ALASKA

K+E PLATE 1, PLAN-PROFILE
KEUFFEL & ESSER CO.
48 7024 MADE IN U.S.A.

D.4 Well Records, Permits, and Classification

D.4.1 October 2019 Engineer Report Request to ADEC for Approval of Well

Request with Engineering Report submitted by Bob Gilfillan. P.E on behalf of the Native Village of Tununak IRA Council Tununak, AK for a New Deep Water Supply Well to serve as a primary drinking water source. Length 131 Pages.

Stantec Consulting Services Inc.
725 East Fireweed Lane Suite 200, Anchorage AK 99503-2245

October 15, 2019
File: 2047057404.200.002

Attention: Roy Robertson, P.E., ADEC Drinking Water Program
Alaska Department of Environmental Conservation
Drinking Water Program
555 Cordova Street
Anchorage, Alaska 99501

Dear Mr. Robertson,

Reference: New Deep Water Supply Well for Native Village of Tununak IRA Council Tununak, Alaska

The purpose of this letter is to request the Alaska Department of Environmental Conservation (ADEC) Drinking Water Program to approve the exploratory deep water well (described herein) that was recently drilled to serve as the primary drinking water source for the Native Village of Tununak IRA Council (Tununak). This request is being submitted to ADEC by Stantec Consulting Services, Inc. (Stantec) on the behalf of Tununak in participation with the ADEC Village Safe Water (VSW) Program.

In 2016 Tununak, in cooperation with the VSW, retained Stantec to prepare a Preliminary Engineering Report (PER) to identify, evaluate and recommend a washeteria and water treatment plant. The PER was prepared in accordance with USDA-RD Rural Utilities Services Bulletin 1780–2, dated April 4, 2013. As part of evaluating the existing and potential water sources for the PER, Stantec prepared a technical memorandum (tech memo) in 2018 that summarized the findings of a desktop study that qualitatively assessed the feasibility of constructing a new deep (greater than 50 feet) water well to serve the entire village of Tununak.

The current water source for Tununak's washeteria and water treatment plant consists of a 40 year old infiltration gallery that uses a surface water source (described herein). The deepest water well in Tununak is less than 40-feet deep and was drilled several decades ago in the lower village area on the spit for the school. The desktop study evaluated published water resources and subsurface hydrogeologic data for the Tununak area including nearby village of Toksook Bay. Regional geologic mapping efforts between Tununak and Toksook Bay indicate similar folded Cretaceous sedimentary rock at both communities including sandstone and shale. The sedimentary rock has been investigated in greater detail in Toksook Bay, where several deep wells were installed and produced adequate quantities of drinking water from Cretaceous sandstone units. In conclusion, the tech memo recommended an exploratory well drilling program be developed to determine if a

Design with community in mind

deep water supply well could be constructed to serve the entire community of Tununak contingent on discovery of an aquifer that is not under the influence of surface water and has sufficient flow and acceptable water quality characteristics.

Background

Tununak is located in southwestern Alaska along the coast of the Bering Sea on the western edge of Nelson Island, approximately 6 miles from the City of Toksook Bay. The village is about 519 miles west of Anchorage and approximately 115 miles northwest of Bethel (see Figure 1 for Location and Vicinity Map for Tununak). The area surrounding Tununak is dominated by the Tununak Bay (Bering Sea) to the west, Tununak River to the south and Ugchirnak Mountain to the north and east.

The community of Tununak is primarily comprised of two residential areas: the "main" part of the community lies on a narrow spit of land between the Tununak River and Tununak Bay (Bering Sea), and the "new" area consists of 23 homes in the Association of Village Council Presidents (AVCP) subdivision located on the North Fork of the Tununak River at the base of the foot slope to Ugchirnak Mountains. The washeteria and Water Treatment Plant (WTP) are located on higher ground, approximately 30 feet above mean sea level, in the eastern portion of the community, overlooking the main village that is located on the sandspit, a few feet above the sea level. Local topography within the project area is relatively flat, with the land gently sloping upwards north-east towards the LKSD Paul Albert High School. In 2010 Tununak's population was reported at 327 and has steadily increased to a population of 387 as noted in the most recent estimate (2017) from the Alaska Department of Labor.

The water source for the existing washeteria/WTP uses a shallow water well that consists of an infiltration gallery located in Unnamed Creek that was constructed in 1978 by the U.S. Public Health Service (USPHS). The well (infiltration gallery) remains in the same configuration as it did when it was installed in Unnamed Creek over 40 years ago. The creek flows through an upland tundra area and has a width that varies from 1 foot to a few feet and has a shallow depth of approximately 1 to 2 feet. The flow of the creek varies throughout the year, depending on precipitation and snow accumulation. During the winter, the creek freezes and often develops aufeis (overflow ice conditions) that creates operational problems for pumping water to refill the WTP's 50,000 gallon water storage tank. The drainage basin for Unnamed Creek is on the south side of Ugchirnak Mountains and has a drainage area of approximately 1 to 1.5 square miles.

The infiltration gallery is located inside an 8- by 8-foot wooden well house structure. The infiltration gallery consists of a 9-foot deep, 24-inch diameter, perforated (slotted) corrugated metal pipe, that was installed vertically in the middle of the Unnamed Creek. The well house is located approximately 900 feet east and downhill of the existing washeteria/WTP. The raw water from the well house is pumped via a 2-inch diameter high density polyethylene (HDPE) pipe

inside a 4-inch diameter Arctic pipe in an aboveground utilidor to the washeteria/WTP. The water source is classified as a surface water source.

Due to operational problems with the existing 40 year old WTP that have resulted in non-compliance in ADEC drinking water standards, the finished water produced by the WTP is only used for the operation of the washeteria. Most if not all residents of Tununak obtain their drinking water by hauling from the school's community watering point.

Exploratory Well Drilling Program

In 2018, the USDA Rural Development (RD) Program provided funding via the State of Alaska VSW Program to Tununak for the development of an exploratory water well drilling program. Stantec was contracted to prepare bid documents and technical specifications for the drilling and development of a 6-inch diameter steel cased water supply well. In addition, Stantec was responsible for monitoring the performance of drilling services provided by the selected well drilling contractor.

The solicitation for bids had assumed the depth of the exploratory well would range from 100 to 200 feet below the ground surface. In addition, the bid specifications included referral and compliance with the State of Alaska, Drinking Water Regulations 18 AAC 80.015 (Well Protection, Source Water Protection and Well Decommissioning) and the Alaska Best Management Practices (BMPs) for Construction of Non-Public Water Wells and Alaska Best Management Practices for Maintaining or Decommissioning Water Wells and Boreholes. The BMPs were recently prepared by the Groundwater Protection Stakeholders Workgroup in Conjunction with Alaska Department of Environmental Conservation, Alaska Department of Natural Resources and the Alaska Water Well Association.

Well Construction

In April 2019, the contract for drilling the exploratory water well for Tununak was awarded to Ridge Contracting, Inc. whose subcontractor well driller was Dave Harper, owner of Alpine Drilling from Anchorage, Alaska. In July 2019, the contractor mobilized to Tununak and began the drilling the exploratory well at a designated location (see Figure 2 for Map of Tununak with approximate location of well site). The well site is located in well-drained tundra area that is approximately 100-feet west of the recently constructed airport haul road. The property owner of the well site is the Native Village of Tununak IRA Council. The exploratory well is located a few hundred feet east of the existing Tununak infiltration gallery on Unnamed Creek and a couple of hundred feet south of Unnamed Creek. Although swing ties were measured for the well location, the latitude and longitude coordinates for the well will be obtained by Stantec at a later date submitted to ADEC for recording purposes.

On July 13, 2019, the well driller began drilling the exploratory well with an air rotary track mounted drill rig. The steel 6-inch diameter well casing was driven to a depth of 124-feet where bedrock conditions resulted in refusal of driving the casing was encountered. Open hole drilling continued in a primarily siltstone bedrock and encountered a water bearing strata of a confined aquifer at a depth of 158-feet that continued to a depth of 180-feet. A 4.5-inch diameter threaded PVC (SDR-21) well casing was inserted inside the 6-inch steel casing for the entire depth of the borehole to prevent/minimize damage from collapsing of the borehole and protect the well pump. The 4-inch casing was perforated in the 20-foot section of the aquifer from 158 to 178- feet.

The upper 20-feet of the steel well casing was grouted with a bentonite seal. The top of the well casing was measured at a height of 1.75 feet above the ground surface and the immediate area around the well casing was sloped to drain away from the well casing. The static water level in the well was recorded at a depth of 28.35 feet below the ground surface, i.e., 30.1 feet below the top of the well casing. The approximate elevation of the top of casing is 40 feet above mean sea level. Prior to demobilization the well driller welded a temporary metal plate over the well casing at the direction of Stantec to prevent unauthorized entry by others. The driller did provide a sanitary well seal/cover that will be installed when the well is put into operation. A detailed well log prepared by the well driller and a hydrogeologic well log prepared by Stantec is attached to this report. The well logs will be submitted to the Alaska Department of Natural Resources for water rights for use by Tununak as their primary water source.

Well Testing Program

Following the completion of drilling the exploratory well, a 20-hour pump test with a 4-hour well recovery test was conducted by Stantec with the assistance of the well driller. The well was pumped at a constant rate of 30 gallons per minute with a Grundfos 1.5 Hp submersible pump, Model 22SQE1.5-220 that was set a depth of 160 feet in the well. During the aquifer pump test, Stantec measured the drawdown water levels, rate of flow and collected representative water samples at pre-set intervals that were tested in the field for the following water quality parameters with calibrated field test equipment: specific conductance/salinity, pH, temperature, redox potential, and ferrous iron. The field test results for these parameters indicated the quality of the well water appeared acceptable for potable use.

Following the pump drawdown test, Stantec conducted a 4-hour well recovery test. Attached to this report is a spreadsheet that shows the field test results collected during the pump aquifer test and a second spreadsheet with the well aquifer recovery test data. Overall, the aquifer characteristics in terms of rate of flow, recovery and water quality based on preliminary field tests appeared to be very satisfactory and encouraging that

indicated the exploratory well to be a strong candidate for use as a primary water production well to serve Tununak.

At the completion of the well pump aquifer test, representative water samples for laboratory analytical tests were collected by Stantec. The water samples were hand delivered by Stantec (see attached chain of custody) to SGS Laboratory located in Anchorage, Alaska. The samples were certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards and were tested for the following parameters by the cited test methods:

Method	Method Description
SM21 2320B	Alkalinity as CaCO3 Langlier w/ Secon Ct
SM21 2340B	Calcium Hardness by ICP-MS-Langlier
SM23 2120B	Color w/ Secondary Contaminants
EPA 300.0 EPA 300	Primary Inorganics only
EPA 300.0 EPA 300	Secondary Contaminants only
SM2330B	Langlier Index by SM2330B
EP200.8	Mercury in Water by 200.8 Inorg-UDig(DW)
EP200.8	Metals in DW by 200.8 ICP-MS Primy/Secdy
SM21 4500NO3-F	Nitrate/Nitrite Flow injection Pres.
SM21 4500-H B	pH Analysis w/ Secondary Contaminants
SM21 4500-N D	TKN by Phenate (W)
SM21 9223B	Total Coliform P/A Qualitative
SM21 4500-CN C, E	Total Cyanide SM4500 (DW)
SM21 2540C	Total Dissolved Solids SM18 2540C w/ SC
SM 5310B	Total Organic Carbon
EPA 524.2	Volatile Organics by 524.2 (DW)

A copy of the laboratory test results completed by SGS is attached to this report. Overall, the test results show the well's water quality meets all requirements for primary water standards mandated by the ADEC Drinking Water Program. Also, except for a slight exceedance in manganese, the well water quality meets the ADEC secondary water standards.

Prior to leaving the well site, the driller under the direction of Stantec chlorinated the well in accordance with the bid specifications that required the application of a disinfection agent (chlorine) at a minimum concentration of 100 parts per million available chlorine. The disinfection agent was left in the well for a minimum of 12 hours and then flushed out for 4 hours. Upon completion of the flushing process, a representative sample was collected and tested by SGS Laboratory for total coliform as reported herein.

Hydraulic Water Analyses

The well aquifer pump test data was submitted to Victor Harris, Senior Certified Professional Geologist with Stantec, to be analyzed for hydrogeological/hydraulic characteristics of the well. Mr. Harris analyzed the pump test results for the well drawdown test and well recovery test with a computer software program that is based on the Cooper-Jacob Method commonly used for aquifer analyses. A copy of the computer software results is shown on the spreadsheets attached to this report. Overall, Mr. Harris concluded the following flow characteristics for the completed well:

Transmissivity = 204 ft^2 per day

Specific Capacity = 1.1 gallon per minute (gpm) per foot

In addition, Mr. Harris noted that the well could theoretically produce 100 gpm for short pumping periods, but to be conservative, the well could provide a continuous pumping rate of 50 gpm. Further pump testing under different pumping conditions could provide more quantitative information on the aquifer's long term yield potential/capability.

Request ADEC to Approve the New Deep Water Well to Serve Tununak

Based on the findings reported above that include the following information, Stantec requests the ADEC Drinking Water Program to approve the recently drilled exploratory well to serve Tununak as their primary water supply production well:

- Well log on the completed exploratory well,
- Well pump aquifer tests,
- Water analytical test results, and

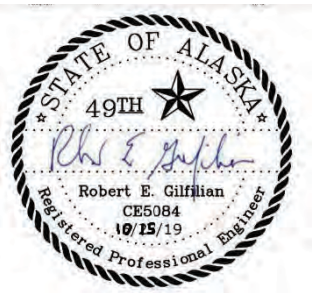
- Well aquifer hydraulic analyses

In addition, we request approval to use the new deep well, as is without additional treatment including disinfection, for drinking water to serve to the residents of Tununak.

We look forward to your response to this request. Please feel free to contact me if you need additional information on this matter.

Regards,

Stantec Consulting Services Inc.



Robert (Bob) Gilfilian PE
Senior Principal Civil Engineer
Cell Phone: 907-227-9883
bob.gilfilian@stantec.com

Attachments: Figure 1 – Location and Vicinity Map for Tununak
Figure 2 – Well Location Map for Tununak Exploratory Well
Wells Logs (2) Prepared by Stantec and Alpine Drilling
Well Pump Aquifer Drawdown and Recovery Tests Spreadsheets prepared by Stantec
SGS Water Quality Test Results for Tununak Exploratory Well
Well Hydraulic Analyses (Spreadsheets) Prepared by Victor Harris, CPG, Stantec

c. James James, Administrator, Native Village of Tununak IRA Council
Xavier Post, Asst Administrator, Native Village of Tununak IRA Council
Doug Poage, PE, ADEC VSW Lead Engineer
Susan Randlett, PE. ADEC VSW Project Engineer

Design with community in mind

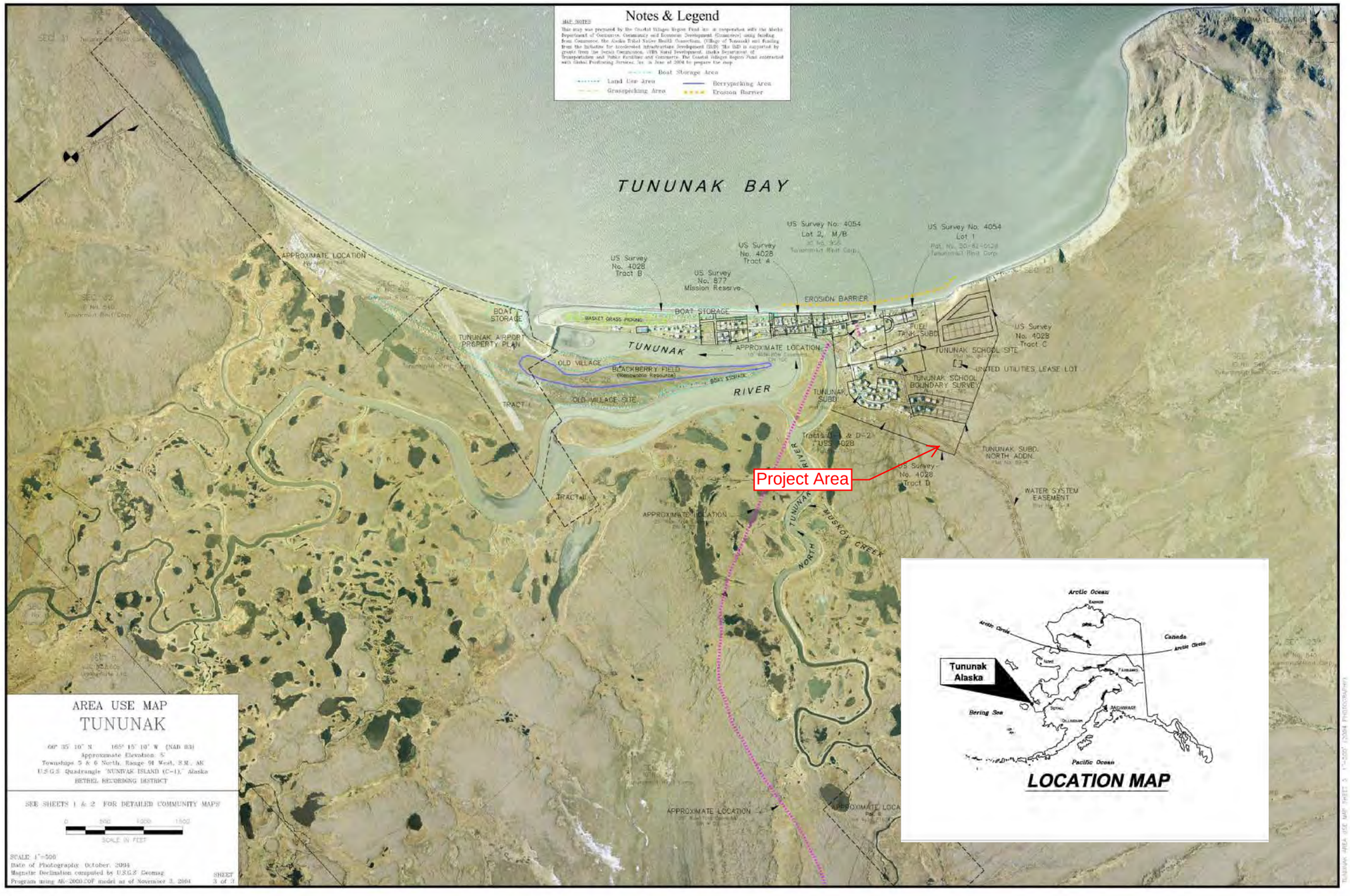


Figure 1
Vicinity and Location (Inset)
Source: ADCRA Mapping

Stantec
Stantec Consulting Services Inc.
725 East Fireweed Lane Suite 200
Anchorage, AK 99503-2245
Tel: (907) 276-4245 • www.stantec.com

FILE: D:\CAD\Proj\WSW - village satlo water\TUNUNAK\Washistoria-Water Treatment Facility\draft\FIG A-1 ADCRA Tununak area map.dgn
TIME: 09-DEC-2010 12:06
JOB No. 1008875.040101



Figure 2
Proposed Well Drilling Locations

Stantec
Stantec Consulting Services Inc
Anchorage, AK 99503-2248
tel (907) 276-6145 • www.stantec.com

TABLE 1
Tununak Exploratory Well
Constant Rate Test Data

Pump On: 7/14/19 @ 1036 **Pump Off:** 7/15/19 @ 0836 **Duration of test: 22 Hours** **Staff:** Jake Keldsen			**Static Water Level: 30.10'** **Measuring Point: TOC** **Elev. of Measuring Point: 40.08' asml**						**Water Quality Measurements**					**Comments**
Date	Clock Time	Time since pump started t (min)	Meter Reading (')	Meter (gal)	Flow rate thru meter (gpm)	Flow rate at spigot prior to meter (gpm)	Total Flow Rate (gpm)	Total Flow Volume (gal)	Ferrous Iron (mg/L)	Redox (mV)	pH	Specific Conductivity (uS/cm)	Temperature (Deg C)	Comments on factors affecting test data
7/14/2019	10:36	0	30.10	-	-	-	0	0	-	-	-	-	-	
7/14/2019	10:36	0.5	35.85	-	-	-	30	15	-	-	-	-	-	
7/14/2019	10:37	1	38.10	-	-	-	30	30	-	-	-	-	-	
7/14/2019	10:37	1.5	39.55	-	-	-	30	45	-	-	-	-	-	
7/14/2019	10:38	2	40.61	-	-	-	30	60	-	-	-	-	-	
7/14/2019	10:38	2.5	41.44	-	-	-	30	75	-	-	-	-	-	
7/14/2019	10:39	3	42.06	-	-	-	30	90	-	-	-	-	-	
7/14/2019	10:39	3.5	42.62	-	-	-	30	105	-	-	-	-	-	
7/14/2019	10:40	4	43.07	-	-	-	30	120	-	-	-	-	-	
7/14/2019	10:40	4.5	43.43	-	-	-	30	135	-	-	-	-	-	
7/14/2019	10:41	5	43.82	-	-	-	30	150	-	-	-	-	-	
7/14/2019	10:41	5.5	44.10	-	-	-	30	165	-	-	-	-	-	
7/14/2019	10:42	6	44.38	-	-	-	30	180	-	-	-	-	-	
7/14/2019	10:42	6.5	44.60	-	-	-	30	195	-	-	-	-	-	
7/14/2019	10:43	7	44.82	-	-	-	30	210	-	-	-	-	-	
7/14/2019	10:43	7.5	45.00	-	-	-	30	225	-	-	-	-	-	
7/14/2019	10:44	8	45.19	-	-	-	30	240	-	-	-	-	-	
7/14/2019	10:44	8.5	45.35	-	-	-	30	255	-	-	-	-	-	
7/14/2019	10:45	9	45.46	-	-	-	30	270	-	-	-	-	-	
7/14/2019	10:45	9.5	45.60	-	-	-	30	285	-	-	-	-	-	
7/14/2019	10:46	10	45.72	-	-	-	30	300	-	-	-	-	-	
7/14/2019	10:47	11	45.95	-	-	-	30	330	-	-	-	-	-	
7/14/2019	10:48	12	46.15	-	-	-	30	360	-	-	-	-	-	

7/14/2019	10:49	13	46.32	-	-	-	30	390	-	-	-	-	-	
7/14/2019	10:50	14	46.49	-	-	-	30	420	-	-	-	-	-	
7/14/2019	10:51	15	46.60	-	-	-	30	450	0.43	188.00	6.00	184.00	3.11	
7/14/2019	10:56	20	47.20	-	-	-	30	600	-	-	-	-	-	
7/14/2019	11:01	25	48.00	-	-	-	30	750	0.37	139.40	6.30	146.00	2.15	
7/14/2019	11:06	30	48.49	-	-	-	30	900	-	-	-	-	-	
7/14/2019	11:11	35	48.79	-	-	-	30	1050	0.35	136.20	6.33	148.00	2.66	
7/14/2019	11:16	40	49.04	-	-	-	30	1200	-	-	-	-	-	
7/14/2019	11:21	45	49.29	-	-	-	30	1350	0.23	134.50	6.37	142.00	2.22	
7/14/2019	11:26	50	49.38	-	-	-	30	1500	-	-	-	-	-	
7/14/2019	11:31	55	49.45	-	-	-	30	1650	0.17	133.90	6.35	142.00	2.24	
7/14/2019	11:36	60	49.54	-	-	-	30	1800	0.24	132.80	6.39	146.00	2.00	
7/14/2019	12:06	90	50.30	-	-	-	30	2700	-	133.30	6.40	150.00	2.55	
7/14/2019	12:36	120	51.12	-	-	-	30	3600	0.02	141.10	6.30	151.00	3.71	
7/14/2019	13:06	150	51.66	-	-	-	30	4500	0.10	153.30	6.30	149.00	2.90	
7/14/2019	13:36	180	52.15	-	-	-	30	5400	-	-	-	-	-	
7/14/2019	14:06	210	52.59	-	-	-	30	6300	-	-	-	-	-	
7/14/2019	14:36	240	53.00	-	-	-	30	7200	0.04	162.80	6.36	151.00	3.98	
7/14/2019	15:36	300	53.61	-	-	-	30	9000	0.30	157.00	6.37	148.00	2.96	
7/14/2019	16:36	360	54.05	-	-	-	30	10800	0.02	165.00	6.39	148.00	3.79	
7/14/2019	17:36	420	54.56	-	-	-	30	12600	-	-	-	-	-	
7/14/2019	18:36	480	54.89	-	-	-	30	14400	-	-	-	-	-	
7/14/2019	19:36	540	55.20	-	-	-	30	16200	0.06	181.30	6.36	148.00	3.96	
7/14/2019	20:36	600	55.50	-	-	-	30	18000	-	-	-	-	-	
7/14/2019	22:36	720	55.90	-	-	-	30	21600	-	-	-	-	-	
7/15/2019	1:36	900	56.36	-	-	-	30	27000	-	-	-	-	-	
7/15/2019	5:00	1104	56.67	-	-	-	30	33120	-	-	-	-	-	
7/15/2019	6:38	1204	56.84	-	-	-	30	36120	-	-	-	-	-	
7/15/2019	8:36	1320	57.03	-	-	-	30	39600	0.03	221.00	5.99	175.00	3.97	

TABLE 2
Tununak Exploratory Well
Pump Test Data

Test Start:	**7/15/19 @ 850**	**Static Water Level: 30.10'**	**Drawdown: 25.94'**
Test End:	**7/15/19 @ 1020**	**Measuring Point: TOC**	**90% Drawdown: 33.69'**
Duration of test:	**90 Mins**	**Measuring Point Elev: 40.08' asml**	
Staff:	**Jake Keldsen**		

Date	Clock Time	Recharge Time t (min)	Meter Reading (')	Comments on factors affecting test data
7/15/2019	8:50	0	57.04	
7/15/2019	8:50	0.25	52.40	
7/15/2019	8:50	0.5	50.80	
7/15/2019	8:50	0.75	49.42	
7/15/2019	8:51	1	48.25	
7/15/2019	8:51	1.25	47.50	
7/15/2019	8:51	1.5	46.90	
7/15/2019	8:51	1.75	46.25	
7/15/2019	8:52	2	45.88	
7/15/2019	8:52	2.5	45.00	
7/15/2019	8:53	3	44.30	
7/15/2019	8:53	3.5	43.71	
7/15/2019	8:54	4	43.26	
7/15/2019	8:54	4.5	42.91	
7/15/2019	8:55	5	42.57	
7/15/2019	8:56	6	42.00	
7/15/2019	8:57	7	41.61	
7/15/2019	8:58	8	41.24	
7/15/2019	8:59	9	40.95	
7/15/2019	9:00	10	40.71	
7/15/2019	9:05	15	39.84	
7/15/2019	9:10	20	39.30	
7/15/2019	9:15	25	38.95	
7/15/2019	9:20	30	38.58	
7/15/2019	9:30	40	38.11	
7/15/2019	9:40	50	37.70	
7/15/2019	9:50	60	37.36	
7/15/2019	10:20	90	36.45	

PER TUNUNAK, AK
STANTEC 2020

Alpine Drilling & Enterprises

Well Log

Permit Number: #SW_____ **Date of Issue: _____**
Date Started: 7-13-19 **Date Completed:** 7-15-19
Legal Description: *Tunanak Well # 1 VSW*
Property Owner Name & Address: *VSW*

Parcel Identification Number: _____
Is well located at approved permit location? x **Yes** ☐ **No**

Borehole Data: Soil Type, Thickness & Water Strata	**Depth (ft)** From	To
silty organic pete unfrozen	*0*	*2*
organic pete frozen	*2*	*11*
siltstone br dry appears thawed	*11*	*20*
clayey siltsone gr soft moist	*20*	*28*
silty clay some chunks br crushed stone	*28*	*35*
silty clay small amt sand moist	*35*	*60*
siltstone w sand gr	*60*	*72*
siltstone sandy br dry	*72*	*83*
siltone br	*83*	*90*
siltstone some sand gr harder	*90*	*106*
sandstone br moist	*106*	*111*
silty sandstone gr moist	*111*	*121*
siltstone br harder casing refusal	*121*	*125*
siltstone br dry	*125*	*143*
siltstone br	*143*	*158*
siltstone H2O highly fractured & caving	*158*	*180*

Method of Drilling x air rotary ☐ cable tool

Casing type: *steel*
Wall Thickness: *.250* inches
Diameter: *6* inches Depth: *123'9"* feet
Liner Type: *pvc*
Diameter: *4.5* inches Depth: *0-180* feet
Casing stickup above ground: *2* feet

Static water level (from ground level): *28.7* feet
Pumping level: *57* feet after
22 hours pumping *30* gpm
Recovery Rate: *30* gpm
Method of Testing: *pump*

Well Intake Opening Type:
☐ Open End x Open Hole
☐ Screened Start _____ feet Stopped _____ feet
x Perforations in liner Start *60* feet Stopped *178* feet

Grout Type: *Bentonite pellets* **Volume:** *3 bgs*
Depth: Start *0* feet Stopped *20* feet

Pump: Intake Depth _____ feet
Pump size _____ hp Brand Name _____

Well Disinfected Upon Completion? x Yes ☐ No
Method of Disinfection: *chlorine*

Comments: *4.5 inch liner perforated from 150' to 178' with multiple 5/8 inch drilled openings with less openings up to 40'.*

Well Driller: *Alpine Drilling & Enterprises*
PO Box 110496
Anchorage AK 99511

PROJECT: **Tununak Water Well**
LOCATION: **Tununak AK**
PROJECT NUMBER:

PER TUNUNAK, AK STANTEC 2020

WELL / PROBEHOLE / BOREHOLE NO: **1**

PAGE 1 OF 4

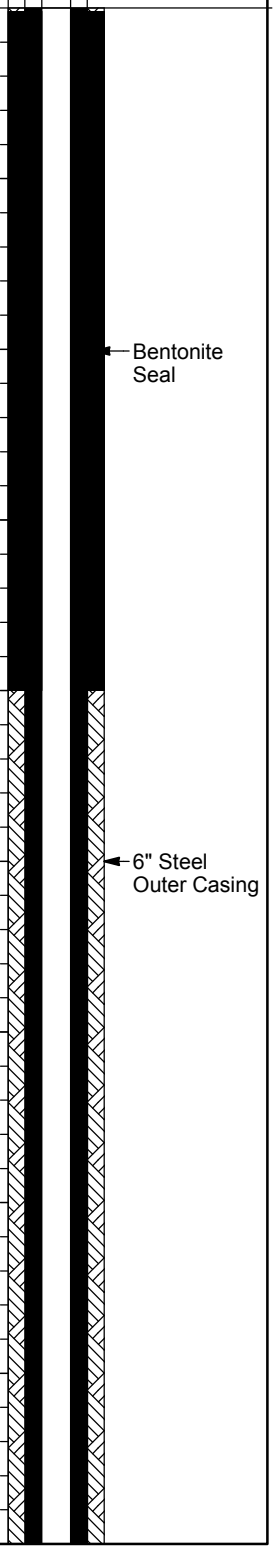
Stantec

DRILLING: STARTED: **7/10/19** COMPLETED: **7/13/19**
INSTALLATION: STARTED: **7/10/19** COMPLETED: **7/13/19**
DRILLING COMPANY: **Alpine**
DRILLING EQUIPMENT: **Morooka Acker MP3**
DRILLING METHOD: **Air Rotary**
SAMPLING EQUIPMENT: **Hand**

NORTHING (ft): EASTING (ft):
GROUND ELEV (ft): TOC ELEV (ft):
INITIAL DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **180**
STATIC DTW (ft): **Not Encountered** WELL DEPTH (ft): **178**
WELL CASING DIA. (in): **4** BOREHOLE DIA.(in): **6**
LOGGED BY: **JK** CHECKED BY:

Depth (feet)	Graphic Log	USCS	Description	Sample	Soil Sample	Measured Recovery (feet)	Headspace PID (units)
0			**SILTY PEAT** ; dark brown; moist to wet; Unfrozen, Organic				
5			**SILTY PEAT** ; dark brown; Frozen, Organic, Possible Permafrost				
10							
15			**SILTSTONE** ; dark brown; dense; dry				
20			**SILT WITH SOME CLAY** ; gray; soft; moist; Crushed				
25							
30		CL-ML	**SILTY CLAY WITH SAND AND GRAVEL** ; CL-ML; dark brown; moist				
35		CL-ML	**SILTY CLAY WITH SAND AND SOME GRAVEL** ; CL-ML; light brown; moist				
40							

Well Construction



GEO FORM 304 TUNUNAK WATER WELL.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 7/30/19

PROJECT: **Tununak Water Well**
LOCATION: **Tununak AK**
PROJECT NUMBER:

PER TUNUNAK, AK STANTEC 2020

WELL / PROBEHOLE / BOREHOLE NO: **1**

Stantec

DRILLING: STARTED: **7/10/19**	COMPLETED: **7/13/19**	NORTHING (ft):	EASTING (ft):
INSTALLATION: STARTED: **7/10/19**	COMPLETED: **7/13/19**	GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING COMPANY: **Alpine**		INITIAL DTW (ft): **Not Encountered**	BOREHOLE DEPTH (ft): **180**
DRILLING EQUIPMENT: **Morooka Acker MP3**		STATIC DTW (ft): **Not Encountered**	WELL DEPTH (ft): **178**
DRILLING METHOD: **Air Rotary**		WELL CASING DIA. (in): **4**	BOREHOLE DIA.(in): **6**
SAMPLING EQUIPMENT: **Hand**		LOGGED BY: **JK**	CHECKED BY:

Depth (feet)	Graphic Log	USCS	Description	Sample	Soil Sample	Measured Recovery (feet)	Headspace PID (units)	Depth (feet)	Well Construction
50		CL-ML	**SILTY CLAY WITH SAND AND SOME GRAVEL** ; light brown; moist					50	
55								55	
60			**SILTSTONE LITTLE CLAY** ; light gray; dry					60	6" Steel Outer Casing
65								65	
70								70	
75		CL-ML	**SILTY CLAY WITH SAND** ; CL-ML; light brown; dry					75	
80								80	
85			**SILTSTONE WITH SAND** ; light brown; soft; moist; Crushed					85	6" Steel Outer Casing

GEO FORM 304 TUNUNAK WATER WELL.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 7/30/19

PROJECT: **Tununak Water Well**
LOCATION: **Tununak AK**
PROJECT NUMBER:

PER TUNUNAK, AK STANTEC 2020

WELL / PROBEHOLE / BOREHOLE NO: **1**

Stantec

DRILLING: STARTED: **7/10/19** COMPLETED: **7/13/19**
INSTALLATION: STARTED: **7/10/19** COMPLETED: **7/13/19**
DRILLING COMPANY: **Alpine**
DRILLING EQUIPMENT: **Morooka Acker MP3**
DRILLING METHOD: **Air Rotary**
SAMPLING EQUIPMENT: **Hand**

NORTHING (ft):
EASTING (ft):
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
BOREHOLE DEPTH (ft): **180**
STATIC DTW (ft): **Not Encountered**
WELL DEPTH (ft): **178**
WELL CASING DIA. (in): **4**
BOREHOLE DIA.(in): **6**
LOGGED BY: **JK**
CHECKED BY:

Depth (feet)	Graphic Log	USCS	Description	Sample	Soil Sample	Measured Recovery (feet)	Headspace PID (units)	Depth (feet)	Well Construction
			SILTY CLAY WITH SAND ; gray; dry						
95			**SANDSTONE WITH SOME SAND** ; gray; hard; dry					95	
100								100	
105		SM	**SILTY SAND** ; SM; brown; loose; moist; subangular					105	
			SANDSTONE ; light brown; dense; moist						
110		SM	**SILTY SAND WITH CLAY** ; SM; gray; moist					110	6" Steel Outer Casing
115								115	
120			**SILTSTONE** ; dark brown					120	
125			**SILTSTONE** ; light tan; dry; Crushed					125	
130								130	

GEO FORM 304 TUNUNAK WATER WELL.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 7/30/19

PROJECT: **Tununak Water Well**
LOCATION: **Tununak AK**
PROJECT NUMBER:

PER TUNUNAK, WI
STANTEC 2020

WELL / PROBEHOLE / BOREHOLE NO:
1

Stantec

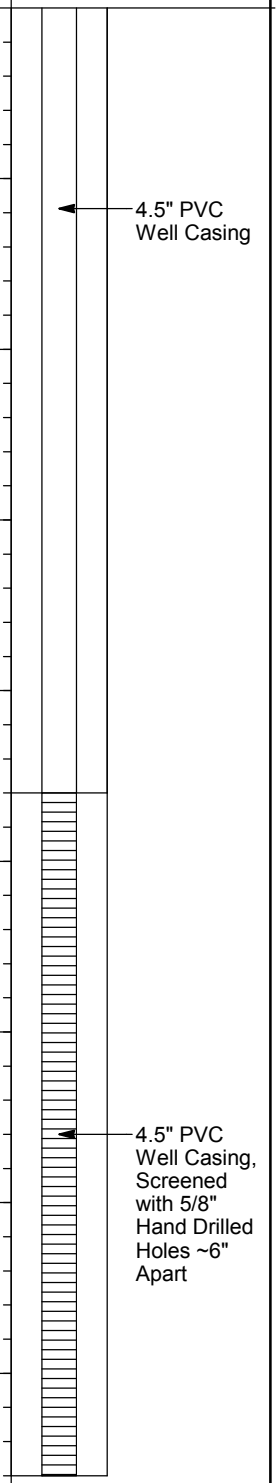
DRILLING: STARTED: **7/10/19** COMPLETED: **7/13/19**
INSTALLATION: STARTED: **7/10/19** COMPLETED: **7/13/19**
DRILLING COMPANY: **Alpine**
DRILLING EQUIPMENT: **Morooka Acker MP3**
DRILLING METHOD: **Air Rotary**
SAMPLING EQUIPMENT: **Hand**

NORTHING (ft):
EASTING (ft):
GROUND ELEV (ft):
TOC ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
BOREHOLE DEPTH (ft): **180**
STATIC DTW (ft): **Not Encountered**
WELL DEPTH (ft): **178**
WELL CASING DIA. (in): **4**
BOREHOLE DIA.(in): **6**
LOGGED BY: **JK**
CHECKED BY:

Depth (feet)	Graphic Log	USCS	Description
140			**SILTSTONE** ; light tan; dry
145		SM	**SILTY SAND** ; SM; dark brown; medium-grained; moist
			SILTSTONE ; light tan; dry; Crushed
150			
155			
160			**SILTSTONE** ; dark brown; dense; wet; Large Chunks, Water Present (Fractured Bedrock)
165			
170			
175			

Sample | Soil Sample | Measured Recovery (feet) | Headspace PID (units)

Well Construction



Borehole terminated at 180 feet.

GEO FORM 304 TUNUNAK WATER WELL.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 7/30/19

Laboratory Report of Analysis

To: Stantec Consulting Services Inc.
725 E Fireweed Ln #200
Anchorage, AK 99503
(907)227-9883

Report Number: **1193845**

Revised Report - Result for Langlier Index has been corrected.

Client Project: **Tununak, AK**

Dear Bob Gilfilian,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Justin at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

_____

Justin Nelson Date
Project Manager
Justin.Nelson@sgs.com

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group

Case Narrative

SGS Client: **Stantec Consulting Services Inc.**
SGS Project: **1193845**
Project Name/Site: **Tununak, AK**
Project Contact: **Bob Gilfilian**

Refer to sample receipt form for information on sample condition.

Tununak-Exp-Well (1193845001) PS

2120B - Color, True - LCS recovery is outside of QC criteria.
MBAS (Surfactants) were analyzed by ALS of Kelso, WA.
Odor was analyzed by ARS Analytical of Anchorage, AK.

Tununak-Exp-Well (1193845003) PS

9223B –Total coliform- Sample received and analysed past hold time. ADEC allows 30 hours from the time of collection to analysis.

LCS for HBN 1796411 [WAT/11390 (1519137) LCS

2120B - Color, True - LCS recovery is outside of QC criteria.

MB for HBN 1796441 [STS/6379] (1519277) MB

2540C - Total Dissolved Solids - MB was detected above half of the LOQ. Associated samples are greater than 10X the MB concentration.

1193821001MS (1519218) MS

300.0 - Anions - MS recoveries for Chloride and Sulfate are outside of QC criteria. Refer to LCS for accuracy requirements.

1193717001MS (1519589) MS

4500NO3-F - Nitrate/Nitrite - MS recovery for Total Nitrite / Nitrate is outside of QC criteria. Refer to LCS for accuracy requirements.

1193781001MS (1519591) MS

4500NO3-F - Nitrate/Nitrite - MS recovery for Total Nitrite / Nitrate is outside of QC criteria. Refer to LCS for accuracy requirements.

1193821001MSD (1519219) MSD

300.0 - Anions - MSD recoveries for Chloride and Sulfate are outside of QC criteria. Refer to LCS for accuracy requirements.

1193717001MSD (1519590) MSD

4500NO3-F - Nitrate/Nitrite - MSD recovery for Total Nitrite / Nitrate is outside of QC criteria. Refer to LCS for accuracy requirements.

1193781001MSD (1519592) MSD

4500NO3-F - Nitrate/Nitrite - MSD recovery for Total Nitrite / Nitrate is outside of QC criteria. Refer to LCS for accuracy requirements.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group

Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. The results apply to the samples as received. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indenmification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & 17-021 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8015C, 8021B, 8082A, 8260C, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). SGS is only certified for the analytes listed on our Drinking Water Certification, and only those analytes will be reported to the State of Alaska for compliance. Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
DF	Analytical Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LLQC/LLIQC	Low Level Quantitation Check
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.

SGS North America Inc. 200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group

Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
Tununak-Exp-Well	1193845001	07/15/2019	07/16/2019	Drinking Water
Trip Blank	1193845002	07/15/2019	07/16/2019	Drinking Water
Tununak-Exp-Well	1193845003	07/15/2019	07/16/2019	Drinking Water
Tununak-Exp-Well-2 - CANCEL	1193845004	07/16/2019	07/16/2019	Drinking Water

Method	Method Description
SM21 2320B	Alkalinity as CaCO3 Langlier w/ Secon Ct
SM21 2340B	Calcium Hardness by ICP-MS-Langlier
SM23 2120B	Color w/ Secondary Contaminants
EPA 300.0	EPA 300 Primary Inorganics only
EPA 300.0	EPA 300 Secondary Contaminants only
SM2330B	Langlier Index by SM2330B
EP200.8	Mercury in Water by 200.8 Inorg-UDig(DW)
EP200.8	Metals in DW by 200.8 ICP-MS Primy/Secdy
SM21 4500NO3-F	Nitrate/Nitrite Flow injection Pres.
SM21 4500-H B	pH Analysis w/ Secondary Contaminants
SM21 4500-N D	TKN by Phenate (W)
SM21 9223B	Total Coliform P/A Qualitative
SM21 4500-CN C,E	Total Cyanide SM4500 (DW)
SM21 2540C	Total Dissolved Solids SM18 2540C w/ SC
SM 5310B	Total Organic Carbon
EPA 524.2	Volatile Organics by 524.2 (DW)

Print Date: 08/13/2019 3:12:23PM

Detectable Results Summary

Client Sample ID: **Tununak-Exp-Well**
Lab Sample ID: 1193845001

	Parameter	Result	Units
Inorganic Contaminants	Barium	49.0	ug/L
	Fluoride	0.111J	mg/L
	Nickel	1.91J	ug/L
Metals by ICP/MS	Hardness (Ca Only)	75.3	mg/L
Secondary Contaminants	Alkalinity	115	mg/L
	Calcium	30200	ug/L
	Chloride	10.7	mg/L
	Copper	0.350J	ug/L
	Fluoride	0.111J	mg/L
	HCO3 Alkalinity	115	mg/L
	Langlier Index @ 50 degree F	-0.89	
	Magnesium	10700	ug/L
	Manganese	764	ug/L
	pH	7.1	pH units
	Sodium	9250	ug/L
	Sulfate	1.93	mg/L
	Total Dissolved Solids	161	mg/L
Waters Department	Total Kjeldahl Nitrogen	0.00	mg/L
	Total Nitrate/Nitrite-N	0.0502J	mg/L
	Total Organic Carbon	1.71	mg/L

Client Sample ID: **Trip Blank**
Lab Sample ID: 1193845002

	Parameter	Result	Units
Volatile GC/MS	Methylene chloride	0.319J	ug/L

Client Sample ID: **Tununak-Exp-Well**
Lab Sample ID: 1193845003

	Parameter	Result	Units
Microbiology Laboratory	E. Coli	Negative	100mL
	Total Coliform	Negative	100mL

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group

Results of **Tununak-Exp-Well**

Client Sample ID: **Tununak-Exp-Well**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845001
Lab Project ID: 1193845

Collection Date: 07/15/19 08:45
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Inorganic Contaminants**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Antimony	0.500	U	1.00	0.310	ug/L	1	(<6)	07/22/19 16:53
Arsenic	2.50	U	5.00	1.50	ug/L	1	(<10)	07/22/19 16:53
Barium	49.0		3.00	0.940	ug/L	1	(<2000)	07/22/19 16:53
Beryllium	0.200	U	0.400	0.130	ug/L	1	(<4)	07/22/19 16:53
Cadmium	0.250	U	0.500	0.150	ug/L	1	(<5)	07/22/19 16:53
Chromium	1.00	U	2.00	0.800	ug/L	1	(<100)	07/22/19 16:53
Nickel	1.91	J	2.00	0.620	ug/L	1	(<100)	07/22/19 16:53
Selenium	2.50	U	5.00	1.50	ug/L	1	(<50)	07/22/19 16:53
Thallium	0.500	U	1.00	0.310	ug/L	1	(<2)	07/22/19 16:53

Batch Information

Analytical Batch: MMS10572
Analytical Method: EP200.8
Analyst: DSH
Analytical Date/Time: 07/24/19 16:34
Container ID: 1193845001-A

Prep Batch: MXX32581
Prep Method: E200.2
Prep Date/Time: 07/18/19 14:15
Prep Initial Wt./Vol.: 50 mL
Prep Extract Vol: 50 mL

Analytical Batch: MMS10570
Analytical Method: EP200.8
Analyst: DSH
Analytical Date/Time: 07/22/19 16:53
Container ID: 1193845001-A

Prep Batch: MXX32586
Prep Method: E200.2
Prep Date/Time: 07/19/19 09:05
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Fluoride	0.111	J	0.200	0.0500	mg/L	1	(<2)	07/17/19 00:47

Batch Information

Analytical Batch: WIC5937
Analytical Method: EPA 300.0
Analyst: DMM
Analytical Date/Time: 07/17/19 00:47
Container ID: 1193845001-D

Prep Batch: WXX12925
Prep Method: METHOD
Prep Date/Time: 07/16/19 15:00
Prep Initial Wt./Vol.: 10 mL
Prep Extract Vol: 10 mL

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Tununak-Exp-Well**

Client Sample ID: **Tununak-Exp-Well**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845001
Lab Project ID: 1193845

Collection Date: 07/15/19 08:45
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Metals by ICP/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Mercury	0.100	U	0.200	0.100	ug/L	2.5	(<2)	07/24/19 16:34

Batch Information

Analytical Batch: MMS10572
Analytical Method: EP200.8
Analyst: DSH
Analytical Date/Time: 07/24/19 16:34
Container ID: 1193845001-A

Prep Batch: MXX32581
Prep Method: E200.2
Prep Date/Time: 07/18/19 14:15
Prep Initial Wt./Vol.: 50 mL
Prep Extract Vol: 50 mL

Analytical Batch: MMS10570
Analytical Method: EP200.8
Analyst: DSH
Analytical Date/Time: 07/22/19 16:53
Container ID: 1193845001-A

Prep Batch: MXX32586
Prep Method: E200.2
Prep Date/Time: 07/19/19 09:05
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Hardness (Ca Only)	75.3		5.00	5.00	mg/L	1		07/22/19 16:53

Batch Information

Analytical Batch: MMS10570
Analytical Method: SM21 2340B
Analyst: DSH
Analytical Date/Time: 07/22/19 16:53
Container ID: 1193845001-A

Prep Batch: MXX32586
Prep Method: E200.2
Prep Date/Time: 07/19/19 09:05
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Tununak-Exp-Well**

Client Sample ID: **Tununak-Exp-Well**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845001
Lab Project ID: 1193845

Collection Date: 07/15/19 08:45
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Secondary Contaminants**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Aluminum	10.0	U	20.0	6.20	ug/L	1	(<200)	07/22/19 16:53
Calcium	30200		500	150	ug/L	1		07/22/19 16:53
Copper	0.350	J	1.00	0.310	ug/L	1	(<1000)	07/22/19 16:53
Iron	125	U	250	78.0	ug/L	1	(<300)	07/22/19 16:53
Magnesium	10700		50.0	15.0	ug/L	1		07/22/19 16:53
Manganese	764	*	1.00	0.350	ug/L	1	(<50)	07/22/19 16:53
Silver	0.500	U	1.00	0.310	ug/L	1	(<100)	07/22/19 16:53
Sodium	9250		500	150	ug/L	1		07/22/19 16:53
Zinc	5.00	U	10.0	3.10	ug/L	1	(<5000)	07/22/19 16:53

Batch Information

Analytical Batch: MMS10572
Analytical Method: EP200.8
Analyst: DSH
Analytical Date/Time: 07/24/19 16:34
Container ID: 1193845001-A

Prep Batch: MXX32581
Prep Method: E200.2
Prep Date/Time: 07/18/19 14:15
Prep Initial Wt./Vol.: 50 mL
Prep Extract Vol: 50 mL

Analytical Batch: MMS10570
Analytical Method: EP200.8
Analyst: DSH
Analytical Date/Time: 07/22/19 16:53
Container ID: 1193845001-A

Prep Batch: MXX32586
Prep Method: E200.2
Prep Date/Time: 07/19/19 09:05
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Chloride	10.7		0.200	0.0500	mg/L	1	(<250)	07/17/19 00:47
Fluoride	0.111	J	0.200	0.0500	mg/L	1	(<2)	07/17/19 00:47
Sulfate	1.93		0.200	0.0500	mg/L	1	(<250)	07/17/19 00:47

Batch Information

Analytical Batch: WIC5937
Analytical Method: EPA 300.0
Analyst: DMM
Analytical Date/Time: 07/17/19 00:47
Container ID: 1193845001-D

Prep Batch: WXX12925
Prep Method: METHOD
Prep Date/Time: 07/16/19 15:00
Prep Initial Wt./Vol.: 10 mL
Prep Extract Vol: 10 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Alkalinity	115		10.0	2.50	mg/L	1		07/18/19 19:15
CO3 Alkalinity	5.00	U	10.0	2.50	mg/L	1		07/18/19 19:15

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Tununak-Exp-Well**

Client Sample ID: **Tununak-Exp-Well**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845001
Lab Project ID: 1193845

Collection Date: 07/15/19 08:45
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Secondary Contaminants**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
HCO3 Alkalinity	115		10.0	2.50	mg/L	1		07/18/19 19:15
OH Alkalinity	5.00 U		10.0	2.50	mg/L	1		07/18/19 19:15

Batch Information

Analytical Batch: WTI5229
Analytical Method: SM21 2320B
Analyst: DMM
Analytical Date/Time: 07/18/19 19:15
Container ID: 1193845001-D

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Dissolved Solids	161		10.0	3.10	mg/L	1	(<500)	07/17/19 12:32

Batch Information

Analytical Batch: STS6379
Analytical Method: SM21 2540C
Analyst: EWW
Analytical Date/Time: 07/17/19 12:32
Container ID: 1193845001-D

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
pH	7.1		0.100	0.100	pH units	1	(6.5-8.5)	07/18/19 19:15

Batch Information

Analytical Batch: WTI5228
Analytical Method: SM21 4500-H B
Analyst: DMM
Analytical Date/Time: 07/18/19 19:15
Container ID: 1193845001-D

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Color, True	5.00 U		5.00	5.00	PCU	1	(<15)	07/16/19 14:55

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Tununak-Exp-Well**

Client Sample ID: **Tununak-Exp-Well**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845001
Lab Project ID: 1193845

Collection Date: 07/15/19 08:45
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Secondary Contaminants**

Batch Information

Analytical Batch: WAT11390
Analytical Method: SM23 2120B
Analyst: EWW
Analytical Date/Time: 07/16/19 14:55
Container ID: 1193845001-D

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Langlier Index @ 50 degree F	-0.89					1		08/01/19 11:11

Batch Information

Analytical Batch: WAT11393
Analytical Method: SM2330B
Analyst: EWW
Analytical Date/Time: 08/01/19 11:11
Container ID: 1193845001-D

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Tununak-Exp-Well**

Client Sample ID: **Tununak-Exp-Well**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845001
Lab Project ID: 1193845

Collection Date: 07/15/19 08:45
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1,1,1,2-Tetrachloroethane	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
1,1,1-Trichloroethane	0.250	U	0.500	0.150	ug/L	1	(<200)	07/21/19 03:01
1,1,2,2-Tetrachloroethane	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
1,1,2-Trichloroethane	0.250	U	0.500	0.150	ug/L	1	(<5)	07/21/19 03:01
1,1-Dichloroethane	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
1,1-Dichloroethene	0.250	U	0.500	0.150	ug/L	1	(<7)	07/21/19 03:01
1,1-Dichloropropene	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
1,2,3-Trichlorobenzene	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
1,2,3-Trichloropropane	0.250	U	0.500	0.250	ug/L	1		07/21/19 03:01
1,2,4-Trichlorobenzene	0.250	U	0.500	0.150	ug/L	1	(<70)	07/21/19 03:01
1,2,4-Trimethylbenzene	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
1,2-Dibromo-3-chloropropane	1.00	U	2.00	0.620	ug/L	1		07/21/19 03:01
1,2-Dibromoethane	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
1,2-Dichlorobenzene	0.250	U	0.500	0.250	ug/L	1	(<600)	07/21/19 03:01
1,2-Dichloroethane	0.250	U	0.500	0.150	ug/L	1	(<5)	07/21/19 03:01
1,2-Dichloropropane	0.250	U	0.500	0.200	ug/L	1	(<5)	07/21/19 03:01
1,3,5-Trimethylbenzene	0.500	U	1.00	0.150	ug/L	1		07/21/19 03:01
1,3-Dichlorobenzene	0.250	U	0.500	0.150	ug/L	1		07/21/19 03:01
1,3-Dichloropropane	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
1,4-Dichlorobenzene	0.250	U	0.500	0.150	ug/L	1	(<75)	07/21/19 03:01
2,2-Dichloropropane	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
2-Chlorotoluene	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
4-Chlorotoluene	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
4-Isopropyltoluene	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
Benzene	0.250	U	0.500	0.200	ug/L	1	(<5)	07/21/19 03:01
Bromobenzene	0.250	U	0.500	0.250	ug/L	1		07/21/19 03:01
Bromochloromethane	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
Bromodichloromethane	0.250	U	0.500	0.250	ug/L	1		07/21/19 03:01
Bromoform	0.250	U	0.500	0.250	ug/L	1		07/21/19 03:01
Bromomethane	1.00	U	2.00	0.620	ug/L	1		07/21/19 03:01
Carbon tetrachloride	0.250	U	0.500	0.150	ug/L	1	(<5)	07/21/19 03:01
Chlorobenzene	0.250	U	0.500	0.150	ug/L	1	(<100)	07/21/19 03:01
Chloroethane	0.500	U	1.00	0.310	ug/L	1		07/21/19 03:01
Chloroform	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01
Chloromethane	1.00	U	2.00	0.600	ug/L	1		07/21/19 03:01
cis-1,2-Dichloroethene	0.250	U	0.500	0.200	ug/L	1	(<70)	07/21/19 03:01
cis-1,3-Dichloropropene	0.500	U	1.00	0.250	ug/L	1		07/21/19 03:01

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Tununak-Exp-Well**

Client Sample ID: **Tununak-Exp-Well**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845001
Lab Project ID: 1193845

Collection Date: 07/15/19 08:45
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Dibromochloromethane	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
Dibromomethane	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
Dichlorodifluoromethane	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
Ethylbenzene	0.250 U		0.500	0.200	ug/L	1	(<700)	07/21/19 03:01
Hexachlorobutadiene	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
Isopropylbenzene (Cumene)	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
Methylene chloride	0.250 U		0.500	0.200	ug/L	1	(<5)	07/21/19 03:01
Methyl-t-butyl ether	0.500 U		1.00	0.310	ug/L	1		07/21/19 03:01
Naphthalene	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
n-Butylbenzene	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
n-Propylbenzene	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
o-Xylene	0.250 U		0.500	0.200	ug/L	1		07/21/19 03:01
P & M -Xylene	0.250 U		0.500	0.400	ug/L	1		07/21/19 03:01
sec-Butylbenzene	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
Styrene	0.250 U		0.500	0.200	ug/L	1	(<100)	07/21/19 03:01
tert-Butylbenzene	0.250 U		0.500	0.250	ug/L	1		07/21/19 03:01
Tetrachloroethene	0.250 U		0.500	0.150	ug/L	1	(<5)	07/21/19 03:01
Toluene	0.250 U		0.500	0.200	ug/L	1	(<1000)	07/21/19 03:01
Total Trihalomethanes	1.00 U		2.00	0.600	ug/L	1	(<80)	07/21/19 03:01
trans-1,2-Dichloroethene	0.250 U		0.500	0.200	ug/L	1	(<100)	07/21/19 03:01
trans-1,3-Dichloropropene	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
Trichloroethene	0.250 U		0.500	0.200	ug/L	1	(<5)	07/21/19 03:01
Trichlorofluoromethane	0.500 U		1.00	0.250	ug/L	1		07/21/19 03:01
Vinyl chloride	0.200 U		0.400	0.200	ug/L	1	(<2)	07/21/19 03:01
Xylenes (total)	0.500 U		0.500	0.500	ug/L	1	(<10000)	07/21/19 03:01
Surrogates								
1,2-Dichloroethane-D4 (surr)	99.4		70-130		%	1		07/21/19 03:01
4-Bromofluorobenzene (surr)	104		70-130		%	1		07/21/19 03:01
Toluene-d8 (surr)	100		70-130		%	1		07/21/19 03:01

Batch Information

Analytical Batch: VMS19189
Analytical Method: EPA 524.2
Analyst: NRB
Analytical Date/Time: 07/21/19 03:01
Container ID: 1193845001-H

Prep Batch: VXX34473
Prep Method: SW5030B
Prep Date/Time: 07/21/19 00:30
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Tununak-Exp-Well**

Client Sample ID: **Tununak-Exp-Well**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845001
Lab Project ID: 1193845

Collection Date: 07/15/19 08:45
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Waters Department**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Organic Carbon	1.71		1.00	0.400	mg/L	1		07/22/19 14:06

Batch Information

Analytical Batch: WTC2936
Analytical Method: SM 5310B
Analyst: BMZ
Analytical Date/Time: 07/22/19 14:06
Container ID: 1193845001-G

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Cyanide	0.00250	U	0.0050	0.0020	mg/L	1	(<0.2)	07/19/19 15:33

Batch Information

Analytical Batch: WDA4610
Analytical Method: SM21 4500-CN C,E
Analyst: DMM
Analytical Date/Time: 07/19/19 15:33
Container ID: 1193845001-C

Prep Batch: WXX12931
Prep Method: METHOD
Prep Date/Time: 07/19/19 12:18
Prep Initial Wt./Vol.: 6 mL
Prep Extract Vol: 6 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Kjeldahl Nitrogen	0.00				mg/L	1		07/31/19 12:46

Batch Information

Analytical Batch: WDA4615
Analytical Method: SM21 4500-N D
Analyst: DMM
Analytical Date/Time: 07/31/19 12:46
Container ID: 1193845001-B

Prep Batch: WXX12944
Prep Method: METHOD
Prep Date/Time: 07/30/19 14:20
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Nitrate/Nitrite-N	0.0502	J	0.200	0.0500	mg/L	2	(<10)	07/17/19 15:49

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Tununak-Exp-Well**

Client Sample ID: **Tununak-Exp-Well**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845001
Lab Project ID: 1193845

Collection Date: 07/15/19 08:45
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Waters Department**

Batch Information

Analytical Batch: WFI2828
Analytical Method: SM21 4500NO3-F
Analyst: EWW
Analytical Date/Time: 07/17/19 15:49
Container ID: 1193845001-B

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Trip Blank**

Client Sample ID: **Trip Blank**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845002
Lab Project ID: 1193845

Collection Date: 07/15/19 08:00
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1,1,1,2-Tetrachloroethane	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
1,1,1-Trichloroethane	0.250	U	0.500	0.150	ug/L	1	(<200)	07/21/19 19:04
1,1,2,2-Tetrachloroethane	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
1,1,2-Trichloroethane	0.250	U	0.500	0.150	ug/L	1	(<5)	07/21/19 19:04
1,1-Dichloroethane	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
1,1-Dichloroethene	0.250	U	0.500	0.150	ug/L	1	(<7)	07/21/19 19:04
1,1-Dichloropropene	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
1,2,3-Trichlorobenzene	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
1,2,3-Trichloropropane	0.250	U	0.500	0.250	ug/L	1		07/21/19 19:04
1,2,4-Trichlorobenzene	0.250	U	0.500	0.150	ug/L	1	(<70)	07/21/19 19:04
1,2,4-Trimethylbenzene	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
1,2-Dibromo-3-chloropropane	1.00	U	2.00	0.620	ug/L	1		07/21/19 19:04
1,2-Dibromoethane	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
1,2-Dichlorobenzene	0.250	U	0.500	0.250	ug/L	1	(<600)	07/21/19 19:04
1,2-Dichloroethane	0.250	U	0.500	0.150	ug/L	1	(<5)	07/21/19 19:04
1,2-Dichloropropane	0.250	U	0.500	0.200	ug/L	1	(<5)	07/21/19 19:04
1,3,5-Trimethylbenzene	0.500	U	1.00	0.150	ug/L	1		07/21/19 19:04
1,3-Dichlorobenzene	0.250	U	0.500	0.150	ug/L	1		07/21/19 19:04
1,3-Dichloropropane	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
1,4-Dichlorobenzene	0.250	U	0.500	0.150	ug/L	1	(<75)	07/21/19 19:04
2,2-Dichloropropane	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
2-Chlorotoluene	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
4-Chlorotoluene	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
4-Isopropyltoluene	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
Benzene	0.250	U	0.500	0.200	ug/L	1	(<5)	07/21/19 19:04
Bromobenzene	0.250	U	0.500	0.250	ug/L	1		07/21/19 19:04
Bromochloromethane	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
Bromodichloromethane	0.250	U	0.500	0.250	ug/L	1		07/21/19 19:04
Bromoform	0.250	U	0.500	0.250	ug/L	1		07/21/19 19:04
Bromomethane	1.00	U	2.00	0.620	ug/L	1		07/21/19 19:04
Carbon tetrachloride	0.250	U	0.500	0.150	ug/L	1	(<5)	07/21/19 19:04
Chlorobenzene	0.250	U	0.500	0.150	ug/L	1	(<100)	07/21/19 19:04
Chloroethane	0.500	U	1.00	0.310	ug/L	1		07/21/19 19:04
Chloroform	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04
Chloromethane	1.00	U	2.00	0.600	ug/L	1		07/21/19 19:04
cis-1,2-Dichloroethene	0.250	U	0.500	0.200	ug/L	1	(<70)	07/21/19 19:04
cis-1,3-Dichloropropene	0.500	U	1.00	0.250	ug/L	1		07/21/19 19:04

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Trip Blank**

Client Sample ID: **Trip Blank**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845002
Lab Project ID: 1193845

Collection Date: 07/15/19 08:00
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Dibromochloromethane	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
Dibromomethane	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
Dichlorodifluoromethane	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
Ethylbenzene	0.250 U		0.500	0.200	ug/L	1	(<700)	07/21/19 19:04
Hexachlorobutadiene	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
Isopropylbenzene (Cumene)	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
Methylene chloride	0.319 J		0.500	0.200	ug/L	1	(<5)	07/21/19 19:04
Methyl-t-butyl ether	0.500 U		1.00	0.310	ug/L	1		07/21/19 19:04
Naphthalene	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
n-Butylbenzene	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
n-Propylbenzene	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
o-Xylene	0.250 U		0.500	0.200	ug/L	1		07/21/19 19:04
P & M -Xylene	0.250 U		0.500	0.400	ug/L	1		07/21/19 19:04
sec-Butylbenzene	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
Styrene	0.250 U		0.500	0.200	ug/L	1	(<100)	07/21/19 19:04
tert-Butylbenzene	0.250 U		0.500	0.250	ug/L	1		07/21/19 19:04
Tetrachloroethene	0.250 U		0.500	0.150	ug/L	1	(<5)	07/21/19 19:04
Toluene	0.250 U		0.500	0.200	ug/L	1	(<1000)	07/21/19 19:04
Total Trihalomethanes	1.00 U		2.00	0.600	ug/L	1	(<80)	07/21/19 19:04
trans-1,2-Dichloroethene	0.250 U		0.500	0.200	ug/L	1	(<100)	07/21/19 19:04
trans-1,3-Dichloropropene	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
Trichloroethene	0.250 U		0.500	0.200	ug/L	1	(<5)	07/21/19 19:04
Trichlorofluoromethane	0.500 U		1.00	0.250	ug/L	1		07/21/19 19:04
Vinyl chloride	0.200 U		0.400	0.200	ug/L	1	(<2)	07/21/19 19:04
Xylenes (total)	0.500 U		0.500	0.500	ug/L	1	(<10000)	07/21/19 19:04
Surrogates								
1,2-Dichloroethane-D4 (surr)	98.5		70-130		%	1		07/21/19 19:04
4-Bromofluorobenzene (surr)	101		70-130		%	1		07/21/19 19:04
Toluene-d8 (surr)	101		70-130		%	1		07/21/19 19:04

Batch Information

Analytical Batch: VMS19192
Analytical Method: EPA 524.2
Analyst: NRB
Analytical Date/Time: 07/21/19 19:04
Container ID: 1193845002-B

Prep Batch: VXX34479
Prep Method: SW5030B
Prep Date/Time: 07/21/19 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Results of **Tununak-Exp-Well**

Client Sample ID: **Tununak-Exp-Well**
Client Project ID: **Tununak, AK**
Lab Sample ID: 1193845003
Lab Project ID: 1193845

Collection Date: 07/15/19 08:45
Received Date: 07/16/19 14:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Microbiology Laboratory**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
E. Coli	Negative		1	1	100mL	1		07/16/19 17:35
Total Coliform	Negative		1	1	100mL	1		07/16/19 17:35

Batch Information

Analytical Batch: BTF17495
Analytical Method: SM21 9223B
Analyst: ACF
Analytical Date/Time: 07/16/19 17:35
Container ID: 1193845003-A

Print Date: 08/13/2019 3:12:25PM

J flagging is activated

Method Blank

Blank ID: MB for HBN 1796416 [BTF/17495]
Blank Lab ID: 1519162

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845003

Results by **SM21 9223B**

Parameter	Results	LOQ/CL	DL	Units
E. Coli	Negative	1	1	100mL
Total Coliform	Negative	1	1	100mL

Batch Information

Analytical Batch: BTF17495
Analytical Method: SM21 9223B
Instrument:
Analyst: A.L
Analytical Date/Time: 7/16/2019 3:08:36PM

Print Date: 08/13/2019 3:12:28PM

Method Blank

Blank ID: MB for HBN 1796529 [MXX/32581]
Blank Lab ID: 1519665

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **EP200.8**

Parameter	Results	LOQ/CL	DL	Units
Mercury	0.100U	0.200	0.100	ug/L

Batch Information

Analytical Batch: MMS10572
Analytical Method: EP200.8
Instrument: Perkin Elmer Nexlon P5
Analyst: DSH
Analytical Date/Time: 7/24/2019 4:14:11PM

Prep Batch: MXX32581
Prep Method: E200.2
Prep Date/Time: 7/18/2019 2:15:51PM
Prep Initial Wt./Vol.: 50 mL
Prep Extract Vol: 50 mL

Print Date: 08/13/2019 3:12:32PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [MXX32581]
Blank Spike Lab ID: 1519666
Date Analyzed: 07/24/2019 16:11

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **EP200.8**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Mercury	10	9.78	98	(85-115)

Batch Information

Analytical Batch: **MMS10572**
Analytical Method: **EP200.8**
Instrument: **Perkin Elmer Nexion P5**
Analyst: **DSH**

Prep Batch: **MXX32581**
Prep Method: **E200.2**
Prep Date/Time: **07/18/2019 14:15**
Spike Init Wt./Vol.: 10 ug/L Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group

Method Blank

Blank ID: MB for HBN 1796556 [MXX/32586]
Blank Lab ID: 1519771

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **EP200.8**

Parameter	Results	LOQ/CL	DL	Units
Aluminum	10.0U	20.0	6.20	ug/L
Antimony	0.500U	1.00	0.310	ug/L
Arsenic	2.50U	5.00	1.50	ug/L
Barium	1.50U	3.00	0.940	ug/L
Beryllium	0.200U	0.400	0.130	ug/L
Cadmium	0.250U	0.500	0.150	ug/L
Calcium	250U	500	150	ug/L
Chromium	1.00U	2.00	0.800	ug/L
Copper	0.500U	1.00	0.310	ug/L
Iron	125U	250	78.0	ug/L
Magnesium	25.0U	50.0	15.0	ug/L
Manganese	0.500U	1.00	0.350	ug/L
Nickel	1.00U	2.00	0.620	ug/L
Selenium	2.50U	5.00	1.50	ug/L
Silver	0.500U	1.00	0.310	ug/L
Sodium	250U	500	150	ug/L
Thallium	0.500U	1.00	0.310	ug/L
Zinc	5.00U	10.0	3.10	ug/L

Batch Information

Analytical Batch: MMS10570
Analytical Method: EP200.8
Instrument: Perkin Elmer Nexlon P5
Analyst: DSH
Analytical Date/Time: 7/22/2019 4:44:22PM

Prep Batch: MXX32586
Prep Method: E200.2
Prep Date/Time: 7/19/2019 9:05:47AM
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Print Date: 08/13/2019 3:12:34PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [MXX32586]
Blank Spike Lab ID: 1519772
Date Analyzed: 07/22/2019 16:47

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **EP200.8**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Aluminum	1000	1140	114	(85-115)
Antimony	1000	1040	104	(85-115)
Arsenic	1000	1000	100	(85-115)
Barium	1000	995	100	(85-115)
Beryllium	100	114	114	(85-115)
Cadmium	100	103	103	(85-115)
Calcium	10000	10800	108	(85-115)
Chromium	400	412	103	(85-115)
Copper	1000	1030	103	(85-115)
Iron	5000	5210	104	(85-115)
Magnesium	10000	11100	111	(85-115)
Manganese	500	514	103	(85-115)
Nickel	1000	1040	104	(85-115)
Selenium	1000	992	99	(85-115)
Silver	100	102	102	(85-115)
Sodium	10000	10900	109	(85-115)
Thallium	10	10.3	103	(85-115)
Zinc	1000	1010	101	(85-115)

Batch Information

Analytical Batch: **MMS10570**
Analytical Method: **EP200.8**
Instrument: **Perkin Elmer Nexion P5**
Analyst: **DSH**

Prep Batch: **MXX32586**
Prep Method: **E200.2**
Prep Date/Time: **07/19/2019 09:05**
Spike Init Wt./Vol.: 1000 ug/L Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 08/13/2019 3:12:37PM

Matrix Spike Summary

Original Sample ID: 1519774
MS Sample ID: 1519775 MS
MSD Sample ID:

Analysis Date: 07/22/2019 16:53
Analysis Date: 07/22/2019 16:56
Analysis Date:
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **EP200.8**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Aluminum	10.0U	1000	1100	110				70-130		
Antimony	0.500U	1000	1030	103				70-130		
Arsenic	2.50U	1000	1010	101				70-130		
Barium	49.0	1000	1050	100				70-130		
Beryllium	0.200U	100	112	112				70-130		
Cadmium	0.250U	100	104	104				70-130		
Calcium	30200	10000	39000	88				70-130		
Chromium	1.00U	400	418	105				70-130		
Copper	0.350J	1000	991	99				70-130		
Iron	125U	5000	5170	103				70-130		
Magnesium	10700	10000	21300	107				70-130		
Manganese	764	500	1270	101				70-130		
Nickel	1.91J	1000	1010	101				70-130		
Selenium	2.50U	1000	1000	100				70-130		
Silver	0.500U	100	100	100				70-130		
Sodium	9250	10000	20100	109				70-130		
Thallium	0.500U	10.0	10.3	103				70-130		
Zinc	5.00U	1000	1000	100				70-130		

Batch Information

Analytical Batch: MMS10570
Analytical Method: EP200.8
Instrument: Perkin Elmer Nexlon P5
Analyst: DSH
Analytical Date/Time: 7/22/2019 4:56:19PM

Prep Batch: MXX32586
Prep Method: DW Digest for Metals on ICP-MS
Prep Date/Time: 7/19/2019 9:05:47AM
Prep Initial Wt./Vol.: 20.00mL
Prep Extract Vol: 50.00mL

Print Date: 08/13/2019 3:12:38PM

Method Blank

Blank ID: MB for HBN 1796441 [STS/6379]
Blank Lab ID: 1519277

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **SM21 2540C**

Parameter	Results	LOQ/CL	DL	Units
Total Dissolved Solids	7.00J	10.0	3.10	mg/L

Batch Information

Analytical Batch: STS6379
Analytical Method: SM21 2540C
Instrument:
Analyst: EWW
Analytical Date/Time: 7/17/2019 12:32:48PM

Print Date: 08/13/2019 3:12:40PM

Duplicate Sample Summary

Original Sample ID: 1193830001
Duplicate Sample ID: 1519280
QC for Samples:
1193845001

Analysis Date: 07/17/2019 12:32
Matrix: Drinking Water

Results by **SM21 2540C**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Dissolved Solids	246	246	mg/L	0.00	(< 5)

Batch Information

Analytical Batch: STS6379
Analytical Method: SM21 2540C
Instrument:
Analyst: EWW

Print Date: 08/13/2019 3:12:41PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [STS6379]
Blank Spike Lab ID: 1519278
Date Analyzed: 07/17/2019 12:32

Spike Duplicate ID: LCSD for HBN 1193845 [STS6379]
Spike Duplicate Lab ID: 1519279
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **SM21 2540C**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Dissolved Solids	333	313	94	333	310	93	(75-125)	0.96	(< 5)

Batch Information

Analytical Batch: **STS6379**
Analytical Method: **SM21 2540C**
Instrument:
Analyst: **EWW**

Print Date: 08/13/2019 3:12:42PM

Method Blank

Blank ID: MB for HBN 1796629 [VXX/34473]
Blank Lab ID: 1520062

Matrix: Drinking Water

QC for Samples:
1193845001

Results by **EPA 524.2**

Parameter	Results	LOQ/CL	DL	Units
1,1,1,2-Tetrachloroethane	0.500U	1.00	0.250	ug/L
1,1,1-Trichloroethane	0.250U	0.500	0.150	ug/L
1,1,2,2-Tetrachloroethane	0.500U	1.00	0.250	ug/L
1,1,2-Trichloroethane	0.250U	0.500	0.150	ug/L
1,1-Dichloroethane	0.500U	1.00	0.250	ug/L
1,1-Dichloroethene	0.250U	0.500	0.150	ug/L
1,1-Dichloropropene	0.500U	1.00	0.250	ug/L
1,2,3-Trichlorobenzene	0.500U	1.00	0.250	ug/L
1,2,3-Trichloropropane	0.500U	1.00	0.250	ug/L
1,2,4-Trichlorobenzene	0.250U	0.500	0.150	ug/L
1,2,4-Trimethylbenzene	0.500U	1.00	0.250	ug/L
1,2-Dibromo-3-chloropropane	1.00U	2.00	0.620	ug/L
1,2-Dibromoethane	0.500U	1.00	0.250	ug/L
1,2-Dichlorobenzene	0.250U	0.500	0.250	ug/L
1,2-Dichloroethane	0.250U	0.500	0.150	ug/L
1,2-Dichloropropane	0.250U	0.500	0.200	ug/L
1,3,5-Trimethylbenzene	0.500U	1.00	0.150	ug/L
1,3-Dichlorobenzene	0.250U	0.500	0.150	ug/L
1,3-Dichloropropane	0.500U	1.00	0.250	ug/L
1,4-Dichlorobenzene	0.250U	0.500	0.150	ug/L
2,2-Dichloropropane	0.500U	1.00	0.250	ug/L
2-Chlorotoluene	0.500U	1.00	0.250	ug/L
4-Chlorotoluene	0.500U	1.00	0.250	ug/L
4-Isopropyltoluene	0.500U	1.00	0.250	ug/L
Benzene	0.250U	0.500	0.200	ug/L
Bromobenzene	0.500U	1.00	0.250	ug/L
Bromochloromethane	0.500U	1.00	0.250	ug/L
Bromodichloromethane	0.500U	1.00	0.250	ug/L
Bromoform	0.250U	0.500	0.250	ug/L
Bromomethane	1.00U	2.00	0.620	ug/L
Carbon tetrachloride	0.250U	0.500	0.150	ug/L
Chlorobenzene	0.250U	0.500	0.150	ug/L
Chloroethane	0.500U	1.00	0.310	ug/L
Chloroform	0.500U	1.00	0.250	ug/L
Chloromethane	1.00U	2.00	0.600	ug/L
cis-1,2-Dichloroethene	0.250U	0.500	0.200	ug/L
cis-1,3-Dichloropropene	0.500U	1.00	0.250	ug/L
Dibromochloromethane	0.500U	1.00	0.250	ug/L

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Member of SGS Group

Method Blank

Blank ID: MB for HBN 1796629 [VXX/34473]
Blank Lab ID: 1520062

Matrix: Drinking Water

QC for Samples:
1193845001

Results by **EPA 524.2**

Parameter	Results	LOQ/CL	DL	Units
Dibromomethane	0.500U	1.00	0.250	ug/L
Dichlorodifluoromethane	0.500U	1.00	0.250	ug/L
Ethylbenzene	0.250U	0.500	0.200	ug/L
Hexachlorobutadiene	0.500U	1.00	0.250	ug/L
Isopropylbenzene (Cumene)	0.500U	1.00	0.250	ug/L
Methylene chloride	0.250U	0.500	0.200	ug/L
Methyl-t-butyl ether	0.500U	1.00	0.310	ug/L
Naphthalene	0.500U	1.00	0.250	ug/L
n-Butylbenzene	0.500U	1.00	0.250	ug/L
n-Propylbenzene	0.500U	1.00	0.250	ug/L
o-Xylene	0.250U	0.500	0.200	ug/L
P & M -Xylene	0.250U	0.500	0.400	ug/L
sec-Butylbenzene	0.500U	1.00	0.250	ug/L
Styrene	0.250U	0.500	0.200	ug/L
tert-Butylbenzene	0.500U	1.00	0.250	ug/L
Tetrachloroethene	0.250U	0.500	0.150	ug/L
Toluene	0.250U	0.500	0.200	ug/L
trans-1,2-Dichloroethene	0.250U	0.500	0.200	ug/L
trans-1,3-Dichloropropene	0.500U	1.00	0.250	ug/L
Trichloroethene	0.250U	0.500	0.200	ug/L
Trichlorofluoromethane	0.500U	1.00	0.250	ug/L
Vinyl chloride	0.200U	0.400	0.200	ug/L
Surrogates				
1,2-Dichloroethane-D4 (surr)	99.5	70-130		%
4-Bromofluorobenzene (surr)	98.8	70-130		%
Toluene-d8 (surr)	99.9	70-130		%

Batch Information

Analytical Batch: VMS19189
Analytical Method: EPA 524.2
Instrument: VPA 780/5975 GC/MS
Analyst: NRB
Analytical Date/Time: 7/21/2019 1:11:00AM

Prep Batch: VXX34473
Prep Method: SW5030B
Prep Date/Time: 7/21/2019 12:30:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 08/13/2019 3:12:44PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [VXX34473]
Blank Spike Lab ID: 1520063
Date Analyzed: 07/21/2019 01:26

Spike Duplicate ID: LCSD for HBN 1193845 [VXX34473]
Spike Duplicate Lab ID: 1520064
Matrix: Drinking Water

QC for Samples: 1193845001

Results by **EPA 524.2**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
1,1,1,2-Tetrachloroethane	30	28.4	95	30	29.5	98	(70-130)	3.50	(< 30)
1,1,1-Trichloroethane	30	27.0	90	30	26.6	89	(70-130)	1.40	(< 30)
1,1,2,2-Tetrachloroethane	30	29.7	99	30	30.2	101	(70-130)	1.70	(< 30)
1,1,2-Trichloroethane	30	28.2	94	30	28.9	96	(70-130)	2.30	(< 30)
1,1-Dichloroethane	30	27.8	93	30	27.5	92	(70-130)	1.40	(< 30)
1,1-Dichloroethene	30	26.8	89	30	26.0	87	(70-130)	3.10	(< 30)
1,1-Dichloropropene	30	27.8	93	30	27.3	91	(70-130)	1.80	(< 30)
1,2,3-Trichlorobenzene	30	30.5	102	30	31.5	105	(70-130)	3.00	(< 30)
1,2,3-Trichloropropane	30	28.9	96	30	29.4	98	(70-130)	1.70	(< 30)
1,2,4-Trichlorobenzene	30	30.2	101	30	31.4	105	(70-130)	4.00	(< 30)
1,2,4-Trimethylbenzene	30	29.4	98	30	30.3	101	(70-130)	2.90	(< 30)
1,2-Dibromo-3-chloropropane	30	27.2	91	30	27.9	93	(70-130)	2.50	(< 30)
1,2-Dibromoethane	30	28.4	95	30	28.9	96	(70-130)	1.70	(< 30)
1,2-Dichlorobenzene	30	28.6	96	30	29.4	98	(70-130)	2.60	(< 30)
1,2-Dichloroethane	30	25.3	84	30	25.4	85	(70-130)	0.34	(< 30)
1,2-Dichloropropane	30	28.0	93	30	27.8	93	(70-130)	0.77	(< 30)
1,3,5-Trimethylbenzene	30	29.2	97	30	30.0	100	(70-130)	2.60	(< 30)
1,3-Dichlorobenzene	30	29.5	99	30	30.0	100	(70-130)	1.60	(< 30)
1,3-Dichloropropane	30	28.5	95	30	28.9	96	(70-130)	1.20	(< 30)
1,4-Dichlorobenzene	30	29.4	98	30	29.8	99	(70-130)	1.10	(< 30)
2,2-Dichloropropane	30	27.2	91	30	26.9	90	(70-130)	1.30	(< 30)
2-Chlorotoluene	30	28.6	95	30	29.1	97	(70-130)	1.60	(< 30)
4-Chlorotoluene	30	28.7	96	30	28.9	97	(70-130)	0.88	(< 30)
4-Isopropyltoluene	30	30.0	100	30	30.7	102	(70-130)	2.40	(< 30)
Benzene	30	28.0	93	30	27.9	93	(70-130)	0.42	(< 30)
Bromobenzene	30	29.7	99	30	30.3	101	(70-130)	1.90	(< 30)
Bromochloromethane	30	28.9	96	30	29.0	97	(70-130)	0.36	(< 30)
Bromodichloromethane	30	27.5	92	30	27.4	91	(70-130)	0.37	(< 30)
Bromoform	30	28.1	94	30	28.8	96	(70-130)	2.40	(< 30)
Bromomethane	30	34.9	116	30	33.8	113	(70-130)	3.20	(< 30)
Carbon tetrachloride	30	27.0	90	30	26.7	89	(70-130)	1.40	(< 30)
Chlorobenzene	30	27.8	93	30	28.4	95	(70-130)	2.20	(< 30)
Chloroethane	30	28.5	95	30	25.2	84	(70-130)	12.30	(< 30)
Chloroform	30	27.6	92	30	27.3	91	(70-130)	1.00	(< 30)

Print Date: 08/13/2019 3:12:45PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [VXX34473]
Blank Spike Lab ID: 1520063
Date Analyzed: 07/21/2019 01:26

Spike Duplicate ID: LCSD for HBN 1193845 [VXX34473]
Spike Duplicate Lab ID: 1520064
Matrix: Drinking Water

QC for Samples: 1193845001

Results by **EPA 524.2**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Chloromethane	30	29.9	100	30	33.0	110	(70-130)	9.90	(< 30)
cis-1,2-Dichloroethene	30	28.1	94	30	27.9	93	(70-130)	1.00	(< 30)
cis-1,3-Dichloropropene	30	27.6	92	30	27.8	93	(70-130)	0.62	(< 30)
Dibromochloromethane	30	28.3	94	30	28.7	96	(70-130)	1.60	(< 30)
Dibromomethane	30	26.9	90	30	26.7	89	(70-130)	0.67	(< 30)
Dichlorodifluoromethane	30	24.8	83	30	24.1	80	(70-130)	3.00	(< 30)
Ethylbenzene	30	28.6	95	30	28.4	95	(70-130)	0.62	(< 30)
Hexachlorobutadiene	30	30.0	100	30	31.3	104	(70-130)	4.40	(< 30)
Isopropylbenzene (Cumene)	30	28.6	95	30	29.2	97	(70-130)	2.20	(< 30)
Methylene chloride	30	31.2	104	30	30.8	103	(70-130)	1.40	(< 30)
Methyl-t-butyl ether	45	39.8	89	45	39.7	88	(70-130)	0.24	(< 30)
Naphthalene	30	28.3	95	30	29.9	100	(70-130)	5.50	(< 30)
n-Butylbenzene	30	29.8	99	30	30.6	102	(70-130)	2.80	(< 30)
n-Propylbenzene	30	29.9	100	30	30.2	101	(70-130)	1.20	(< 30)
o-Xylene	30	27.9	93	30	27.9	93	(70-130)	0.06	(< 30)
P & M -Xylene	60	54.7	91	60	55.2	92	(70-130)	1.00	(< 30)
sec-Butylbenzene	30	29.9	100	30	30.4	101	(70-130)	1.80	(< 30)
Styrene	30	28.9	97	30	29.3	98	(70-130)	1.30	(< 30)
tert-Butylbenzene	30	29.0	97	30	30.4	101	(70-130)	4.70	(< 30)
Tetrachloroethene	30	28.5	95	30	29.2	97	(70-130)	2.20	(< 30)
Toluene	30	27.0	90	30	27.6	92	(70-130)	2.30	(< 30)
trans-1,2-Dichloroethene	30	28.4	95	30	27.6	92	(70-130)	2.70	(< 30)
trans-1,3-Dichloropropene	30	28.8	96	30	29.4	98	(70-130)	2.20	(< 30)
Trichloroethene	30	28.0	93	30	27.8	93	(70-130)	0.78	(< 30)
Trichlorofluoromethane	30	28.2	94	30	26.9	90	(70-130)	4.80	(< 30)
Vinyl chloride	30	28.8	96	30	28.1	94	(70-130)	2.40	(< 30)
Surrogates									
1,2-Dichloroethane-D4 (surr)	30	94.8	95	30	93.3	93	(70-130)	1.60	
4-Bromofluorobenzene (surr)	30	101	101	30	101	101	(70-130)	0.09	
Toluene-d8 (surr)	30	100	100	30	103	103	(70-130)	2.40	

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [VXX34473]
Blank Spike Lab ID: 1520063
Date Analyzed: 07/21/2019 01:26

Spike Duplicate ID: LCSD for HBN 1193845 [VXX34473]
Spike Duplicate Lab ID: 1520064
Matrix: Drinking Water

QC for Samples: 1193845001

Results by **EPA 524.2**

Parameter	Blank Spike (%) Spike	Result	Rec (%)	Spike Duplicate (%) Spike	Result	Rec (%)	CL	RPD (%)	RPD CL

Batch Information

Analytical Batch: **VMS19189**
Analytical Method: **EPA 524.2**
Instrument: **VPA 780/5975 GC/MS**
Analyst: **NRB**

Prep Batch: **VXX34473**
Prep Method: **SW5030B**
Prep Date/Time: **07/21/2019 00:30**
Spike Init Wt./Vol.: 30 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 30 ug/L Extract Vol: 5 mL

Print Date: 08/13/2019 3:12:45PM

Method Blank

Blank ID: MB for HBN 1796665 [VXX/34479]
Blank Lab ID: 1520248

Matrix: Drinking Water

QC for Samples:
1193845002

Results by **EPA 524.2**

Parameter	Results	LOQ/CL	DL	Units
1,1,1,2-Tetrachloroethane	0.500U	1.00	0.250	ug/L
1,1,1-Trichloroethane	0.250U	0.500	0.150	ug/L
1,1,2,2-Tetrachloroethane	0.500U	1.00	0.250	ug/L
1,1,2-Trichloroethane	0.250U	0.500	0.150	ug/L
1,1-Dichloroethane	0.500U	1.00	0.250	ug/L
1,1-Dichloroethene	0.250U	0.500	0.150	ug/L
1,1-Dichloropropene	0.500U	1.00	0.250	ug/L
1,2,3-Trichlorobenzene	0.500U	1.00	0.250	ug/L
1,2,3-Trichloropropane	0.500U	1.00	0.250	ug/L
1,2,4-Trichlorobenzene	0.250U	0.500	0.150	ug/L
1,2,4-Trimethylbenzene	0.500U	1.00	0.250	ug/L
1,2-Dibromo-3-chloropropane	1.00U	2.00	0.620	ug/L
1,2-Dibromoethane	0.500U	1.00	0.250	ug/L
1,2-Dichlorobenzene	0.250U	0.500	0.250	ug/L
1,2-Dichloroethane	0.250U	0.500	0.150	ug/L
1,2-Dichloropropane	0.250U	0.500	0.200	ug/L
1,3,5-Trimethylbenzene	0.500U	1.00	0.150	ug/L
1,3-Dichlorobenzene	0.250U	0.500	0.150	ug/L
1,3-Dichloropropane	0.500U	1.00	0.250	ug/L
1,4-Dichlorobenzene	0.250U	0.500	0.150	ug/L
2,2-Dichloropropane	0.500U	1.00	0.250	ug/L
2-Chlorotoluene	0.500U	1.00	0.250	ug/L
4-Chlorotoluene	0.500U	1.00	0.250	ug/L
4-Isopropyltoluene	0.500U	1.00	0.250	ug/L
Benzene	0.250U	0.500	0.200	ug/L
Bromobenzene	0.500U	1.00	0.250	ug/L
Bromochloromethane	0.500U	1.00	0.250	ug/L
Bromodichloromethane	0.500U	1.00	0.250	ug/L
Bromoform	0.250U	0.500	0.250	ug/L
Bromomethane	1.00U	2.00	0.620	ug/L
Carbon tetrachloride	0.250U	0.500	0.150	ug/L
Chlorobenzene	0.250U	0.500	0.150	ug/L
Chloroethane	0.500U	1.00	0.310	ug/L
Chloroform	0.500U	1.00	0.250	ug/L
Chloromethane	1.00U	2.00	0.600	ug/L
cis-1,2-Dichloroethene	0.250U	0.500	0.200	ug/L
cis-1,3-Dichloropropene	0.500U	1.00	0.250	ug/L
Dibromochloromethane	0.500U	1.00	0.250	ug/L

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Member of SGS Group

Method Blank

Blank ID: MB for HBN 1796665 [VXX/34479]
Blank Lab ID: 1520248

Matrix: Drinking Water

QC for Samples:
1193845002

Results by **EPA 524.2**

Parameter	Results	LOQ/CL	DL	Units
Dibromomethane	0.500U	1.00	0.250	ug/L
Dichlorodifluoromethane	0.500U	1.00	0.250	ug/L
Ethylbenzene	0.250U	0.500	0.200	ug/L
Hexachlorobutadiene	0.500U	1.00	0.250	ug/L
Isopropylbenzene (Cumene)	0.500U	1.00	0.250	ug/L
Methylene chloride	0.250U	0.500	0.200	ug/L
Methyl-t-butyl ether	0.500U	1.00	0.310	ug/L
Naphthalene	0.500U	1.00	0.250	ug/L
n-Butylbenzene	0.500U	1.00	0.250	ug/L
n-Propylbenzene	0.500U	1.00	0.250	ug/L
o-Xylene	0.250U	0.500	0.200	ug/L
P & M -Xylene	0.250U	0.500	0.400	ug/L
sec-Butylbenzene	0.500U	1.00	0.250	ug/L
Styrene	0.250U	0.500	0.200	ug/L
tert-Butylbenzene	0.500U	1.00	0.250	ug/L
Tetrachloroethene	0.250U	0.500	0.150	ug/L
Toluene	0.250U	0.500	0.200	ug/L
trans-1,2-Dichloroethene	0.250U	0.500	0.200	ug/L
trans-1,3-Dichloropropene	0.500U	1.00	0.250	ug/L
Trichloroethene	0.250U	0.500	0.200	ug/L
Trichlorofluoromethane	0.500U	1.00	0.250	ug/L
Vinyl chloride	0.200U	0.400	0.200	ug/L
Surrogates				
1,2-Dichloroethane-D4 (surr)	99.5	70-130		%
4-Bromofluorobenzene (surr)	100	70-130		%
Toluene-d8 (surr)	102	70-130		%

Batch Information

Analytical Batch: VMS19192
Analytical Method: EPA 524.2
Instrument: VPA 780/5975 GC/MS
Analyst: NRB
Analytical Date/Time: 7/21/2019 5:05:00PM

Prep Batch: VXX34479
Prep Method: SW5030B
Prep Date/Time: 7/21/2019 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Member of SGS Group

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [VXX34479]
Blank Spike Lab ID: 1520249
Date Analyzed: 07/21/2019 17:20

Spike Duplicate ID: LCSD for HBN 1193845 [VXX34479]
Spike Duplicate Lab ID: 1520250
Matrix: Drinking Water

QC for Samples: 1193845002

Results by **EPA 524.2**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
1,1,1,2-Tetrachloroethane	30	28.8	96	30	28.8	96	(70-130)	0.01	(< 30)
1,1,1-Trichloroethane	30	26.2	87	30	25.7	86	(70-130)	1.70	(< 30)
1,1,2,2-Tetrachloroethane	30	29.2	97	30	29.7	99	(70-130)	1.70	(< 30)
1,1,2-Trichloroethane	30	28.5	95	30	28.2	94	(70-130)	0.84	(< 30)
1,1-Dichloroethane	30	27.1	91	30	26.6	89	(70-130)	2.10	(< 30)
1,1-Dichloroethene	30	25.8	86	30	25.0	83	(70-130)	3.00	(< 30)
1,1-Dichloropropene	30	27.0	90	30	26.4	88	(70-130)	2.00	(< 30)
1,2,3-Trichlorobenzene	30	28.6	95	30	31.3	104	(70-130)	8.90	(< 30)
1,2,3-Trichloropropane	30	28.2	94	30	28.4	95	(70-130)	0.63	(< 30)
1,2,4-Trichlorobenzene	30	28.6	95	30	30.3	101	(70-130)	5.80	(< 30)
1,2,4-Trimethylbenzene	30	29.3	98	30	29.5	98	(70-130)	0.87	(< 30)
1,2-Dibromo-3-chloropropane	30	26.3	88	30	27.4	91	(70-130)	4.10	(< 30)
1,2-Dibromoethane	30	28.4	95	30	28.5	95	(70-130)	0.47	(< 30)
1,2-Dichlorobenzene	30	28.4	95	30	28.9	96	(70-130)	1.90	(< 30)
1,2-Dichloroethane	30	25.1	84	30	24.8	83	(70-130)	0.98	(< 30)
1,2-Dichloropropane	30	27.9	93	30	27.8	93	(70-130)	0.59	(< 30)
1,3,5-Trimethylbenzene	30	29.2	98	30	29.3	98	(70-130)	0.20	(< 30)
1,3-Dichlorobenzene	30	29.2	98	30	29.7	99	(70-130)	1.70	(< 30)
1,3-Dichloropropane	30	28.8	96	30	28.5	95	(70-130)	0.89	(< 30)
1,4-Dichlorobenzene	30	28.8	96	30	29.5	98	(70-130)	2.30	(< 30)
2,2-Dichloropropane	30	25.6	85	30	25.5	85	(70-130)	0.19	(< 30)
2-Chlorotoluene	30	29.3	98	30	29.3	98	(70-130)	0.18	(< 30)
4-Chlorotoluene	30	28.5	95	30	29.1	97	(70-130)	2.10	(< 30)
4-Isopropyltoluene	30	29.4	98	30	29.5	98	(70-130)	0.27	(< 30)
Benzene	30	27.5	92	30	27.3	91	(70-130)	0.80	(< 30)
Bromobenzene	30	29.5	98	30	30.1	100	(70-130)	2.00	(< 30)
Bromochloromethane	30	28.3	94	30	28.3	94	(70-130)	0.10	(< 30)
Bromodichloromethane	30	27.1	90	30	26.9	90	(70-130)	0.79	(< 30)
Bromoform	30	28.0	93	30	28.1	94	(70-130)	0.17	(< 30)
Bromomethane	30	30.2	101	30	30.1	100	(70-130)	0.22	(< 30)
Carbon tetrachloride	30	26.2	87	30	26.1	87	(70-130)	0.12	(< 30)
Chlorobenzene	30	27.9	93	30	27.7	93	(70-130)	0.53	(< 30)
Chloroethane	30	27.5	92	30	24.7	82	(70-130)	10.50	(< 30)
Chloroform	30	26.8	90	30	26.5	88	(70-130)	1.40	(< 30)

Print Date: 08/13/2019 3:12:47PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [VXX34479]
Blank Spike Lab ID: 1520249
Date Analyzed: 07/21/2019 17:20

Spike Duplicate ID: LCSD for HBN 1193845 [VXX34479]
Spike Duplicate Lab ID: 1520250
Matrix: Drinking Water

QC for Samples: 1193845002

Results by **EPA 524.2**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Chloromethane	30	31.4	105	30	32.2	107	(70-130)	2.50	(< 30)
cis-1,2-Dichloroethene	30	27.0	90	30	27.1	90	(70-130)	0.19	(< 30)
cis-1,3-Dichloropropene	30	27.0	90	30	27.0	90	(70-130)	0.21	(< 30)
Dibromochloromethane	30	28.6	95	30	28.5	95	(70-130)	0.35	(< 30)
Dibromomethane	30	26.7	89	30	26.4	88	(70-130)	1.10	(< 30)
Dichlorodifluoromethane	30	23.3	78	30	22.6	75	(70-130)	3.00	(< 30)
Ethylbenzene	30	28.4	95	30	28.0	93	(70-130)	1.60	(< 30)
Hexachlorobutadiene	30	28.1	94	30	28.9	97	(70-130)	2.80	(< 30)
Isopropylbenzene (Cumene)	30	28.4	95	30	28.3	94	(70-130)	0.59	(< 30)
Methylene chloride	30	29.6	99	30	29.2	97	(70-130)	1.40	(< 30)
Methyl-t-butyl ether	45	39.5	88	45	39.6	88	(70-130)	0.18	(< 30)
Naphthalene	30	27.6	92	30	30.0	100	(70-130)	8.40	(< 30)
n-Butylbenzene	30	29.5	98	30	29.2	97	(70-130)	1.00	(< 30)
n-Propylbenzene	30	29.4	98	30	29.5	98	(70-130)	0.19	(< 30)
o-Xylene	30	27.6	92	30	27.5	92	(70-130)	0.43	(< 30)
P & M -Xylene	60	54.8	91	60	53.9	90	(70-130)	1.60	(< 30)
sec-Butylbenzene	30	29.1	97	30	29.3	98	(70-130)	0.66	(< 30)
Styrene	30	29.0	97	30	28.8	96	(70-130)	0.57	(< 30)
tert-Butylbenzene	30	29.2	97	30	29.1	97	(70-130)	0.20	(< 30)
Tetrachloroethene	30	28.8	96	30	28.4	95	(70-130)	1.50	(< 30)
Toluene	30	27.2	91	30	26.8	89	(70-130)	1.60	(< 30)
trans-1,2-Dichloroethene	30	27.6	92	30	26.9	90	(70-130)	2.60	(< 30)
trans-1,3-Dichloropropene	30	28.5	95	30	28.6	95	(70-130)	0.40	(< 30)
Trichloroethene	30	27.4	91	30	27.0	90	(70-130)	1.30	(< 30)
Trichlorofluoromethane	30	26.8	89	30	25.7	86	(70-130)	4.30	(< 30)
Vinyl chloride	30	27.8	93	30	27.1	90	(70-130)	2.80	(< 30)
Surrogates									
1,2-Dichloroethane-D4 (surr)	30	95.4	95	30	93.7	94	(70-130)	1.90	
4-Bromofluorobenzene (surr)	30	100	100	30	100	100	(70-130)	0.33	
Toluene-d8 (surr)	30	102	102	30	103	103	(70-130)	0.57	

Print Date: 08/13/2019 3:12:47PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [VXX34479]
Blank Spike Lab ID: 1520249
Date Analyzed: 07/21/2019 17:20

Spike Duplicate ID: LCSD for HBN 1193845 [VXX34479]
Spike Duplicate Lab ID: 1520250
Matrix: Drinking Water

QC for Samples: 1193845002

Results by **EPA 524.2**

Parameter	Blank Spike (%) Spike	Result	Rec (%)	Spike Duplicate (%) Spike	Result	Rec (%)	CL	RPD (%)	RPD CL

Batch Information

Analytical Batch: **VMS19192**
Analytical Method: **EPA 524.2**
Instrument: **VPA 780/5975 GC/MS**
Analyst: **NRB**

Prep Batch: **VXX34479**
Prep Method: **SW5030B**
Prep Date/Time: **07/21/2019 06:00**
Spike Init Wt./Vol.: 30 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 30 ug/L Extract Vol: 5 mL

Print Date: 08/13/2019 3:12:47PM

Method Blank

Blank ID: MB for HBN 1796411 [WAT/11390]
Blank Lab ID: 1519136

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **SM23 2120B**

Parameter	Results	LOQ/CL	DL	Units
Color, True	5.00U	5.00	5.00	PCU

Batch Information

Analytical Batch: WAT11390
Analytical Method: SM23 2120B
Instrument: Color Analyzer 2- 177-A1 OH
Analyst: EWW
Analytical Date/Time: 7/16/2019 2:55:00PM

Print Date: 08/13/2019 3:12:50PM

Duplicate Sample Summary

Original Sample ID: 1193830001
Duplicate Sample ID: 1519138
QC for Samples:
1193845001

Analysis Date: 07/16/2019 14:55
Matrix: Drinking Water

Results by **SM23 2120B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Color, True	ND	5.00U	PCU	0.00	(< 20)

Batch Information

Analytical Batch: WAT11390
Analytical Method: SM23 2120B
Instrument: Color Analyzer 2- 177-A1 OH
Analyst: EWW

Print Date: 08/13/2019 3:12:51PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WAT11390]
Blank Spike Lab ID: 1519137
Date Analyzed: 07/16/2019 14:55

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **SM23 2120B**

Blank Spike (PCU)

Parameter	Spike	Result	Rec (%)		CL
Color, True	15	10.0	67	*	(86-113)

Batch Information

Analytical Batch: **WAT11390**
Analytical Method: **SM23 2120B**
Instrument: **Color Analyzer 2- 177-A1 OH**
Analyst: **EWW**

Print Date: 08/13/2019 3:12:52PM

Method Blank

Blank ID: MB for HBN 1796516 (WFI/2828)
Blank Lab ID: 1519620

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **SM21 4500NO3-F**

Parameter	Results	LOQ/CL	DL	Units
Nitrate-N	0.100U	0.200	0.0500	mg/L
Nitrite-N	0.100U	0.200	0.0500	mg/L
Total Nitrate/Nitrite-N	0.100U	0.200	0.0500	mg/L

Batch Information

Analytical Batch: WFI2828
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 7/17/2019 3:19:24PM

Print Date: 08/13/2019 3:12:54PM

Method Blank

Blank ID: MB for HBN 1796516 (WFI/2828)
Blank Lab ID: 1519622

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **SM21 4500NO3-F**

Parameter	Results	LOQ/CL	DL	Units
Nitrate-N	0.100U	0.200	0.0500	mg/L
Nitrite-N	0.100U	0.200	0.0500	mg/L
Total Nitrate/Nitrite-N	0.100U	0.200	0.0500	mg/L

Batch Information

Analytical Batch: WFI2828
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 7/17/2019 4:04:55PM

Print Date: 08/13/2019 3:12:54PM

Method Blank

Blank ID: MB for HBN 1796516 (WFI/2828)
Blank Lab ID: 1519624

Matrix: Water (Surface, Eff., Ground)

QC for Samples:

Results by **SM21 4500NO3-F**

Parameter	Results	LOQ/CL	DL	Units
Nitrate-N	0.100U	0.200	0.0500	mg/L
Nitrite-N	0.100U	0.200	0.0500	mg/L
Total Nitrate/Nitrite-N	0.100U	0.200	0.0500	mg/L

Batch Information

Analytical Batch: WFI2828
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 7/17/2019 4:50:25PM

Print Date: 08/13/2019 3:12:54PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WFI2828]
Blank Spike Lab ID: 1519619
Date Analyzed: 07/17/2019 15:17

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **SM21 4500NO3-F**

Blank Spike (mg/L)

Parameter	Spike	Result	Rec (%)	CL
Nitrate-N	2.5	2.73	109	(70-130)
Nitrite-N	2.5	2.45	98	(90-110)
Total Nitrate/Nitrite-N	5	5.18	104	(90-110)

Batch Information

Analytical Batch: **WFI2828**
Analytical Method: **SM21 4500NO3-F**
Instrument: **Astoria segmented flow**
Analyst: **EWW**

Print Date: 08/13/2019 3:12:55PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WFI2828]
Blank Spike Lab ID: 1519621
Date Analyzed: 07/17/2019 16:03

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **SM21 4500NO3-F**

Blank Spike (mg/L)

Parameter	Spike	Result	Rec (%)	CL
Nitrate-N	2.5	2.69	108	(70-130)
Nitrite-N	2.5	2.47	99	(90-110)
Total Nitrate/Nitrite-N	5	5.16	103	(90-110)

Batch Information

Analytical Batch: **WFI2828**
Analytical Method: **SM21 4500NO3-F**
Instrument: **Astoria segmented flow**
Analyst: **EWW**

Print Date: 08/13/2019 3:12:55PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WFI2828]
Blank Spike Lab ID: 1519623
Date Analyzed: 07/17/2019 16:48

Matrix: Water (Surface, Eff., Ground)

QC for Samples:

Results by **SM21 4500NO3-F**

Blank Spike (mg/L)

Parameter	Spike	Result	Rec (%)	CL
Nitrate-N	2.5	2.56	102	(70-130)
Nitrite-N	2.5	2.47	99	(90-110)
Total Nitrate/Nitrite-N	5	5.03	101	(90-110)

Batch Information

Analytical Batch: **WFI2828**
Analytical Method: **SM21 4500NO3-F**
Instrument: **Astoria segmented flow**
Analyst: **EWW**

Print Date: 08/13/2019 3:12:55PM

Matrix Spike Summary

Original Sample ID: 1193717001
MS Sample ID: 1519589 MS
MSD Sample ID: 1519590 MSD

Analysis Date: 07/17/2019 14:39
Analysis Date: 07/17/2019 14:40
Analysis Date: 07/17/2019 14:42
Matrix: Drinking Water

QC for Samples:

Results by **SM21 4500NO3-F**

		Matrix Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Nitrate/Nitrite-N	0.200U	5.00	6.1	122 *	5.00	6.25	125 *	90-110	2.30	(< 25)

Batch Information

Analytical Batch: WFI2828
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 7/17/2019 2:40:54PM

Print Date: 08/13/2019 3:12:56PM

Matrix Spike Summary

Original Sample ID: 1193781001
MS Sample ID: 1519591 MS
MSD Sample ID: 1519592 MSD

QC for Samples: 1193845001

Analysis Date: 07/17/2019 15:22
Analysis Date: 07/17/2019 15:24
Analysis Date: 07/17/2019 15:26
Matrix: Drinking Water

Results by **SM21 4500NO3-F**

		Matrix Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Nitrate/Nitrite-N	0.200U	5.00	5.93	119 *	5.00	5.86	117 *	90-110	1.20	(< 25)

Batch Information

Analytical Batch: WFI2828
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 7/17/2019 3:24:39PM

Print Date: 08/13/2019 3:12:56PM

Matrix Spike Summary

Original Sample ID: 1199512003
MS Sample ID: 1519595 MS
MSD Sample ID: 1519596 MSD

QC for Samples: 1193845001

Analysis Date: 07/17/2019 16:10
Analysis Date: 07/17/2019 16:11
Analysis Date: 07/17/2019 16:13
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 4500NO3-F**

		Matrix Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Nitrate/Nitrite-N	0.100U	5.00	5.23	105	5.00	5.27	105	90-110	0.72	(< 25)

Batch Information

Analytical Batch: WFI2828
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: EWW
Analytical Date/Time: 7/17/2019 4:11:55PM

Print Date: 08/13/2019 3:12:56PM

Method Blank

Blank ID: MB for HBN 1796678 [WTC/2936]
Blank Lab ID: 1520291

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **SM 5310B**

Parameter	Results	LOQ/CL	DL	Units
Total Organic Carbon	0.500U	1.00	0.400	mg/L

Batch Information

Analytical Batch: WTC2936
Analytical Method: SM 5310B
Instrument: TOC Analyzer
Analyst: BMZ
Analytical Date/Time: 7/22/2019 1:50:09PM

Print Date: 08/13/2019 3:12:57PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WTC2936]
Blank Spike Lab ID: 1520289
Date Analyzed: 07/22/2019 13:35

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **SM 5310B**

Blank Spike (mg/L)

Parameter	Spike	Result	Rec (%)	CL
Total Organic Carbon	75	66.5	89	(80-120)

Batch Information

Analytical Batch: **WTC2936**
Analytical Method: **SM 5310B**
Instrument: **TOC Analyzer**
Analyst: **BMZ**

Print Date: 08/13/2019 3:12:58PM

Matrix Spike Summary

Original Sample ID: 1193881001
MS Sample ID: 1520295 MS
MSD Sample ID: 1520296 MSD

QC for Samples: 1193845001

Analysis Date: 07/22/2019 14:22
Analysis Date: 07/22/2019 14:39
Analysis Date: 07/22/2019 14:54
Matrix: Water (Surface, Eff., Ground)

Results by **SM 5310B**

		Matrix Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Organic Carbon	1.04	10.0	10	90	10.0	9.79	88	75-125	2.50	(< 25)

Batch Information

Analytical Batch: WTC2936
Analytical Method: SM 5310B
Instrument: TOC Analyzer
Analyst: BMZ
Analytical Date/Time: 7/22/2019 2:39:38PM

Print Date: 08/13/2019 3:12:59PM

Duplicate Sample Summary

Original Sample ID: 1199540001
Duplicate Sample ID: 1520310
QC for Samples:
1193845001

Analysis Date: 07/18/2019 16:40
Matrix: Drinking Water

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	6.8	6.80	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI5228
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: DMM

Print Date: 08/13/2019 3:13:01PM

Duplicate Sample Summary

Original Sample ID: 1199540015
Duplicate Sample ID: 1520311
QC for Samples:
1193845001

Analysis Date: 07/18/2019 18:48
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	7.7	7.70	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI5228
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: DMM

Print Date: 08/13/2019 3:13:01PM

Duplicate Sample Summary

Original Sample ID: 1199535001
Duplicate Sample ID: 1520313
QC for Samples:
1193845001

Analysis Date: 07/18/2019 19:44
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	6.2	6.20	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI5228
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: DMM

Print Date: 08/13/2019 3:13:01PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WTI5228]
Blank Spike Lab ID: 1520307
Date Analyzed: 07/18/2019 14:49

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **SM21 4500-H B**

Blank Spike (pH units)

Parameter	Spike	Result	Rec (%)	CL
pH	6.98	7.01	100	(99-101)

Batch Information

Analytical Batch: **WTI5228**
Analytical Method: **SM21 4500-H B**
Instrument: **Titration**
Analyst: **DMM**

Print Date: 08/13/2019 3:13:02PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WTI5228]
Blank Spike Lab ID: 1520312
Date Analyzed: 07/18/2019 19:34

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **SM21 4500-H B**

Blank Spike (pH units)

Parameter	Spike	Result	Rec (%)	CL
pH	6.98	7.01	100	(99-101)

Batch Information

Analytical Batch: **WTI5228**
Analytical Method: **SM21 4500-H B**
Instrument: **Titration**
Analyst: **DMM**

Print Date: 08/13/2019 3:13:02PM

Method Blank

Blank ID: MB for HBN 1796681 [WTI/5229]
Blank Lab ID: 1520314

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **SM21 2320B**

Parameter	Results	LOQ/CL	DL	Units
Alkalinity	2.85J	10.0	2.50	mg/L

Batch Information

Analytical Batch: WTI5229
Analytical Method: SM21 2320B
Instrument: Titration
Analyst: DMM
Analytical Date/Time: 7/18/2019 3:56:39PM

Print Date: 08/13/2019 3:13:04PM

Duplicate Sample Summary

Original Sample ID: 1199540015
Duplicate Sample ID: 1520318
QC for Samples:
1193845001

Analysis Date: 07/18/2019 18:48
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2320B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Alkalinity	70.5	70.8	mg/L	0.52	(< 25)

Batch Information

Analytical Batch: WTI5229
Analytical Method: SM21 2320B
Instrument: Titration
Analyst: DMM

Print Date: 08/13/2019 3:13:04PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WTI5229]
Blank Spike Lab ID: 1520315
Date Analyzed: 07/18/2019 16:07

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **SM21 2320B**

Blank Spike (mg/L)

Parameter	Spike	Result	Rec (%)	CL
Alkalinity	250	243	97	(85-115)

Batch Information

Analytical Batch: **WTI5229**
Analytical Method: **SM21 2320B**
Instrument: **Titration**
Analyst: **DMM**

Print Date: 08/13/2019 3:13:06PM

Method Blank

Blank ID: MB for HBN 1796426 [WXX/12925]
Blank Lab ID: 1519215

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **EPA 300.0**

Parameter	Results	LOQ/CL	DL	Units
Chloride	0.100U	0.200	0.0500	mg/L
Fluoride	0.100U	0.200	0.0500	mg/L
Sulfate	0.100U	0.200	0.0500	mg/L

Batch Information

Analytical Batch: WIC5937
Analytical Method: EPA 300.0
Instrument: 930 Metrohm compact IC flex
Analyst: DMM
Analytical Date/Time: 7/16/2019 5:30:48PM

Prep Batch: WXX12925
Prep Method: METHOD
Prep Date/Time: 7/16/2019 3:00:00PM
Prep Initial Wt./Vol.: 10 mL
Prep Extract Vol: 10 mL

Print Date: 08/13/2019 3:13:08PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WXX12925]
Blank Spike Lab ID: 1519216
Date Analyzed: 07/16/2019 17:49

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **EPA 300.0**

Blank Spike (mg/L)

Parameter	Spike	Result	Rec (%)	CL
Chloride	5	4.92	98	(90-110)
Fluoride	5	4.84	97	(90-110)
Sulfate	5	4.74	95	(90-110)

Batch Information

Analytical Batch: **WIC5937**
Analytical Method: **EPA 300.0**
Instrument: **930 Metrohm compact IC flex**
Analyst: **DMM**

Prep Batch: **WXX12925**
Prep Method: **METHOD**
Prep Date/Time: **07/16/2019 15:00**
Spike Init Wt./Vol.: 5 mg/L Extract Vol: 10 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 08/13/2019 3:13:10PM

Matrix Spike Summary

Original Sample ID: 1193821001
MS Sample ID: 1519218 MS
MSD Sample ID: 1519219 MSD

QC for Samples: 1193845001

Analysis Date: 07/16/2019 20:59
Analysis Date: 07/16/2019 21:18
Analysis Date: 07/16/2019 21:37
Matrix: Drinking Water

Results by **EPA 300.0**

		Matrix Spike (mg/L)				Spike Duplicate (mg/L)						
Parameter	Sample	Spike	Result	Rec (%)		Spike	Result	Rec (%)		CL	RPD (%)	RPD CL
Chloride	20.3	5.00	24	73	*	5.00	24.0	73	*	90-110	0.17	(< 15)
Fluoride	0.200U	5.00	4.9	98		5.00	5.00	100		90-110	2.00	(< 15)
Sulfate	16.9	5.00	20.7	77	*	5.00	20.8	79	*	90-110	0.45	(< 15)

Batch Information

Analytical Batch: WIC5937
Analytical Method: EPA 300.0
Instrument: 930 Metrohm compact IC flex
Analyst: DMM
Analytical Date/Time: 7/16/2019 9:18:37PM

Prep Batch: WXX12925
Prep Method: EPA 300.0 Extraction Waters/Liquids
Prep Date/Time: 7/16/2019 3:00:00PM
Prep Initial Wt./Vol.: 10.00mL
Prep Extract Vol: 10.00mL

Print Date: 08/13/2019 3:13:11PM

Method Blank

Blank ID: MB for HBN 1796657 [WXX/12931]
Blank Lab ID: 1520209

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **SM21 4500-CN C,E**

Parameter	Results	LOQ/CL	DL	Units
Cyanide	0.00250U	0.0050	0.0020	mg/L

Batch Information

Analytical Batch: WDA4610
Analytical Method: SM21 4500-CN C,E
Instrument: Discrete Analyzer 3
Analyst: DMM
Analytical Date/Time: 7/19/2019 3:02:47PM

Prep Batch: WXX12931
Prep Method: METHOD
Prep Date/Time: 7/19/2019 12:18:00PM
Prep Initial Wt./Vol.: 6 mL
Prep Extract Vol: 6 mL

Print Date: 08/13/2019 3:13:12PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WXX12931]
Blank Spike Lab ID: 1520210
Date Analyzed: 07/19/2019 15:05

Spike Duplicate ID: LCSD for HBN 1193845 [WXX12931]
Spike Duplicate Lab ID: 1520211
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **SM21 4500-CN C,E**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Cyanide	0.05	0.055	109	0.05	0.054	109	(75-125)	0.55	(< 25)

Batch Information

Analytical Batch: **WDA4610**
Analytical Method: **SM21 4500-CN C,E**
Instrument: **Discrete Analyzer 3**
Analyst: **DMM**

Prep Batch: **WXX12931**
Prep Method: **METHOD**
Prep Date/Time: **07/19/2019 12:18**
Spike Init Wt./Vol.: 0.05 mg/L Extract Vol: 6 mL
Dupe Init Wt./Vol.: 0.05 mg/L Extract Vol: 6 mL

Print Date: 08/13/2019 3:13:14PM

Matrix Spike Summary

Original Sample ID: 1199489001
MS Sample ID: 1520213 MS
MSD Sample ID: 1520214 MSD

QC for Samples: 1193845001

Analysis Date: 07/19/2019 15:37
Analysis Date: 07/19/2019 15:40
Analysis Date: 07/19/2019 15:42
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 4500-CN C,E**

		Matrix Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Cyanide	0.00250U	0.050	.051	102	0.050	0.053	105	75-125	3.50	(< 25)

Batch Information

Analytical Batch: WDA4610
Analytical Method: SM21 4500-CN C,E
Instrument: Discrete Analyzer 3
Analyst: DMM
Analytical Date/Time: 7/19/2019 3:40:05PM

Prep Batch: WXX12931
Prep Method: Cyanide Distillation
Prep Date/Time: 7/19/2019 12:18:00PM
Prep Initial Wt./Vol.: 6.00mL
Prep Extract Vol: 6.00mL

Print Date: 08/13/2019 3:13:15PM

Method Blank

Blank ID: MB for HBN 1797221 [WXX/12944]
Blank Lab ID: 1522554

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1193845001

Results by **SM21 4500-N D**

Parameter	Results	LOQ/CL	DL	Units
Total Kjeldahl Nitrogen	0.500U	1.00	0.310	mg/L

Batch Information

Analytical Batch: WDA4615
Analytical Method: SM21 4500-N D
Instrument: Discrete Analyzer 2
Analyst: DMM
Analytical Date/Time: 7/31/2019 12:35:56PM

Prep Batch: WXX12944
Prep Method: METHOD
Prep Date/Time: 7/30/2019 2:20:00PM
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Print Date: 08/13/2019 3:13:16PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1193845 [WXX12944]
Blank Spike Lab ID: 1522555
Date Analyzed: 07/31/2019 12:37

Spike Duplicate ID: LCSD for HBN 1193845 [WXX12944]
Spike Duplicate Lab ID: 1522556
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1193845001

Results by **SM21 4500-N D**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Kjeldahl Nitrogen	4	3.31	83	4	3.46	86	(75-125)	4.30	(< 25)

Batch Information

Analytical Batch: **WDA4615**
Analytical Method: **SM21 4500-N D**
Instrument: **Discrete Analyzer 2**
Analyst: **DMM**

Prep Batch: **WXX12944**
Prep Method: **METHOD**
Prep Date/Time: **07/30/2019 14:20**
Spike Init Wt./Vol.: 4 mg/L Extract Vol: 25 mL
Dupe Init Wt./Vol.: 4 mg/L Extract Vol: 25 mL

Print Date: 08/13/2019 3:13:17PM

Matrix Spike Summary

Original Sample ID: 1198801007
MS Sample ID: 1522557 MS
MSD Sample ID: 1522558 MSD

QC for Samples: 1193845001

Analysis Date: 07/31/2019 12:42
Analysis Date: 07/31/2019 12:43
Analysis Date: 07/31/2019 12:45
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 4500-N D**

		Matrix Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Kjeldahl Nitrogen	1.00U	4.00	3.18	79	4.00	3.21	80	75-125	1.10	(< 25)

Batch Information

Analytical Batch: WDA4615
Analytical Method: SM21 4500-N D
Instrument: Discrete Analyzer 2
Analyst: DMM
Analytical Date/Time: 7/31/2019 12:43:45PM

Prep Batch: WXX12944
Prep Method: Distillation TKN by Phenate (W)
Prep Date/Time: 7/30/2019 2:20:00PM
Prep Initial Wt./Vol.: 25.00mL
Prep Extract Vol: 25.00mL

Print Date: 08/13/2019 3:13:18PM

SGS **1193845**

PER TUNUNAK, AK
STANTEC 2020

SGS North America Inc.
CHAIN OF CUSTODY RECORD
WSID sampling for submittal to ADEC

Revised Report - Revision 1

Locations Nationwide
Alaska Maryland
New Jersey New York
North Carolina Florida

www.us.sgs.com

Instructions: Sections 1 - 5 must be filled out. Omissions may delay the onset of analysis.

Page 1 of 1

Section 1

CLIENT: Village Safe Water

CONTACT: Bob Gilfilian — PHONE #: 907-727-9883

PROJECT NAME: Tununak, AK — PROJECT/ PERMIT#:

REPORTS TO: Bob Gilfilian — E-MAIL: Bob.Gilfilian@stantec.com — Profile #:

INVOICE TO: — QUOTE #: — P.O. #: 2047057404

Section 2

RESERVED for lab use	Sample Location	Date of Collection	Time of Collection	# CONTAINERS	Comp / Grab	Analysis: Primary Inorganics	Secondary Inorganics	VOCs (524)	TOC	PWSID#	FAC ID #	Sample Pt. ID
(1) A-J	Tununak-Exp-well	7/15/19	0845	9	G	X	X	X	X			
(2) A-C	Trip-Blank	7/15/19	0800	1	G			X				

Info Required for ADEC Submittal - Missing or incorrect info may result in a delay. Information may be found on your ADEC Monitoring Summary.

Section 3

Preservative

Section 4

Data Deliverable Requirements:

Cooler ID:

Requested Turnaround Time and/or Special Instructions:

Pacific #3642849

Section 5

Relinquished By:	Date	Time	Received By:
(1)	7/16/19		
(2)			
(3)			
(4)	7-16-19	14:29	Received For Laboratory By:

Temp Blank °C: 2.8C 0.30 or Ambient [ ]

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

Delivery Method: Hand Delivery[ ] Commerical Delivery [ ]

http://www.sgs.com/terms-and-conditions

LR HG

PER TUNUNAK, AK
STANTEC 2020

Revised Report

SGS

Chain of Custody for Total Coliform Bacteria Samples

SGS North America, Inc.
200 West Potter Rd
Anchorage, AK 99518
(907) 562-2343

Client:	Village Safe Water
Contact:	Bob Gilfilian
Email:	bob.Gilfilian@Stantec.com
Invoice to:	
Phone:	907-227-9883 **Fax:**
Address:	725 E Fireweed Lane Suite 700
City, State, Zip:	Anchorage, AK 46 99503
Water System Name:	Tununak-Exp-Well
***Sample Location:**	Tununak, AK
***Date/Time of Collection:**	07 (MM) 15 (DD) 2019 (YYYY) 0845 (HH:MM) AM/PM
Sample Collector:	Signature JK Initials

Info Required for ADEC Submittal- ***Missing or incorrect info may result in a delay.***

***PWSID #:**	N/A
***Facility ID:**	
***Sample Point:**	
***Residual Cl- (mg/L):**	

1193845 (3)A

Analysis Requested (Select one)

- ☒ SM9223B-Total Coli P/A (Default)
- ☐ SM9223-Total Coli Quantitray MPN
- ☐ ~~SM9215-HPC - 8 hour~~ **holding time for PWSIDs**

Sample Type: ☒ Drinking Water ☐ Salt Water (Request SM9223 Quantitray)
☐ Repeat Sample - Original Lab Sample ID: _____

Received by: _____ (Signature) CR (Initials) Date: 7.16.19 (MM/DD/YY) Time: 14:29 (HH:MM)

Temperature: ☐ Ambient or 2.2 °C 030 Delivery: ☒ Client or ☐ Other (specify): HD

Please note if the above information is missing it may result in late reporting to the state for compliance

Sample Condition:

- ☐ **Sample over 30 hours old, results may be unreliable.** ***Note: Source water HPC has 8 hour holding ti***
- ☐ **The sample was received frozen or with visible ice, and was rejected.**
- ☐ **The sample was not received in a laboratory issue, pre-sterilized container, and was rejected.**

This section used for immediate notification of UNSATISFACTORY results only:

Analysis Began:		☐ SM9223B Presence/Absence	
Analyst:		☐ SM9223 QuantTray	
Result:	Total Coliform:		
	E. coli / Fecal Coli:		
	Other Bacteria:		
Reported to:		By: Fax: _____ Phone: _____ Email:	
Reported to:		By: Fax: _____ Phone: _____ Email:	
Analyst (Print):			
Signature:		Date/Time:	
Initials:			

Email Positive Total Coliform/E.coli to Project Manager, QC Notices, Micro, and Data Management. Notify ADEC if PWSID is present

PER TUNUNAK, AK
STANTEC 2020

SGS

Chain of Custody for
Total Coliform Bacteria Samples

Revised Report - Revision 1

SGS North America, Inc.
200 West Potter Rd
Anchorage, AK 99518
(907) 562-2343

Client:	Village Safe Water
Contact:	Bob Gilfilian
Email:	Bob.Gilfilian@stantec.com
Invoice to:	
Phone:	907-227-9883 **Fax:**
Address:	725 E. Fireweed Lane Suite 200
City, State, Zip:	Anchorage, AK
Water System Name:	Tununak-Expwell2
***Sample Location:**	Tununak, AK
***Date/Time of Collection:**	07 (MM) 16 (DD) 2019 (YYYY) 0630 (HH:MM) AM/PM

Info Required for ADEC Submittal- ***Missing or incorrect info may result in a delay.***

***PWSID #:**	N/A
***Facility ID:**	
***Sample Point:**	
***Residual Cl- (mg/L):**	

1193845 QA

Analysis Requested (Select one)

- [X] SM9223B-Total Coli P/A (Default)
- [ ] SM9223-Total Coli Quantitray MPN
- [ ] SM9215-HPC - **8 hour holding time for PWSIDs**

Sample Collector: _____ (Signature) JK (Initials)

Sample Type: [X] Drinking Water [ ] Salt Water (Request SM9223 Quantitray)
[ ] Repeat Sample - Original Lab Sample ID: _____

Received by: _____ (Signature) RT (Initials)
Date: 7.15.19 (MM/DD/YY) Time: 1629 (HH:MM)

Temperature: [ ] Ambient or 2.8 °C D30
Delivery: [ ] Client or [ ] Other (specify): _____

Please note if the above information is missing it may result in late reporting to the state for compliance

Sample Condition:

- [ ] **Sample over 30 hours old, results may be unreliable.** ***Note: Source water HPC has 8 hour holding ti***
- [ ] **The sample was received frozen or with visible ice, and was rejected.**
- [ ] **The sample was not received in a laboratory issue, pre-sterilized container, and was rejected.**

This section used for immediate notification of UNSATISFACTORY results only:

Analysis Began:		[ ] SM9223B Presence/Absence	
Analyst:		[ ] SM9223 QuantTray	
Result:	Total Coliform:		
	E. coli / Fecal Coli:		
	Other Bacteria:		
Reported to:		By: Fax: _____ Phone: _____ Email: _____	
Reported to:		By: Fax: _____ Phone: _____ Email: _____	
Analyst (Print):			
Signature:		Date/Time:	
Initials:			

Email Positive Total Coliform/E.coli to Project Manager, QC Notices, Micro, and Data Management. Notify ADEC if PWSID is present

PER TUNUNAK, AK

e-Sample Receipt Form

SGS Report #: 1193845 REC 2020

Revised Report - Revision 1

SGS Workorder #: 1193845

1 1 9 3 8 4 5

Review Criteria	Condition (Yes, No, N/A)	Exceptions Noted below
Chain of Custody / Temperature Requirements		N/A Exemption permitted if sampler hand carries/delivers.
Were Custody Seals intact? Note # & location	Yes	1 front
COC accompanied samples?	Yes	
DOD: Were samples received in COC corresponding coolers?	N/A	
N/A **Exemption permitted if chilled & collected <8 hours ago, or for samples where chilling is not required		
Temperature blank compliant* (i.e., 0-6 °C after CF)?	Yes	Cooler ID: 1 @ 2.8 °C Therm. ID: D30
If samples received without a temperature blank, the "cooler temperature" will be documented instead & "COOLER TEMP" will be noted to the right. "ambient" or "chilled" will be noted if neither is available.		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
*If >6°C, were samples collected <8 hours ago?	N/A	
If <0°C, were sample containers ice free?	N/A	
Note: Identify containers received at non-compliant temperature . Use form FS-0029 if more space is needed.		
Holding Time / Documentation / Sample Condition Requirements		Note: Refer to form F-083 "Sample Guide" for specific holding times.
Were samples received within holding time?	Yes	
Do samples **match COC**** (i.e.,sample IDs,dates/times collected)?	No	No TOC sample was provided; poured off sufficient sample from container 1D (1L unpreserved HDPE) into a 125 mL HCl amber jar per PM.
**Note: If times differ <1hr, record details & login per COC.		
***Note: If sample information on containers differs from COC, SGS will default to COC information		
Were analytical requests clear? (i.e., method is specified for analyses with multiple option for analysis (Ex: BTEX, Metals)	No	Adding TKN to sample 1B per client.
	N/A	***Exemption permitted for metals (e.g,200.8/6020A).
Were proper containers (type/mass/volume/preservative***)used?	No	Sample 4A contained insufficient volume and is being cancelled per PM. Sample 1E was in a 500mL HDPE instead of a 500mL amber, proceeding per PM.
Volatile / LL-Hg Requirements		
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	Yes	
Were all water VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	Yes	
Were all soil VOAs field extracted with MeOH+BFB?	N/A	

Note to Client: Any "No", answer above indicates non-compliance with standard procedures and may impact data quality.

Additional notes (if applicable):

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1193845001-A	HNO3 to pH < 2	OK			
1193845001-B	H2SO4 to pH < 2	OK			
1193845001-C	NaOH to pH > 10	OK			
1193845001-D	No Preservative Required	OK			
1193845001-E	No Preservative Required	OK			
1193845001-F	No Preservative Required	OK			
1193845001-G	HCL to pH < 2	IC			
1193845001-H	HCL to pH < 2	OK			
1193845001-I	HCL to pH < 2	OK			
1193845001-J	HCL to pH < 2	OK			
1193845002-A	HCL to pH < 2	OK			
1193845002-B	HCL to pH < 2	OK			
1193845002-C	HCL to pH < 2	OK			
1193845003-A	Na2S2O3 for Chlorine Redu	OK			
1193845004-A	Na2S2O3 for Chlorine Redu	QN			

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.
BU - The container was received with headspace greater than 6mm.
DM - The container was received damaged.
FR - The container was received frozen and not usable for Bacteria or BOD analyses.
IC - The container provided for microbiology analysis was not a laboratory-supplied, pre-sterilized container and therefore was not suitable for analysis.
NC- The container provided was not preserved or was under-preserved. The method does not allow for additional preservative added after collection.
PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

July 26, 2019 Service Request No:K1906623

Julie Shumway
SGS North America, Inc.
200 West Potter Drive
Anchorage, AK 99518

Laboratory Results for:1193845

Dear Julie,

Enclosed are the results of the sample(s) submitted to our laboratory July 18, 2019
For your reference, these analyses have been assigned our service request number **K1906623.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3364. You may also contact me via email at howard.holmes@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Howard Holmes
Project Manager

ADDRESS 1317 S. 13th Avenue, Kelso, WA 98626
PHONE +1 360 577 7222 | FAX +1 360 636 1068
ALS Group USA, Corp.
dba ALS Environmental

Narrative Documents

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Client: SGS North America, Inc. (SGS Environmental) **Service Request:** K1906623
Project: 1193845 **Date Received:** 07/18/2019
Sample Matrix: Water

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier II level requested by the client.

Sample Receipt:

One water sample was received for analysis at ALS Environmental on 07/18/2019. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by _____ Date 07/26/2019

Sample Receipt Information

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Client: SGS North America, Inc. (SGS Environmental) **Service Request:**K1906623

Project: 1193845

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
K1906623-001	Tununak-Exp-Well	7/15/2019	0845

PER TUNUNAK, AK
STANTEC 2020

SGS North America Inc.
CHAIN OF CUSTODY RECORD

Locations Nationwide
Alaska Florida
New Jersey Colorado
Texas North Carolina
Virginia Louisiana
www.us.sgs.com

Revised Report - Revision 1

K1906623

CLIENT:	SGS North America Inc. - Alaska Division	SGS Reference:	ALS Kelso, WA
CONTACT:	Julie Shumway	PHONE NO:	(907) 562-2343
PROJECT NAME:	1193845	PWSID#:	
		NPDL#:	
REPORTS TO:	Julie Shumway	E-MAIL:	Julie.Shumway@sgs.com; Env.Alaska.RefLabTeam@sgs.com
INVOICE TO:	SGS - Alaska	QUOTE #:	
		P.O. #:	1193845

Additional Comments: All soils report out in dry weight unless

Page 1 of 1

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HHMM	MATRIX/ MATRIX CODE	# CONTAINERS	Preservative Used: NONE	TYPE C = COMP G = GRAB MI = Multi Incremental Soils	MBAS (Surfactants)			MS	MSD	SGS lab #	Location ID
	Tununak-Exp-Well	07/15/2019	08:45:00	DW	1			X					1193845001	

Relinquished By: (1)	Date	Time	Received By:	DOD Project?	No
				Report to DL (J Flags)? If J- Report as DL/LOD/LOQ.	Yes
Relinquished By: (2)	Date	Time	Received By:	Cooler ID:	
Relinquished By: (3)	Date	Time	Received By:	Temp Blank °C:	
Relinquished By: (4)	Date	Time	Received For Laboratory By:	or Ambient [ ]	
J Shumway	7/17/19	0901	Cliff Cowan 7/18/19		

Data Deliverable Requirements: Level II + Dataview

Requested Turnaround Time and-or Special Instructions:

Please analyze outside of holding time.

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

[X] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

http://www.sgs.com/terms_and_conditions.htm

Cooler Receipt and Preservation Form

Client SGS Service Request K19 06623

Received: 7/18/19 Opened: 7/18/19 By: CG Unloaded: 7/18/19 By: CG

1. Samples were received via? *USPS* *Fed Ex* (UPS) *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) (*Box*) *Envelope* *Other* _____ NA
3. Were custody seals on coolers? NA (Y) N If yes, how many and where? 2, (1 each end of box)
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number NA	Filed
2.1	2.3	4.4	4.6	+0.2	395		1Z A86 19W 01 6778 5221	

4. Packing material: *Inserts* *Baggies* (*Bubble Wrap*) (*Gel Packs*) *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Were samples received in good condition (temperature, unbroken)? *Indicate in the table below.* NA (Y) CG 7/18 (N)
   If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed*
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. Was C12/Res negative? (NA) Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: Sample received past hold, noted by client on COC.

Miscellaneous Forms

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Analyst Summary report

Client:	SGS North America, Inc. (SGS Environmental)	**Service Request:**	K1906623
Project:	1193845/		

Sample Name:	Tununak-Exp-Well	**Date Collected:**	07/15/19
Lab Code:	K1906623-001	**Date Received:**	07/18/19
Sample Matrix:	Water		

Analysis Method	Extracted/Digested By	Analyzed By
SM 5540 C	JMADISON	JMADISON

Sample Results

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Analytical Report

Client:	SGS North America, Inc. (SGS Environmental)	**Service Request:**	K1906623
Project:	1193845	**Date Collected:**	07/15/19 08:45
Sample Matrix:	Water	**Date Received:**	07/18/19 09:45
Sample Name:	Tununak-Exp-Well	**Basis:**	NA
Lab Code:	K1906623-001		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Methylene Blue Active Substances	SM 5540 C	ND U	mg/L	0.050	0.020	1	07/25/19 08:24	07/19/19	

QC Summary Forms

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Analytical Report

Client:	SGS North America, Inc. (SGS Environmental)	**Service Request:**	K1906623
Project:	1193845	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	NA
Lab Code:	K1906623-MB		

General Chemistry Parameters

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Methylene Blue Active Substances	SM 5540 C	ND	U	mg/L	0.050	0.020	1	07/25/19 08:24	07/19/19	

QA/QC Report

Client:	SGS North America, Inc. (SGS Environmental)	**Service Request:**	K1906623
Project:	1193845	**Date Collected:**	07/15/19
Sample Matrix:	Water	**Date Received:**	07/18/19
		Date Analyzed:	07/25/19
		Date Extracted:	07/19/19

Duplicate Matrix Spike Summary
Methylene Blue Active Substances

Sample Name:	Tununak-Exp-Well	**Units:**	mg/L
Lab Code:	K1906623-001	**Basis:**	NA
Analysis Method:	SM 5540 C		
Prep Method:	Method		

		Matrix Spike K1906623-001MS			Duplicate Matrix Spike K1906623-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Methylene Blue Active Substances	ND U	0.094	0.100	94	0.102	0.100	102	70-130	9	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	SGS North America, Inc. (SGS Environmental)	**Service Request:**	K1906623
Project	1193845	**Date Collected:**	07/15/19
Sample Matrix:	Water	**Date Received:**	07/18/19
		Date Analyzed:	07/25/19

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Tununak-Exp-Well	**Units:**	mg/L
Lab Code:	K1906623-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample K1906623-001DUP Result	Average	RPD	RPD Limit
Methylene Blue Active Substances	SM 5540 C	0.050	0.020	ND U	ND U	NC	NC	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

QA/QC Report

Client:	SGS North America, Inc. (SGS Environmental)	**Service Request:**	K1906623
Project:	1193845	**Date Analyzed:**	07/25/19
Sample Matrix:	Water	**Date Extracted:**	07/19/19

Lab Control Sample Summary
Methylene Blue Active Substances

Analysis Method:	SM 5540 C	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA
		Analysis Lot:	644625

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1906623-LCS	0.205	0.200	102	70-130

Revised Report - Revision 1
3710 Woodland Dr. Suite 900
Anchorage, AK 99517
(907) 258-2155 | Fax (907) 258-6634

ARS Aleut Analytical, LLC

Laboratory Analytical Report

ARS3-19-02142

SGS Environmental Services
Julie Shumway
200 W. Potter Drive
Anchorage, AK 99523
907-550-3215
Julie.Shumway@sgs.com

PO Number: **1193845**
Job Number: **Job#1193845**
Project Name: **SGS Environmental**

Questions regarding this analytical report should be addressed to ARS project manager, Jennifer Roberts, who can be reached by phone at 907-258-2155 or email at datareporting@amrad.com.

I certify that the test results presented in this report (in either hardcopy or electronic file (EDD)) meet the requirements of the laboratory's certifications and other applicable contract terms and conditions. Any exceptions to the certification or contract will be noted within the case narratives presented in the report. Any subcontracted sample results will be identified within the case narratives presented in the report. In the event this report is an amendment to a previously released report, the case narrative will clearly identify the original report as well as the reason(s) for reissuance. A statement of uncertainty for each analysis is available upon request. I authorize release and issuance of this report on the date signed below.

		Laboratory Management, ARS Aleut Analytical
Signature	**Date**	**Title**

This report provides analytical results of the requested analysis and does not include any opinions or interpretations. ARS Aleut Analytical, LLC assumes no liability for the use or interpretation of analytical results. Results relate only to items tested. A partial reproduction of this test report is prohibited. Reproduction of this report in full requires the written approval of the laboratory.

Alaska Laboratory# AK00969

ARS Aleut Analytical
3710 Woodland Dr. Suite 900 • Anchorage, AK 99517
907-258-2155 • FAX 907-258-6634

Table Of Contents

Cover Sheet 1
Table Of Contents 2
Case Narrative 3
Analytical Results 6
Batch QC 8
Sample Management Records 10

ARS Aleut Analytical
3710 Woodland Dr. Suite 900 • Anchorage, AK 99517
907-258-2155 • FAX 907-258-6634

ARS Aleut Analytical, LLC
Analytical Reports

for

SGS Environmental Services

Case Narrative

ARS Aleut Analytical
3710 Woodland Dr. Suite 900 ● Anchorage, AK 99517
(907) 258-2155 ● Fax (907) 258-6634

PROJECT SAMPLE IDENTIFICATION CROSS-REFERENCE
TO ARS SAMPLE LABORATORY IDs

Client Sample ID	ARS Aleut Analytical Sample ID
Tununak-Exp-Well Tununak-Exp-Well	ARS3-19-02142-001

Sample	Date Collected	Date Received	Analysis	Prep Date/Time	Analysis Date/Time
001	07/15/19 08:45	07/17/19	WCH-ODOR-AQ	07/17/19 14:22	07/17/19 14:22

SAMPLE RECEIPT/PREP

The samples arrived in good condition. Turnaround time was set at 15 work days.

Sample 001 Comment:
Sample received out of hold, run per COC. CDJ
SGS approved running out of poly container. MCC 7/17/2019
SGS#1193845001

ANALYTICAL METHODS

Odor analysis was performed using **ARS-WCH-017, "Odor (SM2150B)".**

ANALYTICAL RESULTS

**No QC failures or CRDL failures found.

ARS3-19-02142: Ok per client to run outside hold time. jkr 7/17/19

Notes (Case Narrative):

General Comments:

1.0) Soil and Sludge analysis are reported on a wet basis or an as received basis unless otherwise indicated.
2.0) Modified analysis procedures are procedures that are modified to meet the certain specifications. An example may be the use of a water method to analyze a solid matrix due to the lack of an officially recognized procedure for the analysis of the solid matrix. Modified analyses are indicated by the subsequent addition of “m” to the procedure number (i.e. 900.0M).
3.0) All NIOSH method results are reported without blank corrections applied.

Radiochemistry Comments:

1.0) All MDA/MDC values are calculated on a sample specific basis.
2.0) Data in this report are within the limits of uncertainty specified in the reference method unless otherwise specified.
3.0) Total activity is actually total gamma activity and is determined utilizing the prominent gamma emitters from the naturally occurring radioactive decay chains and other prominent radioactive nuclides. Total activity may be lower than the actual total activity due to the extent of secular equilibrium achieved in the various decay chains at the time of analysis. The total activity is not representative of nuclides that emit solely alpha or beta particles.
4.0) Ra-228 is determined via secular equilibrium with its daughter, Actinium 228 (Gamma Spectroscopy only).
5.0) U-238 is determined via secular equilibrium with its daughter, Thorium 234 (Gamma Spectroscopy only).
6.0) All gamma spectroscopy was performed utilizing high purity germanium detectors (**HPGe**).
7.0) ARS makes every attempt to match sample density to calibrated density; however, in some cases, it is not practical or possible to do so and data results may be affected (Gamma Spectroscopy only).
8.0) Gamma spectroscopy results are calculated values based on the **ORTEC**® GammaVision ENV32 Analysis Engine.
9.0) ACLASS DOD and ISO 17025 certification applies only to the following analytes and methods: Gross Alpha and Gross Beta (EPA 900, SM7110B&C, SW846 9310); Radium 226 (EPA 903, EPA 903.1, SM 7500 Ra-B, SW846 9315); Radium 228 (EPA 904, SM 7500 Ra-B SW846 9320); Iodine-131(EPA 901.1); Uranium by ICPMS (EPA 200.8); Strontium 89/90 (EPA 905, Eichrom SRW01, HASL 300 Sr-03-RC); Tritium (EPA 906, EPA 906M); Gamma Emitters (EPA 901.1, SM7120B, HASL 300 Ga-01-R); Americium-241, Curium 242/244, Plutonium 239/240 and 241, Thorium 228/230/232, Uranium 234/233 and 238 (Eichrom ACW03 VBS); Lead 210 (HASL 300 Pb-01-RC, Eichrom OTW01); Polonium 210 (HASL 300 Po-01-RC, HASL 300 Po-02-RC); Technetium-99 (Eichrom TCW02, Eichrom TCS01M).

Definitions:

CRDL	Contract Required Detection Limit
CSU	Combined Standard Uncertainty
DLC	Decision Level Concentration (ANSI N42.23) or critical level
DO	Duplicate Original
DUP	Method Duplicate
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
MDA	Minimum Detectable Activity
MDC	(Minimum Detectable Concentration) minimum concentration of the analyte that ARS can detect utilizing the specific analysis
MBL	Method Blank
MS/MSD	Matrix Spike/Matrix Spike Duplicate
N/A	Not Applicable
NP	Not Provided
NR	Not Referenced
LOD	Limit of Detection
LOQ	Limit of Quantitation
MCL	Maximum Contaminant Level

Data Qualifiers:

B	The activity of both the method blank and the target sample are above the MDL.
D	Sample analysis accomplished through dilution.
J	The reported result is an estimated value above the LOD but below the LOQ.
Q	The LCS and LCSD percent recoveries are out of range.
U	Activity is below the MDC, MDA, MDL, or LOD
N	The analyte is a tentatively identified compound using mass spectrometry or any non-customer requested compounds that are tentatively identified.
*****	LCS/LCSD or Sample DUP fails one or more Duplicate criteria.
S	Spike
SC	Subcontracted out to another qualified laboratory
H	Holding time exceeded
E	Exceeds MCL
****	Reporting Limit is higher than MCL; Target cannot be detected

ARS Aleut Analytical
3710 Woodland Dr. Suite 900 • Anchorage, AK 99517
907-258-2155 • FAX 907-258-6634

ARS Aleut Analytical, LLC
Analytical Reports

for

SGS Environmental Services

Analytical Results

ARS Aleut Analytical
475 Hall St. • Fairbanks, AK 99701
907-456-3116 • FAX 907-456-3125

ARS Sample Delivery Group: ARS3-19-02142
Client Sample ID: Tununak-Exp-Well
Sample Collection Date: 07/15/19 8:45
Sample Matrix: Drinking Water
Percent Solids: N/A

Request or PO Number: 1193845
ARS Sample ID: ARS3-19-02142-001
Date Received: 07/17/19
Report Date: 08/06/19

Inorganics

Analysis Description	Analysis Results	MDL	LOQ	MCL	Analysis Units	Method	Analysis Date/Time	Analysis Technician
Odor	<1.00	1.00	1.00	N/A	T.O.N.	ARS-WCH-017/SM2150B	07/17/19 14:22	JRAY

3710 Woodland Dr. Suite 900 • Anchorage, AK 99517
907-258-2155 • FAX 907-258-6634

ARS Aleut Analytical, LLC
Analytical Reports

for

SGS Environmental Services

Batch QC

ARS Aleut Analytical

QC Results per Analytical Batch

Analytical Batch	ARS3-B19-01218
SDG	ARS3-19-02142
Analysis	Odor
Method	ARS-WCH-017/SM2150B
Analysis Code	WCH-ODOR-AQ
Report Units	T.O.N.

Method Blank

Analysis Date: 07/17/19 14:22 | Analysis Technician: JRAY

CAS #	Analyte	Blank Results	Qualifier	MDL	LOQ	CRDL
N/A	Odor	<1.00	U	1.00	1.00	NP

ARS Aleut Analytical
3710 Woodland Dr. Suite 900 • Anchorage, AK 99517
907-258-2155 • FAX 907-258-6634

ARS Aleut Analytical, LLC
Analytical Reports

for

SGS Environmental Services

Sample Management Records

SGS North America Inc.
CHAIN OF CUSTODY RECORD

Locations Nationwide
Alaska Florida
New Jersey Colorado
Texas North Carolina
Virginia Louisiana
www.us.sgs.com

CLIENT:	SGS North America Inc. - Alaska Division	SGS Reference:	ARS Anchorage
CONTACT:	Julie Shumway	PHONE NO:	(907) 562-2343
PROJECT NAME:	1193845	PWSID#:	
		NPDL#:	
REPORTS TO: Julie Shumway		E-MAIL:	Julie.Shumway@sgs.com
			Env.Alaska.RefLabTeam@sgs.com
INVOICE TO:		QUOTE #:	
SGS - Alaska		P.O. #:	1193845

Additional Comments: All soils report out in dry weight unless

Page 1 of 1

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HHMM	MATRIX/ MATRIX CODE	# CONTAINERS	Preservative Used:	NONE				MS	MSD	SGS lab #	Location ID
						TYPE C = COMP G = GRAB MI = Multi Incremental Soils	Odor							
	Tununak-Exp-Well	07/15/2019	08:45:00	DW	1		X						1193845001	

Relinquished By: (1)	Date	Time	Received By:	DOD Project?	No
				Report to DL (J Flags)? If J- Report as DL/LOD/LOQ.	Yes
Relinquished By: (2)	Date	Time	Received By:	Data Deliverable Requirements:	Level II + Dataview
				Cooler ID:	
Relinquished By: (3)	Date	Time	Received By:	Requested Turnaround Time and-or Special Instructions:	
				Please analyze outside of holding time.	
Relinquished By: (4)	Date	Time	Received For Laboratory By:	Temp Blank °C: 8.3	Chain of Custody Seal: (Circle)
[signature]	7/17/19	0901	ERM	Cooler / Sample temp 12.6 or Ambient [ ]	INTACT BROKEN ABSENT

[X 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ]5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

http://www.sgs.com/terms_and_conditions.htm

7-17-19 12:03

SDG Report - Samples and Containers

SDG Specific Data					
SDG	ARS3-19-02142	TAT Days	15	Project Type	Environmental
Sample Count	1 Rpt Level 2	Date Received	7/17/2019	COC Number	
Client	SGS Environmental Services	Client Deadline	8/6/2019	PO Number	1193845
Client Code	2808	Internal Deadline	8/6/2019	Job Number	Job#1193845
Profile Number	PN-03565	Lab Deadline	8/2/2019	Job Location	
Comment	Received in Anc by ERM on 7-17-19 @ 8.3C. CDJ 7-17-19				

Samples and Containers Checked In Thus Far

FR	Name	Matrix	Start Date	End Date	Disp	Hold	Arch	Storage	Comments
001	Tununak-Exp-Well	Drinking Water	07/15/2019 08:45	07/15/2019 08:45	H	30	5	WC Samples	Sample received out of hold, run per COC. CDJ SGS approved running out of poly container. MCC 7/17/2019 SGS#1193845001

IC_ID	Cnt	Container Type	Container Size	pH Orig	pH Final	Temp (C)	Comments
64626	1	HDP Container	500mL			8.3	

SDG Report - Analysis Assignments

SDG	**ARS3-19-02142**	**Sample Count**	**1**
Client	**SGS Environmental Services**	**Analysis Count**	**1-1**

Sample Count Totals Per Analysis

Analysis Code	Analysis Description	In/Out	Samples Count
WCH-ODOR-AQ	Odor	I	1

Analyses Assigned Per Fraction

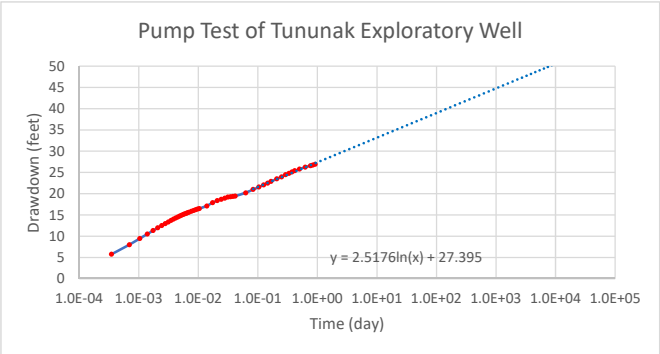
Fraction	Analysis Code	X = Assigned
001	WCH-ODOR-AQ	**X**

Client Name: SGS Environmental Services Profile Name: SGS Environmental Report Level: 2

Analysis Code	Prep Type	Units	Aliquot	Prep Code	Procedure	Count Time					
WCH-ODOR-AQ	WINO	T.O.N.		N/A	ARS-WCH-017						
	Analyte			**RDL**	**LCS LL/UL**	**MS LL/UL**	**RadY LL/UL**	**GravY LL/UL**	**RER**	**RPD**	**Surr LL/UL**
	Odor				0/0	0/0	30/110	40/110	1	20	N/A

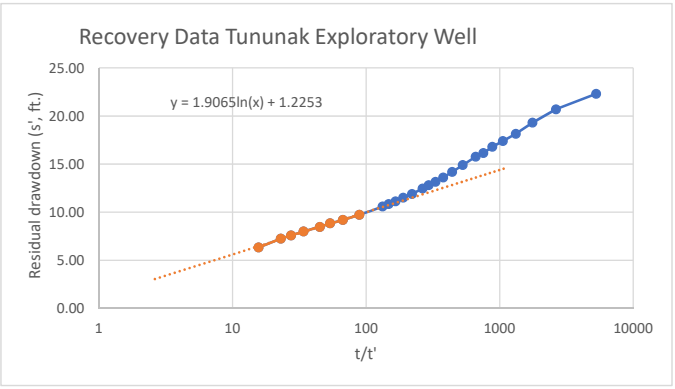
Analysis Code	Fraction	Units	Aliquot	Conductivity	Analyte Count
WCH-ODOR-AQ	001	T.O.N.		N/A	1
		Group		**Analyte**	
		Odor		Odor	

Drawdown data utilizing the Cooper-Jacob method:



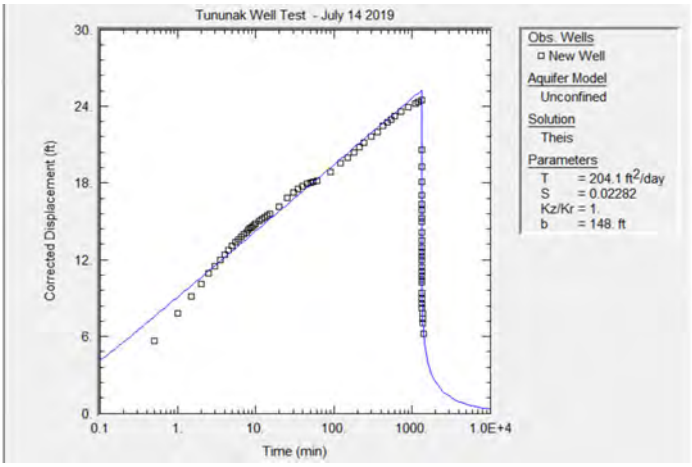
Time (days)	Drawdown (feet)
1	27.4
30	36.0
365	42.2
T=	183 ft^2/day

Recovery data utilizing the Cooper-Jacob method:

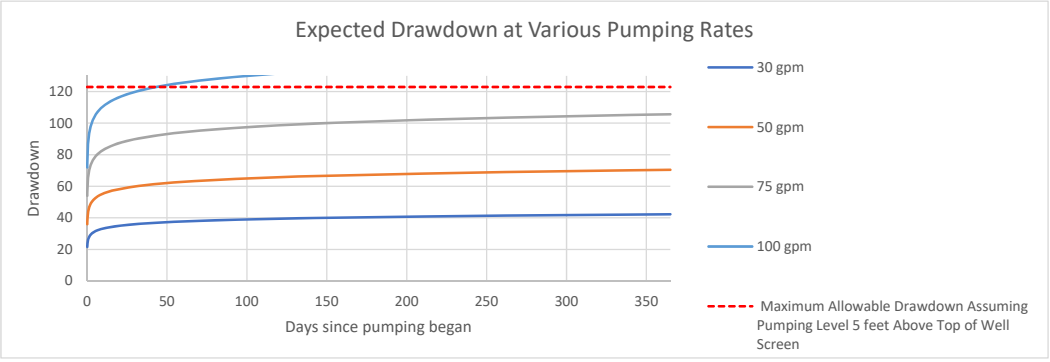


T=	241 ft^2/day

Analysis of both the pumping and recovery tests utilizing Aqtesov software:



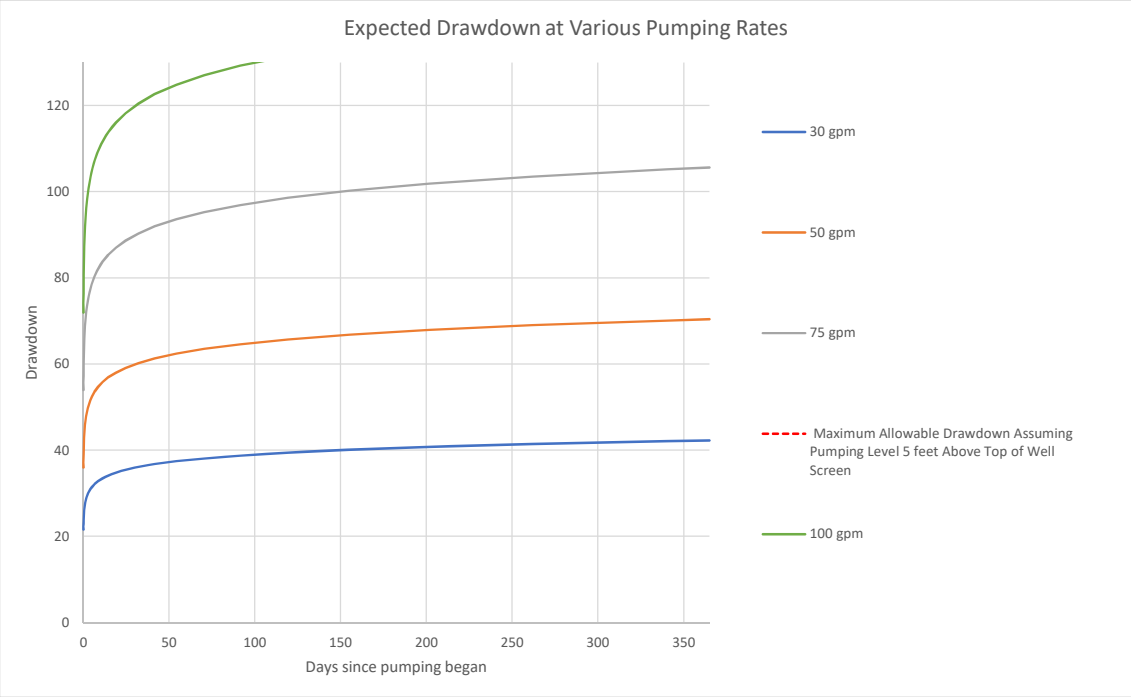
Time to fill 25,000 gallon tank		
GPM	Minutes	Hours
30	833	14
40	625	10
50	500	8
60	417	7
70	357	6
80	313	5
90	278	5
100	250	4



Recommendation: Pumping rate should be no more than the 50-75 gpm range

PER TUNUNAK, AK
STANTEC 2020

Well Facts:
Screen Interval: 158.0 to 178.0
Static Water Level: 30.1
Maximum Allowable Drawdown 122.9
(assume maximum pumping depth 5 feet above the top of the screen)



Graph Axis Multiplier:		1.3	Graph Axis Multiplier:		1.3	Graph Axis Multiplier:		1.3	Graph Axis Multiplier:		1.3
Rate (gpm)	Days	Drawdown	Rate (gpm)	Days	Drawdown	Rate (gpm)	Days	Drawdown	Rate (gpm)	Days	Drawdown
30	0.10	21.6	50	0.10	36.0	75	0.10	54.0	100	0.10	72.0
30	0.13	22.3	50	0.13	37.1	75	0.13	55.6	100	0.13	74.2
30	0.17	22.9	50	0.17	38.2	75	0.17	57.3	100	0.17	76.4
30	0.22	23.6	50	0.22	39.3	75	0.22	58.9	100	0.22	78.6
30	0.29	24.2	50	0.29	40.4	75	0.29	60.6	100	0.29	80.8
30	0.37	24.9	50	0.37	41.5	75	0.37	62.3	100	0.37	83.0
30	0.48	25.6	50	0.48	42.6	75	0.48	63.9	100	0.48	85.2
30	0.63	26.2	50	0.63	43.7	75	0.63	65.6	100	0.63	87.4
30	0.82	26.9	50	0.82	44.8	75	0.82	67.2	100	0.82	89.6
30	1.06	27.5	50	1.06	45.9	75	1.06	68.9	100	1.06	91.8
30	1.38	28.2	50	1.38	47.0	75	1.38	70.5	100	1.38	94.0
30	1.79	28.9	50	1.79	48.1	75	1.79	72.2	100	1.79	96.2
30	2.33	29.5	50	2.33	49.2	75	2.33	73.8	100	2.33	98.4
30	3.03	30.2	50	3.03	50.3	75	3.03	75.5	100	3.03	100.6
30	3.94	30.8	50	3.94	51.4	75	3.94	77.1	100	3.94	102.8
30	5.12	31.5	50	5.12	52.5	75	5.12	78.8	100	5.12	105.0
30	6.65	32.2	50	6.65	53.6	75	6.65	80.4	100	6.65	107.2
30	8.65	32.8	50	8.65	54.7	75	8.65	82.1	100	8.65	109.4
30	11.25	33.5	50	11.25	55.8	75	11.25	83.7	100	11.25	111.6
30	14.62	34.1	50	14.62	56.9	75	14.62	85.4	100	14.62	113.8
30	19.00	34.8	50	19.00	58.0	75	19.00	87.0	100	19.00	116.0
30	24.71	35.5	50	24.71	59.1	75	24.71	88.7	100	24.71	118.2
30	32.12	36.1	50	32.12	60.2	75	32.12	90.3	100	32.12	120.4
30	41.75	36.8	50	41.75	61.3	75	41.75	92.0	100	41.75	122.6
30	54.28	37.5	50	54.28	62.4	75	54.28	93.6	100	54.28	124.8
30	70.56	38.1	50	70.56	63.5	75	70.56	95.3	100	70.56	127.0
30	91.73	38.8	50	91.73	64.6	75	91.73	96.9	100	91.73	129.2
30	119.25	39.4	50	119.25	65.7	75	119.25	98.6	100	119.25	131.4
30	155.03	40.1	50	155.03	66.8	75	155.03	100.2	100	155.03	133.6
30	201.54	40.8	50	201.54	67.9	75	201.54	101.9	100	201.54	135.8
30	262.00	41.4	50	262.00	69.0	75	262.00	103.5	100	262.00	138.0
30	340.60	42.1	50	340.60	70.1	75	340.60	105.2	100	340.60	140.2
30	365.00	42.2	50	365.00	70.4	75	365.00	105.6	100	365.00	140.8

Time since pump started (t, min)	Time since pump stopped (t', min)	Ratio t/t'	Residual Drawdown (s', ft)
1320	0		26.94
1320.25	0.25	5281	22.30
1320.5	0.5	2641	20.70
1320.75	0.75	1761	19.32
1321	1	1321	18.15
1321.25	1.25	1057	17.40
1321.5	1.5	881	16.80
1321.75	1.75	755	16.15
1322	2	661	15.78
1322.5	2.5	529	14.90
1323	3	441	14.20
1323.5	3.5	378	13.61
1324	4	331	13.16
1324.5	4.5	294	12.81
1325	5	265	12.47
1326	6	221	11.90
1327	7	190	11.51
1328	8	166	11.14
1329	9	148	10.85
1330	10	133	10.61
1335	15	89	9.74
1340	20	67	9.20
1345	25	54	8.85
1350	30	45	8.48
1360	40	34	8.01
1370	50	27	7.60
1380	60	23	7.26
1410	90	16	6.35

For late time:	
89	9.74
67	9.20
54	8.85
45	8.48
34	8.01
27	7.60
23	7.26
16	6.35

For the late time data:

Y	X
5.62	10
10.01	100
4.39	

Using units of gallons and ft

T gpd/ft

Q gpm

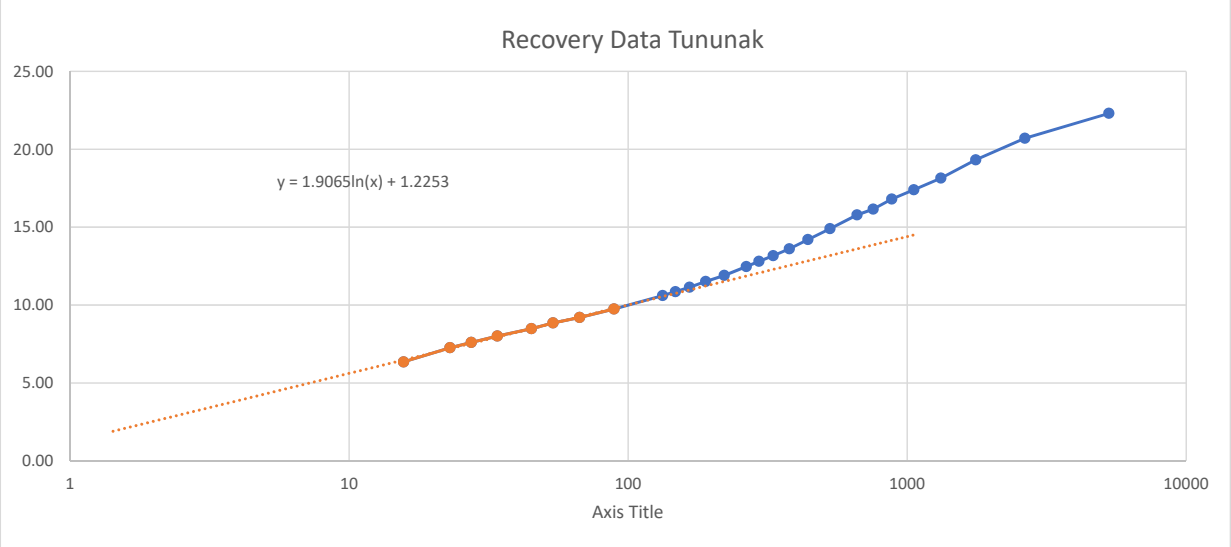
T=264Q/Δs

T= 1804 gpd/ft

241 ft^2/day

For early time data:

Y	X
0.51	10
8.86	100
8.35	



Time (days)	Drawdown (feet)
0.08	21.02
0.10	21.56
0.13	22.05
0.15	22.49
0.17	22.90
0.21	23.51
0.25	23.95
0.29	24.46
0.33	24.79
0.38	25.10
0.42	25.40
0.50	25.80
0.63	26.26
0.77	26.57
0.84	26.74
0.92	26.93
1	27.4

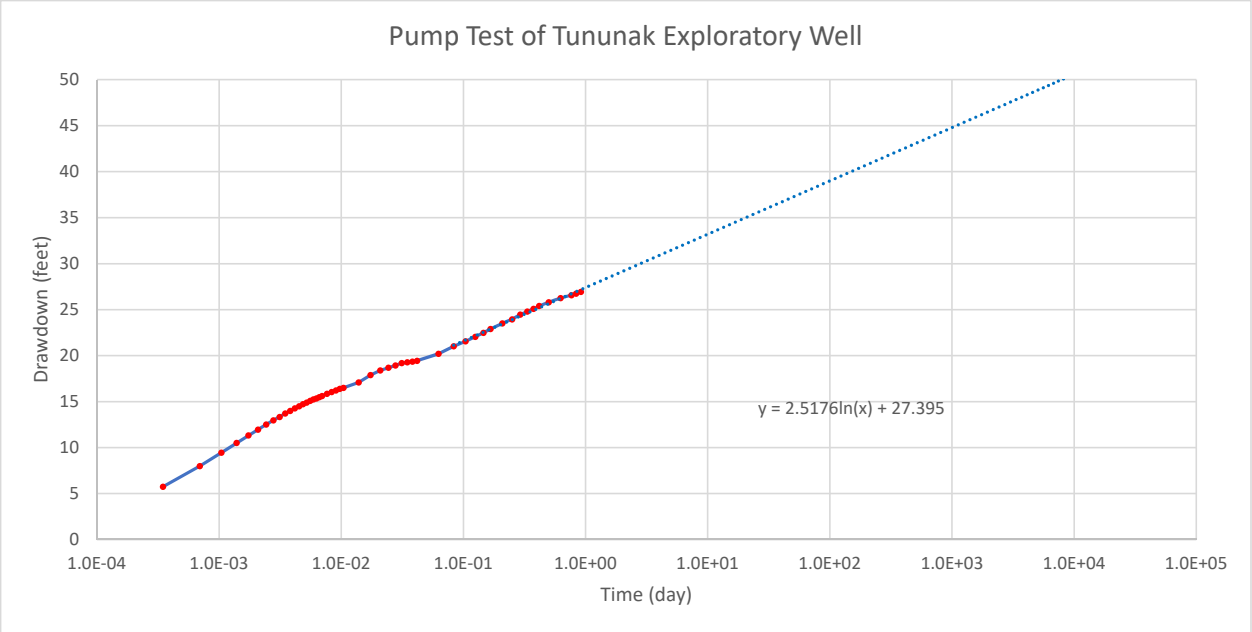
30 Gallons per minute — *Using units of gallons and ft*
4.01 Cubic feet per minute — T gpd/ft
5775 Cubic feet per day — Q gpm

X (day)	Y (DD)
1	27.4
10	33.2
	5.8

In consistent units of day and feet:

$T=2.303Q/4\pi\Delta s$ $T=264Q/\Delta s$

T= 183 ft^2/day 1365.732 GPD/ft T= 1366 gpd/ft
S.C.= 1.1 gpm/ft 183 ft^2/day



SWL: **30.1**

Time (min)	Head	Time (day)	Drawdown
0.5	35.85	0.0003	5.75
1	38.10	0.0007	8.00
1.5	39.55	0.0010	9.45
2	40.61	0.0014	10.51
2.5	41.44	0.0017	11.34
3	42.06	0.0021	11.96
3.5	42.62	0.0024	12.52
4	43.07	0.0028	12.97
4.5	43.43	0.0031	13.33
5	43.82	0.0035	13.72
5.5	44.10	0.0038	14.00
6	44.38	0.0042	14.28
6.5	44.60	0.0045	14.50
7	44.82	0.0049	14.72
7.5	45.00	0.0052	14.90
8	45.19	0.0056	15.09
8.5	45.35	0.0059	15.25
9	45.46	0.0063	15.36
9.5	45.60	0.0066	15.50
10	45.72	0.0069	15.62
11	45.95	0.0076	15.85
12	46.15	0.0083	16.05
13	46.32	0.0090	16.22
14	46.49	0.0097	16.39
15	46.60	0.0104	16.50
20	47.20	0.0139	17.10
25	48.00	0.0174	17.90
30	48.49	0.0208	18.39
35	48.79	0.0243	18.69
40	49.04	0.0278	18.94
45	49.29	0.0313	19.19
50	49.38	0.0347	19.28
55	49.45	0.0382	19.35
60	49.54	0.0417	19.44
90	50.30	0.0625	20.20
120	51.12	0.0833	21.02
150	51.66	0.1042	21.56
180	52.15	0.1250	22.05
210	52.59	0.1458	22.49
240	53.00	0.1667	22.90
300	53.61	0.2083	23.51
360	54.05	0.2500	23.95
420	54.56	0.2917	24.46
480	54.89	0.3333	24.79

540	55.20	0.3750	25.10
600	55.50	0.4167	25.40
720	55.90	0.5000	25.80
900	56.36	0.6250	26.26
1104	56.67	0.7667	26.57
1204	56.84	0.8361	26.74
1320	57.03	0.9167	26.93

D.4.2 2019 Application for Water Right

Application Alaska Department of Natural Resource for the New Well Drilled July 13, 2019. Length 19 Pages.

Fill in the form online by clicking in the appropriate field and typing.
Print the completed application and mail in one signed copy of the form with fees and supporting documents.
You will not be able to save your data entry online, so print an extra copy for yourself.

DIVISION OF MINING, LAND AND WATER
WATER RESOURCES SECTION
dnr.alaska.gov/mlw/water/

Alaska Department of NATURAL RESOURCES

Anchorage Office	Juneau Office	Fairbanks Office	***For ADNR Use Only***
550 West 7th Avenue, Suite 1020 Anchorage, AK 99501-3562 (907) 269-8600 Fax: (907) 269-8904	PO Box 111020 Juneau, AK 99811-1020 400 Willoughby, #400 (907) 465-3400 Fax: (907) 586-2954	3700 Airport Way Fairbanks, AK 99709 (907) 451-2705 Fax: (907) 451-2703	***Date/Time Stamp***
For ADNR Use Only ***LAS #***	***For ADNR Use Only*** ***CID #*** ***CID #***	***For ADNR Use Only*** ***Receipt Type WR***	

APPLICATION FOR WATER RIGHT

INSTRUCTIONS

1. Complete one application for each water source. **Incomplete applications will not be accepted.**
2. Attach a copy of an executed deed, lease agreement, or other possessory interest document for property where water will be used (applicant must own, lease, or obtain written authorization to use water on property).
3. Attach copy of legal access document (i.e. right-of-way, easement, permit) or application for legal access to water withdrawal point and transport route, if applicable, or copy of request or application for legal access to water withdrawal point.
4. Attach driller's well log for drilled wells (if already drilled and available).
5. Attach sketch, photos, plans of water system, or project description (if applicable).
6. Attach legible map that includes Meridian, Township, Range, and Section lines such as a subdivision Plat, USGS topographical quadrangle, or borough tax map. Indicate location of water withdrawal, route of water transmission, water use area boundary, points of water use within boundary, and point of water return flow (if applicable).
7. Attach copy of approved ADEC Water and Wastewater system certificate (if applicable).
8. Attach copy of ADF&G Fish Habitat Permit (if applicable).
9. Attach completed and notarized Statement of Beneficial Use of Water form and associated fee if water system and water use are fully developed.
10. **Submit the non-refundable fee** (see page 4)

APPLICANT INFORMATION

Native Village of Tununak IRA Council	Stantec Consulting Services, Inc.
Organization Name (if applicable)	Agent or Consultant Name (if applicable)
Attn: James James, Tribal Administrator	
Individual Applicant Name (if applicable)	Individual Co-applicant Name (if applicable)

P.O. Box 77	Tununak	AK	99681
Mailing Address	City	State	Zip Code

(907) 652-6527	
Daytime Phone Number	Alternate Phone Number (optional)
(907) 652-6011	tribe2work@yahoo.com
Fax Number (if available)	E-Mail Address (optional)

PROPERTY DESCRIPTIONS

Location of Water Use

Subdivision Name or Survey Number	Lot, Block, or Tract	Meridian	Township	Range	Section	Quarter Sections	
Village of Tununak		SM	6N	91W	21,27,28	QQ ¼	Q ¼

Location of Water Source

Subdivision Name or Survey Number	Lot, Block, or Tract	Meridian	Township	Range	Section	Quarter Sections	
Tununak North Addition (89-6)	Tract D-1B USS 4028	SM	6N	91W	27	SW QQ ¼	NW Q ¼

Location of Water Return Flow or Discharge (if applicable)

Geographic Name of Water Body or Well Depth	Meridian	Township	Range	Section	Quarter Sections	
					QQ ¼	Q ¼

WATER SOURCE DESCRIPTION

Ground Water

Type (e.g. drilled, dug)	Total Depth (in feet)	Static Water Level (in feet)	Date Completed	Well Yield (in gpm)
Drilled	180	28	7/13/2019	50+

Surface Water

Type (e.g. stream, lake, spring)	Geographic Name (if named)

METHOD OF TAKING WATER (IF KNOWN)

Pump	Pump Intake _____ Inches Pump Output _____ GPM	Hours Working _____ Hours/Day Length of Pipe _____ Feet (from pump to point of use)
Gravity	Pipe Diameter _____ Inches Head _____ Feet	Length of Pipe _____ Feet (take point to point of use) Diversion Rate _____ ☐GPM or ☐CFS
Ditch	L _____ D _____ W _____ Feet	Diversion Rate _____ ☐GPM or ☐CFS
Reservoir	L _____ D _____ W _____ Feet	Water Storage _____ AF
Dam	L _____ H _____ W _____ Feet	Water Storage _____ AF

AMOUNT OF WATER

Common Water Uses and Standard Amounts

Type of Use	How Many		Standard Amounts		Total Amount Requested	Months of Use	
						Begin	End
Fully Plumbed Single-family Home (includes irrigation of 10,000 sq. ft.)	#_____Homes	X	500 GPD	=			
Partially Plumbed Single-family Home (no hot water heater)	#_____Homes	X	250 GPD	=			
Unplumbed Single-family Home (hand carry water)	#_____Homes	X	75 GPD	=			
Duplex or Triplex	#_____Bldgs.	X	1000 GPD	=			
Four-plex and Larger Housing	#_____Units	X	250 GPD	=			
Motel or Resort	#_____Rooms	X	150 GPD	=			
Work Camps	#_____People	X	50 GPD	=			
Domestic Irrigation	#_____Sq. ft.	X	250 GPD per 10,000 Sq. ft.	=			
Non-domestic Irrigation	#_____Acres	X	0.5 AFY	=			

Other Water Uses

Type of Use	How Many		Amount		Total Amount Requested	Months of Use	
						Begin	End
		X		=			
		X		=			

Type of Use	Total Amount Requested	Months of Use	
		Begin	End
466 Residents (20 year projection) at 100 gpc/d	46,600	Jan	Dec

Expected date for water system and water use to be fully developed or date when existing use started 2022 (subject to funding).

Note: Pursuant to AS 46.15.160(a)(1). Crimes, a person may not construct works for an appropriation, or divert, impound, withdraw, or use a significant amount of water from any source without a permit, certificate of appropriation, or authorization issued under this chapter.

11 AAC 93.040 sets out the required information on an application for a water right. AS 38.05.035(a) authorizes the director to decide what information is needed to process an application for the sale or use of state land and resources. This information is made a part of the state public land records and becomes public information under AS 40.25.110 and 40.25.120 (unless the information qualifies for confidentiality under AS 38.05.035(a)(8) and confidentiality is requested, AS 43.05.230, or AS 45.48). Public information is open to inspection by you or any member of the public. A person who is the subject of the information may challenge its accuracy or completeness under AS 44.99.310, by giving a written description of the challenged information, the changes needed to correct it, and a name and address where the person can be reached. False statements made in an application for a benefit are punishable under AS 11.56.210. In submitting this form, the applicant agrees with the Department to use "electronic" means to conduct "transactions" (as those terms are used in the Uniform Electronic Transactions Act, AS 09.80.010 – AS 09.80.195) that relate to this form and that the Department need not retain the original paper form of this record: the department may retain this record as an electronic record and destroy the original.

SIGNATURE

The information presented in this application is true and correct to the best of my knowledge. I understand that per 11 AAC 93.040 and 11 AAC 93.050 additional information may be required by the department to adjudicate this application. Failure to provide requested information could result in this file being closed.

Signature

November 18, 2019
Date

Robert (Bob) Gilfilian, P.E.
Name (please print)

(Phone: (907) 227-9883 email: bob.gilfilian@stantec.com)

Stantec, Senior Engineer
Title (if applicable)

FEE required by regulation 11 AAC 05.260.

Make checks payable to "Alaska Department of Natural Resources":

- **$100** for one single-family residence or duplex, or for water use associated with one single-family residence or duplex.
- **$1,500** for up to 60 hours of staff time, for activities related to oil and gas and associated substances.
- **$1,500** for up to 60 hours of staff time, for activities related to locatable mining.
- **$1,500** for up to 60 hours of staff time, for hydroelectric power generation capacity greater than 100 kilowatts.
- **$1,500** for up to 60 hours of staff time, for water removal out of a hydrologic unit under AS 46.15.035 or 46.15.037.
- **$250** for 5,000 GPD or less for a use not listed above.
- **$565** for greater than 5,000 GPD and no more than 30,000 GPD for a use not listed above.
- **$690** for greater than 30,000 GPD and no more than 100,000 GPD for a use not listed above.
- **$1,125** for greater than 100,000 GPD for a use not listed above.

REFERENCES

Measurement Units
GPD = gallons per day
CFS = cubic feet per second
GPM = gallons per minute
AF = acre-feet
AFY = acre-feet per year (325,851 gallons/year)
AFD = acre-feet per day (325,851 gallons/day)
MGD = million gallons per day

Conversion Table

5,000GPD=	30,000GPD=	100,000GPD=	500,000GPD=	1,000,000GPD=
0.01 CFS	0.05 CFS	0.2 CFS	0.8 CFS	1.5 CFS
3.47 GPM	20.83 GPM	69.4 GPM	347. 2 GPM	694.4 GPM
5.60 AFY	33.60 AFY	112.0 AFY	560.1 AFY	1120.1 AFY
0.02 AFD	0.09 AFD	0.3 AFD	1.5 AFD	3.1 AFD
0.01 MGD	0.03 MGD	0.1 MGD	0.5 MGD	1.0 MGD

Alpine Drilling & Enterprises

Well Log

Permit Number: #SW_____ **Date of Issue: _____**
Date Started: 7-13-19 **Date Completed:** 7-15-19
Legal Description: *Tunanak Well # 1 VSW*
Property Owner Name & Address: *VSW*

Parcel Identification Number: _____
Is well located at approved permit location? x **Yes** ☐ **No**

Borehole Data: Soil Type, Thickness & Water Strata	**Depth (ft)** From	To
silty organic pete unfrozen	*0*	*2*
organic pete frozen	*2*	*11*
siltstone br dry appears thawed	*11*	*20*
clayey siltsone gr soft moist	*20*	*28*
silty clay some chunks br crushed stone	*28*	*35*
silty clay small amt sand moist	*35*	*60*
siltstone w sand gr	*60*	*72*
siltstone sandy br dry	*72*	*83*
siltone br	*83*	*90*
siltstone some sand gr harder	*90*	*106*
sandstone br moist	*106*	*111*
silty sandstone gr moist	*111*	*121*
siltstone br harder casing refusal	*121*	*125*
siltstone br dry	*125*	*143*
siltstone br	*143*	*158*
siltstone H2O highly fractured & caving	*158*	*180*

Method of Drilling x air rotary ☐ cable tool

Casing type: *steel*
Wall Thickness: *.250* inches
Diameter: *6* inches Depth: *123'9"* feet
Liner Type: *pvc*
Diameter: *4.5* inches Depth: *0-180* feet
Casing stickup above ground: *2* feet

Static water level (from ground level): *28.7* feet
Pumping level: *57* feet after
22 hours pumping *30* gpm
Recovery Rate: *30* gpm
Method of Testing: *pump*

Well Intake Opening Type:
☐ Open End x Open Hole
☐ Screened Start _____ feet Stopped _____ feet
x Perforations in liner Start *60* feet Stopped *178* feet

Grout Type: *Bentonite pellets* **Volume:** *3 bgs*
Depth: Start *0* feet Stopped *20* feet

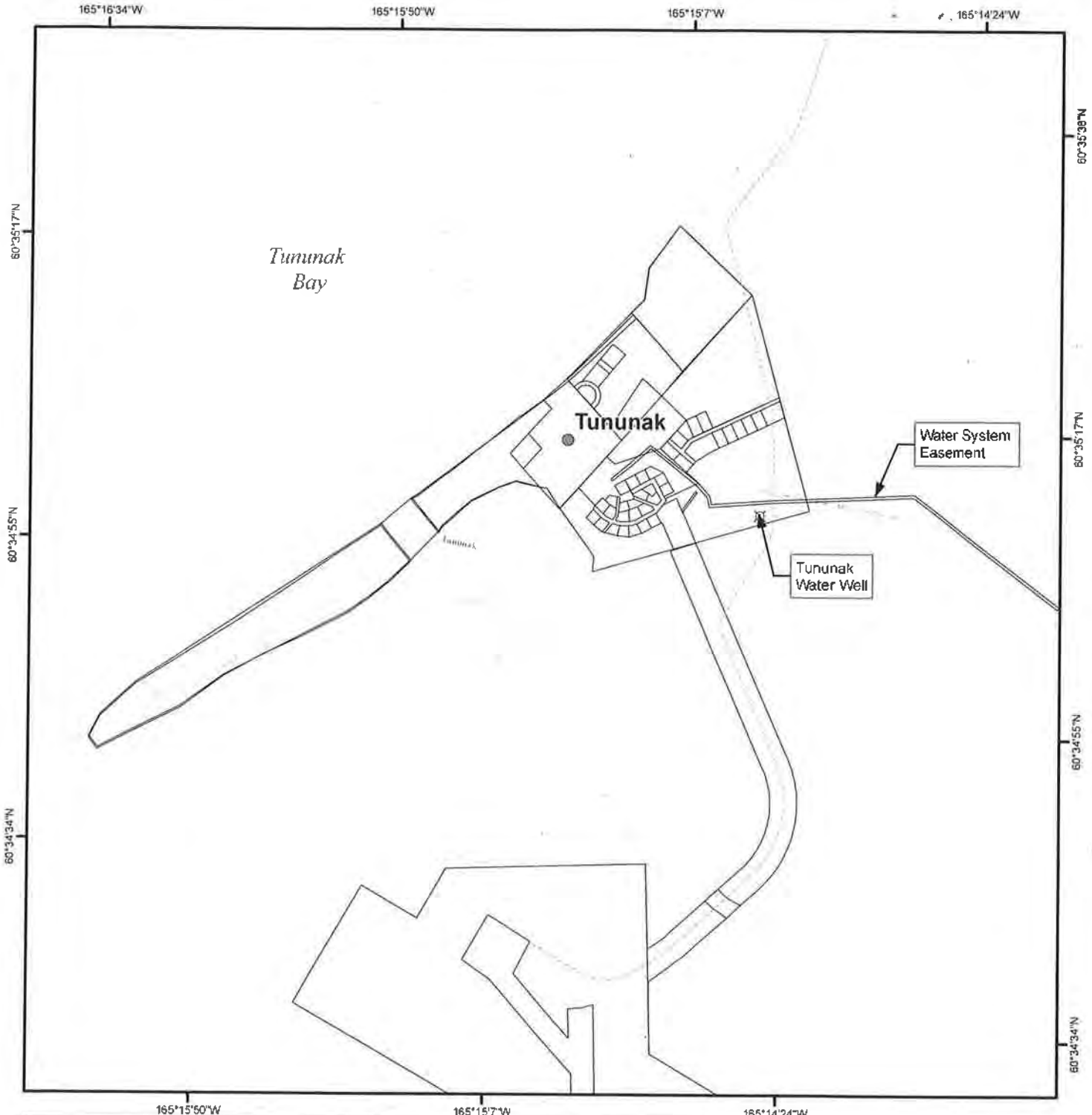
Pump: Intake Depth _____ feet
Pump size _____ hp Brand Name _____

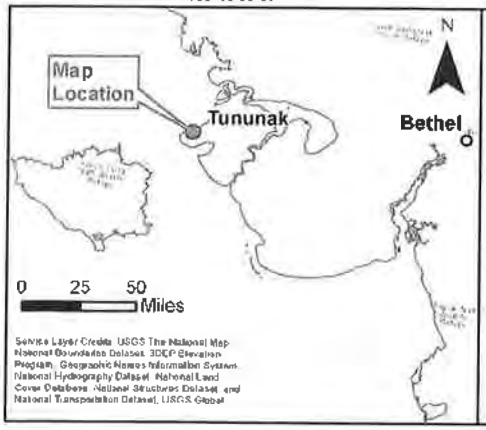
Well Disinfected Upon Completion? x **Yes** ☐ **No**
Method of Disinfection: *chlorine*

Comments: *4.5 inch liner perforated from 150' to 178' with multiple 5/8 inch drilled openings with less openings up to 40'.*

Well Driller: *Alpine Drilling & Enterprises*
PO Box 110496
Anchorage AK 99511

STANTEC 2020





Stantec

Water Well 2019

Gravel Road

0 500 1,000 2,000 Feet

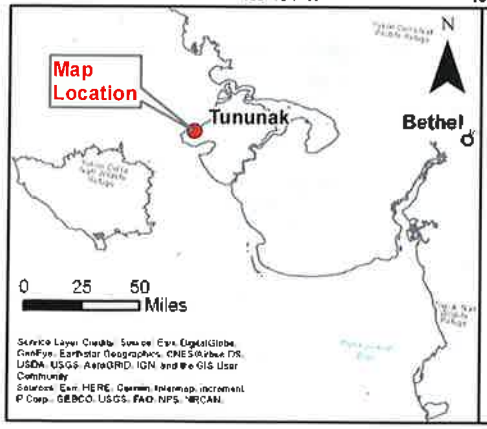
1 inch = 1,000 feet 1:12,000

Village of Tununak Location Vicinity Map

Applicant: Village of Tununak
File No.:
Waterway: Tununak River
Proposed Activity: Water Well
Location of Well:
Section: 27 Township: 6N
Range: 91W Meridian: Seward
Latitude: 60.5827 N Longitude: 165.2453 W
Sheet: 2 Date: 12/6/2019

STANTEC 2020





Stantec

Water Well 2019

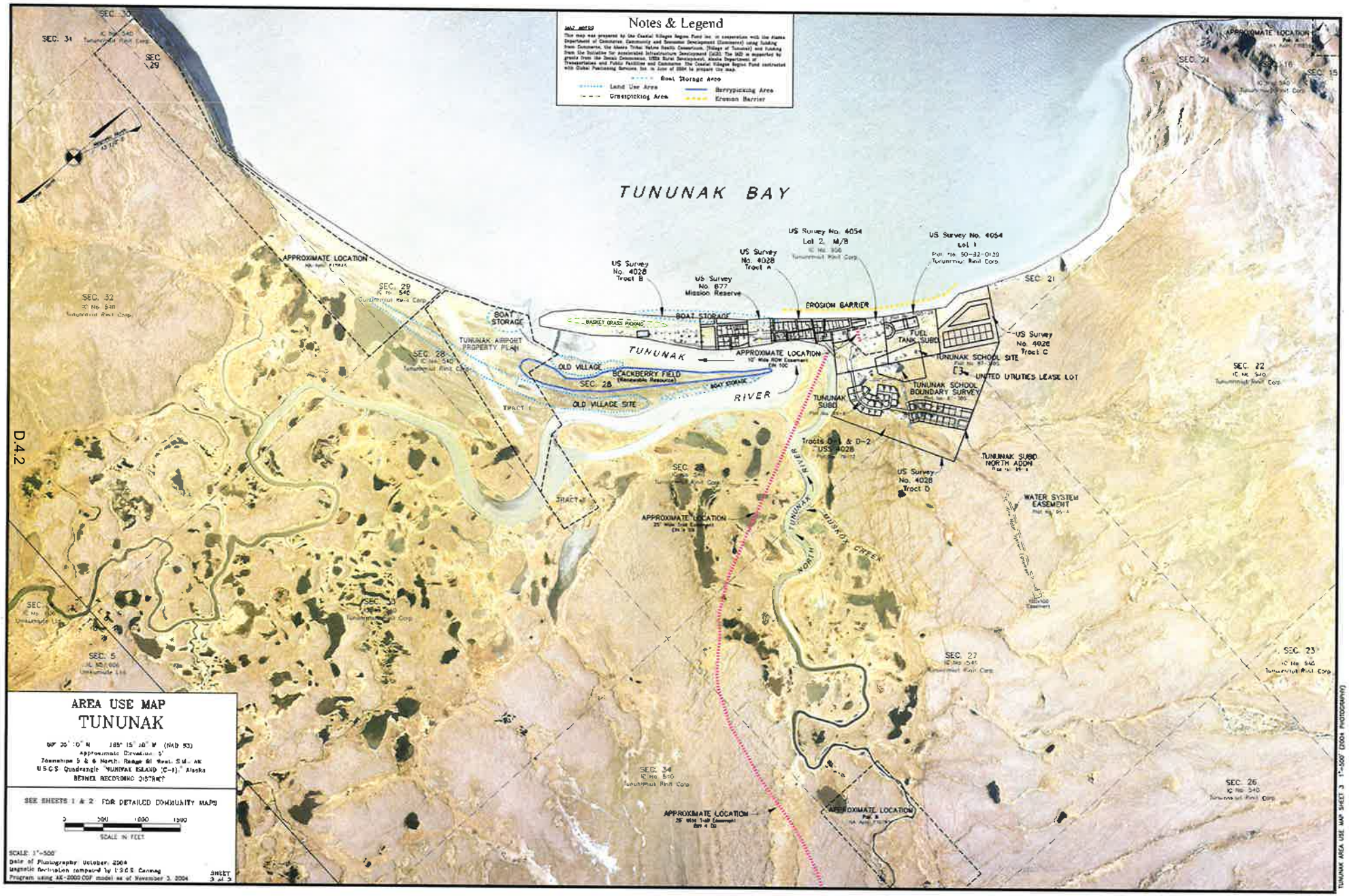
Gravel Road

0 150 300 600 Feet

1 inch = 300 feet 1:3,600

Village of Tununak
Water Well 2019 - Site Map

Applicant: Village of Tununak
File No.:
Waterway: Tununak River
Proposed Activity: Water Well
Location of Well:
Section: 27 Township: 6N
Range: 91W Meridian: Seward
Latitude: 60.5827 N Longitude: 165.2453 W
Sheet: 2 Date: 12/6/2019



D.4.2

PER TUNUNAK, AK

STANTEC 2020

AGREEMENT TO CONVEY AND ACCEPT THE ASSETS, LIABILITIES, AND OBLIGATIONS OF THE DISSOLVED CITY OF TUNUNAK

This AGREEMENT TO CONVEY AND ACCEPT THE ASSETS, LIABILITIES, AND OBLIGATIONS OF THE DISSOLVED CITY OF TUNUNAK (this "Agreement") is entered into as of April 15, 2016 (the "Effective Date"), between the NATIVE VILLAGE OF TUNUNAK IRA COUNCIL, a federally-recognized Indian Tribe located in Tununak, Alaska ("NVT"), and TUNUNAK TRADITIONAL COUNCIL, also located in Tununak, Alaska ("TTC").

RECITALS

A. TTC and the State of Alaska, through the Department of Community and Regional Affairs (predecessor to the Alaska Department of Community, Commerce, and Economic Development, Division of Community and Regional Affairs) (the "State"), entered into that certain Memorandum of Agreement to Convey and Accept Assets, Liabilities and Obligations of the Dissolved City of Tununak, dated February 7, 1997, and recorded February 28, 1997 in the Bethel Recording District, Fourth Judicial District, State of Alaska (the "Memorandum Agreement"), whereby the State conveyed, and TTC accepted and succeeded in title to, the assets, liabilities, and obligations of the dissolved City of Tununak (collectively, the "Assets").

B. TTC had certain obligations under the Memorandum Agreement, which the State asserts TTC did not satisfy.

C. The State, pursuant to that certain letter from Ruth St. Amour, Local Government Specialist, to the Community Leaders, dated June 12, 2015, gave the Village of Tununak three options for ownership and management of the Assets: (1) create a new city government in Tununak and convey the Assets to the city; (2) convey the Assets to the State; or (3) agree, as a community, on the appropriate disposition of the Assets.

D. TTC and NVT share common membership and the common purposes of promoting and protecting the social and economic well-being of their common membership and promoting community development while preserving the lands, culture, heritage, and traditions of the Village of Tununak.

E. To further these common purposes, and in consideration of the demand letter from the State, the Village of Tununak expressed its desire to pursue alternative (3), and determined that TTC should convey the Assets to NVT, as set forth in that certain Trilateral Resolution for Agreement to Transfer the Assets, Liabilities and Obligations of the Dissolved City of Tununak, passed and approved October 26, 2015, by and among TTC, NVT, and Tununrmiut Rinit Corporation, the Alaska Native village corporation for Tununak, Alaska (the "Trilateral Resolution").

F. The State conditioned its approval of the conveyance of the Assets to NVT on TTC and NVT entering into a binding agreement as to the specific terms and conditions of the conveyance, and the execution of an assignment of the Memorandum Agreement whereby NVT assumes all of TTC's rights and obligations thereunder.

G. NVT and TTC desire to enter into this Agreement to: (1) satisfy the State's condition that TTC and NVT enter into a binding agreement as to the transfer of the Assets to NVT; and (2) further define their respective rights and obligations related to the conveyance.

H. NVT and TTC entered into that certain Assignment and Assumption of Memorandum of Agreement to Convey and Accept Assets, Liabilities, and Obligations of the Dissolved City of Tununak, dated as of the Effective Date (the "Assignment"), pursuant to which TTC assigned to NVT all of TTC's right, title, and interest under the Memorandum Agreement, and NVT assumed the same, which Assignment is subject to the written consent of the State, and which the State and NVT intend to record simultaneously with the Quitclaim Deed (as defined below).

I. The State's conditions have been meet and the State has approved the conveyance, as indicated by its execution of the consent to this Agreement below, and its execution of its consent to the Assignment, as set forth in that document.

NOW, THEREFORE, for good and valuable consideration, the receipt of which is hereby acknowledged, NVT and TTC agree as follows:

1. Recitals. The above recitals are hereby incorporated by reference.

2. Conveyance. Subject to the terms and conditions of this Agreement, in consideration of the mutual covenants, representations, and warranties set forth in this Agreement (which the parties acknowledge they have received and are sufficient), TTC hereby conveys, assigns, transfers, and delivers to NVT and its successors and assigns all of the right, title, and interest of TTC in and to the Assets, and NVT accepts and succeeds in title to the same.

TTC shall convey title to the Assets to NVT by delivering to NVT on the Effective Date a fully executed quitclaim deed in the form attached as Exhibit A (the "Quitclaim Deed"). NVT shall pay all recording costs related to the Quitclaim Deed.

3. Assets Sold "As-Is". NVT represents that it is accepting conveyance of, and succeeding in title to, the Assets "AS-IS, WHERE-IS," and with all faults and without warranties or representations of any kind whatsoever, expressed or implied, as to their condition.

4. TTC Indemnification. Notwithstanding anything in this Agreement to the contrary, in consideration of NVT entering into this Agreement, TTC shall indemnify, defend, and hold harmless NVT, and NVT's successors and assigns, from and against all claims, actions, losses, liabilities, damages, costs, and expenses (including, but not limited to, reasonable attorneys' fees and costs) incurred, suffered by, or claimed against any of them arising from or related to the Assets to the extent accruing or becoming due prior to the Effective Date, including, without limitation, in connection with the emanation, migration from, disposal, release, or threatened release of hazardous wastes or substances on, in, or from the Assets prior to the Effective Date.

5. Authority of TTC. This Agreement has been duly and validly authorized, executed, and delivered by TTC, as evidenced by that certain Resolution Approving the Conveyance of the Assets, Liabilities, and Obligations of the Dissolved City of Tununak to Native Village of Tununak IRA Council, adopted April 15, 2016, and attached at Exhibit B. This Agreement constitutes the valid and binding obligation of TTC, and is fully enforceable in accordance with its terms, and all necessary actions have been taken to authorize the execution, delivery, and performance of this Agreement, and to consummate and perform the transactions contemplated in this Agreement. No other consent or authorization is required in connection with the execution and delivery of this Agreement or the consummation or performance of any of the transactions contemplated in this Agreement (including, without limitation, execution and delivery of the Quitclaim Deed).

6. Miscellaneous Provisions.

6.1. No Strict Construction. Each of NVT and TTC represents and warrants that it has had the opportunity to consult counsel with respect to the preparation and execution of this Agreement. NVT and TTC agree that the rule that a contract will be construed against the party drafting the contract will have no application to the interpretation or construction of this Agreement.

6.2. No Waiver of Breach. A failure by either party to insist upon the strict performance by the other of any term, covenant, or condition of this Agreement, or to exercise any right or remedy available under this Agreement, whether upon a breach of this Agreement or otherwise, shall not constitute a waiver of any subsequent breach or of such term, covenant, or condition.

6.3. No Assignment. Neither party shall have any right to transfer or assign this Agreement. Any transfer or assignment that violates this Section 6.3 shall be null and void and of no force or effect.

6.4. Binding Effect. This Agreement will be binding upon and inure to the benefit of the parties and their respective successors and assigns.

6.5. Relationship of the Parties. Nothing in this Agreement, express or implied, shall be construed as creating a principal and agent relationship, a partnership, joint venture, or employee-employee relationship, or any other relationship, between NVT and TTC.

6.6. Further Acts. Each party agrees to cooperate with the other in effectuating the purposes and intent of this Agreement, and each party will, from time to time at or after the Effective Date, without further consideration, execute and deliver other instruments and take other actions as may be reasonably required by the other party to confer upon the other the benefits contemplated by this Agreement.

6.7. Entire Agreement; Modification. This Agreement (including exhibits) is the entire agreement of the parties. This Agreement supersedes all prior agreements and understandings, oral and written, between NVT and TTC with respect to the subject matter of this Agreement. This Agreement may not be amended, modified, or terminated unless in a written instrument executed by NVT and TTC.

6.8. Headings. The section and other headings in this Agreement are for convenience and reference purposes only and will not be deemed to be a part of this Agreement or to affect the meaning or interpretation of this Agreement.

6.9. Severability. If any provision of this Agreement is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remainder of the provisions shall remain in full force and effect and shall in no way be affected, impaired, or invalidated.

6.10. Governing Law. This Agreement shall be governed by, interpreted, and enforced in accordance with the laws of the State of Alaska.

6.11. Attorneys' Fees. In the event of any action or proceeding arising out of or in connection with this Agreement, the prevailing party will be entitled to all costs, expenses, and reasonable attorneys' fees incurred with or without suit and on appeal.

6.12. Counterparts. This Agreement may be executed in one or more counterparts and delivered by fax or e-mail. Each counterpart, when executed, will be deemed to be an original and all counterparts together will be deemed to be one and the same instrument.

NVT and TTC have executed this Agreement as of the Effective Date.

[SIGNATURE AND CONSENT PAGES FOLLOW]

NVT: **NATIVE VILLAGE OF TUNUNAK**
IRA COUNCIL

By: _____
George Hooper, Jr.
Its: President

TTC: **TUNUNAK TRADITIONAL COUNCIL**

By: _____
Amy Konrilak
Its: President

Signature Page to Agreement to Convey and Accept the Assets, Liabilities, and Obligations of the Dissolved City of Tununak

STATE CONSENT:
Subject to the exceptions set forth in the Quitclaim Deed and the terms and conditions of the Assignment and Assumption of Memorandum of Agreement to Convey and Accept Assets, Liabilities, and Obligations of the Dissolved City of Tununak, the State of Alaska, through the Department of Commerce, Community, and Economic Development, Division of Community and Regional Affairs (successor to the Alaska Department of Community and Regional Affairs), whose address is P.O. Box 110809, Juneau, Alaska 99811-0809, hereby consents to the conveyance, assignment, transfer, and delivery of Tununak Traditional Council's right, title, and interest in and to the assets, liabilities, and obligations of the dissolved City of Tununak to the Native Village of Tununak IRA Council.

Dated this 9th **day of** August, **2016.**

STATE OF ALASKA
DEPARTMENT OF COMMERCE,
COMMUNITY, AND ECONOMIC
DEVELOPMENT

By: _____
Chris Hladick

Its: Commissioner of Commerce
Community + Economic Development

STATE OF ALASKA)
) ss
_____ **JUDICIAL DISTRICT**)

The foregoing consent to Agreement to Convey and Accept the Assets, Liabilities and Obligations of the Dissolved City of Tununak was acknowledged before me this 9th **day of** August, **2016, by** Linda Mattson, Executive Administrator **as an authorized representative and on behalf of the State of Alaska, Department of Commerce, Community, and Economic Development, for the uses and purposes set forth therein.**

STATE OF ALASKA
OFFICIAL SEAL
Linda Mattson
NOTARY PUBLIC
My Commission Expires With Office

Linda J Mattson
Notary Public for the State of Alaska
My Commission Expires: with my office

Consent Page to Agreement to Convey and Accept the Assets, Liabilities, and Obligations of the Dissolved City of Tununak

ALASKA

2016-000780-0
Recording Dist: 402 - Bethel
8/24/2016 01:18 PM Pages: 1 of 4

After recording return to:
Native Village of Tununak IRA Council
Attn:. Tribal Council
P.O. Box 77
Tununak, Alaska 99681

Bethel Recording District

QUITCLAIM DEED

The GRANTOR, TUNUNAK TRADITIONAL COUNCIL, whose address is P.O. Box 97, Tununak, Alaska 99681, for and in consideration of the sum of Ten Dollars ($10.00) lawful money of the United States of America and other good and valuable consideration in hand paid, the receipt and sufficiency of which is hereby acknowledged, does hereby convey and quitclaim to NATIVE VILLAGE OF TUNUNAK IRA COUNCIL, a federally-recognized Indian tribe, whose address is P.O. Box 77, Tununak, Alaska 99681, GRANTEE, as successor to the assets and liabilities of the dissolved City of Tununak, all right, title, and interest it has, if any, in and to the following described real property located in the Bethel Recording District, Fourth Judicial District, State of Alaska:

Lots 1, 2 and 3, Block 1; Lot 7, Block 2; Lots 1 and 6, Block 3; Lots 4, 5, 7 and 8, Block 4; Lots 2, 4, 5, 9 and 10, Block 5; Lots 1, 3 and 4, Block 6; Lots 3, 6 and 7, Block 7; Lots 1, 3, 4 and 5, Block 8; Lot 2, Block 9; Lots 1, 2 and 3, Block 10; of Tract "A" as shown on the official plat of U.S. Survey 4028, Tununak Townsite, as accepted by the Chief, Division of Cadastral Survey, for the Director, on February 3, 1972.

Lots 1, 2, 3 and 5, Block 1; Lots 1, 2, 3, 4 and 5, Block 2; Lots 1, 2 and 3, Block 3; Lots 1 through 15, Block 4; All of Block 5; of Tract "B" as shown on the official plat of U.S. Survey 4028, Tununak Townsite, as accepted by the Chief, Division of Cadastral Survey for the Director on February 3, 1972.

Lots 1 through 16, Block 1 and All of Blocks 2 and 3 of Tract "C", as shown on the official plat of U.S. Survey 4028, Tununak Townsite, as accepted by the Chief, Division of Cadastral Survey, for the Director on February 3, 1972.

eRecorded Document

All of Tract "D" as shown on the official plat of U.S. Survey 4028, Townsite of Tununak as accepted by the Chief, Division of Cadastral Survey, for the Director on February 3, 1972, excepting:

- Tract D-2 as shown on Plat No. 79-12 which was a deeded to the AVCP Housing Authority by quitclaim deed dated June 1, 1974 and recorded at Book 27, page 363, Bethel Recording District.

- A conveyance to United Utilities, Inc. dated August 11, 1981, and recorded in book 31, page 6, Bethel Recording office.

- Lots 1, 2, 3, 4 and 5 of Block 1; Lots 1, 2, 3, 4, 5 and 6 of Block 2, a subdivision of D-1, U.S. Survey 4028, according to the Tununak Subdivision North Addition plat filed under 89-6, Bethel Recording District which were deeded to the AVCP Housing Authority.

TOGETHER WITH all improvements currently located thereon, if any, and all rights, privileges, easements, tenements, hereditaments, and appurtenances of Grantor pertaining to such property, if any.

SUBJECT TO:

Conditions for public use specified in that certain "Memorandum of Agreement to Convey and Accept Assets and Liabilities of the Dissolved City of Tununak", between the State of Alaska and the Grantor, recorded January 28, 1997 in the Bethel Recording District, Fourth Judicial District, State of Alaska, as assigned to the Grantee, whereby the Grantee assumed the rights and obligations of the Grantor thereunder.

Easements and reservations of record.

Easements, if any, necessary to ensure to access to navigable or public waters pursuant to AS 38.05.127.

Valid existing rights, if any:

Excluding therefrom, however, all land underlying any navigable waters, if any, which may be located within the described real property.

Save and Except, those restrictions appearing in the Federal Patent or other conveyance by which this the State of Alaska acquired title.

To Have and To Hold the said land, together with the tenements, hereditaments and appurtenances thereunto appertaining, unto the Grantee, subject to the

conditions and requirements of transfer said land to a future organized municipality, if any, or the State of Alaska, without consideration, upon request by a future organized municipality or the State of Alaska, for the reasons specified and agreed to in the "Memorandum of Agreement To Convey and Accept Assets and Liabilities of the Dissolved City of Tununak", referenced above.

A power of termination in the State, such that if Grantee or an agent or trustee acting for the Grantee ever restricts use of the property in a manner inconsistent with paragraph 1 of the "Memorandum of Agreement To Convey and Accept Assets and Liabilities of the Dissolved City of Tununak", then by operation of law, the State shall have the immediate right to terminate all of Grantee's right and interest in the property and to reenter and take possession of the property.

DATED this 15 day of April, 2016.

GRANTOR: TUNUNAK TRADITIONAL COUNCIL

By: _____
Amy Kanrilak

Its: President

STATE OF ALASKA)
) ss
___ JUDICIAL DISTRICT)

The foregoing Quitclaim Deed was acknowledged before me this 15 day of April, 2016, by Amy Kanrilak, President, of TUNUNAK TRADITIONAL COUNCIL, on behalf of the organization.

_____
Notary Public for the State of Alaska
My Commission Expires: _____

TUNUNAK ALASKA APR 15 2016 USPS 99681-9998

STATE CONSENT:

The State of Alaska, through the Alaska Department of Commerce, Community, and Economic Development, Division of Community and Regional Affairs (successor to the Alaska Department of Community and Regional Affairs), whose address is P.O. Box 110809, Juneau, Alaska 99811-0809, hereby consents to the execution and delivery of this Quitclaim Deed by the Tununak Traditional Council, and the conveyance of Tununak Traditional Council's right, title, and interest in and to the aforementioned property to the Native Village of Tununak IRA Council, to the extent set forth in therein.

Dated this 9th day of August, 2016.

STATE OF ALASKA
DEPARTMENT OF COMMERCE,
COMMUNITY, AND ECONOMIC
DEVELOPMENT

By: _____
Chris Hladick

Its: Commissioner of Commerce
Community & Economic Development

STATE OF ALASKA)
) ss
_____ JUDICIAL DISTRICT)

The foregoing consent to execution and delivery of Quitclaim Deed was acknowledged before me this 9th day of August, 2016, by Linda Mattson, Executive Administrator as an authorized representative and on behalf of the State of Alaska, Department of Commerce, Community, and Economic Development, for the uses and purposes set forth therein.

STATE OF ALASKA
OFFICIAL SEAL
Linda Mattson
NOTARY PUBLIC
My Commission Expires With Office

_____
Notary Public for the State of Alaska
My Commission Expires: With office

D.4.3 2012 ADEC Reclassification of WTP as a Non-Public Water System

Letter for ADEC Drinking Water Program on June 14, 2012 changing the classification of the Tununak WTP to a Non-Public Water System with a Surface Source, Length 2 Pages.

STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION

DIVISION OF ENVIRONMENTAL HEALTH
DRINKING WATER PROGRAM

SEAN PARNELL, GOVERNOR

555 Cordova Street
Anchorage, AK 99501
PHONE: (907) 269-7518
FAX: (907) 269-7650
http://www.dec.state.ak.us/

June 14, 2012

Mr. James James
Tribal Administrator
P.O. Box 77
Tununak, AK 99681

Re: Reclassification of Tununak, PWSID AK2270231, to Non-Public Water System Source: Surface Water

Dear James,

Following our meeting on June 13, 2012, this letter is to confirm that the water system for the Native Village of Tununak is being reclassified from community water system to Non-public (NP) water system. This reclassification is effective June 13, 2012.

Under the DEC drinking water regulations, *a public water system* means an intake works, collection system, water treatment works, storage facility, constructed conveyance, distribution main, or vehicle that provides water for human consumption to one or more multi-family dwellings; a factory, office building, restaurant, school, or similar facility; or two or more duplexes or single-family residences; and does not include a private water system (18 AAC 80.1990 (111) (A) and (B)). Furthermore, a *community public water system* is defined as a public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents (18 AAC 80.1990 (a) (21)).

During the meeting, the following were confirmed:

1. The Native Village of Tununak water plant provides water to the community washeteria.
2. The water in the washeteria is only used for washing clothes in the washing machines. There is no bathroom or toilet inside the washeteria.
3. The watering point immediately outside of the washeteria is deteriorated, the hose is disconnected, and the operation is shut down. The watering point is not accessed by the public.
4. All of the other watering points previously served by the village's water treatment plant are in the same state of non-operation and are currently not accessed by the public.
5. The residents of the Native Village of Tununak are collecting their drinking water from the school's watering point served by the school's public water system, LKSD Tununak Paul Albert HS, PWSID# AK2270613.
6. Both the Native Village of Tununak tribal administrator (you) and the remote water operator for the Lower Kuskokwim School District (LKSD), Bob Miller, agreed that the school's public water system will provide the drinking water to the school, the teacher housing, and the school's watering point. The school's watering point will primarily serve the residents of Tununak.
7. The LKSD will be responsible for the operations and maintenance of the school's public water system.

Based on all these information, our Department reclassifies the water system for the Native Village of Tununak as **non-public water system**.

Printed on Recycled Paper

With the exception of the 2011 Consumer Confidence Report requirement that is due to our DEC office by July 1, 2012, your water system is no longer subject to the monitoring and reporting requirements based on your previous water system classification.

Please note that any change(s) in the future that will impact your reclassification as non-public water system, your administration needs to notify our Department as soon as possible for further review and approvals.

If you have further questions regarding this letter, please contact me at phone 907-269-7518 or email Leah.guzman@alaska.gov.

Sincerely,

Leah A. Guzman
Environmental Program Specialist

Cc: Bob Miller, Remote Water Operator, Lower Kuskokwim School District, via email
Brian Berube, Environmental Health Officer, YKHC, via email
Allan Paukan, Remote Maintenance Worker, YKHC, via email
Dan Reichardt, P.E, DEC, Drinking Water Program
Susan Randlett, P.E., DEC, Village Safe Water Program
Heather Newman, Southcentral Program Coordinator, DEC, Drinking Water Program
Hannah Drake, Environmental Program Specialist, DEC, Drinking Water Program
Jeanine Oakland, Environmental Program Specialist, DEC, Drinking Water Program
Kenneth Smith, Environmental Program Specialist, DEC, Drinking Water Program

95%
PER

D.5 Community Records

D.5.1 Quit Claim Deed 8/24/2016

Quit Claim Deed of property from Tununak Traditional Council to the Native Village of Tununak IRA Council.

ALASKA
2016-000780-0
Recording Dist: 402 - Bethel
8/24/2016 01:18 PM Pages: 1 of 4

After recording return to:
Native Village of Tununak IRA Council
Attn: Tribal Council
P.O. Box 77
Tununak, Alaska 99681

Bethel Recording District

QUITCLAIM DEED

The GRANTOR, TUNUNAK TRADITIONAL COUNCIL, whose address is P.O. Box 97, Tununak, Alaska 99681, for and in consideration of the sum of Ten Dollars ($10.00) lawful money of the United States of America and other good and valuable consideration in hand paid, the receipt and sufficiency of which is hereby acknowledged, does hereby convey and quitclaim to NATIVE VILLAGE OF TUNUNAK IRA COUNCIL, a federally-recognized Indian tribe, whose address is P.O. Box 77, Tununak, Alaska 99681, GRANTEE, as successor to the assets and liabilities of the dissolved City of Tununak, all right, title, and interest it has, if any, in and to the following described real property located in the Bethel Recording District, Fourth Judicial District, State of Alaska:

Lots 1, 2 and 3, Block 1; Lot 7, Block 2; Lots 1 and 6, Block 3; Lots 4, 5, 7 and 8, Block 4; Lots 2, 4, 5, 9 and 10, Block 5; Lots 1, 3 and 4, Block 6; Lots 3, 6 and 7, Block 7; Lots 1, 3, 4 and 5, Block 8; Lot 2, Block 9; Lots 1, 2 and 3, Block 10; of Tract "A" as shown on the official plat of U.S. Survey 4028, Tununak Townsite, as accepted by the Chief, Division of Cadastral Survey, for the Director, on February 3, 1972.

Lots 1, 2, 3 and 5, Block 1; Lots 1, 2, 3, 4 and 5, Block 2; Lots 1, 2 and 3, Block 3; Lots 1 through 15, Block 4; All of Block 5; of Tract "B" as shown on the official plat of U.S. Survey 4028, Tununak Townsite, as accepted by the Chief, Division of Cadastral Survey for the Director on February 3, 1972.

Lots 1 through 16, Block 1 and All of Blocks 2 and 3 of Tract "C", as shown on the official plat of U.S. Survey 4028, Tununak Townsite, as accepted by the Chief, Division of Cadastral Survey, for the Director on February 3, 1972.

All of Tract "D" as shown on the official plat of U.S. Survey 4028, Townsite of Tununak as accepted by the Chief, Division of Cadastral Survey, for the Director on February 3, 1972, excepting:

- Tract D-2 as shown on Plat No. 79-12 which was a deeded to the AVCP Housing Authority by quitclaim deed dated June 1, 1974 and recorded at Book 27, page 363, Bethel Recording District.

- A conveyance to United Utilities, Inc. dated August 11, 1981, and recorded in book 31, page 6, Bethel Recording office.

- Lots 1, 2, 3, 4 and 5 of Block 1; Lots 1, 2, 3, 4, 5 and 6 of Block 2, a subdivision of D-1, U.S. Survey 4028, according to the Tununak Subdivision North Addition plat filed under 89-6, Bethel Recording District which were deeded to the AVCP Housing Authority.

TOGETHER WITH all improvements currently located thereon, if any, and all rights, privileges, easements, tenements, hereditaments, and appurtenances of Grantor pertaining to such property, if any.

SUBJECT TO:

Conditions for public use specified in that certain "Memorandum of Agreement to Convey and Accept Assets and Liabilities of the Dissolved City of Tununak", between the State of Alaska and the Grantor, recorded January 28, 1997 in the Bethel Recording District, Fourth Judicial District, State of Alaska, as assigned to the Grantee, whereby the Grantee assumed the rights and obligations of the Grantor thereunder.

Easements and reservations of record.

Easements, if any, necessary to ensure to access to navigable or public waters pursuant to AS 38.05.127.

Valid existing rights, if any:

Excluding therefrom, however, all land underlying any navigable waters, if any, which may be located within the described real property.

Save and Except, those restrictions appearing in the Federal Patent or other conveyance by which this the State of Alaska acquired title.

To Have and To Hold the said land, together with the tenements, hereditaments and appurtenances thereunto appertaining, unto the Grantee, subject to the

conditions and requirements of transfer said land to a future organized municipality, if any, or the State of Alaska, without consideration, upon request by a future organized municipality or the State of Alaska, for the reasons specified and agreed to in the "Memorandum of Agreement To Convey and Accept Assets and Liabilities of the Dissolved City of Tununak", referenced above.

A power of termination in the State, such that if Grantee or an agent or trustee acting for the Grantee ever restricts use of the property in a manner inconsistent with paragraph 1 of the "Memorandum of Agreement To Convey and Accept Assets and Liabilities of the Dissolved City of Tununak", then by operation of law, the State shall have the immediate right to terminate all of Grantee's right and interest in the property and to reenter and take possession of the property.

DATED this 15 day of April, 2016.

GRANTOR: **TUNUNAK TRADITIONAL COUNCIL**

By: _____
Amy Kanrilak
Its: President

STATE OF ALASKA)
) ss
___ JUDICIAL DISTRICT)

The foregoing Quitclaim Deed was acknowledged before me this 15 day of April, 2016, by Amy Kanrilak, President, of TUNUNAK TRADITIONAL COUNCIL, on behalf of the organization.

_____
Notary Public for the State of Alaska
My Commission Expires: _____

TUNUNAK ALASKA APR 15 2016 USPS 99681-9998

STATE CONSENT:
The State of Alaska, through the Alaska Department of Commerce, Community, and Economic Development, Division of Community and Regional Affairs (successor to the Alaska Department of Community and Regional Affairs), whose address is P.O. Box 110809, Juneau, Alaska 99811-0809, hereby consents to the execution and delivery of this Quitclaim Deed by the Tununak Traditional Council, and the conveyance of Tununak Traditional Council's right, title, and interest in and to the aforementioned property to the Native Village of Tununak IRA Council, to the extent set forth in therein.

Dated this 9th day of August, 2016.

STATE OF ALASKA
DEPARTMENT OF COMMERCE,
COMMUNITY, AND ECONOMIC
DEVELOPMENT

By: _____
Chris Hladick

Its: Commissioner of Commerce
Community & Economic Development

STATE OF ALASKA)
) ss
_____ JUDICIAL DISTRICT)

The foregoing consent to execution and delivery of Quitclaim Deed was acknowledged before me this 9th day of August, 2016, by Linda Mattson, Executive Administrator as an authorized representative and on behalf of the State of Alaska, Department of Commerce, Community, and Economic Development, for the uses and purposes set forth therein.

STATE OF ALASKA
OFFICIAL SEAL
Linda Mattson
NOTARY PUBLIC
My Commission Expires With Office

_____
Notary Public for the State of Alaska
My Commission Expires: with office

D.5.2 Tununak Income Records November 2009- 2016

Community Statement of Account Receivable and *"Budgeted Operating Expenditures"* Length 10 Pages.

2014

BUDGETED OPERATING EXPENDITURES *Administration and Planning*

Month:	Acctual Expense report	Budget	Current Expenditures	Prior Expenditures	Year to Date Expenditures	Balance
FY	Report #					
Personal Services:	Salaries		$ 25,573.25		$ 25,573.25	$ (25,573.25)
	Stipends		$ -		$ -	$ -
	Payroll Taxes		$ -		$ -	$ -
	Workmen Compensation				$ -	$ -
	Retirement/Pension				$ -	$ -
	Other:Mobilization				$ -	$ -
	Other:				$ -	$ -
	Total Personal Services:	$ -	$ 25,573.25	$ -	$ 25,573.25	$ (25,573.25)
Travel:	Airfare				$ -	$ -
	Per Diem				$ -	$ -
	Training, Workshops & Conference Fees				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Travel:	$ -	$ -	$ -	$ -	$ -
Facility Expenses:	Telephone	$ -	$ -		$ -	$ -
	Rent	$ -			$ -	$ -
	Electricity		$ 6,063.47		$ 6,063.47	$ (6,063.47)
	Water	$ -	$ -		$ -	$ -
	Sewage	$ -	$ -		$ -	$ -
	Repairs / Maintenance (buildings)				$ -	$ -
	Other:fuel oil		$ 4,642.35		$ 4,642.35	$ (4,642.35)
	Other:				$ -	$ -
	Total Facility Expenses:	$ -	$ 10,705.82	$ -	$ 10,705.82	$ (10,705.82)
Supplies	Office & Clerical Supplies				$ -	$ -
	Postage Supplies				$ -	$ -
	Copier Supplies				$ -	$ -
	Other:	$ -	$ 1,171.09		$ 1,171.09	$ (1,171.09)
	Other:				$ -	$ -
	Total Supplies	$ -	$ 1,171.09	$ -	$ 1,171.09	$ (1,171.09)
Equipment	Equipment				$ -	$ -
	Vehicle / Equipment Maintenance				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Equipment:	$ -	$ -	$ -	$ -	$ -
Other Operating Expenses:	Interest & Late Charges				$ -	$ -
	Insurance & Bonding				$ -	$ -
	Memberships Dues & Fees / Subcription				$ -	$ -
	Bank Charges				$ -	$ -
	Contractual: Legal Services				$ -	$ -
	Contractual: Accounting/Audit Services				$ -	$ -
	Other: Search And Rescue				$ -	$ -
	Other:Festival Donation				$ -	$ -
	Other:Youth Dontion				$ -	$ -
	Total Other:		$ -	$ -	$ -	$ -
TOTAL EDUCATION HOUSING ASSISTANCE BUDGET:		$ -	$ 37,450.16	$ -	$ 37,450.16	$ (37,450.16)

2015

BUDGETED OPERATING EXPENDITURES *Administration and Planning*

Month:	Acctual Expense report	Budget	Current Expenditures	Prior Expenditures	Year to Date Expenditures	Balance
FY	Report #					
Personal Services:	Salaries		$ 27,079.00		$ 27,079.00	$ (27,079.00)
	Stipends		$ -		$ -	$ -
	Payroll Taxes		$ -		$ -	$ -
	Workmen Compensation				$ -	$ -
	Retirement/Pension				$ -	$ -
	Other:Mobilization				$ -	$ -
	Other:				$ -	$ -
	Total Personal Services:	$ -	$ 27,079.00	$ -	$ 27,079.00	$ (27,079.00)
Travel:	Airfare				$ -	$ -
	Per Diem				$ -	$ -
	Training, Workshops & Conference Fees				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Travel:	$ -	$ -	$ -	$ -	$ -
Facility Expenses:	Telephone	$ -	$ -		$ -	$ -
	Rent	$ -			$ -	$ -
	Electricity		$ 6,764.21		$ 6,764.21	$ (6,764.21)
	Water	$ -	$ -		$ -	$ -
	Sewage	$ -	$ -		$ -	$ -
	Repairs / Maintenance (buildings)				$ -	$ -
	Other:fuel oil		$ 6,116.00		$ 6,116.00	$ (6,116.00)
	Other:				$ -	$ -
	Total Facility Expenses:	$ -	$ 12,880.21	$ -	$ 12,880.21	$ (12,880.21)
Supplies	Office & Clerical Supplies				$ -	$ -
	Postage Supplies				$ -	$ -
	Copier Supplies				$ -	$ -
	Other:	$ -	$ 792.00		$ 792.00	$ (792.00)
	Other:				$ -	$ -
	Total Supplies	$ -	$ 792.00	$ -	$ 792.00	$ (792.00)
Equipment	Equipment				$ -	$ -
	Vehicle / Equipment Maintenance				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Equipment:	$ -	$ -	$ -	$ -	$ -
Other Operating Expenses:	Interest & Late Charges				$ -	$ -
	Insurance & Bonding				$ -	$ -
	Memberships Dues & Fees / Subcription				$ -	$ -
	Bank Charges				$ -	$ -
	Contractual: Legal Services				$ -	$ -
	Contractual: Accounting/Audit Services				$ -	$ -
	Other: Search And Rescue				$ -	$ -
	Other:Festival Donation				$ -	$ -
	Other:Youth Dontion				$ -	$ -
	Total Other:		$ -	$ -	$ -	$ -
TOTAL EDUCATION HOUSING ASSISTANCE BUDGET:		$ -	$ 40,751.21	$ -	$ 40,751.21	$ (40,751.21)

2016

BUDGETED OPERATING EXPENDITURES *Administration and Planning*

Month:	Acctual Expense report	Budget	Current Expenditures	Prior Expenditures	Year to Date Expenditures	Balance
FY	Report #					
Personal Services:	Salaries		$ 27,015.43		$ 27,015.43	$ (27,015.43)
	Stipends		$ -		$ -	$ -
	Payroll Taxes		$ -		$ -	$ -
	Workmen Compensation				$ -	$ -
	Retirement/Pension				$ -	$ -
	Other:Mobilization				$ -	$ -
	Other:				$ -	$ -
	Total Personal Services:	$ -	$ 27,015.43	$ -	$ 27,015.43	$ (27,015.43)
Travel:	Airfare				$ -	$ -
	Per Diem				$ -	$ -
	Training, Workshops & Conference Fees				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Travel:	$ -	$ -	$ -	$ -	$ -
Facility Expenses:	Telephone	$ -	$ -		$ -	$ -
	Rent	$ -			$ -	$ -
	Electricity		$ 4,109.00		$ 4,109.00	$ (4,109.00)
	Water	$ -	$ -		$ -	$ -
	Sewage	$ -	$ -		$ -	$ -
	Repairs / Maintenance (buildings)				$ -	$ -
	Other:fuel oil		$ 5,214.00		$ 5,214.00	$ (5,214.00)
	Other:				$ -	$ -
	Total Facility Expenses:	$ -	$ 9,323.00	$ -	$ 9,323.00	$ (9,323.00)
Supplies	Office & Clerical Supplies				$ -	$ -
	Postage Supplies				$ -	$ -
	Copier Supplies				$ -	$ -
	Other:	$ -	$ 2,058.45		$ 2,058.45	$ (2,058.45)
	Other:				$ -	$ -
	Total Supplies	$ -	$ 2,058.45	$ -	$ 2,058.45	$ (2,058.45)
Equipment	Equipment				$ -	$ -
	Vehicle / Equipment Maintenance				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Equipment:	$ -	$ -	$ -	$ -	$ -
Other Operating Expenses:	Interest & Late Charges				$ -	$ -
	Insurance & Bonding				$ -	$ -
	Memberships Dues & Fees / Subcription				$ -	$ -
	Bank Charges				$ -	$ -
	Contractual: Legal Services				$ -	$ -
	Contractual: Accounting/Audit Services				$ -	$ -
	Other: Search And Rescue				$ -	$ -
	Other:Festival Donation				$ -	$ -
	Other:Youth Dontion				$ -	$ -
	Total Other:		$ -	$ -	$ -	$ -
TOTAL EDUCATION HOUSING ASSISTANCE BUDGET:		$ -	$ 38,396.88	$ -	$ 38,396.88	$ (38,396.88)

Laundry money collected

November			
11/7/2009	$	35.00	*
11/6/2009	$	50.00	*
11/8/2009	$	80.00	*
11/10/2009	$	44.75	*
11/13/2009	$	19.25	*
11/14/2009	$	25.00	*
11/17/2009	$	40.00	*
11/18/2009	$	35.00	*
11/19/2009	$	50.25	*
11/20/2009	$	25.00	*
11/21/2009	$	40.00	*
11/22/2009	$	29.00	*
11/15.16/2009	$	79.25	*
11/18/2009	$	40.00	*
11/19/2009	$	35.00	*
11/20/2009	$	50.25	*
11/23/2009	$	25.00	*
11/23/2009	$	40.00	*
11/23/2009	$	29.00	*
11/27/2009	$	55.00	*
11/28/2009	$	75.00	*
11/29/2009	$	25.00	*
Total	$	926.75	
12/4/2009	$	20.00	*
12/14/2009	$	82.00	*
12/17/2009	$	70.00	*
12/18/2009	$	35.00	*
12/19/2009	$	70.00	*
12/20/2009	$	35.25	*
12/22/2009	$	60.00	*
12/26/2009	$	73.50	*
Total	$	445.75	
1/6/2010	$	85.25	*
Total	$	85.25	
2/23/2010	$	95.00	*
2/24/2010	$	25.25	*
2/25/2010	$	40.00	*
Total	$	160.25	
3/1/2010	$	55.00	*
3/3/2010	$	45.00	*
3/15/2010	$	55.00	*
3/19/2010	$	60.00	*
3/22/2010	$	95.00	*
Total	$	310.00	
6/3/2010	$	49.75	*
6/4/2010	$	39.75	*
6/4/2010	$	35.00	*
6/7/2010	$	115.00	*
6/8/2010	$	20.00	*
6/12/2010	$	20.50	*

Closed on Mondays

			12/8/2014
4/1/2013	$	125.00	12/9/2014
4/2/2013	$	115.00	12/15/2014
	$	270.00	12/17/2014
	$	65.00	12/21/2014
	$	335.00	12/23/2014
	$	115.00	
	$	190.00	1/8/2015
	$	76.00	1/12/2015
	$	300.00	1/14/2015
	$	110.00	1/15/2015
	$	40.00	1/23/2015
	$	60.00	1/24/2015
	$	50.00	1/27/2015
	$	20.00	1/28/2015
4/29/2013	$	1,871.00	
			2/6/2015
5/1/2013	$	70.00	2/8/2015
	$	175.00	2/9/2015
	$	65.00	2/12/2015
	$	120.00	2/16/2015
	$	50.00	2/17/2015
	$	220.25	2/19/2015
	$	145.00	2/19/2015
	$	145.00	2/22/2015
	$	35.00	2/24/2015
	$	125.00	
	$	30.00	3/2/2015
	$	90.00	3/3/2015
	$	35.00	3/5/2015
5/28/2013	$	95.00	3/6/2015
5/29/2013	$	55.00	3/9/2015
	$	1,455.25	3/11/2015
6/4/2013	$	100.00	3/15/2015
	$	35.00	3/16/2015
	$	205.00	3/17/2015
	$	30.00	3/19/2015
	$	25.00	3/23/2015
	$	130.00	3/24/2015
	$	50.00	3/26/2015
	$	30.00	3/29/2015
	$	125.00	
	$	70.00	4/1/2015
	$	60.00	4/3/2015
	$	50.00	4/6/2015
	$	300.00	4/7/2015
	$	35.00	4/8/2015
6/30/2013	$	130.00	4/9/2015
	$	1,375.00	4/10/2015
7/6/2013	$	90.00	4/13/2015
	$	330.00	4/14/2015

6/13/2010	$ 100.00	*	
6/17/2010	$ 95.00	*	
6/18/2010	$ 45.00	*	
6/23/2010	$ 107.25	*	
6/17/2010	$ 125.00	*	
6/25/2010	$ 30.25	*	
6/26/2010	$ 45.00	*	
6/27/2010	$ 70.00	*	
6/28/2010	$ 54.00	*	
Total	$ 951.50		
7/1/2010	$ 60.00	*	
7/2/2010	$ 75.00	*	
7/3/2010	$ 59.00	*	
7/4/2010	$ 45.00	*	
7/9/2010	$ 64.75	*	
7/9/2010	$ 85.25	*	
7/10/2010	$ 35.50	*	
7/12/2010	$ 49.50	*	
7/13/2010	$ 40.00	*	
7/14/2010	$ 60.00	*	
7/15/2010	$ 20.00	*	
7/17/2018	$ 157.75	*	
7/22/2010	$ 93.25	*	
7/27/2010	$ 115.00	*	
7/28/2010	$ 69.75	*	
7/29/2010	$ 65.00	*	
	$ 1,094.75		
8/4/2010	$ 113.25	*	
8/10/2010	$ 60.25	*	
8/11/2010	$ 60.00	*	
8/5/2010	$ 30.00	*	
8/6/2010	$ 30.25	*	
8/7/2010	$ 55.00	*	
8/21/2010	$ 119.75	*	
8/22/2010	$ 40.00	*	
8/23/2010	$ 82.25	*	
8/25/2010	$ 24.25	*	
8/26/2010	$ 40.00	*	
8/27/2010	$ 30.00	*	
8/30/2010	$ 124.25	*	
8/31/2010	$ 34.25	*	
	$ 843.50		
9/1/2010	$ 50.25	*	
9/7/2010	$ 28.50	*	
9/16/2010	$ 45.00	*	
9/17,18/10	$ 124.25	*	
9/23/2010	$ 65.00	*	
9/28/2010	$ 109.50	*	
	$ 422.50	*	
11/12/2010	$ 130.00	*	
11/15/2010	$ 106.00	*	
11/22/2010	$ 183.00	*	

	$ 220.00	4/15/2015
	$ 430.00	4/16/2015
	$ 390.00	4/18/2015
	$ 80.00	4/21/2015
7/28/2013	$ 325.00	4/22/2015
	$ 1,865.00	4/28/2015
8/7/2013	$ 150.00	4/29/2015
	$ 359.50	4/29/2015
	$ 204.00	
	$ 165.00	5/4/2015
	$ 228.00	5/5/2015
	$ 120.00	5/7/2015
	$ 85.00	5/11/2015
	$ 110.00	5/14/2015
	$ 225.00	5/15/2015
	$ 330.00	5/16/2015
8/29/2013	$ 120.00	5/21/2015
	$ 2,096.50	5/22/2015
9/4/2013	$ 375.00	5/28/2015
	$ 100.00	
	$ 65.50	6/2/2015
	$ 120.00	6/4/2015
	$ 130.00	6/10/2015
	$ 75.00	6/11/2015
	$ 226.00	6/15/2015
	$ 115.00	6/16/2015
9/29/2013	$ 90.00	6/19/2015
	$ 1,296.50	6/22/2015
10/1/2013	$ 150.00	6/23/2015
	$ 145.00	6/25/2015
	$ 175.00	6/28/2015
	$ 130.00	
	$ 295.00	7/1/2015
	$ 175.00	7/6/2015
	$ 95.00	7/6/2015
	$ 190.00	7/8/2015
	$ 350.00	7/9/2015
	$ 143.00	7/13/2015
	$ 220.00	7/16/2015
	$ 305.00	7/19/2015
	$ 190.00	7/20/2015
	$ 105.00	7/22/2015
	$ 205.00	7/23/2015
	$ 115.00	
	$ 125.00	8/2/2015
10/31/2013	$ 85.00	8/3/2015
	$ 3,198.00	8/4/2015
11/4/2013	$ 130.00	8/5/2015
	$ 335.00	8/6/2015
	$ 300.00	8/8/2015
	$ 95.00	8/10/2015
	$ 80.00	8/12/2015

11/26/2010	$	1.50				$	270.00	8/13/2015
11/27/2010	$	29.00				$	80.00	8/19/2015
11/28/2010	$	2.50				$	130.00	8/20/2015
11/29/2010	$	2.00				$	130.00	8/25/2015
11/30/2010						$	250.00	8/29/2015
						$	110.00	
	$	454.00	*			$	171.00	9/1/2015
12/8/2010	$	261.26	*		11/27/2013	$	206.00	9/3/2015
12/8/2010	$	178.15	*			$	2,287.00	9/10/2015
12/10/2010	$	120.00	*		12/3/2013	$	190.00	9/11/2015
12/12/2010	$	40.00	token			$	145.00	9/14/2015
12/16/2010	$	40.00	token			$	30.00	9/17/2015
12/16/2010	$	200.25	token			$	151.00	9/22/2015
12/17/2010	$	80.00	token			$	70.00	9/28/2015
12/20/2010	$	150.00	token			$	90.00	
12/20/2010	$	195.00	token			$	40.00	10/5/2015
12/21/2010	$	45.00	token			$	181.00	10/7/2015
12/22/2010	$	95.00	token			$	65.00	10/11/2015
12/27/2010	$	160.00	token			$	35.00	10/13/2015
						$	195.00	10/25/2015
8/31/2011	$	77.00			12/26/2013	$	40.00	10/27/2015
						$	1,232.00	
9/1/2011	$	50.00			1/7/2014	$	55.00	11/1/2016
9/3/2011	$	50.00				$	50.00	11/2/2016
9/4/2011	$	95.00				$	125.00	11/3/2016
9/6/2011	$	20.00				$	185.00	11/8/2016
9/9/2011	$	40.00				$	180.00	11/12/2016
9/10/2011	$	65.00				$	85.00	11/13/2016
9/11/2011	$	50.00				$	140.00	11/17/2016
9/16/2011	$	10.00				$	170.00	11/18/2016
9/20/2011	$	20.00				$	110.00	11/20/2016
9/22/2011	$	5.00			1/28/2014	$	45.00	11/23/2016
9/24/2011	$	15.00				$	1,145.00	
9/25/2011	$	40.00			2/3/2014	$	205.00	12/1/2016
9/28/2011	$	130.00				$	125.00	12/6/2016
9/29/2011	$	230.00				$	105.00	12/9/2016
	$	820.00	$ -			$	90.00	12/15/2016
10/3/2011	$	125.00				$	330.25	12/16/2016
10/5/2011	$	179.25				$	80.00	12/21/2016
10/6/2011	$	100.00				$	270.00	12/22/2016
10/11/2011	$	367.75				$	35.00	12/26/2016
10/12/2011	$	125.50				$	25.00	12/29/2016
10/13/2011	$	110.00				$	25.00	
10/18/2011	$	485.00				$	145.00	1/2/2016
10/19/2011	$	95.00				$	50.00	1/4/2016
10/22/2011	$	175.00				$	45.00	1/7/2016
10/26/2011	$	280.00				$	60.00	1/11/2016
10/27/2011	$	125.00			2/27/2014	$	35.00	1/13/2016
10/28/2011	$	265.25				$	1,625.25	1/19/2016
	$	2,432.75	$ -		3/2/2014	$	115.00	1/21/2016
11/1/2011	$	65.00				$	30.00	1/23/2016
11/3/2011	$	175.00				$	20.00	1/26/2016

11/6/2011	$	280.25	
11/11/2011	$	155.25	
11/15/2011	$	120.58	
11/16/2011	$	329.75	
11/17/2011	$	25.00	
	$	1,150.83	$ -
12/30/2011	$	391.75	
[redacted]			
1/4/2012	$	174.50	
1/5/2012	$	175.25	
1/12/2012	$	195.00	
1/17/2012	$	273.25	
1/18/2012	$	35.00	
1/26/2012	$	135.00	
1/27/2012	$	294.00	
	$	1,282.00	$ -
2/3/2012	$	240.00	
2/10/2012	$	554.25	
2/17/2012	$	535.00	
2/24/2012	$	355.00	
2/28/2012	$	215.25	
	$	1,899.50	$ -
3/9/2012	$	565.53	
3/15/2012	$	155.00	
3/16/2012	$	380.00	
3/23/2012	$	319.25	
3/30/2012	$	339.50	
	$	1,759.28	$ -
4/10/2012	$	80.00	
4/12/2012	$	352.75	
4/20/2012	$	20.00	
4/27/2012	$	338.75	
4/30/2012	$	183.75	
	$	975.25	$ -
5/1/2012	$	259.75	
5/2/2012	$	215.00	
5/3/2012	$	165.25	
5/7/2012	$	85.00	
5/8/2012	$	145.00	
5/9/2012	$	60.00	
5/10/2012	$	135.00	
5/15/2012	$	511.25	
5/18/2012	$	215.00	
5/23/2012	$	80.00	
5/24/2012	$	225.50	
5/29/2012	$	144.00	
5/30/2012	$	276.75	
5/31/2012	$	119.55	
	$	2,637.05	$ -
6/1/2012	$	130.00	
6/4/2012	$	170.50	
6/7/2012	$	165.00	

	$	50.00	1/29/2016
	$	25.00	
	$	50.00	2/3/2016
	$	75.00	2/4/2016
	$	170.00	2/8/2016
	$	245.00	2/8/2016
	$	60.00	2/11/2016
	$	70.00	2/13/2016
	$	150.00	2/17/2016
	$	240.25	2/22/2016
	$	165.00	2/24/2016
	$	100.00	2/25/2016
	$	89.80	2/29/2016
3/27/2014	$	90.00	
	$	1,745.05	3/2/2016
4/1/2014	$	199.00	3/6/2016
	$	55.00	3/9/2016
	$	25.00	3/11/2016
	$	85.00	3/16/2016
	$	120.02	3/18/2016
	$	60.00	3/21/2016
	$	75.00	3/23/2016
	$	30.00	3/24/2016
	$	80.00	3/28/2016
	$	190.25	3/29/2016
	$	359.00	
	$	125.00	4/3/2016
	$	205.00	4/5/2016
	$	165.00	4/7/2016
	$	55.00	4/12/2016
	$	75.00	4/14/2016
	$	196.00	4/17/2016
	$	79.00	4/22/2016
	$	40.00	4/27/2016
4/31/2014	$	20.00	
	$	2,238.27	5/8/2016
5/1/2014	$	115.00	5/10/2016
	$	250.00	5/12/2016
	$	85.00	5/15/2016
	$	115.00	5/18/2016
	$	115.00	5/19/2016
	$	175.00	5/24/2016
	$	80.00	
	$	38.00	6/1/2016
	$	68.00	6/2/2016
	$	93.90	6/5/2016
	$	152.00	6/12/2016
	$	69.00	6/13/2016
	$	24.00	6/16/2016
5/30/2014	$	115.00	6/27/2016
	$	1,494.90	6/28/2016
6/3/2014	$	107.00	

6/15/2012	$ 199.75		
6/16/2012	$ 235.50		
6/11/2012	$ 130.25		
6/20/2012	$ 90.00		
	$ 1,121.00	$ -	
7/13/2012	$ 124.00		
7/23/2012	$ 30.00		
	$ 154.00	$ -	
8/1/2012	$ 25.00		
8/30/2012	$ 40.00		
	$ 65.00	$ -	
9/5/2012	$ 30.00		
9/9/2012	$ 45.00		
9/21/2012	$ 65.00		
	$ 140.00	$ -	
10/2/2012	$ 465.00		
10/3/2012	$ 276.00		
10/4/2012	$ 345.25		
10/10/2012	$ 115.00		
10/12/2012	$ 303.00		
10/15/2012	$ 358.75		
10/17/2012	$ 198.00		
10/18/2012	$ 200.00		
10/21/2012	$ 360.00		
10/25/2012	$ 70.00		
10/24/2012	$ 84.90		
10/26/2012	$ 150.00		
	$ 2,925.90	$ -	
11/6/2012	$ 280.00		
11/8/2012	$ 195.00		
11/13/2012	$ 350.00		
11/14/2012	$ 70.00		
11/15/2012	$ 225.00		
11/20/2012	$ 131.00		
11/23/2012	$ 125.00		
11/28/2012	$ 150.75		
	$ 1,526.75	$ -	
12/11/2012	$ 20.00		
12/21/2012	$ 55.00		
12/31/2012	$ 245.00		
	$ 320.00	$ -	
1/31/2013	$ 60.00		
1/14/2013	$ 260.00		
1/15/2013	$ 130.00		
1/17/2013	$ 200.00		
1/22/2013	$ 99.75		
1/24/2013	$ 185.00		
1/28/2013	$ 165.00		
1/29/2013	$ 50.00		
1/30/2013	$ 135.00		
1/31/2013	$ 121.00		
	$ 1,405.75	$ -	

	$ 69.00	7/5/2016
	$ 66.00	7/7/2016
	$ 88.99	7/14/2016
	$ 142.00	7/19/2016
	$ 53.00	7/25/2016
	$ 22.00	7/27/2016
	$ 81.00	7/28/2016
	$ 172.00	
	$ 75.00	8/4/2016
6/30/2014	$ 310.00	
	$ 1,185.99	
7/6/2014	$ 310.00	
	$ 54.00	
	$ 56.00	
7/10/2014	$ 101.00	
7/13/2014	$ 168.00	
7/16/2014	$ 198.00	
7/20/2014	$ 105.00	
7/21/2014	$ 96.00	
7/22/2014	$ 33.00	
7/23/2014	$ 57.00	
7/27/2014	$ 298.00	
7/29/2014	$ 72.00	
7/31/2014	$ 59.00	
	$ 1,607.00	
8/1/2014	$ 212.00	
8/10/2014	$ 281.00	
8/12/2014	$ 30.00	
8/13/2014	$ 24.00	
8/14/2014	$ 32.00	
8/17/2014	$ 152.00	
8/18/2014	$ 30.00	
8/19/2014	$ 31.75	
8/20/2014	$ 99.25	
8/24/2014	$ 85.00	
8/25/2014	$ 33.50	
8/26/2014	$ 42.00	
8/27/2014	$ 24.00	
8/28/2014	$ 51.00	
	$ 1,127.50	
9/1/2014	$ 93.00	
9/2/2014	$ 118.00	
9/9/2014	$ 156.10	
9/10/2014	$ 33.00	
9/11/2014	$ 20.60	
9/12/2014	$ 64.10	
9/15/2014	$ 75.00	
9/17/2014	$ 72.00	
9/18/2014	$ 50.00	
9/24/2014	$ 243.30	
9/25/2014	$ 24.00	
9/28/2014	$ 184.00	

2/3/2013	$	160.00	
2/4/2013	$	185.00	
2/5/2013	$	50.00	
2/6/2013	$	130.00	
2/7/2013	$	165.00	
2/10/2013	$	130.00	
2/13/2013	$	95.00	
2/12/2013	$	100.00	
2/20/2013	$	45.00	
2/21/2013	$	40.00	
2/25/2013	$	95.00	
2/28/2013	$	170.00	
	$	1,365.00	$ -
3/1/2013	$	120.00	
3/4/2013	$	326.00	
3/5/2013	$	79.00	
3/6/2013	$	155.00	
3/7/2013	$	130.00	
3/11/2013	$	94.00	
3/12/2013	$	135.00	
3/13/2013	$	110.00	
	$	45.00	
	$	235.00	
	$	120.00	
	$	120.00	
	$	215.00	
	$	50.00	
	$	245.00	
	$	140.00	
	$	185.00	
3/28/2013	$	105.00	
	$	2,609.00	$ -

9/28/2014	$	57.00
	$	1,190.10
10/6/2014	$	427.00
10/8/2014	$	26.00
10/9/2014	$	68.00
10/12/2014	$	250.00
10/13/2014	$	30.00
10/14/2014	$	87.00
10/15/2014	$	50.00
10/16/2014	$	66.00
10/20/2014	$	306.00
10/21/2014	$	39.00
10/22/2014	$	9.00
10/26/2014	$	125.00
10/24/2014	$	27.00
10/27/2014	$	165.00
10/28/2014	$	106.00
10/29/2014	$	16.00
10/30/2014	$	60.00
	$	1,857.00
11/2/2014	$	156.00
11/4/2014	$	166.00
11/5/2014	$	189.00
11/6/2014	$	87.00
11/11/2014	$	271.00
11/13/2014	$	179.00
11/16/2014	$	143.00
11/17/2014	$	93.00
11/18/2014	$	48.00
11/19/2014	$	78.00
11/23/2014	$	219.75
11/24/2014	$	70.11
11/25/2014	$	85.00
11/26/2014	$	143.95
11/27/2014	$	58.00
	$	1,986.81

Native Village of Tununak
Transaction Detail By Account
January 1, 2014 through March 15, 2016

Type	Date	Num	Name	Memo	Class	Clr	Split	Amount	Balance
Miscellaneous Income									
Deposit	01/02/2014			Reg Deposit	Tununak ...		FNBA Water & ...	378.06	378.06
Deposit	01/30/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,334.93	1,712.99
Deposit	02/12/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,040.79	2,753.78
Deposit	02/18/2014			Reg Deposit	Tununak ...		FNBA Water & ...	376.36	3,130.14
Deposit	03/21/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,038.93	4,169.07
Deposit	04/11/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,525.43	5,694.50
Deposit	04/14/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,229.24	6,923.74
Deposit	04/24/2014			Reg Deposit	Tununak ...		FNBA Water & ...	2,093.45	9,017.19
Deposit	05/12/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,000.14	10,017.33
Deposit	06/04/2014			Reg Deposit	Tununak ...		FNBA Water & ...	327.00	10,344.33
Deposit	06/04/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,851.00	12,195.33
Deposit	06/04/2014			Reg Deposit	Tununak ...		FNBA Water & ...	830.92	13,026.25
Deposit	07/16/2014			Reg Deposit	Tununak ...		FNBA Water & ...	536.06	13,562.31
Deposit	07/25/2014			Reg Deposit	Tununak ...		FNBA Water & ...	933.02	14,495.33
Deposit	08/04/2014			Reg Deposit	Tununak ...		FNBA Water & ...	348.05	14,843.38
Deposit	08/22/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,256.00	16,099.38
Deposit	09/08/2014			Reg Deposit	Tununak ...		FNBA Water & ...	946.00	17,045.38
Deposit	10/03/2014			Reg Deposit	Tununak ...		FNBA Water & ...	100.00	17,145.38
Deposit	10/17/2014			Reg Deposit	Tununak ...		FNBA Water & ...	545.00	17,690.38
Deposit	10/17/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,372.25	19,062.63
Deposit	10/27/2014			Reg Deposit	Tununak ...		FNBA Water & ...	253.06	19,315.69
Deposit	10/27/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,717.77	21,033.46
Deposit	11/10/2014			Reg Deposit	Tununak ...		FNBA Water & ...	974.00	22,007.46
Deposit	12/08/2014			Reg Deposit	Tununak ...		FNBA Water & ...	340.00	22,347.46
Deposit	12/08/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,464.67	23,812.13
Deposit	12/22/2014			Reg Deposit	Tununak ...		FNBA Water & ...	900.00	24,712.13
Deposit	02/02/2015			Reg Deposit	Tununak ...		FNBA Water & ...	327.33	25,039.46
Deposit	02/02/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,083.85	26,123.31
Deposit	02/17/2015			Reg Deposit	Tununak ...		FNBA Water & ...	417.00	26,540.31
Deposit	02/17/2015			Reg Deposit	Tununak ...		FNBA Water & ...	397.00	26,937.31
Deposit	03/02/2015			Reg Deposit	Tununak ...		FNBA Water & ...	340.00	27,277.31
Deposit	03/23/2015			Reg Deposit	Tununak ...		FNBA Water & ...	75.00	27,352.31
Deposit	03/23/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,078.68	28,430.99
Deposit	04/20/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,034.00	29,464.99
Deposit	05/13/2015			Reg Deposit	Tununak ...		FNBA Water & ...	411.00	29,875.99
Deposit	05/29/2015			Reg Deposit	Tununak ...		FNBA Water & ...	607.00	30,482.99
Deposit	06/03/2015			Reg Deposit	Tununak ...		FNBA Water & ...	765.00	31,247.99
Deposit	06/30/2015			Reg Deposit	Tununak ...		FNBA Water & ...	2,388.52	33,636.51
Deposit	07/17/2015			Reg Deposit	Tununak ...		FNBA Water & ...	733.22	34,369.73
Deposit	07/27/2015			Reg Deposit	Tununak ...		FNBA Water & ...	683.93	35,053.66
Deposit	08/10/2015			Reg Deposit	Tununak ...		FNBA Water & ...	577.00	35,630.66
Deposit	08/24/2015			Reg Deposit	Tununak ...		FNBA Water & ...	754.78	36,385.44
Deposit	09/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,050.00	37,435.44
Deposit	10/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	106.66	37,542.10
Deposit	10/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	2,350.21	39,892.31
Deposit	10/19/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,751.69	41,644.00
Deposit	11/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	850.00	42,494.00
Deposit	11/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	2,443.88	44,937.88
Deposit	11/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	10,794.00	55,731.88
Deposit	12/07/2015			Reg Deposit	Tununak ...		FNBA Water & ...	50.00	55,781.88
Deposit	12/07/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,266.71	57,048.59
Deposit	12/28/2015			Reg Deposit	Tununak ...		FNBA Water & ...	729.98	57,778.57
Deposit	01/08/2016			Reg Deposit	Tununak ...		FNBA Water & ...	1,183.07	58,961.64
Deposit	02/01/2016			Reg Deposit	Tununak ...		FNBA Water & ...	75.00	59,036.64
Deposit	02/01/2016			Reg Deposit	Tununak ...		FNBA Water & ...	912.00	59,948.64
Deposit	02/25/2016			Reg Deposit	Tununak ...		FNBA Water & ...	50.00	59,998.64
Deposit	02/25/2016			Reg Deposit	Tununak ...		FNBA Water & ...	931.00	60,929.64
Deposit	02/29/2016			Reg Deposit	Tununak ...		FNBA Water & ...	436.47	61,366.11
Total Miscellaneous Income								61,366.11	61,366.11
TOTAL								61,366.11	61,366.11

D.5.3 Resolution 2015-02 Requesting Planning Project Funding

Resolution 2015-02 Passed January 5, 2015 to requesting funding for a plan for a New Tununak Washeteria, Water Treatment Plant, and Wastewater Disposal. Length 1 Page.

PER TUNUNAK, AK
STANTEC 2020

NATIVE VILLAGE OF TUNUNAK
RESOLUTION # 2015-02

A Resolution requesting Planning Project Funding through the State of Alaska, Village Safe Water Program

WHEREAS: The Native Village of Tununak, hereinafter called the Council, is the governing body of Tununak, Alaska, and

WHEREAS: The Department of Environmental Conservation/ Village Safe Water Program, hereinafter called VSW, may provide assistance necessary to address the following sanitation facility planning need in the community: *lack of a community laundromat and shower facility and advanced age of the water plant, and failing on-site system*, and

WHEREAS: The Council desires to provide adequate sanitation facilities for residents of the community and has determined the following project to be the highest priority for sanitation facility planning for the community: Plan for a New Tununak Washeteria-Water Treatment Plant, including Wastewater Disposal,

NOW THEREFORE BE IT RESOLVED, that the Council hereby requests the Governor and Legislature to appropriate $75,000 through the VSW Program to complete the planning project identified above.

BE IT FURTHER RESOLVED, that Susie Walter (Chief, or President) is hereby authorized to negotiate, execute, and administer any and all documents, contracts and agreements required for granting funds to the Native Village of Tununak and managing funds on behalf of this entity, including any subsequent amendments to said agreements.

BE IT FURTHER RESOLVED that the Council hereby authorizes VSW or its representatives to enter upon or cross community land for the purposes of assisting the Council in carrying out this project.

BE IT FURTHER RESOLVED that the Council will cooperate with the provisions of needed agreements entered into between the Council and VSW, and that said provisions will be duly carried out.

I, the undersigned, hereby certify that the Council is composed of 5 members, of whom 5 constituting a QUORUM, were present and that the foregoing resolution was **PASSED AND APPROVED** by the Council this 9th day of January, ~~2014~~. 2015

Vote: 5 Yeas 0 Nays

Signed Susie Walter
Chief, or President

[signature]
ATTEST: City Clerk or Council Member

95%
PER

D.5.4 February 2020 Profit and Loss Statement

Combined Water, Washeteria, and Wastewater Profit and Loss Statement provided Tununak's accountant MDM Financial Management, LLC.

Native Village of Tununak
Profit & Loss by Class
January through December 2019

	Water & Sewer
Ordinary Income/Expense	
Income	
Water and Sewer Income	27,081
Total Income	27,081
Gross Profit	27,081
Expense	
Bad Debt	760
Other expense	569
Salaries	10,477
Fringe Benefits	
Payroll Taxes	885
Workers Compensation	-
Total Fringe Benefits	885
Bank Charges	1,153
Dues & Fees	30
Freight & Postage	120
Supplies	1,699
Utilities	2,384
Total Expense	18,076
Net Ordinary Income	9,005
Net Income	**9,005**

95%
PER

Appendix E ADDITIONAL RECORD PHOTOS



Tununak: View of Washeteria, WST, and School from West (2010)



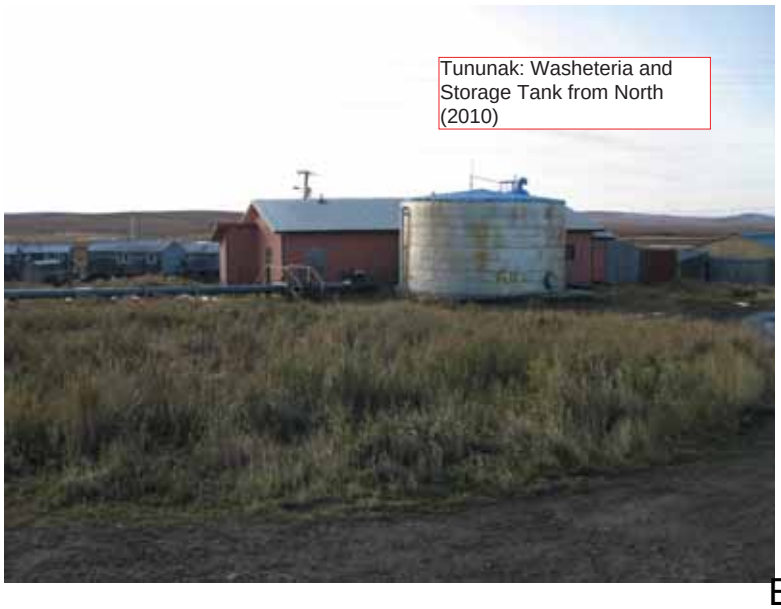
Tununak: Utilidor from Washeteria to School (2010)



Tununak: Aerial from West (2010)



Tununak: Washeteria from South (2010)



Tununak: Washeteria and Storage Tank from North (2010)



Tununak: Utilidor from Washeteria to Clinic (2010)



Tununak Washeteria. Photo shows decay of the door and flooring, and peeling of the wall.



Tununak Washeteria - Speed Queen SWRX7 18 pound capacity washers and 30 pound electric dryers.



Tununak Washeteria - boarded up window.



Tununak Washeteria - space behind machines. Note the wall splitting, and corrosion.

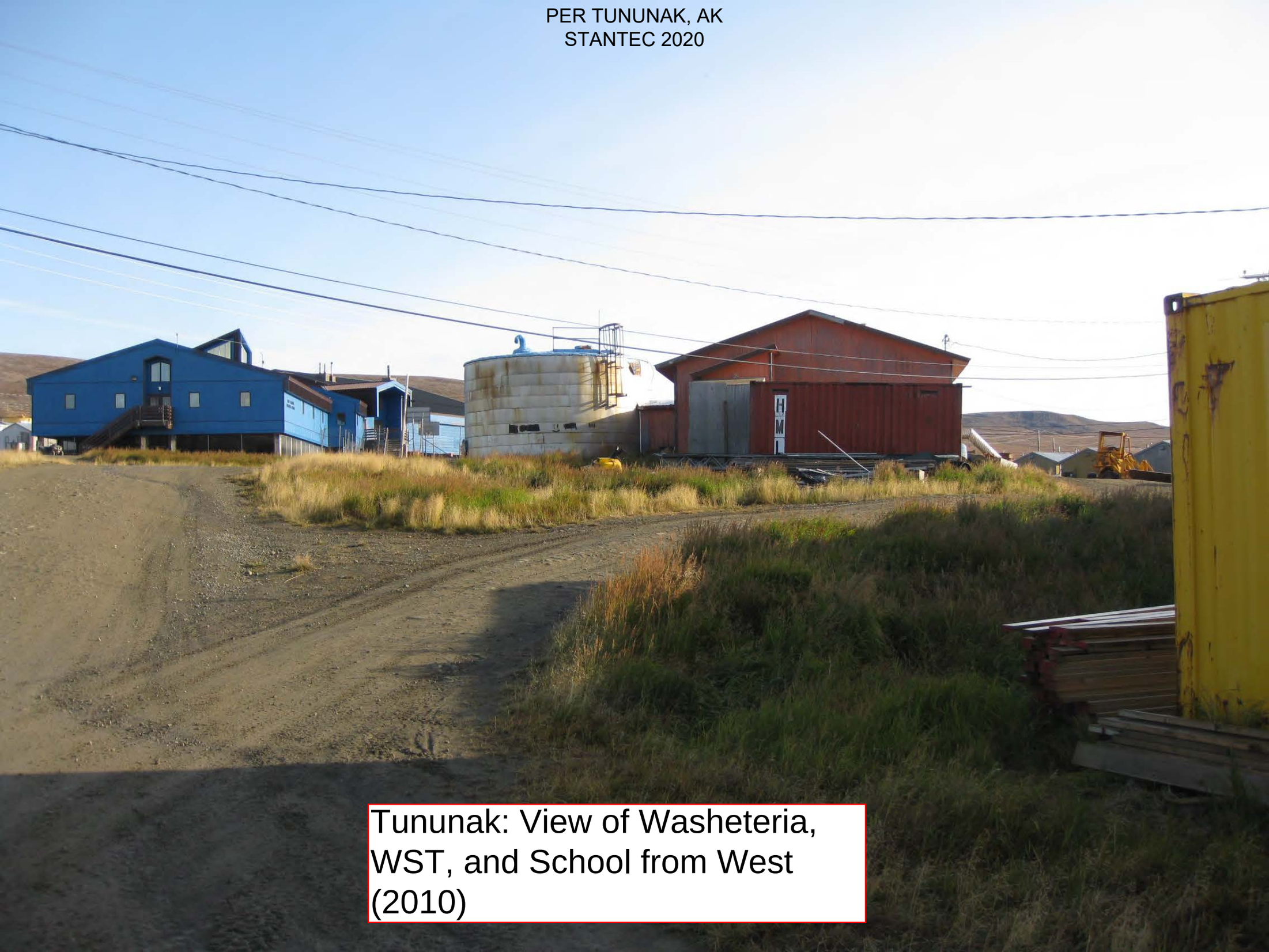


Tununak Washeteria. Speed Queen Multi-housing commercial dryer bought with assistance from AVCP.

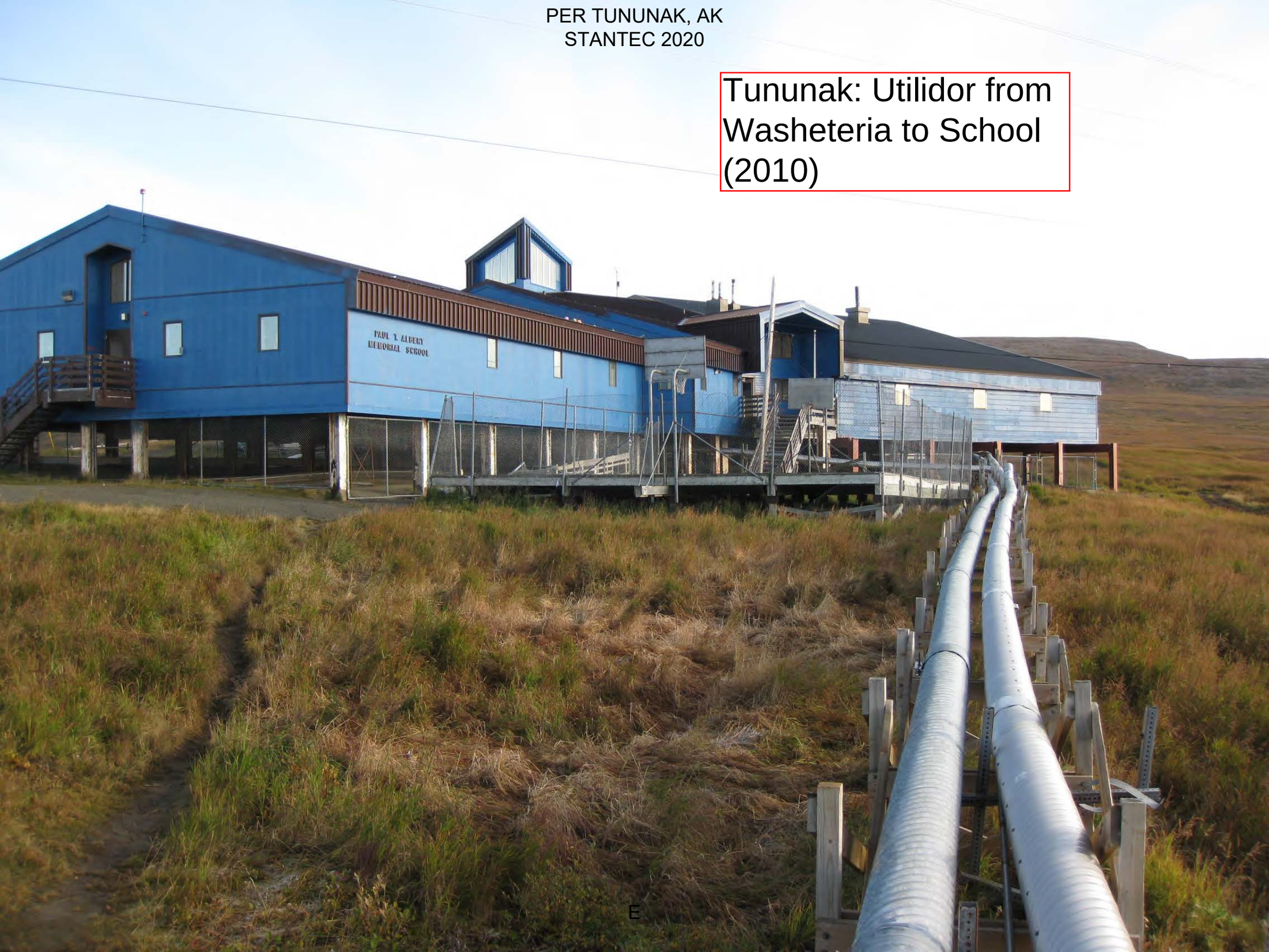


Tununak Washeteria - laundry equipment, table, carts, and chair.

PER TUNUNAK, AK
STANTEC 2020



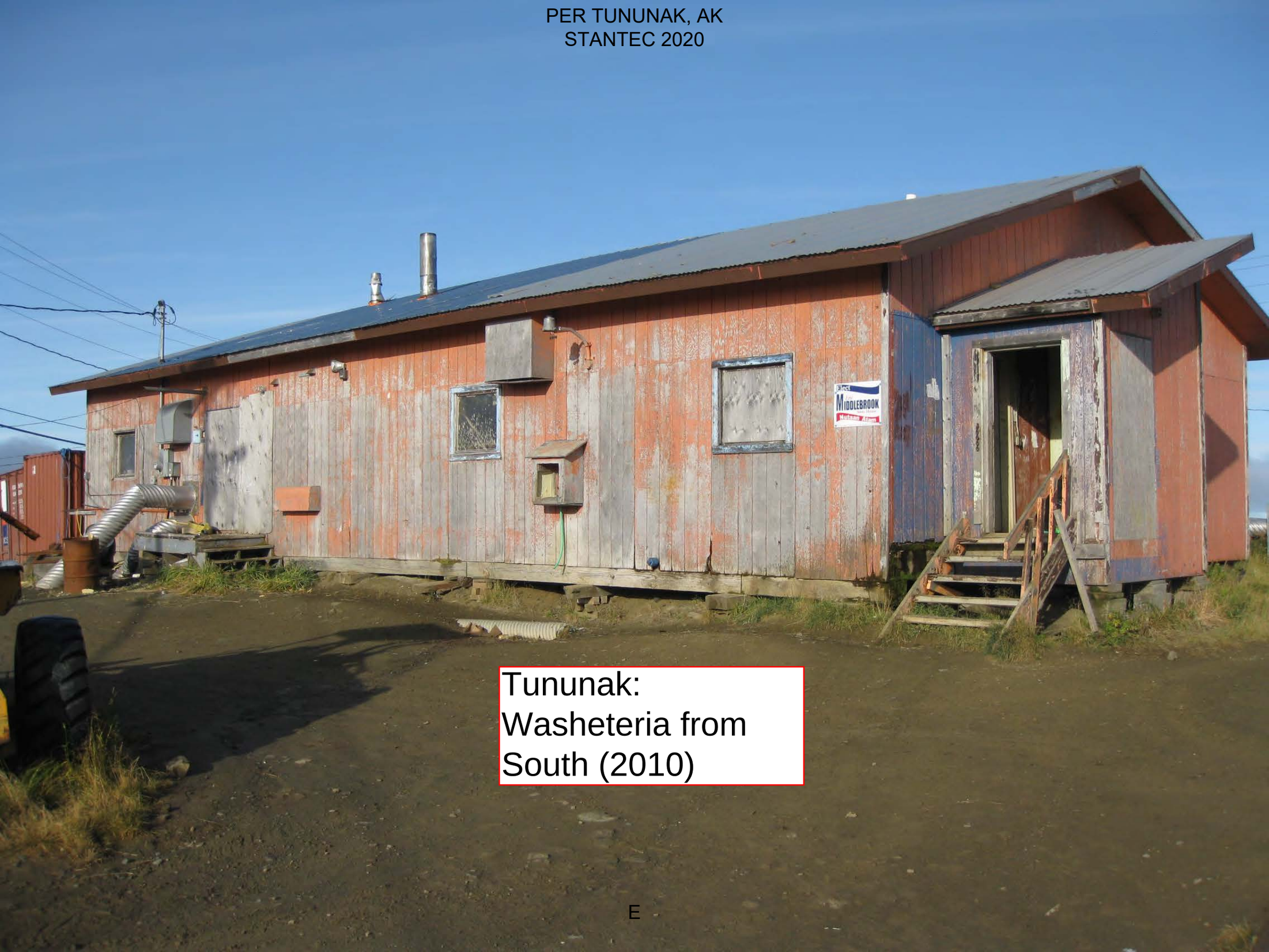
Tununak: View of Washeteria, WST, and School from West (2010)



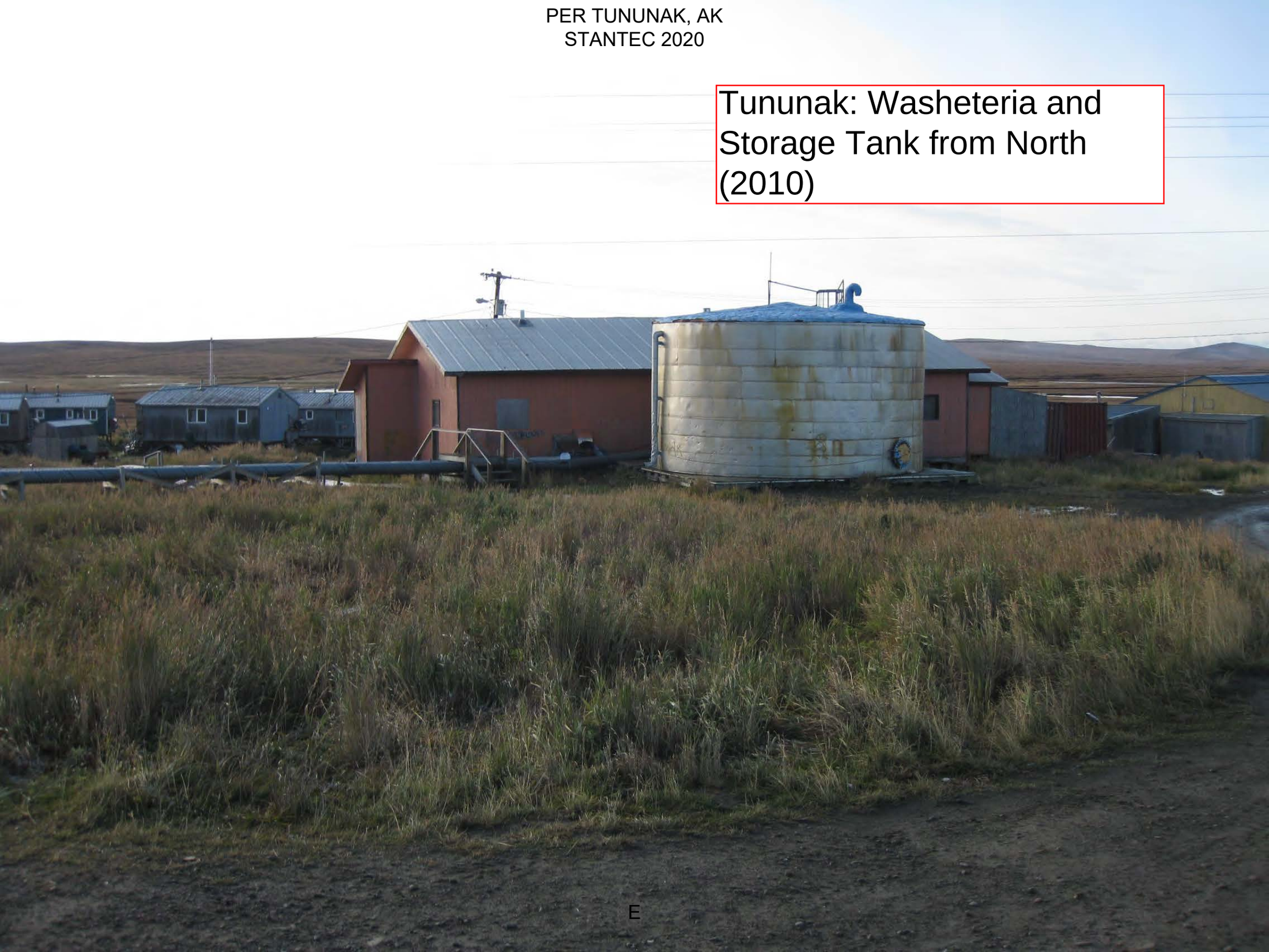
Tununak: Utilidor from Washeteria to School (2010)

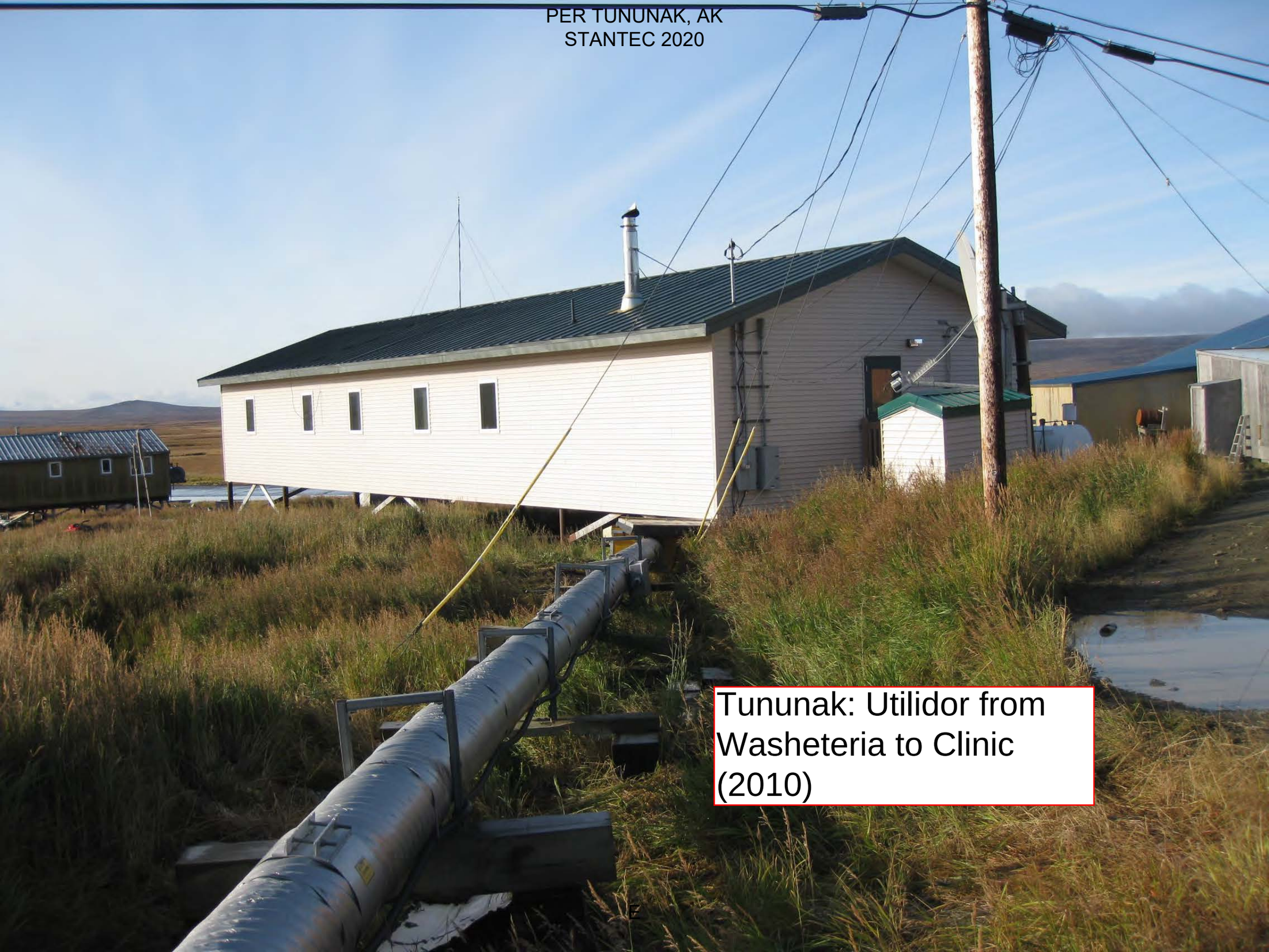


Tununak: Aerial from West (2010)



Tununak: Washeteria from South (2010)


Tununak: Washeteria and Storage Tank from North (2010)



Tununak: Utilidor from Washeteria to Clinic (2010)

PER TUNUNAK, AK
STANTEC 2020

Tununak: Utilidor from Washeteria to School (2010)



E

PER TUNUNAK, AK
STANTEC 2020



Tununak: Aerial from West (2010)

E

PER TUNUNAK, AK
STANTEC 2020



Tununak: Washeteria from South (2010)

E

PER TUNUNAK, AK
STANTEC 2020



PER TUNUNAK, AK
STANTEC 2020



Tununak: Utilidor from Washeteria to Clinic (2010)