Big Eddy Drainage

Drainage Report

Prepared for:

By

Date Prepared: 5/4/2024

Revised 6/12/24

KENAI PENINSULA BOROUGH
DRAINAGE REPORT

This is a planning document. Nothing herein constitutes a commitment by the Kenai Peninsula Borough to construct any project, study any area, acquire any right of way or enter into any contract. This drainage report does not obligate the Kenai Peninsula Borough in any way.

Drainage facility alignments, conveyance treatments, corridors, locations, rights-of-way and cost estimates are conceptual only, and may be altered or revised based upon future project analysis, changed circumstances or otherwise. This document does not provide adequate detail for construction.

Land uses included in this document were assumed for the basis of hydrologic analysis only.

By:_____ Date: 5/4/2024
Blake Larson, P.E.

Table of Contents

APPENDICES

ACRONYMS, ABBREVIATIONS AND DEFINITIONS

AF	Acre – Foot. Volumetric measure that covers one acre one foot deep – 43,560 cubic feet.
CFS	Cubic feet per second
CHDPE	Corrugate High Density Polyethylene
GIS	Geographical Information System
HEA	Homer Electric Association
LID	Low Impact Development
ROW	Right-of-way

Purpose:

This report develops drainage concepts for localized drainage issues along Greenridge St, located in Soldotna, Alaska. This plan was requested by the Kenai Peninsula Borough (KPB) due to on-going subsurface and surface drainage issues along Greenridge St, such as basement flooding, ground saturation, erosion, and heaving. The KPB desires to develop a plan to convey surface water and ground water to minimize impacts on properties along Greenridge St.

Drainage Management Options:

Evaluate, select and implement the following drainage management options.

Option #1 – Storm Water Diversion Along North Kobuk St:
Construct berm along the North East property line of Parcel # 05710007. There is an existing storm water spillway located on the Wet side of North Kobuk St. There is very little evidence that the spillway conveys surface water, however in the interest of storm water control it is recommended to abandon the spillway and contain storm water runoff from the roadways within the existing ditches. The most efficient way to mitigate this storm water potential is to construct an earthen berm over the spillway.

Option #2 – Surface Drainage Ditch/Swale:
Construct vegetated drainage swale from Parcel #05710007 towards the existing drainage swale to the North of Big Eddy Road. The existing 24” diameter culvert located along Big Eddy Road will need to be replaced, as the South end of the culvert is significantly lower than the north end. The culvert replacement will require excavation and backfill within the Big Eddy Road.

Option #3 – Do Nothing

1.0 INTRODUCTION

This report has been prepared to present the results of the surface drainage investigation performed near Parcel # 05710007, North Kobuk Street and Greenridge Street. Larson Engineering & Design (LED) evaluated surface conditions across the site to aid in the design recommendations for subsurface drainage and storm water collection facilities.

Results of this report are for planning purposes.

2.0 SITE DESCRIPTION

The site is located in Soldotna, Alaska near Parcel # 05710007 bound to the east by North Kobuk Street, an Alaska Pipeline easement to the North, Enzler Subdivision Greenridge Addition to the West, and Spruce Ave. to the South, see **Sheet 3 of the Plans**. Parcel #05710007 is currently an active gravel mining site.

The developed property, up-gradient from Parcel# 05710007, consists of North Kobuk Street and residential housing. The north Kobuk Street right way is approximately 1 acre in area and the developed residential properties to the East of North Kobuk are approximately 3.3 acres in size.

3.0 CLIMATE

The Soldotna area is located in the Transitional to Maritime climate zone typical of lower Cook Inlet. The following climate summary is from maps in the Environmental Atlas of Alaska by Johnson and Phillips, 1978.

Climatic Data for Soldotna

Mean Annual Temperature	33° F.
Average Thawing Index	2900 F. - days
Average Freezing Index	900 F. - days
Design Thawing Index	3800 F. - days
Design Freezing Index	2200 F. - days

Prevailing wind direction in the summer months is from the southwest. In winter, the winds are usually from the northeast to north.

Precipitation Data:
The following precipitation data is from Table 1, Page 2, “Soil Survey of Kenai-Kasilof Area, Alaska” USDA and NRCS.
Homer Alaska Airport Data collected from 1971 - 2000

Month	Average Precipitation (Inches)	Average Snow (Inches)
January	.91	13
February	.91	10.8
March	.92	9.9
April	.79	5.2
May	.79	1.3
June	1.10	0.0
July	2.24	0.0
August	3.14	0.0
September	3.31	0.0
October	2.1	2.7
November	1.62	8.6
December	1.10	14.8
Total	**18.93**	**66.3**

Frost penetration depth in the vicinity of this project site is up to six (6) feet below grade.

4.0 CRITERIA AND ASSUMPTIONS

The criteria and assumptions used for this study include:

- During times of high-water/flooding, properties along Greenridge Street have been inundated with water. It is assumed that this water is comprised of ground water percolating to the surface.
- Improvements made along North Kobuk Street and adjoining residential properties to the east have contributed to excessive storm water run-off on to Parcel #05710007 and flowing to the east contributing the high water along Greenridge Street.

5.0 EXISTING SUBSURFACE CONDITIONS

Observations of subsurface drainage conditions were made during the onsite investigation by reviewing archived photos of parcel #05710007, and elevation surveys of existing daylighted groundwater. The elevations of exposed groundwater stair step from approximately 32' elevation to 53' elevation towards the East side of parcel #05710007. Subsurface groundwater flows from the East to the West of the site.

Subsurface soils, within this area of Soldotna, generally consist of 6 inches or organics overlaying 2.0 to 3.0 feet of brown silt. Below the silt layer is porous well graded gravel down to an unknown elevation below water table.

Toward the east property line of the gravel pit, there appeared to be ground water spring day-lighting at approximately 52.78' of elevation. That spring flowed into a holding pond at 51.28', which in turn flows into the western most settling pond with a surface elevation of 47.78'.

6.0 EXISTING SURFACE DRAINAGE CONDITIONS

Parcel # 05710007: consists of vegetated surfaces, ground water ponds, and exposed free draining gravels and sands. Based off of the surface conditions, it is anticipates that the majority of storm water collected onsite gets directed to the ponds or percolates into the soils.

North Kobuk Street: Consists of a 22' wide paved surface with roadside ditches consisting of gravels and native vegetation. Do to the hardened surface of North Kobuk street, 85% of all storm water runs off to roadside ditches.

Residential Developments along North Kobuk Street: Consist of single or multi-family homes ranging in size from 1,000 SF to 4,000 SF, with gravel or paved driveways and site landscaping. The residential development is approximately 3.3 acres along North Kobuk St, and has an estimated average run-off coefficient of 20%.

Utilizing the Rational Method for calculating the peak discharge from the above drainage areas, the total volume of storm water discharged from North Kobuk Street and adjoining residential lots 266 gallons per minute or 2,113 cubic feet per hour. The drainage areas utilized for the Rational Method calculation are shown on **Sheet 3** of the attached plans.

7.0 ENGINEERING CONCLUSIONS

Based on site investigations, it appears that North Kobuk St storm water run-off or run-off from adjoining residential developments would have very little, if any effect on flooding of Greenridge Street towards the West. When I investigated Greenridge Street during a fall high water event of the Kenai River, I noticed exposed ground water was flowing, from a pond located to the East, into the Greenridge roadside ditches. The contributing water was not localized storm water, however it was water percolating up from the ground.

As the ground water travels from East to West throughout the Soldotna area, it follows a natural gradient from the Hills to the East and the Kenai River to the West. The area along Greenridge Street has an elevation of approximately 36' above sea level. The Poacher's cove area of the Kenai river typically has a bank full water elevation of 34' to 30' feet above sea level.

It appears that when the Kenai River experiences near flooding water elevations, the entire Poachers cove area inundates with shallow ground water, as the river water percolated into the porous surrounding soils. Groundwater flowing from the Hills to the East has nowhere to go and compounds the effect of the Kenai river saturation of ground water, therefore acting like an artesian well and inundating the low lying areas.

I my professional opinion, there is very little the KPB can do about shallow ground water occurring near the Kenai River during high water events, however there are a few options to

mitigate storm water potentially entering Parcel # 05710007 as described within the attached plan.

During my numerous site observations of North Kobuk Street during the 2023 season, I never witnessed standing water within the roadside ditches. The existing porous ditches allow storm water to percolate at a faster rate than the incoming drainage.

APPENDIX A

FIGURES

Larson Engineering & Design
53510 Veco Ave. Kenai, AK 99611
Ph: (907) 283-1565 – Fax: (907) 283-1566

Picture 1:

Spillway located adjacent to North Kobuk.

Picture 2:

Standing water along Greenridge Street.

Picture 3:

Water Discharge from pond to the East of Greenridge Street.

APPENDIX B
CALCULATIONS

Larson Engineering & Design
53510 Veco Ave. Kenai, AK 99611
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10YR - 3HR STORM WATER RUNOFF CALCULATION

North Kobuk Street Drainage Area

Existing Site Run-off:

Drainage Area	Runoff Coefficient (C)	Rain Fall Intensity (I) (inches/hour)	Area (A) square feet	Area (A) (acres)	Flow (Q) (ft^3/sec)
DA1 (N Kobuk St)	0.85	0.33	26262	0.603	0.169
DA2 (Developed Lots East of N Kobuk - Grass)	0.20	0.33	144131	3.309	0.218
Lot A (Total area)			**170393**	**3.912**	
	North Kobuk	**Q=**		**0.387**	**ft^3/sec**
		V=		**175.766**	**gpm**

Where (**Q**) is the total peak runoff flow expressed in ft^3/sec
and (**A**) is the drainage area expressed in (acres)
and (**V**) is the total peak hourly volume expressed in gallons per minute (gpm)

10YR RAINFALL - Soldotna, AK

DURATION (Hours)	INCHES	INTENSITY (in/hr)
1	0.55	0.55
2	0.75	0.38
3	1	0.33
6	1.45	0.24
12	1.9	0.16
24	2.4	0.10

50YR - 3HR STORM WATER RUNOFF CALCULATION

North Kobuk Street Drainage Area

Existing Site Run-off:

Drainage Area	Runoff Coefficient (C)	Rain Fall Intensity (I) (inches/hour)	Area (A) square feet	Area (A) (acres)	Flow (Q) (ft^3/sec)
DA1 (N Kobuk St)	0.85	0.50	26262	0.603	0.256
DA2 (Developed Lots East of N Kobuk - Grass)	0.20	0.50	144131	3.309	0.331
Lot A (Total area)			**170393**	**3.912**	
	North Kobuk	**Q=**		**0.587**	**ft^3/sec**
		V=		**266.312**	**gpm**

Where (**Q**) is the total peak runoff flow expressed in ft^3/sec
and (**A**) is the drainage area expressed in (acres)
and (**V**) is the total peak hourly volume expressed in gallons per minute (gpm)

50YR RAINFALL - Soldotna, AK

DURATION (Hours)	INCHES	INTENSITY (in/hr)
1	0.7	0.70
2	1	0.50
3	1.5	0.50
6	2	0.33
12	2.9	0.24
24	3.4	0.14

100YR - 3HR STORM WATER RUNOFF CALCULATION

North Kobuk Street Drainage Area

Existing Site Run-off:

Drainage Area	Runoff Coefficient (C)	Rain Fall Intensity (I) (inches/hour)	Area (A) square feet	Area (A) (acres)	Flow (Q) (ft^3/sec)
DA1 (N Kobuk St)	0.85	0.53	26262	0.940	0.426
DA2 (Developed Lots East of N Kobuk - Grass)	0.20	0.53	144131	3.309	0.353
Lot A (Total area)			**170393**	**3.912**	
	North Kobuk	**Q=**		**0.779**	**ft^3/sec**
		V=		**353.387**	**gpm**

Where (**Q**) is the total peak runoff flow expressed in ft^3/sec
and (**A**) is the drainage area expressed in (acres)
and (**V**) is the total peak hourly volume expressed in gallons per minute (gpm)

100YR RAINFALL - Soldotna, AK

DURATION (Hours)	INCHES	INTENSITY (in/hr)
1	0.78	0.78
2	1.25	0.63
3	1.6	0.53
6	2.5	0.42
12	3.1	0.26
24	3.8	0.16