

APPENDIX A

Well Database

0273

A.1 Well Database

Existing well information was compiled into a well database developed in Microsoft Access. Well and water quality data obtained from Ecology well logs, Sullivan (2005), Whatcom County Health 1994 study, DOH and Whatcom County were organized in the relational database with location being the primary table.

Each well location has standard attributes including spatial coordinates, addresses, owner names, Township-Range-Section and Quarter-Quarter section designations. Additional information such as water levels, water quality data, and well construction information (boring depths, casings, filters, screens, seals), are grouped into tables that are linked to the primary locations table. These data may be viewed and edited using Aspect Consulting's Well database MS Access user interface, or exported and viewed spatially using ESRI mapping software. A listing of data fields included in the database are presented in Table A-1. An extract from the database summarizing well construction information, chloride data, and water levels for wells with well logs is presented in Table A-2.

A goal was to develop a database that links all available groundwater data from Lummi Island. We downloaded approximately 230 well logs from Ecology and cross referenced those with the well database in Sullivan (2005). The correlation process revealed 40

those with the well database in Sullivan (2005), for which he had obtained logs or other additional wells from Sullivan (2005), for which he had obtained logs or other information from the well owner or Whatcom County. The result is a database of about 270 wells for the northern half of Lummi Island.

Some reported well locations are obviously in error, such as those plotting offshore (and corresponding well elevations of zero listed in Table A-2 are also in error). Others are questionable such as those indicating deep unconsolidated completions in known or suspected bedrock areas. Locations reported on well logs are frequently in error, and many of the erroneous locations were corrected in this investigation. In addition, locational accuracy of wells was identified.

Water quality data from the previous reports and raw data sources were linked, when possible, to a specific well in the database. Water quality data collected by Sullivan (2005) were easily linked using available well information.

Water quality data listed in Appendix D of Whatcom County (1994) were linked to wells in the database based on well location (quarter-quarter section), well depth, and whether the well was completed in bedrock. If a well in the database had all three fields in common with the information in Appendix D of Whatcom County, 1994, the water quality data were linked to that well in the database. As a final check, the completion date on the well log was compared to the earliest date the well was sampled. In February, 2006, the locations of approximately 30 wells used in the 1994 study were surveyed with a field grade GPS unit and the assistance of Lummi Island residences that participated in the 1994 study. The results of this GPS survey were incorporated into the database.

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Water quality data listed in Appendix C of Schmidt (1978) were linked to specific wells in the database based on well information provided in his Appendix D. However, a limited number of study wells were linked to a specific well log due to the lack of information provided in the report (Table A-3).

Water quality data from PWS on the Island provided by DOH were correlated to well logs in the database based on well owner information, well location and well depth. Raw water quality data from specific land parcels provided by Whatcom County were correlated to wells in the database based on well owner information, and Ecology unique well ID number, if available. Forty-one out of 117 of these wells were correlated to a well in the database.

As indicated above and summarized in the following table, not all water quality data and information associated with each well compiled for this study could be definitively linked to a specific well in the database. These "orphan" data were entered into the database and the entry flagged so that it may be resolved at a later time or kept as a potential unique entry of its own. Based on this methodology, 126 entries were added to the database that have minimal information other than water quality data. It is likely that some of these individual water quality entries could represent the same well from the different data sources. For example, if studies only locate wells to the nearest $\frac{1}{4}$, $\frac{1}{4}$ section, and no other unique well characteristics are presented, then, with the existing information, the water quality data could not be tied to the same sample location.

Table A-3**Sources of Water Quality Data input to the Well Database**

Data Sources	# of Wells	Total # of Samples Collected	# of Wells Correlated to a Well Log⁽¹⁾
Robinson and Noble (1978)	38	38	6
Whatcom County (1994)	93	354	44
Sullivan (2005)	80	151	80
DOH (PWS)	31	187	24
Whatcom County	117	307	41

⁽¹⁾ Status as of January, 2006.

Table A-1

Summary of Well Database Data Fields

Northern Lummi Island Hydrogeologic Investigation
 Northern Lummi Island, WA

Location Information	
Location Name	Combined TRSQQ and Station Number
Historic Name	Aspect's designated consecutive numbering of the locations
Owner Name	Best known current owner of the location
Owner Address	Best known current address of the owner
Location Address	Address of the location
Description	Typically the name of the owner as it appeared on the well log
Comments	Additional information about the location
X & Y Coordinates	Coordinates of the location, provided in UTM 10N NAD83 (meters)
Surface Elevation	Elevation at the location, provided in NAVD88 (feet)
Township	Township that the location resides in
Range	Range that the location resides in
Section	Section that the location resides in
Quarter-Quarter	Quarter-Quarter section that the location resides in
Horizontal & Vertical Datum	Entries that define the coordinate datums
XY Accuracy Code	Specifies a category of accuracy that applies to the coordinates
Z Accuracy Code	Specifies the accuracy of the surface elevation

Well Information	
Installation Date	Date that the well was installed
Driller	Name of the company that drilled the well
Drilling Method	Method of drilling that was employed to drill the well
Depth of Well	Completed depth of the well
Depth to Bedrock	Depth at which bedrock was encountered
Construction Start/End	Dates during which the well was constructed
Stickup Height	Height above ground surface that the casing protrudes (feet)
Pump Type	Style of pump installed in the well
Pump Manufacturer	Name of the company that built the pump
Pump Horsepower	Horsepower rating of the well pump

Water Quality Parameters
Arsenic
Barium
Beryllium
Cadmium
Chloride
Chromium
Color
Conductivity
Copper
Fluoride
Hardness
Iron
Lead
Manganese
Mercury
Nickel
Nitrate
Nitrate
Selenium
Silver
Sodium
Specific Conductance
Sulfate
Total Dissolved Solids
Zinc

Static Water Level	Static water level for this well
SWL Date	Date at which the SWL was taken

Well Construction Information	
Casing Start/End Depth	Depths at which casing is installed in the well
Casing Diameter	Diameter of the installed casing
Casing Material	Type of material used in the casing
Screen Start/End Depth	Depths at which screen(s) were installed in the well
Screen Material	Type of material used in the screen
Screen Slot	Slot size of the screen
Perforations Start/End Depth	Depths at which perforations were put into the casing
Perforation Size	Size of the perforations that were cut into the casing
Well Seal Start/End Depth	Depth at which seals were added to the well
Well Seal Type	Type of material used to seal the well
Gravel Pack Start/End Depth	Depth at which the well was gravel packed
Gravel Pack Size	Size of the gravel used in the well

Water Quality	
Test Date/Time	When the sample was taken
Sample Parameter	Parameter that was tested for in the sample
Sample Result	Quantity of the parameter that was in the sample
Parameter Units	Units that the sample was measured in
Measured By	Person/Group that took the sample

Note: Not all information is available for all wells

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W:\050039 Whatcom Cty- Lummi Island GW-Hydrogeologic Investigation\Table A-1 Database Data Description.xls

Table A-1

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Air Quality Designation	West Test Information			Summary of State Water Leaks (SWL) Rejected			
	Maximum Specific Capacity (gpm)	Compressing Pump Rate (gpm)	Compressing Drumpan (gpm)	Average (See NA(024))	Min/Max (See NA(024))	Maximum (See NA(024))	Number of Rejections
				61.90	65.72	55.27	3
				-9.08	-9.08	-9.06	1
	0.12	10	85	100.20	100.20	100.20	1
	0.01	1	107	111.20	111.20	111.20	1
	0.50	8	28	9.51	10.87	8.82	5
		10	0	0.00	0.00	0.00	1
	0.25	10	40	-30.00	-30.00	-30.00	1
	1.33	20	15	30.90	31.43	29.97	3
	0.09	5.5	61	8.41	8.53	8.18	3
	0.01	1.5	122	195.13	200.82	192.36	5
	0.75	15	20	-0.60	-0.60	-0.60	1
	0.43	15	35	213.20	213.20	213.20	1
	0.86	15	22.67	220.03	220.03	220.03	1
	0.67	20	30	205.61	216.32	196.30	2
	0.02	2	90	424.02	429.59	419.27	3
	0.17	8.5	50	106.53	106.53	106.53	1
	0.25	10	40	92.15	92.15	92.15	1
	0.25	17	60	78.90	78.90	78.90	1
				18.00	18.80	18.80	1
				76.80	76.80	76.80	1
	0.06	7	123	79.47	87.55	73.76	4
	0.25	15	60	77.57	77.57	77.57	1
	0.13	20	150	25.80	28.30	25.80	1
	0.01	1.5	295	87.80	87.80	87.80	1
	0.11	6	57	86.50	86.50	86.50	1
				82.50	82.50	82.50	1
	0.10	5	50	21.70	21.70	21.70	1
	0.85	10	15.17	7.00	7.00	7.00	1
	0.30	12	40	65.75	65.75	65.68	3
	0.25	15	60	77.57	77.57	77.57	1
	0.13	20	150	25.80	28.30	25.80	1
	0.01	1.5	295	87.80	87.80	87.80	1
	0.11	6	57	86.50	86.50	86.50	1
				82.50	82.50	82.50	1
	0.10	5	52	37.35	37.35	37.35	1
	0.75	9	12	59.00	76.26	48.74	3
	0.16	5	32	42.10	42.10	42.10	1
		5	0	10.43	11.00	9.89	3
	0.35	7	20	-11.70	-11.70	-11.70	1
	0.00	1	218	50.50	50.50	50.50	1
	0.04	7	200	42.87	44.03	41.71	2
				38.50	38.50	38.50	1
	1.47	12.5	6.5	3.76	4.24	3.41	3
	0.22	6	27	138.00	135.00	135.00	1
	0.32	10	30	74.60	74.80	74.60	1
	0.00	1.5	380	94.00	94.00	94.00	1
	0.44	11	25	6.37	10.17	4.26	3
	0.12	4	30	25.00	-25.00	-25.00	3
	0.01	2	186	146.01	160.12	138.72	3
		5	0	15.85	18.87	13.37	3
	1.67	20	12	1.51	2.00	1.27	4
				18.33	18.17	17.82	4
	0.00	0.5	205	5.02	52.72	-42.68	2

Table A-2
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Table A-2 Study Area Well Summary
 Northern Lummi Island Hydrogeologic Investigation
 Northern Lummi Island, WA

Well ID No.	General Information		Production Data		Production Zone				
	Location (P, R, S, W)	Ground Surface Elevation (MSL/0000 Feet)	Drilled Depth (Feet)	Completed Depth (Feet)		Top Of Case Interval (Well ID/0000)			
001	37N01E04M1	78.7	Domestic Well	185	155	10-Nov-00	47	78.3	
002	37N01E04M1	0	Domestic Well	52	52	10-Nov-00		47	
003	37N01E04A	128.2	Domestic Well	134	134			-89.2	5.8
004	37N01E04M1	154.2	Domestic Well	150	150	03-Aug-91		-81.2	4.2
005	37N01E04M2	101.97	Domestic Well	117	117	28-Nov-84		10.03	15.03
008	37N01E04B1	0	Domestic Well	70	70	21-Nov-85		27	100
007	37N01E04B2	0	Domestic Well	100	100	21-Oct-73		21	100
008	37N01E04B3	67.64	Domestic Well	78	78	03-Jul-88		-48.84	10.36
009	37N01E04D2	8.53	Domestic Well	61	61	22-Oct-88		46.47	52.47
010	37N01E04D3	226.92	Domestic Well	122	122	08-Dec-85		-211.92	-107.92
011	37N01E04M4	3.4	Domestic Well	73	73	20-Nov-01		64.6	69.6
012	37N01E04D5	223.2	Domestic Well	141	141			-129.2	82.2
013	37N01E04D6	223.2	Domestic Well	136	136	12-Apr-93		-107.2	87.2
014	37N01E04D7	252.32	Domestic Well	152	152	29-Oct-92		-234.32	-100.32
016	37N01E04E7	168.27	Domestic Well	150	150	25-Dec-74		-118.27	-18.27
017	37N01E04E3	154.2	Domestic Well	195	195	18-Dec-01		5.8	35.8
018	37N01E04G1	86.9	Domestic Well	108	106	11-Jul-85		-78.9	9.1
019	37N01E04G3	108.9	Domestic Well	322	322			-108.9	213.1
020	37N01E04G1	108.9	Domestic Well	175	175			-108.9	86.1
021	37N01E04G3	108.9	Domestic Well	96	96			-108.9	10.9
022	37N01E04G2	108.9	Domestic Well	65	65			-108.9	-23.9
023	37N01E04D3	91.47	Domestic Well	127	127	25-Nov-88		-63.47	35.53
024	37N01E04M1	80.1	Domestic Well	227	227	28-Aug-88		148.9	84.1
025	37N01E04M2	0	Domestic Well	148	149	05-Oct-84		53	149
026	37N01E04M1	49.2	Domestic Well	114	114			-19.2	84.8
027	37N01E04M2	49.2	Domestic Well	100	100			-49.2	50.8
028	37N01E04M3	49.2	Domestic Well	127	127	15-May-81		23.2	72.5
029	37N01E04M4	31.5	Domestic Well	94	94	14-Aug-88		-7.5	22.5
030	37N01E04M5	115.29	Domestic Well	75	75	11-Jun-80		-45.29	-40.29
031	37N01E04M1	81.8	Domestic Well	150	150	12-Dec-88		-55.9	66.1
032	37N01E04M1	72.3	Domestic Well	241	241	20-Jul-87		163.7	188.7
033	37N01E04M2	160.8	Domestic Well	365	365	25-Oct-03		81.8	194.2
034	37N01E04M1	146.5	Domestic Well	113	113	28-Feb-95		-80.5	-33.5
035	37N01E04M1	128	Domestic Well	72	72			-61	66
036	37N01E04M2	86	Domestic Well	70	70	27-Feb-81		-42	-31
037	37N01E04M1	42.1	Domestic Well	94	90	28-Dec-84		32.9	37.9
038	37N01E04E4	137.26	Domestic Well	153	153			-47.26	15.74
039	37N01E04M2	42.1	Domestic Well	51	51	13-Nov-81		3.9	8.9
040	37N01E04M3	16.4	Domestic Well	250	230	12-Nov-84		8.8	13.6
041	37N01E04D1	25.3	Domestic Well	105	105	01-Dec-73		0.7	79.7
042	37N01E04B1	68.5	Domestic Well	260	240	30-Jul-88		55.5	160.5
043	37N01E04M2	97.63	Domestic Well	275	275	23-May-02		43.63	193.37
044	37N01E04E3	68.5	Domestic Well	70	70	28-Apr-00		-42.5	0.5
045	37N01E05	73.43	Domestic Well	109	109	01-Jun-78		30.87	35.57
047	37N01E05C1	182	Domestic Well	75	74	04-Mar-92		-112	-108
047	37N01E05C1	182	Domestic Well	163	163	11-Mar-91		-67	61
048	37N01E05C2	102	Domestic Well	450	390			188	283
049	37N01E05D1	118.17	Domestic Well	148	148	08-Nov-95		26.83	28.83
050	37N01E05D2	0	Domestic Well	65	65	19-Sep-85		30	65
051	37N01E05D3	180.12	Domestic Well	218	216	10-Aug-98		-128.12	27.88
052	37N01E05D4	46.97	Domestic Well	168	158	05-Dec-99		11.67	111.33
053	37N01E05E1	66.45	Municipal Well	93	92	13-May-87		20.545	25.845
054	37N01E05F1	96.97	Not Utilized	165	168			85.87	72.03
055	37N01E05J1	113.07	Domestic Well	360	360	09-Oct-88		38.93	41.93

Year	Market Capacity (MW)	Variable Specific Capacity (MW)	Net Generation		Compressing		State Value Cams (SWT) Residuals		Number of Residuals
			Capacity (MW)	Power Rate (\$/MWh)	Capacity (MW)	Power Rate (\$/MWh)	Average (MWh)	Minimum (MWh)	
1	1.67	10	6	72.80	72.80	72.80	72.80	1	
2	0.35	7	20	-51.20	-51.20	-51.20	-51.20	1	
3	0.43	10	23	-24.00	-24.00	-24.00	-24.00	1	
4	1.00	10	0	-24.00	-24.00	-24.00	-24.00	1	
5	0.08	20	20	-2.00	-2.00	-2.00	-2.00	6	
6	0.33	30	210	-70.00	-70.00	-70.00	-70.00	1	
7	0.04	12	210	184.20	184.20	184.20	184.20	1	
8	2.00	16	20	-140.00	-140.00	-140.00	-140.00	1	
9	0.04	4	101	1.00	1.00	1.00	1.00	1	
10	0.04	20	10	8.21	8.21	8.21	8.21	3	
11	0.04	9	9						
12	0.04	9	9						
13	0.33	8.5	8.5	18.80	18.80	18.80	18.80	1	
14	0.33	15	45	-19.60	-19.60	-19.60	-19.60	1	
15	0.33	5	15	14.31	14.31	14.31	14.07	4	
16	0.18	0.93	5	54.80	54.80	54.80	53.69	3	
17	0.60	10	55	1.40	1.40	1.40	1.40	1	
18	0.60	20	33	2.05	2.05	2.05	2.05	3	
19	0.60	20	33	131.50	131.50	131.50	131.50	1	
20	0.60	132	132	131.50	131.50	131.50	131.50	1	
21	0.01	15	0	-50.60	-50.60	-50.60	-50.60	1	
22	0.05	15	325	18.05	18.05	18.05	18.05	1	
23	0.38	7	12	8.95	8.95	8.95	8.62	3	
24	1.33	20	13.66	10.90	10.90	10.90	10.90	3	
25	0.04	10	0	-81.60	-81.60	-81.60	-81.60	1	
26	0.04	10	0	-43.60	-43.60	-43.60	-43.60	1	
27	0.04	10	0	23.90	23.90	23.90	23.90	1	
28	0.04	10	0	6.83	6.83	6.83	6.83	3	
29	0.08	4.5	51	17.00	17.00	17.00	17.00	1	
30	1.00	10	10	-89.00	-89.00	-89.00	-89.00	1	
31	0.10	6	60	-21.70	-21.70	-21.70	-21.70	1	
32	0.04	1	128	-11.00	-11.00	-11.00	-11.00	1	
33	0.04	5	55	-8.00	-8.00	-8.00	-8.00	1	
34	0.32	5.5	17.25	-32.22	-32.22	-32.22	-32.22	1	
35	0.32	5.5	17.25	-10.00	-10.00	-10.00	-10.00	1	
36	0.32	2	133	-17.00	-17.00	-17.00	-17.00	1	
37	0.01	4	145	-17.00	-17.00	-17.00	-17.00	1	
38	0.45	10	22	-28.00	-28.00	-28.00	-28.00	1	
39	1.67	10	5	5.90	5.90	5.90	5.90	3	
40	0.35	15	0	6.56	6.56	6.56	6.56	3	
41	2.00	10	5	-10.80	-10.80	-10.80	-10.80	1	
42	1.20	12	10	65.30	65.30	65.30	64.52	3	
43	0.37	20	10	-63.60	-63.60	-63.60	-63.60	1	
44	0.37	15	90	174.54	174.54	174.54	149.89	3	
45	0.37	10	0	-30.50	-30.50	-30.50	-30.50	1	
46	0.01	1.5	124	57.34	57.34	57.34	57.34	3	
47	0.01	15	0	4.40	4.40	4.40	4.40	1	

Table A-2
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Table A-2 Study Area Well Summary

Northem Lummi Land and Archaeologic Investigation
 Northern Lummi Island, WA

Well ID	Location (N/E/S/E)	General Information		Integrity Details		Production Status		
		Ground Surface Elevation (NGVD83 Feet)	Well Type	Current Depth (Feet)	Completed (Month/Year)	Production Start Date	Estimated Internal Flow Rate (gpm)	Flow Cap Internal Flow Rate (gpm)
056	37ND1EG011	169.8	Not Identified	116		01-Jan-25	-160.8	479.3
057	37ND1EG011	58.7	Not Identified	278				178.8
058	37ND1EG0M1	88.8	Domestic Well	301		15-Dec-37	67.8	212.2
059	37ND1EG0M1	0	Domestic Well	108		05-Feb-92	10	108
060	37ND1EG0M1	0	Domestic Well	54		12-Jun-92	54	54
061	37ND1EG0M3	0	Domestic Well	121		24-Jan-98	121	
062	37ND1EG0M4	254.91	Domestic Well	295		24-Sep-91	-103.51	40.09
064	37ND1EG0M8	0	Domestic Well	315		17-Sep-91	18	
065	37ND1EG05	208.2	Domestic Well	350			-208.2	143.8
066	37ND1EG0P1	0	Domestic Well	0			0	0
067	37ND1EG0P1	73.28	Domestic Well	140			1.74	6.74
068	37ND1EG0R2	8	Domestic Well	108		15-Aug-20	95	100
069	37ND1EG0R3	113.17	Domestic Well	181		18-Apr-90	62.83	87.83
070	37ND1EG0A2	0	Domestic Well	80			0	0
071	37ND1EG0A1	0	Domestic Well	85			0	85
072	37ND1EG0A3	0	Domestic Well	85		10-Jun-55	80	85
073	37ND1EG0B1	0	Domestic Well	52			0	52
074	37ND1EG0B2	23.8	Not Identified	84			-23.8	80.2
075	37ND1EG0A1	47.4	Domestic Well	134		04-Feb-95	91.8	86.6
076	37ND1EG0A2	104.19	Domestic Well	116		03-Mar-03	0.81	10.81
077	37ND1EG0A3	87.45	Domestic Well	95		19-Oct-85	58.45	6.55
078	37ND1EG0A4	47.4	Domestic Well	119		15-Jun-92	70.6	70.6
079	37ND1EG0A5	224.12	Municipal Well	76		18-Jun-76	48.88	53.88
080	37ND1EG0A6	185.5	Domestic Well	187		26-Aug-82	-104.42	0.5
081	37ND1EG0A6	47.4	Domestic Well	142		21-Dec-83	84.6	93.6
082	37ND1EG0A6	85.8	Domestic Well	280		06-Dec-90	160.2	174.2
083	37ND1EG0A9	48.28	Domestic Well	65		04-Oct-84	13.22	18.22
084	37ND1EG0A10	47.4	Domestic Well	79		31-May-01	19.6	22.6
085	37ND1EG0A11	47.4	Domestic Well	121		17-Aug-91	73.8	71.61
086	37ND1EG0A12	47.4	Domestic Well	122		14-Sep-83	70.6	74.6
087	37ND1EG0A13	86.9	Domestic Well	113		20-Jan-02	26.1	26.1
088	37ND1EG0B1	103.095	Domestic Well	158		05-Jul-98	-103.095	59.400
089	37ND1EG0C1	104.9	Domestic Well	157		04-Jun-94	56.3	60.30
090	37ND1EG0C2	20	Domestic Well	105		09-Jun-77	85	85
091	37ND1EG0D1	3.3	Domestic Well	103		30-Mar-88	94.7	98.7
092	37ND1EG0D2	0	Domestic Well	137		16-Nov-90	21	137
093	37ND1EG0D3	0	Domestic Well	75		11-Jun-99	70	75
094	37ND1EG0D4	19.7	Domestic Well	80		24-Jan-94	56.3	60.30
095	37ND1EG0D1	0	Domestic Well	95		31-Mar-03	4.1	52.1
096	37ND1EG0D5	0	Domestic Well	82			0	0
097	37ND1EG0D6	0	Domestic Well	150		28-Mar-93	42	150
098	37ND1EG0D7	0	Domestic Well	150		04-Apr-91	38	150
099	37ND1EG0D8	0	Domestic Well	71		03-Nov-98	65	65
100	37ND1EG0E1	0	Domestic Well	0			0	0
101	37ND1EG0E2	9.88	Domestic Well	64		02-Nov-84	51.95	57.19
102	37ND1EG0E3	73.24	Domestic Well	251		21-Sep-81	177.76	177.76
103	37ND1EG0E4	58.4	Domestic Well	105		18-Aug-80	23.85	23.85
104	37ND1EG0E5	145.77	Domestic Well	115		05-Dec-81	30.7	30.7
105	37ND1EG0E6	58.4	Domestic Well	150		01-Mar-90	90.6	90.6
106	37ND1EG0G1	58.4	Domestic Well	101		21-Sep-81	35.6	41.81
107	37ND1EG0E7	227.63	Domestic Well	176		08-Apr-88	-208.63	38.6
108	37ND1EG0G2	58.4	Domestic Well	103		18-Mar-88	38.6	42.42
109	37ND1EG0G3	174.06	Domestic Well	224		10-Mar-60	-56.16	48.88
110	37ND1EG0G4	58.4	Domestic Well	81		21-Jun-83	21.6	21.6

Maximum Seismic Category (Per ASCE 7-10)	Map Test Number	Compressing Ratio	Compressing Ratio	Compressing Ratio	Scale (Wales Level (S0.0))			Approximate Number of Readings						
					Average (Wales Level (S0.0))	Minimum (Wales Level (S0.0))	Maximum (Wales Level (S0.0))							
6.5	6.5				8.87	9.54	116.20	116.20	116.20	1	1	7.85	116.20	1
40.00	50	1.25			16.48	25.94	130.68	130.68	130.68	3	5	15.70	130.68	3
1.43	10	7			28.22	32.10	75.00	75.00	75.00	1	1	2.60	75.00	1
0.71	12	17			2.60	66.00	105.25	105.25	105.25	3	3	10.87	105.25	3
1.67	15	9			10.26	12.48	29.25	29.25	29.25	1	1	5.58	29.25	1
0.85	4	0			9.30	9.30	5.70	5.70	5.70	1	1	8.30	5.70	1
3.20	16	5			8.30	8.30	60.30	60.30	60.30	1	1	72.60	60.30	1
18.00	18	1			48.00	48.00	48.00	48.00	48.00	1	1	47.58	48.00	1
0.15	8	52			4.08	9.90	31.60	31.60	31.60	3	3	42.00	31.60	3
1.00	5	5			13.90	13.90	13.90	13.90	13.90	1	1	62.00	13.90	1
0.00	20	0			69.42	79.76	82.60	82.60	82.60	1	1	82.60	82.60	1
0.00	9	88.75			157.04	157.04	157.04	157.04	157.04	2	2	157.04	157.04	2
0.10	13	0.1			128.80	128.80	128.80	128.80	128.80	1	1	128.80	128.80	1
	8	140			28.55	28.55	28.55	28.55	28.55	1	1	28.55	28.55	1
0.12	20	186			120.80	120.80	120.80	120.80	120.80	1	1	120.80	120.80	1
0.01	1	70			6.70	6.70	6.70	6.70	6.70	1	1	6.70	6.70	1
0.08	5	62			53.61	54.84	52.87	52.87	52.87	3	3	54.84	52.87	3
0.02	7	322			42.82	42.82	42.82	42.82	42.82	1	1	42.82	42.82	1
0.03	1	30			21.70	21.70	21.70	21.70	21.70	1	1	21.70	21.70	1
0.06	2	41			60.00	60.00	60.00	60.00	60.00	1	1	60.00	60.00	1
0.10	5	50			-77.00	-77.00	-77.00	-77.00	-77.00	1	1	-77.00	-77.00	1
0.06	8	140			137.10	137.10	137.10	137.10	137.10	1	1	137.10	137.10	1
0.01	1.5	214												
0.01	0.5													
0.01	2	178												
0.11	10	94												
7.52	10	133												
0.23	10	64												
0.55	11	20												
0.01	0.5													
0.01	1	90												
0.00	1	208												
0.30	1.5	5												
0.01	1	180												
4.00	12	3												
	8													
0.12	5	40.25												
1.00	10	10												
	20	0												
	10	10												
0.85	15	1778												
0.24	10	41												
0.74	10	13.5												
0.24	7	29												
1.11	15	13.5												

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Table A-2 Study Area Well Summary
 Northern Lummi Island Hydrogeologic Investigation
 Northern Lummi Island, WA

Well ID	General Information			Well Use		Construction		Production	
	County	Section	Block	Depth (Feet)	Well Use	Drilled Depth (Feet)	Completed	Installation	Production
NS	T.S. & L.P.	Edwards	Depth (Feet)	Well Use	Drilled Depth (Feet)	Completed	Installation	Production	Production
111	37ND1E00R41	146.2	111.54	Domestic Well	143	103	03-Feb-60	26.48	31.46
112	37ND1E00R41	146.2	111.54	Domestic Well	114	109		-140.2	-97.2
113	37ND1E00R42	103.64	203.64	Domestic Well	130	130	21-May-01	16.98	16.98
114	37ND1E00R43	155.18	155.18	Domestic Well	54	54	04-Aug-87	-105.66	-105.18
115	37ND1E00R41	95.93	95.93	Domestic Well	252	252	22-Sep-66	128.47	195.47
116	37ND1E00R44	0	0	Domestic Well	91	91	14-Oct-85	91	91
117	37ND1E00R45	71.6	71.6	Domestic Well	227	227	08-Nov-86	147.4	155.4
118	37ND1E00R46	0	0	Domestic Well	154	154	27-May-00	148	154
119	37ND1E00R44	0	0	Domestic Well	145	145	16-Feb-05	140	145
120	37ND1E00R41	116.89	116.89	Domestic Well	178	178	07-Aug-95	61.31	61.31
121	37ND1E00R42	89.3	89.3	Domestic Well	143	143	04-Aug-88	38.7	49.7
122	37ND1E00R43	154.272	154.272	Domestic Well	145	146	10-Oct-02	-41.772	-39.272
123	37ND1E00R44	87.48	87.48	Domestic Well	96	96	23-May-86	8.52	8.52
124	37ND1E00R45	61.5	61.5	Domestic Well	295	295	28-Jul-02	228.5	233.5
125	37ND1E00R46	123.22	123.22	Domestic Well	155	155	20-Feb-86	26.78	31.78
126	37ND1E00R47	93.3	93.3	Domestic Well	200	200	12-Dec-92	-71.3	100.7
127	37ND1E00R48	88.3	88.3	Domestic Well	105	106	29-Aug-80	5.7	6.7
128	37ND1E00R49	98.3	98.3	Domestic Well	155	158	04-Aug-80	50.7	55.7
129	37ND1E00R10	99.3	99.3	Domestic Well	205	205	10-Feb-80	40.63	105.7
130	37ND1E00R11	98.3	98.3	Domestic Well	123	123		18.7	23.7
131	37ND1E10	170.6	170.6	Domestic Well	178	178		7.4	7.4
132	37ND1E10A1	0	0	Domestic Well	110	110	11-Sep-91	28	110
133	37ND1E10B1	0	0	Domestic Well	371	371	14-Nov-94	60	110
134	37ND1E10C1	58.2	58.2	Domestic Well	220	220	17-Jul-86	64.8	181.8
135	37ND1E10D1	121.4	121.4	Domestic Well	116	116	16-Sep-74	108	116
136	37ND1E10E1	0	0	Domestic Well	182	182	22-Jun-01	50.6	60.6
137	37ND1E10F2	104.76	104.76	Domestic Well	230	230	30-Dec-86	230	230
138	37ND1E10F4	104.76	104.76	Domestic Well	170	170	17-Oct-01	-14.76	65.24
139	37ND1E10F4	160.8	160.8	Domestic Well	250	250	04-Jun-76	-15.8	11.7
140	37ND1E10M1	158.3	158.3	Not Identified	170	170		-112.8	-52.8
141	37ND1E10L1	182.52	182.52	Not Identified	200	200	28-Feb-03	-133.42	17.48
142	37ND1E10N1	152.8	152.8	Domestic Well	100	100	12-Feb-94	-52.8	17.48
143	37ND1E10M2	137.8	137.8	Domestic Well	144	144	18-Jul-89	1.2	6.2
144	37ND1E10M3	137.8	137.8	Domestic Well	130	130		-113.8	-7.8
145	37ND1E10M4	137.183	137.183	Domestic Well	149	149		11.817	11.817
146	37ND1E10Q1	81.7	81.7	Domestic Well	225	225	01-Apr-76	-61.7	143.3
147	37ND1E10Q2	74.45	74.45	Domestic Well	123	123	12-Jan-85	-83.45	54.55
148	37ND1E10Q3	91.7	91.7	Domestic Well	248	248	22-Aug-89	-82.7	105.3
149	37ND1E10Q4	90.6	90.6	Domestic Well	186	186	21-Aug-88	75.4	75.4
150	37ND1E10Q5	81.7	81.7	Domestic Well	242	242	30-Jun-94	-3.7	180.3
151	37ND1E10R1	0	0	Domestic Well	265	265	24-Mar-05	70	265
152	37ND1E10R2	0	0	Domestic Well	98	97	20-Oct-02	93	98
153	37ND1E15B1	100	100	Domestic Well	300	300	22-Jun-03	192	200
154	37ND1E15C1	136.1	136.1	Domestic Well	225	225	08-Dec-03	-121.1	88.9
155	37ND1E15D1	108.3	108.3	Domestic Well	140	140	30-Jun-92	-82.3	31.7
156	37ND1E15E1	113.86	113.86	Domestic Well	188	186	06-Feb-60	38.11	49.11
157	37ND1E15E2	105	105	Domestic Well	103	103		-7	-2
158	37ND1E15E3	105	105	Domestic Well	210	210	01-Nov-86	114	105
159	37ND1E15E4	85.4	85.4	Domestic Well	207	207	01-May-77	121.6	121.6
160	37ND1E15E5	98.4	98.4	Domestic Well	168	168	27-Aug-01	84.6	89.6
161	37ND1E15F1	100	100	Domestic Well	213	213	24-Feb-04	108	113
162	37ND1E15F2	112.63	112.63	Domestic Well	149	149	29-Oct-01	31.37	38.37
163	37ND1E15H1	0	0	Domestic Well	99	99	19-May-04	84	99
164	37ND1E16G1	54.8	54.8	Domestic Well	85	85	31-Dec-88	35.2	30.2

Station	Water Intake			Summary of Static Water Level (SWL) Readings			
	Maximum Source Capacity (GPM)	Compressed Air Supply (GPM)	Estimated Emission (GPM)	Average (feet MSLD)	Minimum (feet MSLD)	Number of Readings	
1	5.91	15	2.17	6.73	9.35	6.10	2
2	0.86	15	17	5.97	7.27	6.79	5
3	1.28	15	11.75	7.39	7.57	7.06	3
4		22					
5							
6	0.26	11	4h	6.16	7.67	3.84	3
7	0.11	15	1.8	0.80	0.80	0.80	1
8	0.50	5	10	3.30	3.30	3.30	1
9	0.06	2	34	6.60	6.80	6.80	1
10	0.04	2	48.4	12.90	13.12	12.98	2
11	0.14	15	104.58	20.50	20.50	20.50	1
12		7.5		-57.90	-57.90	-57.90	1
13	1.54	10	5.5	-60.00	-60.00	-60.00	1
14	0.05	5	96	4.07	3.99	2.36	4
15				13.66	23.46	8.93	4
16				186.80	186.60	186.60	1
17	0.40	12	30	170.20	170.20	170.20	1
18	0.03	6	186	201.50	201.50	201.50	1
19	0.00	8	90	8.33	10.26	6.40	2
20	10.00	20	2	169.06	179.23	160.56	5
21	3.45	25	7.25	59.10	59.10	59.10	1
22	2.00	12	6	-0.10	-0.10	-0.10	1
23	0.36	20	72.25	156.88	171.51	147.22	3
24	0.35	15	56	183.60	183.60	183.60	1
25	0.05	7.5	59.8	17.13	17.13	17.13	1
26	0.05	4	160	156.63	156.63	156.63	1
27	1.33	40	84	181.90	181.90	181.90	1
28	0.04	30	0	48.70	48.70	48.70	1
29	0.30	2.5	60	33.80	33.80	33.80	1
30	0.30	15	50	188.74	180.68	188.58	3
31		20	0	42.10	42.10	42.10	1
32	0.96	25	43	9.67	15.64	3.40	2
33	0.67	20	30	175.83	176.75	174.90	2
34	0.04	2.5	57	163.31	173.00	149.24	4
35	0.10	10	100	31.80	31.80	31.80	1
36	0.06	3	57	3.60	3.60	3.60	1
37	0.13	12	92	11.83	13.22	9.25	5
38	1.04	14	13.5	9.00	9.00	8.00	1
39	0.14	15	110	76.50	76.50	76.50	1
40	0.10	10	100	217.00	217.00	217.00	1
41		5		34.50	34.50	34.50	1
42	0.35	7	20	57.00	57.00	57.00	1
43	0.54	12	22.17	63.00	63.00	63.00	1
44	0.06	5	82	34.00	34.00	34.00	1
45				27.87	27.87	27.87	1
46				7.83	8.153	6.03	2

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Table A-2 Study Area Well Summary
Northern Lummi Island Hydrogeologic Investigation
Northern Lummi Island, WA

Well ID No.	General Information		Geological Information		Neighboring Districts		Production Data	
	Location (T.R.S. #)	On-Island Surface Elevation (NOVD)	On-Island Surface Elevation (NOVD)	Well Use	Drilled Depth (feet)	Completed Depth (feet)	Installation Date	First On-Island Production (MGAL/Day)
165	37401E1552	60.1		Domestic Well	84	93	11-Jan-99	27.9
166	37401E1553	51.58		Domestic Well	56	86	04-Apr-80	28.44
167	37401E1554	85.44		Domestic Well	121	121	22-Jun-83	48.58
168	37401E1512	0		Domestic Well	118	118	03-Oct-49	118
169	37401E1513	0		Domestic Well	200	200		0
170	37401E1511	142.2		Domestic Well	300			142.2
171	37401E1511	83.84		Domestic Well	172	173	15-Oct-95	89.16
172	37401E1511	94.8		Domestic Well	146	148	29-Jun-90	53.2
173	37401E1611	35.4		Domestic Well	272	272	28-Aug-92	42.5
174	37401E1616	69.6		Domestic Well	91	91	29-Jun-79	16.2
175	37401E1611	63.8		Domestic Well	92	92	04-Jun-70	23.2
176	37401E16A2	76.7		Domestic Well	116	97	02-Sep-83	13.3
177	37401E16G1	86.5		Domestic Well	174	174	18-Jul-00	79.5
178	37401E16H1	0		Domestic Well	177	177	20-Jun-95	172
179	37401E16H1	0		Domestic Well	82	82		0
180	37401E16H0	70.79		Domestic Well	101	101	10-May-84	26.21
181	38401E23Q1	30.634		Domestic Well	103	103	12-Jun-69	-5.634
182	38401E23Q2	25.1		Domestic Well	54			-26.1
183	38401E23H1	197.5		Domestic Well	65	84	-123.0	-187.6
184	38401E23P1	95.1		Domestic Well	72	72		-95.1
185	38401E23A1	177.2		Not identified	103	100	20-Jul-68	-166.2
186	38401E23R1	216.5		Domestic Well	201	201	01-Mar-92	458.5
187	38401E23A1	25.9		Domestic Well	120	120	05-Aug-85	-7.9
188	38401E23A2	206.59		Domestic Well	118	118	20-Apr-00	-483.59
189	38401E23P2	95.1		Domestic Well	58	58	23-Jun-76	-37.1
190	38401E23K1	246.2		Domestic Well	201	201	18-Jul-81	-227.2
191	38401E23L1	136.9		Domestic Well	163	163	11-Mar-04	21.1
192	38401E23J2	195.18		Domestic Well	227	267	30-Jun-96	164.16
193	38401E23H2	197.6		Domestic Well	110	110	02-Feb-73	-77.6
194	38401E23A3	29.3		Domestic Well	140	140	12-Nov-88	-40.3
195	38401E23H3	189.133		Domestic Well	278	228	25-Aug-94	-109.133
196	38401E23H4	193.9		Domestic Well	106	106	23-Jun-97	-175.9
197	38401E23E1	48.7		Domestic Well	191	191	10-Mar-78	-21.7
198	38401E23E2	50.8		Domestic Well	100	100	19-May-78	-30.8
199	38401E23L2	128.16		Domestic Well	161	161	19-Jul-99	-22.16
200	38401E23M2	212.68		Domestic Well	164	87	20-Oct-98	-135.68
201	38401E23P3	95.1		Domestic Well	73	75		-35.1
202	38401E23Q2	74.4		Domestic Well	100	100	03-Oct-91	49.9
203	38401E23Q3	177.9		Domestic Well	117	117	01-Mar-91	-159.9
204	38401E23J	110.1		Domestic Well	70	70	01-Jan-41	-110.1
205	38401E23M1	202.88		Not Identified	97	126		-117.68
206	38401E23M2	30.6		Domestic Well	120	120	28-Jun-74	7.2
207	38401E23R1	12.6		Domestic Well	69	66	09-Jul-90	47.4
208	38401E23O1	33.94		Domestic Well	82	82	20-Sep-85	43.06
209	38401E23Q2	12		Domestic Well	246	238	04-Feb-04	222
210	38401E23P1	79		Domestic Well	51	61	03-Apr-86	-33
211	38401E23N3	233		Domestic Well	180	180	09-Nov-02	-188
212	38401E23M4	30.4		Domestic Well	222	222	31-Oct-89	-6.4
213	38401E23P2	42.9		Domestic Well	80	81	10-May-83	3.1
214	38401E23P3	79		Domestic Well	121	121	01-Jun-70	-4
215	38401E23P4	76		Domestic Well	230	230	05-Mar-03	61
216	38401E23O1	0		Domestic Well	162	162	22-Nov-86	48
217	38401E23Q3	3.3		Domestic Well	81	81	12-Aug-86	72.7
218	38401E23R2	97.9		Domestic Well	209	208		184.27

Year	Map Test Results			Summary of State Year Work (BTL) Results			Number of Readings
	Number of Copies (BTL)	Number of BTLs (BTL)	Number of BTLs (BTL)	Average Score (BTL)	Million Dollars (BTL)	Million Dollars (BTL)	
1	0.05	5	82	7.70	7.70	7.70	1
2	0.05	4	76	1.60	1.60	1.60	1
3	0.83	20	24	3.10	3.10	3.10	1
4	1.17	21	18	60.20	60.20	60.20	1
5	0.34	20	59	-1.60	-1.60	-1.60	1
6				4.53	5.48	3.28	4
7				94.22	97.93	90.08	3
8				49.19	54.55	43.72	4
9				1.63	2.04	1.62	2
10	0.10	7	85	97.76	97.86	97.66	2
11				115.96	123.50	108.34	2
12				5.12	5.81	5.02	2
13				-0.39	-0.39	-0.39	1
14				58.88	59.73	58.02	2
15				48.82	48.13	45.70	2
16				71.78	72.12	71.44	2
17				84.92	68.08	63.16	2
18				15.33	15.88	14.55	3
19				7.55	7.89	7.21	2
20				5.24	5.40	5.09	2
21				226.51	229.82	224.19	2
22				17.44	17.44	17.44	1
23		25	0	31.81	43.96	20.53	4
24				7.74	7.74	7.74	1
25	0.00	8	250	54.74	54.09	45.89	5
26	0.20	19	178	28.68	76.46	3.88	3
27	0.16	1.5	26	147.93	152.97	138.27	3
28				111.42	112.34	110.49	2
29				170.65	173.62	167.67	2
30				40.44	43.84	36.93	2
31				145.72	145.25	142.18	2
32	0.19	10	85	44.08	50.73	32.78	3
33				4.20	4.53	3.68	2
34	0.20	15	96	2.59	9.80	-2.88	3
35				190.27	141.83	119.85	4
36				-65.80	-65.80	-65.80	1
37				32.70	34.70	32.70	1
38				14.80	14.80	14.80	1
39				50.70	50.30	50.30	1
40				97.97	89.20	87.61	3
41	0.46	20	42	2.60	2.60	2.60	1
42	2.00	20	40	-46.00	-48.00	-46.00	1
43		15	0	-73.70	-73.70	-73.70	1
44				148.12	148.12	148.12	1
45				109.20	109.20	109.20	1
46				98.50	98.87	98.13	2

Table A-2
Page 5 of 5

Table A-2 Study Area Well Summary
Northern Lummi Island Hydrogeologic Investigation
Northern Lummi Island, WA

Well ID	Well Location (T14 S, R 14 W)	Overall Hydrologic		Regulatory Priority		Production	
		Groundwater Elevations (WAB) (ft)	Well Use	Drawn From Well (ft)	Complete Installation Date	Production (ft)	Production (ft)
218	38ND1E33Q4	9.8	Domestic Well	105	23-Jan-89	90.2	89.2
220	38ND1E33R3	9.8	Domestic Well	87	12-Aug-88	72.2	77.2
221	38ND1E33P5	3.3	Domestic Well	280	27-Mar-03	246.7	256.7
222	38ND1E33Q6	6.1	Domestic Well	219	11-Jan-04	207.9	212.9
223	38ND1E33E1	64.2	Domestic Well	295	24-Nov-04	135.8	215.6
224	38ND1E33Q1	3.4	Domestic Well	207	22-Feb-05	198.5	203.6
228	37ND1E09	9.17	Domestic Well	83		49.83	63.83
228	37ND1E04	195.97	Domestic Well	234		152.97	78.83
227	37ND1E04	122.03	Domestic Well	170		129.03	47.97
228	37ND1E04	7.44	Domestic Well	8.85		7.44	2.41
230	37ND1E04	222.6	Domestic Well	85		203.6	137.61
231	37ND1E04	159.87	Domestic Well	81		159.87	77.87
232	37ND1E09	160.54	Domestic Well	120		160.54	40.54
233	37ND1E04	15.5	Domestic Well	48		13.5	32.5
234	37ND1E04	9.3	Domestic Well	48		33.7	35.7
236	37ND1E05	64.55	Domestic Well	11.5		64.55	55.05
238	37ND1E04	121.1	Domestic Well	108		103.1	66.9
237	38ND1E33	75.76	Domestic Well	14		75.76	61.76
238	38ND1E33	67.94	Domestic Well	215		87.94	127.06
239	37ND1E04	31.76	Domestic Well	60		37.24	37.24
240	37ND1E09	85.03	Domestic Well	161		109.97	115.97
241	37ND1E05	71.09	Domestic Well	168		71.69	71.69
242	38ND1E32	118.1	Domestic Well	188		118.1	69.9
243	38ND1E33	232.1	Domestic Well	13		232.1	219
244	37ND1E04	25.24	Domestic Well	137		20.24	107.76
245	38ND1E32	58.1	Domestic Well	140		54.1	81.9
246	37ND1E04	21.18	Domestic Well	90		20.81	25.81
247	37ND1E04	130.48	Domestic Well	250		50.48	155.5
248	37ND1E09	114.48	Domestic Well	193		74.52	74.52
249	37ND1E10	172.27	Domestic Well	62		130.27	109.27
250	37ND1E10	117.39	Domestic Well	7		117.39	110.39
251	37ND1E10	207.69	Domestic Well	134		178.69	73.69
252	37ND1E04	55.86	Domestic Well	45		10.86	10.86
253	37ND1E10	150.76	Domestic Well	10		150.76	140.76
254	37ND1E04	60.78	Domestic Well	83		51.78	22.22
255	37ND1E09	6.78	Domestic Well	48		4.78	41.24
256	37ND1E09	10.6	Domestic Well	100		44.4	88.4
257	38ND1E32	164.1	Domestic Well	215		115.1	59.9
258	37ND1E10	12.2	Domestic Well	205		189.8	192.82
260	37ND1E05	81.7	Domestic Well	365		56.7	261.7
261	37ND1E09	24.8	Domestic Well	99		70.2	74.2
262	37ND1E05	0	Domestic Well	258		0	258
263	37ND1E09	101.7	Domestic Well	85		21.7	18
264	37ND1E04	144.028	Domestic Well	77		84.028	178.07
260	38ND1E31	6.6	Domestic Well	185	12-Nov-04	173.4	173.4
261	37ND1E10Q1	11	Domestic Well	202	16-Aug-04	84	89
262	37ND1E10E1	124.3	Domestic Well	264	11-Oct-04	64.3	139.3
263	38ND1E32B1	105.8	Domestic Well	130		105.8	105.8
268	37ND1E09H1	180.5	Domestic Well	140		180.5	180.5
268	37ND1E10M1	161.3	Domestic Well	200		161.3	161.3
401	37ND1E04Q1	201.4	Domestic Well	63		201.4	201.4
402	37ND1E04M1	156.355	Domestic Well			156.355	156.35

APPENDIX B

Field Methods

0282

B.1 Field Methods

This section provides a summary of the field methods used for sampling wells in April and August 2006, including process of identifying study participants, field sampling methods, laboratory methods and quality assurance/quality control (QA/QC) procedures. A Sampling and Analysis plan was developed for this study and was included as Appendix A in Technical Memorandum 2 (Aspect Consulting, 2006b) and was used as the basis for field sampling and laboratory methods.

B.1.1 Study Participants

Study participants were primarily identified from well owner questionnaires completed by Island residents at the public workshop held on January 28, 2006. Well owners indicated if they would grant permission for Aspect to perform two rounds of water sampling, obtain water level measurements and survey well locations. Twenty-five study participants were identified through this process. Data gaps were identified based on the distribution of these initial 25 wells. Specific areas on the Island were targeted to locate additional volunteers to fill the data gaps and meet the objectives of the study. Eleven additional participants were contacted through either local residents or based on their participation in Sullivan's (2005) study and volunteered to participate. Additionally, three

wells were used for measurement of static water level, but were not operational to provide a water sample. The total number of wells in the April sample round of the study was 39. During the August sample round, five additional volunteers were contacted through their participation in Sullivan's (2005) study and agreed to participate, bringing the total number of wells in the August Sample round to 44. During the first sample round, Aspect field staff determined the suitability of the wellhead installation for reliable measurement of static water level and the presence of a usable sample port prior to any water treatment system.

B.1.2 Field Sampling Methods

The following field sampling methods were used by all field personnel during both the April and August sampling rounds.

B.1.2.1 Groundwater Level Monitoring

Prior to groundwater sampling, a measurement of static water level was obtained from each well where permission was granted. Pitless wells (wells not enclosed in a well or pump house) were typically accessed for water levels measurements by removing the well head cap. Non-Pitless wells were typically enclosed in a well- or pump-house and access for water level measurements was obtained through a threaded access port. Depth-to-water measurements were recorded to the nearest 0.01 foot. Depth-to-water measurements were recorded at 5-minute intervals until consecutive measurements were within 0.02 feet. If this criterion was not achieved within four measurements, the water level was identified as "not static", and the well was sampled. The measuring point was marked on each wellhead, photographed if necessary, and recorded in the field

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documentation. If the measuring point was not accessible for surveying, a suitable reference point for surveying was marked and the vertical and horizontal offsets to an accuracy of 0.01 feet from the measuring point were made and recorded.

The water level sounder was decontaminated between each well. The decontamination sequence consisted of a scrub with a detergent (Alconox) solution, followed by deionized or distilled water rinse, and finished with thorough spraying with deionized or distilled water.

B.1.2.2 **Well Survey**

Aspect subcontracted to Wilson Engineering (Wilson) of Bellingham, WA to survey the top of well casings for selected wells in the study. Eight previously unsurveyed wells were surveyed to a horizontal accuracy of 1 foot and a vertical accuracy of 0.1 foot. Wilson also surveyed three wells that had been previously surveyed by Sullivan (2005). Two of the wells agreed with Sullivan's top of casing elevation within elevations of 0.23 and 0.11 feet. However one well surveyed by Wilson was over 19 feet lower than Sullivan's survey. This is likely due to Sullivan not being able to achieve survey-grade GPS elevations due to dense vegetation and steep surrounding topography of that particular well.

B.1.2.3 **Field Instrument Calibration**

Prior to each day's sampling, all field instruments were calibrated in accordance with manufacturer's instructions and the results recorded in notebooks accompanying the instruments. The lot numbers and expiration dates of calibration solutions used were

recorded. The field instruments were calibrated to a specific conductivity standard of 447 $\mu\text{mhos/cm}$, dissolved oxygen of 100 percent, a fresh pH solution of 7 prepared from buffer packets, and an ORP standard.

B.1.2.4 Groundwater Sampling

Groundwater samples were collected through the sample port or spigot nearest to the well, preferably prior to a storage or pressure tank or water quality treatment system. The exact sample location was recorded in the field documentation and photographed, if necessary. Each well was purged at the maximum flow rate allowed by the sample port. The field parameters of temperature, pH, electrical conductance, dissolved oxygen, and oxidation-reduction potential (Eh) were monitored using a YSI meter and flow-through cell. The field parameters were recorded at 2- to 4-minute intervals throughout well purging for up to 10 minutes or until they stabilized. Stabilization is defined as three successive readings where the parameter values vary by less than 10 percent (or 0.5 milligrams per liter [mg/L] dissolved oxygen if the readings are below 1 mg/L). All purge water was discharged to the ground near the well. The YSI instrument was rinsed thoroughly with deionized or distilled water between wells.

Care was taken to record in the field documentation the time during purging that the well pump turned on indicating fresh groundwater was being pumped through the system. For small, single domestic wells with pressure tanks, this would take approximately 30 seconds to 2 minutes for the pressure in the tank to drop enough for the pump to activate. For systems with large storage tanks, the pump was typically activated by a manual pump override switch or, for smaller tanks, drawing the water down enough for the pump to

turn on. In some instances, it was not possible to activate the pump during sampling, in which case, the sample was identified as filled from storage. Once purging was complete, the sample bottles were filled directly from the sample port.

Each well was analyzed for total and dissolved arsenic and dissolved chloride. Selected wells were also analyzed for dissolved major ions (calcium, magnesium, potassium, sodium, carbonate, and bicarbonate) arsenic research parameters (dissolved iron, manganese, phosphorus, sulfur and silicate, and total phosphorus) and dissolved bromide. Samples for dissolved analysis were filtered by the laboratory. In the August sample round, coliform was added to the list of analytes by Whatcom County based on requests from Island residents. Analytical test methods are presented in Table B-1 with sample bottle type, preservatives, and holding times.

B.1.2.5 Sample Documentation and Handling Procedures

B.1.2.5.1 Field Documentation

Static water levels, measuring points, water quality parameters, sample bottle identifications, and field notes were recorded on a field form. All bottles were clearly labeled with well name and number, date, time, and preservative, and recorded on the Chain-of-Custody. Sample IDs and locations of the blind field duplicates were recorded on the field form.

B.1.2.5.2 Sample Handling

Upon collection, all samples were immediately stored in a cooler. Ice was placed in each cooler and refreshed as necessary to meet sample preservation requirements (Table B.1).

cooler and refreshed as necessary to meet sample preservation requirements (Table B-1). Inert cushioning material was placed in the remaining space of the cooler to limit movement of the sample containers. Samples were hand delivered by Aspect to the analytical laboratory at the end of the sampling round.

B.1.2.5.3 Sample Custody

After collection, samples were maintained in Aspect's custody until formally transferred to the analytical laboratory. For purposes of this work, custody of the samples was defined as follows.

- In plain view of the field representatives;
- Inside a cooler that is in plain view of the field representative; or
- Inside any locked space such as a garage, locker, car, or truck to which the field representative has the only immediately available key(s).

A Chain-of-Custody record provided by the laboratory was initiated at the time of sampling for all samples collected. The record was signed by the field representative and others who subsequently took custody of the samples. A copy of the Chain-of-Custody form with appropriate signatures is kept in the project file by Aspect's project manager.

B.1.3 Laboratory Methods and QA/QC Procedures

AmTest, Inc. of Redmond, Washington analyzed the samples collected during this study with the exception of coliform. Coliform was analyzed at Avocet Laboratory in Bellingham, Washington. Both laboratories are accredited by Ecology and/or Health for

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analysis of parameters analyzed in this project. The contact information for the laboratories is as follows:

AmTest, Inc.
14603 N.E. 87th St.
Redmond, Washington 98052
(425) 885-1664
Fax: (425) 883-3495

Avocet Environmental Testing
1500 N State Street, # 200
Bellingham, Washington 98225
(360) 734-9033

B.1.3.1 Analytical Methods

Table B-1 lists the analytes, sample methods, sample bottles, preservatives, and holding times and temperatures for the analyses performed during this round of sampling. The laboratory report included the Chain-of-Custody form, samples IDs, detection limits, test results, and results of all laboratory quality assurance procedures.

B.1.3.2 Analytical Data Quality Assurance Review

A quality assurance review of the laboratory's analytical data package was performed to ensure that the data were of suitable quality for their intended use. Aspect hand delivered the April samples to the lab in one sample delivery group on April 17, 2006, including

the April samples to the laboratory. The laboratory analyzed the samples collected between April 12 and April 15, 2006. A courier sent by the lab picked up the August samples in on sample delivery group on September 1, 2006, including samples collected between August 29 and August 30, 2006.

The quality assurance review included evaluation of sample custody, holding times, reporting limits, method blank analysis, standard reference materials, and matrix spike/matrix spike duplicate recoveries and precision. The results of the quality assurance review are as follows:

3. Sample custody, holding times, and reporting limits were acceptable.
4. No method blank contamination was detected.
5. Standard Reference Materials (SRM) recoveries were within control limits.
6. Matrix spike recoveries were within control limits
7. The relative percent differences (RPDs) for matrix spike/matrix spike duplicate sample pairs were within control limits.
8. The field duplicate pair RPDs for total arsenic and dissolved chloride were 0 percent and 3.5 percent, respectively for the April sample round. The field duplicate pair RPDs for total arsenic and dissolved chloride were 5.5 percent and 0 percent, respectively for the April sample round. Because field duplicates represent both field and laboratory variability, EPA provides no required review criteria for determining comparability of field duplicate analyses; however, the results appear reasonable based on our experience with similar studies.

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Based on the quality assurance review, the analytical data are determined to be of acceptable quality for their intended use. No data were rejected; therefore, the data set is 100 percent complete.

Bottle	Preservative	Holding Time and Temperature
HDPE	None	28 days, 4°C
"	None	6 months
"	None	6 months
"	None	28 days, 4°C
"	None	
"	None	14 days, 4°C
"	None	28 Days
HDPE	HNO ₃	6 months
HDPE	H ₂ SO ₄	28 days, 4°C
Plastic	Sodium Thiosulfate	24 hours

Table B-1
Page 1 of 1

Table B-1

Analytes and Test Methods for Groundwater Samples

Northern Lummi Island Hydrogeologic Investigation
Northern Lummi Island, WA

Analyte	Method	Sample
Anions (Cl & SO ₄)	EPA 300.0 & EPA 375.4	1 L FH
Arsenic ¹ (dissolved As)	EPA 200.9	
Dissolved Metals ¹ (Fe, Mn, Na, K, Mg, Ca, P, & S)	EPA 200.7	
Silica as SiO ₂	4500SI-E	
Alkalinity (CO ₃ , HCO ₃ , & total alkalinity)	SM 2320B	
Bromide	EPA 320.1	
Arsenic (Total As)	EPA 200.9	500 m
Phosphorus (Total P)	EPA 365.1	500 m
Total Coliform	Micr-2720	100 m

Notes:

1) Lab Filtration Required

Aspect Consulting

12/31/2006

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AQUIFER TEST
BEACH CLUB CONDOMINIUMS
LUMMI ISLAND
WHATCOM COUNTY, WASHINGTON

by Peder Grimstad

January 26, 1979

Open-File Technical Report 79-02

The opinions, findings, conclusions, or recommendations expressed in this report are those of the authors and do not necessarily reflect the views of the Water Resources Program or the Department of Ecology. Mention of trade names does not constitute recommendation for use by the State of Washington. This report is intended as a working document and may be circulated to other agencies and the public, but it is not a formal Department of Ecology publication.

0289



STATE OF
WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, Olympia, Washington 98504

206/753-2353

MEMORANDUM

January 26, 1979

To: Herman Huggins
Northwest Regional Office

From: Pete Grimstad *PH*
Water Resources Investigations Section

Subject: Aquifer Test, Beach Club Condominiums, Lummi Island

As previously requested, a second pumping test was conducted at the Beach Club Condominiums which are under construction by John Stewart near Migley Point at the north end of Lummi Island. The purpose of this test was to determine possible hydraulic continuity between the pumped well, the previously tested well (memorandum of July 25, 1978), and other nearby wells.

The pumped well (Stewart #2) is 100 feet deep and drilled entirely in sandstone of the Chuckanut Formation. This unit has little, if any,

primary permeability; therefore, transmission and storage of water is dependent upon secondary permeability such as interconnected fractures. The Stewart No. 1, Austin and Stewart (house) wells are developed in the same lithology.

With the assistance of Steve West and Jim Gavin of the Northwest Regional Office, pumping of the Stewart #2 well started at 1005 hours, January 9, 1979. A pumping rate of 22 gallons per minute (gpm) was attempted but with the rapid drawdown the rate dropped to 16 gpm after two and one-half hours, to ten (10) gpm after eight (8) hours, to eight (8) gpm after ten (10) hours, and to six (6) gpm near the end of the twenty-five hour test.

A totalizing water meter was installed to determine the pumping rate; however, this became inoperative near the end of the test because of freezing and possibly the low rate of flow.

As seen in Figure 1, the water in the pumped well dropped from the initial level of 18.84 feet below top of casing to 60 feet in one hour and to 80+ feet (reportedly the depth of the pump intake) in two hours. Water level measurements at this depth proved difficult because of water entering the well above the pumping water level.

When the pumping ceased, the water level rebounded, but the rate of recovery was much less than the rate of drawdown and after 24 hours of recovery, the water level was still 23 feet below that measured at the beginning of the test.

Memo to Herman Huggins
January 26, 1979
Page Two

The Stewart #1 well (677 feet from the pumped well) was affected almost immediately and after one hour the level had dropped 0.6 foot, and after two hours about two feet. When the pump was turned off, the drawdown measured nearly nine feet. This is a conservative figure because the well is undoubtedly affected by the tides and, if the lag time for the well is similar to that observed at the Stewart (home) and Austin wells, removal of the tidal effects of the incoming tide which causes the water in the wells to rise, would drop the water level in the Stewart #1 even more. Shutting off the pump had no obvious effect other than a leveling off of the decline and 24 hours later the water level remained nearly seven feet below that measured before the beginning of the pumping test.

The data collected at the Stewart (house) and Austin wells show tidal influence and no discernable drawdown because of the pumping.

The elevation of the casing top at Stewart #1 has been surveyed and determined to be 47.0 feet above mean sea level. The top of the casing of the pumped well is 79.5 feet above mean sea level. To avoid sea water contamination of the aquifer, it is recommended that the pump intakes be set above mean sea level. The specific capacity of the Stewart #1 is 0.3 gpm/ft. of drawdown as determined in the earlier test and a withdrawal of 12 gpm will result in a drawdown of 40 feet. The average pumping rate of the Stewart #2 well was $10 \pm$ gpm for the 25-hour test; this caused a drawdown of about 18 feet in the Stewart #1 well.

test, this caused a drawdown of about 10 feet in the Stewart #1 well. Simultaneous pumping of both wells at the above rates would have resulted in a total drawdown of 40 feet + 10 feet or to a level below mean sea level.

It should be noted that the final nine hours of pumping of the Stewart #2 which was at 6 to 7 gpm did not result in a rise in the pumping water level. This indicates that the inflow to the well at the point of intake and above is no more than 6 to 7 gpm. Given the conditions encountered during the test, it is suggested that the combined pumpage from the two wells not exceed 15 to 20 gpm.

PG:cp

cc: Steve West

DIETZGEN CORPORATION
MADE IN U. S. A.

FEET

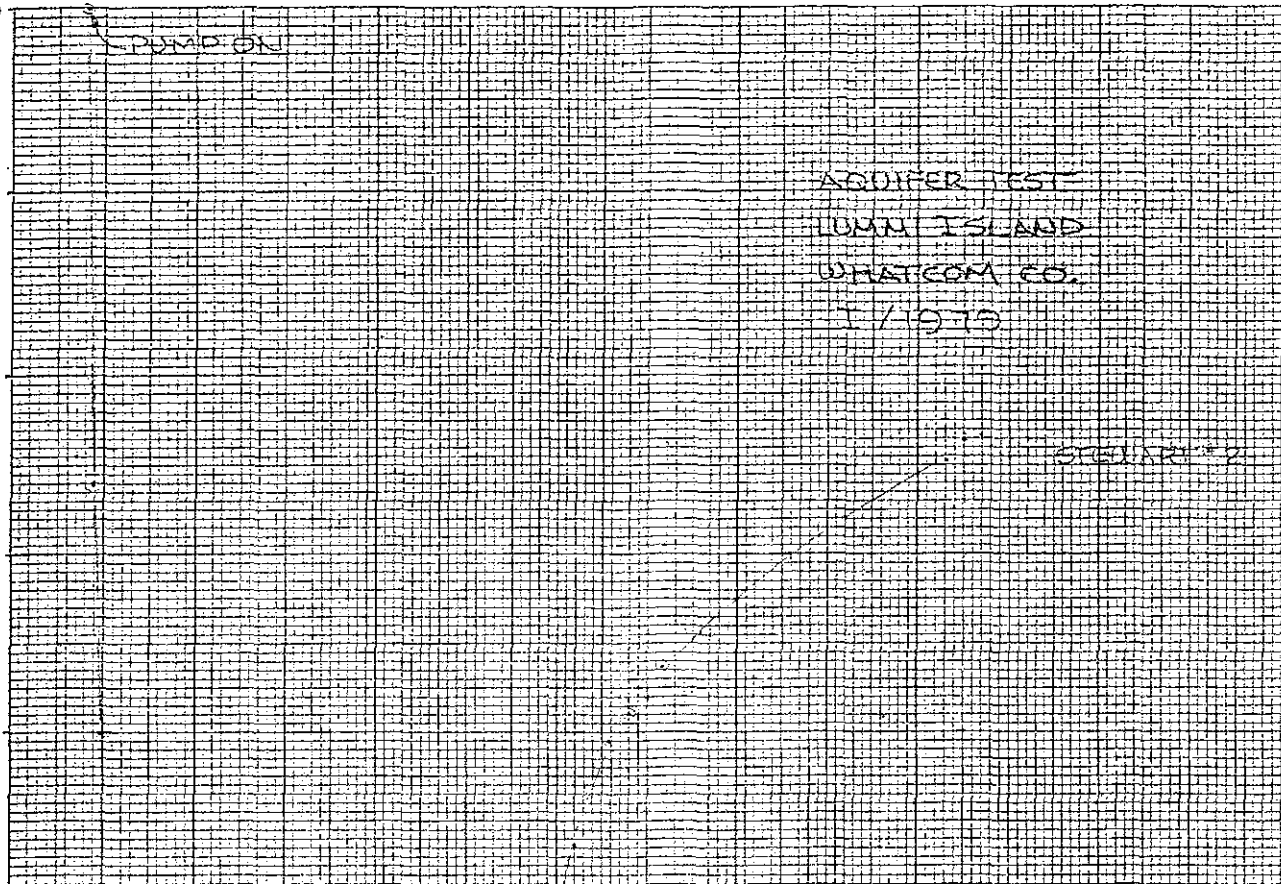
ONS

0
10
20
30
40

PUMP ON

AQUIFER TEST
LUNN ISLAND
WHATCOM CO.
1/1970

STEWART #2



WATER LEVEL FLUCTUATION

0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0

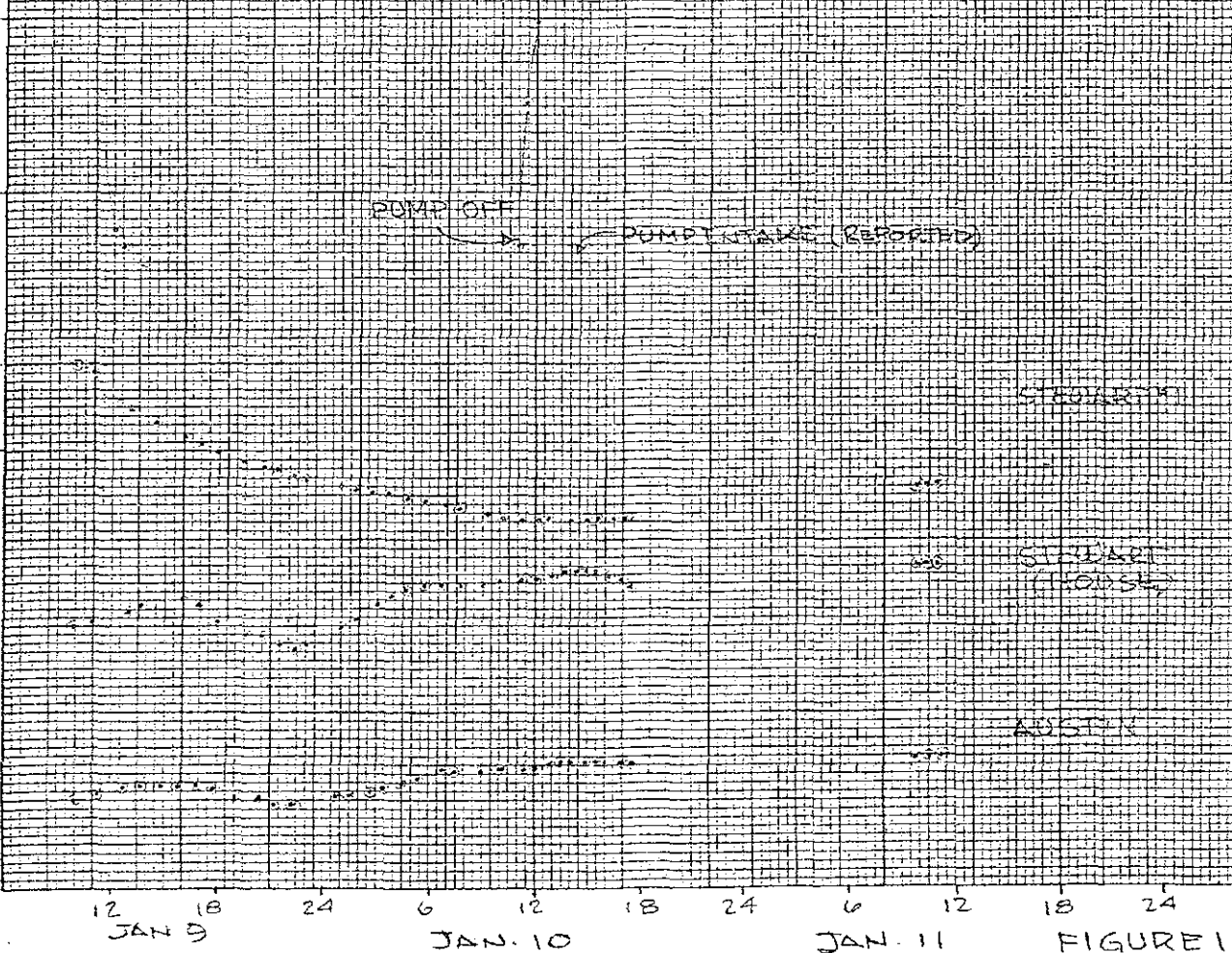


FIGURE 1





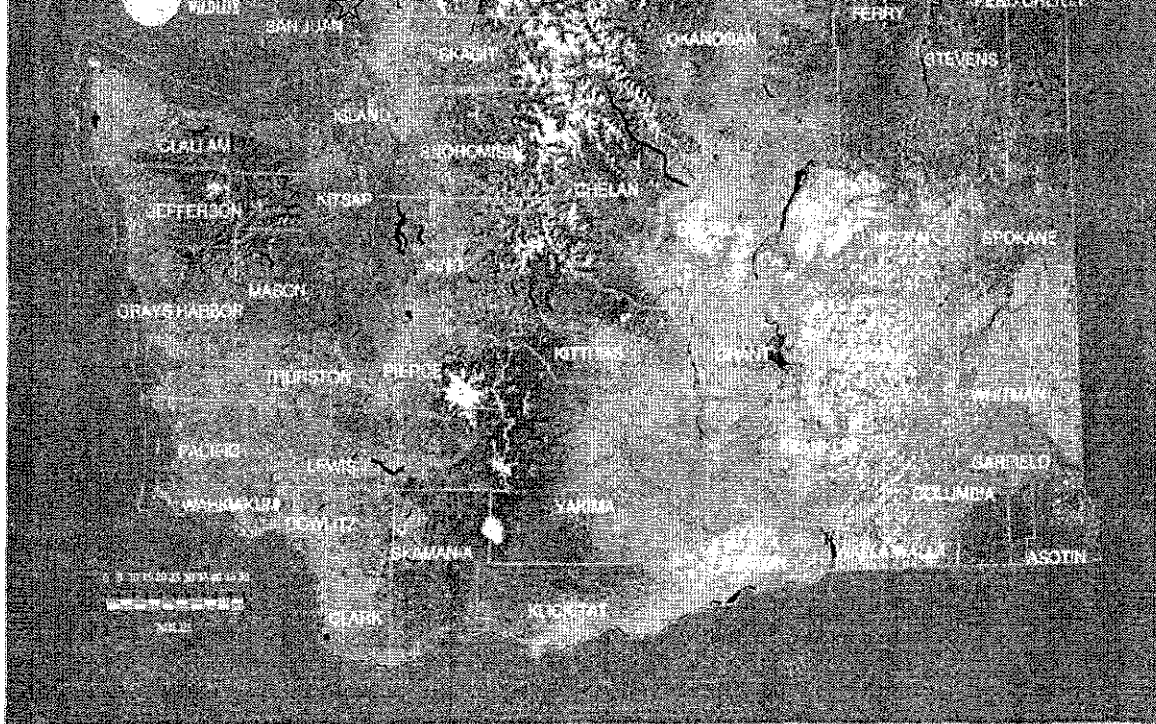
Lummi Island Coastal Conservation Project

PROJECT DESCRIPTION/SCOPE OF WORK

Project Size and Relationship to the Coast and/or Estuary

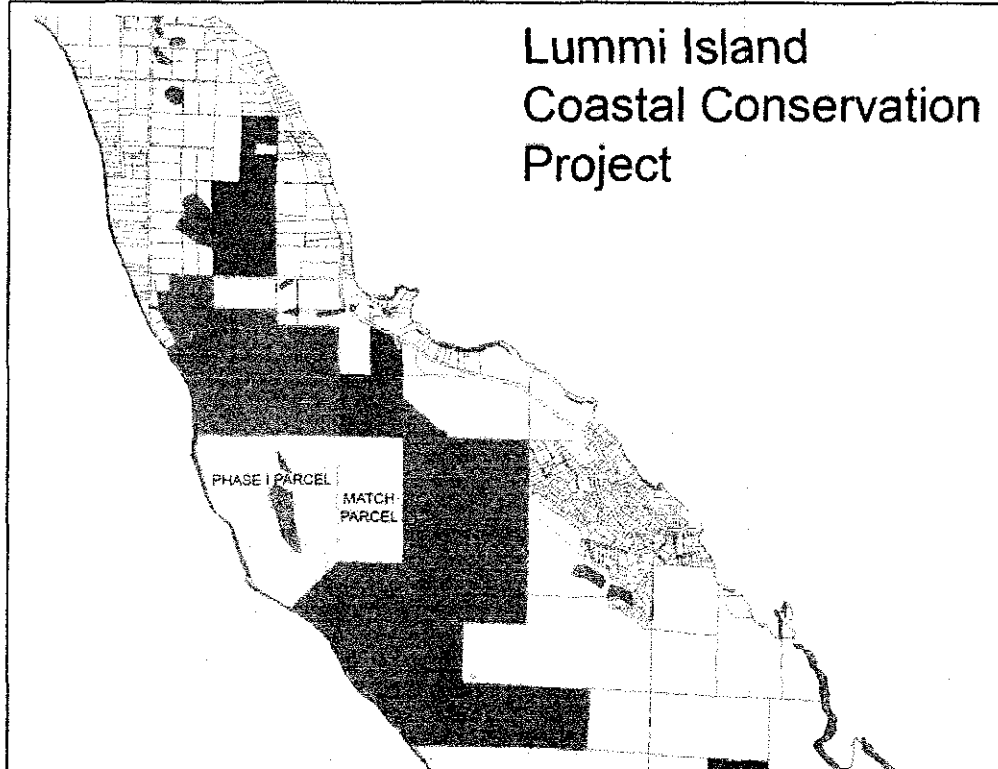
The project site is on Lummi Island in the San Juan Islands of northwest Washington. Lummi Island is within the five mile zone of freshwater influence of the Nooksack River Estuary and borders Georgia Strait, which is the south end of the Inside Passage. The project site is comprised of three parcels totaling 442 acres on the west coast of Lummi Island. WDFW will acquire protection of all three parcels, permanently protecting approximately 7,200 feet of saltwater shoreline and associated uplands. The property includes eel grass beds, kelp beds, feeder bluffs, freshwater wetlands, mature forest, and critical habitat for threatened and endangered species. Because non-federal matching funds are not currently available to purchase all project parcels, the project will be completed in two phases. The first phase will protect the highest priority parcel, which is 151 acres and includes 4,000 feet of shoreline (see Phase I Parcel on map next page). The adjacent upland parcel, which is 80 acres (referred to as the Match Parcel on map next page), will be protected with matching funds.













Map of Washington Counties (red star indicates project site location)

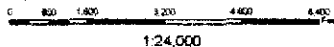
Lummi Island Coastal Conservation Project



PHASE II PARCEL

Legend

-  Acquisition Parcels
-  WDFW Protected
-  Land Trust Protected
-  WDNR Protected
-  BLM Protected
-  Land Trust Acquisition
-  Wetland (NWI)
-  Streams



Legal Rights to Be Acquired

The Washington Department of Fish and Wildlife (WDFW) will purchase perpetual conservation easements on the three parcels. An 80-acre portion of the site will be accessible to the public in the first phase of the project. An adjacent 151 acre parcel will become accessible to the public at the end of a life tenancy. The third parcel will be closed to the public in the near-term to protect sensitive wildlife habitat.

CELCP Goals

The primary purpose of the Lummi Island Coastal Conservation Project is **ecological**.

Ecological

The primary purpose of the Lummi Island Coastal Conservation Project is to protect the *ecological* integrity of the project area, consolidating and expanding protection of an ecologically intact shoreline, wetlands, rare plant communities, and habitat for threatened and endangered species. The project site includes approximately 7,200 feet of diverse, undeveloped saltwater shoreline and an important feeder bluff. The shoreline of the project site is especially valuable because the intertidal area is largely vegetated and within the zone of freshwater influence of the Nooksack River. A portion of the site is semi-protected by Bakers Reef, contributing to the habitat diversity of the vegetated shoreline. Marine Biologist Chris Fairbanks, who chairs the Whatcom County Marine Resources Committee and is principal of Fairbanks Environmental Services, describes the nearshore habitat on the project site as "...very valuable, highly functional and wholly intact with very little human impact." The intertidal wetlands on

the project site include nearly 10 acres of eelgrass beds, which comprises approximately 50 percent of one of the largest eelgrass beds on the west side of Lummi Island. The feeder bluffs on the 151-acre parcel are identified as a "protection target" in the 2005 Puget Sound Action Team report entitled *Regional Nearshore and Marine Aspects of Salmon Recovery*.

This project will permanently protect both estuarine and freshwater *wetland* resources. Approximately 25 acres of estuarine intertidal and 22 acres of freshwater wetlands will be protected through the acquisition of perpetual conservation easements. Of the freshwater wetlands, approximately 11 acres are palustrine emergent. This type of habitat is a "declining" wetland type, both nationally and locally. The project would protect the entire watershed for a 13 acre open water wetland on the Phase I Parcel. This wetland is a rich habitat for cavity-nesting ducks and a bald eagles nest is near the shoreline. Protection of associated uplands on the project site is a very important component of the project because upland habitats in the project area are extremely high value real estate and subject to intense development pressures.

The project site is located along South Georgia Strait, a known migratory corridor for several species of Pacific Salmon, including at least two historically independent subpopulations of the federally-threatened Puget Sound Chinook Evolutionary Significant Unit (the North Fork/Middle Fork early Chinook and the South Fork early Chinook). According to the 2005 Puget Sound Action Team report entitled *Regional Nearshore and Marine Aspects of Salmon Recovery*, "Juvenile Chinook salmon of all four life history types of the Nooksack populations, and larger juveniles from throughout Puget Sound (particularly from the Skagit River), utilize the [South Georgia Strait] sub-basin for feeding and growth, refuge, physiological transition and as a migratory corridor."

Within the South Georgia Strait sub-basin, there is very little semi-protected shoreline combined with major eelgrass beds. Eelgrass beds along the project shoreline provide important foraging opportunities and shelter for juvenile salmon. Eelgrass beds in the area are a declining habitat resource in Washington State due to a number of factors, including pollution, dredging, and over-water structures.

The protection of estuarine habitat on the project site also will provide important spawning and/or rearing habitat areas for forage fish, including sand lance, Pacific herring and surf smelt. Sand lance, also known as "candlefish," have been shown to provide up to 35% of the diet of many juvenile salmon, and as much as 60% of the diet of juvenile Chinook salmon. Minke whales, other marine mammals, and many species of seabirds also prey on sand lance. Surf smelt are also important foods for a variety of seabirds, marine mammals, and a variety of fishes including salmon. Pacific herring lay their eggs in eelgrass beds. These forage fish have been documented to provide important prey for approximately 40 species of birds, 12 species of marine mammals and 45 species of fish, including salmon and bottom fish populations that are at-risk or already federally listed under the Endangered Species Act.

The best example known in the world of the globally rare Douglas-fir/baldhip rose-oceanspray forest community occurs on the project site. The Lummi Island occurrence of the Douglas-fir/baldhip rose-oceanspray community is the largest in extent of Puget Trough sites and in as good or better condition than all other sites. Approximately 50 percent of the area of this

community occurrence on the site remains currently unprotected. One occurrence of the Douglas-fir-Pacific madrone/hairy honeysuckle community is located on the Phase I Parcel. This community type is globally rare and has very little current representation in the state's natural areas system, thus it is a Priority 1 in the State's Natural Heritage Plan. The project site also includes small grassy balds and seven WDFW priority habitats: rock and gravel marine shoreline, cliffs, shallow caves, talus, wetlands, ephemeral streams, and snag-rich areas.

The two dry forest community types are in good to excellent ecological condition. They have never been logged and are composed of mature (100+ years old), old-growth, and natural-origin young stands. Only two percent of forested ecosystems in the Puget Trough ecoregion remain in a mature to old-growth condition due to the combination of historic logging and ongoing development pressures

The project will protect the largest open water wetland on Lummi Island, which provides nesting habitat for bald eagle, pileated woodpecker, and cavity-nesting ducks. The project site supports one, and possibly two, breeding pairs of bald eagle, a federally threatened species. The project site and adjacent protected land is large enough to support additional breeding pairs of bald eagle. There are at least seven nesting territories on Lummi Island alone, with additional nesting sites on nearby islands. The intertidal portion of the property is key juvenile rearing habitat for the Puget Sound Chinook and Puget Sound bull trout, both federally-threatened species. Eelgrass beds on the site provide shelter and foraging opportunities for juvenile salmon as they exit nearby rivers.

The project site also provides important habitat for the recently de-listed peregrine falcon,

a federal species of concern. One of the oldest known peregrine falcon eyries in Washington State is located on an adjacent protected coastal parcel owned by Washington Department of Fish and Wildlife. The eyrie has produced one to three young most years from 1981 to present. Protection of the project site will buffer both the eagle nest and the peregrine eyrie from development. The snag-rich mature forest habitat on the project site provides excellent habitat for all of these avian species. With habitat loss being the major cause of species decline, protecting intact habitat from logging and future development will help with recovery efforts for listed species and help prevent listings of candidate species.

The southern resident Orca (killer whale), recently added to the federal endangered species list, will also benefit from the project. The project will both prevent contaminants from entering nearshore waters and support salmon populations, the whale's principal prey species. The west side of Lummi Island (which includes the project site) is part of the main out-migration route for all Fraser River salmon stocks, all Nooksack River salmon stocks, and Skagit River salmon stocks in most years, according to Pete Castle, WDFW habitat biologist. Other federally threatened and endangered species that forage on the project site are Steller's sea lion and marbled murrelet.

The Lummi Island Coastal Conservation Project will support many species that have been listed by the WDFW in one of the following categories: endangered, threatened, sensitive or candidate species. Those species that will benefit from this project include bald eagle, peregrine falcon, marbled murrelet, Steller's sea lion, Brandt's cormorant, common murre, tufted puffin, merlin, pileated woodpecker, bull trout, rockfish, chum salmon, Chinook salmon, harbor

seal, Southern resident killer whale (Orca), and Pacific harbor porpoise. In addition to this list, the WDFW also identifies habitat types that are a priority within the state. Estuarine habitat is identified by the state as one of the habitat types that is a priority for restoration and acquisition purposes.

Conservation

This project site is a land *conservation* “target area,” as defined in the Washington State’s 2005 Coastal and Estuarine Land Conservation Plan (WashCELCP). The project site has estuarine intertidal wetlands, rock and gravel shorelines (with some sand flats), and intact uplands that demonstrate “immediate and direct connectivity” to the shoreline to be preserved. Consistent with the WashCELCP, the project site has priority recreational and aesthetic attributes. The project site rises dramatically from sea level to over 1,000 feet. A walking trail and overlook area on the site would provide both low-impact recreation and expansive views of the San Juan Islands and the Canadian Gulf Islands to the north.

The project site contains eelgrass beds that are key juvenile rearing habitat for Chinook salmon. The 2005 Watershed Resource Inventory Area 1 (WRIA 1) Watershed Management Plan lists protection of juvenile rearing habitat for Chinook salmon as a goal.

The draft Puget Sound Salmon Recovery Plan recommends habitat protection “as the primary strategy direction for nearshore and marine areas, given the current state of knowledge.” The Recovery Plan further identifies two “key protection actions” that specifically support the project acquisitions: 1) “...protect shallow water/low gradient habitats and pocket estuaries

within five miles of the Nooksack River for natal and non-natal functions.” (Lummi Island falls within this geographic designation.); and 2) “...protect functioning drift cells that support eelgrass bands and depositional features along Birch Bay, Drayton Harbor, Portage and Lummi Island shorelines.”

The project will assist in achieving the goals of several specific management plans and objectives. The Pacific Coast Joint Venture Strategic Plan, developed as part of the North American Waterfowl Management Plan, identified the Puget Sound as a critical area to focus wetland conservation activities within the Northern Washington Bays and Straits Focus Area. The Northern Pacific Coast Regional Shorebird Plan recommends the restoration and protection of estuarine habitats along the Washington coast. The Salmon and Steelhead Habitat Limiting Factors Report for the San Juan Islands identified the protection and restoration of nearshore habitats, including estuarine habitats, as important to provide nursery habitat for salmon and both spawning and nursery habitat for several forage species, including herring, surf smelt and Pacific sand lance.

This project site is one of the few areas in the ecoregion with both a relatively large undeveloped forested landscape and significant remnant forest plant communities that have not been altered by timber harvest. The project parcels all lie within a more than 2,000 acre priority conservation area, as designated in The Nature Conservancy's Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment. This conservation area is one of the largest remaining undeveloped forested ecosystems in the San Juan Islands. It provides an important link between the island and the other San Juan Islands. The fact that this forested landscape is contiguous

the mainland and the other San Juan Islands. The fact that this forested landscape is contiguous with unaltered marine shorelines is also unusual.

The project site borders both the 623 acre Lummi Island Natural Area Preserve, managed by WDFW, and the 661-acre Lummi Island Natural Resources Conservation Area, managed by the Washington Department of Natural Resources. The project will expand and consolidate these protected areas, creating a substantial corridor for wildlife movement. Protection of the Phase I and Match Parcels will create a contiguous protected area of more than 900 acres. Protection of the Phase II Parcel would connect the north and south parcels of the existing Natural Area Preserve and expand the contiguous protected area to 1,900 acres, with just over 3.5 miles of contiguous protected saltwater shoreline.

The large natural area on the mountainous, southern portion of Lummi Island provides an important link between the mainland and the other San Juan Islands to the west. It is a resting point for migratory birds and is located within five miles of the Cypress Island Aquatic Reserve. The Padilla Bay National Estuarine Reserve is less than 10 miles from South Lummi Island.

Recreational

The project site will provide public access to a scenic overlook, offering spectacular views of the project site, Georgia Strait, and the other San Juan Islands. This trail is identified as a *recreation* priority in Whatcom County's Natural Heritage Plan. Lummi Island Heritage Trust and the North Cascades Audubon Society will lead regular environmental education tours on the Match Parcel, building on existing programs on other properties. Total visitor use is estimated at several thousand per year. The Heritage Trust will provide stewardship for the walking trail and

public access will be managed to insure that recreational access does not result in degradation or destruction of the protected resources. The Lummi Island Heritage Trust Resource Center is located 0.25 mile from the proposed trail access point and will serve as a place for the public to learn more about nature-based recreation opportunities on the project site.

The nearshore area along the project site is a popular area for kayakers. Lummi Island lies along the Cascadia Marine Trail, which is a saltwater trail that stretches over 140 miles from the Canadian border to southernmost Puget Sound near Olympia, Washington. The Cascadia Marine Trail is a designated National Recreation Trail. After the lifetime of the Priority I parcel's current owner, .75 miles of shoreline will be accessible for low-impact recreation managed by Lummi Island Heritage Trust, providing additional environmental education and wildlife-dependent recreation benefits.

The project site will be added to literature produced by Lummi Island Heritage Trust and the San Juan Preservation Trust to illustrate the many conservation activities that have occurred on the island and the biological resources that have been protected.

Historical

The project site is undeveloped land and contains no significant historical, cultural or archaeological features.

Aesthetic

The project site is *highly visible* from Lummi Island's scenic main road to the north of the

The project site is highly visible from Lummi Island. The site is also highly visible to boaters and passengers traveling the Alaska Ferry (which passes close to Lummi Island's western shoreline twice a week). This is also a popular area for whale-watching trips, as well as kayakers, given the frequent occurrence of Orca whales along the project shoreline.

Protection of the Phase II Parcel would complete the protection of virtually the entire, undeveloped, western face of Lummi Mountain, which is highly visible from the adjacent waterway. The Phase II Parcel rises from saltwater shoreline more than 1,600 feet to Lummi Peak, the highest point on Lummi Island and the second highest point in the San Juan Island Archipelago.

The project protects a scenic area along the Cascadia Marine Trail, a National Recreation Trail, which is designated as one of only 16 National Millennium Trails. It also provides a scenic buffer for Lummi Rocks, a conservation area owned and managed by the Bureau of Land Management in association with the Whatcom Land Trust, a local land trust based in Whatcom County.

Relevance to CELCP and Other State/Local Plans

Relevance to CELCP

The project meets all of the criteria to qualify as a "project area," as defined by Washington State's Coastal and Estuarine Land Conservation Program (CELCP) plan.

The project will protect *ecological* features including intertidal estuarine wetlands, freshwater wetlands, undeveloped saltwater shoreline, and adjacent uplands. Most of the intertidal wetlands within Puget Sound have been lost and, therefore, the intertidal wetlands that remain are critical areas to preserve. Freshwater wetlands often flow into estuarine systems serving to enrich the diversity of environments. Natural vegetated shorelines, home to forage fish and critical to salmon migration, are increasingly threatened. Human impact of the Puget Sound nearshore environment continues to erode the ecological integrity and sustainability of natural shoreline functions; therefore, retaining intact segments of un-impacted shoreline is crucial. High quality natural uplands adjacent to shorelines and wetlands are vital to the health of these water environments and supply rich habitats necessary for a diversity of wildlife.

The project will create low-impact, non-consumptive *recreational* public access, consistent with the state Interagency Commission for Outdoor Recreation mission to protect and enhance Washington's natural and recreational resources for current and future generations.

The dramatic mountain to sea landscape of Puget Sound is an *aesthetic* value that is unmatched. The project will protect a marine to mountaintop landscape of Lummi Island that will preserve the beauty of the area and contribute to the economic vitality attributable to the aesthetic qualities of Washington.

The project will protect landscape-scale processes and functions. The Washington State CELCP plan specifically recognizes "marine drift cell units" as important landscape processes. The project site contributes to such a drift cell unit on the west side of Lummi Island.

The project site contributes to such a drift cell unit on the west side of Lummi Island.

The project site is a core *conservation* area, with over 1,300 acres already protected on Lummi Mountain by State agencies, the Bureau of Land Management, and the local land trust. The project will further connect and buffer existing protected land, enhancing existing corridors for wildlife movement.

The project site will contribute significantly to salmon recovery by protecting key juvenile rearing habitat, as well as making an important contribution to preservation of native plant diversity. The project site contains high quality examples of two rare plant communities that will be afforded protection by the project.

The feasibility of project completion is high, given that options have already been secured on two of the project properties and the third property has already been identified and the landowner contacted. State funding has been awarded for the first phase of the project and additional funding for the second phase is likely if federal funds are secured to complete Phase I of the project.

The long-term management of the Phase I and Match Parcels will be provided by the local land conservancy, which has a core of volunteer stewards. The Phase II parcel will not be open to the public due to sensitive wildlife habitat on the site. A WDFW wildlife manager will combine monitoring of the conservation easements with existing obligations to monitor use restrictions on the existing protected land. Most of the project site will have a substantial buffer from development upon project completion. The San Juan Preservation Trust will acquire a

conservation easement on 204 acres to the north of the project site if funds are available to protect the Phase I Parcel.

Relevance to Washington State CZM

By protecting coastal wetlands, the project will fulfill a high priority programmatic objective of the Washington Coastal Zone Management Section 309 Assessment and Strategy (CZMAS) 2006. In addition, by increasing public access to a coastal property, the project will fulfill a medium priority objective of the CZMAS to “acquire, improve, and maintain public access sites to meet current and future demand through the use of innovative funding and acquisition techniques.” Preservation of natural shorelines and protection of coastal wetlands through non-regulatory means are also programmatic objectives of the CZMAS.

Relevance to regional and state watershed planning efforts

The project supports The Nature Conservancy’s Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment, which designates South Lummi Island as a “priority conservation area” for its biodiversity concentration and target species.

The project supports the Shared Salmon Strategy Puget Sound Salmon Recovery Plan by protecting shallow water/low gradient areas within five miles of the Nooksack River and functional drift cells that support eelgrass beds.

The project supports the Northwest Straits Marine Conservation Initiative’s goal to protect marine waters, habitats, and species in the Northwest Straits region. The project will

protect water quality by preventing sources of pollution and protect 7,200 feet of important shoreline habitat along Georgia Strait.

The project protects estuarine habitat on the Pacific Coast, which is identified as a critical *protection action* for shorebirds as defined in the Northern Pacific Coast Regional Shorebird Management Plan developed as part of the U.S. Shorebird Conservation Plan.

Puget Sound is designated as one of 17 estuaries in the National Estuary Program. The project prevents habitat loss and alteration, which is designated as a priority management issue by the National Estuary Program a part of the U.S. Environmental Protection Agency.

The project protects wetlands on the North Pacific Coast, which is identified as a "High" priority for the wetland conservation activities of the Ducks Unlimited Conservation Plan.

The project acquires and restores estuarine habitat, which is designated as a priority action item by the Puget Sound Action Team in the Puget Sound Water Quality Management Plan.

The project protects estuarine habitat in the Puget Sound Ecosystem, which is designated as a priority goal in the Puget Sound Estuary Restoration and Protection Plan.

The project controls contamination of aquatic habitat for Orca (killer whale) and harbor porpoise, both Species of Greatest Conservation Need (SGCN); will prevent blasting and

construction disturbance in close proximity to nest sites of peregrine falcon, a SGCN; and maintains access to important feeding areas for surf scoter, identified as a SGCN in the Washington Department of Fish and Wildlife Comprehensive Wildlife Conservation Strategy (CWCS.)

The project site is identified as a priority area within the State's Natural Heritage Plan. The Natural Heritage Plan's primary goals are to preserve highest quality remaining examples of native plant communities and habitats within the state. All three of the project parcels contain globally rare native plant communities. The best example known in the world of the globally rare Douglas-fir/baldhip rose-oceanspray forest community occurs on the project parcels. The Lummi Island occurrence of the Douglas-fir/baldhip rose-oceanspray community is the largest in extent of Puget Trough sites and in as good or better condition than all other sites.

Relevance to local watershed planning efforts

The project protects estuarine habitat in the San Juan Archipelago, which is identified as an important action in the Salmon and Steelhead Habitat Limiting Factors Report for the San Juan Islands.

The project supports the Water Resources Inventory Area No. 1 (Whatcom County) Salmon Restoration Strategy by protecting areas with high quality habitat and functional processes for wild-spawning coho.

In addition, the Whatcom County Marine Resources Committee, the local advisory group charged with implementing the Northwest Straits Initiative, supports the project.

Manageability of the Project Site

Current use and condition of the site

The extensive shoreline of the Phase I Parcel and Phase II Parcel is in a pristine condition, with no evidence of human disturbance. No sources of pollution currently impact the shoreline of the project parcels. Eelgrass beds show no signs of decline. According to marine biologist Chris Fairbanks, the nearshore habitat on the project site is "highly functional and wholly intact with very little human impact."

A large portion of the project site is in an undisturbed mature and/or old growth forest condition. Portions of the property were extensively logged roughly 100 years ago, but steep slopes were not harvested and remain in an old growth condition. Occurrences of the rare Douglas fir/baldhip rose-oceanspray community, identified as a priority plant community within the State's Natural Heritage Plan, are in excellent condition. According to Chris Chappell, former plant ecologist with the State's Natural Heritage Program, this plant community occurrence is the largest in extent of all sites in the Puget Trough (the greater Puget Sound Region). The condition of the plant community occurrence is also in as good or better condition than all other sites in the Puget Trough.

The 13-acre open water wetland and surrounding snag-rich area on the Phase I Parcel provides a rich breeding habitat for cavity-nesting ducks. The wetland has historically been used for irrigation of fields on the farmland to the north of the parcel and for domestic water supply of several homes to the north of the project site. Water withdrawals, however, have not compromised wildlife values of the wetland, which also provides freshwater to the shoreline.

The only significant human impact on the project site, other than historic logging roads, is a gravel quarry on the northern boundary of the property. This quarry has been actively mined for approximately 50 years. The current landowner will continue using the quarry for his lifetime, but the conservation easement will limit the quarry area to a 1.5 acre envelope on the Phase I Parcel. The quarry envelope does not impact sensitive habitats on the project site and all mining will cease at the end of the owner's life tenancy.

The area surrounding the site is currently zoned by Whatcom County as "rural forestry," allowing subdivision into 20 acre parcels. The project will leverage protection of a large parcel immediately to the north of the Phase I Parcel (shown on the project map in pink). A preserve owned by Lummi Island Heritage Trust will buffer the Match Parcel on its northern boundary. An existing WDFW preserve buffers the east and south boundaries of the Phase I and Match Parcels. The Phase II Parcel is buffered on the north and south by existing WDFW preserve land. Although the land to the east will remain unprotected, it is separated from the Phase II property by a ridgeline. As shown on the project map, sections of the Lummi Island shoreline have been developed with high-density subdivisions. This project represents an opportunity to protect nearly an entire watershed that is threatened by intense development pressure.

nearly an entire watershed that is threatened by intense development pressure.

The project site is not significantly impacted by non-native species. Scotch broom is starting to take hold in an approximately one-quarter acre area along the historic logging road on the Match Parcel, but the occurrence can easily be eliminated once the property is protected. The local land trust has pledged to coordinate volunteers to eradicate this invasive plant from the site following the acquisition.

Long-term Use of the Site

The Phase I Parcel will be managed for protection of shoreline processes, wetland values, and rare plant communities. The Match Parcel will be managed for protection of rare plant communities and low-impact recreation. The Phase II Parcel will be managed to protect native plant communities and as a wildlife refuge with limited public access for educational purposes and scientific research.

Public use of the site will be limited to historic logging roads and no new trails will be constructed through sensitive plant communities, ensuring recreation will be compatible with protection of the site's ecological values.

Threat of Conversion

Lummi Island is one of only seven islands in the San Juan Islands that have regular ferry service. Due to the spectacular natural beauty of the San Juan Islands and the high demand for waterfront building sites that can be accessed by automobile, the ferry-served islands are under intense development pressure. The population of Lummi Island increased by one third in the

1990s and demand for building sites remains strong. Property values on Lummi Island have been rising rapidly, greatly increasing the pressure on landowners to sell for development.

The project site could be developed into 40 high-value waterfront estates under existing zoning. Although the project site includes steep slopes, it also includes sufficient benches and ridgeline property to accommodate the maximum number of home sites. The project site also contains substantial areas of marketable timber.

The Phase I Parcel and the Match Parcel are currently under option contract until June of 2007, with the possibility of a bridge loan if the Lummi Island Coastal Conservation Project is likely to be fully funded. If funds are not secured to complete the project, the property's ecological values will be severely compromised by logging and development.

The Phase II Parcel is not under contract but the landowners have expressed interest in selling a conservation easement. Given that the landowner also has expressed interest in logging the property in the near future, the ecological values of the site are at risk.

Project Readiness

WDFW has identified the project parcels as acquisition priorities and has been awarded a grant from the Interagency for Outdoor Recreation (IAC) to purchase a conservation easement on the Match Parcel. Project partner Lummi Island Heritage Trust has been working for eight years to bring this project to fruition and, with the help of the San Juan Preservation Trust, has

secured conservation easement option contracts on the Phase I Parcel and the Match Parcel. The Phase II Parcel was defined as a Phase II acquisition priority within WDFW's FY 2005 application for funding from the IAC. The owners of the Phase II Parcel have indicated an interest in selling a conservation easement.

An appraisal is underway for the Match Parcel. Appraisals of the proposed conservation easements to protect the Phase I and Phase II Parcels have yet to be conducted.

Lummi Island Heritage Trust has completed a Phase I Environmental Site Assessment on the Match Parcel and the Phase I Parcel. The site work and research was conducted by Northwest HydroGeo Consultants in April 2006 and showed the site was "in excellent condition, and no evidence of hazardous materials or hazardous wastes were found as a result of investigation and literature research."

The property is not subject to any known litigation, liens, judgments or other situations that may affect the likelihood that a project could be completed.

Ability to Acquire Land

The grant applicant, the Washington Department of Fish and Wildlife (WDFW), is authorized by Washington law to purchase conservation easements for the benefit of the public. WDFW currently owns and manages 623 acres adjacent to the project site as a wildlife area for long-term conservation. The northerly block of WDFW protected land shown on the attached map was purchased in 1991. The southerly block was purchased in 1998, in cooperation with the

Trust for Public Land. WDFW manages wildlife areas around the state, including a total of 4,650 acres in Whatcom County, where the project site is located.

Ability to Manage Land

WDFW has 22 wildlife area managers in Washington State. WDFW's wildlife manager for the Lummi Island wildlife area also manages property owned by WDFW on the mainland. The wildlife manager will conduct annual monitoring of the conservation easements. Lummi Island Heritage Trust (LIHT), the local land trust, will acquire the fee title to the Match Parcel and will hold exclusive fee title to the Phase I Parcel at the end of the current landowner's life tenancy. LIHT, founded in 1997, currently owns 186 acres on Lummi Island and manages 137 acres as two publicly-accessible nature preserves. The organization holds 13 conservation easements on another 159 acres. LIHT has been awarded grants from NFWF and the North American Wetlands Conservation Council for past land conservation projects. The San Juan Preservation Trust (SJPT), another local land trust, will hold a conservation easement on the property immediately to the north of the Phase I Parcel.

Other Pertinent Information

Photographs of the project site are attached.

PROJECT TIMELINE

March 2008 to September 2008

Benchmarks:

- Acquire appraisal, title opinion, survey March 2008
- Complete negotiations with landowner(s) May 2008
- Submit documentation to NOAA for approval June 2008
- Complete baseline documentation August 2008
- Close on property September 2008

BUDGET NARRATIVE

WDFW will use CELCP funds to purchase a conservation easement on the Phase I Parcel, as shown on the project map. If funds become available from other funding sources to purchase the conservation easement on the Phase I Parcel, WDFW will use any residual CELCP grant funds toward purchase of a conservation easement on the Phase II Parcel. WDFW has applied for \$600,000 in FY 2007 funding from the National Coastal Wetlands Conservation Grant Program and Lummi Island Heritage Trust (a local land trust) has applied for \$223,000 in FY 2007 from the National Fish and Wildlife Foundation. The Heritage Trust will be applying for an additional \$75,000 in FY 2007 funding from NAWCA in November.

Conservation easements on the project parcels have not yet been appraised, however, Lummi Island Heritage Trust and the San Juan Preservation Trust have secured options to purchase conservation easements on a 355 acre property that includes the Phase I Parcel. The

land trusts have had the 355 acre property appraised. The appraiser estimated the fair market value of the fee interest at \$5,150,000 in late 2005. The market value of the 151-acre Phase I Parcel is conservatively estimated at \$2,265,000. The fair market value of the conservation easement on that parcel is estimated to be 75 to 90 percent of the fee value. The land trusts have expressed their willingness to pre-acquire the conservation easement on the Phase I Parcel and sell it to WDFW for \$883,000 (about 40 percent of the estimated fee value). The balance of the 355 acre property, which includes grazing land to the north of the Phase I Parcel, will be protected with a conservation easement held by the San Juan Preservation Trust. Although this conservation easement will buffer the Phase I Parcel and Match Parcel from development, it is not being used as match because it allows livestock grazing, selective logging, and a home site. (It should be noted that a proposed conservation easement on the entire 355 acre property was valued at 48 percent of the fee interest by a state-approved appraiser. This strongly suggests that a conservation easement prohibiting commercial logging and residential use would diminish the value of the encumbered Phase I property by at least 75 percent).

As part of the Lummi Island Coastal Conservation Project, WDFW also will purchase a conservation easement on 80 acres adjacent to the Phase I Parcel. This parcel is designated as the "Match Parcel" on the project map. The Match Parcel is integral to the success of the project. It will provide public access to the project site upon project completion and provide a critical buffer for the sensitive plant and wildlife habitat on the acquisition parcels. The local land trusts have secured an option to purchase the Match Parcel from a private landowner and are negotiating an agreement to sell a conservation easement to WDFW. The Interagency Committee for Outdoor Recreation (a state funding program) has already approved funds for this purchase.

for Outdoor Recreation (a state funding program) has already approved funds for this purchase.

A portion of project expenses of the Phase I Parcel and the Match Parcel are included in the CELCP budget in the table below. WDFW completed negotiating the conservation easement on the Match Parcel in August of 2006 and the conservation easement is currently being appraised. The agency has \$800,000 in approved acquisition funds for purchase of this conservation easement, which are being used to cover the cost of negotiating and securing this conservation easement, as well as for the appraisal, survey, signage, and closing costs. The administrative costs of securing the conservation easement on the Phase I Parcel are estimated at 5 percent of the Federal Share. The cost of finalizing the easement terms, the appraisal, survey, baseline documentation, and closing costs for the Phase I Parcel are included in the Federal Share in the below table.

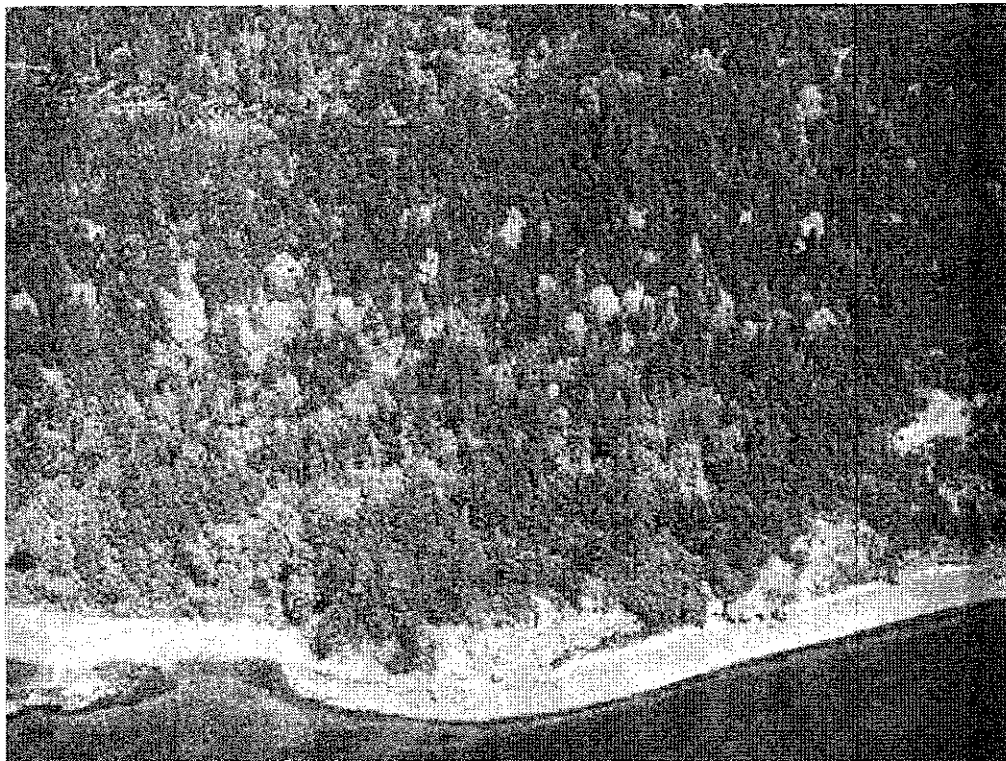
The owners of the Phase II Parcel (shown on the project map) have expressed interest in selling a conservation easement, though no option has been secured. The fee value of the Phase II Parcel is conservatively estimated at \$2,532,000. The conservation easement value is conservatively estimated at \$1,900,000 (equal to 75 percent of the estimated fee value). WDFW will apply for state funds to support the purchase of a conservation easement on this Priority II Parcel in the state's FY 2009 budget; these prospective funds are not used as match in the below budget table.

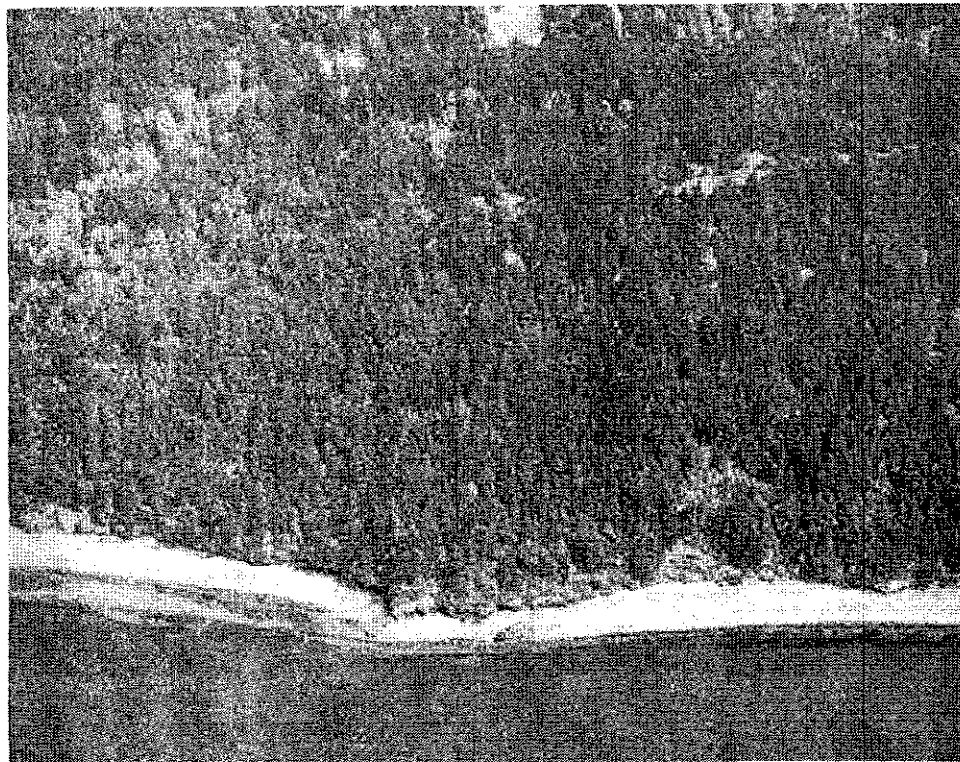
Provided the Lummi Island Heritage Trust successfully acquires interests in the project site, the trust may, at some point, institute a user fee to cover the costs of maintaining the property. Any user fees would go exclusively toward paying the costs of maintaining the

pedestrian access trail, a parking area on an adjacent parcel at the edge of the County road, and signage.

Lummi Island Heritage Trust and the San Juan Preservation Trust hold options to purchase the *fee interest in the Match Parcel* and conservation easements on the adjacent 355 acres, including the Phase I Parcel. Because the current landowners are only willing to sell the property interests for conservation if all interests are purchased, the fate of the entire property depends on funding being made available for protection of the Phase I Parcel.

Lummi Island Coastal Conservation Project Photos





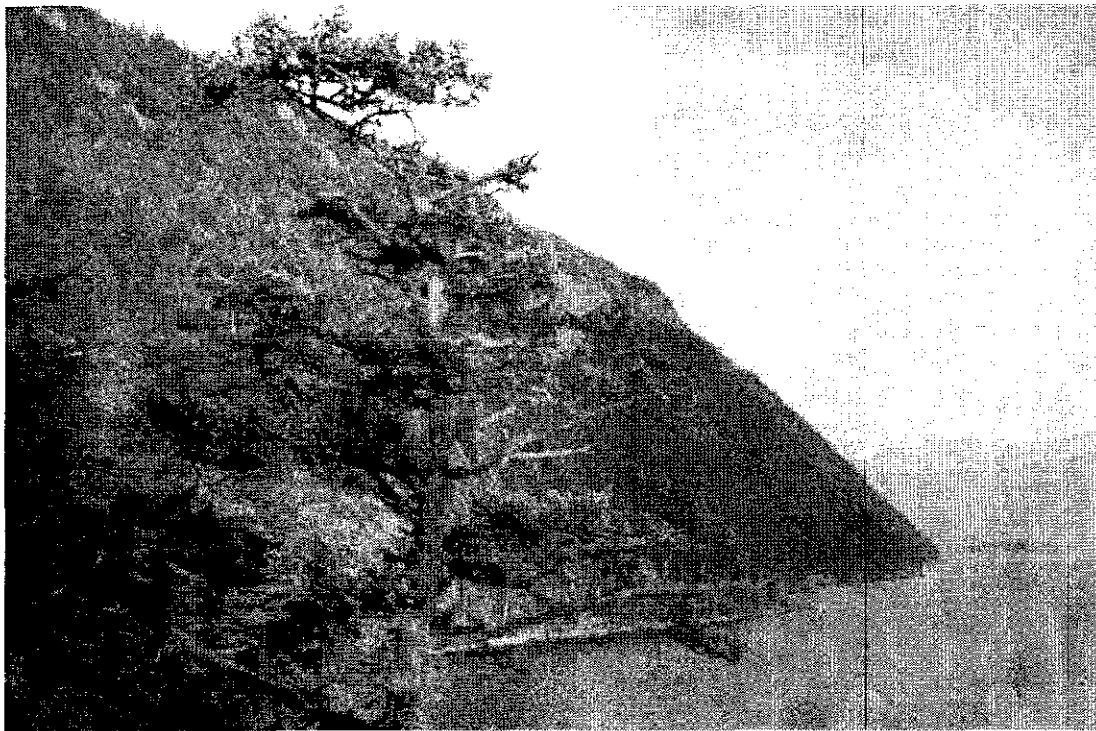
Northerly extent of Phase I Parcel shoreline with grassy balds above DoE Photo



Mudflat on Phase I Parcel looking toward Lummi Rocks

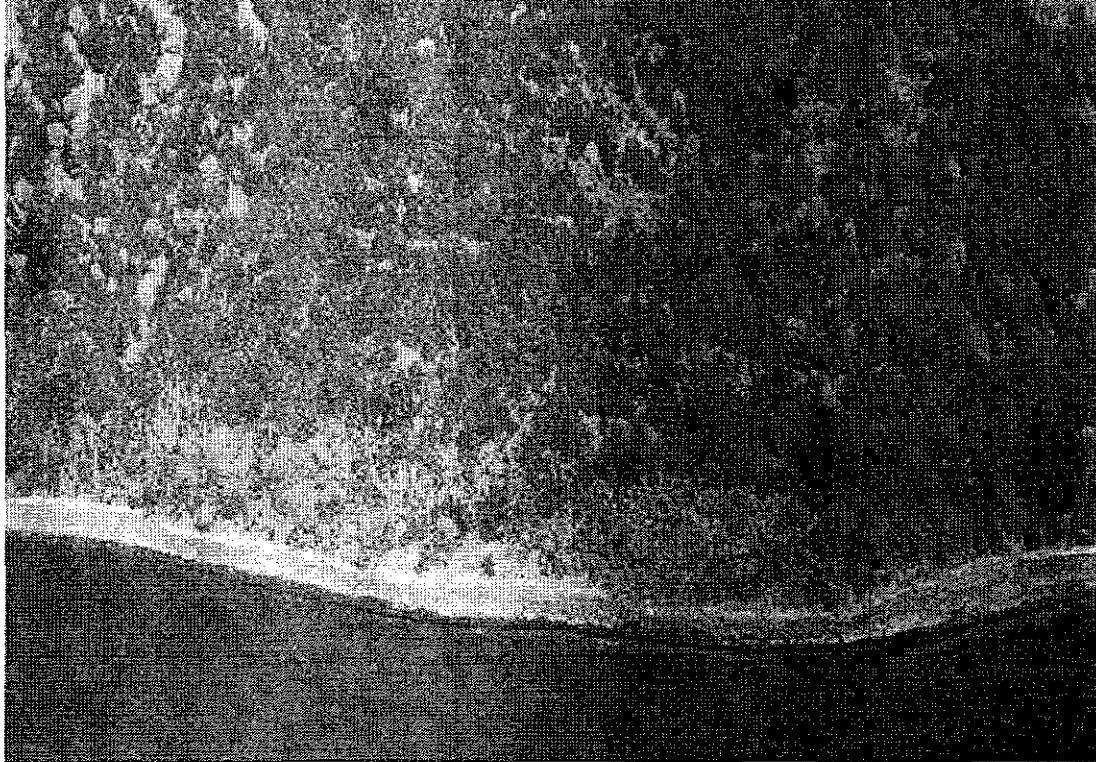


Phase I Parcel intertidal area with eelgrass beds (looking north)



Phase I Parcel Looking South at WDFW-protected shoreline and Phase II Parcel

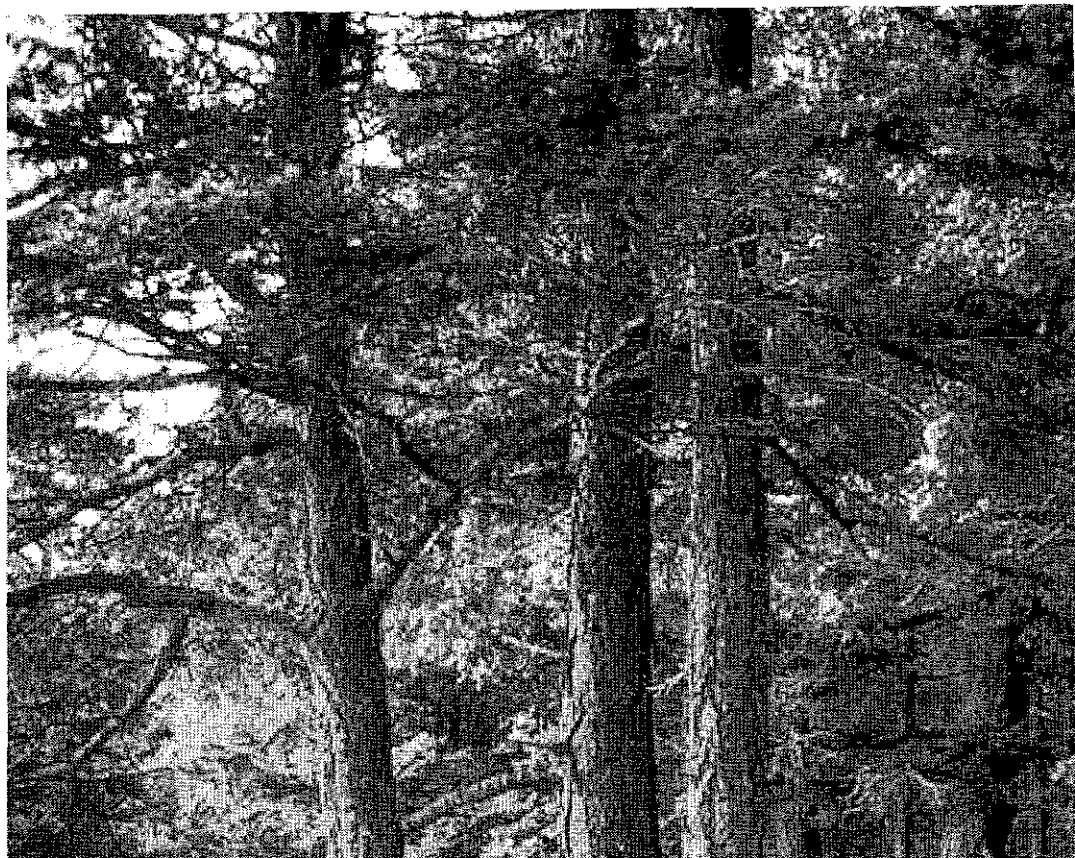




Central portion of Phase II Parcel shoreline

DoE Photo


0310





Douglas-fir/baldhip rose-oceanspray forest community on project site





View from overlook on Match Parcel looking northwest (large wetland in foreground)

0312

disembark. When waiting to board or disembark, pedestrians should wait in designated areas. Stay in your own lane unless signaled to change lanes by a crewmember.

- When boarding the ferry at night, please only use your parking lights.
- Be cautious of ferry employees on the car deck.
- Pull close to the car in front of you.
- Set parking brakes
- Turn your engine off.
- Warn used traffic around you and in the adjacent lane has stopped before opening your doors.
- Turn your engine on when your lane begins to leave the boat.
- Remember, bicyclists and pedestrians disembark last.

Welcome to the Lummi Island Ferry Whatcom Chief

SCHEDULE FARE INFORMATION

1-360-676-6874

Via the Internet
<http://www.whatcomcounty.us/>

SENIOR/DISABLED/INCOME

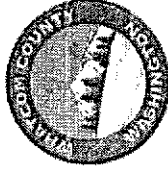
Can only be purchased on the

Whatcom County Treasurer's
Office 311 Grand Ave, Suite 104
Bellingham, WA 98225 (360) 676-
6774

EBL FARE TICKETS

Can only be purchased on the ferry,
boat and at the Whatcom County
Public Works Civic Center Annex
322 N. Commercial, Suite 110
Bellingham, WA 98225
(360) 676-6874

Lummi Island Ferry



PUBLIC WORKS

SAFETY PRECAUTIONS

U. S. Coast Guard Regulations require the following:

Propane tanks must be shut off and sealed. Anytime tanks are not permitted aboard. Pressurized tanks (oxygen) must be capped. No dumping of hazardous waste (oil, antifreeze) while on board the ferry.

Livestock carriers cannot leak waste.

Trailered boats may have two portable gas tanks. Each tank may carry up to 6 gallons provided each are secured to the boat and in good condition.

If you violate these rules, you may be refused passage.

**Tickets (Whatcom/Skipt) Commies -
and checks.
the fare receipt.**

GENERAL INFORMATION

Animals - Animals must be on a leash or in a pet container when on the car deck.

Animals that are not people-friendly shall be muzzled or transported in a pet container. Owners are required to clean up (5000P) after their pets. With the exception of service animals, animals are not allowed in the cabin spaces.

Navigation Bridge & Pilothouse - Per 46CFR 16, all passengers are excluded from the navigation bridge and pilothouse.

Open Flames/Smoking - Open flames, including heaters or stoves, are prohibited on the ferry vessel. No smoking is allowed anywhere on board the vessel or in vehicles. All smoking material must be extinguished prior to boarding the vessel.

Propane/Gasoline Containers - U.S. Coast Guard regulations require propane tanks be shut off and sealed prior to boarding unless they are the primary fuel source for your vehicle. You may carry up to 2 freestanding propane tanks in addition to those in recreational vehicles, not to exceed 20 pounds water equivalent weight (approx. 25 gallons). All propane tanks must be secured. Gasoline may be transported in limited quantities up to 12 gallons total in portable containers, not to exceed 4 gallons maximum per container.

Containers must be UL or ECCC approved, in good condition, and transported in a vehicle. All vehicles and containers must have gas caps.

Running Vehicles - It is prohibited to run vehicle engines while the vessel is underway or to start engines before the vessel has docked.

Vehicle Fare Structure Applicability - The fare structure applies to all motorized vehicles including automobiles,

motorcycles, and trucks. The rates apply to all vehicles pulling trailers, unlicensed vehicles, and road machinery on wheels.

Unattended Vehicles - Leaving vehicles unattended in the ferry lane for longer than one ferry arrival and departure cycle is prohibited and may result in the vehicle being towed at the owner's expense.

NOTE: There can be unsecluded nuts.

Vehicle Width - Any vehicle occupying more than one ferry lane, shall be charged a 50 % surcharge.

Legal Weapons - Weapons may be carried either in vehicles (in accordance with Washington state law) or in a case. The Master may choose to allow a visible weapon aboard provided the weapon is unloaded, secured and locked under crew control. The Master has the right to deny passage if a condition warrant.

CODE OF CONDUCT

Welcome aboard! Please review the following guidelines:

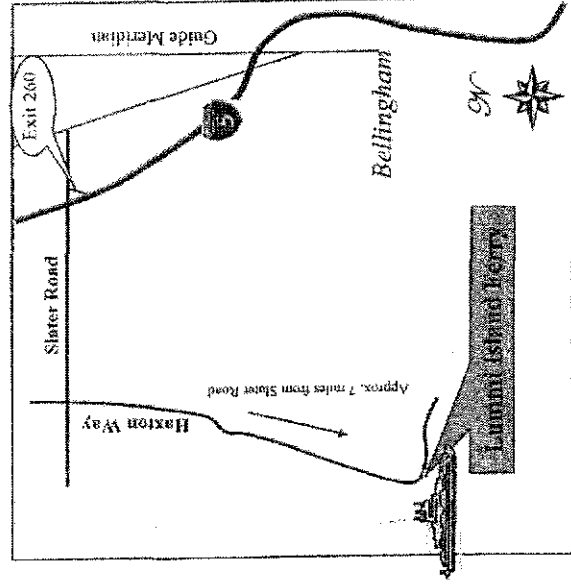
- Follow all directions from the ferry crew regarding safety, emergencies, orderly behavior, loading, and unloading procedures. Any instructions given during the voyage and during roll-off and roll-on operations must be observed. CRF-49 Chapter 176.09(9).
- Act respectfully toward each other and the ferry crew. Please, no quarreling, pushing, loud noises, vulgar or obscene language or gestures, fighting, spitting, running, etc.
- Do not tamper with safety or life saving equipment.
- Do not litter, including throwing objects on the ferry or overboard.
- No possession or use of illegal drugs, alcohol, tobacco products (including chewing tobacco), or weapons will be tolerated. Smoking and consuming alcohol are prohibited anywhere on or within the ferry vessel.
- No use of open flame or engagement in any actions that may be hazardous to others or the ferry vessel.
- No destruction, defacement, damage, or theft to any personal or county property. Any vandalism or theft will be reported to the appropriate authorities.
- Remain in areas designated for passengers. Do not enter any unauthorized area.
- Radios, tape or CD players, and other electronic or musical equipment may be used only if headphones are used so that the

- sound is audible only to the individual listener.
- Crew members are obligated to report violations of any of the above regulations by recording and reporting vehicle licenses to the appropriate authorities.



BOARDING & DISEMBARKING THE VESSEL

- Prior to boarding or disembarking the vessel, drivers should turn off cell phones.
- During boarding and disembarking, drivers should pay close attention to hand signals from the crewmembers.
- A crewmember will announce or signal pedestrians and bicyclists to board or prepare to



DIRECTIONS

From Canada and points north

Follow Interstate 5 south to Slater Road
Exit 260. Approximately 20 miles south of border.

Turn right or west on Slater Road
Follow Slater Road 1.22 miles to Haxton Way

Turn left or south on Haxton Way
Follow Haxton Way 7.02 miles to the Whatcom County Public Works Lummi Island Ferry

From Seattle and points south

Follow Interstate 5 north to Slater Road
Exit 260

Turn left or west on Slater Road
Follow Slater Road 1.22 miles to Haxton Way

Turn left or south on Haxton Way
Follow Haxton Way 7.02 miles to the Whatcom County Public Works Lummi Island Ferry

PAYMENT

- Cash (US currency) and local ID required are accepted.
- There is a \$30.00 fee for return.
- The white punch book sheet is

FARES

Cost	Rate Basis - Roundtrips
\$2.00	1 roundtrip
\$25.00	25 roundtrips
\$15.00	10 roundtrips
FREE	1 roundtrip
FREE	1 roundtrip
\$20.00	25 roundtrips
\$20.00	25 roundtrips
\$15.00	25 roundtrips
FREE	1 roundtrip
\$2.00	1 roundtrip
\$3.00	1 roundtrip
\$7.00	1 roundtrip
\$18.00	25 roundtrips
\$60.00	10 roundtrips
\$30.00	10 roundtrips
\$20.00	1 roundtrip
\$100.00	10 roundtrips
\$45.00	1 roundtrip
\$225.00	10 roundtrips
\$60.00	1 roundtrip
\$450.00	10 roundtrips
\$12.00	1 roundtrip
\$25.00	1 roundtrip
\$48.00	1 roundtrip
\$500.00	1 roundtrip

50% surcharge (see identification)
 Per trip surcharge - one way. Special trips are a surcharge on addition to the applicable fare.

Chief of or at the Whatcom County Courthouse, 100 North 10th Street, Suite 110, Pottsville, PA 17854

Departure Time: Lummel Island to Mainland Gooseberry Point		
Monday - Friday	Saturday	Sunday & Holidays (P)
3:40 a.m.	7:00 a.m.	7:00 a.m.
6:00	8:30	8:30
6:30	9:00	9:00
7:00	10:00	10:00
7:30	11:00	11:00
7:40	12:00 p.m.	12:00 p.m.
8:00	1:00	1:00
8:20	2:00	2:00
8:40	3:00	3:00
9:20	4:00	4:00
9:40	5:00	5:00
10:00	6:00	6:00
10:30	7:00	7:00
11:00	8:00	8:00
11:20 (2)	9:00	9:00
11:40	10:00	10:00
12:00 p.m.	11:00	11:00
12:30 (2)	12:00 a.m.	12:00 a.m.
1:00	12:30	12:30

Departure Time: Mainland Gooseberry Point to Lummel Island		
Monday - Friday	Saturday	Sunday & Holidays (P)
3:40 a.m.	3:10 a.m.	7:10 a.m.
6:10	5:40	8:10
6:30	6:10	8:30
7:10	7:10	9:10
7:30 (2)	8:10	10:10
7:50	9:10	11:10
8:10	10:10	12:10 p.m.
8:30	11:10	1:10
9:10	12:10	2:10
9:30	1:10	3:10
9:50	2:10	4:10
10:30	3:10	5:10
10:50	4:10	6:10
11:30	5:10	7:10
11:50	6:10	8:10
12:10	7:10	9:10
1:10 (2)	8:10	10:10
1:30 p.m.	9:10	11:10
1:40	10:10	12:10 a.m.
1:50 p.m.	11:10	12:30
12:10 a.m.	12:30	

On the weekends, unless it will cause the ferry to miss the next SCHEDULED RUNS, whenever necessary the ferry will make ADDITIONAL RUNS if required to clear the deck. This will be the Master's decision.

1. New Years Day, July 4th, Labor Day, Thanksgiving, Christmas
2. Fuel trucks only on Tuesday & Thursday - no vehicles until next run
3. NO RUNS on alternate Thursday - ferry re-fueling (~12:30 pm to 1:20 pm)

CLARIFICATIONS

1. All children under the age of twelve years when traveling on the Whatcom County ferry must be accompanied by an adult. An exception to this policy will be made only if the parent or guardian signs a waiver exempting Whatcom County from all liabilities for any and all injuries, loss of life, etc., while the child is traveling on the ferry.

2. No special child or student discount is available for drivers of vehicles.

3. Student multiple racks shall be sold to full-time students only. Student multiple cards shall only be sold at Public Works Accounting (Administration) office. Proof of full-time enrollment shall be required at the time of purchase.

4. Enrolled members of the Lammis Indian Tribe who are issued appropriate identification cards by the Tribe, or current fishing, crab, bayside, or Lammis Indian Bayside Councils (Lammis tribal) racks and who have legitimate tribal business on Lammis Island as indicated by the Lammis Indian Nation have free boat passage upon and leaves the ferry operated by Whatcom County between Gooseberry Point and Lammis Island.

5. Annual needs based discount is provided for Lammis Island residents who meet the income levels listed below:

These special tickets will only be sold at the Whatcom County Treasurer's Office in Bethlehem and will require proof of income and family size. Eligibility will be reviewed at least annually. Forms and procedures will be developed by the Whatcom County Treasurer's Office.

- Family of 2 or more with less than \$10,000 total annual net income
- Family of 3 with less than \$30,000 total annual net income
- Family of 2 with less than \$20,000 total annual net income
- Individual with less than \$10,000 total annual income

6. Eligibility for a special "senior/disabled" discount is available to all Lammis Island residents who currently hold property tax exemptions or deferral as defined under RCW 84.36.031 and 84.34.030 and WAC 458.16.020 and 458.18.020, and as their may be further extended.

Eligibility for a special "senior/disabled" discount is also available to all Lammis Island residents that also qualify for medical assistance within the Medicaid Program.

7. Trucks and tow vehicles with trailers shall be charged a rate based on length and weight. Heavy machinery and motor homes shall be charged at the rate of the corresponding vehicle rate.

8. Trucks shall indicate bar not be leaned to, ball benches, military benches, fifth wheel in bed of pickup, dump trailers, recreation trailers, and mobile homes.

9. Any vehicle, bus, motor home, or trailer carrying more than one ferry rack shall be charged a 30 percent surcharge. The surcharge will consist of 5% percent added to the total charge. In addition, vehicle's towing over weight trailers shall also be charged a 30 percent surcharge.

10. Successor tags are a surcharge in addition to the applicable fare.

11. A weekly run limited to fuel trucks, charged at the regular rate, shall be scheduled by the Public Works Department and published appropriately.

12. All trucks shall be charged round trip rates based on legal tonnage capacity.

13. Vehicles over 30,000 pounds need special permission from the captain to board, including weight slip. Maximum weight limit is 50,000 pounds. Call the Department of Public Works at (509) 676-6876 for further information. Maximize restrictions not apply.

Whatcom County employees on official County business shall be exempt from fare.

DRY DOCK FERRY SCHEDULE

The Whatcom County typically goes into dry dock in September on or about the first Sunday after Labor Day. During dry dock, a passenger only ferry is put into service for approximately two weeks. An abbreviated ferry schedule is activated during dry dock. Schedules and other information can be obtained online at the ferry website: www.whatcomcounty.wa.gov. At the ferry terminal on the Whatcom or the Glen Center Annex (see contact information).

FERRY FARE

PASSENGER FARES

Passenger/Passenger

Passenger/Passenger - multiple

Passenger/Passenger - multiple

Children under 12 with Parent only¹

Resident School Children^{2,3}

12-18 years

Sept. 1 through June 30

Resident School Children^{2,3}

12-18 years

July 1 through August 31

Post-High School Full-time^{2,3}

Students - multiple

Needs Based Passenger/Passenger^{5,6}

Senior/Disability Income - multiple

Lammis Tribal Member with

Identification (food passage)

Bicycle w/Driver

Motorcycle w/Driver

Vehicle w/Driver under 8,000 lbs.

Vehicle w/Driver under 8,000 lbs. multiple

Vehicle w/Driver under 8,000 lbs. multiple

Senior/Disability Income - multiple

Vehicle w/Driver 8,001-20,000 lbs. 7, 11, 12

Vehicle w/Driver 8,001^{7, 11, 12}

Vehicle w/Driver 20,001 - 30,000 lbs. 7, 11, 12

Vehicle w/Driver 20,001

36,000 lbs. - multiple 7, 11, 12

Vehicle w/Driver 36,001 -

50,000 lbs. 7, 11, 12, 13

Vehicle w/Driver 36,001 -

50,000 lbs. - multiple 7, 11, 12, 13

Trailer (under 16 feet) 7, 11, 12

Trailer (over 30 feet) 7, 11, 12

Overweight Vehicle/Trailers, etc.

> 1 ton

SPECIAL TRIPS

Special Trips after regularly

scheduled rates¹⁰

Ticket Purchase

Ferry fare tickets can be purchased on the Whatcom County Annex offices. Student multiple cards can be purchased at the Whatcom County Treasurer's Office, 311 Glen Center Annex Office, 322 N. Commercial Street (509) 676-6876. Needs Based tickets - Senior/Disability Income - can be purchased at the Whatcom County Treasurer's Office, 311 Glen Center Annex Office, 322 N. Commercial Street (509) 676-6876.

Lummi Island Community Land Trust

Organizational Profile and History

Throughout the 1990's, Lummi Island residents saw land prices skyrocketing and socio-economic opportunities changing and threatening the quality of life in their community. In 1998 a group of Lummi Island residents established community focus groups to address these concerns. Through these groups and surveys, Island residents identified priorities that would promote the development of permanently affordable housing, create economic opportunities, and protect the environment and rural way of life. Our community's goal of preserving the rural character of the Island and its socio-economically diverse community has been the driving force behind the establishment of the Lummi Island Community Land Trust (LICT). In 1999 Lummi Island CLT received its nonprofit status as a 501(c)(3) Community Housing Development Organization (CHDO). Currently, the organization is comprised of six board members, an executive director, and one part-time grant writer.

LICT belongs to the National Community Land Trust organization, whose membership exceeds 160 CLTs. The Lummi Island CLT is one of 13 members of the Northwest Community Land Trust Coalition and a member of the Washington Low Income Housing Alliance (WLIHA).

The LICLT Mission

As a grassroots membership organization, the LICLT's board members and community members chose to develop an organization that would help preserve the community's

supporters chose to develop an organization that would help preserve the community's unique cultural, economic, and rural character of Lummi Island. This led to the creation of the following mission:

To serve as a community resource, to provide access to permanently affordable housing and land for Lummi Island residents, to create sustainable economic opportunities, and to foster environmental stewardship.

Values and Guiding Principles

Our mission has provided us with the guiding principles necessary to develop strategies and methodologies that continually reflect the demographic needs of the Lummi Island community. As appropriate to each project or program that the LICLT addresses, we utilize focus groups, feasibility studies, and surveys. Our commitment to each project is to address the needs of the community that we serve, which has enabled our board, staff, members, and volunteers to develop criteria and considerations for new project selections. New projects will:

- Meet community needs
- Provide equal opportunity: be empowering and inclusive
- Be perpetually affordable
- Be sustainable and environmentally sound
- Encourage socio-economic and ethnic diversity
- Present opportunities to partner with other community organizations

These approaches have enabled LICLT to develop solid partnerships with funders, individual members, and various agencies that have contributed time and financial resources to our past and present projects.

Geographic Service Area Profile

Lummi Island Community Land Trust's primary service area is Lummi Island, Washington. The Island's population is comprised of over 900 full time, year round residents, and an estimated additional 900-1,000 seasonal (summer) residents. This rural island community is 5,600 acres (8.8 sq. mi.), which averages one mile across by 8.5 miles long with 20 miles of shoreline. Lummi Island's topography includes forested mountains, beaches, agricultural fields, wetlands, meadows, and grazing land. Approximately 345 acres on Lummi Island are preserved to protect fragile ecosystems and the native wildlife through ownership or easements through the Lummi Heritage Trust. There are approximately 1,340 acres of publicly owned (federal, state, county) lands on Lummi Island.

The LICLT's vision is to act as a conduit to promote a diverse community that offers all residents opportunities to enrich and improve their lives. Lummi Island's population is experiencing rapidly changing. According to the 2000 U.S. Census Bureau, 8.8% of the families and 11.6% of the individuals on the Island live in poverty. Additionally, over 15% of residents are senior citizens and 6% are veterans, many of whom live on fixed incomes. Since the year 2000 census was taken, Lummi Island has seen a significant change in demographics that has driven up the median price of homes and rental units, making housing inaccessible for many low and moderate-income individuals and

making housing more affordable for many low-income families and families with children. LICALT's primary objective is to maintain a vibrant and diverse community by developing fair and equal access to: housing, transportation, food production, health care, unified families, and healthy environments.

Board of Directors Composition

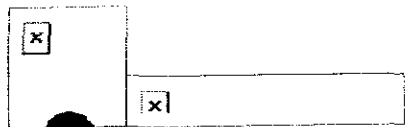
Currently the LICALT Board of Directors is composed of six individuals that are representative of the stakeholders in our community. These board members are Lummi Island residents and include a combination of LICALT leaseholders from Cedrus Cooperative, community business owners, social service and retired professionals, and environmental activists. A project to recruit additional board members to strengthen organization and fundraising strategies is underway.

Strategic Plan Evaluation

The LICALT Board of Directors and all staff members meet annually for a strategic plan evaluation meeting. We review our overall approach and evaluate our success in achieving milestones, suggest improvements, document accomplishments, update benchmarks, and address challenges. The strategic plan and project approaches are modified accordingly.

Accomplishments

In 2005, the LICALT successfully completed Cedrus Cooperative, a five acre, nine home low-income housing project located on Cedrus Lane, Lummi Island. The project was executed with methods consistent with the LICALT's commitment to create a thriving socio-economically diverse community while using ecologically sound methods of



Winter 2004

Rural Character
by Lucas Henning

(web
version)

A dimly lit vessel loaded with 16 cars slowly accelerates beneath afternoon rain clouds as it leaves Gooseberry Point, Lummi Indian Reservation's southwest tip. After a five-minute trip across Hale Passage, the Whatcom Chief ferry reaches its small blue terminal. Cars unload onto Lummi Island where they fade away into the fog. Here — nearly eight miles west across the bay from downtown Bellingham — the roads are as quiet as the surrounding waters and sometimes the only things moving are trees leaning with the wind. When the sky is clear, views of snow-covered Mount Baker to the east and the San Juan Islands to the west highlight the 360-degree scenic horizon.

Stoplights, Starbucks and sprawl are absent on this island. Except for Scenic Estates, a subdivision of closely gathered houses, Lummi Island's southern half is nearly uninhabited. Most of the residents live on the northern half, which is flatter and lower in elevation. Yet, the island's population is growing and changes are taking place. Wells run low in the summer, ferry lines can take hours and, as more housing is built, many residents say the island is losing its rural character.

For the past year and a half, the Lummi Island Planning Committee has been revising the island's 1979 plan for growth management, known as the Subarea Plan. The committee is aiming to improve groundwater protection, limit population growth and density and preserve the island's rural character. As the committee approaches the final steps of the planning process, community opposition to the plan has increased because of a perceived lack of community representation.

Before settlement, Lummi Indians occasionally visited the island to pick berries, dig clams, fish and hunt deer, according to historical research compiled by islander Beth Hudson. In 1871, Captain Christian Tuttle, a whaler and California gold miner, canoed to the island from Whatcom, the first European settlement on Bellingham Bay, and became the first permanent resident. On their 320-acre plot of land, Tuttle and his wife, Clara, raised seven children. Soon after, people traveling west joined them and the island's population began to grow. Before the turn of the century, the island had a salmon cannery, fertilizer plant and a shingle mill. After WWII, many people built summer homes on the island.

Eleven-year resident Bob Busch remembers spending summers on the island with his parents in the 1940s. Upon his retirement in the early 1990s, he moved to the island permanently. Since those long-past summers with his parents, Busch has watched the growing population change the island.

"It's getting a lot more crowded out here and nobody likes that," Busch said. "But there's nothing you can do. If people want to move out here they have the right to."

Busch is a member of the Lummi Island Planning Committee. In September 2003, committee members completed the revised draft of the 1979 Subarea Plan. Members of the committee decided the original plan was outdated because of population growth.

In the new draft, the committee members propose downzoning the minimum lot sizes. The downzone would decrease density by changing minimum lot sizes from one house per three acres to one house per five acres. According to the draft, this downzone would better follow the Washington Growth Management Act's rural element requirements and help preserve the rural character of the island. By lowering density, the downzone would also ease the demand on the island's water supply.

Much of the community disagrees with the downzone, but the opposition has been poorly represented, said Art Thomas, an islander who resigned from the planning committee in October.

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“I feel the plan reflects the desires of the committee and not the community,” Thomas said. “There was no dialog between the community and the committee. During public comment periods in meetings the comments were of frustration towards the process rather than ideas about the plan.”

The new draft also suggests limiting the number of annual building permits to allow a 1.9 percent growth rate, or about 12 houses per year during the next 20 years. Committee members recommended this growth rate, based on water studies from 1979, until new studies are able to more accurately determine groundwater quantity and quality and the island’s carrying capacity.

Ronald Schmidt, a hydrological consultant, conducted hydro-geologic studies on the island in the late 1970s for the 1979 Subarea Plan, but was only able to create an estimate of the island’s north end carrying capacity, according to the new draft. Schmidt estimated the north end could sustain 2,380 people based on the assumption that the water-use levels were near 100 gallons per person per day (gppd). According to the new draft, 150 gppd is a more accurate amount of daily water use. After recalculating Schmidt’s estimates, committee members projected the island’s north-end carrying capacity to be 1,587 people.

“The majority of the community wants to find out about the water first, before downzoning,” Thomas said. “The committee says ‘better safe than sorry,’ and wants to downzone before water studies because they’re afraid studies will find that there is even more water (than Schmidt estimated.)”

If new studies find that the island’s carrying capacity is greater than what Schmidt estimated, water wouldn’t be a valid reason to downzone or limit the growth rate, Thomas said.

“Some people have the notion that a water study answers everything, but if they knew anything about hydrology they would understand how complicated it is to form a water budget,” said Wynn Lee, islander and planning committee

member. "We have objective data from the Department of Health that shows we have a water problem and the Groundwater Management Act requires that we take a 'no risk approach.'"

Currently, the year-round population is more than 800 residents and in the summer the number nearly doubles, according to the 2000 U.S. Census.

Groundwater is the only source of water on the northern end. During the summer, many residential wells at this end run low, requiring residents to conserve water. Saltwater leaches into many shoreline wells and some wells have high levels of arsenic, according to the draft. Exposure to arsenic can cause cardiovascular disease, diabetes, nervous system damage and several forms of cancer, according to the American Cancer Society.

"My main concern on the island is water," said Victor Armfield, Lummi Island Water Resource Team chairman. "People have to be careful where they are building because the water supply is not evenly spread on the island."

Armfield, a 16-year island resident and member of the planning committee, is working together with Kent Nielson, island resident and part-time ecology professor at Western Washington University, to study runoff and groundwater levels on the island.

"We're really only now beginning to get a picture of how much water is in the ground and where it is exactly," Nielson said. "The Schmidt studies from 1979 were based on estimates. Now we're getting quantifications of run-off and recharge."

Although the water resource team is coming up with numbers of how much rainwater is staying on the island and how much is leaving, it remains unknown how many people the island's water supply can sustain. Nielson estimates the north end of the island, starting at the base of Lummi Mountain, has enough groundwater to sustain nearly 3,000 people at 250 gppd.

“We’re trying to be as objective about this as possible,” Nielson said. “But we are finding what seems to be a significant amount of water on the island.”

Armfield and Nielson arrived at their estimate by measuring rainfall and calculating the number of gallons that fall on the island per year. Assuming 60 percent evaporates, they estimated 5 percent to 7 percent runs off the island and 33 percent to 35 percent stays in the ground. By estimating that 50 percent of the groundwater is recoverable, Nielson calculated the number of gallons of groundwater on the north end of the island and how many people that number could sustain. Nielson’s estimate is nearly 1,500 people more than what the committee estimated as a sustainable number of people on the north end.

Since the summer of 2001, hydrologist Robert Mitchell, a professor at Western Washington University, has been supervising graduate student Bill Sullivan’s thesis characterizing the hydrogeology of the northern half of Lummi Island.

“We’re just not at a point in our scientific study to predict how much water is available,” Mitchell said.

Sullivan’s research is expected to be finished in June 2004 and is aimed at providing the best available science for making planning decisions, Mitchell said. Mitchell stressed that their job is to characterize what is going on in terms of water resources, not to decide if there is enough water.

While the revised draft of the Subarea Plan addresses the importance of protecting the water on the island, many islanders were disappointed to see that it didn’t focus on the ferry. According to the Public Works Department, the ferry might not be able to handle much more growth.

“I think that the ferry is going to be the limiting factor on growth before water,” Nielson said.

During the summer, drivers sometimes wait in line for hours to catch a ferry. The ferry has been serving the island since 1962. In 2001, it transported more than 381,000 passengers.

sin 962. In 2001, it transported more than 381,000 passengers.

According to the August 2001 Phase-One Report of a 20-year plan for the Lummi ferry service, the ferry system is near overload and will need to be replaced if island growth continues. The report also stated that a greater demand for vehicle passengers has increased the number of daily runs and created more wear on the ferry.

Typically, the ferry runs according to schedule, providing about 38 roundtrips each weekday and fewer than 20 on Saturdays and Sundays. During the morning and afternoon rush hours and on summer weekends, the lines have been so long that the 18-car-capacity ferry must make extra trips in order to get all of the vehicle passengers on and off the island.

“There are a lot more people coming and going these days,” ferry captain Fred Nyland said. “During the winter the ferry is alright, but in the summer lines get too long and people have to wait a while.”

Nyland, who has been piloting the ferry since 1980, said he would like to have a new, larger ferry. Yet, many islanders don’t want a new ferry because it would increase growth and access to the island.

“It’s hard to see the island change and grow,” islander Torrey Joyce said. “The ferry lines used to be a bunch of old pick-ups and beaters. Now you see all of these people with their BMWs and Mercedes.”

To avoid long ferry lines, Joyce leaves her car in the Gooseberry Point parking lot and walks on and off the ferry. Many islanders take the bus once on the mainland and others carpool. For people who can’t walk to the terminal and have to commute long distances to work, waiting in the ferry line is the only solution, Joyce said.

According to the 20-year plan, changes in ferry service will depend on what islanders’ projections of growth and transportation conclude in the revised Subarea Plan. Some alternatives include replacing the ferry with a larger boat, adding another ferry to run in tandem or improving park and ride possibilities. The alternative that is chosen will

depend heavily on whether or not the new Subarea Plan is approved by the Whatcom County Council. If the plan is approved, its restrictions will permit less growth than the 1979 plan. If the growth rate slows on the island, it will be longer until the ferry issue needs to be resolved, Nielson said.

After three public hearings, the county planning commission brought public testimony to a close in February. The commission then held a workshop, closed to public opinion, to sort through the plan and come to an agreement on whether it needed changes.

“My concern is the fairness,” said Bob Wiesen, Whatcom County planning commissioner. “It appears that one group got a hold of the issue and then another group, who wanted to play, didn’t get to play.”

At the time of publication, this matter had neither been sent to the county council nor had the planning commission resolved it.

Growth continues to change the island, commuters wait in ferry lines and an increasing number of islanders take interest in the future of Lummi Island. For now, the rural character is intact and heavy winter rainfall is preventing wells from running low.

The curving roads are quiet this time of year and seldom lead to stop signs. Island homes seem to have blended into the landscape with time. And as the future brings change to Lummi Island, residents will continue to look after the island they call home.

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acres. Outside of recharge areas, a density of one house per three acres was established, with the idea that higher density could not be supported by the groundwater.

In 1997, when the Critical Areas Ordinance was adopted, an entirely different identification of recharge areas was made, based on maps of soil types unavailable in 1979. This conflict is best interpreted as indicating

that recharge areas on Lummi Island are not well understood. Indeed, a primary recommendation of the 1978 water study was for additional studies, as the author of the study highlighted its inadequacies.

Most islanders recognize the current need for *more groundwater studies*. But zoning on the island continues to be based upon the 1978 identification of recharge areas, without regard for recharge areas identified in the Critical Areas Ordinance.

Apart from contamination by septic systems, evidence of saltwater intrusion is more and more apparent. Naturally occurring arsenic is an additional problem in many locations. The issue of water quantity involves still more uncertainty. It is not reassuring to have wells go dry, as some did last fall. Saltwater intrusion is another indication that some current wells are pumping beyond the capacity of the aquifer they draw on.

The draft plan, written by a consultant hired by the county, takes some notice of this and calls for downzoning of the entire north end of the island to one house per five acres. It also calls for a *limitation on building permits to keep growth rate consistent with the average growth rate over the past 20 years until better groundwater information is in hand.*

Nevertheless, the Whatcom County Planning Department has concluded in their staff report on the draft plan that "Without additional groundwater information, it may be premature to downzone properties or limit building permits."

Many of us suspect that groundwater availability varies greatly with the location on the island; perhaps an ongoing study for a Master's Degree thesis in geology at Western Washington University will shed some light on this issue.

Property Rights

The complex issue of property rights has generated much controversy on Lummi Island. The downzone proposal of the November draft plan is at the center of this controversy.

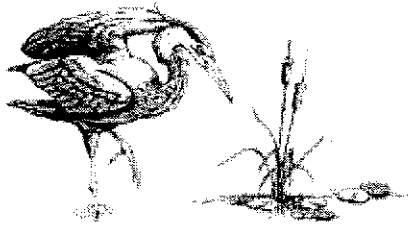
No doubt, some property owners want to retain the option of subdividing their land in the future, and they could be impacted by the proposed downzone. Some islanders believe that a downzone would impose an unreasonable hardship on such people and they believe that a downzone would trespass on legitimate property rights. Others islanders believe that without a change in zoning, rural character of the island will soon disappear. Many think that a downzone to one per five units acres would be inadequate, and that some larger parcels need to be preserved.

Those of us who acquired land on the island precisely because of the island's rural character find the continuing incursions of suburban *sprawl* disturbing. *Light and noise* from neighboring properties are unwelcome intrusions. Neighbors' activities can disrupt the wildlife we enjoy and pollute our groundwater.

Does a neighbor, intent on making a buck, have a right to erode our ability to enjoy the use of our property? For some, a rural setting even is more important than the ability to subdivide. A balance may be needed between the right to unfettered use of a property and restrictions imposed as protection from intrusive activities of neighbors. Where is the appropriate balance point?

The issue of public vs. private rights also comes into the picture. Visitors come to Lummi Island in considerable numbers to walk or bike the roads. They come to enjoy the rural aspects of the island and the marine views offered from the roads along shorelines. Clearly the general public has an interest in *what happens here*. Should they have a voice in the current deliberations? To date, this issue has not been addressed or even raised.

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Lummi Island Subarea Plan Generates Controversy

by Albert W. Marshall

Albert W. Marshall has been a board member the Lummi Island Conservancy for many years; he worked to promote the establishment of the state Peregrine Falcon Refuge on Lummi Mountain and on the conversion of school lands there to a conservation status.

Lummi Island is one of several areas in Whatcom County with a subarea plan to supplement the county's comprehensive plan. The current subarea plan for Lummi Island, adopted in 1979, is now being revised. Revision, a time-consuming and difficult process for all involved, is not yet complete, and it continues to generate a considerable amount of controversy. Basic issues include questions about rural character, water quality and quantity, and property rights. These issues are elaborated on below.

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Rural Character

The basic goal of the 1979 subarea plan was to preserve the islands rural character. But the zoning adopted at that time was based entirely upon estimates of the water available for domestic uses, without regard for impacts on the goal of the plan.

A vision statement drafted by islanders in 2002 essentially elaborates on the goal of preserving rural character. This vision statement has not been controversial. In the survey conducted to ascertain the views of property owners and registered voters, 77 percent of respondents gave preservation of rural character a high priority, and 86 percent want no increase in the island's population.

Nevertheless, the proposed revision of the subarea plan (draft plan of November, 2003) was written with little regard for the vision statement, just as the 1979 plan ignored its own goal. Many islanders believe that the draft revision has no chance of making the vision a reality.

In any case the goal was (and still is) a difficult one because subdivision activity prior to 1979 created many small lots, especially along the shorelines. Nevertheless, when the county adopted a lot consolidation law, Lummi Island alone was exempted, and the draft plan does not correct this.

Water

Lummi Island is composed of two geologically different islands brought together by plate tectonics. The southern half, rocky and mountainous, is zoned for rural forestry. A residential development on the northeast side of Lummi Mountain utilizes surface water for domestic purposes.

Most island residents live on the northern half of the island and depend upon groundwater (wells). In preparation for the 1979 plan, an expert on island hydrogeology conducted a study of the groundwater in 1978. Estimates of the carrying capacity of the aquifer were made.

Various aquifer recharge areas were identified and classified as "primary," "secondary" or "sensitive." Recommendations were made regarding the maximum density that should be allowed in these recharge areas to avoid groundwater contamination: one septic system per six acres in primary recharge areas, one per three acres in secondary recharge areas, and no septic systems in sensitive recharge areas.

County planners who wrote the 1979 plan rejected these recommendations. Instead, all three kinds of recharge areas were lumped together and zoned for a density of one septic system per five

Please call our County Council members and the County Executive and request a public debate on this issue. §

- Starting in the fall of 2000, a group of islanders got together to foster a revision of the 1979 plan. Meetings were announced and held with all interested parties welcome. At these meetings, a vision statement was drafted. To validate the vision, a comprehensive survey was conducted of island property owners and registered voters.

- In July, 2002, the County Executive appointed a formal Lummi Island Planning Committee (consisting of all 24 islanders who applied for membership), a county planner was assigned to work with the committee, and a consultant was hired to draft a revised plan. A number of public meetings were held, and a "final" (third) draft was produced by the consultant in November 2003.

Many committee members were dissatisfied with the draft plan; they had been constantly pushed to make decisions without being properly informed and without adequate discussions within the committee or within the broader community. As work of the Planning Committee progressed, decisions became more controversial, not so much within the committee as between the committee and a group of islanders opposed to what was being recommended.

- Late in 2003, the committee voted to forward that draft plan to the Whatcom County Planning Commission; there was a feeling that further progress by the committee was unlikely, and pressures from the planning department to wind up the work were intense. Hearings before the Planning Commission commenced on December 4 and were continued on January 22, 2004.

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