

Appendix C

Employment-Induced Water Demand Analysis



Employment-Induced Water Demand Analysis MountainStar MPR and Cle Elum UGA

Trendwest Properties: Cle Elum UGA Final EIS

Prepared by:

**Shapiro and Associates, Inc.
Brown & Caldwell
Johnson-Gardner, LLC
Mentor Law Group, PLLC**

March 18, 2002

Introduction

The primary purpose of this report is to evaluate potential impacts on groundwater quantity resulting from direct and indirect employment impacts associated with development of the MountainStar Master Planned Resort (MPR) and the Cle Elum Urban Growth Area (UGA). The report also identifies potential water supply impacts to incorporated areas. The scope of this technical report includes Trendwest induced employment as well as employment generated by development of the City of Cle Elum Business Park. The analysis does the following:

- Estimates direct and indirect employment in-migration and households associated with Trendwest development in the MPR and Cle Elum UGA;
- Describes the method used for distributing in-migrant households within incorporated and unincorporated Kittitas County;
- Distributes in-migrant households in unincorporated Kittitas County within subbasins of the Yakima River;
- Estimates the quantity of consumptive groundwater use associated with in-migrant households in unincorporated areas on an average annual and seasonal basis;
- Estimates the water demand associated with in-migrant households in incorporated areas;
- Compares the estimated per basin consumption from in-migrant households in unincorporated areas with average annual baseflows of those basins to evaluate the potential impact on stream baseflows; and
- Compares water demand estimates for incorporated jurisdictions to the jurisdiction's available water rights and current water demand.

Direct, Indirect, and Induced Employment

Construction and operation of the UGA and MPR would generate direct impacts from local and non-local (outside Kittitas County) employment demand. The increased economic activity associated with Trendwest would produce a ripple effect through the Kittitas County economy in the form of indirect impacts and induced impacts. Depending on their locations, the new households would increase water demand from municipal systems or from exempt groundwater wells.

In-migrant households were calculated as the quotient of employment impacts (Table 3.18-32 from the Cle Elum UGA Draft EIS) and the Washington household workforce participation rate of 1.34 workers per household. Methods and assumptions used to calculate employment impacts are the same as those used in the Draft EIS and are summarized as follows:

- Employment impacts represent the sum of non-local direct employment and total indirect/induced employment.
- Non-local, direct employment includes those jobs that will not be able to be filled by the existing Kittitas County labor force. Based on the labor supply analysis performed for the Draft EIS, approximately 33% (or one-third) of the available Kittitas County labor force could be obtained for direct employment on an annual basis. A natural annual labor force growth rate of 3% was assumed.¹

¹ Washington Employment Security Department 2000.

- Total indirect/induced employment is the product of the total direct employment and the employment multiplier. The source of the multiplier is the state of Washington's input-output model, which is used to estimate activity in an economy based on the interactions between industries in that economy.
- For purposes of estimating a worst-case scenario, it was assumed that all indirect/induced population represented in-migrant population. In reality, local residents would fill a portion of the indirect/induced jobs.
- The workforce participation rate is the ratio of Washington's 2000 labor force of 3,045,200² and Washington's household count in 2000 of 2,271,398.³

Alternative 5 represents a site plan variation of the alternatives analyzed in the Draft EIS. A master site plan application for Alternative 5 was submitted to the City of Cle Elum in August 2001, following publication of the Draft EIS. Alternative 5 is the designated Preferred Alternative for development of the UGA and is evaluated in the Final EIS (refer to Chapter 1, Summary and Chapter 2, Description of Alternatives). Alternative 5 differs from the development alternatives analyzed in the Draft EIS in that the proposal does not include any significant Trendwest-associated employment generators (e.g. lodge, golf course). Trendwest-generated operational employment under Alternative 5 is assumed at zero.

Following publication of the Cle Elum UGA Draft EIS, Trendwest reduced the total number of units that would be constructed in the MPR from 4,650 to 3,785. This represents an overall decrease of 865 units and would result in a lower demand for construction employment than was identified in the Draft EIS. Table 1 shows projected cumulative in-migrant households from construction and operation of the MPR Reduced Density and UGA Alternative 5.

Table 1: In-Migration from Trendwest Employment, MPR Reduced Density and UGA Alternative 5

Employment Category	Year 1	Year 3	Year 5	Year 10	Year 20	Year 30
Construction						
Non-Local Direct Employment	227	444	243	173	113	100
+ Indirect/Induced Employment	200	390	210	145	91	80
= <i>Total Possible Job In-Migration</i>	427	834	453	318	204	180
÷ Labor Force Participants per Household	1.34	1.34	1.34	1.34	1.34	1.34
= Total In-Migrant Households	319	622	338	237	152	134
Operation						
Non-Local Direct Employment	56	630	907	1,000	1,036	944
+ Indirect/Induced Employment	17	136	189	243	265	265
= <i>Total Possible Job In-Migration</i>	73	766	1,096	1,243	1,301	1,209
÷ Labor Force Participants per Household	1.34	1.34	1.34	1.34	1.34	1.34
= Total In-Migrant Households	54	572	818	928	971	902
Combined In-Migrant Households	373	1,194	1,156	1,165	1,123	1,036

Source: Cle Elum UGA Draft EIS 2001; Johnson-Gardner 2001.

2 Washington Employment Security Department 2001.

3 Office of Financial Management 2001.

Table 1 shows that the number of in-migrant jobs associated with construction would peak in Project Year 3. In-migration related to operational employment would increase steadily through Project Year 10, at which point it is projected to stabilize. Project Year 10 is the year used to calculate projected water demand from direct and indirect/induced employment.

The total direct operational employment demand for Year 20 and Year 30 is identical, as are the indirect/induced jobs they create. However, as a result of Kittitas County's inherent labor force growth rate of 3% a year, more locals will be available by Year 30 to fill the direct operation jobs. As a result, the amount of potential non-local in-migration in Year 30 would be less than in Year 20 (shown in Table 1).

Business Park

As in Alternative 2 (Draft EIS), Alternative 5 includes development by the City of Cle Elum of a 950,000 square foot Business Park. To date, no market studies have been completed. As such, the UGA Draft EIS analysis of employment demand reflects an even incremental buildout over a 30-year period. Table 2 identifies projected in-migrant households from operation of the Business Park. Construction employment for the Business Park is accounted for in demand estimates for Trendwest facilities included in Table 1. Project Year 30 represents full buildout conditions and is the year used to calculate projected water demand from direct and indirect/induced employment.

Table 2: In-Migration from Cle Elum UGA Business Park, Alternative 5

Employment Category	Year 5	Year 10	Year 20	Year 30
Operation¹				
Non-Local Direct Employment	35	124	302	479
+ Indirect/Induced Employment	44	154	373	593
= <i>Total Possible Job In-Migration</i>	79	278	675	1,072
÷ Labor Force Participants per Household	1.34	1.34	1.34	1.34
= Total In-Migrant Households	59	207	504	800

Source: Cle Elum UGA Draft EIS 2001; Johnson-Gardner 2001.

¹ Construction employment for the Business Park is accounted for in demand estimates for Trendwest facilities included in Table 1.

Household Distribution

Total water consumption would be influenced by the distribution of households between incorporated and unincorporated areas across Kittitas County. Consumptive use varies throughout the County based on factors including different domestic water consumption rates among utility districts and climate variations that affect irrigation demands for crops and lawns. This section describes how projected employment-induced households are distributed across the County.

The projected distribution of households across Kittitas County is based on the Kittitas County Council of Governments (KCCOG) 20-year population allocations (Kittitas Countywide

Planning Policies, as amended, 1999) for unincorporated and incorporated areas. Countywide Planning Policies (CWPP) population allocations are shown in Table 3.

Table 3: Kittitas County Population Allocations - 2020

Jurisdiction	Allocation Percentage (1999 CWPP)
Cle Elum/UGA	19.0%
South Cle Elum/UGA	1.5%
Roslyn/UGA	1.0%
Ellensburg/UGA	35.0%
Kittitas/UGA	2.5%
Unincorporated Kittitas County	26.0%
Urban Growth Nodes ¹	15.0%

Source: Kittitas County CWPP 1999.

¹ Urban Growth Nodes include Snoqualmie Pass, Easton, and Ronald in the upper county and Vantage and Thorp in the lower county.

Table 4 shows projected in-migrant households associated with Trendwest-related employment by jurisdiction for the MPR Reduced Density/UGA Alternative 5 development scenario and, separately, for the City of Cle Elum Business Park, based on the KCCOG population allocations.

Table 4: Distribution of In-Migrant Households within Kittitas County Jurisdictions

Jurisdiction	Allocation Percentage (1999 CWPP)	Number of In-Migrant Households (MPR Reduced Density and UGA Alternative 5)	Number of In-Migrant Households (Business Park)
Cle Elum/UGA	19.0%	221.4	152.0
South Cle Elum/UGA	1.5%	17.5	12.0
Roslyn/UGA	1.0%	11.7	8.0
Ellensburg/UGA	35.0%	407.8	280.0
Kittitas/UGA	2.5%	29.1	20.0
Unincorporated County	26.0%	302.9	208.0
Urban Growth Nodes	15.0%	174.8	120.0
Total	100%	1,165.0	800.0

Source: Kittitas County CWPP 1999; Mentor Law Group, PLLC 2001.

To be conservative, this analysis reflects a study area determined most likely to accommodate future population based on existing growth patterns and the location of the MPR and UGA. The study area extends from Snoqualmie Pass to Ellensburg. Households are not distributed to the area east of Ellensburg, including Kittitas and its UGA. The identified in-migrant households allocated to Kittitas and its UGA in Table 4 were proportionally reallocated to the four other incorporated jurisdictions and UGAs. The revised distribution of projected in-migrant households is shown in Table 5.

Table 5: Distribution of In-Migrant Households within Kittitas County Jurisdictions excluding Kittitas/UGA

Jurisdiction	Allocation Percentage (1999 CWPP percentages after redistribution of Kittitas/UGA)	Number of In-Migrant Households ¹ (MPR and UGA Alternative 2)	Number of In-Migrant Households ¹ (MPR Reduced Density and UGA Alternative 5)	Number of In-Migrant Households (Business Park)
Cle Elum/UGA	19.84%	285.3	231.1	158.7
South Cle Elum/UGA	1.57%	22.6	18.3	12.5
Roslyn/UGA	1.04%	15.0	12.1	8.4
Ellensburg/UGA	36.55%	525.6	425.8	292.4
Kittitas/UGA	0.0%	0	0	0
Unincorporated County	26.0%	373.9	302.9	208.0
Urban Growth Nodes	15.0%	215.7	174.8	120.0
Total	100.0%	1,438.1	1,165.0	800.0

Source: Kittitas County CWPP 1999; Mentor Law Group, PLLC 2001.

¹ Households identified are associated with Trendwest-related employment.

Distribution by Subbasin

The projected distribution of households across unincorporated Kittitas County was further broken down within the Yakima River subbasins. Distribution of projected households within Yakima River subbasins was performed based on percentages derived from estimates of the current distribution of population within these subbasins. The following resources were used to estimate the current population distribution across the individual subbasins:

- ArcView 3.2 GIS software;
- Department of Ecology’s GIS layer of Yakima Adjudication subbasins;
- Kittitas County’s boundary data (including the location of incorporated areas within the county);
- Washington State Department of Transportation data on the location of Urban Growth Nodes (UGNs) within the county;
- 2000 Census tract data available from the Washington Redistricting Commission; and
- Washington Department of Natural Resources public lands data.

Figure 1 depicts the location of the census tracts and subbasins in Kittitas County.

Unincorporated Population by Census Tract

According to the 2000 Census, the total population of Kittitas County is 33,362. The 2000 Census provides information on the population of incorporated areas within Kittitas County and the UGNs. Incorporated areas are: Ellensburg, Cle Elum, South Cle Elum, Kittitas, and Roslyn. The total population within incorporated areas is 19,748 people. Therefore, the total population of the unincorporated areas (including UGAs and UGNs) is 13,614 people.

Urban Growth Nodes include Easton, Ronald, Snoqualmie Pass, Vantage, and Thorp. Because population information is available for these areas from the 2000 Census, they are evaluated

separately, which allows for increased refinement in projecting location choices for in-migrant households. The current population of the UGNs is 1,192 people. For purposes of this analysis, the unincorporated population will not include the UGN population, which is shown as a separate category. The remaining population within the unincorporated areas of Kittitas County is 12,422 people (13,614 minus 1,192).

To determine the unincorporated population by census tract, the population of the incorporated areas and UGNs was subtracted from the total population of that tract. For Ellensburg, where the incorporated area is located in three census tracts, the total incorporated population of Ellensburg was subtracted from the total population of the three census tracts combined. The remaining unincorporated population within the combined census tracts was then distributed back to each tract according to the calculated area of each. The unincorporated population of each census tract was then distributed among the subbasins as described below.

Unincorporated Population by Subbasin

Subbasins 1 through 9 and 12, which encompass the I-90 corridor from Snoqualmie Pass to Ellensburg, were selected as the study area. The study area represents the basins determined most likely to accommodate future population based on existing growth patterns and the location of the MPR and UGA.

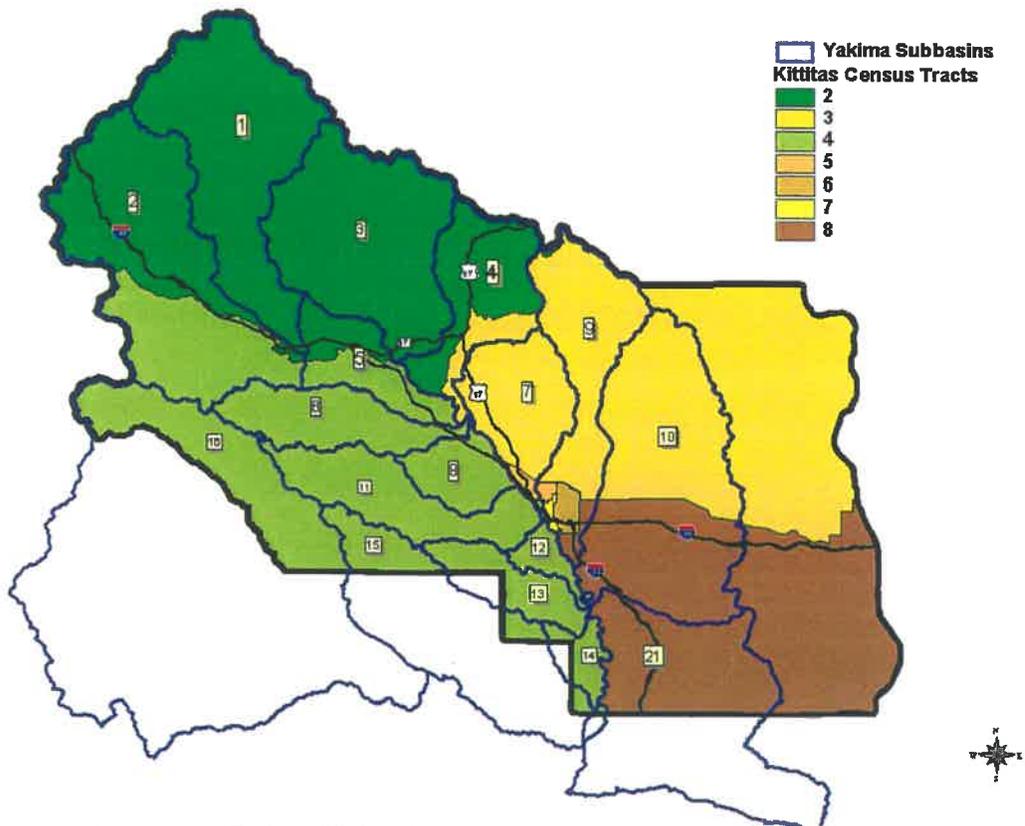
In-migrant households were allocated to subbasins within the study area by: calculating the area of each subbasin available for development; calculating existing population density by subbasin based on the proportion of developable area; calculating the representative percentages of population by subbasin; and distributing in-migrant households to subbasins based on those respective percentages. This provides a possible distribution scheme for future in-migrant households within unincorporated areas.

It is assumed that future population in unincorporated areas could not locate in areas designated as public land. Therefore, the area of each subbasin less the area of public land within that subbasin was assumed to be the area within the subbasin available for development. To calculate the developable area within each subbasin, subbasin boundary data from the Washington Department of Ecology and public lands data from the Washington State Department of Natural Resources were used to identify the location and amount of public land in each subbasin. Figure 2 shows the subbasin boundaries relative to the areas of public lands in Kittitas County.

The calculation of existing unincorporated population densities within each subbasin is based on the percentage of the census tract contained within the developable area of each subbasin. Where a subbasin includes developable area in more than one census tract, the percentage of the area of each census tract located within the developable area of the subbasin was estimated, applied to the unincorporated population of the respective census tracts, and summed to provide a total estimate of unincorporated population for the respective subbasin.

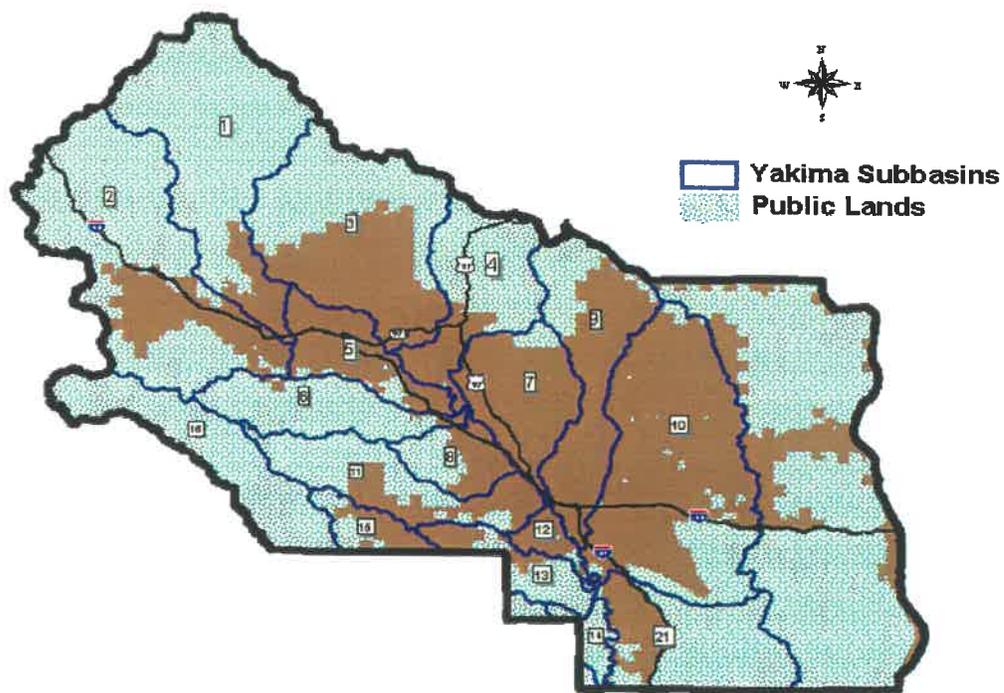
Projected households are distributed to subbasins based on percentages of total existing population applied, proportionately, to the 26% KCCOG projection for unincorporated Kittitas County. These subbasin percentages are inherently conservative as the study area does not

Figure 1: Acquavella Subbasins and Census Tracts in Kittitas County



Sources: Department of Ecology, Kittitas County, Washington Redistricting Commission, and Washington Department of Transportation.

Figure 2: Acquavella Subbasins and Public Lands in Kittitas County



Sources: Department of Ecology, Kittitas County, Washington Department of Natural Resources, and Washington Department of Transportation.

include all of the unincorporated area of Kittitas County. Table 6 shows Trendwest related in-migrant households in unincorporated areas (not including UGNs) distributed by basin for the MPR Reduced Density/UGA Alternative 5 development scenario, and households associated with the Business Park.

Table 6: Distribution of In-Migrant Households in Unincorporated Kittitas County by Subbasin

Subbasin Number	Percentage of Total Population	Number of In-Migrant Households (MPR Reduced Density and UGA Alternative 5)	Number of In-Migrant Households (Business Park)
Subbasin No. 1 (Cle Elum)	1.1 %	13.3	9.2
Subbasin No. 2 (Easton)	3.7 %	43.3	29.7
Subbasin No. 3 (Teaway)	3.1 %	36.0	24.8
Subbasin No. 4 (Swauk)	1.0 %	12.1	8.3
Subbasin No. 5 (Elk Heights)	1.8 %	20.9	14.4
Subbasin No. 6 (Taneum)	0.9 %	10.0	6.9
Subbasin No. 7 (Reecer)	3.5 %	40.3	27.7
Subbasin No. 8 (Thorp)	1.8 %	21.5	14.8
Subbasin No. 9 (Wilson-Naneum)	8.6 %	100.3	68.8
Subbasin No. 12 (Shushuskin)	0.5 %	6.4	4.4
Total	26 %	302.9	208.8

Source: Mentor Law Group, PLLC 2001.

Urban Growth Nodes. Projected households are distributed to UGN's based on percentages of total existing population applied, proportionately, to the 15% KCCOG projection. Households were allocated to Easton, Ronald, Snoqualmie Pass, and Thorp. Vantage is located in far-eastern Kittitas County and is outside the study area; as such, it was not determined a reasonable location for in-migrant households. Population for Vantage and projected in-migrant households were proportionally reallocated to the four other UGNs. Table 7 shows these percentages and the corresponding household distributions.

Table 7: Distribution of In-Migrant Households within Urban Growth Nodes

Urban Growth Node (Subbasin)	Percentage of Total Population	Number of In-Migrant Households (MPR Reduced Density and UGA Alternative 5)	Number of In-Migrant Households (Business Park)
Ronald (Subbasin No. 1 - Cle Elum)	3.5 %	41.2	28.3
Easton & Snoqualmie Pass (Subbasin No. 2 - Easton)	7.8 %	90.9	62.4
Thorp (Subbasin No. 8 - Thorp)	3.6 %	42.5	28.7
Total	15 %	174.8	119.4

Source: Mentor Law Group, PLLC 2001.

Water Demand Associated with In-Migrant Population

Unincorporated Areas by Subbasin

Water demand for unincorporated in-migrant households was estimated by applying the same method for "per household" demands as was used for the Cle Elum UGA Draft EIS, Water Supply Technical Report (Volume 1 of the appendices). Water demand for unincorporated Kittitas County was calculated based on the average household domestic water use less domestic return flows plus irrigation of one-half acre of lawn. This analysis assumes a domestic diversion of 240 gallons per household (100 gallons per person per day x 2.4 persons per household), less 80% return flows. Irrigation demands were calculated using the *Washington Irrigation Guide* in Cle Elum for subbasins in the upper county (18.11 inches per acre per year) and in Ellensburg for subbasins in the lower county (31.46 inches per acre per year) to determine total average annual consumption. Average seasonal consumption was determined by combining the total irrigation consumption with five months of domestic consumption. Table 8 shows cumulative water demand estimates from Trendwest related households in unincorporated subbasin areas. Table 9 shows water demand estimates from Business Park households in unincorporated subbasin areas.

Incorporated Areas by Jurisdiction

Water demand for in-migrant households in incorporated areas was determined based on estimates of "per household" water use from each jurisdiction's latest Water System Plan. In many cases, data for these water systems are based on demand estimates from the early to mid-1990s.⁴ Where data were available for per capita, per day consumption, a factor of 2.4 was applied to reach a per household number. Table 8 shows cumulative water demand estimates from Trendwest related households in incorporated areas. Table 9 shows water demand estimates from Business Park households in incorporated areas.

Groundwater Consumptive Use and Base Flow Comparison

Water demands associated with in-migrant households in unincorporated areas are compared with the estimated mean annual subbasin base flows in Table 10 (MPR Reduced Density and UGA Alternative 5). In-migrant households associated with the Business Park are included in consumptive use estimates for each development scenario.

⁴ City of Roslyn: Average annual per day water use 266 gallons per capita per day based on 1994-1995 data. Source: City of Roslyn Comprehensive Water System Plan (Gray & Osborne, Inc. June 1996), p.2-6.

City of Cle Elum: Consumption per Service 508 gallons per day based on 1995 data. Source: City of Cle Elum Town of South Cle Elum Comprehensive Water Plan (Huibregtse, Louman Assoc., Inc., Oct. 1997), p. 32.

Town of South Cle Elum: Consumption per Service 733 gallons per day based on 1981-1984 data. Source: City of Cle Elum Town of South Cle Elum Comprehensive Water Plan (Huibregtse, Louman Assoc., Inc. Oct. 1997), p. 32.

Ellensburg: Average day demand 246 gallons per capita per day based on 1998 data. Source: Draft City of Ellensburg Water System Plan Update (HDR, Inc. 1999), p. 2-9.

Table 8: Water Demand, In-migrant Households Associated with Trendwest Employment, MPR Reduced Density and UGA Alternative 5

1,165 Households	MPR (Reduced Density) & UGA Alternative 5 Induced In-Migration		Domestic Diversion Per ERU gpd	Domestic Return Percent	Domestic CU Per ERU gpd	Domestic CU gpd	Domestic CU acft/yr	Total Diversion acft/yr		Total CU acft/yr	
	Percent	Percent									
687	59%	Incorporated Areas									
231.1	19.84	Cle Elum / UGA	508	80	102	23483	26.3	132		26.30	
18.3	1.57	South Cle Elum / UGA	733	80	147	2681	3.00	15.0		3.00	
425.8	36.55	Ellensburg / UGA	590	80	118	50245	56.3	281		56.30	
		Kittitas / UGA ¹									
12.1	1.04	Roslyn / UGA	638	80	128	1546	1.73	8.66		1.73	
41.2		Ronald UGN ²	257	80	51	2118	2.37	11.86		2.37	
		Total Incorporated Areas								89.69	
			Domestic Diversion Per ERU gpd	Domestic Return Percent	Domestic CU Per ERU gpd	Domestic CU gpd	Domestic CU acft/yr	Irrigation CU / unit acft/yr	Irrigation CU Total acft/yr	Total CU acft/yr	Total CU Irrigation Season
302.9	26%	Unincorporated Areas									
13.3	1.1	Subbasin No. 1 (Cle Elum)	240	80	48	640	0.717	0.755	10.1	10.7	10.4
43.3	3.7	Subbasin No. 2 (Easton)	240	80	48	2079	2.33	0.755	32.7	35.0	33.7
36.0	3.1	Subbasin No. 3 (Teaway)	240	80	48	1730	1.94	0.755	27.2	29.1	28.0
12.1	1.0	Subbasin No. 4 (Swauk)	240	80	48	582	0.651	0.755	9.14	9.79	9.4
20.9	1.8	Subbasin No. 5 (Elk Heights)	240	80	48	1003	1.12	0.755	15.8	16.9	16.3
10.0	0.9	Subbasin No. 6 (Taneum)	240	80	48	480	0.537	1.31	13.1	13.6	13.3
40.3	3.5	Subbasin No. 7 (Reecer)	240	80	48	1934	2.17	1.31	52.8	55.0	53.7
21.5	1.8	Subbasin No. 8 (Thorp)	240	80	48	1032	1.16	1.31	28.2	29.3	28.7
100.3	8.6	Subbasin No. 9 (Wilson-Naneum)	240	80	48	4812	5.39	1.31	131	137	133.2
6.4	0.5	Subbasin No. 12 (Shushuskin)	240	80	48	305	0.342	1.31	8.34	8.68	8.5
		Total Unincorporated Areas								345	335.2
174.8	15%	Growth Nodes									
41.2	3.5	Subbasin No. 1 (Cle Elum) (Ronald) ²	240	80	48						
90.9	7.8	Subbasin No. 2 (Easton) (Snoqualmie Pass & Easton)	240	80	48	4362	4.89	0.755	68.6	73.5	70.6
42.5	3.6	Subbasin No. 8 (Thorp) (Thorp)	240	80	48	2038	2.28	1.31	55.7	57.9	56.7
		Total Unincorporated Areas								131	127.3
		Total Unincorporated Areas								476	466.2

1 The households allocated to the Kittitas UGA by the CWPP were reallocated across the other UGAs because Kittitas was not a likely location for the in-migrant households.
 2 Water demands from the Ronald Urban Growth Node are calculated as incorporated demands because Ronald receives water from Kittitas County Water District #2, which is a wholesale customer of the City of Roslyn. Source: Mentor Law Group, PLLC 2001; Brown & Caldwell 2001.

Table 9: Water Demand, In-migrant Households Associated with the Cle Elum UGA Business Park

800 Households	UGA Business Park, Alternatives 2 & 5 Induced In-Migration		Domestic Diversion Per ERU gpd	Domestic Return Percent	Domestic CU Per ERU gpd	Domestic CU gpd	Domestic CU acft/yr	Total Diversion acft/yr		Total CU acft/yr	
	Percent	Percent									
472.0	59%	Incorporated Areas									
158.7	19.84	Cle Elum / UGA	508	80	102	16124	18.060	90.3		18.060	
12.5	1.57	South Cle Elum / UGA	733	80	147	1833	2.053	10.3		2.053	
292.4	36.55	Ellensburg / UGA	590	80	118	34503	38.646	193		38.646	
	0	Kittitas / UGA ¹									
8.4	1.04	Roslyn / UGA	638	80	128	1072	1.201	6.01		1.201	
28.3		Ronald UGN ²	257	80	51	1455	1.629	8.15		1.629	
		Total Incorporated Areas								61.589	
			Domestic Diversion Per ERU gpd	Domestic Return Percent	Domestic CU Per ERU gpd	Domestic CU gpd	Domestic CU acft/yr	Irrigation CU / unit acft/yr	Irrigation CU Total acft/yr	Total CU acft/yr	Total CU Irrigation Season
208.0	26%	Unincorporated Areas									
9.2	1.1	Subbasin No. 1 (Cle Elum)	240	80	48	439	0.492	0.755	6.906	7.398	7.1
29.7	3.7	Subbasin No. 2 (Easton)	240	80	48	1428	1.599	0.755	22.444	24.043	23.1
24.8	3.1	Subbasin No. 3 (Teaway)	240	80	48	1188	1.331	0.755	18.677	20.008	19.2
8.3	1.0	Subbasin No. 4 (Swauk)	240	80	48	399	0.447	0.755	6.278	6.725	6.5
14.4	1.8	Subbasin No. 5 (Elk Heights)	240	80	48	689	0.772	0.755	10.830	11.601	11.2
6.9	0.9	Subbasin No. 6 (Taneum)	240	80	48	329	0.369	1.311	8.998	9.367	9.2
27.7	3.5	Subbasin No. 7 (Reecer)	240	80	48	1328	1.487	1.311	36.263	37.750	36.9
14.8	1.8	Subbasin No. 8 (Thorp)	240	80	48	709	0.794	1.311	19.358	20.152	19.7
68.8	8.6	Subbasin No. 9 (Wilson-Naneum)	240	80	48	3305	3.702	1.311	90.248	93.950	91.8
4.4	0.5	Subbasin No. 12 (Shushuskin)	240	80	48	210	0.235	1.311	5.726	5.961	5.8
										236.956	
120.0	15%	Growth Nodes									
28.3	3.5	Subbasin No. 1 (Cle Elum) (Ronald) ²									
62.4	7.8	Subbasin No. 2 (Easton) (Snoqualmie Pass & Easton)	240	80	48	2995	3.355	0.755	47.086	50.441	48.5
29.2	3.6	Subbasin No. 8 (Thorp) (Thorp)	240	80	48	1400	1.568	1.311	38.224	39.792	38.9
										91.232	87.4
		Total Unincorporated Areas								327.188	321.6

1 The households allocated to the Kittitas UGA by the CWPP were reallocated across the other UGAs because Kittitas was not a likely location for the in-migrant households.

2 Water demands from the Ronald Urban Growth Node are calculated as incorporated demands because Ronald receives water from Kittitas County Water District #2, which is a wholesale customer of the City of Roslyn. Source: Mentor Law Group, PLLC 2001; Brown & Caldwell 2001.

Table 10: Subbasin Groundwater Demand and Base Flow Comparison, MPR Reduced Density and UGA Alternative 5 including Business Park

Subbasin Number	Total Consumptive Use from In-Migrant Households acft/yr ¹	Mean Annual Base Flow acft/yr	Total Consumptive Use as a Percentage of Base Flow
Subbasin No. 1 (Cle Elum) ²	18.2	115,076	0.02%
Subbasin No. 2 (Easton) ²	183	143,986	0.13%
Subbasin No. 3 (Teaway)	49.1	66,687	0.07%
Subbasin No. 4 (Swauk)	16.5	23,624	0.07%
Subbasin No. 5 (Elk Heights)	28.5	13,116	0.22%
Subbasin No. 6 (Taneum)	23.0	29,542	0.08%
Subbasin No. 7 (Reecer)	92.7	13,248	0.70%
Subbasin No. 8 (Thorp) ²	147	7,099	2.07%
Subbasin No. 9 (Wilson-Naneum)	231	22,144	1.04%
Subbasin No. 12 (Shushuskin)	14.6	2,033	0.72%
Total	804	436,555	0.18% Avg. Annual³

Source: Brown & Caldwell 2001.

- 1 Consumptive use calculated for in-migrant households includes those associated with the Business Park.
- 2 Consumptive use calculations for Subbasin Nos. 2 and 8 reflect water use from both unincorporated and urban growth node households. UGN households for Subbasin 1 (Ronald) are reflected in incorporated water demands because Ronald receives apart of its water from the City of Roslyn.
- 3 Average annual percentage was calculated by summing the total consumptive use for all of the subbasins and dividing this by the mean annual basin flow for all the subbasins.

Mean annual subbasin baseflow was estimated at 13% of the mean annual precipitation in the subbasin times the total area of the subbasin. The 13% estimate is consistent with information contained in Ecology's Water Supply Bulletin 60 - Estimated Baseflow Characteristics of Selected Washington Rivers and Streams (Ecology 1999).

In Ecology's Water Supply Bulletin 60 - groundwater baseflow is estimated by analyzing streamflow hydrographs. Mean monthly groundwater baseflow (except during snowmelt season) discharge to the Teaway River is calculated based on the streamflow record of the Reclamation gauge below Forks. In order to estimate the mean annual groundwater baseflow for the Teaway subbasin, the baseflow for the months of March through July were assumed to equal the average baseflow of the other months of the year. The resulting mean annual baseflow estimate was 13% of the mean annual precipitation in the subbasin.

The percentage of base flow that would be consumed by demand from in-migrant households in unincorporated areas ranges from 0.02% to 2.07% for the MPR Reduced Density and UGA Alternative 5 development scenario (including the Business Park). These low percentages indicate that water demands associated with in-migrant households in unincorporated Kittitas County would result in a minor impact on water availability in the upper Yakima River Basin.

The potential impact on tributary streamflow is dependent on many factors such as the amount of base flow that discharges to an individual tributary, whether or not hydraulic continuity exists between the groundwater and the tributary, and the specific number, location, depth, and screened interval of future exempt wells within a basin. Where hydraulic continuity exists, the

magnitude of this impact would depend on the percentage of groundwater base flow that would be pumped and consumed. Due to the complexity and uncertainty related to any analysis that would attempt to quantify all these variables, average annual values of consumptive groundwater use and tributary baseflow were used to provide a basis for assessing potential magnitude of impact to tributary streamflows for all the basins.

The analysis compares annual subbasin water demand to mean annual base flow. The analysis shows that groundwater consumptive use represents a small percentage of mean annual base flows in individual subbasins and an average annual percentage of approximately 0.18% (MPR and UGA Alternative 5, including the Business Park) for the basins combined. These percentages are small and support a reasonable conclusion of no significant adverse impact. It is not likely that this conclusion would be affected by the uncertain placement of future exempt wells and their hydraulic continuity to the streams draining each basin.

However, this report recognizes that: (1) some portion of the total groundwater base flow within each subbasin would discharge into tributaries where hydraulic continuity exists; and, (2) that some portion of the wells associated with indirect/induced households within unincorporated Kittitas County could withdraw groundwater that is in hydraulic continuity with tributaries.

Potential impacts on tributary streamflow would likely be lower during the high flow season and would be greater during the later summer months, when streamflows are more dependant on baseflows and instantaneous rates of baseflow are lower than the average annual baseflow. Summer lowflows measured in the Teanaway River from 1999 to 2001 at the Forks gage ranged from 8 to 16 cfs, which is about 9% to 17% of the annual average baseflow of 92 cfs (66,687 ac-ft/yr, Table 10). Summer baseflow can be substantially lower than average annual baseflow; as such, the relative impact of reduced groundwater availability can be greater during the summer low-flow season.

On the Teanaway River, where the lower Teanaway is known to be in hydraulic continuity with groundwater, a worst case scenario was assumed for the purposes of evaluating potential magnitude of impact during the summer low flow season. In the absence of well data, all of the in-migrant wells were assumed to be shallow and located next to the lower reach of the river. Based on information contained in Ecology's Water Supply Bulletin No. 60, October 1999, Brown and Caldwell calculated the consumptive use as a percentage of base flow during the summer low-flow season as approximately 0.57% (as compared to the annual 0.07%, Table 10). This more specific "worst case" seasonal analysis shows a higher consumptive use impact during the low flow season due to seasonally high consumptive water use for irrigation of lawns and gardens.

Incorporated Areas' Existing Water Supplies

City of Roslyn Water Supply

The City of Roslyn relies exclusively on Domerie Creek, a tributary to the Cle Elum River, as its municipal water supply. Roslyn owns a surface water right from Domerie Creek that entitles the City to withdraw 3.14 cubic feet of water per second (cfs), not to exceed 446.7 acre-feet (AF) of

water each year. Roslyn's Domerie Creek water right has a priority date of September 2, 1908.⁵ Roslyn also provides water for the community of Ronald. As of 1996, based on a combined population estimated at 1,026, the City of Roslyn used approximately 328.6 AF of water each year,⁶ leaving approximately 118.1 AF available for future growth. Roslyn estimated its water demands in 2015 to be approximately 430,920 gpd, or 482.9 AF each year.⁷

City of Cle Elum / Town of South Cle Elum Water Supply

The City of Cle Elum owns a water right for 3 cfs, not to exceed 1,100 AF annually from the Cle Elum River. Cle Elum's water right has a priority date of June 30, 1896.⁸ In addition, in 1932 Cle Elum entered into a Water Rental Agreement with the Bureau of Reclamation. The Water Rental Agreement was extended in 1940, and the City currently is negotiating with Reclamation to extend the Water Rental Agreement. Under the agreement, Cle Elum is entitled to divert water from the Cle Elum and Yakima rivers at a rate of 3 cfs, not to exceed 2,170 AF of water annually. The water right used by Reclamation to serve Cle Elum under the Water Rental Agreement has a priority date of May 10, 1905. In 1995, Cle Elum's annual water demand was 356.9 million gallons (MG), or 1,095.3 AF. Cle Elum's projected water demand in 2016 is 357.1 MG, or 1,095.9 AF.⁹

The Town of South Cle Elum has a water right certificate entitling it to withdraw 500 gallons per minute (gpm), not to exceed 101 AF each year from two groundwater wells. The City's groundwater right has a priority date of July 13, 1983. South Cle Elum also has a surface water right to withdraw 1 cfs, not to exceed 168 AF each year. The City's surface water right has a priority date of June 12, 1957.¹⁰ In 1995, South Cle Elum estimated its annual water demand was 62.9 MG or 193.0 AF. South Cle Elum's projected water demand in 2016 is 93.3 MG, or 286.3 AF.¹¹

In 1998, both the City of Cle Elum and Town of South Cle Elum filed change applications with the Department of Ecology to change to a common point of diversion and to consolidate the place of use to the area served by a regional water supply system. This regional water system will serve both the City of Elum and the Town of South Cle Elum. Ecology issued change orders with conditions on these applications in April 2001 which Cle Elum and South Cle Elum Appealed. On October 9, 2001, Cle Elum, South Cle Elum and Ecology entered a Stipulation and Agreed Order of Dismissal approving the combined place of use.

5 *Report of Referee for Subbasin No. 1 (Lake Cle Elum)*, Washington v. Acquavella (Yakima Co. Sup. Ct Cause No. 77-2-01484-5) (June 15, 1998) pp. 17-18.

6 City of Roslyn Comprehensive Water System Plan (Gray & Osborne, Inc. June 1996), p.2-7.

7 City of Roslyn Comprehensive Water System Plan (Gray & Osborne, Inc. June 1996), p.2-9.

8 *See Conditional Final Order – Subbasin 1*, Washington v. Acquavella (Yakima Co. Sup. Ct Cause No. 77-2-01484-5) (June 9, 1989) and *Report of Referee Re: Subbasin No. 1*, Washington v. Acquavella (Yakima Co. Sup. Ct Cause No. 77-2-01484-5) (June 15, 1988) p. 17.

9 Cle Elum-South Cle Elum Comprehensive Water Plan (Huibregtse, Louman Assoc., Inc. 1997), p. 35. Cle Elum expects to meet its future growth needs in large part through installation of water meters and implementation of system improvements and water conservation measures.

10 *Supplemental Report of Referee for Subbasin No. 5 (Elk Heights)*, Washington v. Acquavella (Yakima Co. Sup. Ct. Cause No. 77-2-01484-5) (May 10, 1999) p. 94.

11 Cle Elum-South Cle Elum Comprehensive Water Plan, p. 72,74.

City of Ellensburg Water Supply

The City of Ellensburg owns a combination of surface water and groundwater rights. Ellensburg currently is using several wells with an estimated production capacity of 10,431 gpm. In addition, Ellensburg has surface water rights from the Yakima River under shares the City owns in the Ellensburg (Town Ditch) Water Company and under a 1971 contract assignment between Ellensburg, the Kittitas Reclamation District (KRD), and the Bureau of Reclamation. The 1971 KRD contract and the City's shares in the Ellensburg Water Company represent a capacity from surface water resources totaling about 12,713 gpm, not to exceed about 7,761.6 AF each year.¹² In its July 1997 Ellensburg Water Supply Source Evaluation, HDR Engineering projected the City's population growth over a 25-year period at approximately 1% each year. According to Ellensburg's 1999 Draft Water System Comprehensive Plan, the City's projected average day demand in 2020 is 6.29 million gallons per day, or 7,045.7 AF each year.¹³

Water Demand Compared to Water Use and Available Water Rights

Table 11 compares water demands for in-migrant households associated with Trendwest employment within each jurisdiction to the jurisdictions' available water rights and current water use. For all jurisdictions, the water demand associated with potential in-migrant households falls within the difference between the amount of water available under the current water rights and the jurisdiction's projected future water demand. For all jurisdictions except the City of Roslyn, the water demand associated with potential in-migrant households added to the jurisdiction's projected future water demands still falls within the amount of water available under the current water rights. The City of Roslyn was projecting a water right deficit in meeting its projected future water demand without the Trendwest projects. As part of a settlement agreement entered with RIDGE, Trendwest has agreed to mitigate for increased water demands on Roslyn resulting from induced offsite development within Roslyn.¹⁴

Table 11: Comparison of Current Water Use as Reported by Jurisdiction with Water Demands from In-Migrant Households

Jurisdiction	Water Available under Water Rights*	Current Water Use ¹⁵	Water Demand by Jurisdiction (MPR Reduced Density and UGA Alternative 5)	Projected Future Water Demand
Roslyn/UGA	446.7 AF	328.6 AF ¹⁶	20.5 AF	482.9 AF
Ronald UGN				
Cle Elum/UGA	3,539 AF	1,288.3 AF ¹⁷	147 AF	1,382.2 AF
South Cle Elum/UGA				
Ellensburg/UGA	18,312.6 AF	2,708 AF ¹⁸	281 AF	7,045.7 AF

* Available water rights represent those as stated in the jurisdiction's respective water supply plans.

Source: Mentor Law Group 2001.

¹² Ellensburg Water Supply Source Evaluation (HDR Engineering, Inc. 1997), p. III-7.

¹³ City of Ellensburg Comprehensive Water Plan Update (HDR Engineering, Inc. 1999), p. 2-10.

¹⁴ *Settlement Agreement Regarding MountainStar Master Planned Resort, Cle Elum Urban Growth Area and Supporting Infrastructure and Services* (Sept. 19, 2001).

¹⁵ Current water use based on information from the most recent WDOH Approved Water System Plan available.

¹⁶ City of Roslyn Comprehensive Water System Plan (Gray & Osborne, Inc. 1996), p. 2-7.

¹⁷ City of Cle Elum Town of South Cle Elum Comprehensive Water Plan (Huibregtse, Louman Assoc., Inc. 1997), p. 32.

¹⁸ Draft City of Ellensburg Comprehensive Water Plan Update (HDR Engineering, Inc. 1999), p. 2-11.

Table 12 compares water demands for in-migrant households associated with both Trendwest employment and Business Park employment within each jurisdiction to the jurisdictions' available water rights and current water use. Water demand estimates that reflect the Business Park also falls within the difference between the amount of water available under the current water rights and the jurisdiction's projected future water demand

Table 12: Comparison of Current Water Use as Reported by Jurisdiction with Water Demands from In-Migrant Households, Including the Business Park

Jurisdiction	Water Available under Water Rights*	Current Water Use ¹⁹	Water Demand by Jurisdiction (MPR Reduced Density and UGA Alternative 5)	Projected Future Water Demand
Roslyn/UGA	446.7 AF	328.6 AF ²⁰	34.7 AF	482.9 AF
Ronald UGN				
Cle Elum/UGA	3,539 AF	1,288.3 AF ²¹	247 AF	1,382.2 AF
South Cle Elum/UGA				
Ellensburg/UGA	18,312.6 AF	2,708 AF ²²	475 AF	7,045.7 AF

* Available water rights represent those as stated in the jurisdiction's respective water supply plans.
Source: Mentor Law Group 2001.

19 Current water use based on information from the most recent WDOH Approved Water System Plan available.

20 City of Roslyn Comprehensive Water System Plan (Gray & Osborne, Inc. 1996), p. 2-7.

21 City of Cle Elum Town of South Cle Elum Comprehensive Water Plan (Huibregtse, Louman Assoc., Inc. 1997), p. 32.

22 Draft City of Ellensburg Comprehensive Water Plan Update (HDR Engineering, Inc. 1999), p. 2-11.