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Technical Memorandum

To: Kittitas County

From: Dan Ireland, PE

Date: 10/06/2021

Project: Vantage Culvert Design

Subject: Existing Culvert Capacity Memo

Introduction

IHM Investments LLC is proposing to fill in the existing coulee located on the subject property. This memorandum was prepared to discuss the existing culverts and drainage ditch on the proposed property on Parcel 930993. There are two 36" concrete culverts underneath Wayne Street that daylight onto the parcel in the northwest corner and flow in the existing ditch to a 72" metal culvert at the southwest corner of the parcel. This 72" metal culvert's outlet is in Parcel 352933 which is also a part of the proposed development area.

To prepare these lots, the developer would like to connect the two 36" culverts to the 72" culvert downstream with the installation of catch basin and 72" culvert.

Culvert Capacity

Per the County's request, a pipe capacity analysis has been performed to ensure that the proposed improvements will not have any adverse upstream or downstream effects. For the pipe capacity calculations, SCJ assumes there is no current drainage, flooding, or other known issues on the site that would indicate the current system is failing.

The culverts are named A, B, C and D and their locations are shown in Figure 1. The culvert information along with their capacities are in Table 1, the calculations are attached in the appendix.

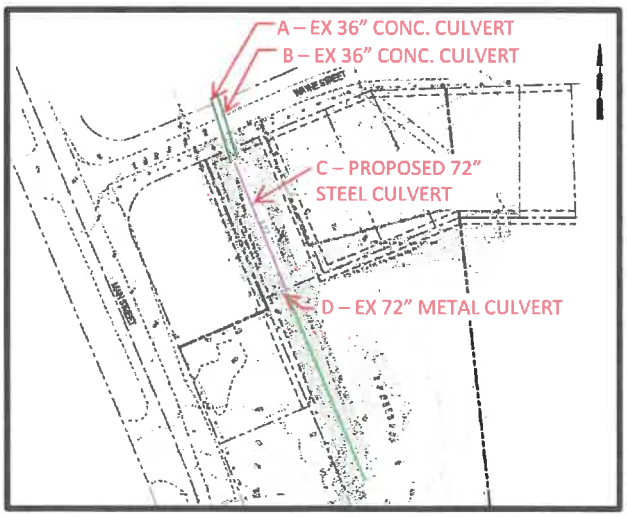

Figure 1 –Culvert Locations, NTS

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Table 1 –Culvert Information

CULVERT NAME	CULVERT SIZE (IN.)	INLET IE	OUTLET IE	SLOPE (%)	PIPE CAPACITY (CFS)
A	EX 36	644.89	643.04	2.33	125.99
B	EX 36	644.89*	642.84	2.56	120.34
C	72	640.14	636.23.	2.30	379.51
D	EX 72	636.23	630.11	2.30	379.36

*Assumed elevation – not given on survey. On a site visit it was visually verified to be at the same elevation as Culvert A.

The combined capacity of existing Culverts A and B is 246.19 cfs. The proposed downstream Culvert C has a capacity of 379.53 cfs, 133.34 cfs more than the upstream pipes.

Conclusion

The proposed pipe capacity exceeds the existing flow capacity. Currently there are no conveyance issues, therefore we do not anticipate any negative impacts with replacing the ditch with the 72" culvert.

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Appendix 1
SSA Analysis

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
A	1 Link-01	61.06	644.89	644.89	643.33	643.33	1.56	2.5500	CIRCULAR	36.000	36.000	0.0110	0.0000	0.0000	0.0000	0.00	No
B	2 Link-02	61.35	644.89	644.89	643.46	643.46	1.43	2.3300	CIRCULAR	36.000	36.000	0.0110	0.0000	0.0000	0.0000	0.00	No
	3 Link-03	9.00	643.36	643.36	643.23	643.23	0.13	1.4400	CIRCULAR	36.000	36.000	0.0110	0.5000	0.5000	0.0000	0.00	No
	4 Link-04	9.00	643.23	643.23	643.01	643.01	0.22	2.4400	CIRCULAR	36.000	36.000	0.0110	0.5000	0.5000	0.0000	0.00	No
C	5 Link-05	170.02	640.14	640.14	636.23	636.23	3.91	2.3000	CIRCULAR	72.000	72.000	0.0220	0.0000	0.0000	0.0000	0.00	No
D	6 Link-06	266.33	636.23	636.23	630.11	630.11	6.12	2.3000	CIRCULAR	72.000	72.000	0.0220	0.0000	0.0000	0.0000	0.00	No

No. of Barrels
1
1
1
1
1
1

Pipe Results

	SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
A	1	Link-01	0.00	0 00:00	125.99	0.00	0.00		0.00	0.00	0.00		Calculated
B	2	Link-02	0.00	0 00:00	120.34	0.00	0.00		0.00	0.00	0.00		Calculated
	3	Link-03	0.00	0 00:00	94.74	0.00	0.00		0.00	0.00	0.00		Calculated
	4	Link-04	0.00	0 00:00	123.24	0.00	0.00		0.00	0.00	0.00		Calculated
C	5	Link-05	0.00	0 00:00	379.51	0.00	0.00		0.00	0.00	0.00		Calculated
D	6	Link-06	0.00	0 00:00	379.36	0.00	0.00		0.00	0.00	0.00		Calculated