Aspect consulting
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WATER QUANTITY AND QUALITY REPORT
Foothills Subarea

Prepared for: Whatcom County Planning & Development Services

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Flows in Kendall Creek, particularly during the low flow period, still may be significantly impacted depending on the timing of groundwater withdrawals and natural groundwater contributions to the stream. A quantitative groundwater model could be developed for the Columbia Valley/Kendall UGA to evaluate if and when impacts to Kendall Creek flows would occur and assist in the design of infiltration facilities to maintain baseflow in the stream.

Water Quality

The most significant risk to surface water quality under all three Alternatives is the introduction of stormwater pollutants to surface waters or groundwater through infiltration. These impacts are most likely to occur in the area of most intense development, the Columbia Valley/Kendall UGA under Alternatives 1 and 2. These impacts could be mitigated effectively and reasonably by implementing LID strategies and/or runoff treatment prior to infiltration consistent with state and county regulations. More rigorous runoff treatment is recommended prior to infiltration in Critical Aquifer Recharge Areas and within ¼ mile of sensitive lakes. Additionally, new infiltration facilities should not be permitted within the 1-year time of travel of wellhead protection areas, or in high groundwater hazard areas.

Other possible impacts to surface water quality include elevated water temperatures and sediment in streams near development. These impacts could be mitigated effectively and reasonably by the compliance with Whatcom County Code (WCC) 16.16 which establishes protective buffers of natural vegetation around streams. Protective buffers should also be implemented along all perennial tributaries to streams and rivers for the mitigation to be most effective.

Groundwater withdrawals in the Columbia Valley/Kendall UGA also have the potential to decrease streamflow in Kendall Creek and subsequently increase water temperature. As previously discussed, mitigation measures for the reduction of Kendall Creek flows could require a quantitative groundwater model to design stormwater facilities to maintain baseflows and low water temperatures in the creek.

Modeling of new non-sewered dwellings in the Paradise Lakes subdivision in the Columbia Valley/Kendall UGA predicts additional nitrate loading slightly exceeds state groundwater quality standards. A nitrate increase close to the allowable state standard is predicted for the WCWD #13 drainfield. This potential for nitrate increases should monitored. If monitoring indicates nitrate levels are likely to exceed state water quality standards, they could be effectively mitigated by providing sewer service to unsewered homes, by requiring enhanced nitrate removal (e.g., recirculating gravel filters) for the new on-site septic systems, or reducing density. Nitrate loading in the subarea outside the Columbia Valley/Kendall UGA has the potential to exceed groundwater quality standards, depending on the final development layout.

Public Stormwater Facilities

There are no significant impacts to existing stormwater facilities under any of the Alternatives analyzed. Historically, stormwater has been managed informally throughout the Foothills Subarea. In the Columbia Valley/Kendall UGA coarse soils allow for ready

infiltration of stormwater and there are no existing public stormwater flow control facilities (e.g., detention/retention or infiltration ponds) or water quality treatment facilities. Limited conveyance features (e.g., culverts and ditches) are present in the county and state road rights-of-way. Since most, if not all, proposed development in the subarea will be private, additional pressure on these existing features should be minimal. It is not anticipated that any programs or capital facility improvements will be needed in the subarea over the 6- and 20-year planning periods.

Table 2.13 Well Head Protection Areas Having Potential Sources of Contamination[69]

System Name	Source Name	Source Susceptibility Rating	Protection Type in Time of Travel (TOT)	Potential Contaminant Source Name	Potential Contaminant Source Type
Columbia Valley/Kendall UGA					
Evergreen Water-Sewer District #19	Well #2	Moderate	6-Month	Starvin Sams Mini Mart 5	Underground Storage Tank
	Well #3	Low	10-Year	Starvin Sams Mini Mart 5	Underground Storage Tank
	Well #3	Low	10-Year	Lehigh Northwest Cement Co Sumas	Industrial NPDES Permit
	Well #3	Low	10-Year	Lehigh Northwest Cement Co Sumas	Underground Storage Tank
Whatcom County Water District #13	Well #1	Moderate	1-Year	Starvin Sams Mini Mart 5	Underground Storage Tank
	Well #1	Moderate	5-Year	Whatcom Cnty Blue Bird Pit	Industrial NPDES Permit
	Well #1	Moderate	5-Year	Lehigh Northwest Cement Co Sumas	Industrial NPDES Permit
	Well #1	Moderate	5-Year	Lehigh Northwest Cement Co Sumas	Underground Storage Tank
Rest of the Subarea					
Maple FALLS Water Coop	Well #1	Moderate	6-Month	Maple Fuels Wash A Ton	Underground Storage Tank
	Well #1	Moderate	6-Month	Yorkston Oil Co Inc	Underground Storage Tank
	Well #1	Moderate	6-Month	Frosty Inn	Underground Storage Tank
	Well #1	Moderate	6-Month	Maple Falls Elementary School	Underground Storage Tank
	Well #1	Moderate	6-Month	Frosty Inn	LUST Facility
	Well #1	Moderate	6-Month	Maple Falls Elementary School	Voluntary Cleanup Sites
	Well #1	Moderate	6-Month	Maple Falls Elementary School	State Cleanup Site
	Well #1	Moderate	5-Year	Wa Dot Maple Falls Maint Facility Site	Emergency/Haz Chem Rpt TIER2
	Well #1	Moderate	5-Year	Wa Dot Maple Falls Maint Facility Site	Hazardous Waste Generator
	Well #1	Moderate	5-Year	Wa Dot Maple Falls Maint Facility Site	Underground Storage Tank
	Well #2	Unknown / High	Assigned	Maple Fuels Wash A Ton	Underground Storage Tank
	Well #2	Unknown / High	Assigned	Yorkston Oil Co Inc	Underground Storage Tank
	Well #2	Unknown / High	Assigned	Frosty Inn	Underground Storage Tank
	Well #2	Unknown / High	Assigned	Maple Falls Elementary School	State Cleanup Site
	Well #2	Unknown / High	Assigned	Maple Falls Elementary School	Voluntary Cleanup Sites
	Well #2	Unknown / High	Assigned	Frosty Inn	LUST Facility
	Well #2	Unknown / High	Assigned	Maple Falls Elementary School	Underground Storage Tank
North Fork Water System	Well	Unknown / High	Assigned	Paisano Pizza	Underground Storage Tank
	Well	Unknown / High	Assigned	Paisano Pizza	LUST Facility
Mount Baker School District-Deming	Well #1	Low	5-Year	Mt Baker School Dist 507	Hazardous Waste Generator

2.3 Public Stormwater Facilities

Stormwater management in the Foothills Subarea is currently informal, with limited public stormwater infrastructure. There are no public flow control facilities (infiltration or

detention ponds) or runoff treatment facilities in the subarea. Whatcom County maintains a simple conveyance network along County roads throughout the subarea. The conveyance system typically consists of shallow, vegetated roadside ditches, and small approach and driveway cross culverts, with larger culverts crossing under the main road as necessary. The Washington State Department of Transportation (WSDOT) maintains a similar conveyance system along state highways.

Two inventories of the public stormwater facilities within the Columbia Valley/Kendall UGA have been performed recently:

- Whatcom County inventoried stormwater conveyance features along County roads within the Paradise Lakes subdivision.[70]
- Aspect Consulting inventoried stormwater facilities for portions of State Route (SR) 542 (Mount Baker Highway) and SR 547 (Kendall Road) in May 2008.

Whatcom County's inventory identified 772 culverts in the County right-of-way in the Columbia Valley/Kendall UGA. These culverts are summarized in Table 2.14, and shown on Figure 2.6. The vast majority of culverts inventoried were 12-inch driveway cross culverts located in the Paradise Lakes subdivision. All but four culverts inventoried were in good condition. Three ditch sections were also inventoried by the County. Two of these ditches are located along Limestone Road at the northern boundary of the UGA, and the other ditch is located along Eason Road west of Kendall School near the southern boundary of the UGA. The culverts inventoried in the UGA were typically noted as flowing into and from road side ditches, although the ditch network within the residential subdivisions was not specifically inventoried. Drainage features located along private roadways, such as in the majority of the Paradise Lakes and Campers Paradise subdivisions, were also not inventoried.

Table 2.14 Inventoried Culverts in the County Right-of-Way in the Columbia Valley/Kendall UGA

Type of Culvert	Diameter Size in Inches	Number of Culverts	Material	Length	Condition
Driveway Cross Culvert	8	6	Iron, HDPE, Concrete	20 FT	Good
Driveway Cross Culvert	10	3	Plastic, HDPE	15 - 40 FT	Good
Driveway Cross Culvert	12	750	CMP, Concrete, HDPE	15 - 100 FT	Good
Driveway Cross Culvert	12	4	Concrete, HDPE	20-25 FT	Needs Repair
Driveway Cross Culvert	15	1	HDPE	20 FT	Good
Driveway Cross Culvert	18	1	HDPE	20 FT	Good
Driveway Cross Culvert	36	1	CMP	20 FT	Good
Storm Conveyance	12	6	Concrete, HDPE	6-20 FT	Good

Aspect Consulting's inventory identified eight culverts and three bridges in the WSDOT right-of-way. Culverts are listed in Table 2.15 and bridges in Table 2.16. There were very few culverts under or adjacent to the state highways in and around the Columbia Valley. Approach and driveway cross culverts were not common, and the three inventoried were either damaged or plugged. Two of the bridges spanned Kendall Creek and the third was located on SR 542 over an unnamed tributary to Kendall Creek. All three bridges were relatively low with 1.5 to 2.8 feet of freeboard between the top of the water surface to the bottom of the bridge beams on the day of the inventory.

Table 2.15 Inventoried Culverts in the WSDOT Right-of-Way near the Columbia Valley UGA

Culvert ID	Material	Diameter Size in Inches	Type	Length	Longitude	Latitude	Flow Direction	Condition
C1	HDPE	12	Driveway Cross Culvert	30 FT	122.156512	48.955189	South	Inlet almost completely plugged, outlet buried
C2	Concrete	12	SR 547 Culvert	40 FT	122.154392	48.951488	West	Good
C3	Concrete	12	SR 547 Culvert	40 FT	122.155210	48.953078	West	Good
C4	CMP	12	Driveway Cross Culvert	30 FT	122.156642	48.955697	South	Inlet crushed, outlet buried
C5	Concrete	12	SR 547 Culvert	40 FT	122.151953	48.946703	West	Good
C6	Concrete	12	SR 547 Culvert	40 FT	122.150998	48.945033	West	Good
C7	Concrete	18	Approach Cross Culvert	210 FT	122.147600	48.938418	South	Inlet 1/2 plugged, outlet 3/4 plugged
C8	Plastic	12	SR 547 Culvert	60 FT	122.141729	48.917228	North	Good

Table 2.16 Inventoried Bridges in the WSDOT Right-of-Way near the Columbia Valley

Bridge ID	Description	Longitude	Latitude	Span in feet	Height from Water Surface in feet
BR1	SR 542 at Kendall Creek	122.140628	48.905124	89.3	2.8
BR2	SR 542 at Kendall Creek tributary	122.137820	48.913493	17.3	2
BR3	SR 547 at Kendall Creek	122.143537	48.933870	18.8	1.5

The inventory also included catch basins and roadside ditches. There was a single catch basin identified. It is located in the WSDOT SR 547 right-of-way located near the entrance to Kendall Elementary. The catch basin collects road runoff and stormwater from culvert C8 and discharges it to the west, presumably to an outfall on the west side of Eason Road, although the outlet could not be located.

Roadside ditches were also intermittent and, where present, were typically shallow and vegetated. The ditches appeared to be designed to collect and infiltrate road runoff rather than convey it any significant distance.

Table 3.8 Nitrate Loading Analysis

Symbol	Description	units	Alternative 1[1]		3DU/AC Density[2]
			Paradise Div 1-6 (south part of PD)	Paradise Div 7-8 (north part of PD)	
Ad	Area of drainfield	ft^2	117,000	181,000	3,000
R	Precipitation recharge	in/yr	34.0	34.0	33
Vr	Volume rate of Precipitation Recharge	gpd	6793	10510	169
Nr	Nitrogen concentration in precipitation	mg/L	0.24	0.24	0.24
d	Denitrification rate in aquifer		10%	10%	10%
n	Number of homes		117	181	3
w	Septic waste generated per household	gpd	113	113	113
Vw	Volume rate of septic waste discharge	gpd	13,221	20,453	339
Ns	Nitrate concentration in septic waste inflows	mg/L	60	60	60
D	Denitrification rate in septic system		0%	0%	0%
Nw	Nitrate concentration in septic waste discharge	mg/L	60	60	60
V1	Total infiltration from drainfield area	gpd	20,014	30,963	508
N1	Total nitrogen concentration from drainfield area	mg/L	35.8	35.8	36.1
K	Hydraulic conductivity of aquifer	ft/d	500	500	500
i	Hydraulic gradient of aquifer	ft/ft	0.002	0.002	0.002
b	Thickness of mixing zone in aquifer	ft	20.0	20.0	20.0
Wa	Width of aquifer that mixes with drainfield	ft	2,444	2,666	206
Q	Aquifer discharge	gpd	402,185	438,717	33,949
Nb	Nitrate concentration - background	mg/L	4.1	4.1	0.6
Ngw	Downgradient nitrate concentration in the aquifer	mg/L	5.6	6.2	1.11
	Increase over background	mg/L	1.5	2.1	0.5

[1]The model parameters and results are only shown for Alternative 1. The results for Alternatives 2 and 3 are the same as Alternative 1.

[2]Model shows expected loading for a single, generic 1-acre parcel. Final configuration of lots may lead to higher nitrate loading. Precipitation recharge from Utah State University, 2001a, p. 30.

3.3 Public Stormwater Facilities

Public stormwater facilities in the Foothills Subarea are currently limited to conveyances along public rights-of-way. These facilities appear to function adequately for conveying, and/or infiltrating stormwater flows under existing conditions.

The development that would occur under all Alternatives is primarily located on private property and would require development of private stormwater facilities. Private development could impact public stormwater facilities either by discharging to a public stormwater conveyance system with inadequate capacity, or by discharging to a stream such that flows increase sufficiently to require changing the capacity of a public bridge or culvert. These impacts are unlikely to occur in the Columbia Valley/Kendall UGA because the coarse outwash will favor infiltration for stormwater management, and stormwater management regulations hold developers responsible for not increasing peak flows or negatively impacting downstream conveyances.

No new public facilities are anticipated to be required under any of the Alternatives. No significant impacts to public stormwater facilities are anticipated under any of the Alternatives.