COLDWELL BANKER
SETTLERS REAL ESTATE

309383 HIGHWAY 101 / P.O. BOX 247
BRINNON, WA 98320
BUS. (360) 796-4900
FAX (360) 796-4215
TOLL FREE (800) 962-6401
WEBSITE www.cbsettlers.com

September 28, 2006

Ms. Marie Peter
Water Resource Program
State of Washington
Department of Ecology
P.O. Box 47775
Olympia, Washington 98504-7775

Re: Application for Water Right G2-29065

Dear Marie:

Thank you for your letter dated August 24, 2006 transmitting review comments on the Aspect Consulting report - *Tudor Well Pump Test and Aquifer Analysis, March 16, 2006* - prepared in accordance with the November 12, 2004 Amended Preliminary Permit under Ground Water Application G2-29065 requirements and conditions.

Based on your letter it is my understanding that the current water right application for an instantaneous discharge (Qi) of 46 gallons per minute (gpm) will not be approved as a result of potential seawater intrusion concerns. Your letter provided four alternative options for consideration with one option (Option 2) consisting of pumping the well at a reduced discharge rate.

I would like to propose that the Qi for my well be reduced to 30 gpm without further testing. To date I have completed two tests at flow rates around 30 gpm, both of which have exhibited stable chloride levels. As you recall the Aspect report presented step test results at lower pumping rates (20, 30 and 40 gpm) to evaluate chloride levels at reduced pumping rates. This data indicated that the 30 gpm rate produced stable chloride levels under the At Risk level of 100 parts per million (ppm) threshold with a drawdown level at the end of the step of 98 feet. In addition, on August 24, 2006 the well was pumped for about 150 minutes at an average of 31.5 gpm with a chloride level measured at 70.6 ppm at the end of the pumping period. The August sampling represents water quality collected during the dry season which is well below the At Risk level for seawater intrusion. Attachment 1 provides the analytical test result for the August 2006 chloride sample event.

My preliminary plan for the water system consists of a storage tank with a capacity of 95,000 gallons. The storage tank will allow us to reduce the pumping rate of the well as well as alter the pumping regime as necessary based on chloride water quality monitoring. In addition there are other Best Management Practices (BMPs) that typically are used as remedial measures to

provide sustainable water resource management in seawater intrusion settings. I am fully committed to implementing these BMPs as necessary which may include the following:

- Reduce instantaneous pumping rate of well;
- Raise pump intake;
- Alter the pumping regime (low use periods or low tide periods);
- Reduce the annual quantity pumped;
- Implement water conservation measures;
- Establish engineering controls such as pumping control switches based on water quality trigger levels and/or drawdown levels.

The following response comments to Mr. John Pearch's review are prepared for your further consideration of my application.

Antidegradation Policy

The Ecology publication *Implementation Guidance for the Ground Water Quality Standards, Publication # 96-02, April 1996, Section 3.1* clearly states that "*This policy (Antidegradation Policy) is not a nondegradation policy. Nondegradtion is different than antidegradation in that it prohibits any increase in contaminant concentrations in groundwater*". The guidance document clearly states that water quality increases above background levels are acceptable before enforcement actions become necessary. The groundwater quality standards allows for the development of an early warning value and enforcement value which are each higher than background water quality but below the criteria. The overall intent of the Antidegradation Policy is to prevent degradation of groundwater quality beyond the criteria which in my case is maintaining chloride levels below 250 ppm. All of the water quality testing results performed to date at my well has been well below the chloride criteria.

In response to Mr. Pearch's comment regarding impairing water quality of existing nearby water rights recall that we continuously monitored the water quality of the Pleasant Tides water supply well during the long term pump test conducted in November 2005. These monitoring results indicated that there was no increase in chloride levels at the Pleasant Tides well as a result of pumping my well. Table 1 of the Aspect report lists all of the reported wells in Township 25N Range 2W Section 15 and only lists one well (Bob Riley) completed in the basalt aquifer that contains a water right. It is my understanding that the Bob Riley well is already impaired with elevated chlorides and is currently inactive. All other water rights in Section 15 are for wells completed in the shallow sand and gravel aquifer. Based on our pump testing and water quality sampling results, it appears that basalt aquifer is hydraulically isolated from the upper aquifer and therefore impairment of these shallower water rights is highly unlikely.

Recharge Event

Mr. Pearch indicates that the 2005 pump and step test was conducted during a period of strong recharge events. We have reviewed the daily precipitation records on file with National Oceanic and Atmospheric Administration for a nearby rain gage station in Quilcene. These records indicate that there was no measurable rainfall recorded prior to both the 24-hour test conducted in November 2005 and the step test conducted in December 2005. In addition the drawdown data do not indicate a recharge boundary as the drawdown slope never stabilizes or flattens. The drawdown data collected during the November test clearly indicate a steeper drawdown after about 450 minutes of pumping which is not indicative of a recharge boundary.

I appreciate your further consideration regarding the reduction in my discharge rate to 30 gpm and your efforts to date in processing my application. If you have any questions or would like to discuss these issues further please call me at 1-800-962-6401.

Sincerely,

Linda Tudor
Coldwell Banker Settlers Real Estate

Attachments: Twiss Analytical Laboratories, Inc. – Chloride results for data collected 8/24/06

cc: John Strunk – Aspect Consulting

RECEIVED
OCT 09 2006
Washington State
Department of Ecology

TWISS ANALYTICAL LABORATORIES, INC.

26280 Twelve Trees Lane, Suite C Poulsbo, WA 98370 Telephone (360) 779-5141 FAX (360) 779-5150

INORGANIC CHEMICALS (IOCS) REPORT

System ID No:	Private	System Name:	Tudor Well		
Lab/Sample No:	010 63474	Date Collected:	8/24/2006	DOH Source No:	
Multiple Sources:		Sample Type:	B	Sample Purpose:	B
Date Received:	8/24/2006	Date Reported:	9/11/2006	Supervisor:	ST
Date Prepared:		Date Analyzed:	8/28/2006	Analyst:	KW
County:	Jefferson			Group:	
Sample Location:	Tudor Well (Tudor 082406)				
Send Report To:	Aspect Consulting 179 Madrone Lane N Bainbridge Island, WA 98110	Bill To:			

DOH #	Analytes	Results	Units	SRL	Trigger	MCL	Exceeds		Method / Analyst	
	EPA REGULATED (Secondary)						Trigger?	MCL?		
21	Chloride	70.6	mg/L	20	250	250			EPA 300.0	KW

Notes:

SRL: (State Reporting Level), indicates the minimum reporting level required by the Washington Department of Health (DOH).
Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.
MCL: (Maximum Contaminant Level), If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.
NA: (Not Analyzed), in the results column indicates this compound was not included in the current analysis.
ND: (Not Detected), in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL
< (0.001): indicates the compound was not detected in the sample at or above the concentration indicated.

Comments:

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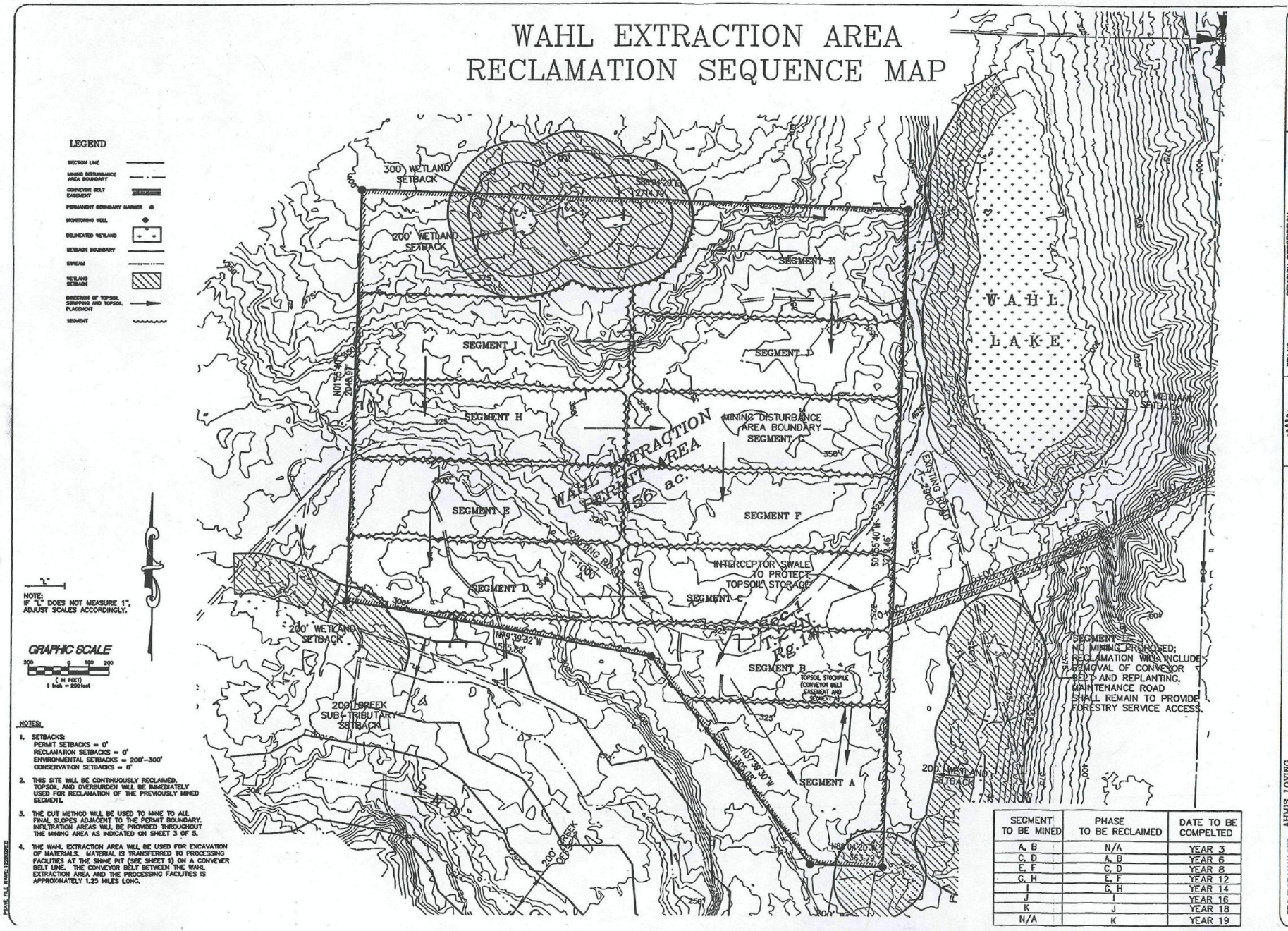
SEP 13 2006

Twiss Laboratory Number: 69836

WAHL EXTRACTION AREA
RECLAMATION SEQUENCE MAP



NOTES:

1. SETBACKS:
   PERMIT SETBACKS = 0'
   RECLAMATION SETBACKS = 0'
   ENVIRONMENTAL SETBACKS = 200'-300'
   CONSERVATION SETBACKS = 0'
2. THIS SITE WILL BE CONTINUOUSLY RECLAIMED. TOPSOIL AND OVERBURDEN WILL BE IMMEDIATELY USED FOR RECLAMATION OF THE PREVIOUSLY MINED SEGMENT.
3. THE CUT METHOD WILL BE USED TO MINE TO ALL FINAL SLOPES ADJACENT TO THE PERMIT BOUNDARY. INFILTRATION AREAS WILL BE PROVIDED THROUGHOUT THE MINING AREA AS INDICATED ON SHEET 3 OF 5.
4. THE WAHL EXTRACTION AREA WILL BE USED FOR EXCAVATION OF MATERIALS. MATERIAL IS TRANSFERRED TO PROCESSING FACILITIES AT THE SHINE PIT (SEE SHEET 1) ON A CONVEYER BELT LINE. THE CONVEYOR BELT BETWEEN THE WAHL EXTRACTION AREA AND THE PROCESSING FACILITIES IS APPROXIMATELY 1.25 MILES LONG.

SEGMENT TO BE MINED	PHASE TO BE RECLAIMED	DATE TO BE COMPELTED
A, B	N/A	YEAR 3
C, D	A, B	YEAR 6
E, F	C, D	YEAR 8
G, H	E, F	YEAR 12
I	G, H	YEAR 14
J	I	YEAR 16
K	J	YEAR 18
N/A	K	YEAR 19

REV NO	REVISION DESCRIPTION	DATE	BY
1	REQUIRES PER DEPT. OF NATURAL RESOURCES	11/19/01	ASL
2	UPDATE TOPO MAP	1/18/02	ASL
3	"NEW" PERMIT SUBMITTAL REPLACES EXPANSION	1/10/03	ASL

DESIGN ASL
DRAWN ASL
CHECKED MAK
SEC 1 T 27N R 1W
DISC NO. ___ DATE 4/30/01
SCALE 1" = 200'

EXPIRES: 1/30/05
DATE SEALED

TITLE: WAHL EXTRACTION AREA
RECLAMATION SEQUENCE MAP
PERMIT NO. TO BE ASSIGNED

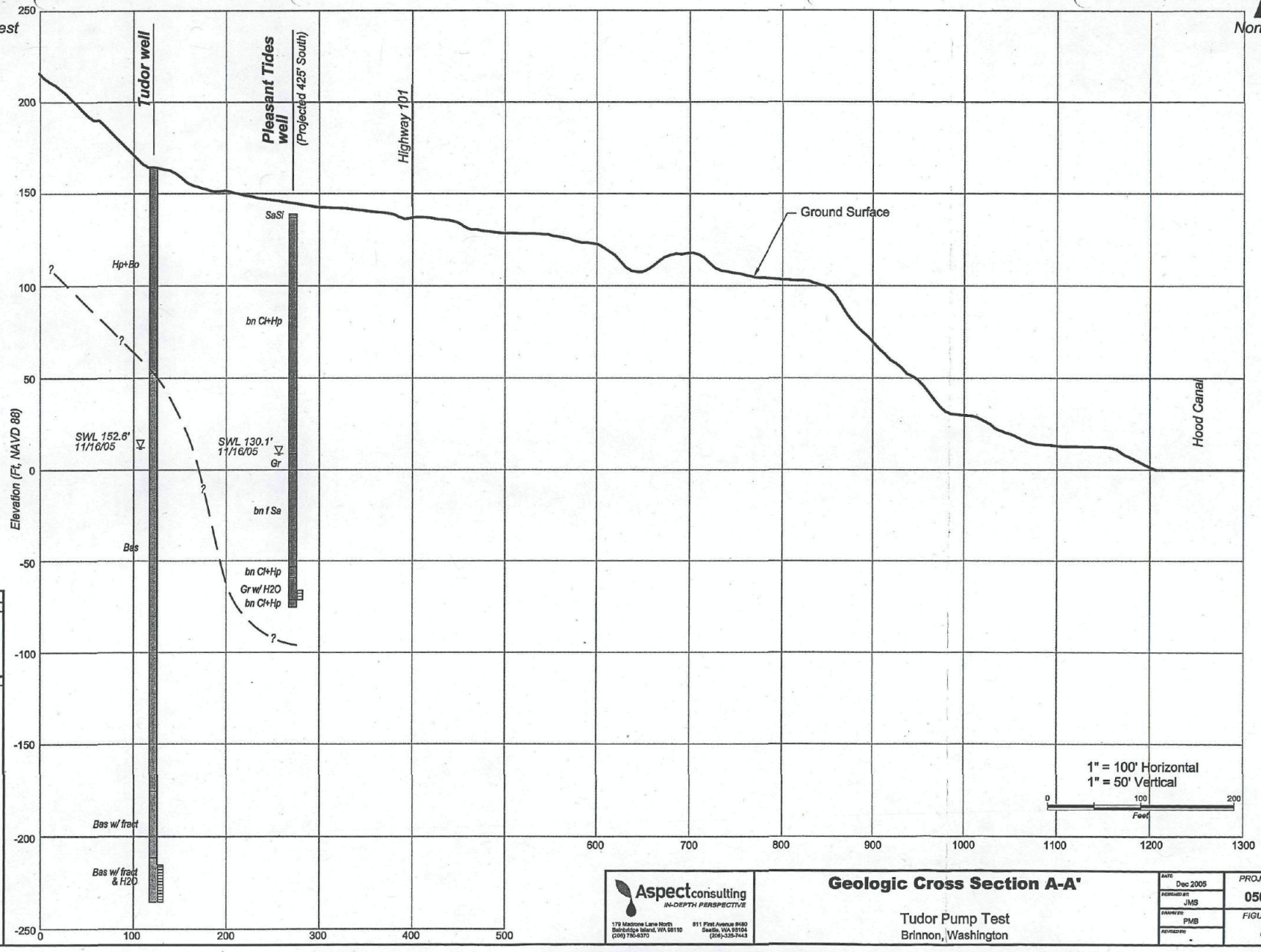
CLIENT: FRED HILL MATERIALS
P.O. BOX 6
POULSBO, WA 98370
(360) 779-4431

PROJECT MANAGER: AHMIS LOVING
SIGNATURE

Team 4 Engineering
5613 N.E. Minor Road, Poulsbo, WA 98370
Phone (360) 297-3090

SHEET 3 OF 5
FILE NO 122B

Site Plan Figure 2



LEGEND

SYMBOLS

- Approximate Ground Surface
- Approximate Geologic Unit Contact
- Well Screen or Perforated Zone
- Static Water Level (SWL)

REPORTED SOIL DESCRIPTIONS

bk	= black	Bas	= Basalt
bl	= blue	Cl	= Clay
br	= brown	Si	= Silt
dk	= dark	Sa	= Sand
gr	= green	Gr	= Gravel
gy	= gray	Co	= Cobbles
l	= light	Bo	= Boulders
ol	= olive	Dr	= Dropstone
or	= orange	Hp	= Hardpan
py	= purple	Till	= Glacial Till
rd	= red	Ts	= Topsoil
ru	= rusty	Pt	= Peat
tn	= tan	Org	= Organic
wh	= white	Pum	= Pumice
ye	= yellow	Volc	= Volcanic
		Wd	= Wood
		H2O	= Water

occ	= occasional	cem	= cemented
sc	= scattered	fract	= fractures
tr	= trace	int	= interbeds
w/	= with	lam	= laminations
l	= little	lay	= layers
s	= some	len	= lenses
+	= and	ox	= oxidized
abd	= abundant		
f	= fine		
m	= medium		
c	= coarse		

Example: bn gy f-c SiGr, s Sa, tr Co + Bo

Brownish gray, fine to coarse Silty Gravel, some sand, trace cobbles and boulders.

(Colors refer to fine grained portion.)

Aspect consulting
IN-DEPTH PERSPECTIVE

179 Madrone Lane North
Bainbridge Island, WA 98110
(206) 780-5370

811 First Avenue #480
Seattle, WA 98104
(206)-325-7443

Geologic Cross Section A-A'

Tudor Pump Test
Brinnon, Washington

DATE: Dec 2005	PROJECT NO. 050154
DESIGNED BY: JMS	
DRAWN BY: PMB	FIGURE NO. 4
REVISED BY: -	

Q:\Coldwell Banker\Tudor Pump Test 050154\2005-11\050154-AA.dwg

Aspect consulting
IN-DEPTH PERSPECTIVE

P:\Seawater Intrusion Assessments\Tudor Well CB Settlers\Data\Well Summary.xls

Table 1 - WELL RECORDS
Vicinity of Tudor Well
(T25NR02W-15)
Tudor Pump Test
Brinnon, WA

1,000 ft. Theis drawdown

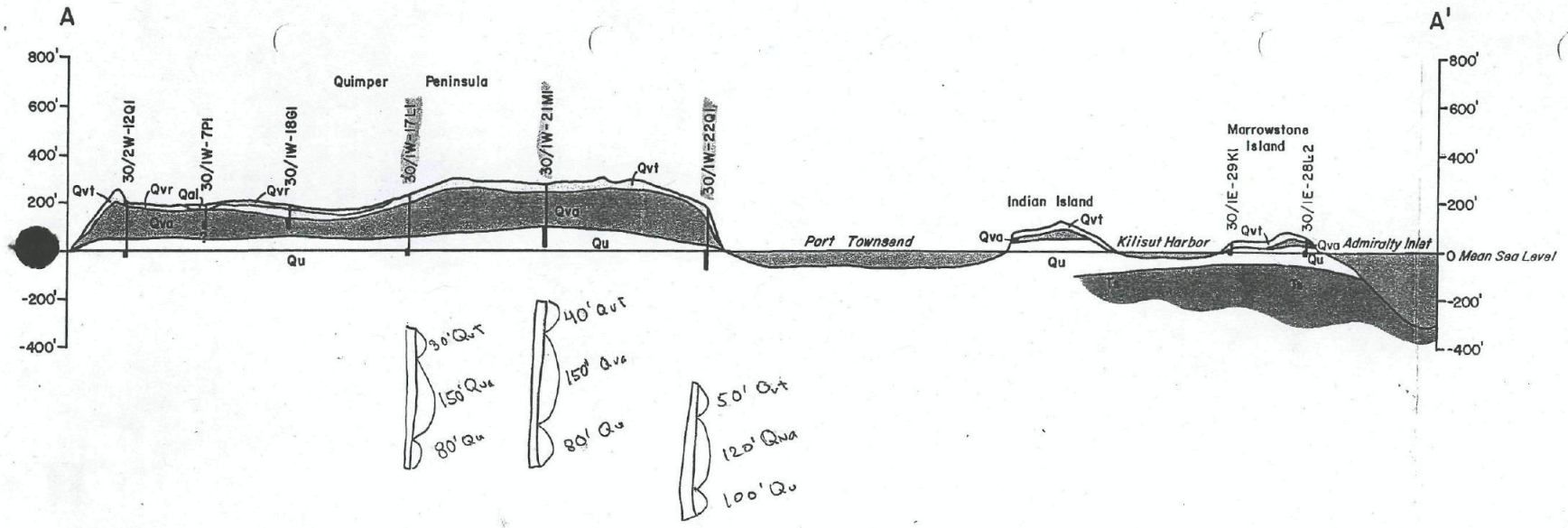
Location ID							Well Information							Productivity							Water Right					
Town N	Range W	Sect	Qtr Section	Qtr-Qtr Section	Original Owner / Current Owner	Jefferson County Parcel Number	Proposed Use	Drilled Depth (ft)	Completed Well Depth (ft)	Well Diam. (in)	Casing Diam. (in)	Open From (ft)	Open To (ft)	Static Water Level (ft TOC)	Date of Static Water Level	Yield (gal/min)	Drawdown (ft)	Specific Capacity	Completion Date	Producing Unit	Document Number	Date	Source	Qi (gpm)	Qa (acre-ft)	Data Source
25	2	15	-	-	AGNES DOBB. - PALME	-	Domestic	229	229	6	6	65	229	113	4/4/1972	-	-	-	4/15/1972	Gray Basalt	-	-	-	-	-	Ecology
25	2	15	-	-	AL WIESENBURGER	502153007	Domestic	255	255	6	6	250	255	130	-	12	105	0.11	12/13/1989	Clay; Brown Fine Sand	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	SE	SW	AMERICAN CAMPGROUNDS	-	Domestic	271	270	8	8	215	270	135.7	7/12/1972	-	34.6	-	7/12/1972	Sand; Gravel	G2-20465CWRIS	12/14/1973	WELL	55.0000	25	Ecology, Jefferson Co & 2005 WRAT
25	2	15	NW	NE	ART ENCTER	-	Domestic	107	107	6	6	102	107	43	1/4/1974	12	20	0.60	1/4/1974	Gray Fine Sand and Clay; Coarse Sand	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	NW	SW	BILL BOOTH	-	Domestic	320	320	6	6	300	320	188	6/10/1996	-	-	-	6/10/1996	Gray Clay and Gravel; Green Basalt; Fractured Black Basalt	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	NE	NE	BILL LAGEMAN	-	Domestic	413	413	6	4.5	50	413	16	7/6/1993	-	-	-	7/28/1993	Gray, Green and Red Basalt	-	-	-	-	-	Ecology
25	2	15	SW	SW	BLACK POINT PROPERTIES LLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Ecology
25	2	15	NW	NW	BOB RILEY	-	-	88	88	-	6	83	88	36	5/1/1977	18	42	0.43	5/1/1977	Gravel and Sand	-	-	-	-	-	Ecology
25	2	15	NW	NW	BOB RILEY	-	Domestic	195	195	6	5	180	195	36	5/8/1977	35	144	0.24	5/8/1977	Gray Basalt	G2-24359CWRIS	09/23/1977	WELL	60.0000	3	Ecology, Jefferson Co & 2005 WRAT
25	2	15	-	-	CHARLES HODSON	-	Domestic	50	50	6	6	-	-	30	-	-	-	-	-	Brown Hardpan; Gravel	-	-	-	-	-	Ecology
25	2	15	NW	SE	CHARLES MARLEY	502154005	Domestic	140	140	6	6	-	-	61	5/7/1995	-	-	-	5/6/1995	Gravel and Sand	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	SW	SW	CHARLES ROBINSON	502151018	Domestic	34	34	6	5	29	34	5	1/26/2001	-	-	-	1/26/2001	Brown Fine Sand	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	SW	SW	CHARLES ROBINSON	502153013	Domestic	36	36	6	5	31	36	5.5	1/25/2001	-	-	-	1/25/2001	Brown Fine Sand	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	-	SW	CHUCK ROBINSON	-	Domestic	28	28	6	6	-	-	3.5	9/10/1984	25	15	1.67	9/10/1984	Sand and Gravel	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	SE	SE	DON THACKEN	-	Domestic	29	29	6	6	-	-	7	8/20/1988	-	-	-	8/20/1988	Sand and Gravel; Brown Hardpan; Brown Sand, Gravel and Harpan	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	NW	NW	DONALD SILSBEE	-	Domestic	312	309	6	6	298	309	91	5/30/1995	-	-	-	5/30/1995	Brown Hardpan; Gray Sand	G2-29237	-	WELL	26.0000	-	Ecology & 2005 WRAT
25	2	15	NE	NW	ED BYRNES	-	Domestic	320	320	6	6	18	320	88	4/15/1996	-	-	-	4/15/1996	Basalt	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	SW	NE	ELDEN KILMER	502154007	Domestic	199	199	6	6	119	120	55	7/29/1994	-	-	-	7/29/1994	Gravel and Gray Sand	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	-	-	EMLY HEROD	-	Domestic	104	104	6	6	-	-	48	7/3/1968	30	0	-	7/3/1968	Hardpan; Sandy Clay; Sand; Gravel	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	SW	SW	HEN GAUL	-	Domestic	30	28	6	6	23	28	8	4/29/1978	-	-	-	4/29/1978	Gravel; Brown Sand	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	NW	NW	JERRY ROLOSON	-	Domestic	235	235	6	4.5	205	235	77	4/17/1995	3	106	0.03	4/17/1995	Basalt	-	-	-	-	-	Ecology
25	2	15	NW	NW	JERRY ROLOSON	-	Domestic	235	235	6	4.5	233	235	67	5/8/1995	-	-	-	4/19/1995	Fractured Basalt	-	-	-	-	-	Ecology
25	2	15	NW	NW	JERRY ROLOSON	-	Domestic	225	220	6	4.5	195	225	69.7	5/17/1995	4	58	0.07	4/21/1995	Basalt	-	-	-	-	-	Ecology
25	2	15	NW	NW	JERRY ROLOSON	-	Domestic	230	227	6	4.5	227	230	22.3	5/8/1995	4	160	0.03	4/26/1995	Basalt with Granite	-	-	-	-	-	Ecology
25	2	15	NE	SE	JIM WARD	502151005	Domestic	400	400	6	5	-	-	131	7/25/2003	-	-	-	7/18/2003	Basalt	-	-	-	-	-	Ecology
25	2	15	NW	NW	JOHN & JOANN MOSER	502094001	Domestic	165	160	6	4.5	5	165	120	5/19/1999	-	-	-	5/18/1999	Basalt	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	-	-	JON WAGER	-	Domestic	80	80	6	6	-	-	25	3/14/1972	50	2	25.00	3/14/1972	Gravel	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	SW	SW	KEN GAUL	502153014	Domestic	367	367	6	6	-	-	134	12/17/1998	-	-	-	12/17/1998	Clay; Sand; Gravel	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	NE	SE	L. E. ADAMS	-	-	63	63	6	6	-	-	18	8/1/1964	15	10	1.50	8/1/1964	Sand; Gravel	-	-	-	-	-	Ecology
25	2	15	NE	SE	LARRY HANUSA	-	Domestic	58	58	6	6	-	-	32	10/17/1991	-	-	-	10/17/1991	Sandy Gravel; Gravel	-	-	-	-	-	Ecology
25	2	15	NW	NE	LIQUOIL STOLE - PLEASANT	-	-	120	120	-	-	-	-	75.8	9/2/1975	-	-	-	9/2/1975	-	-	-	-	-	-	Ecology
25	2	15	NE	SW	LOREN KREUTNER	-	Domestic	108	108	6	6	-	-	92	6/15/1980	20	0	-	6/18/1980	Sand; Hardpan; Gravel	G2-27059CWRIS	07/17/1987	WELL	21.0000	1	Ecology & 2005 WRAT
25	2	15	SW	NW	LOUIE & MRILYN COOK	502151011	Domestic	352	352	6	6	-	-	186	6/7/1995	10	10	1.00	6/7/1995	Clay; Sand and Gravel	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	SW	NW	LOUIS COLBY	-	Domestic	143	138	6	6	133	138	10	10/14/1977	5	20	0.25	10/14/1977	Brown Sand	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	NE	SE	MAC THOMPSON	-	Domestic	-	-	8	8	-	-	35.3	9/4/1975	-	-	-	9/4/1975	-	-	-	-	-	-	Ecology
25	2	15	NW	NW	MIKE FISHER	502103023	Domestic	72	70	6	6	-	-	39	5/18/1999	-	-	-	5/18/1999	Gravel	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	NE	NW	MR. WOOD	-	-	70	70	6	6	-	-	30	-	-	-	-	-	-	-	-	-	-	-	Ecology
25	2	15	SW	SW	PHYLLIS SEE	-	Domestic	55	41	6	6	36	55	6	5/10/1977	10	20	0.50	5/10/1977	Brown Sand	-	-	-	-	-	Ecology & Jefferson Co

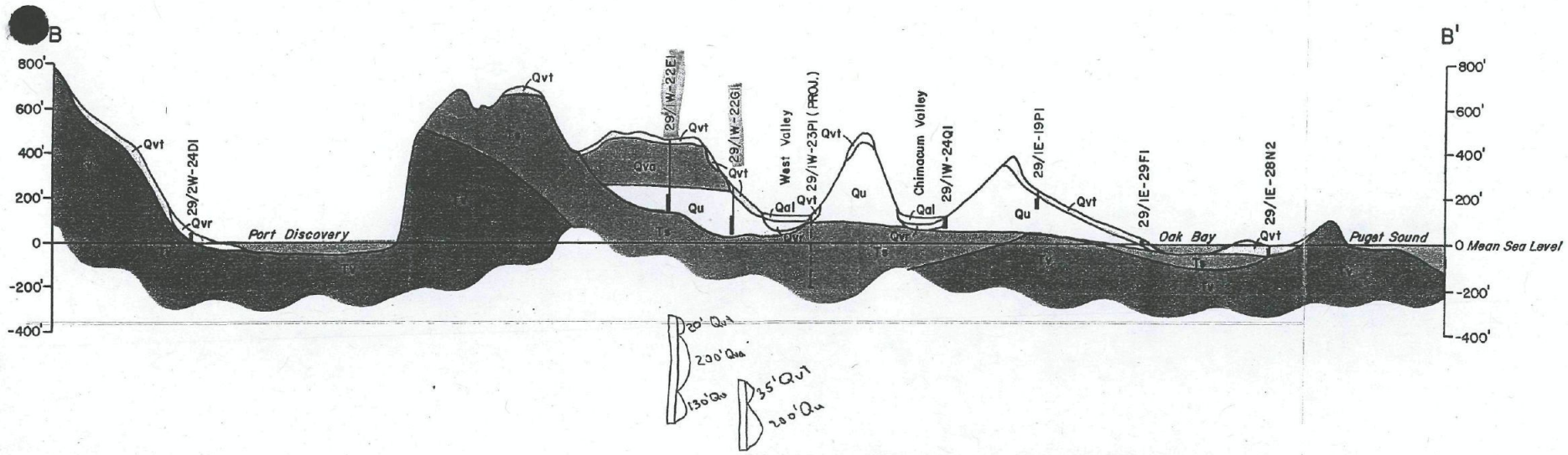
Aspect consulting
IN-DEPTH PERSPECTIVE

P:\Seawater Intrusion Assessment\Tudor Well CS Settlers\Data\Well Summary.xls

Table 1 - WELL RECORDS
Vicinity of Tudor Well
(T25NR02W-15)
Tudor Pump Test
Brinnon, WA

Location ID							Well Information							Productivity							Water Right					
Town N	Range W	Sect	Qtr Section	Qtr-Qtr Section	Original Owner / Current Owner	Jefferson County Parcel Number	Proposed Use	Drilled Depth (ft)	Completed Well Depth (ft)	Well Diam. (in)	Casing Diam. (in)	Open From (ft)	Open To (ft)	Static Water Level (ft TOC)	Date of Static Water Level	Yield (gal/min)	Drawdown (ft)	Specific Capacity	Completion Date	Producing Unit	Document Number	Date	Source	Ql (gpm)	Qa (acre-ft)	Data Source
25	2	15	NW	SW	PLEASANT TIDES	-	Municipal	214	210	6	6	205	210	118	11/22/1974	41	72	0.57	11/22/1974	Gravel; Brown Clay	G2-21134CWRIS	07/12/1974	WELL	40.0000	60	Ecology, Jefferson Co & 2005 WRAT
25	2	15	NW	SW	PLEASANT TIDES WATER COOP.	-	Municipal	210	210	6	6	-	-	117	4/16/1986	50	0	-	4/16/1986	Gravel; Clay	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	-	-	PLEASNAT TIDES	-	-	-	-	6	6	-	-	13.51	9/3/1975	-	-	-	9/3/1975	-	G2-23623CWRIS	04/12/1977	WELL	45.0000	60	Ecology & 2005 WRAT
25	2	15	-	-	RICHARD CALL	-	Domestic	107	107	6	6	-	-	65	7/1/1968	15	10	1.50	-	Sand; Gravel	G2-006452CL	-	-	-	-	Ecology, Jefferson Co & 2005 WRAT
25	2	15	NE	NE	RICHARD VAN COTT	-	Domestic	96	95	6	6	-	-	68	10/12/1978	28	15	1.87	10/12/1982	Brown Sand and Gravel	-	-	-	-	-	Ecology
25	2	15	SW	SW	ROBINSON	-	Industrial	40	39	6	6	33	38	3	11/4/1990	10	0	-	11/2/1990	Brown Sand	-	-	-	-	-	Ecology
25	2	15	NW	SW	RONALD ACHENBACH	-	Domestic	440	440	6	4.5	272	332	119	5/9/1996	-	-	-	5/9/1996	Black Basalt; Green Basalt	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	NE	SE	SAM BOLING	-	Domestic	98	97	6	6	-	-	36	11/3/1992	-	-	-	11/2/1992	Gravel and Sand	-	-	-	-	-	Ecology
25	2	15	NW	SW	SAM BOLING	-	Domestic	400	400	6	4.5	380	400	188	5/25/1991	-	-	-	5/4/1991	Basalt	G2-29065	-	WELL	48.0000	-	Ecology & 2005 WRAT
25	2	15	NW	NW	TERRY MATSON	502152019	Domestic	220	220	6	4.5	185	225	116	3/5/2001	-	-	-	3/5/2001	Basalt	-	-	-	-	-	Ecology & Jefferson Co
25	2	15	NE	SE	VIRGIL SPRAGUE	502152009	-	100	100	6	6	-	-	40	9/13/1968	20	10	2.00	9/2/1968	Clay; Sand; Gravel	G2-*11071CWRIS	11/18/1970	WELL	20.0000	1	Ecology & 2005 WRAT
25	2	15	SE	SE	JOHNSTON	988200303	Domestic	159	158	6	6	-	-	120	9/16/1994	-	-	-	-	-	-	-	-	-	-	Jefferson Co

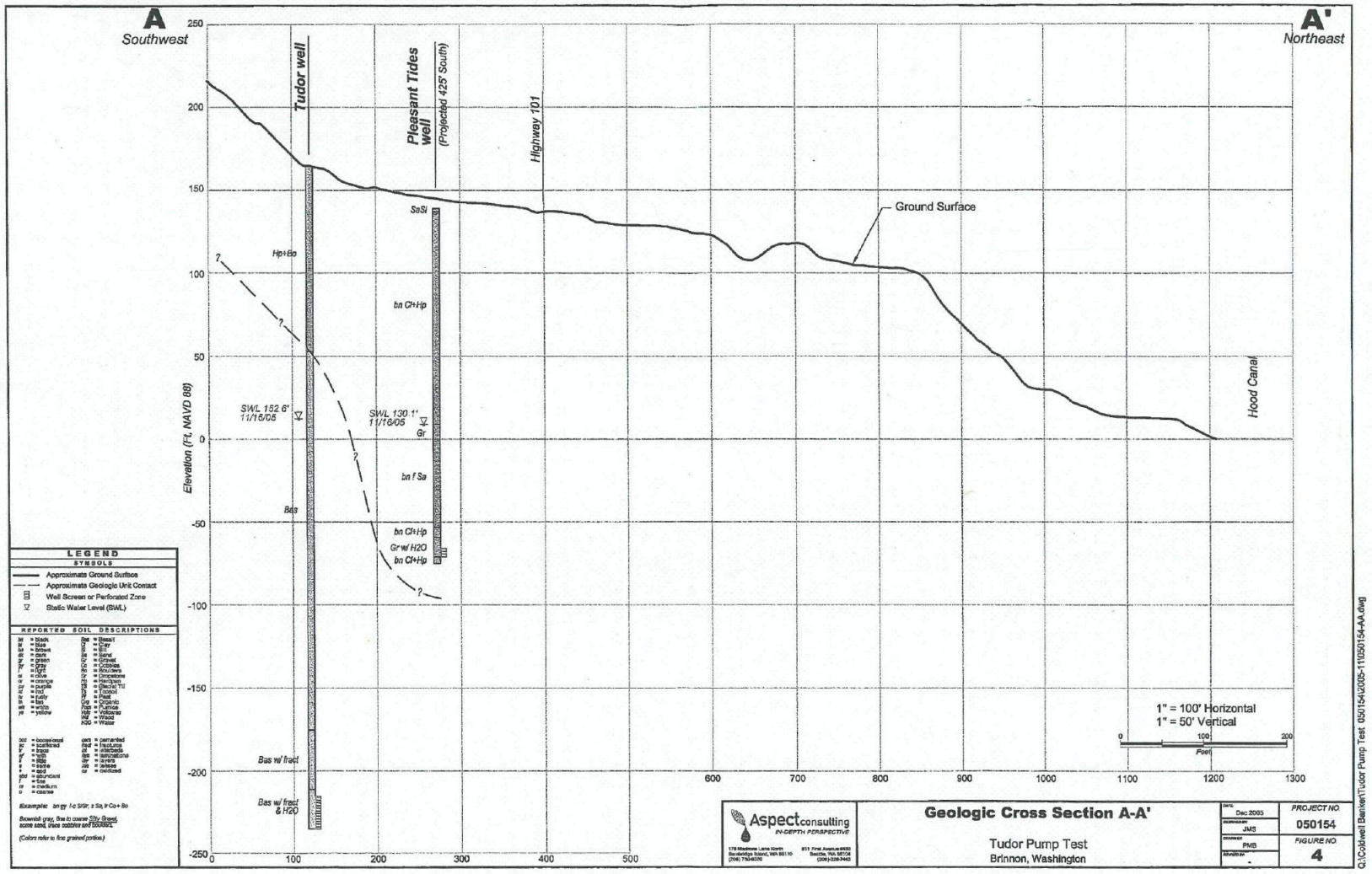




QUATERNARY

TERTIARY

Appendix C: Cross Section of the Area Surrounding the Tudor Well



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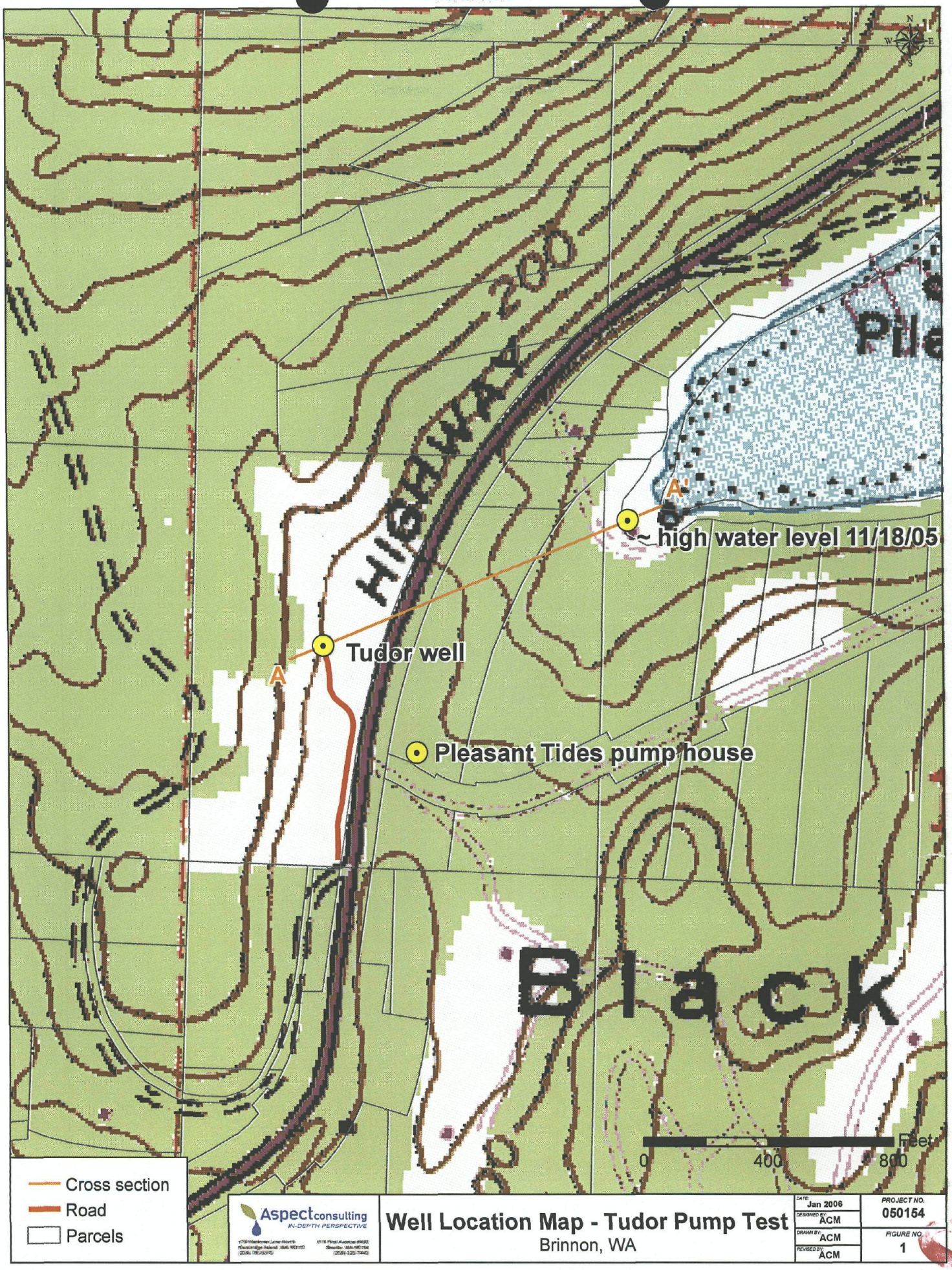
P:\Seawater Intrusion Assessments\Tudor Well CB Settlers\Data\Step Test\Tudor Step Test.xls

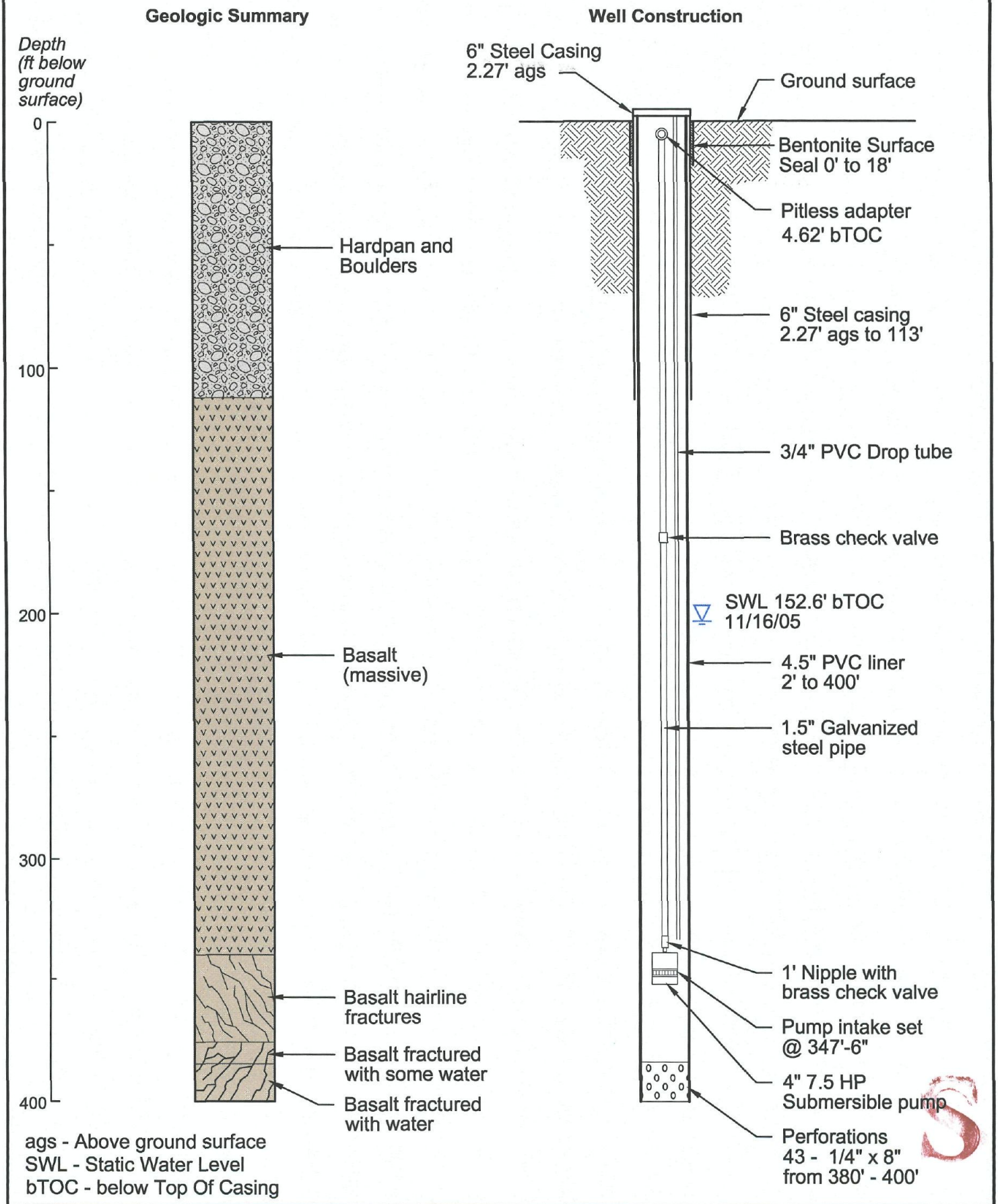
Table 2
Projected Drawdown and Choride Concentration
Tudor Pump Test
Brinnon, WA

Pumping Rate[a] (gpm)	Measured Conductivity (uS/cm)	24-hour Projected Conductivity[b] (uS/cm)	Measured Chloride Concentration (mg/L)	24-hour Projected Chloride Concentration (mg/L)	24-hour Calculated Drawdown[d] (ft)
20	377	464	96.9	123	74
30	386	444	98.3	117	110
40	405	515	105	140	147
46	430[c]	465	110[c]	123	186

Notes:
[a]46 gpm rate is from a 24-hour constant rate test.
[b]Slope of specific conductivity values at 20 gpm was higher than observed during later steps of the test and during the 24-hour constant rate test.
[c]Measured values at 20.3 hours as a result of pump limitations; maximum drawdown of 182.2 ft.
[d]At current configuration, the Tudor Well will sustain approximately 170 ft of drawdown (includes 10 ft buffer).


HIGHWAY 200
Pile
Black
A
A'
Tudor well
~ high water level 11/18/05
Pleasant Tides pump house
0
400
800
Feet
Cross section
Road
Parcels
Aspect consulting
IN-DEPTH PERSPECTIVE
Well Location Map - Tudor Pump Test
Brinnon, WA
DATE: Jan 2006
DESIGNED BY: ACM
DRAWN BY: ACM
REVISED BY: ACM
PROJECT NO. 050154
FIGURE NO. 1
\Projects_8\tudor\tudor_well_site.mxd

Tudor Well



ags - Above ground surface
SWL - Static Water Level
bTOC - below Top Of Casing

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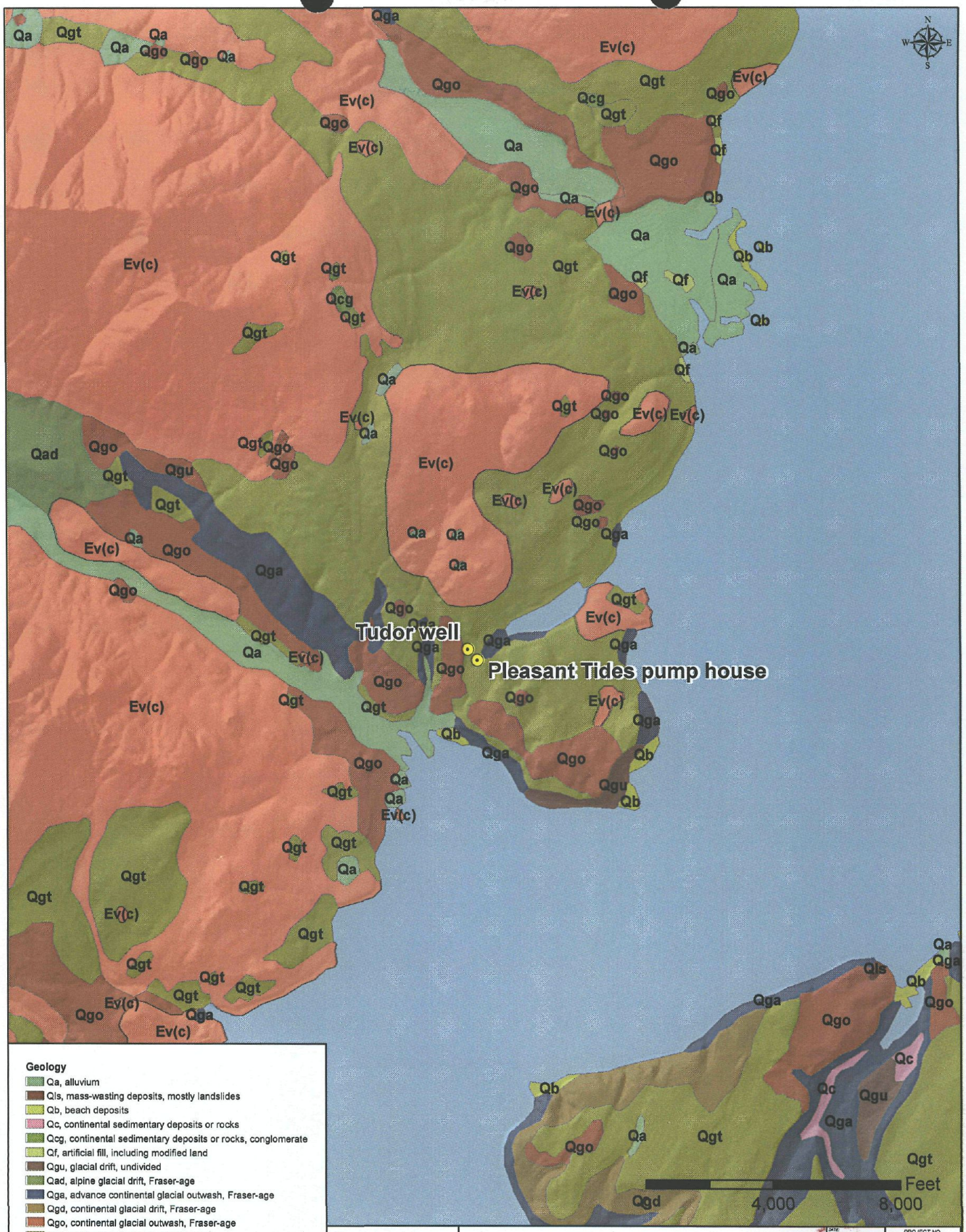
Bainbridge Island, WA 98110
(206) 780-9370
811 First Avenue #480
Seattle, WA 98104
(206)-328-7443

Tudor Well Geologic and Construction Summary
Tudor Pump Test
Brinnon, Washington

DATE: Nov 2005	PROJECT NO. 050154
DESIGNED BY: JJS	
DRAWN BY: PMB	FIGURE NO. 2
REVISED BY: PMB (Jan 2006)	

Q:\Coldwell Banker\Tudor Pump Test 050154\2005-11\050154-01.dwg



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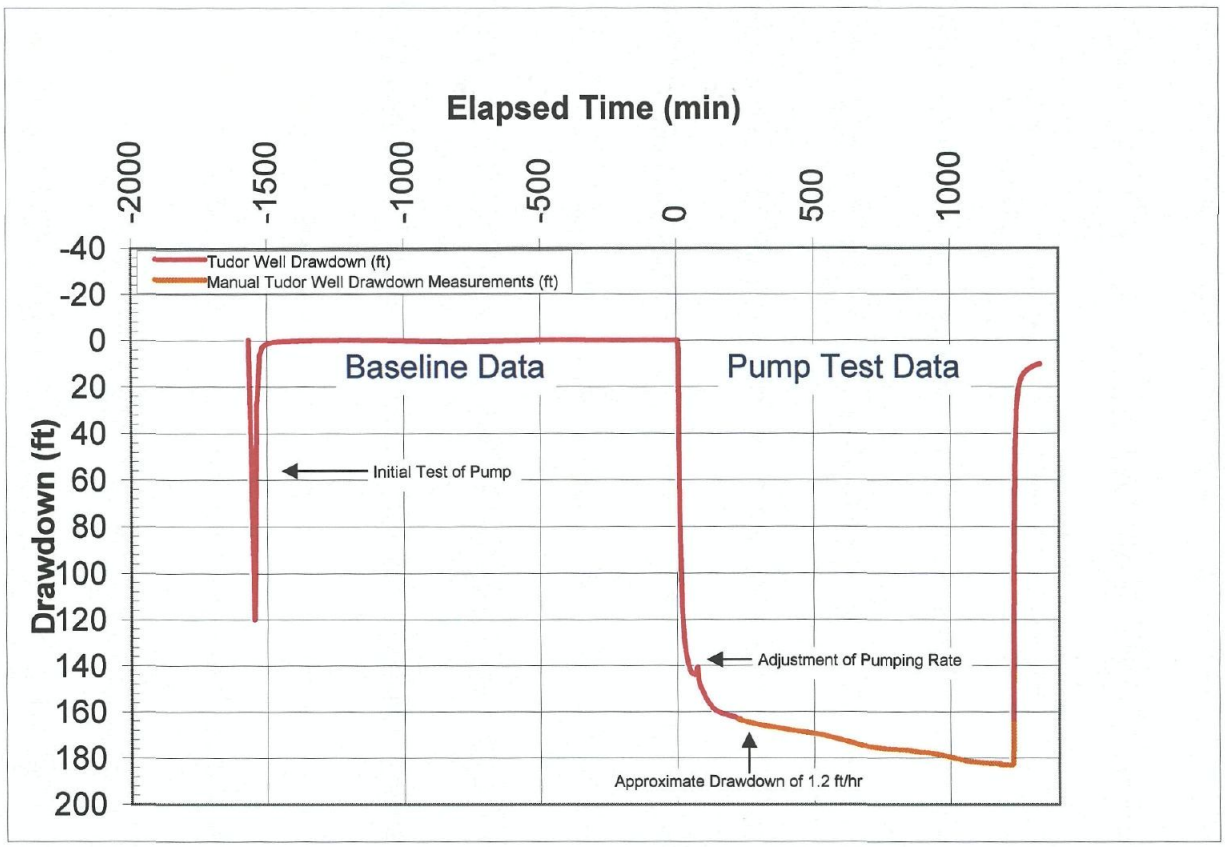
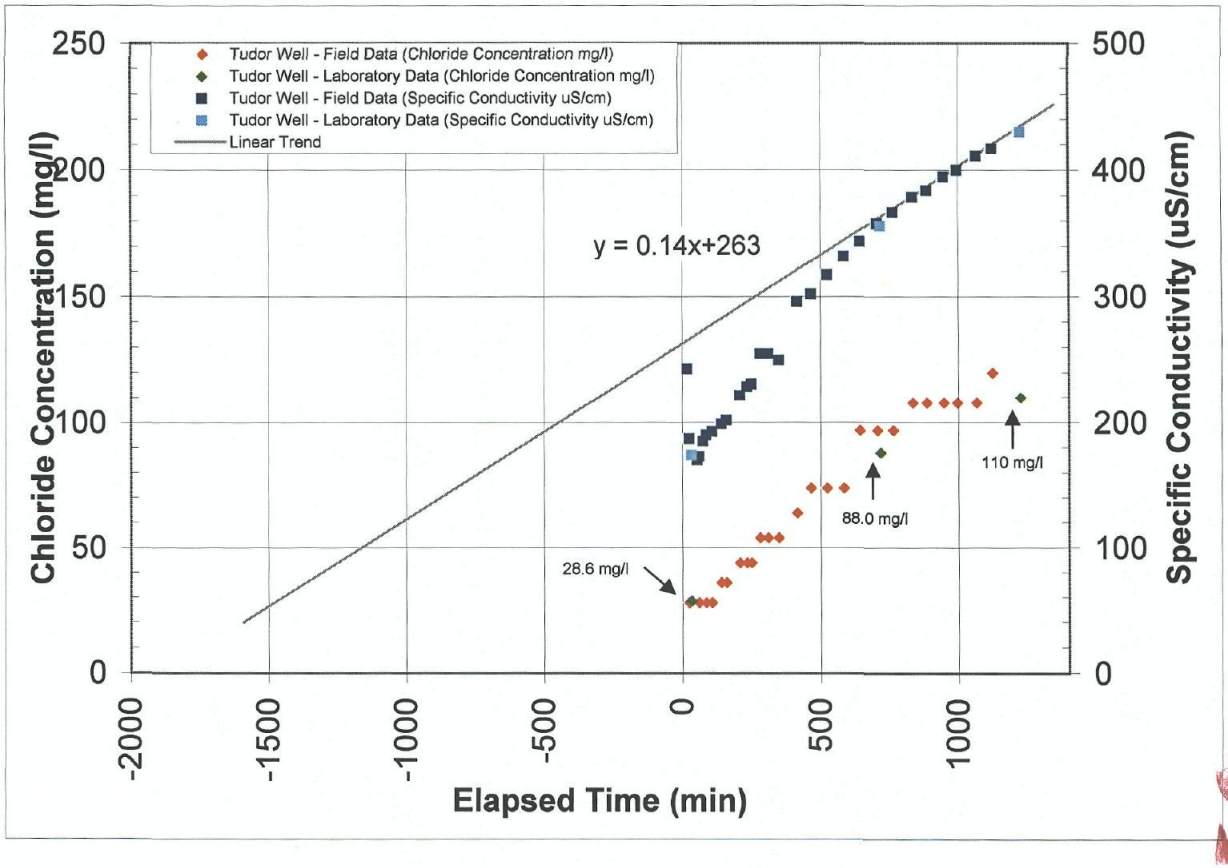
Geologic Map - Tudor Pump Test

Brinnon, WA

DATE: Jan 2006	PROJECT NO. 050154
DESIGNED BY: ACM	
DRAWN BY: ACM	FIGURE NO. 3
REVISED BY: ACM	

T:\Projects_8\tudor\tudor_well_site.mxd





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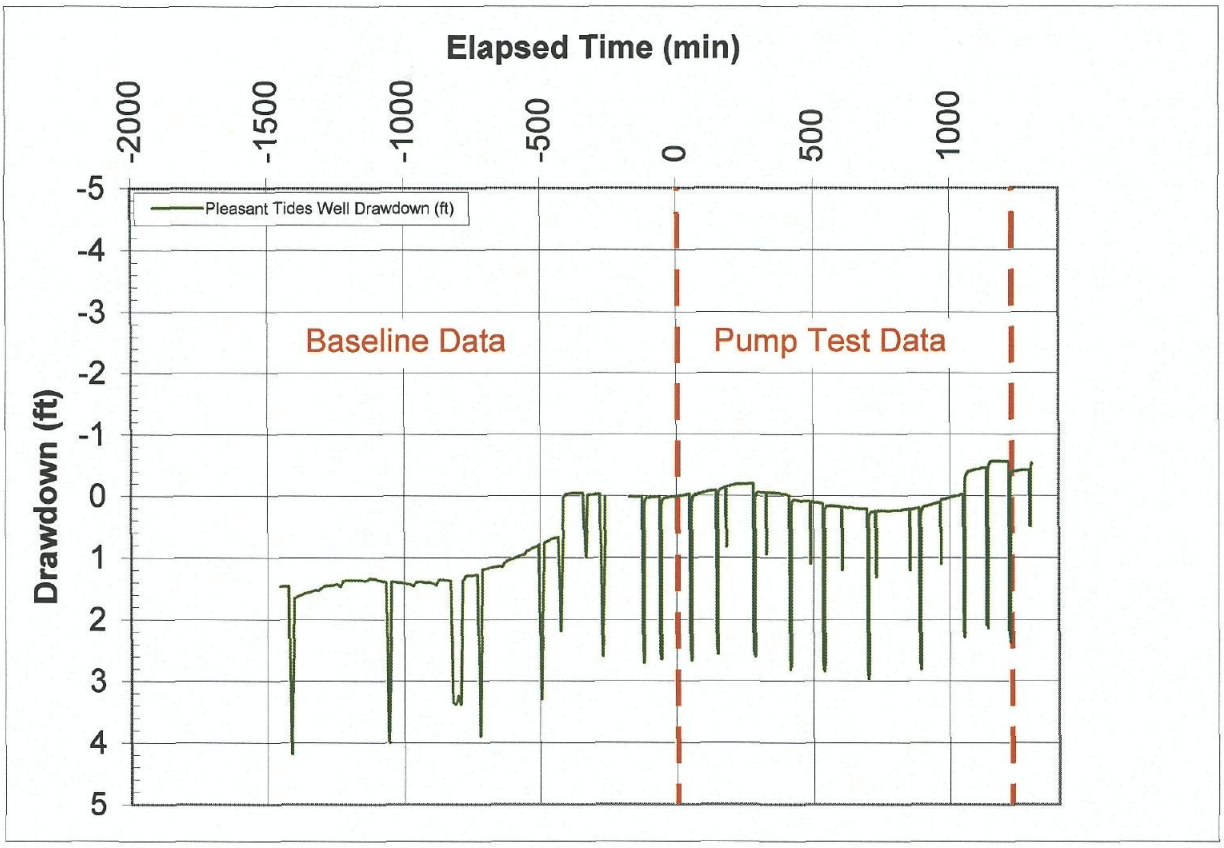
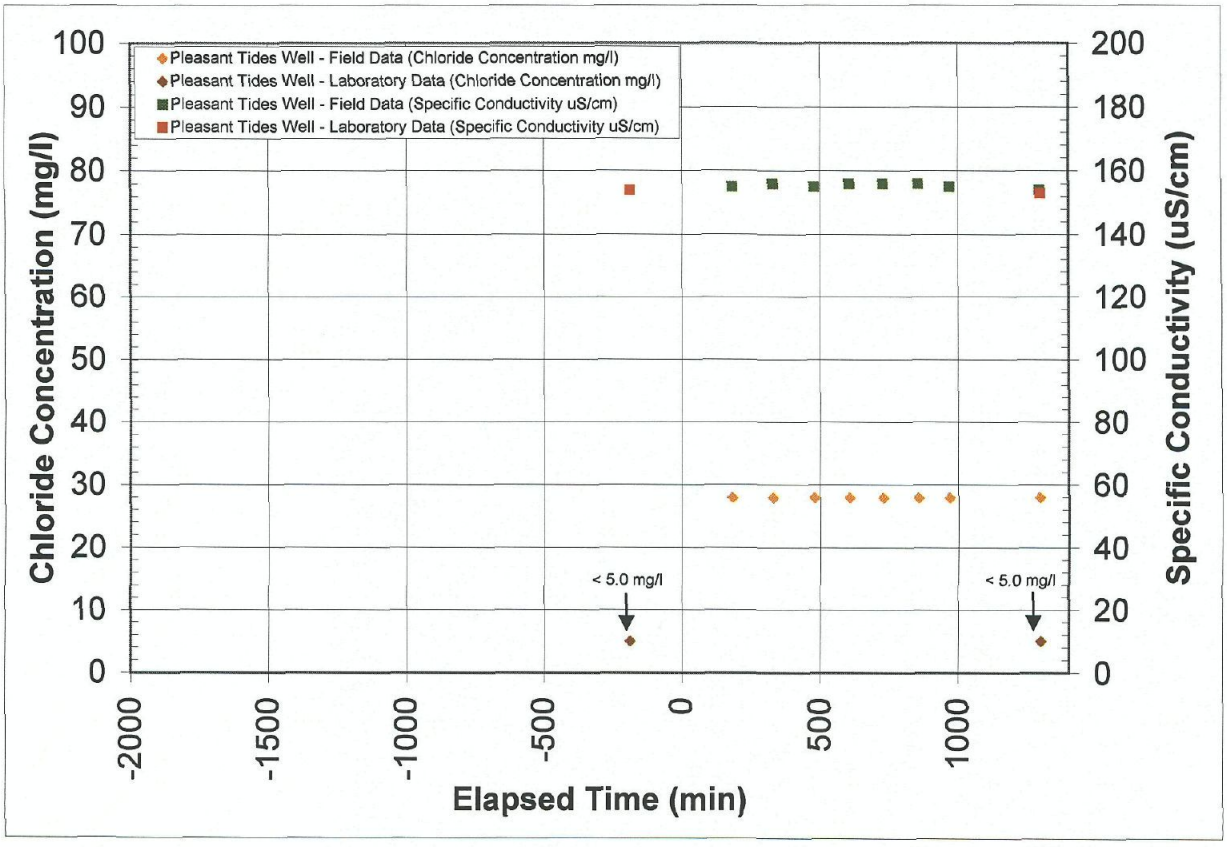
P:\Seawater Intrusion Assessments\Tudor Well CB Settlers\Data\24-Hour Test\Tudor Pump Test.xls

Tudor Well 24-hour
Constant Rate Test Data
Tudor Pump Test
Brinnon, WA

Figure 5





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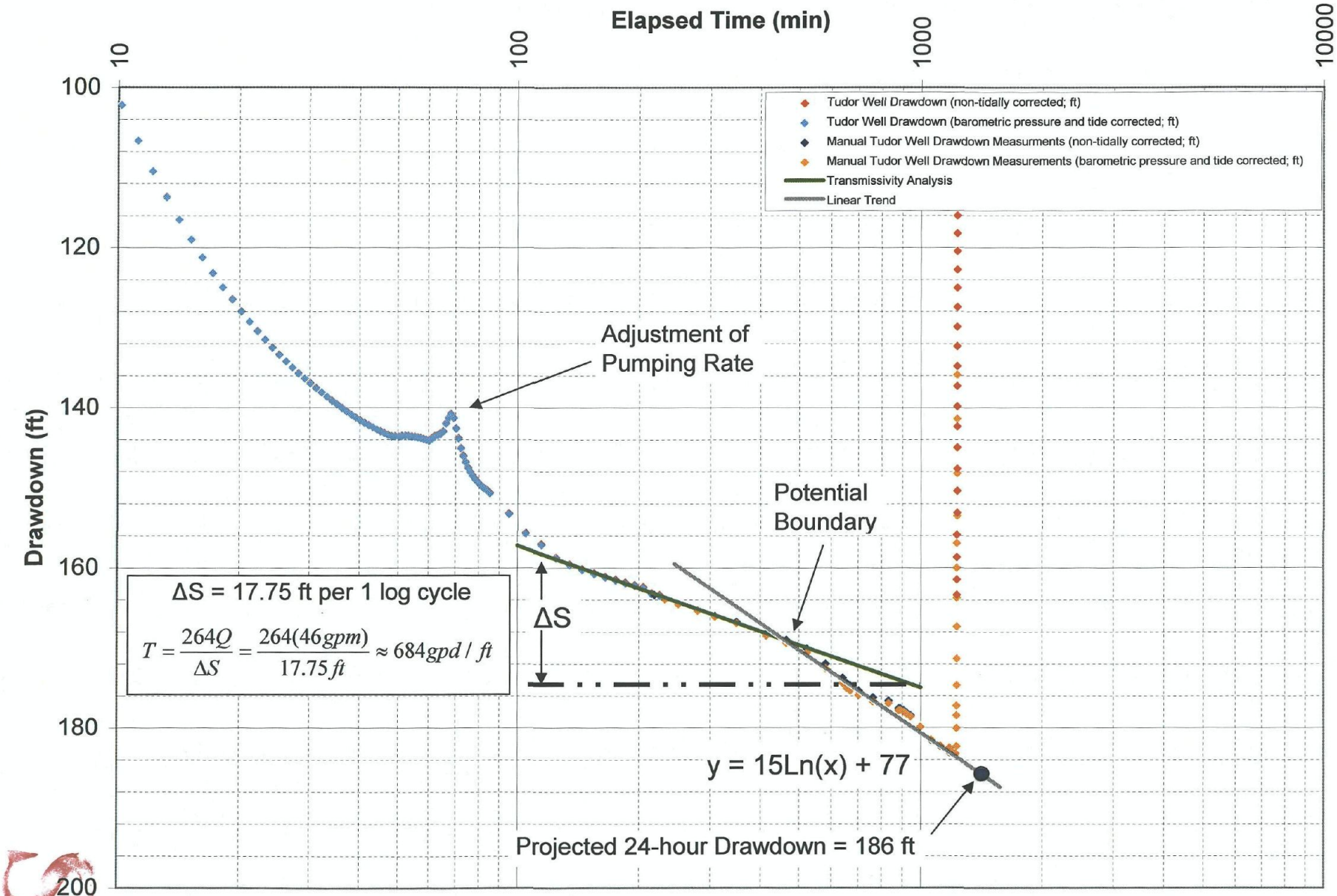
Pleasant Tides Monitoring Well
24-hour Constant Rate Test Data
Tudor Pump Test
Brinnon, WA

Figure 6



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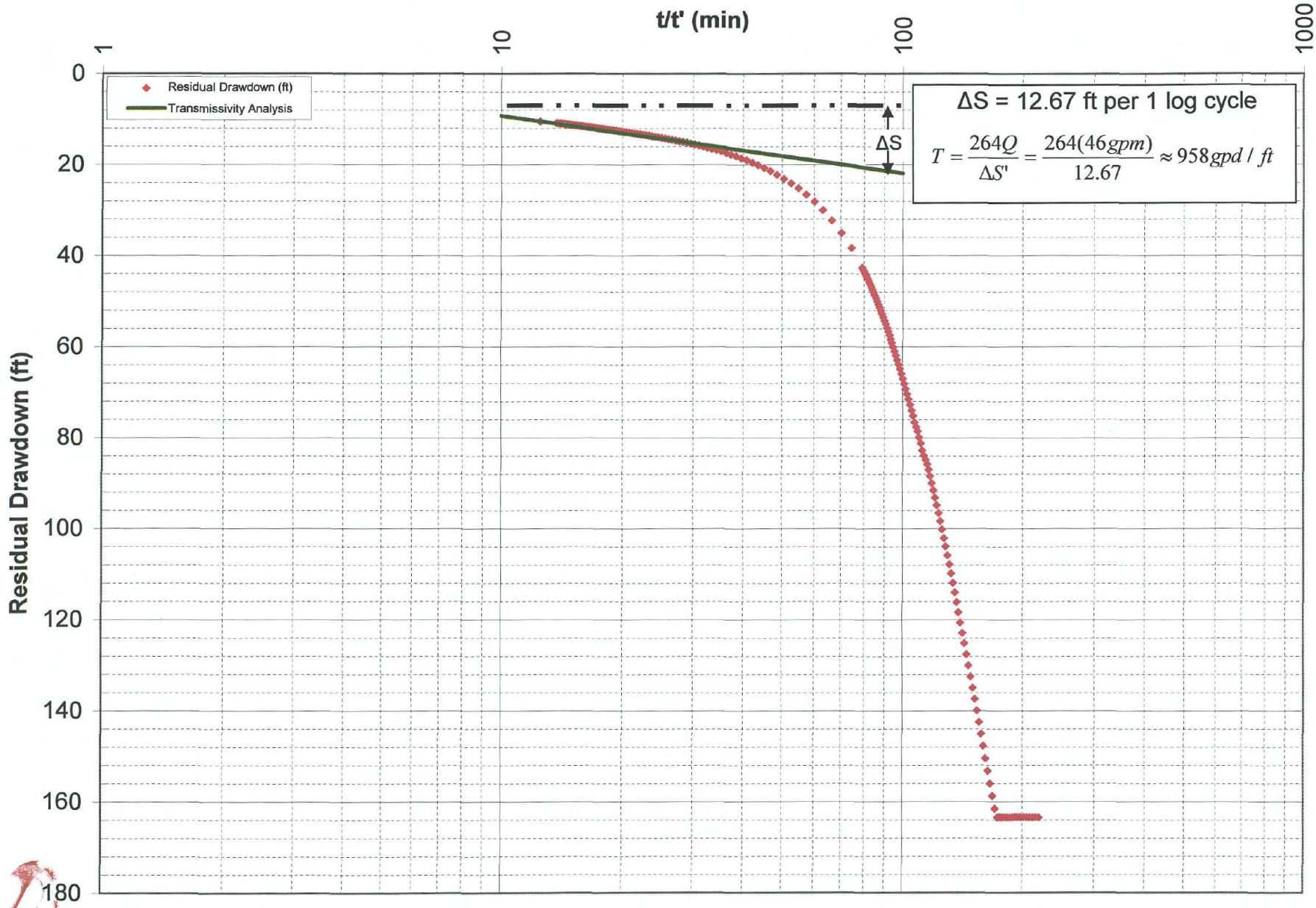
Drawdown Transmissivity Analysis:
24-hour Constant Rate Test
Tudor Pump Test
Brinnon, WA

Figure 7



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Recovery Transmissivity Analysis:
24-hour Constant Rate Test
Tudor Pump Test
Brinnon, WA

Figure 8

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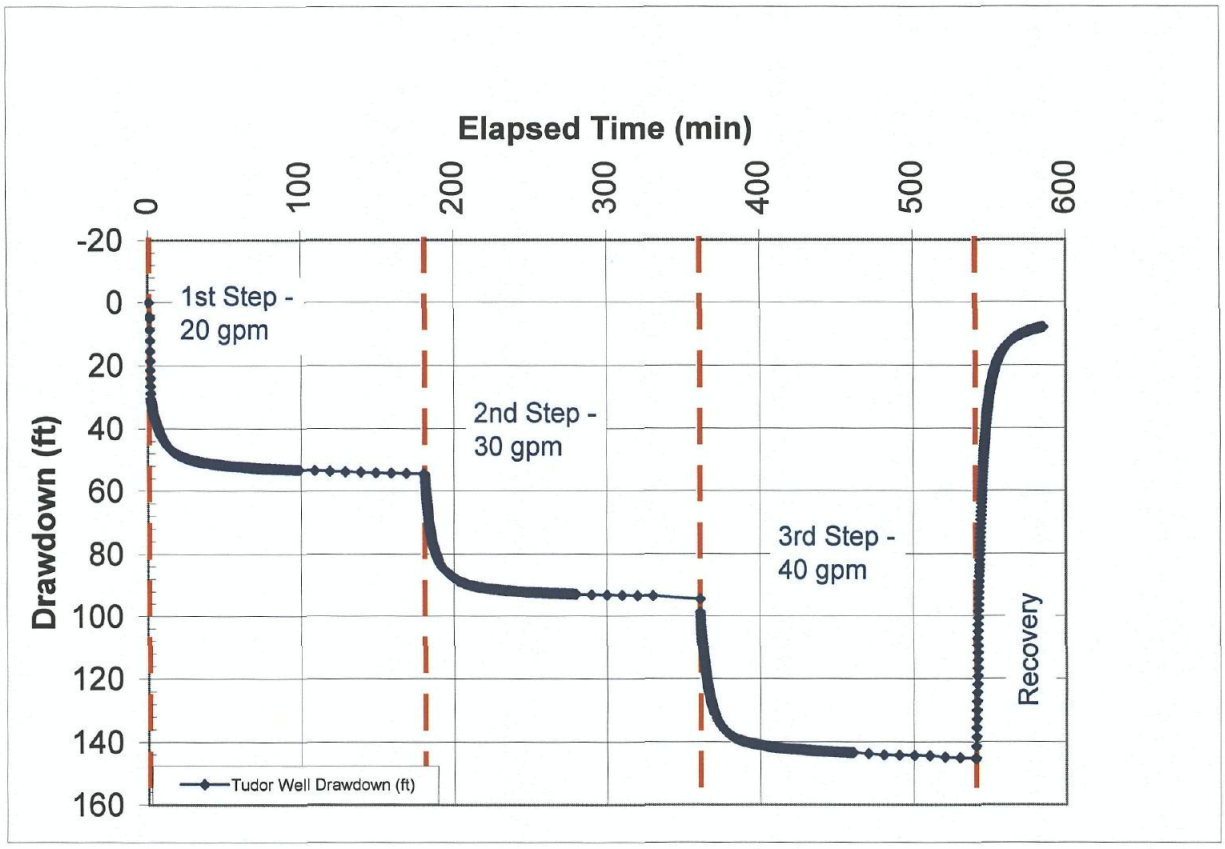

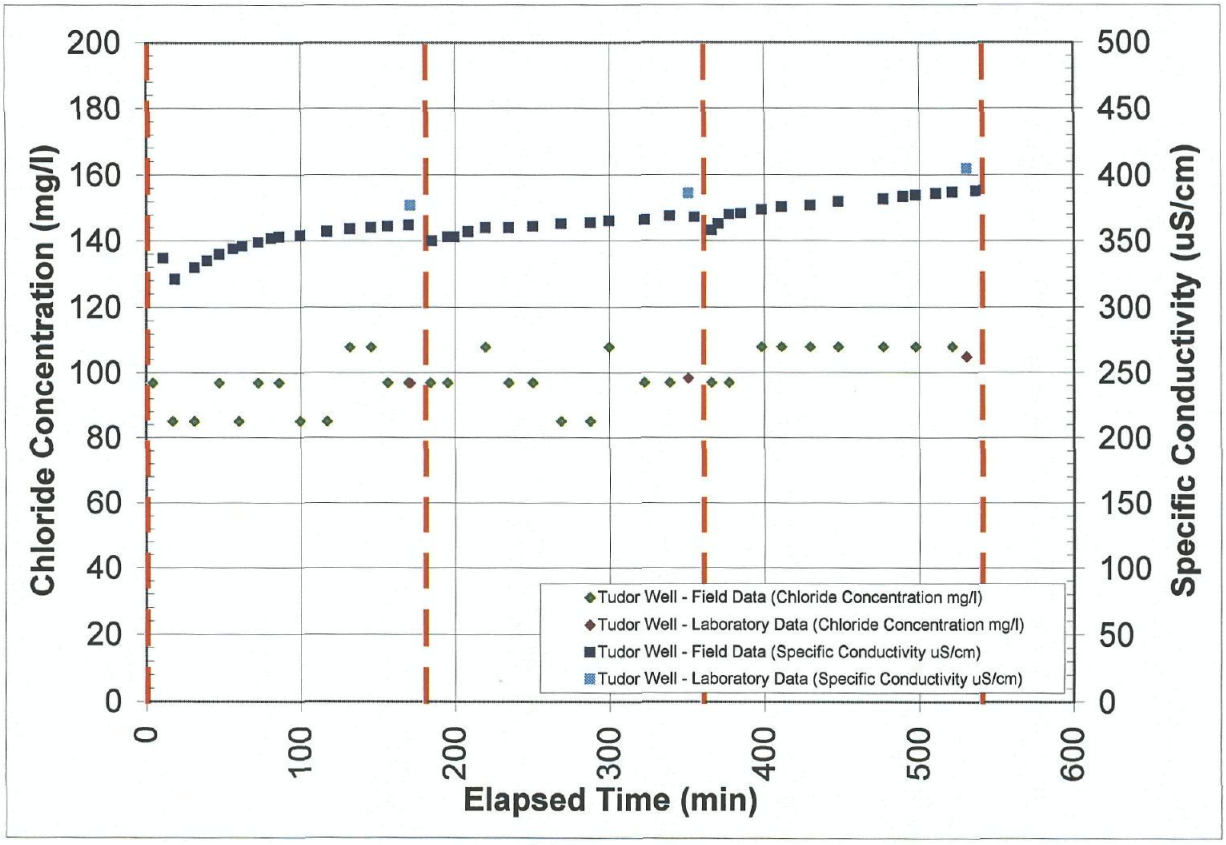

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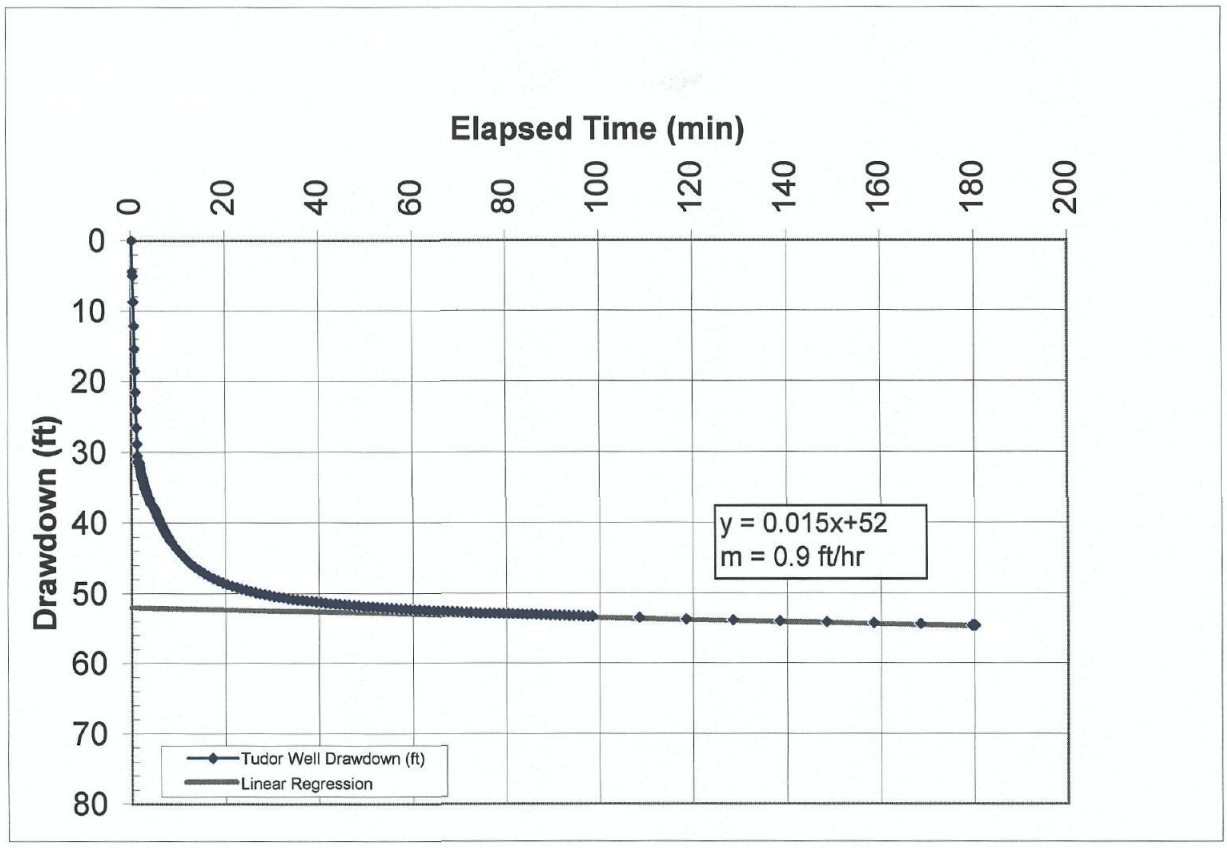
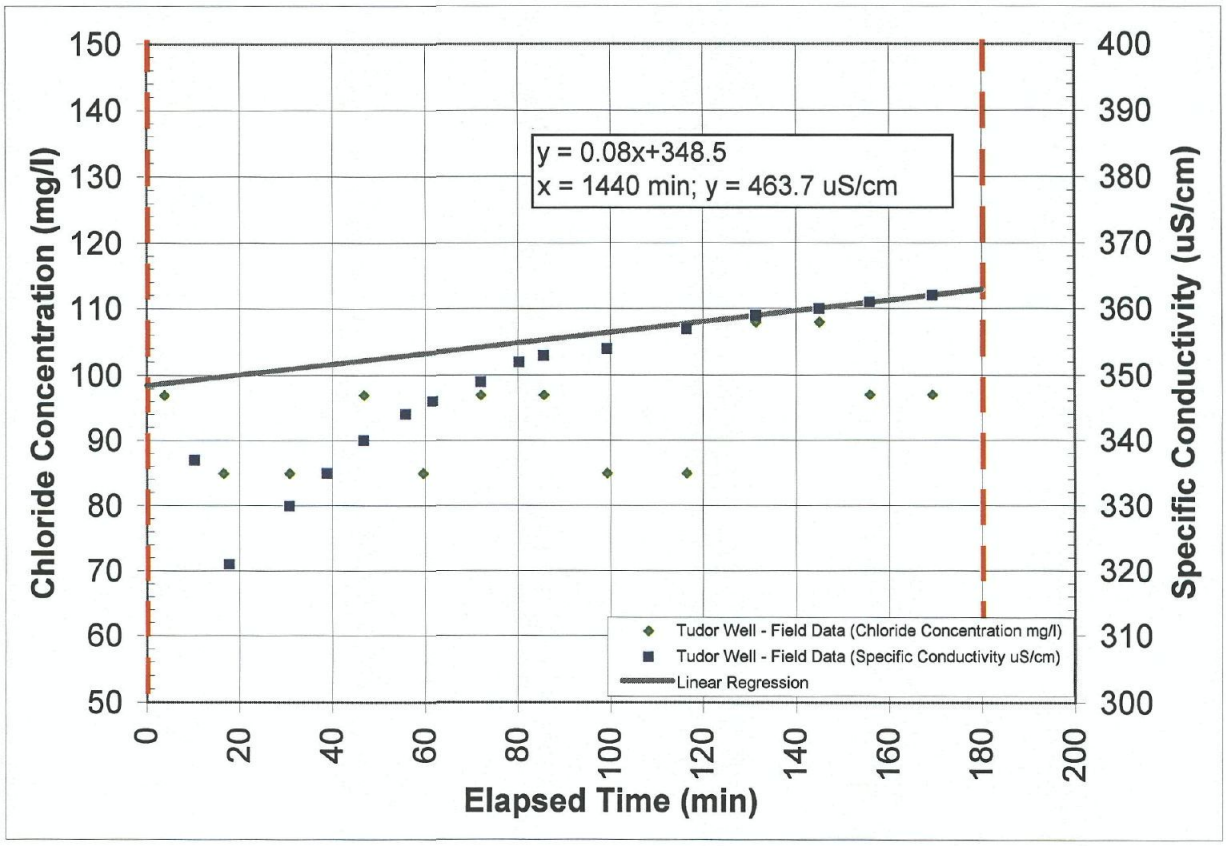
Tudor Well Step Test Data
Tudor Pump Test
Brinnon, WA

Figure 9





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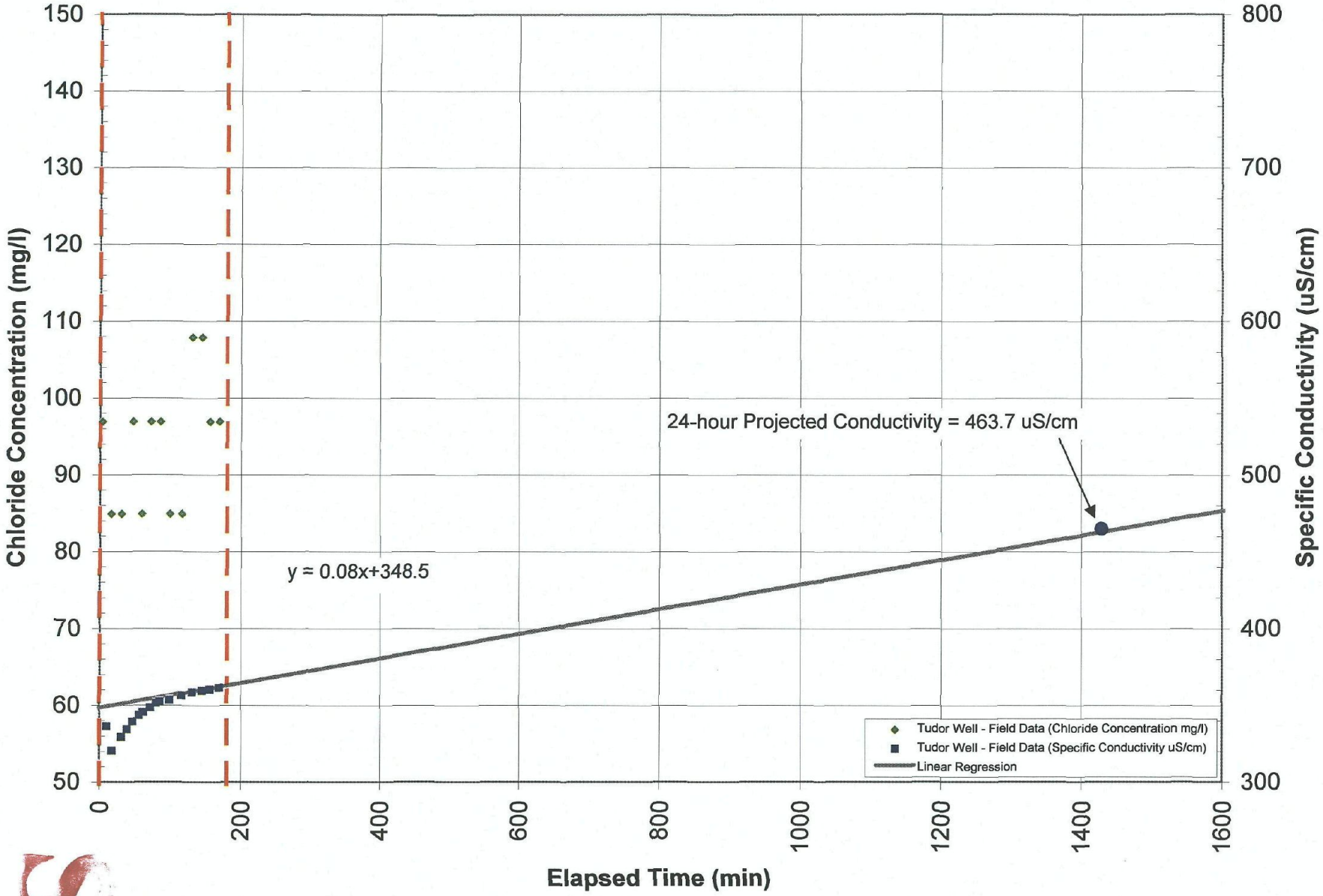
P:\Seawater Intrusion Assessments\Tudor Well CB Settlers\Data\Step Test\Tudor Step Test.xls

Tudor Well Step Test
Data: 20 gpm Step
Tudor Pump Test
Brinnon, WA

Figure 10



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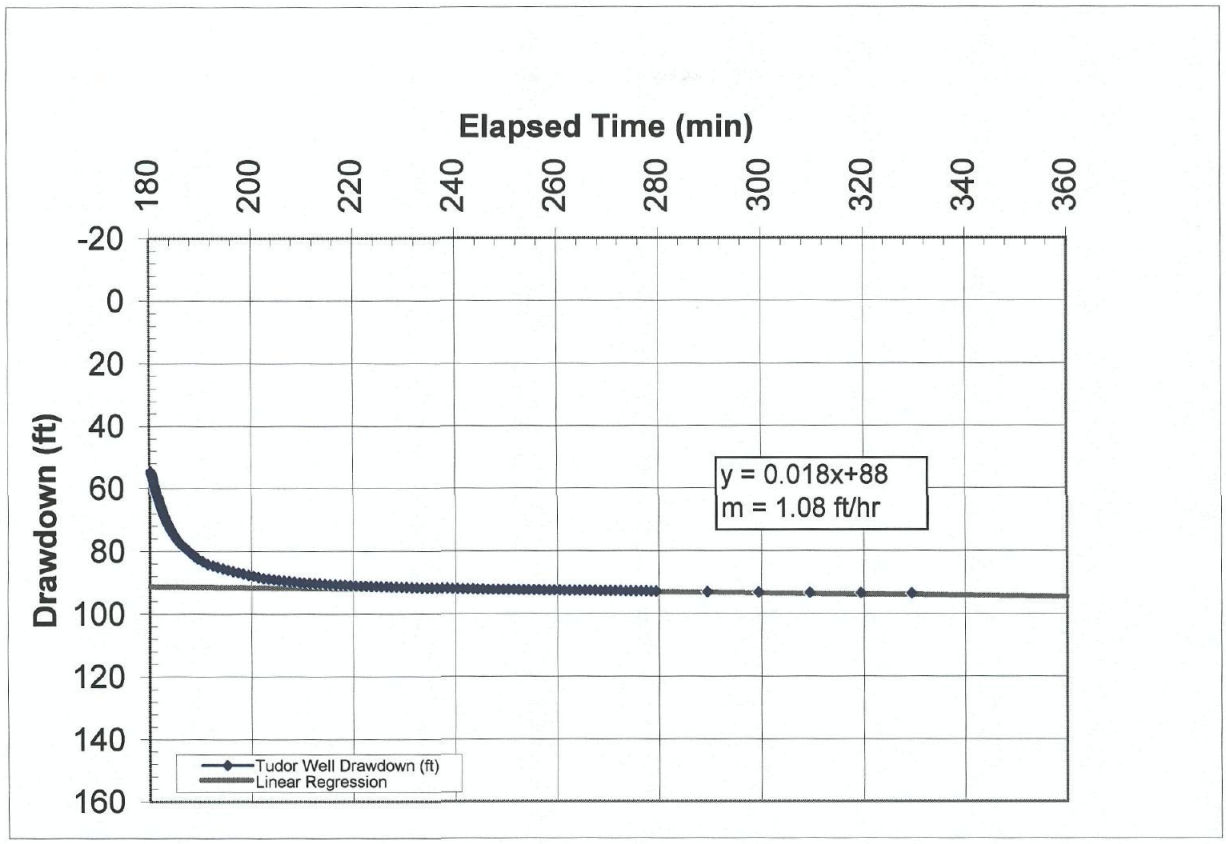
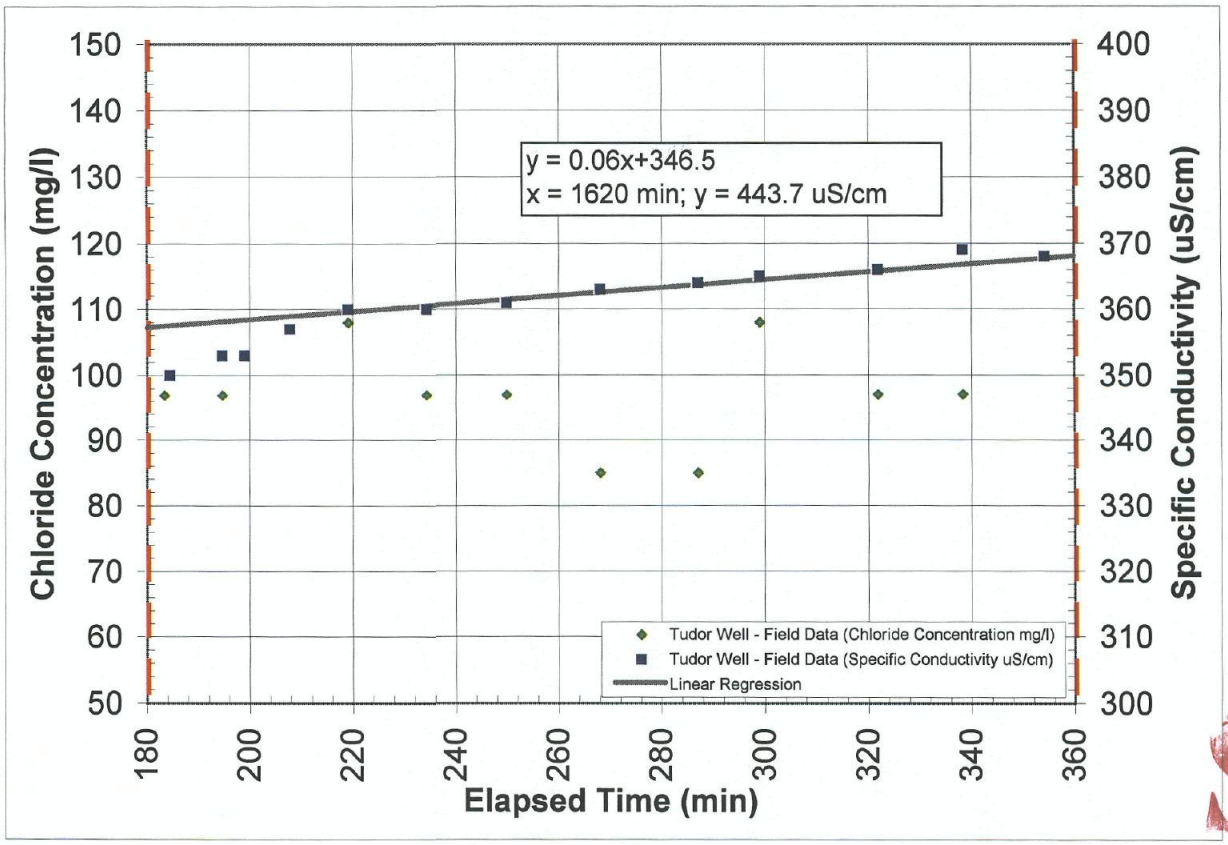
P:\Seawater Intrusion Assessments\Tudor Well CB Settlers\Data\Step Test\Tudor Step Test.xls

Tudor Well Projected Chloride Concentration Data: 20 gpm Step
Tudor Pump Test
Brinnon, WA

Figure 10a





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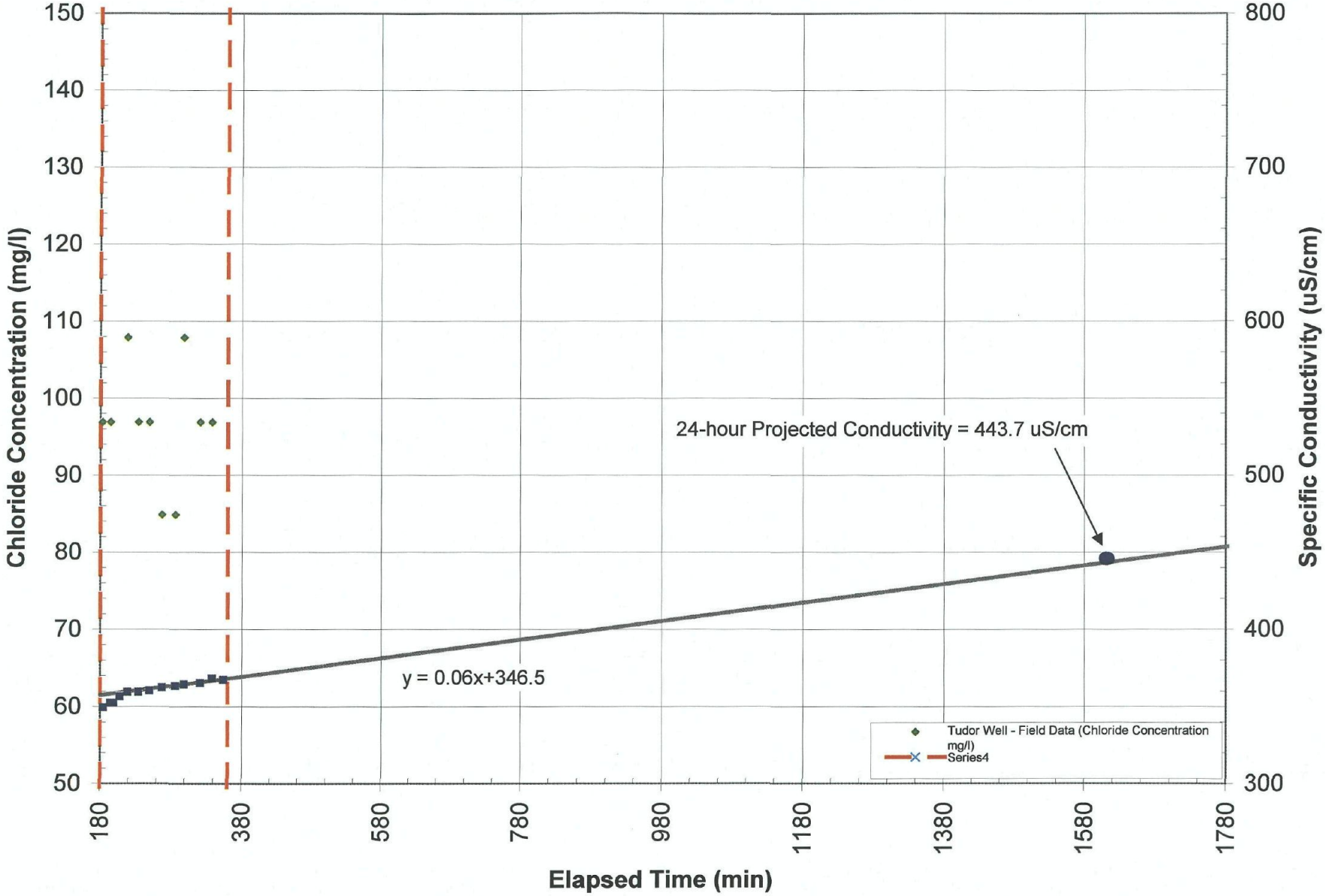
Tudor Well Step Test
Data: 30 gpm Step
Tudor Pump Test
Brinnon, WA

Figure 11



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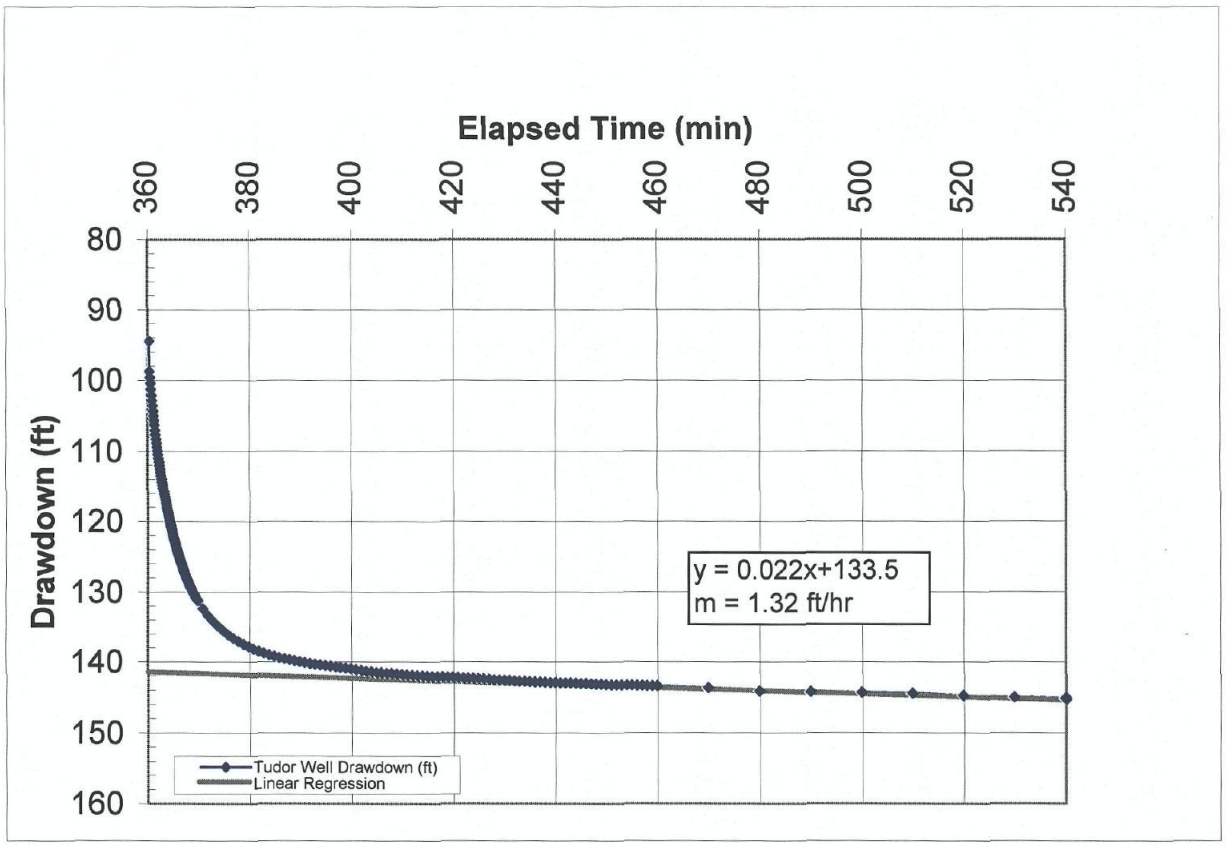
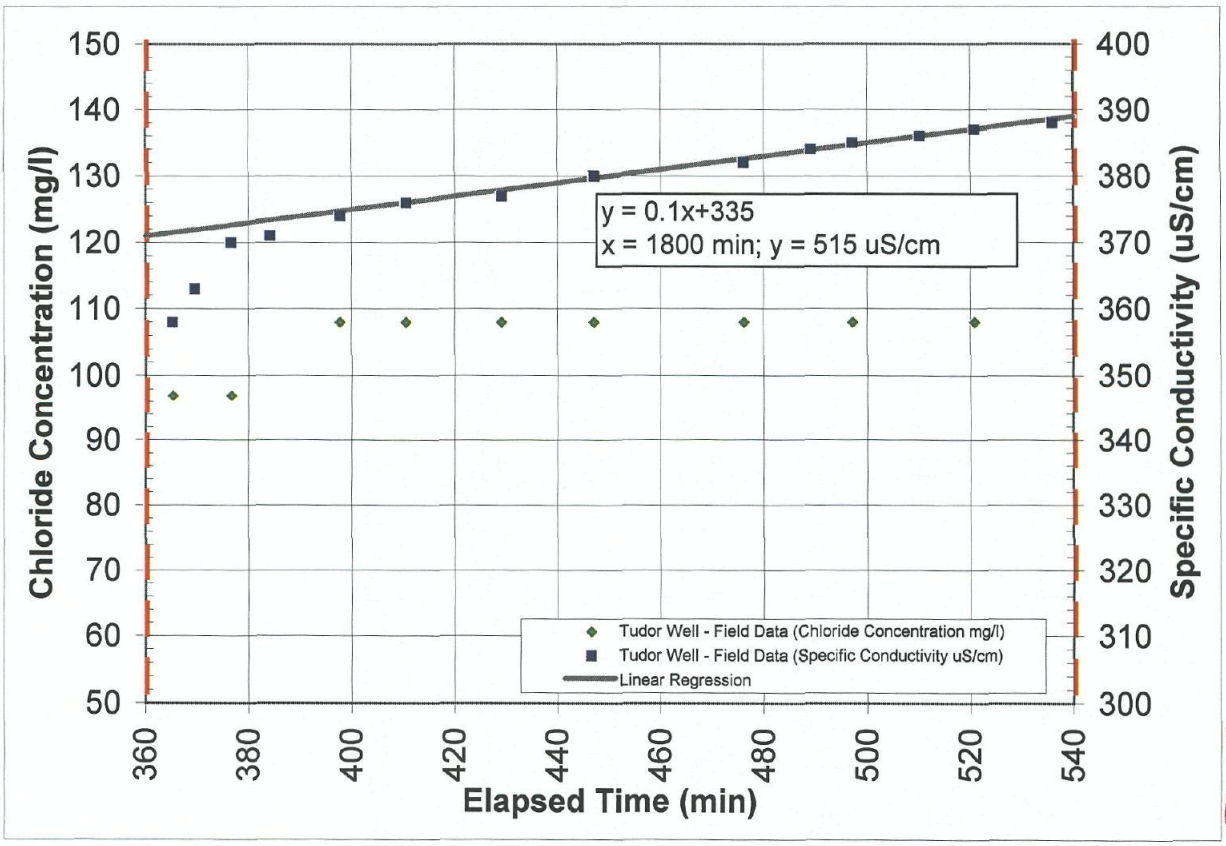
Tudor Well Projected Chloride Concentration Data: 30 gpm Step

Tudor Pump Test
Brinnon, WA

Figure 11a





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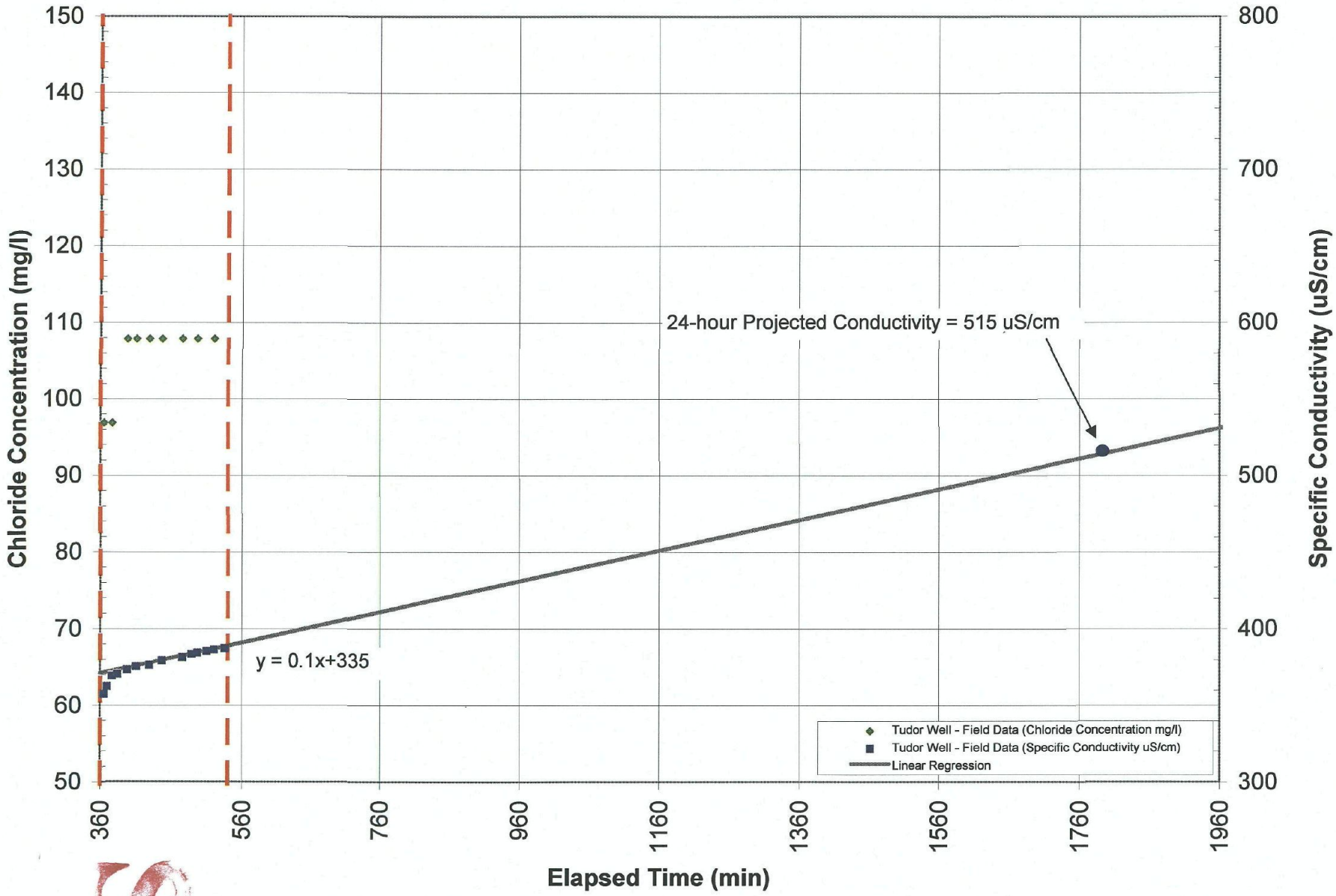
P:\Seawater Intrusion Assessments\Tudor Well CB Settlers\Data\Step Test\Tudor Step Test.xls

Tudor Well Step Test
Data: 40 gpm Step
Tudor Pump Test
Pleasant Harbor, WA

Figure 12



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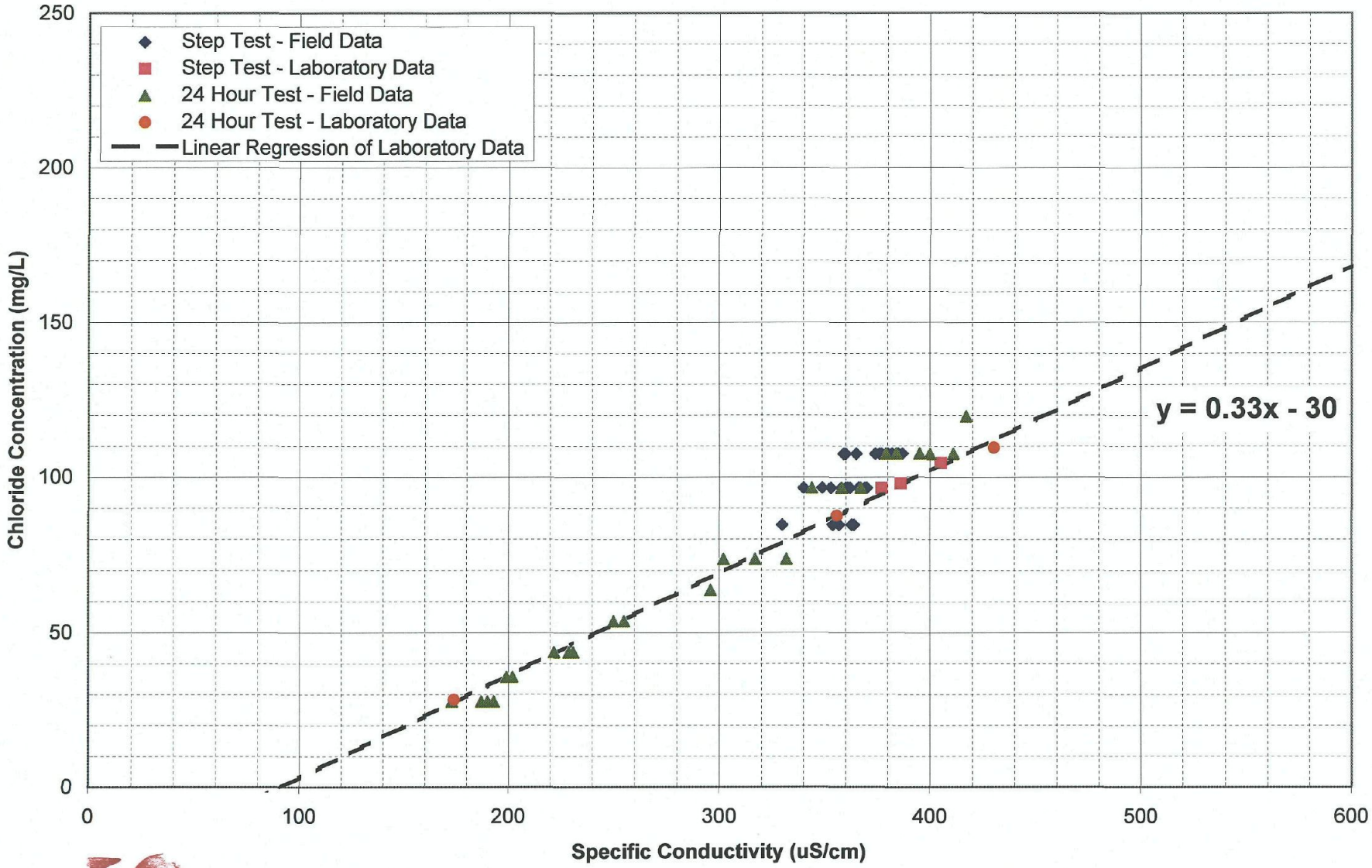
IN-DEPTH PERSPECTIVE

P:\Seawater Intrusion Assessments\Tudor Well CB Settlers\Data\Step Test\Tudor Step Test.xls

Tudor Well Projected Chloride Concentration Data: 40 gpm Step

Tudor Pump Test
Brinnon, WA

Figure 12a



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P:\Seawater Intrusion Assessments\Tudor Well CB Settlers\Data\Correlation Plot.xls

Correlation Between Specific Conductivity Measurements and Chloride Concentrations

Tudor Pump Test
Brinnon, WA

Figure 13

Tudor Well Pump Test and Aquifer Analysis

Ecology Meeting
February 10, 2006

The following provides a brief summary of the data and analysis from the Tudor well aquifer tests:

- **Water Well Reports**
  - **Tudor Well**
    - The well was installed on May 4, 1991 to a total depth of 400 ft bgs.
    - The well is perforated from 380 to 400 ft bgs and produces water from a fractured basalt unit observed between 376 and 400 ft bgs (Crescent Formation).
    - The water-bearing, fractured basalt unit is confined by a massive, unfractured basalt unit from 112 to 340 ft bgs.
    - A static water level of 152.5 ft bTOC (~ 12.3 ft MSL) was recorded on November 16, 2005.
  - **Pleasant Tides Well**
    - Well is located between Pleasant Harbor and the Tudor well (450 feet).
    - The well was installed on Nov. 22, 1974 to a total depth of 214 ft bgs.
    - The well is screened from 205 to 210 ft bgs in pre-Vashon gravel deposits.
    - A pumping water level of 130.1 ft bTOC (~ 8.9 ft MSL) was recorded on November 16, 2005.
    - Well remained in operation during test with pumping cycles every 4 to 6 hours with a drawdown of about 2.5 - 2.6 feet.

- **Aquifer Testing**
  - **24-hour Constant Rate Test**
    - Baseline water level and barometric pressure data was collected prior to the test for both the Tudor and Pleasant Tides wells.
    - The test was performed at 46 gpm on November 17 and 18, 2005 for a total of 20.3 hours (time at which the drawdown extended below the maximum lift capacity of the pump).
    - A total drawdown of approximately 182 ft was observed in the Tudor well (see Figure 5).
    - No drawdown, due to pumping of the Tudor well, was observed in the Pleasant Tides well (see Figure 6).
    - Both tidal and barometric pressure influences were removed from the data.
      - Tidal efficiency of 4.4%
      - Barometric efficiency of 28%
      - Tidal and barometric pressure influences had a relatively small effect on water levels within the Tudor well (0.7 and 0.1 ft, respectively).
    - Aquifer Properties
      - Pumping transmissivity of 680 gpd/ft (see Figure 7).
      - Recovery transmissivity of 960 gpd/ft.
      - Storage coefficient of 1×10^{-5} (based on tidal efficiency).
    - Laboratory analysis water quality data (see Figures 5 and 6):

Tudor Well				Pleasant Tides Well	
Sample Time (elapsed time from start of pumping in minutes)	Quantity of water removed (gallons)	Specific Conductivity (uS/cm)	Chloride Concentration (mg/l)	Sample Time (elapsed time from start of pumping in minutes)	Specific Conductivity (uS/cm)
30	1380	174	28.6	Prior to Test	154
710	32660	356	88	Following Test	153
1220	56120	430	110		

- **Step Test**
  - The step test was performed on December 15, 2005 for a total of 9-hours at pumping rates of 20, 30 and 40 gpm (3-hours per step).
  - Drawdown and specific capacity data (see Figure 9):

Pumping Rate (gpm)	Duration (min)	Drawdown (ft)	Specific Capacity (gpm/ft)
20	180	56	0.36
30	180	39	0.77
40	180	50	0.80

- Estimated 147 feet of projected drawdown at 40 gpm appears to be within pump capacity

  - Laboratory analysis water quality data (see Figure 9):

Approximate Pumping Rate (gpm)	Sample Time (elapsed time since start of pumping in minutes)	Specific Conductivity (uS/cm)	Chloride Concentration (mg/l)
20	170	377	96.9
30	350	386	98.3
40	530	405	105.0

- **Groundwater Development Impact Assessment**
  - **Impairment of Wells**
    - No impairment of quantity or quality of groundwater in the Pleasant Tides well was observed during the pumping of the Tudor well (see Figure 6).
  - **Seawater Intrusion**
    - Concentrations are well below the Secondary Maximum Contaminant Level (SMCL) of 250 mg/l.

- **Well Yield Assessment**
  - Based on the 24-hour pump test, the Tudor well will not provide a sustainable yield of 46 gpm with the current pump capacity.
  - It is recommended that a 10-foot buffer is kept above the maximum lift capacity of the pump during pumping (approximately 170 ft of drawdown with current pump).
  - Based on 24-hour projected drawdowns for the step test (see Table 2), the Tudor well is capable of providing a sustainable yield of 40 gpm.

- **Conclusions**
  - The Tudor well is completed at a depth of 400 ft bgs in a fractured basalt aquifer and is slightly influenced by barometric pressure and tidal fluctuations.

- Water quality data collected during both the 24-hour constant rate test and the 9-hour step test indicate that the well would not classify as a high risk to seawater intrusion. Projected 24-hour chloride concentrations are well below the EPA SMCL (250 mg/l).

- Monitoring of chloride concentrations under actual pumping conditions should be conducted to ensure sustainable withdrawl prevents long-term degradation of the aquifer.

- Monitoring of the nearby Pleasant Tides well during the 24-hour constant rate test indicates that pumping of the Tudor well will not impair the Pleasant Tides well.

- The Tudor well appears capable of providing a sustainable yield at 40 gpm using the current pump configuration.

- Based on the 24-hour constant rate test, the fractured basalt aquifer surrounding the Tudor well has a transmissivity ranging between 680 and 960 gpd/ft and a storage coefficient of 1×10^{-5}.

- Recommend the following elements:
  - Installation of a source-totalizing meter (flow)
  - On-going well monitoring for chloride concentration (twice per year)
  - Collect and record flow and chloride data

Brinnon
BM 77
Creek
Walkers
Harbor
PLEASANT HARBOR
STATE MARINE PARK
Pleasant
Piles
HIGHWAY
Substation
ROAD
River
Tudor
Silsbee
Boling well #1
Kilmer
Black Point
Duckabush
BM 19
Mud
Quatsap Point
OLYMPIC
BM 34
HOOD
JEFFERSON CO
KITSAP CO
C.I. = 40 feet
~ 200' elev
S
McDaniel
Cove
EACON POINT 2.7 MI.
OODSPORT 20 MI.
(HOLLY)
1479 III SW
SCALE 1:24000
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIR
Tudor

Pearch, John (ECY)

From: John Strunk [jstrunk@aspectconsulting.com]
Sent: Tuesday, October 10, 2006 5:14 PM
To: Pearch, John
Cc: Linda Tudor
Subject: Tudor Well Aug06 Field Data
Attachments: Field Data.xls

John - As we discussed attached are the drawdown, chloride and conductivity data from the Aug. 24, 2006 sample event at the Tudor well. Let me know if you have any questions regarding this data set.

John Strunk, LG, LHG
Associate Geologist

Aspect Consulting
179 Madrone Lane North
Bainbridge Island, WA 98110
206-780-7719 (direct)
206-780-9370 (main)
206-780-9438 (fax)
www.aspectconsulting.com

Aspect consulting
IN-DEPTH PERSPECTIVE

PUMPING TEST DATA

179 Madrone Lane North
Bainbridge Island, Washington 98110
(206) 780-9370

811 First Avenue, Suite 480
Seattle, Washington 98104
(206) 328-7443

Project: Tudor Well Water Characterization Sample
Project No.: 050154-001-01
Date: 8/24/06
Pumping well: Tudor Well
Well water level data collected from:
Water level measuring point: TOC (2.27 ft ags)
Depth to initial static water level in feet: 153.31

Clock Time	Elapsed Time in Minutes	Depth to Water in Feet	Drawdown below Initial SWL in Feet	Pumping Rate - Flowmeter (gpm)	Pumping Rate - Voumetric (gpm)	Conductivity (uS/cm)	Cl (mg/l)	Comments
8/24/06 12:59:30	-10.5	153.31	0					
8/24/06 13:07:30	-2.5	153.32	0.01					
8/24/06 13:10:00	0.0							Start Pumping; Meter = 70,500 gal
8/24/06 13:22:30	12.5					183.9		Adjusted Flow
8/24/06 13:31:50	21.8					194.9	40	
8/24/06 13:36:55	26.9	260.7	107.39					
8/24/06 13:39:25	29.4			35.3				Adjusted Flow
8/24/06 13:41:50	31.8					217.9	47	
8/24/06 13:45:00	35.0			29.5	32.5			
8/24/06 13:50:10	40.2					227.1	54	
8/24/06 13:54:00	44.0	252.05	98.74					
8/24/06 13:58:30	48.5			30.3		234.8	54	
8/24/06 14:05:27	55.5	252.25	98.94					
8/24/06 14:07:50	57.8					239.6	54	
8/24/06 14:14:30	64.5			33.6				
8/24/06 14:16:12	66.2					249.2	62	
8/24/06 14:20:00	70.0			29.7				
8/24/06 14:22:25	72.4	253.04	99.73					
8/24/06 14:26:30	76.5					258.2	62	
8/24/06 14:29:35	79.6				32.9			
8/24/06 14:36:20	86.3		82			259.1	62	
8/24/06 14:39:40	89.7			30.1				
8/24/06 14:41:10	91.2	253.83	100.52					
8/24/06 14:46:00	96.0					268.2	62	
8/24/06 14:51:30	101.5		52		32.1			
8/24/06 14:55:10	105.2					268.9	62	
8/24/06 14:56:25	106.4	254.41	101.1	28.1				

Notes:
Elapsed time and drawdown are based on a starting time of 8/24/06 13:10:00; the time at which pumping was started.

Aspect consulting
IN-DEPTH PERSPECTIVE

PUMPING TEST DATA

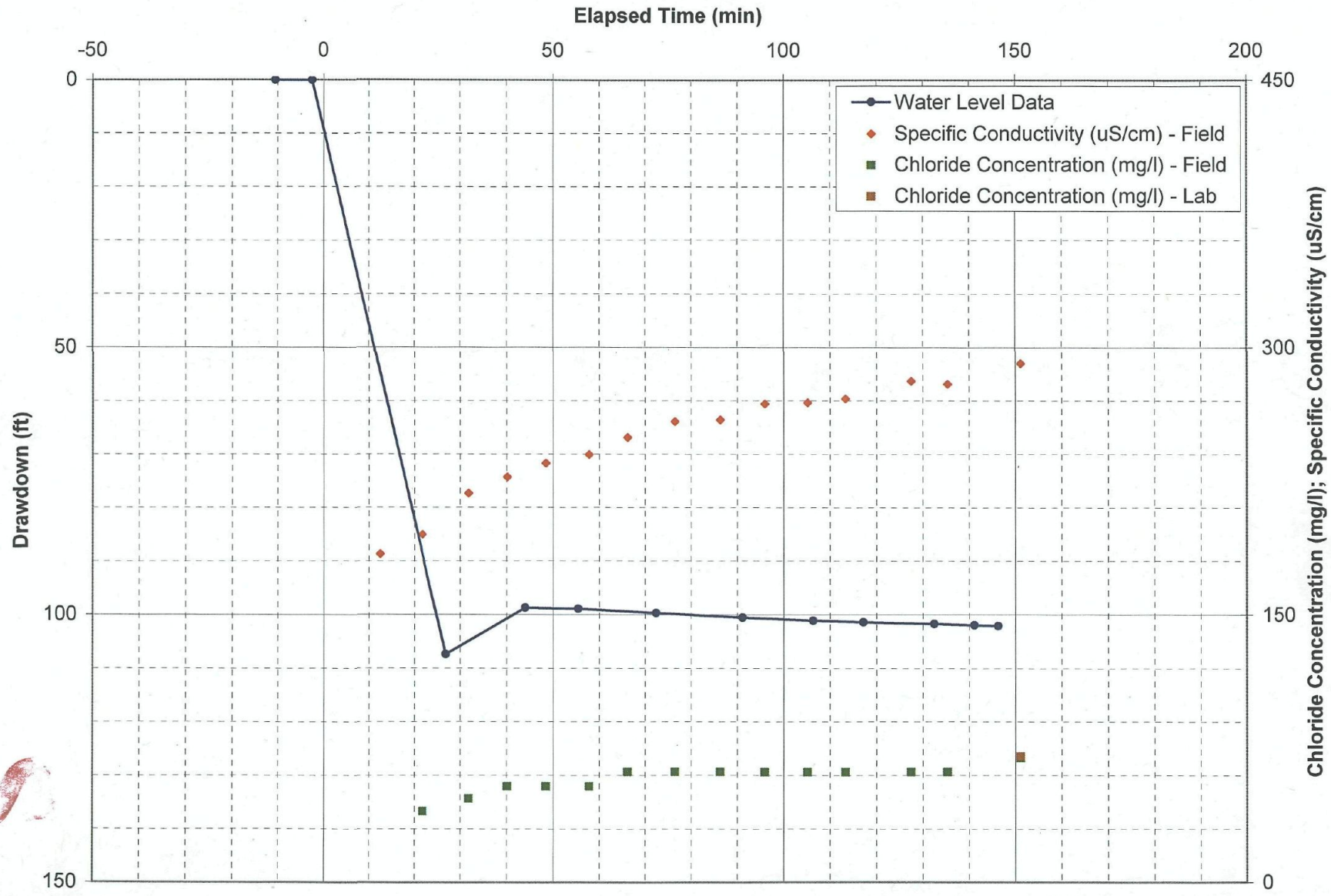
179 Madrone Lane North
Bainbridge Island, Washington 98110
(206) 780-9370

811 First Avenue, Suite 480
Seattle, Washington 98104
(206) 328-7443

Project: Tudor Well Water Characterization Sample
Project No.: 050154-001-01
Date: 8/24/06
Pumping well: Tudor Well
Well water level data collected from:
Water level measuring point: TOC (2.27 ft ags)
Depth to initial static water level in feet: 153.31

Clock Time	Elapsed Time in Minutes	Depth to Water in Feet	Drawdown below Initial SWL in Feet	Pumping Rate - Flowmeter (gpm)	Pumping Rate - Voumetric (gpm)	Conductivity (uS/cm)	Cl (mg/l)	Comments
8/24/06 15:03:20	113.3		.29			271	62	
8/24/06 15:07:10	117.2	254.7	101.39	28.8	31.7			
8/24/06 15:17:30	127.5		.32			281	62	
8/24/06 15:22:30	132.5	255.02	101.71	29.7				
8/24/06 15:25:20	135.3		.19			279.4	62	
8/24/06 15:31:10	141.2	255.21	101.9	29	32.3			
8/24/06 15:35:35	145.6		.15					
8/24/06 15:36:20	146.3	255.36	102.05					
8/24/06 15:40:00	150.0							Tudor-082406 Sample Collected
8/24/06 15:41:10	151.2					290.9	70	
8/24/06 15:42:10	152.2							Stopped Pumping; Meter = 75300 gal

Notes:
Elapsed time and drawdown are based on a starting time of 8/24/06 13:10:00; the time at which pumping was started.



Aspect consulting
IN-DEPTH PERSPECTIVE

C:\Documents and Settings\jope461\Local Settings\Temporary Internet Files\OLKD\Field Data.xls

Tudor Well Data
Tudor Well Groundwater Characterization
Brinnon, WA

Figure 1

Date		Time	Date & Time	Elapsed Time (min)	Depth to Water	Drawdown	Pumping Rate	Volumetric Pumping Rate	Conductivity	Chloride	Comments	Laboratory Conductivity	Laboratory Chloride
8/24/2006	125930	12:59:30	8/24/06 12:59:30	-10.5	153.31	0							
8/24/2006	130730	13:07:30	8/24/06 13:07:30	-2.5	153.32	0.01							
8/24/2006	131000	13:10:00	8/24/06 13:10:00	0.0							Start Pumping; Meter = 70,500 gal		
8/24/2006	132230	13:22:30	8/24/06 13:22:30	12.5					183.9		Adjusted Flow		
8/24/2006	133150	13:31:50	8/24/06 13:31:50	21.8					194.9	40			
8/24/2006	133655	13:36:55	8/24/06 13:36:55	26.9	260.7	107.39							
8/24/2006	0:00:00	13:39:25	8/24/06 13:39:25	29.4			35.3				Adjusted Flow		
8/24/2006	134150	13:41:50	8/24/06 13:41:50	31.8					217.9	47			
8/24/2006	134500	13:45:00	8/24/06 13:45:00	35.0			29.5	32.5					
8/24/2006	135010	13:50:10	8/24/06 13:50:10	40.2					227.1	54			
8/24/2006	135400	13:54:00	8/24/06 13:54:00	44.0	252.05	98.74							
8/24/2006	135830	13:58:30	8/24/06 13:58:30	48.5			30.3		234.8	54			
8/24/2006	140527	14:05:27	8/24/06 14:05:27	55.5	252.25	98.94							
8/24/2006	140750	14:07:50	8/24/06 14:07:50	57.8					239.6	54			
8/24/2006	141430	14:14:30	8/24/06 14:14:30	64.5			33.6						
8/24/2006	141612	14:16:12	8/24/06 14:16:12	66.2					249.2	62			
8/24/2006	142000	14:20:00	8/24/06 14:20:00	70.0			29.7						
8/24/2006	142225	14:22:25	8/24/06 14:22:25	72.4	253.04	99.73							
8/24/2006	142630	14:26:30	8/24/06 14:26:30	76.5					258.2	62			
8/24/2006	142935	14:29:35	8/24/06 14:29:35	79.6				32.9					
8/24/2006	143620	14:36:20	8/24/06 14:36:20	86.3					259.1	62			
8/24/2006	143940	14:39:40	8/24/06 14:39:40	89.7			30.1						
8/24/2006	144110	14:41:10	8/24/06 14:41:10	91.2	253.83	100.52							
8/24/2006	144600	14:46:00	8/24/06 14:46:00	96.0					268.2	62			
8/24/2006	145130	14:51:30	8/24/06 14:51:30	101.5				32.1					
8/24/2006	145510	14:55:10	8/24/06 14:55:10	105.2					268.9	62			
8/24/2006	145625	14:56:25	8/24/06 14:56:25	106.4	254.41	101.1	28.1						
8/24/2006	150320	15:03:20	8/24/06 15:03:20	113.3					271	62			
8/24/2006	150710	15:07:10	8/24/06 15:07:10	117.2	254.7	101.39	28.8	31.7					
8/24/2006	151730	15:17:30	8/24/06 15:17:30	127.5					281	62			
8/24/2006	152230	15:22:30	8/24/06 15:22:30	132.5	255.02	101.71	29.7						
8/24/2006	152520	15:25:20	8/24/06 15:25:20	135.3					279.4	62			
8/24/2006	153110	15:31:10	8/24/06 15:31:10	141.2	255.21	101.9	29	32.3					
8/24/2006	153535	15:35:35	8/24/06 15:35:35	145.6									
8/24/2006	153620	15:36:20	8/24/06 15:36:20	146.3	255.36	102.05							
8/24/2006	154000	15:40:00	8/24/06 15:40:00	150.0							Tudor-082406 Sample Collected		
8/24/2006	154110	15:41:10	8/24/06 15:41:10	151.2					290.9	70			70.6
8/24/2006	154210	15:42:10	8/24/06 15:42:10	152.2							Stopped Pumping; Meter = 75300 gal		

COLDWELL BANKER

SETTLERS REAL ESTATE, LTD.

P.O. Box 247, Brinnon, WA 98320
1-800-962-6401 / 1-360-796-4900
FAX #: 1-775-459-7506
www.cbsettlers.com

DATE: 5/26/06

NO. OF PAGES (INC. COVER SHEET):

TO: MARIE PETER - DEPT. OF ECOLOGY.

FROM: LINDA TUDOR.

PHONE:

FAX: 360-407-6305

MESSAGE::

RE: WATER RIGHTS

1. COPY OF MAP SHOWING MY 20 ACRES AND SURROUNDING ACREAGE WHICH MAY BENEFIT FROM A FUTURE WATER SYSTEM EXPANSION.
2. COPY OF PARCEL MAPS IDENTIFYING THOSE PARCELS IN THE PROPOSED WATER SYSTEM AREA (EXHIBIT 1 & 2.)
3. LIST OF PARCEL #'S
4. COPY OF ORIGINAL DNS FOR THE PROJECT ON MY 20 ACRES.

S