WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

TIMBER NOTICE OF SALE

***SALE NAME**: GEM TWIST* ***AGREEMENT NO**: 30-094429*

DRAFT

AUCTION: March 30, 2017 starting at 10:00 a.m., Pacific Cascade Region Office, Castle Rock, WA **COUNTY:** Lewis

SALE LOCATION: Sale located approximately 8 miles northwest of Centralia

PRODUCTS SOLD AND SALE AREA: All timber, except leave trees marked with blue paint, trees bounded out by yellow "Leave Tree Area" tags with pink flagging, snags and all down timber existing 5 years prior to the day of sale, bound by the following: white "Timber Sale Boundary" tags and pink flagging, Teague Road, D-3600, and reprod in Unit 1; white "Timber Sale Boundary" tags with pink flagging, D-3700, D-3720 and reprod in Unit 2; white "Timber Sale Boundary" tags with pink flagging, the D-3700 and reprod in Unit3. on part(s) of Sections 6 all in Township 14 North, Range 3 West, Sections 31 and 32 all in Township 15 North, Range 3 West, W.M., containing 127 acres, more or less.

CERTIFICATION: This sale is certified under the Sustainable Forestry Initiative® program Standard (cert no: BV-SFIS-US09000572)

ESTIMATED SALE VOLUMES AND QUALITY:

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Species	Avg DBH	Ring Count	Total MBF	MBF by Grade 1P	2P	3P	1S	2S	3S	4S	UT
Douglas fir	21.7	7	4,726			384		3,361	789	165	27
Red alder	13.3		452					25	99	301	27
Maple	16.6		[illegible]				22	77	48	74	50
Red cedar	21.9		11						10	1	
Hemlock	8.8		6							6	
Sale Total			5,466								

MINIMUM BID: $0.00 **BID METHOD:** Sealed Bids

PERFORMANCE SECURITY: $0.00 **SALE TYPE:** Lump Sum

EXPIRATION DATE: October 31, 2018 **ALLOCATION:** Export Restricted

BID DEPOSIT: $0.00 or Bid Bond. Said deposit shall constitute an opening bid at the appraised price.

DRAFT

HARVEST METHOD: Cable, Motorized Carriage, Ground based equipment and Shovel. Harvesting activities are estimated to be 10% cable harvesting and 90% ground-based harvesting. Ground-based harvesting equipment shall be restricted to slopes of 40% and less, and during dry soil conditions. See clause H-140 for further harvest requirements. A detailed felling and yarding plan shall be required prior to any harvest activities and approved in writing by the Contract Administrator. Shovel Yarding will not be permitted from November 1 to May 1 unless authorized in writing by the Contract Administrator.

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TIMBER NOTICE OF SALE

ROADS: 47.70 stations of optional construction. 91.00 stations of required pre-haul maintenance. Rock for construction, reconstruction, and pre-haul maintenance under this contract shall be obtained from any commercial rock source at the Purchaser's expense. Rock amounts used in accordance with the quantities on the ROCK LIST. Rock sources are subject to written approval by the Contract Administrator before their use. Road construction will not be permitted from November 1 to May 1 unless authorized in writing by the Contract Administrator. The hauling of forest products will not be permitted from November 1 to May 1 unless authorized in writing by the Contract Administrator.

ACREAGE DETERMINATION

CRUISE METHOD: The sale acres were determined by GIS delineation. Cruise was completed using variable plot cruise methods.

FEES: $97,000.00 is due on day of sale. $9.00 per MBF is due upon removal. These are in addition to the bid price.

SPECIAL REMARKS: This sale has approximately 1,191 MBF of high quality DF 2 sawlog , 335 MBF of high quality DF 3 sawlog, and 10 MBF oversize sawlog DF. The gates shall be kept closed and locked except during periods of haul. The gates may remain open during haul must be locked or securely fastened in the open position. The gate must be closed at termination of use. See driving map for gate location. PCP 1-1 gate keys may be obtained from the Pacific Cascade Region Office.

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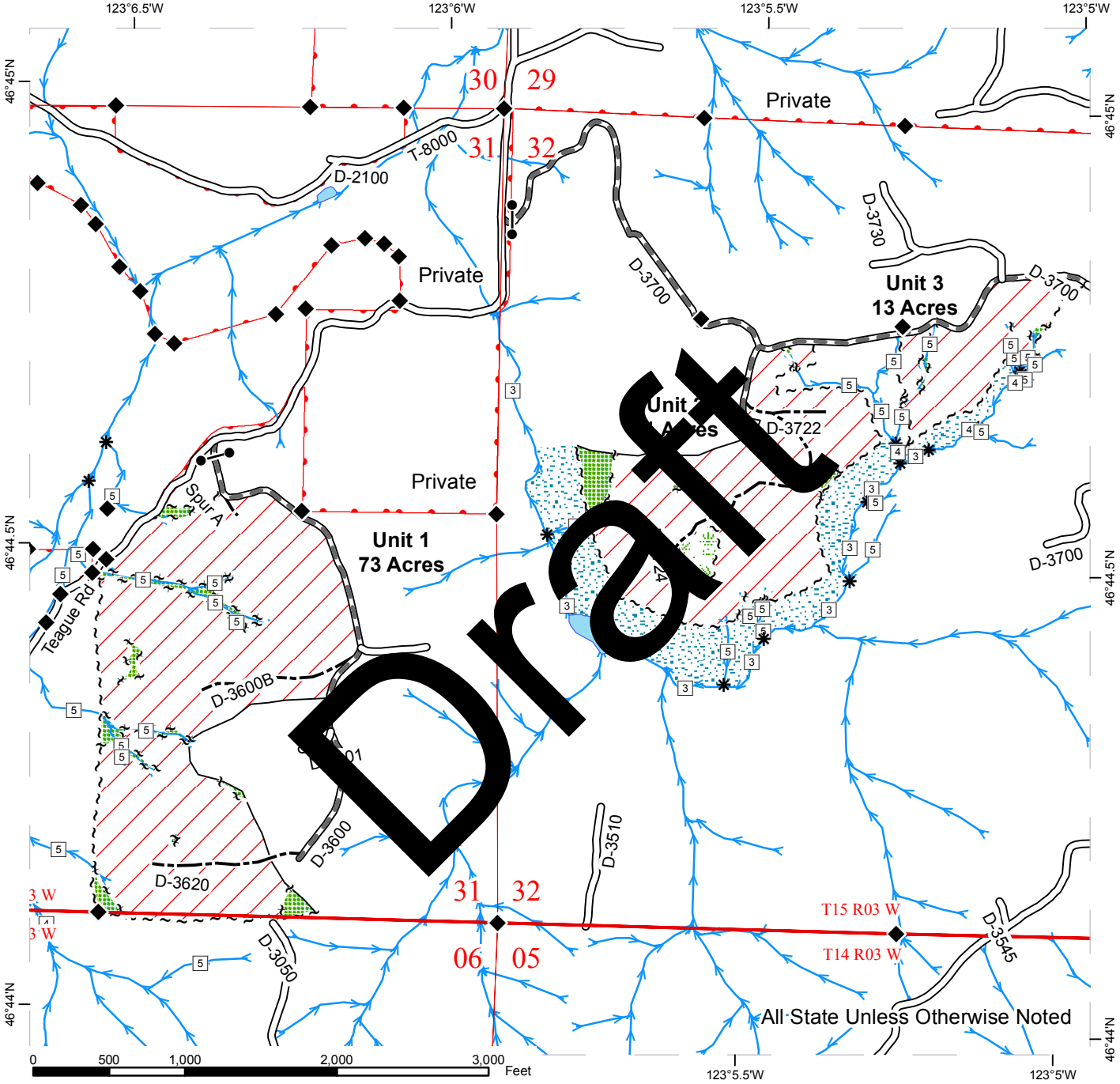
TIMBER SALE MAP

SALE NAME: GEM TWIST
AGREEMENT #: 30-094429
TOWNSHIP(S): T15R03W, T14R03W
TRUST(S): State Forest Transfer(1), Common School and Indemnity(3)

REGION: Pacific Cascade Region
COUNTY(S): LEWIS
ELEVATION RGE: 196-574



Variable Retention Harvest	Sale Boundary Tags	Stream Type
Leave Tree Area	Leave Tree Tags	Stream Type Break
Riparian Mgt Zone	Reprod	Gate (PCP 1-1)
Wetland Mgt Zone	Existing Roads	Monumented Corners
	Required Pre-Haul Maintenance	
	Optional Construction	
	Streams	

N

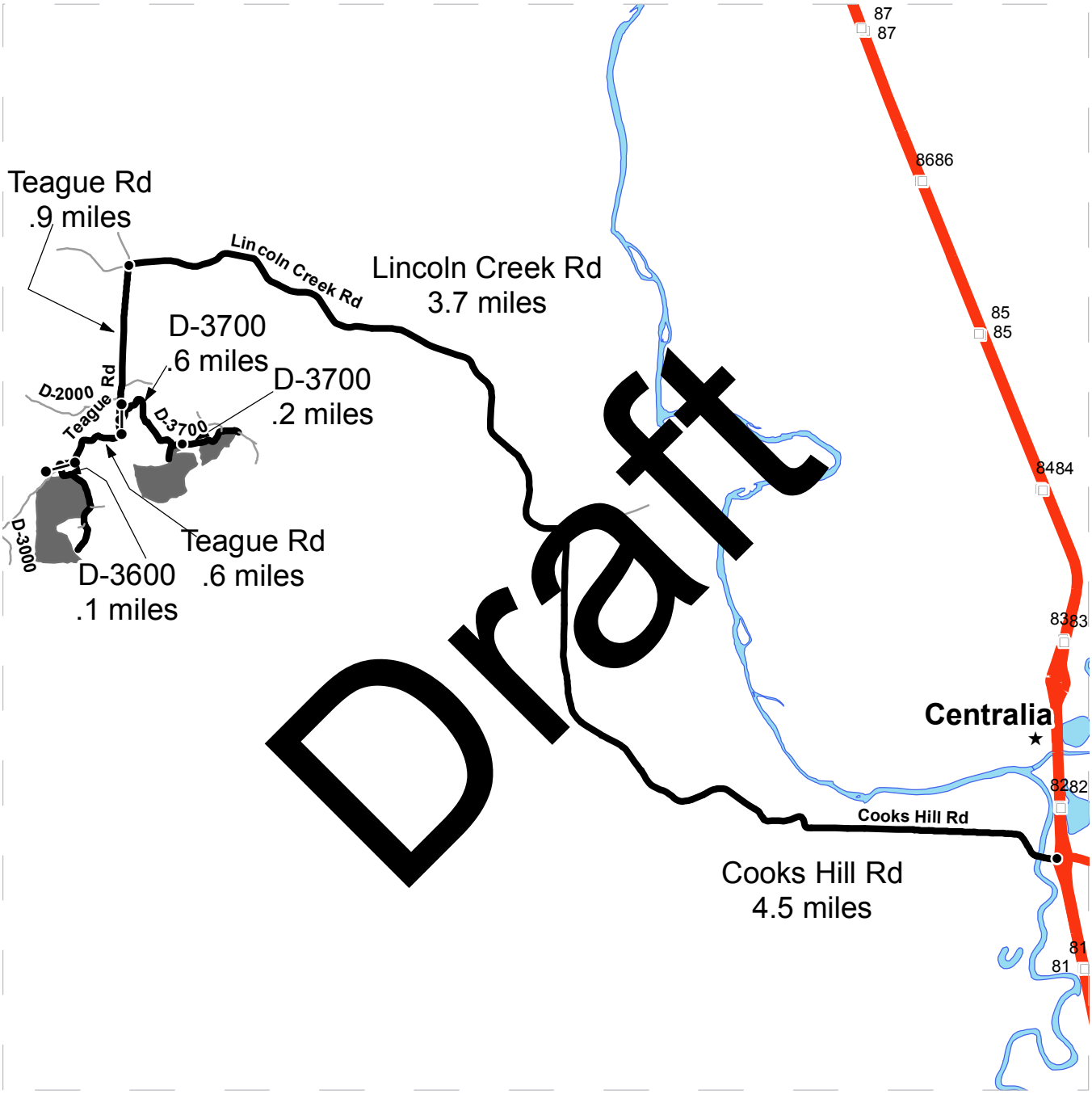
Prepared By: gdey490 12/16/2015

Modification Date: 9/21/2016

DRIVING MAP

SALE NAME: GEM TWIST
AGREEMENT#: None
TOWNSHIP(S): T15R03W, T14R03W
TRUST(S): State Forest Transfer(1), Common School and Indemnity(3)

REGION: Pacific Cascade Region
COUNTY(S): LEWIS
ELEVATION RGE: 196-574



Timber Sale Unit	
Highways	
Haul Route	
Other Route	
Milepost Markers	
Distance Indicator	
Town	
Gate	

DRIVING DIRECTIONS:

From I-5, head west on Cooks Hill Road (exit 82) for approximately 4.5 miles to Lincoln Creek Road. Turn left (west) onto Lincoln Creek Road at the T intersection. Travel Lincoln Creek Road for 3.7 miles to Teague Road. Turn left (south) onto Teague Road. Follow Teague Road for .9 miles to the D-3700. Turn left onto the D-3700 and follow for .6 miles to Unit 2. Continue on the D-3700 for .2 miles to Unit 3. Continue on Teague Road for .6 miles to the D-3600. Turn left onto the D-3600 and travel .1 miles to Unit 1

N

Prepared By: gdey490 12/16/2015

Modification Date: 7/26/2016

Cruise Narrative

Sale Name: Gem Twist	**Region:** Pacific Cascade
App. #: 30-094429	**District:** Lewis
Lead Cruiser: Bryce Frank	**Completion date:** 8-25-2016
Other Cruisers: Eric Carlson , Kalvin Bailey	

Unit acreage specifications:

1 VRH	73	Yes	
2 VRH	41	Yes	
3 VRH	13	Yes	
Total	127	Yes	

Unit cruise specifications:

Unit #	Sample type (VP, FP, ITS,100%)	Expansion factor (BAF, full/ half)	Sighting height (4.5 ft, 16 ft.)	[illegible]d size [illegible]t s[illegible]acin[illegible] o[illegible] area)	Plot ratio (Cru./Tally)	Total number of plots
1 VRH	VP	40	4.5 ft	250' x [illegible]'	1:1	51
2 VRH	VP	54.44, 33.61	4.5 ft	[illegible]6' x 236	1:1	32
3 VRH	VP	40	4.5 f[illegible]	[illegible]21[illegible] [illegible]217'	Cruise All	12

Sale/Cruise Description:

Minor species cruise intensity:	[illegible]on app[illegible]riate plots.					
Minimum cruise spec:	40% 0f F[illegible] Facto[illegible] 16 feet D.O.B or 5 inch Top, and merchantable top.					
Avg. ring count by sp:	**DF** =	7	**WH** =	7	**SS** =	n/a
Leave/take tree description:	Leave tree [illegible]mps are bounded with yellow "Leave Tree Area" tags and pink [illegible]gging, i[illegible]vidual leave trees are marked with a single band of blue paint.					
Sort Description:	**HA**[illegible]gs meeting the following criteria: Surface characteristics for a high quality A sort will have sound tight knots not to exceed 1 ½" in diameter, numbering not more than an average of one per foot of log length. May include logs with not more than two larger knots. Knots and knot indicators ½" in diameter and smaller shall not be a determining factor. Logs will have a growth ring count of 6 or more rings per inch in the outer third top end of the log. (min dia 8".) **HB** – Logs meeting the following criteria: Surface characteristics for a B sort will have sound tight knots not to exceed 1 ½" in diameter. May include logs with not more than two larger knots up to 2 ½" in diameter. Logs will have a growth ring count of 6 or more rings per inch in the outer third to end of the log. (min dia 8".) **R** – Logs meeting the following criteria: Gross diameter of 12 inches or greater, excessive knots greater than 2 ½ inches with recovery less than 65% of the net scale.					
Status Description:	**P** – Logs classified as pole volume. **D** – Logs classified as wind thrown downed wood.					

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Field observations:

Gem Twist - consists of 3 units in total. Unit 1, 2 and 3 are all VRH units. These units all had minimum defect and a substantial amount of A sort, B sort and Special Mill logs.

Unit 1 is located off the D-3600 to the west. This unit consisted mainly of Douglas-fir at 92% and there was also small amounts of Western Hemlock, Red Alder and Big Leaf Maple throughout the unit. Douglas-fir had an average diameter of 21.5 inches and 99 ft. for average bole ht. Defect for this unit is at 2.6%. The defect was composed of spike knots and hooked butts and sweep. This unit consisted of 73 acres of the total sale area for an average per-acre net volume of 45,929 bdft and a total volume of 3,353 mbf.

Units 2 is located off the D-3700 to the southwest and southeast. This unit consisted of 78% Douglas-fir and small amounts of Red Alder, Big Leaf Maple and Red Cedar. The average diameter for Douglas-fir was 24.3 inches and the average bole ht. was 100 ft. Defect for this unit is at 3.1% and is composed of spike-knots and hooked butts and sweep. This unit consisted of 41 acres of the total sale area for an average per-acre net volume of 41,851 bdft and a total volume of 1,716 mbf.

Unit 3 is located to the southwest and southeast of the D-3700.This unit consisted mainly of Douglas-fir at 74% and there was also small amounts of Red Alder and Big Leaf Maple. Defect was minimal with 3.6% and is composed of spike-knots, sweep and hooked butts. This unit consisted of 13 acres of the total sale area for an average per-acre net volume of 30,569 bdft. and a total volume of 397 mbf.

Access to the units is relatively easy as they are all located off the roads.
The harvest system is 10% Uphill cable and 90% Ground based.

Grant: 03,01 **Prepared by: Eric Carlson** **Title: Timber Cruiser**

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TC PSPCSTGR

Species, Sort Grade - Board Foot Volumes (Project)

T15N R03W S31 Ty00U1	73.00
T15N R03W S31 Ty00U2	41.00
T15N R03W S31 Ty00U3	13.00

Project: GEMTWIST

Acres 127.00

Page 1
Date 8/25/2016
Time 2:55:52PM

Spp	S T	So Gr rt ad	% Net BdFt	Bd. Ft. per Acre Def%	Gross	Net	Total Net MBF	Percent of Net Board Foot Volume: Log Scale Dia. 5-7	8-11	12-15	16+	Log Length 12-20	21-30	31-35	36-99	Average Log Ln Ft	Dia In	Bd Ft	CF/ Lf	Logs Per /Acre
DF		CU CU		100.0	82											2	9		0.00	12.2
DF		HA 2S	2		809	809	103			100					100	40	14	286	1.66	2.8
DF		HA 3S	1	1.4	572	564	72		100						100	40	10	145	0.94	3.9
DF		HB 2S	23	.8	8,640	8,568	1,088			36	64				100	40	16	398	2.13	21.5
DF		HB 3S	6	1.0	2,095	2,075	263		100					11	89	38	9	122	0.82	17.0
DF		D SM	8	.3	3,029	3,022	384				100				100	40	19	643	3.02	4.7
DF		D 2S	46	3.8	17,763	17,088	2,170			26	74	0	1	4	95	39	17	465	2.46	36.8
DF		D 3S	9	2.1	3,567	3,493	444	27	73			1	8	30	61	35	8	88	0.68	39.8
DF		D 4S	4	.3	1,301	1,297	165	87	13			30	33	9	29	25	6	30	0.32	43.8
DF		D UT			214	214	27	42	4	1	53	70	22	9		21	6	49	0.42	4.4
DF		RO 3S	1		82	82	10			71	[illegible]		57	20	23	27	14	214	2.03	.4
DF	**Totals**		86	2.5	38,155	37,213	4,726	6	14	[illegible]	57	2	3	6	90	32	11	199	1.35	187.2
RA		CU CU		100.0	23											3	6		0.00	10.2
RA		D UT	6		214	214	27	100				46				18	5	21	0.25	10.0
RA		D 2S	5	6.0	207	195	25			100			62		38	31	12	155	1.33	1.3
RA		D 3S	22	4.3	816	781	99		[illegible]				70		30	33	10	123	0.99	6.4
RA		D 4S	29	7.3	1,124	1,042	132		100				49		48	33	9	75	0.71	13.8
RA		D 4S	38	1.1	1,333	1,318	167	10[illegible]				3	28	16	53	33	6	41	0.39	32.4
RA	**Totals**		8	4.5	3,717	3,550	4[illegible]	43	5[illegible]	5		5	47	6	42	27	7	48	0.53	74.0
BM		CU CU		100.0	22											5	11		0.00	6.6
BM		D UT	18		396	[illegible]	5[illegible]	60	12	13	15	54	33	4	9	20	6	31	0.52	12.9
BM		D 1S	8	6.3	1[illegible]	173	22				100	52		48		23	17	263	2.48	.7
BM		D 2S	29	8.3	[illegible]	610	77			100			43		57	33	13	197	1.70	3.1
BM		D 3S	17	6.4	[illegible]	379	[illegible]		100				54		46	34	11	129	1.10	2.9
BM		D 4S	18	4.5	4[illegible]	383	[illegible]		100			4	52		44	31	9	68	0.76	5.6
BM		D 4S	10	4.7	207	197	[illegible]25	100					39	19	42	34	6	40	0.58	5.0
BM	**Totals**		5	6.2	2,280	2,[illegible]	271	20	38	31	11	15	41	6	38	23	8	58	0.81	36.8
RC		CU CU														5	25		0.00	.1
RC		D 3S	87	1.1	79	78	10		37	63			44	17	38	33	10	130	1.84	.6
RC		D 4S	10	8.3	10	9	1	59	41			82	18			18	6	23	0.48	.4
RC		D UT	3		2	2	0	100				100				12	5	10	0.24	.2
RC	**Totals**		0	1.9	91	89	11	8	37	55		11	41	15	33	23	10	67	1.35	1.3
WH		D 4S	100		51	51	6	100					100			25	5	24	0.26	2.1
WH	**Totals**		0		51	51	6	100					100			25	5	24	0.26	2.1
Totals				2.8	44,293	43,040	5,466	10	19	21	50	3	8	6	83	30	9	143	1.11	301.4

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TC PSTATS

PROJECT STATISTICS

PROJECT GEMTWIST

DATE 8/25/2016

TWP	RGE	SC	TRACT	TYPE	ACRES	PLOTS	TREES	CuFt	BdFt
15N	03	31	GEMTWIST	00U1	127.00	95	553	S	W
15N	03W	31	GEMTWIST	00U2					
15N	03W	31	GEMTWIST	00U3					

	PLOTS	TREES	TREES PER PLOT	ESTIMATED TOTAL TREES	PERCENT SAMPLE TREES
TOTAL	95	553	5.8		
CRUISE	58	318	5.5	15,975	2.0
DBH COUNT					
REFOREST					
COUNT	36	218	6.1		
BLANKS	1				
100 %					

STAND SUMMARY

	SAMPLE TREES	TREES /ACRE	AVG DBH	BOLE LEN	REL DEN	BASAL AREA	GROSS BF/AC	NET BF/AC	GROSS CF/AC	NET CF/AC
DOUG FIR	221	68.9	21.7	96	38.0	176.[illegible]	38,155	37,213	8,137	8,125
R ALDER	55	37.0	13.3	60	9.8	35.[illegible]	3,717	3,550	1,045	1,040
BL MAPLE	36	17.1	16.6	55	6.3	25.9	2,280	2,137	691	686
WR CEDAR	4	.6	21.9	54	0.3	[illegible]	91	89	41	41
WHEMLOCK	2	2.1	8.8	33	0.3	[illegible]	[illegible]	51	14	14
TOTAL	*318*	*125.8*	*18.7*	*78*	*55.6*	*[illegible]*	*44,29[illegible]*	*43,040*	*9,927*	*9,906*

CONFIDENCE LIMITS OF THE SAMPLE

68.1 TIMES OUT OF 100 THE VOLUME WILL BE WITH[illegible] THE SA[illegible]E ERRO[illegible]

CL 68.1 SD: 1.0	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF TREES REQ. 5	10	INF. POP. 15
SAMPL[illegible] TR[illegible]ES - [illegible]								
DOUG FIR	77.2	5.2	9[illegible]	979	1,0[illegible]			
R ALDER	42.8	5.8	105	111	118			
BL MAPLE	77.8	13.[illegible]	[illegible]55	179	203			
WR CEDAR	59.8	[illegible]	[illegible]	[illegible]	225			
WHEMLOCK	28.3	[illegible]6.5	[illegible]	2[illegible]	32			
TOTAL	*102.5*	[illegible]	*683*	*725*	*767*	*419*	*105*	*47*

CL 68.1 SD: 1.0	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF TREES REQ. 5	10	INF. POP. 15
SA[illegible]LE TREES - CF								
DOUG FIR	68.8	4.7	[illegible]94	203	213			
R ALDER	40.8	5.6	31	33	34			
BL MAPLE	54.8	9.4	50	55	60			
WR CEDAR	46.2	26.4	57	77	98			
WHEMLOCK	57.2	53.6	3	7	11			
TOTAL	*89.8*	*5.1*	*147*	*155*	*163*	*322*	*81*	*36*

CL 68.1 SD: 1.0	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF PLOTS REQ. 5	10	INF. POP. 15
TREES/ACRE								
DOUG FIR	91.2	9.3	62	69	75			
R ALDER	150.7	15.4	31	37	43			
BL MAPLE	185.3	19.0	14	17	20			
WR CEDAR	583.0	59.8	0	1	1			
WHEMLOCK	974.7	99.9	0	2	4			
TOTAL	*53.3*	*5.5*	*119*	*126*	*133*	*113*	*28*	*13*

CL 68.1 SD: 1.0	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF PLOTS REQ. 5	10	INF. POP. 15
BASAL AREA/ACRE								
DOUG FIR	74.1	7.6	163	177	190			
R ALDER	145.3	14.9	30	36	41			
BL MAPLE	173.8	17.8	21	26	30			
WR CEDAR	576.9	59.1	1	2	2			
WHEMLOCK	974.7	99.9	0	1	2			
TOTAL	*44.7*	*4.6*	*230*	*241*	*252*	*80*	*20*	*9*

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PROJECT STATISTICS

PROJECT GEMTWIST

TWP	RGE	SC	TRACT	TYPE	ACRES	PLOTS	TREES	CuFt	BdFt
15N	03	31	GEMTWIST	00U1	127.00	95	553	S	W
15N	03W	31	GEMTWIST	00U2					
15N	03W	31	GEMTWIST	00U3					

CL 68.1	COEFF		NET BF/ACRE			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR	74.4	7.6	34,375	37,213	40,051			
R ALDER	146.0	15.0	3,019	3,550	4,081			
BL MAPLE	177.8	18.2	1,748	2,137	2,527			
WR CEDAR	582.8	59.7	36	89	143			
WHEMLOCK	974.7	99.9	0	51	101			
TOTAL	*57.8*	*5.9*	*40,489*	*43,040*	*45,591*	*133*	*33*	*15*

CL 68.1	COEFF		NET CUFT FT/ACRE			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR	74.7	7.7	7,502	8,125	8,747			
R ALDER	146.0	15.0	885	1,040	1,196			
BL MAPLE	172.6	17.7	565	686	808			
WR CEDAR	596.3	61.1	16	41	66			
WHEMLOCK	974.7	99.9	0	14	27			
TOTAL	*53.1*	*5.4*	*9,366*	*9,906*	*10,445*	*113*	*28*	*13*

CL 68.1	COEFF		V_BAR/ACRE			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR			194	210	[illegible]			
R ALDER	65.3	6.7	85	100	[illegible]			
BL MAPLE	109.0	11.2	68	83	98			
WR CEDAR	577.0	59.1	23	57	91			
WHEMLOCK	974.7	99.9	0	[illegible]	[illegible]			
TOTAL	*56.0*	*5.7*	*168*	[illegible]	[illegible]	*125*	*31*	*14*

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T TSPCSTGR

Species, Sort Grade - Board Foot Volumes (Type)

Project: GEMTWIST

Date 8/25/2016

Time 2:55:53PM

T15N R03W S31 T00U1

Twp	Rge	Sec	Tract	Type	Acres	Plots	Sample Trees	CuFt	BdFt
15N	03W	31	GEMTWIST	00U1	73.00	51	161	S	W

T15N R03W S31 T00U1

Spp	ST	Sort	Grade	% Net BdFt	Bd. Ft. per Acre Def%	Gross	Net	Total Net MBF	Percent Net Board Foot Volume: Log Scale Dia. 5-7	8-11	12-15	16+	Log Length 12-20	21-30	31-35	36-99	Average Log Ln Ft	Dia In	Bd Ft	CF/ Lf	Logs Per /Acre
DF		CU	CU		100.0	143											4	10		0.00	12.3
DF		HA	2S	3		1,276	1,276	93			100					100	40	14	290	1.67	4.4
DF		HA	3S	1	1.7	790	776	57		100						100	40	10	137	0.90	5.6
DF		HB	2S	22	.5	9,068	9,019	658			40	60				100	40	15	381	2.03	23.7
DF		HB	3S	7	1.0	3,054	3,025	221		100					10	90	38	9	124	0.82	24.4
DF		DM	SM	9	.4	3,696	3,683	269				100				100	40	20	671	3.10	5.5
DF		DM	2S	43	4.0	19,157	18,384	1,342			28	72	1	1	5	93	38	16	432	2.33	42.5
DF		DM	3S	10	1.2	4,391	4,337	317	33	67			1	6	33	60	35	8	87	0.65	49.8
DF		DM	4S	4	.4	1,564	1,557	114	88	12			34	28	7	31	25	6	29	0.31	54.3
DF		DM	UT			212	212	15		7		93	100				18	18	261	2.04	.8
DF		RO	3S	1		39	39	3						100			23	13	140	1.66	.3
DF	**Totals**			92	2.5	43,390	42,307	3,088	7	16	[illegible]		2	[illegible]	6	89	33	11	189	1.27	223.6
BM		CU	CU														5	18		0.00	1.8
BM		DM	UT	9		153	153	11	[illegible]	29				71			18	6	22	0.33	7.0
BM		DM	1S	6	15.0	136	116	8					100				20	16	170	1.90	.7
BM		DM	2S	25	3.4	434	419	[illegible]			100			40		60	34	13	226	1.55	1.9
BM		DM	3S	18	2.4	311	304	22								100	40	11	164	1.08	1.9
BM		DM	4S	29	4.1	521	[illegible]	[illegible]		100				41		59	33	8	72	0.76	7.0
BM		DM	4S	13	7.5	225	208	[illegible]	100						31	69	37	5	39	0.64	5.3
BM	**Totals**			4	4.5	[illegible]	1,700	124	[illegible]	50	25	7	9	28	4	59	28	8	67	0.76	25.4
RA		CU	CU		100.0	[illegible]											8	6		0.00	4.2
RA		DM	UT	5		93	93	7	100				100				14	5	16	0.21	5.7
RA		DM	3S	16	3.6	309	[illegible]	22		100				47		53	35	10	124	0.93	2.4
RA		DM	4S	32	6.1	635	[illegible]	44		100			9	20		71	34	9	83	0.72	7.1
RA		DM	4S	47		846	846	62	100				3	22	17	58	33	6	45	0.44	18.9
RA	**Totals**			4	4.1	1,913	1,834	134	51	49			9	24	8	58	28	6	48	0.51	38.3
WH		DM	4S	100		88	88	6	100					100			25	5	24	0.26	3.7
WH	**Totals**			0		88	88	6	100					100			25	5	24	0.26	3.7
Type Totals					2.6	47,172	45,929	3,353	9	19	23	49	3	4	6	87	31	10	158	1.13	291.0

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T TSPCSTGR

Species, Sort Grade - Board Foot Volumes (Type)

Project: GEMTWIST

Date 8/25/2016

Time 2:55:53PM

T15N R03W S31 T00U2

Twp	Rge	Sec	Tract	Type	Acres	Plots	Sample Trees	CuFt	BdFt
15N	03W	31	GEMTWIST	00U2	41.00	32	93	S	W

T15N R03W S31 T00U2

Spp	ST	Sort	Grade	% Net BdFt	Bd. Ft. per Acre Def%	Gross	Net	Total Net MBF	Percent Net Board Foot Volume: Log Scale Dia. 5-7	8-11	12-15	16+	Log Length 12-20	21-30	31-35	36-99	Average Log Ln Ft	Dia In	Bd Ft	CF/ Lf	Logs Per /Acre
DF		CU	CU															7		0.00	11.7
DF		HA	3S	1		365	365	15		100						100	40	11	180	1.12	2.0
DF		HB	2S	29	1.4	9,717	9,584	393			30	70				100	40	16	433	2.34	22.1
DF		HB	3S	3		928	928	38		100					14	86	38	9	120	0.81	7.8
DF		DM	SM	7		2,335	2,335	96				100				100	40	19	580	2.85	4.0
DF		DM	2S	49	3.1	16,648	16,124	661			26	74			2	98	40	17	496	2.56	32.5
DF		DM	3S	8	3.5	2,602	2,509	103	13	87				12	25	63	35	9	93	0.77	26.9
DF		DM	4S	2		885	885	36	83	17			20	48	5	26	26	6	32	0.36	27.5
DF		DM	UT			30	30	1	100				100				11	5	10	0.20	3.0
DF		RO	3S	1		52	52	2			100				100		31	14	220	2.11	.2
DF		**Totals**		78	2.2	33,561	32,811	1,345	3	11	[illegible]	64		2	3	94	32	12	238	1.63	137.8
RA		CU	CU														1	7		0.00	17.8
RA		DM	UT	5		330	330	14	100				18	82			23	5	27	0.29	12.0
RA		DM	2S	10	6.0	641	602	25						62		38	31	12	155	1.33	3.9
RA		DM	3S	25	4.4	1,507	1,441	59		100				82		18	31	11	121	1.00	11.9
RA		DM	4S	29	9.3	1,885	1,710	[illegible]		[illegible]				60		40	32	9	71	0.70	24.2
RA		DM	4S	31	1.2	1,819	1,797	74	100					36	16	48	33	5	39	0.36	46.3
RA		**Totals**		14	4.9	6,183	[illegible]	[illegible]	36	54	10		1	60	5	35	27	7	51	0.55	116.1
BM		CU	CU		100.0	[illegible]	[illegible]	[illegible]									5	9		0.00	14.4
BM		DM	UT	27		[illegible]	799	33	49	9	20	23	68	25		7	20	7	38	0.65	21.2
BM		DM	1S	9		[illegible]	256	11				100			100		32	20	560	3.55	.5
BM		DM	2S	35	11.8	1,134	[illegible]	41			100			36		64	34	13	187	1.82	5.4
BM		DM	3S	15	8.0	467	[illegible]	18		100				100			30	10	107	1.04	4.0
BM		DM	4S	8	4.5	236	[illegible]	9		100			19	81			28	8	58	0.75	3.9
BM		DM	4S	6		172	172	7	100					100			30	6	37	0.44	4.7
BM		**Totals**		7	8.0	3,133	2,883	118	19	25	40	15	20	47	9	24	20	9	53	0.87	54.1
RC		CU	CU														5	25		0.00	.4
RC		DM	3S	87	1.1	244	241	10		37	63			44	17	38	33	10	130	1.84	1.9
RC		DM	4S	10	8.3	32	29	1	59	41			82	18			18	6	23	0.48	1.3
RC		DM	UT	3		6	6	0	100				100				12	5	10	0.24	.6
RC		**Totals**		1	1.9	282	277	11	8	37	55		11	41	15	33	23	10	67	1.35	4.1
Type Totals					3.0	43,159	41,851	1,716	9	18	21	51	2	14	4	80	28	9	134	1.15	312.0

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T TSPCSTGR

Species, Sort Grade - Board Foot Volumes (Type)

Project: GEMTWIST

Page 1
Date 8/25/2016
Time 2:55:53PM

T15N R03W S31 T00U3

Twp	Rge	Sec	Tract	Type	Acres	Plots	Sample Trees	CuFt	BdFt
15N	03W	31	GEMTWIST	00U3	13.00	12	64	S	W

T15N R03W S31 T00U3

Spp	ST	Sort	Grade	% Net BdFt	Bd. Ft. per Acre Def%	Gross	Net	Total Net MBF	Percent Net Board Foot Volume: Log Scale Dia. 5-7	8-11	12-15	16+	Log Length 12-20	21-30	31-35	36-99	Average Log Ln Ft	Dia In	Bd Ft	CF/ Lf	Logs Per /Acre
DF		CU	CU														1	11		0.00	13.3
DF		HA	2S	3		739	739	10			100					100	38	13	250	1.52	3.0
DF		HB	2S	12		2,837	2,837	37			26	74				100	39	15	380	2.05	7.5
DF		HB	3S	2	8.0	388	356	5		100					52	48	33	8	74	0.70	4.8
DF		DM	SM	7		1,475	1,475	19				100				100	40	19	619	2.99	2.4
DF		DM	2S	57	4.5	13,456	12,854	167			11	89	1		5	94	37	20	726	3.70	17.7
DF		DM	3S	8	6.2	1,978	1,855	24	20	80				10	26	64	35	8	77	0.67	24.0
DF		DM	4S	5		1,138	1,138	15	97	3			17	29	33	21	28	5	32	0.30	35.7
DF		DM	UT	4		809	809	11	97				21	56	23		25	5	28	0.26	29.1
DF		RO	3S	2		425	425	6			6	54		57		43	29	16	290	2.30	1.5
DF		**Totals**		74	3.3	23,244	22,487	292	10	8		68		5	8	84	28	9	162	1.21	138.8
RA		CU	CU		100.0	61											4	6		0.00	19.3
RA		DM	UT	9		531	531	7	100				46	54			17	5	19	0.23	28.5
RA		DM	3S	24	4.7	1,483	1,414	18		100				57		43	34	10	126	1.04	11.2
RA		DM	4S	24	1.9	1,467	1,440	19		100				79		21	31	9	77	0.73	18.7
RA		DM	4S	43	3.1	2,530	2,453		100				9	23	14	54	31	6	38	0.39	64.2
RA		**Totals**		19	3.9	6,073	5,837	76	51				8	48	6	38	25	6	41	0.49	141.9
BM		CU	CU														2	9		0.00	8.9
BM		DM	UT	21			484	6					26	8	31	35	24	5	25	0.43	19.5
BM		DM	1S	10			231	3				100	100				20	16	200	2.27	1.2
BM		DM	2S	20	6.1		452	6			100			100			30	12	153	1.55	3.0
BM		DM	3S	29	12.8	736	641	8		100				100			30	11	113	1.28	5.7
BM		DM	4S	10	9.3	247		3		100				100			28	9	63	0.78	3.5
BM		DM	4S	10		212		3	100					100			30	7	50	0.53	4.2
BM		**Totals**		7	6.1	2,391	2,244	29	31	39	20	10	16	70	7	8	21	8	49	0.77	46.0
Type Totals					3.6	31,708	30,569	397	19	18	12	51	4	18	8	70	26	8	94	0.86	326.7

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TC TSTATS

STATISTICS

PROJECT GEMTWIST

DATE 8/25/2016

TWP	RGE	SECT	TRACT	TYPE	ACRES	PLOTS	TREES	CuFt	BdFt
15N	03W	31	GEMTWIST	00U1	73.00	51	306	S	W

	PLOTS	TREES	TREES PER PLOT	ESTIMATED TOTAL TREES	PERCENT SAMPLE TREES
TOTAL	51	306	6.0		
CRUISE	28	161	5.8	8,581	1.9
DBH COUNT					
REFOREST					
COUNT	23	134	5.8		
BLANKS					
100 %					

STAND SUMMARY

	SAMPLE TREES	TREES /ACRE	AVG DBH	BOLE LEN	REL DEN	BASAL AREA	GROSS BF/AC	NET BF/AC	GROSS CF/AC	NET CF/AC
DOUG FIR	137	79.6	21.5	99	43.2	200.0	43,390	42,307	9,290	9,268
BL MAPLE	10	14.1	16.0	54	4.9	19.[illegible]	1,780	1,700	541	541
R ALDER	12	20.2	13.1	59	5.2	18.8	1,913	1,834	553	547
WHEMLOCK	2	3.7	8.8	33	0.5	1.[illegible]	88	88	24	24
TOTAL	*161*	*117.5*	*19.3*	*85*	*54.6*	[illegible]	*47,[illegible]*	*45,929*	*10,408*	*10,381*

CONFIDENCE LIMITS OF THE SAMPLE

68.1 TIMES OUT OF 100 THE VOLUME WILL BE WITHIN TH[illegible]E ERRO[illegible]

CL: 68.1 %	COEFF		**SAMPLE TR[illegible]ES - BF**			# OF TREES REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AV[illegible]	[illegible]GH	5	10	15
DOUG FIR	67.4	5.8	831	882	933			
BL MAPLE	91.6	30.5	1[illegible]	154	20[illegible]			
R ALDER	32.4	10.2	100	111	[illegible]2			
WHEMLOCK	28.3	26.5	18	25	32			
TOTAL	*79.4*		[illegible]	[illegible]	*820*	*252*	*63*	*28*

CL: 68.1 %	COEFF		**SA[illegible]LE TREES - CF**			# OF TREES REQ.		INF. POP.
SD: 1.0	VAR.%	S[illegible]	LOW	AVG	HIGH	5	10	15
DOUG FIR	59.7	5.[illegible]	176	185	195			
BL MAPLE	66.3	22.1	[illegible]	47	58			
R ALDER	23.1	7.3	[illegible]1	33	35			
WHEMLOCK	57.2	53.6	3	7	11			
TOTAL	*70.4*	*5.6*	*155*	*164*	*173*	*198*	*49*	*22*

CL: 68.1 %	COEFF		**TREES/ACRE**			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR	78.9	11.0	71	80	88			
BL MAPLE	172.5	24.1	11	14	18			
R ALDER	214.4	30.0	14	20	26			
WHEMLOCK	714.1	99.9	0	4	7			
TOTAL	*48.6*	*6.8*	*110*	*118*	*126*	*94*	*24*	*10*

CL: 68.1 %	COEFF		**BASAL AREA/ACRE**			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR	58.1	8.1	184	200	216			
BL MAPLE	170.1	23.8	15	20	24			
R ALDER	218.2	30.5	13	19	25			
WHEMLOCK	714.1	99.9	0	2	3			
TOTAL	*39.6*	*5.5*	*227*	*240*	*253*	*63*	*16*	*7*

CL: 68.1 %	COEFF		**NET BF/ACRE**			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR	57.2	8.0	38,923	42,307	45,692			
BL MAPLE	180.4	25.2	1,271	1,700	2,128			
R ALDER	221.3	31.0	1,266	1,834	2,402			
WHEMLOCK	714.1	99.9	0	88	176			
TOTAL	*47.7*	*6.7*	*42,861*	*45,929*	*48,997*	*91*	*23*	*10*

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TC TSTATS

STATISTICS

PROJECT GEMTWIST

DATE 8/25/2016

TWP	RGE	SECT	TRACT	TYPE	ACRES	PLOTS	TREES	CuFt	BdFt
15N	03W	31	GEMTWIST	00U1	73.00	51	306	S	W

CL: 68.1 %	COEFF		NET CUFT FT/ACRE			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.	S.E.%	LOW	AVG	HIGH	5	10	15

CL: 68.1 %	COEFF		NET CUFT FT/ACRE			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR	57.3	8.0	8,526	9,268	10,011			
BL MAPLE	173.5	24.3	410	541	673			
R ALDER	220.3	30.8	379	547	716			
WHEMLOCK	714.1	99.9	0	24	48			
TOTAL	*44.8*	*6.3*	*9,729*	*10,381*	*11,032*	*80*	*20*	*9*

CL: 68.1 %	COEFF		V-BAR/ACRE			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR			195	212	228			
BL MAPLE	82.0	11.5	65	87	109			
R ALDER	128.3	17.9	67	97	128			
WHEMLOCK	714.1	99.9	0	56	112			
TOTAL	*184.3*	*25.8*	*179*	*191*	*204*	*1,356*	*339*	*151*

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TC TSTATS

STATISTICS

PROJECT GEMTWIST

DATE 8/25/2016

TWP	RGE	SECT	TRACT	TYPE	ACRES	PLOTS	TREES	CuFt	BdFt
15N	03W	31	GEMTWIST	00U2	41.00	32	183	S	W

	PLOTS	TREES	TREES PER PLOT	ESTIMATED TOTAL TREES	PERCENT SAMPLE TREES
TOTAL	32	183	5.7		
CRUISE	18	93	5.2	5,180	1.8
DBH COUNT					
REFOREST COUNT	13	84	6.5		
BLANKS	1				
100 %					

STAND SUMMARY

	SAMPLE TREES	TREES /ACRE	AVG DBH	BOLE LEN	REL DEN	BASAL AREA	GROSS BF/AC	NET BF/AC	GROSS CF/AC	NET CF/AC
DOUG FIR	48	47.8	24.3	100	31.2	153.5	33,561	32,811	7,154	7,154
R ALDER	24	55.3	13.7	62	15.3	56.7	6,183	5,880	1,706	1,707
BL MAPLE	17	21.4	17.5	57	8.5	35.7	3,133	2,883	939	924
WR CEDAR	4	1.9	21.9	54	1.0	4[illegible]	282	277	126	126
TOTAL	*93*	*126.3*	*19.1*	*75*	*57.4*	*250.8*	*43,159*	*41,851*	*9,925*	*9,911*

CONFIDENCE LIMITS OF THE SAMPLE

68.1 TIMES OUT OF 100 THE VOLUME WILL BE WITHIN THE SAMP[illegible] ROR

CL: 68.1 % SD: 1.0	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF TREES REQ. 5	10	INF. POP. 15
SAMPLE TREES								
DOUG FIR	55.0	8.0	981	1,[illegible]	[illegible]			
R ALDER	41.9	8.7	112	[illegible]	134			
BL MAPLE	80.4	20.7	164	207	250			
WR CEDAR	59.8	34.2	11[illegible]	168	225			
TOTAL	*99.7*	*10.4*	*561*	*627*	[illegible]	*397*	*99*	*44*

CL: 68.1 % SD: 1.0	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF TREES REQ. 5	10	INF. POP. 15
SAMPLE TREES - CF								
DOUG FIR	51.5	[illegible]7.5	20[illegible]	22[illegible]	243			
R ALDER	40.7	[illegible]	33[illegible]	36	39			
BL MAPLE	56.2	1[illegible]	54	63	72			
WR CEDAR	46.2	26.4	[illegible]	77	98			
TOTAL	*87.8*	*9.2*	[illegible]	*141*	*154*	*308*	*77*	*34*

CL: 68.1 % SD: 1.0	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF PLOTS REQ. 5	10	INF. POP. 15
TREES/ACRE								
DOUG FIR	108.2	19.1	39	48	57			
R ALDER	114.5	20.2	44	55	66			
BL MAPLE	201.0	35.5	14	21	29			
WR CEDAR	331.8	58.6	1	2	3			
TOTAL	*54.7*	*9.7*	*114*	*126*	*139*	*119*	*30*	*13*

CL: 68.1 % SD: 1.0	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF PLOTS REQ. 5	10	INF. POP. 15
BASAL AREA/ACRE								
DOUG FIR	95.8	16.9	128	154	179			
R ALDER	109.0	19.3	46	57	68			
BL MAPLE	173.9	30.7	25	36	47			
WR CEDAR	328.1	58.0	2	5	8			
TOTAL	*50.9*	*9.0*	*228*	*251*	*273*	*103*	*26*	*11*

CL: 68.1 % SD: 1.0	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF PLOTS REQ. 5	10	INF. POP. 15
NET BF/ACRE								
DOUG FIR	95.6	16.9	27,270	32,811	38,352			
R ALDER	107.4	19.0	4,764	5,880	6,996			
BL MAPLE	175.2	30.9	1,991	2,883	3,775			
WR CEDAR	331.7	58.6	115	277	439			
TOTAL	*68.2*	*12.0*	*36,809*	*41,851*	*46,894*	*186*	*46*	*21*

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STATISTICS

PROJECT **GEMTWIST**

TWP	RGE	SECT	TRACT	TYPE	ACRES	PLOTS	TREES	CuFt	BdFt
15N	**03W**	**31**	**GEMTWIST**	**00U2**	41.00	32	183	S	W

CL: 68.1 %	COEFF		**NET CUFT FT/ACRE**			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.	S.E.%	LOW	AVG	HIGH	5	10	15

CL: 68.1 %	COEFF		**NET CUFT FT/ACRE**			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR	95.7	16.9	5,945	7,154	8,364			
R ALDER	107.9	19.1	1,381	1,707	2,032			
BL MAPLE	169.7	30.0	647	924	1,201			
WR CEDAR	339.8	60.0	50	126	202			
TOTAL	*60.8*	*10.7*	*8,847*	*9,911*	*10,976*	*148*	*37*	*16*

CL: 68.1 %	COEFF		**V-BAR/ACRE**			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR	14.0	2.5	178	214	250			
R ALDER			84	104	123			
BL MAPLE	104.7	18.5	56	81	106			
WR CEDAR	328.2	58.0	24	57	90			
TOTAL	*203.6*	*36.0*	*147*	*167*	*187*	*1,654*	*414*	*184*

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TC TSTATS

STATISTICS

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PROJECT GEMTWIST

DATE 8/25/2016

TWP	RGE	SECT	TRACT	TYPE	ACRES	PLOTS	TREES	CuFt	BdFt
15N	03W	31	GEMTWIST	00U3	13.00	12	64	S	W

	PLOTS	TREES	TREES PER PLOT	ESTIMATED TOTAL TREES	PERCENT SAMPLE TREES
TOTAL	12	64	5.3		
CRUISE	12	64	5.3	2,214	2.9
DBH COUNT					
REFOREST					
COUNT					
BLANKS					
100 %					

STAND SUMMARY

	SAMPLE TREES	TREES /ACRE	AVG DBH	BOLE LEN	REL DEN	BASAL AREA	GROSS BF/AC	NET BF/AC	GROSS CF/AC	NET CF/AC
DOUG FIR	36	75.5	17.1	63	29.0	120.0	23,244	22,487	4,763	4,764
R ALDER	19	74.2	12.5	59	17.9	63.3	6,073	5,837	1,719	1,709
BL MAPLE	9	20.6	16.3	53	7.4	30.0	2,391	2,244	751	751
TOTAL	*64*	*170.3*	*15.2*	*60*	*54.8*	*213.3*	*31,708*	*30,569*	*7,234*	*7,224*

CONFIDENCE LIMITS OF THE SAMPLE

68.1 TIMES OUT OF 100 THE VOLUME WILL BE WITHIN THE SAMPLE ERROR

CL: 68.1 % SD: 1.0

	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF TREES REQ. 5	10	INF. POP. 15
SAMPLE TREES - BF								
DOUG FIR	103.9	17.3	1,017	1,229	[illegible]			
R ALDER	48.3	11.4	86	[illegible]	[illegible]			
BL MAPLE	34.9	13.2	134	[illegible]	174			
TOTAL	*147.8*	*18.6*	*612*	*731*	*891*	*872*	*218*	*97*

CL: 68.1 % SD: 1.0

	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF TREES REQ. 5	10	INF. POP. 15
SAMPLE TREES - [illegible]								
DOUG FIR	95.7	15.6	202	241	279			
R ALDER	48.6	[illegible]	[illegible]	[illegible]	32			
BL MAPLE	18.5	7.0	[illegible]	[illegible]	53			
TOTAL	*132.2*	[illegible]	*127*	*152*	*178*	*698*	*174*	*78*

CL: 68.1 % SD: 1.0

	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF PLOTS REQ. 5	10	INF. POP. 15
TR[illegible]S/ACRE								
DOUG FIR	95.0	28.6	54	75	97			
R ALDER	106.2	32.0	50	74	98			
BL MAPLE	155.7	46.9	11	21	30			
TOTAL	*67.9*	*20.5*	*135*	*170*	*205*	*201*	*50*	*22*

CL: 68.1 % SD: 1.0

	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF PLOTS REQ. 5	10	INF. POP. 15
BASAL AREA/ACRE								
DOUG FIR	68.2	20.5	95	120	145			
R ALDER	82.8	24.9	48	63	79			
BL MAPLE	140.7	42.4	17	30	43			
TOTAL	*34.2*	*10.3*	*191*	*213*	*235*	*51*	*13*	*6*

CL: 68.1 % SD: 1.0

	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF PLOTS REQ. 5	10	INF. POP. 15
NET BF/ACRE								
DOUG FIR	69.6	21.0	17,775	22,487	27,200			
R ALDER	81.1	24.4	4,412	5,837	7,262			
BL MAPLE	142.2	42.8	1,284	2,244	3,205			
TOTAL	*42.7*	*12.9*	*26,634*	*30,569*	*34,504*	*80*	*20*	*9*

CL: 68.1 % SD: 1.0

	COEFF VAR.%	S.E.%	LOW	AVG	HIGH	# OF PLOTS REQ. 5	10	INF. POP. 15
NET CUFT FT/ACRE								
DOUG FIR	70.1	21.1	3,758	4,764	5,769			
R ALDER	80.7	24.3	1,294	1,709	2,124			
BL MAPLE	151.8	45.7	408	751	1,094			
TOTAL	*36.9*	*11.1*	*6,421*	*7,224*	*8,026*	*59*	*15*	*7*

Draft

TC TSTATS

STATISTICS

PROJECT **GEMTWIST**

PAGE 2
DATE 8/25/2016

TWP	RGE	SECT	TRACT	TYPE	ACRES	PLOTS	TREES	CuFt	BdFt
15N	**03W**	**31**	**GEMTWIST**	**00U3**	13.00	12	64	S	W

CL: 68.1 %	COEFF		**V-BAR/ACRE**			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.	S.E.%	LOW	AVG	HIGH	5	10	15

CL: 68.1 %	COEFF		**V-BAR/ACRE**			# OF PLOTS REQ.		INF. POP.
SD: 1.0	VAR.%	S.E.%	LOW	AVG	HIGH	5	10	15
DOUG FIR	69.6	21.0	148	187	227			
R ALDER	81.1	24.4	70	92	115			
BL MAPLE	142.2	42.8	43	75	107			
TOTAL	*42.7*	*12.9*	*125*	*143*	*162*	*80*	*20*	*9*

Draft

TC PSPCTLTCM

Species Summary - Trees, Logs, Tons, CCF, MBF

T15N R03W S31 Ty00U	73.0
T15N R03W S31 Ty00U	41.0
T15N R03W S31 Ty00U	13.0

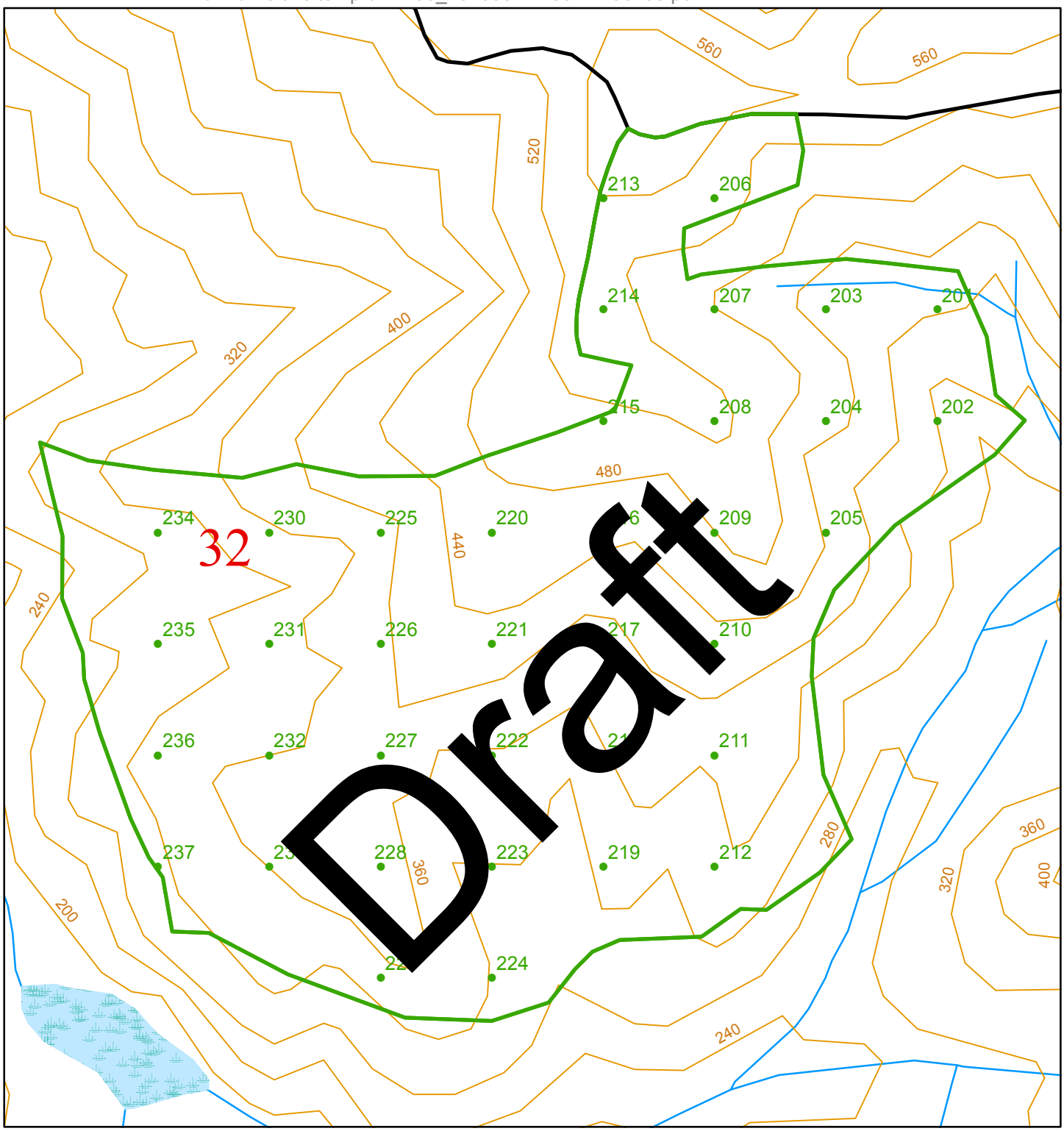
Project GEMTWIST
Acres 127.00

Page No 1
Date: 8/25/2016
Time 2:55:53PM

Species	S T	Total Trees	Total Logs	Total Tons	Net Cubic Ft/ Tree	Net Cubic Ft/ Log	CF/ LF	Total CCF Gross	Total CCF Net	Total MBF Gross	Total MBF Net
DOUG FIR		8,752	22,230	29,452	117.89	46.42	1.37	10,334	10,318	4,846	4,726
R ALDER		4,701	8,109	3,649	28.11	16.29	0.54	1,327	1,321	472	451
BL MAPLE		2,177	3,831	2,326	40.04	22.75	0.84	878	872	290	271
WR CEDAR		76	152	122	68.16	34.08	1.36	52	52	12	11
WHEMLOCK		269	269	57	6.49	6.49	0.26	18	17	6	6
Totals		15,975	34,592	35,604	78.75	36.37	1.13	12,608	12,581	5,625	5,466

Wood Type Species	Total Trees	Total Logs	Total Tons	Net Cubic Ft/ Tree	Net Cubic Ft/ Log	CF/ LF	Total CCF Gross	Total CCF Net	Total MBF Gross	Total MBF Net
C	9,097	22,651	29,630	114.18	45.86	1.36	10,403	10,387	4,864	4,744
H	6,877	11,941	5,974	31.89	[illegible]	.53	2,204	2,193	762	722
Totals	15,975	34,592	35,604	78.75	[illegible]	1.[illegible]	12,608	12,581	5,625	5,466

Draft



FMU POLYGON AND SAMPLE POINT INFORMATION

FMU_NM:	GEM TWIST U2	Township:	T15R03W
FMU_ID:	36468	DNR Region:	PACIFIC CASC
Acres:	46	Total Sample Points:	37
County:	LEWIS	Spacing Between Points:	Width: 230 Height: 230
		Point Rotation Degrees:	0

N

0 100 200 400 600 800 Feet

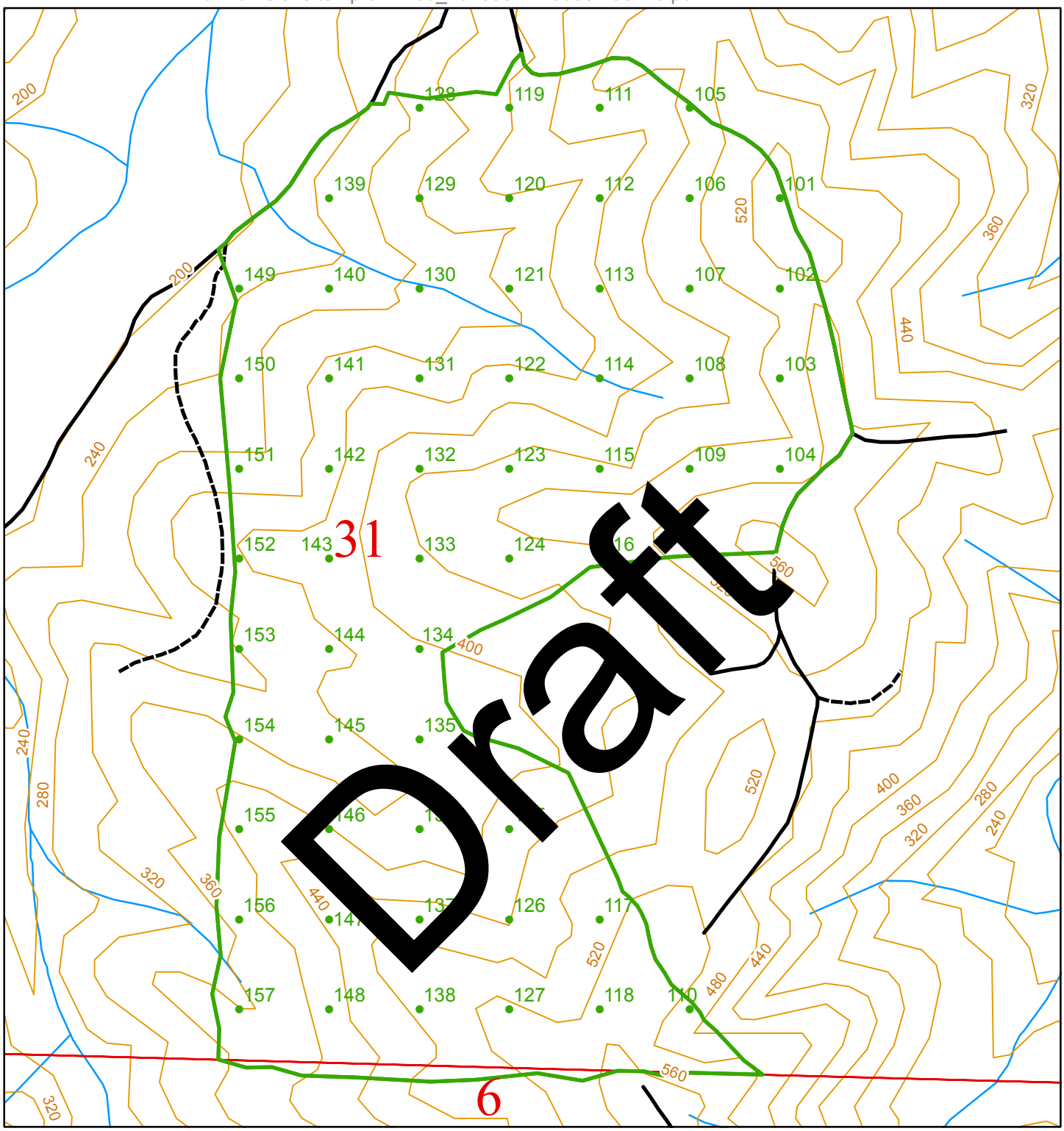
Scale 1:3,500

Legend

- Sample Points
- FMU polys
- Public Land Survey Sections
- Contours 40-foot

Washington State Department of Natural Resources
Peter Goldmark, Commissioner of Public Lands

Aug 17, 2016 01:04 PM



FMU POLYGON AND SAMPLE POINT INFORMATION

FMU_NM:	GEM TWIST U1	Township:	T15R03W, T14R03W
FMU_ID:	36470	DNR Region:	PACIFIC CASC
Acres:	79	Total Sample Points:	57
County:	LEWIS	Spacing Between Points:	Width: 250 Height: 250
		Point Rotation Degrees:	0

N

0 135 270 540 810 1,080 Feet

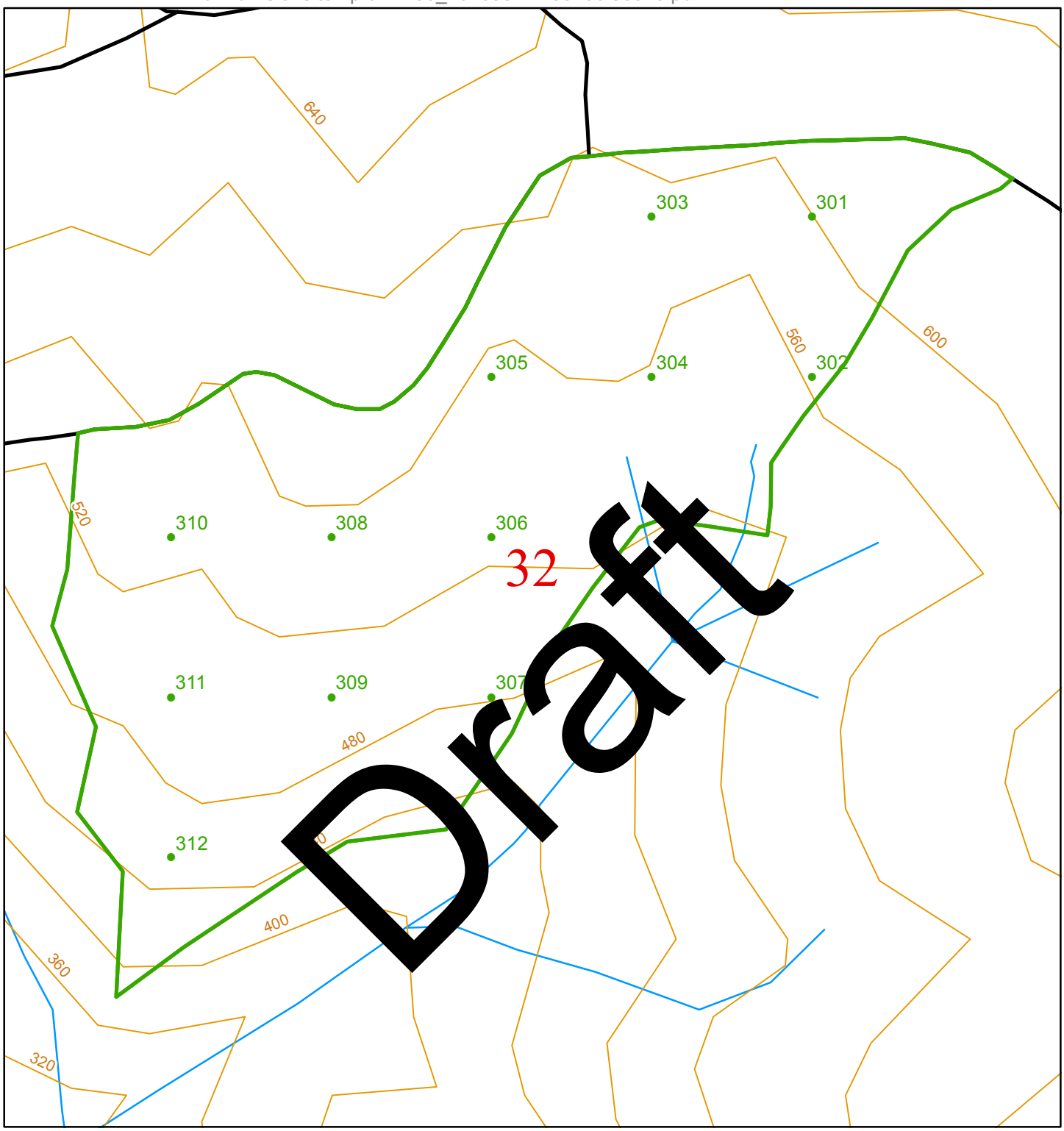
Scale 1:4,700

Legend

- Sample Points
- FMU polys
- Public Land Survey Sections
- Contours 40-foot

Washington State Department of Natural Resources
Peter Goldmark, Commissioner of Public Lands

Aug 17, 2016 01:04 PM



FMU POLYGON AND SAMPLE POINT INFORMATION

FMU_NM:	GEM TWIST U3	Township:	T15R03W
FMU_ID:	95325	DNR Region:	PACIFIC CASC
Acres:	14	Total Sample Points:	12
County:	LEWIS	Spacing Between Points:	Width: 208 Height: 208
		Point Rotation Degrees:	0

N

0 62.5 125 250 375 500 Feet

Scale 1:2,200

Legend

- Sample Points
- FMU polys
- Public Land Survey Sections
- Contours 40-foot

Washington State Department of Natural Resources
Peter Goldmark, Commissioner of Public Lands

Aug 17, 2016 01:05 PM

GEM TWIST

ROAD PLAN MAP

Map page 1 of 2

GEM TWIST

ROAD PLAN MAP

Map page 2 of 2

STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES

GEM TWIST TIMBER SALE ROAD PLAN
LEWIS COUNTY
LEWIS DISTRICT

AGREEMENT NO.: 30-094429 STAFF ENGINEER: CHRIS WERNER

DATE: 09/07/2016 DRAWN & COMPILED BY: ALICIA COMPTON

SECTION 0 – SCOPE OF PROJECT

0-1 ROAD PLAN SCOPE

Clauses in this road plan apply to all road related work, including landings and rock source development, unless otherwise noted.

0-2 REQUIRED ROADS

The specified work on the following roads is required.

Road	Stations	Type
D-3600	0+00 to 35+00	Pre-haul Maintenance
D-3700	0+00 to 52+00	Pre-haul Maintenance
D-3720	0+00 to 4+00	Pre-haul Maintenance

0-3 OPTIONAL ROADS

The specified work on the following roads is not required. Any optional roads built by the Purchaser must meet all the specifications in the road plan.

Road	Stations	Type
D-3600B	0+00 to 14+71	Construction
D-3620	0+00 to 9+92	Construction
Spur A	0+00 to 1+69	Construction
D-3722	0+00 to 5+88	Construction
D-3724	0+00 to 18+50	Construction

0-4 CONSTRUCTION

Construction includes, but is not limited to clearing, grubbing, right-of-way debris disposal, excavation and/or embankment to subgrade, ditch construction, ditch-out construction, landing construction, acquisition and installation of drainage structures; acquisition, processing and application of rock and grass seeding.

Draft

0-6 PRE-HAUL MAINTENANCE

This project includes, but is not limited to the following pre-haul maintenance requirements:

Road	Stations	Requirements
D-3600	0+00 to 35+00	Grade, shape and compact. Brush Road in accordance with Clause 3-1. Apply spot rock per the ROCK LIST.
D-3700	0+00 to 52+00	Grade, shape and compact. Brush Road in accordance with Clause 3-1. Apply spot rock per the ROCK LIST.
D-3720	0+00 to 4+00	Grade, shape and compact. Brush Road in accordance with Clause 3-1. Apply spot rock per the ROCK LIST.

0-7 POST-HAUL MAINTENANCE

This project includes post-haul road maintenance listed in Clause 9-5 POST-HAUL MAINTENANCE.

SECTION 1 – GENERAL

1-1 ROAD PLAN CHANGES

If the Purchaser desires a change from this road plan, including, but not limited to, relocation, extension, change in design, or adding roads; a revised road plan must be submitted in writing to the Contract Administrator for consideration. Before work begins, Purchaser shall obtain approval from the State for any submitted plan that changes the scope of work or environmental condition from the original road plan.

1-2 UNFORESEEN CONDITIONS

Quantities established in this road plan are minimum acceptable values. Additional quantities required by the state due to unforeseen conditions or Purchaser's choice of construction season or techniques will be at the Purchaser's expense. Unforeseen conditions include, but are not limited to, solid subsurface rock, subsurface springs, saturated ground, and unstable soils.

1-3 ROAD DIMENSIONS

Purchaser shall perform road work in accordance with the dimensions shown on the TYPICAL SECTION SHEET and the specifications within this road plan.

1-4 ROAD TOLERANCES

Purchaser shall perform road work within the tolerances listed below. The tolerance class for each road is listed on the TYPICAL SECTION SHEET.

Tolerance Class	A	B	C
Road and Subgrade Width (feet)	+1.5	+1.5	+2.0
Subgrade Elevation (feet +/-)	0.5	1.0	2.0
Centerline alignment (feet lt./rt.)	1.0	1.5	3.0

Draft

1-6 ORDER OF PRECEDENCE

Any conflict or inconsistency in the road plan will be resolved by giving the documents precedence in the following order:

1. Addenda.
2. Designs or Plans. On designs and plans, figured dimensions shall take precedence over scaled dimensions.
3. Road Plan Clauses.
4. Typical Section Sheet.
5. Standard Lists.
6. Standard Details.

In case of any ambiguity or dispute over interpreting the road plan, the Contract Administrator's or designee's decision will be final.

1-7 TEMPORARY ROAD CLOSURE

Purchaser shall notify the Contract Administrator a minimum of 5 days before the closure of any road. Construction may not close any road for more than 21 consecutive calendar days.

1-8 REPAIR OR REPLACEMENT OF DAMAGED MATERIALS

Purchaser shall repair or replace all materials, roadway infrastructure and road components damaged during road work or operation activities. The Contract Administrator will direct repairs and replacements. Repairs to structural materials must be made in accordance with the manufacturer's recommendation, and may not begin without written approval from the Contract Administrator.

1-9 DAMAGED METALLIC COATING

Any damaged galvanized or aluminized coating on existing or new bridge components, culverts, downspouts, and flumes must be cleaned and treated with a minimum of two coats of zinc rich paint.

1-15 ROAD MARKING

Purchaser shall perform road work in accordance with the state's marked location. All road work is marked as follows:

- Road centerline marked with wooden stakes, orange flagging and RP's.

1-18 REFERENCE POINT DAMAGE

Purchaser shall reset reference points (RPs) that were moved or damaged at any time during construction to their original locations. Excavation and embankment may not proceed on road segments controlled by said RPs until Purchaser resets all moved or damaged RPs.

1-20 COMPLETE BY DATE

Purchaser shall complete pre-haul road work before the start of timber haul.

1-21 HAUL APPROVAL

Purchaser shall not use roads under this road plan for any hauling, without written approval from the Contract Administrator.

1-22 WORK NOTIFICATIONS

Purchaser shall notify the Contract Administrator a minimum of 14 calendar days before work begins.

Draft

1-23 ROAD WORK PHASE APPROVAL

Purchaser shall obtain written approval from the Contract Administrator upon completion of each of the following phases of road work:

- Subgrade construction
- Drainage installation
- Rock application

1-25 ACTIVITY TIMING RESTRICTION

The specified activities are not allowed during the listed closure period(s) unless authorized in writing by the Contract Administrator. Restrictions for hauling forest products are specified in Contract Clause H-130 HAULING SCHEDULE.

Road	Stations	Activity	Closure Period
All Roads	All Stations	All Road Work	November 1 to May 1

1-26 OPERATING DURING CLOSURE PERIOD

If permission is granted to operate during a closure period listed in Clause 1-25 ACTIVITY TIMING RESTRICTION or Contract Clause H-130 HAULING SCHEDULE, Purchaser shall provide a maintenance plan to include further protection of state resources. Purchaser shall obtain written approval from the Contract Administrator for the maintenance plan, and shall put preventative measures in place before operating during the closure period. Purchaser is required to maintain all haul roads at their own expense including those listed in Contract Clause G-[illegible] DESIGNATED ROAD MAINTAINER. If other operators are using, or desire to use these designated maintainer roads, a joint operating plan must be developed. All parties shall follow this plan.

1-29 SEDIMENT RESTRICTION

Purchaser shall not allow silt-laden runoff to enter any streams.

1-30 CLOSURE TO PREVENT DAMAGE

In accordance with Contract Clause G-22 STATE SUSPENDS OPERATION, the Contract Administrator will suspend road work or hauling right-of-way timber, forest products, or rock under the following conditions:

- Wheel track rutting exceeds 6 inches on jaw run roads.
- Wheel track rutting exceeds 4 inches on crushed rock roads.
- Surface or base stability problems persist.
- Weather is such that satisfactory results cannot be obtained in an area of operations.
- When, in the opinion of the Contract Administrator excessive road damage or rutting may occur.

Operations must stop unless authority to continue working or hauling is granted in writing by the Contract Administrator. In the event that surface or base stability problems persist, Purchaser shall cease operations, or perform corrective maintenance or repairs, subject to specifications within this road plan. Before and during any suspension, Purchaser shall protect the work from damage or deterioration.

Draft

1-32 BRIDGE SURFACE RESTRICTION

The use of metal tracked equipment is not allowed on bridge surfaces at any time. If Purchaser must run equipment on bridge surfaces, then rubber tired equipment or other methods, approved in writing by Contract Administrator, must be used.

If tracked equipment is used on bridge surfaces, Purchaser shall immediately cease all road construction and hauling operations. Purchaser shall remove any dirt, rock, or other material tracked or spilled on the bridge surface(s) and have surface(s) evaluated for any damage caused by transporting equipment. Any damage to the surface(s) will be repaired, at the Purchaser's expense, as directed by the Contract Administrator.

1-33 SNOW PLOWING RESTRICTION

Snowplowing will be allowed after the execution of a SNOW PLOWING AGREEMENT, which is available from the Contact Administrator upon request. If damage occurs while plowing, further permission to plow may be revoked by the Contract Administrator.

1-40 ROAD APPROACHES TO COUNTY ROADS AND STATE HIGHWAYS

Purchaser shall immediately remove any mud, dirt, rock, or other material tracked or spilled on to county roads and state highways.

If additional damage to the surface, signs, guardrails, etc. occurs then the damage will be repaired, at the Purchaser's expense, as directed by the Contract Administrator when authorized by the county or WSDOT.

1-41 REQUIREMENTS FOR PAVED ROAD APPROACHES

Purchaser shall immediately remove any mud, dirt, rock, or other material tracked or spilled on to county roads and state highways.

If additional damage to the surface, signs, guardrails, etc. occurs then the damage will be repaired, at the Purchaser's expense, as directed by the Contract Administrator when authorized by the county or WSDOT.

Draft

SECTION 2 – MAINTENANCE

2-1 GENERAL ROAD MAINTENANCE

Purchaser shall maintain all roads used under this contract in accordance with the FOREST ACCESS ROAD MAINTENANCE SPECIFICATIONS for the entire term of this contract. Maintenance is required even during periods of inactivity.

2-2 ROAD MAINTENANCE – PURCHASER MAINTENANCE

Purchaser shall perform maintenance on roads listed in Contract Clause C-050 PURCHASER ROAD MAINTENANCE AND REPAIR in accordance with FOREST ACCESS ROAD MAINTENANCE SPECIFICATIONS.

2-3 ROAD MAINTENANCE – DESIGNATED MAINTAINER

Purchaser may be required to perform maintenance on roads listed in Contract Clause C-060 DESIGNATED ROAD MAINTAINER as directed by the Contract Administrator. Purchaser shall maintain roads in accordance with FOREST ACCESS ROAD MAINTENANCE SPECIFICATIONS.

2-4 PASSAGE OF LIGHT VEHICLES

Purchaser shall maintain road(s) in a condition that will allow the passage of light administrative vehicles.

2-5 MAINTENANCE GRADING – EXISTING ROAD

Purchaser shall use a grader to shape the existing surface before rock application. Purchaser shall accomplish all grading using a motor grader with a minimum of 175 horsepower.

3-1 BRUSHING

On the following road(s), Purchaser shall cut vegetative material up to 3 inches in diameter, including limbs, as shown on the BRUSHING DETAIL. Brushing must be achieved mechanical cutting of brush, trees, and branches. Root systems and stumps of cut vegetation may not be disturbed unless directed by the Contract Administrator. Purchaser shall remove brushing debris from the road surface, ditchlines, and culvert inlets and outlets.

Road	Stations
D-3600	[illegible]00 to 35+[illegible]0
D-3700	0+[illegible] to 52+00
D-3720	[illegible]+00 [illegible]+00

3-2 BRUSHING RESTRICTION

Pulling, digging, pushing over and other non-cutting methods used for vegetation removal may not be used for brushing.

3-5 CLEARING

Purchaser shall fall all vegetative material larger than 2 inches DBH or over 5 feet high between the marked right-of-way boundaries or if not marked in the field, between the clearing limits specified on the TYPICAL SECTION SHEET. Clearing must be completed before starting excavation and embankment.

3-7 RIGHT-OF-WAY DECKING

Purchaser shall deck all right-of-way timber. Decks must be parallel to the road centerline and placed within the cleared right-of-way. Decks must be free of dirt, limbs, and other right-of-way debris, and removable by standard log loading equipment from the roadbed.

3-8 PROHIBITED DECKING AREAS

Purchaser shall not deck right-of-way timber in the following areas:

- Within the grubbing limits.
- Within 50 feet of any stream.
- In locations that interfere with the construction of the road prism.
- In locations that impede drainage.
- On slopes greater than 45%.
- Against standing trees unless approved by the Contract Administrator.

Draft

3-10 GRUBBING

Purchaser shall remove all stumps between the grubbing limits specified on the TYPICAL SECTION SHEET**.** Purchaser shall also remove stumps with undercut roots outside the grubbing limits. Purchaser shall remove stumps using a hydraulic mounted excavator unless authorized in writing by the Contract Administrator. Stumps over 24 inches diameter must be split. Stumps over 40 inches must be quartered. Grubbing must be completed before starting excavation and embankment.

3-12 STUMP PLACEMENT

Purchaser shall place grubbed stumps outside of the clearing limits or as directed by the Contract Administrator and in compliance with all other clauses in this road plan. Stumps must be positioned upright, with root wads in contact with the forest floor on stable locations

3-20 ORGANIC DEBRIS DEFINITION

Organic debris is defined as all vegetative material not eligible for removal by Contract Clause G-010 PRODUCTS SOLD AND SALE AREA or G-011 RIGHT TO REMOVE FOREST PRODUCTS AND CONTRACT AREA that is larger than one cubic foot in volume within the clearing limits.

3-23 PROHIBITED DISPOSAL AREAS

Purchaser shall not place organic debris in the following areas:

- Within 50 feet of a cross drain culvert.
- Within 100 feet of a live stream, or wetland.
- On road subgrades, or excavation and embankment slopes.
- On slopes greater than 45%.
- Within the operational area for cable landings where debris may shift or roll.
- On locations where brush can fall into the ditch or onto the road surface.
- Against standing timber.

3-24 BURYING ORGANIC DEBRIS RESTRICTION

Purchaser shall not bury organic debris unless otherwise stated in this plan.

3-25 SCATTERING ORGANIC DEBRIS

Purchaser shall scatter organic debris outside of the clearing limits, in natural openings as directed by the Contract Administrator. When natural openings are unavailable or restrictive, alternate debris disposal methods are subject to the written approval of the Contract Administrator.

SECTION 4 – EXCAVATION

4-2 PIONEERING

Pioneering may not extend past construction that will be completed during the current construction season. In addition, the following actions must be taken as pioneering progresses:

- Drainage must be provided on all uncompleted construction.
- Road pioneering operations may not undercut the final cut slope or restrict drainage.
- Culverts at live stream crossings must be installed during pioneering operations prior to embankment.

Draft

4-3 ROAD GRADE AND ALIGNMENT STANDARDS

Purchaser shall follow these standards for road grade and alignment:

- Grade and alignment must have smooth continuity, without abrupt changes in direction.
- Maximum grades may not exceed 18 percent favorable and 16 percent adverse.
- Minimum curve radius is 60 feet at centerline.
- Maximum grade change for sag vertical curves is 6% in 100 feet.
- Maximum grade change for crest vertical curves is 6% in 100 feet.

4-5 CUT SLOPE RATIO

Purchaser shall construct excavation slopes no steeper than shown on the following table:

Material Type	Excavation Slope Ratio	Excavation Slope Percent
Common Earth (on side slopes up to 55%)	1:1	100
Common Earth (56% to 70% side slopes)	¾:1	133
Common Earth (on slopes over 70%)	½:1	200
Fractured or loose rock	½:1	200
Hardpan or solid rock	¼:1	400

4-6 EMBANKMENT SLOPE RATIO

Purchaser shall construct embankment slopes no steeper than shown on the following table:

Material Type	Embankment Slope Ratio	Embankment Slope Percent
Sandy Soils	2:1	50
Common Earth and Rounded Gravel	1½:1	67
Angular Rock	1¼:1	80

4-7 SHAPING CUT AND FILL SLOPE

Purchaser shall construct excavation and embankment slopes to a uniform line and left rough for easier revegetation.

4-8 CURVE WIDENING

The minimum widening placed on the inside of curves is:

- 6 feet for curves of 50 to 79 feet radius.
- 4 feet for curves of 80 to 100 feet radius.

4-9 EMBANKMENT WIDENING

The minimum embankment widening is:

- 2 feet for embankment heights at centerline of 2 to 6 feet.
- 4 feet for embankment heights at centerline of greater than 6 feet.

4-21 TURNOUTS

Purchaser shall construct turnouts intervisible with a maximum distance of 1,000 feet between turnouts. Locations may be adjusted to fit the final subgrade alignment and sight distances. Locations are subject to written approval by the Contract Administrator. Minimum dimensions are shown on the TYPICAL SECTION SHEET.

Draft

4-22 TURNAROUNDS

Turnarounds must be no larger than 40 feet long and 40 feet wide. Locations are subject to written approval by the Contract Administrator.

4-25 DITCH CONSTRUCTION AND RECONSTRUCTION

Purchaser shall construct ditches into the subgrade as specified on the TYPICAL SECTION SHEET. Ditches must be constructed concurrently with construction of the subgrade.

4-27 DITCH WORK – MATERIAL USE PROHIBITED

Purchaser shall not pull ditch material across the road or mix in with the road surface. Excavated material must be scattered outside the grubbing limits.

4-28 DITCH DRAINAGE

Ditches must drain to cross-drain culverts or ditchouts.

4-35 WASTE MATERIAL DEFINITION

Waste material is defined as all dirt, rock, mud, or related material that is extraneous or unsuitable for construction material. Waste material, as used in Section 4 EXCAVATION, is not organic debris.

4-36 DISPOSAL OF WASTE MATERIAL

Purchaser may sidecast waste material on side slopes up to 45% if the waste material is compacted and free of organic debris. On side slopes greater than 45%, all waste material must be end hauled to an area designated by the Contract Administrator.

4-37 WASTE AREA LOCATION

Purchaser shall deposit waste material in areas identified or approved by the Contract Administrator. The amount of material allowed in waste area is at the discretion of the Contract Administrator.

4-38 PROHIBITED WASTE DISPOSAL AREAS

Purchaser shall not deposit waste material in the following:

- Within 50 feet of a cross drain culvert.
- Within 100 feet of a live stream or wetland.
- Within a riparian management zone.
- On side slopes steeper than 45%.
- In locations that interfere with the construction of the road prism.
- In locations that impede drainage.
- Within the operational area for cable landings.
- Against standing timber.

4-47 NATIVE MATERIAL

Native material consists of naturally occurring material that is free of organic debris, trash, and rocks greater than 6 inches in any dimension.

4-55 ROAD SHAPING

Purchaser shall shape the subgrade and surface as shown on the TYPICAL SECTION SHEET. The subgrade and surface shape must ensure runoff in an even, un-concentrated manner, and must be uniform, firm, and rut-free.

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4-56 DRY WEATHER SHAPING

At any time of year, the Contract Administrator may require the application of water to facilitate shaping activities. The method of water application is subject to written approval by the Contract Administrator.

4-60 FILL COMPACTION

Purchaser shall compact all embankment and waste material in accordance with the COMPACTION LIST by routing equipment over the entire width of each lift.

4-61 SUBGRADE COMPACTION

Purchaser shall compact constructed subgrades deeper than 5 feet at the road shoulder in accordance with the COMPACTION LIST by routing equipment over the entire width except ditch. Purchaser shall obtain written approval from the Contract Administrator for subgrade compaction before Rock application.

4-62 DRY WEATHER COMPACTION

At any time of year, the Contract Administrator may require the application of water to facilitate compaction activities. The method of water application is subject to written approval by the Contract Administrator.

4-63 EXISTING SURFACE COMPACTION

Purchaser shall compact maintained road surfaces in accordance with the COMPACTION LIST by routing equipment over the entire width.

5-5 CULVERTS

Purchaser shall install culverts as part of this contract. Culverts must be installed concurrently with subgrade work and must be installed before subgrade compaction and rock application. Culvert locations and the minimum requirements for culvert length and diameter are designated on the CULVERT LIST. Culvert downspout, and flume lengths may be adjusted to fit as-built conditions and may not terminate directly on unprotected soil. Culverts must be new material and meet the specifications in Clauses 10-[illegible] through 1[illegible]-23.

5-11 UNUSED MATERIALS STATE PROPERTY

On required roads, any materials listed on the CULVERT LIST that are not installed will become the property of the state. Purchaser shall stockpile materials as directed by the Contract Administrator.

5-15 CULVERT INSTALLATION

Culvert installation must be in accordance with the CULVERT AND DRAINAGE SPECIFICATION DETAIL and the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings".

5-17 CROSS DRAIN SKEW AND SLOPE

Cross drains, on road grades in excess of 3%, must be skewed at least 30 degrees from perpendicular to the road centerline, except where the cross drain is at the low point in the road culverts will not be skewed. Cross drain culverts must be installed at a slope steeper than the incoming ditch grade, but not less than 3% or more than 10%.

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5-18 CULVERT DEPTH OF COVER

Cross drain culverts must be installed with a depth of cover of not less than 1 foot of compacted subgrade over the top of the culvert at the shallowest point. Stream crossing culverts must be installed with a depth of cover recommended by the culvert manufacturer for the type and size of the pipe.

5-20 ENERGY DISSIPATERS

Purchaser shall install energy dissipaters in accordance with the CULVERT AND DRAINAGE SPECIFICATION DETAIL at all culverts on the CULVERT LIST that specify the placement of rock. Energy dissipater installation is subject to approval by the Contract Administrator.

The type of energy dissipater and the amount of material must be consistent with the specifications listed on the CULVERT LIST AND ROCK LIST. Energy dissipaters must extend a minimum of 1 foot to each side of the culvert at the outlet and a minimum of 2 feet beyond the outlet. Placement must be by zero-drop-height method only. No placement by end dumping or dropping of rock is allowed.

5-25 CATCH BASINS

Purchaser shall construct catch basins in accordance with CULVERT AND DRAINAGE SPECIFICATION DETAIL. Minimum dimensions of catch basins are 2 feet wide by 4 feet long.

5-26 HEADWALLS FOR CROSS DRAIN CULVERTS

Purchaser shall construct headwalls in accordance with the CULVERT AND DRAINAGE SPECIFICATION DETAIL at all culverts on the CULVERT LIST that specify the placement of rock. Rock must be placed on shoulders, slopes, and around culvert inlets and outlets. Minimum specifications require that rock be placed at a width of one culvert diameter on each side of the culvert opening, and to a height of one culvert diameter above the top of the culvert. Rock may not restrict the flow of water into culvert inlets or catch basins. No placement by end dumping or dropping of rock is allowed.

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SECTION 6 ROCK AND SURFACING

6-5 ROCK FROM COMMERCIAL SOURCE

Rock used in accordance with the quantities on the ROCK LIST shall be obtained from any commercial source at the Purchaser's expense. Rock sources are subject to written approval by the Contract Administrator before their use.

Possible Source	Location
Northwest Rock	6801 State Route 12, Oakville, WA 98568

6-20 ROCK GRADATION TYPES

Purchaser shall provide rock in accordance with the types and amounts listed in the ROCK LIST. Rock must meet the following specifications for gradation and uniform quality when placed in hauling vehicles. Purchaser shall provide a sieve analysis upon request from the Contract Administrator.

6-22 FRACTURE REQUIREMENT FOR ROCK

A minimum of 50% by visual inspection of coarse aggregate must have at least one fractured face. Coarse aggregate is the material greater than 1/4-inch in size.

6-30 2-INCH MINUS CRUSHED ROCK

% Passing 2” square sieve	100%
% Passing 1” square sieve	50 - 85%
% Passing U.S. #4 sieve	30 - 50%
% Passing U.S. #40 sieve	16% maximum
% Passing U.S. #200 sieve	5% maximum

The portion of aggregate retained on the No. 4 sieve may not contain more than 0.2 percent organic debris and trash. All percentages are by weight.

6-37 4-INCH JAW RUN ROCK

% Passing 4” square sieve	95%
% Passing U.S. #40 sieve	16% maximum
% Passing U.S. #200 sieve	5% maximum

The portion of aggregate retained on the No. 4 sieve may not contain more than 0.2 percent organic debris and trash. All percentages are by weight.

6-43 QUARRY SPALLS

% Passing 8" square sieve	100%
% Passing 3" square sieve	40% maximum
% Passing 3/4" square sieve	10% maximum

Rock may not contain more than 5 percent vegetative debris or trash. All percentages are by weight.

6-55 ROCK APPLICATION MEASURED BY COMPACTED DEPTH

Measurement of specified rock depths, are defined as the compacted depth(s) using the compaction methods required in this road plan. Estimated quantities specified in the ROCK LIST are compacted yards. Purchaser shall supply adequate amounts of rock to meet the specified rock depths. Specified rock depths are minimum requirements and are not subject to reduction.

6-56 ROCK MEASURMENT BY TRUCK VOLUME

Measurement of ALL ROCK is on a cubic yard truck measure basis. The Contract Administrator will measure each truck box before rock hauling. An average of such volumes for each truck will be used to tally the volume hauled. The Contract Administrator may periodically require that a load be flattened off and its volume calculated.

6-70 APPROVAL BEFORE ROCK APPLICATION

Purchaser shall obtain written approval from the Contract Administrator for Compaction before rock application.

6-71 ROCK APPLICATION

Purchaser shall apply rock in accordance with the specifications and quantities shown on the ROCK LIST. Rock must be spread, shaped, and compacted full width concurrent with rock hauling operations. The Contract Administrator will direct locations for rock that is to be applied as spot patching. Road surfaces must be compacted in accordance with the COMPACTION LIST by routing equipment over the entire width.

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6-73 ROCK FOR WIDENED PORTIONS

Purchaser shall apply rock to turnarounds, turnouts, and areas with curve widening to the same depth and specifications as the traveled way unless otherwise specified in the ROCK LIST.

SECTION 7 – STRUCTURES

7-70 GATE CLOSURE

Purchaser shall keep gates closed and locked except during periods of haul. All gates that remain open during haul must be locked or securely fastened in the open position. All gates must be closed at termination of use.

SECTION 8 – EROSION CONTROL

8-2 PROTECTION FOR EXPOSED SOIL

Purchaser shall provide and evenly spread a 6-inch layer of straw to all exposed soils within 50 feet of a stream or wetland. Soils must be covered before the first anticipated storm event. Soils may not sit exposed during any rain event.

8-15 REVEGETATION

Purchaser shall spread grass seed on all exposed soils resulting from road work activities. Cover all exposed soils using manual dispersal. Other methods of covering must be approved in writing by the Contract Administrator. Required seed not spread by the termination of this contract will become the property of the state.

Road	Location	Qty (lbs)*	Type
All Roads	All Stations	100	Grass Seed

*Quantities are estimates only. Actual quantities may vary and are the responsibility of the Purchaser.

8-17 REVEGETATION TIMING

Purchaser shall revegetate during the first available opportunity after road work is completed**.** Soils may not be allowed to sit exposed for longer than one month without receiving revegetation treatment unless otherwise approved in writing by the Contract Administrator.

8-18 PROTECTION FOR SEED

Purchaser shall provide a protective cover for seed on all exposed soils within 50 feet of streams or wetlands if revegetation occurs between July 1 and March 31. The protective cover may consist of straw. Seed must be covered before the first anticipated storm event. Seed may not be allowed to sit exposed during any rain event. The protective cover requirement may be waived in writing by the Contract Administrator if Purchaser is able to demonstrate a revegetation plan that will result in the establishment of a uniform dense crop (at least 50% coverage) of 3-inch tall grass by October 31.

8-19 ASSURANCE FOR SEEDED AREA

Purchaser shall ensure the growth of a uniform and dense crop (at least 50% coverage) of 3-inch tall grass. Purchaser shall reapply the grass seed in areas that have failed to germinate or have been damaged through any cause. Restore eroded or disturbed areas, clean up and properly dispose of eroded materials, and reapply the grass seed at no addition cost to the state.

Draft

8-25 GRASS SEED

Purchaser shall evenly spread the seed mixture listed below on all exposed soil inside the grubbing limits at a rate of 40 pounds per acre of exposed soil. Grass seed must meet the following specifications:

1. Weed seed may not exceed 0.5% by weight.
2. All seed species must have a minimum 90% germination rate, unless otherwise specified.
3. Seed must be certified.
4. Seed must be furnished in standard containers showing the following information:
    a. Common name of seed
    b. Net weight
    c. Percent of purity
    d. Percentage of germination
    e. Percentage of weed seed and inert material
5. Seed must conform to the following mixture.

Kind and Variety of Seed in Mixture	% by Weight
Perennial Rye	35-45
Red Fescue	30-40
Highland Bent	5-15
White Clover	10-20
Inert and Other Crop	0.5

SECTION 9 POST-HAUL ROAD WORK

9-5 POST-HAUL MAINTENANCE

Purchaser shall perform post-haul maintenance in accordance with the FOREST ACCESS ROAD MAINTENANCE SPECIFICATIONS.

9-10 LANDING DRAINAGE

Purchaser shall provide for drainage of the landing surface.

9-11 LANDING EMBANKMENT

Purchaser shall slope landing embankments to the original construction specifications.

SECTION 10 MATERIALS

10-17 CORRUGATED PLASTIC CULVERT

Polyethylene culverts must meet AASHTO M-294 specifications, or ASTM F-2648 specifications for recycled polyethylene. Culverts must be Type S – double walled with a corrugated exterior and smooth interior.

10-22 PLASTIC BAND

Plastic coupling and end bands must meet the AASHTO specification designated for the culvert. Only fittings supplied or recommended by the culvert manufacturer may be used.

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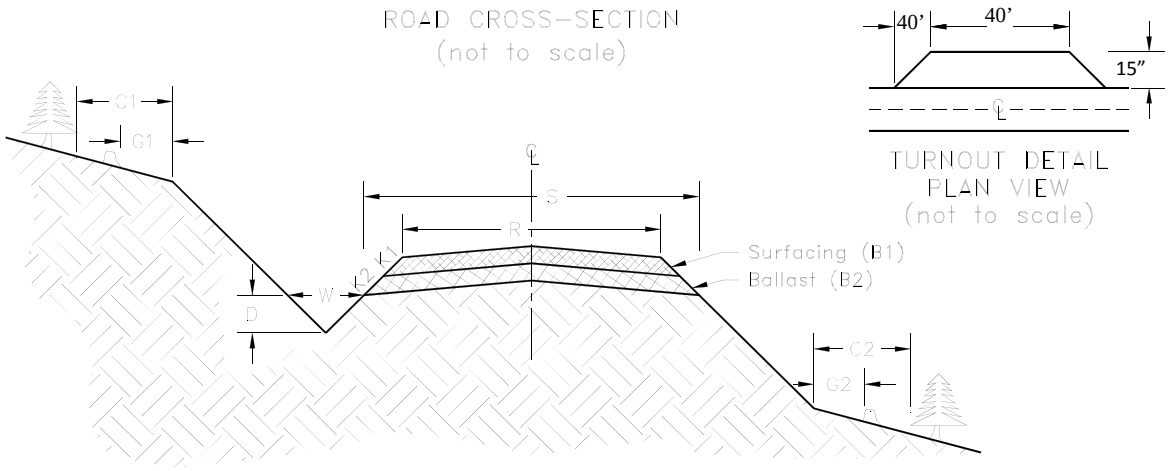
TYPICAL SECTION SHEET



Road Number	From Station	To Station	Tolerance Class	Subgrade Width	Road Width	Ditch Width	Ditch Depth	Crown in. @ CL	Grubbing Limits		Clearing Limits	
				S	R	W	D		G1	G2	C1	C2
D-3600	0+00	35+00	A	16’	12’							
D-3700	0+00	52+00	A	16’	12’							
D-3720	0+00	4+00	A	16’	12’							
D-3600B	0+00	11+71	C	16’	12’	3’	1’	4”	5’	5’	10’	10’
D-3620	0+00	9+92	C	16’	12’	3’	1’	4”	5’	5’	10’	10’
Spur A	0+00	1+69	C	16’	12’	3’	1’	4”	5’	5’	10’	10’
D-3722	0+00	5+88	C	16’	12’	3’	1’	4”	5’	5’	10’	10’
D-3724	0+00	18+50	C	16’	12’	3’	1’	4”	5’	5’	10’	10’

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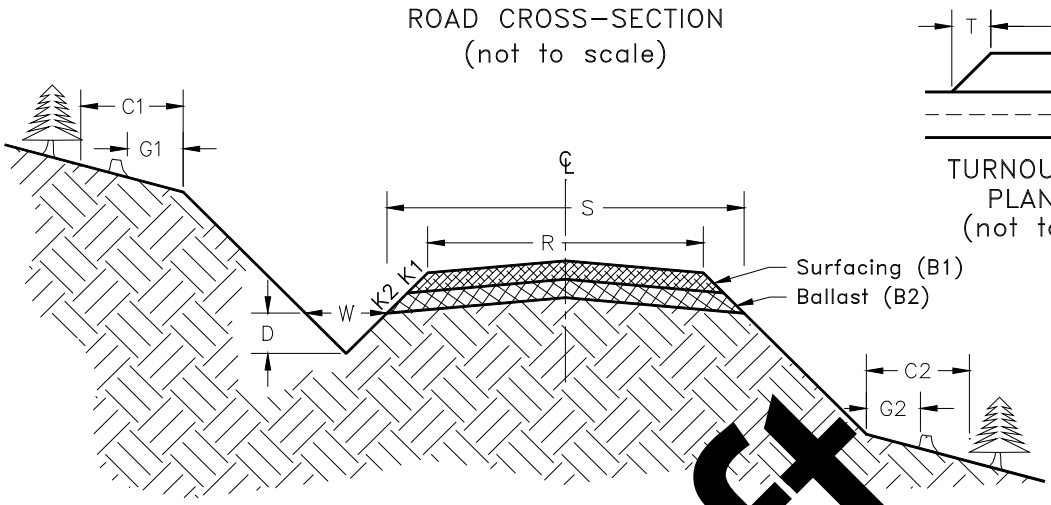
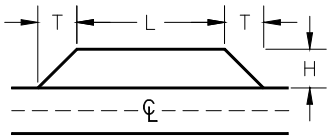
ROCK LIST
(Page 1 of 2)





TURNOUT DETAIL
PLAN VIEW
(not to scale)

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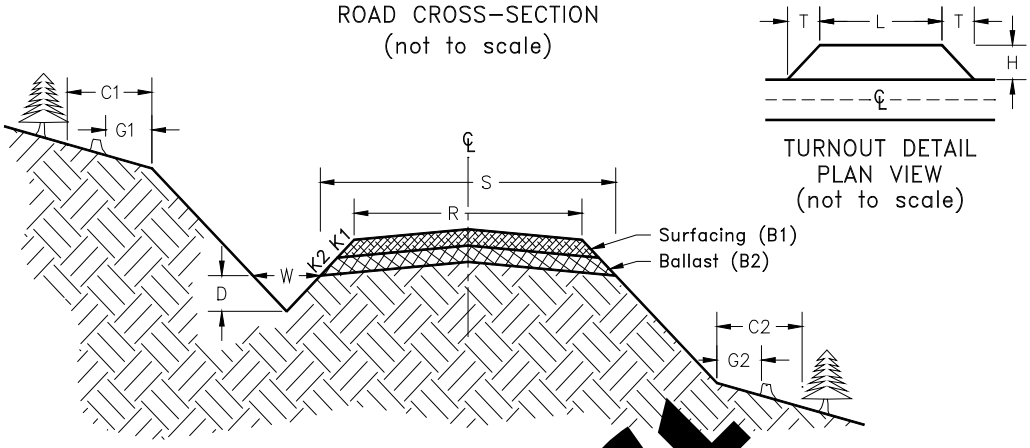
BALLAST

Road Number	From Station	To Station	Rock Slope	Compacted Rock Depth	C.Y. Station	# of Stations	C.Y. Subtotal	Rock Source
				B2		4" JAW RUN		**Commercial**
D-3600B	0+00	[illegible]	1 ½:1	15"	81	11.71	950	Commercial
D-3620	0+00	9+92	1 ½:1	15"	81	9.92	800	Commercial
Spur A	0+00	1+69	[illegible]:1	[illegible]"	81	1.69	140	Commercial
D-3722	[illegible]00	5+88	1[illegible]	[illegible]	81	5.88	475	Commercial
D-3724	[illegible]00	18+50	1 ½	15"	81	18.50	2500	Commercial
LANDINGS					75	11	825	Commercial
INTERSECTIONS					100	5	500	Commercial
TURNAROUNDS					75	5	375	Commercial
TURNOUTS					75	5	375	Commercial
CURVE WIDENING							400	Commercial

BALLAST TOTAL **7,340** Cubic Yards

ROCK LIST
(Page 2 of 2)



SURFACE

Road Number	From Station	To Station	Rock Slope	Compacted Rock Depth	C.Y./ Station	# of Stations	C.Y. Total	Rock Source
			K1		2" [illegible]S CRUSHED ROCK			COMMERCIAL
D-3724	0+00	18+50	1 ½ : 1		10[illegible] yds³ SPOT ROCK			Commercial
D-3600	0+00	35+00	1 ½ : 1		[illegible] yds³ SPOT ROCK			Commercial
D-3700	0+00	52+00	1 ½ :		[illegible]00 yds³ SPOT ROCK			Commercial
D-3720	0+00		½ : 1	6"	30	4	120	Commercial

SURFACE TOTAL **1,220** Cubic Yards

QUARRY SPALLS

Road Number	From Station	To Station	Rock Slope	Compacted Rock Depth	C.Y./ Station	# of Stations	C.Y. Total	Rock Source
			K1	B1				
CULVERTS					1	6	6	Commercial

QUARRY SPALLS TOTAL 6 Cubic Yards

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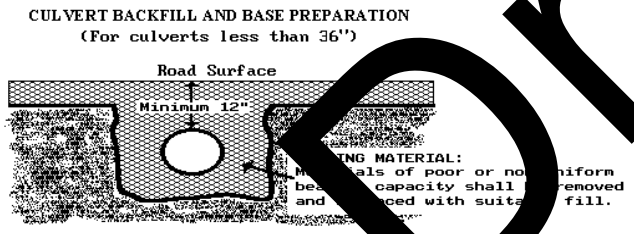
CULVERT LIST

Road Number	Locati	Culvert Dia.	Culvert Gaug	Length (ft) Culver	Length (ft) Downs	Length (ft) Flum	Riprap (C.Y.) Inle	Riprap (C.Y.) Outle	Riprap (C.Y.) Type	Backfill Materi	Placement Method
D-3600B	6+63	18”		30’			.5	.5	QS	NT	ZDH
D-3620	5+30	18”		30’			.5	.5	QS	NT	ZDH
D-3724	6+50	18”		30’			.5	.5	QS	NT	ZDH
D-3724	10+10	18”		30’			.5	.5	QS	NT	ZDH
D-3724	11+30	18”		30’			.5	.5	QS	NT	ZDH
D-3724	13+80	18”		30’			.5	.5	QS	NT	ZDH



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QS - Quarry Spalls
NT - Native (bank run)
SL - Select Fill
ZDH - Zero Drop Height
LL - Light Loose Riprap
Downspout - Full round pipe

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COMPACTION LIST

Road	From Station	To Station	Type	Max Depth Per Lift (inches)	Equipment Type	Equipment Weight (lbs)	Minimum Number of Passes	Maximum Operating Speed (mph)
D-3600	0+00	35+00	Pre-haul Surface		Vibratory Smooth Drum	14000	3	4
D-3700	0+00	52+00	Pre-haul Surface		Vibratory Smooth Drum	14000	3	4
D-3720	0+00	4+00	Pre-haul Surface		Vibratory Smooth Drum	14000	3	4
D-3600B	0+00	11+71	Subgrade/Rock	8”	Vibratory Smooth Drum	14000	3	4
D-3620	0+00	9+92	Subgrade/Rock	8”	Vibratory Smooth Drum	14000	3	4
Spur A	0+00	1+69	Subgrade/Rock	8”	Vibratory Smooth Drum	14000	3	4
D-3722	0+00	5+88	Subgrade/Rock	8”	Vibratory Smooth Drum	14000	3	4
D-3724	0+00	18+50	Subgrade/Rock	8”	Vibratory Smooth Drum	14000	3	4
Waste Areas & Embankments					Vibratory Smooth Drum	14000	3	4

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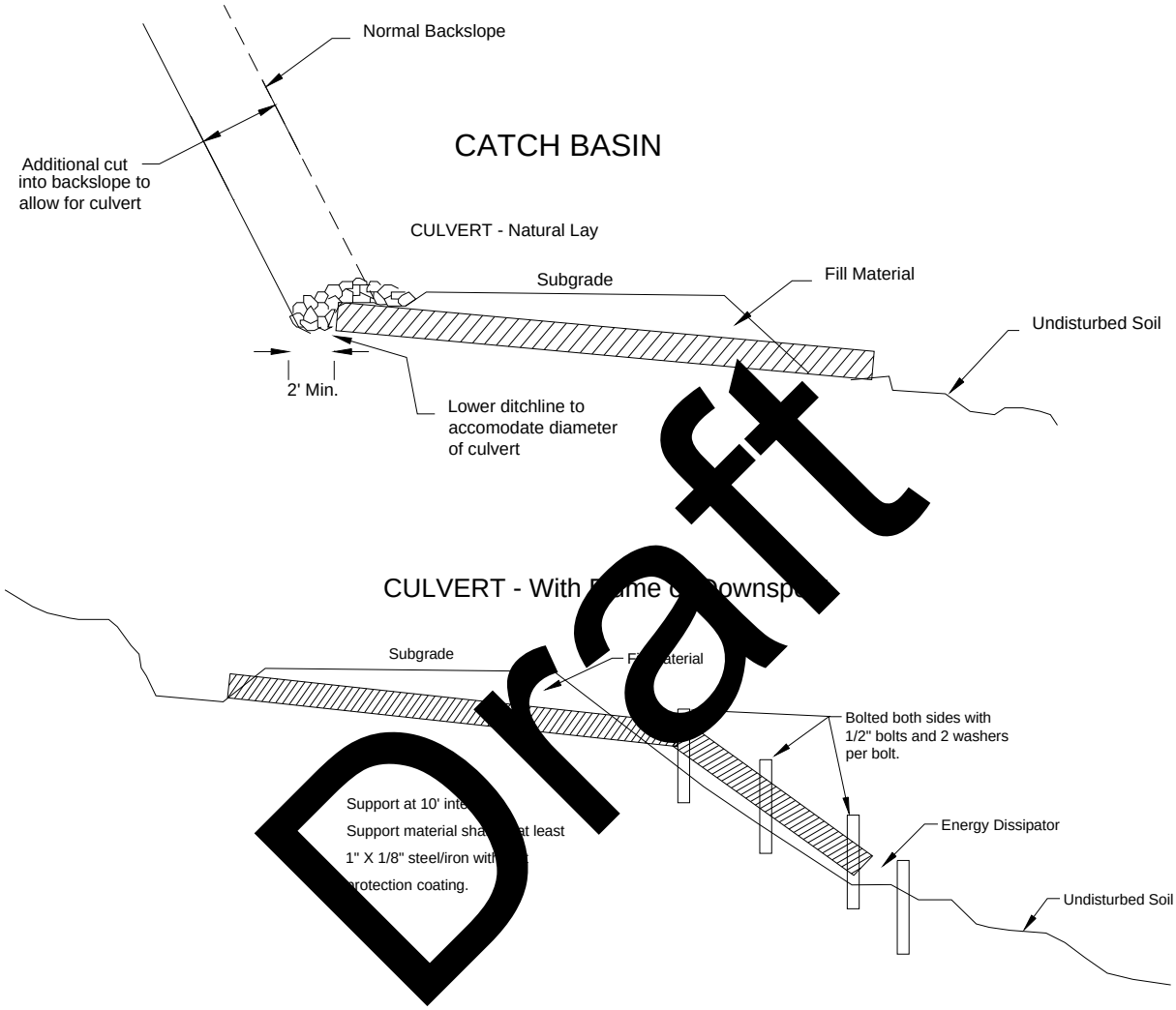
CULVERT AND DRAINAGE SPECIFICATION DETAIL

(Page 1 of 3)



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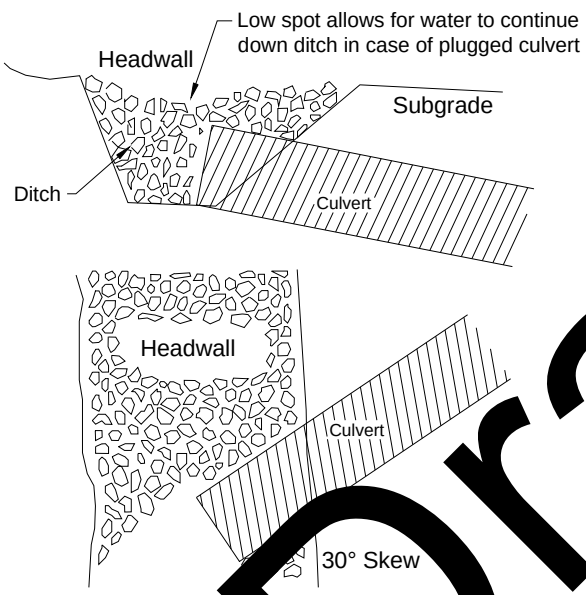
CULVERT AND DRAINAGE SPECIFICATION DETAIL

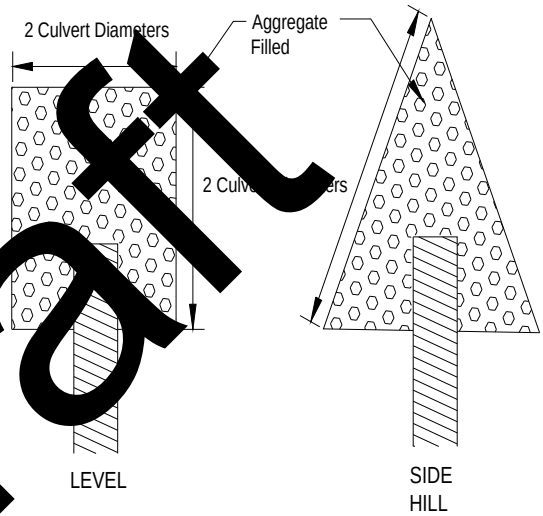
(Page 2 of 3)

Proper preparation of foundation and placement of bedding material shall precede the installation of all culvert pipe. This includes necessary leveling of the native trench bottom and compaction of required bedding material to form a uniform dense unyielding base. The backfill material shall be placed so that the pipe is uniformly supported along the barrel.

HEADWALLS



ENERGY DISSIPATORS



Headwalls to be constructed of material that will resist erosion.

Dissipator Specifications:
Depth: 1 culvert diameter
Aggregate: as specified in the CULVERT LIST.

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CULVERT AND DRAINAGE SPECIFICATION DETAIL

(Page 3 of 3)

POLYETHYLENE PIPE INSTALLATION

INSTALLATION REQUIREMENTS:

1. Crushed stone, gravel, or compacted soil backfill material shall be used as the bedding and envelope material around the culvert. The aggregate size shall not exceed 1/6 pipe diameter or 4" diameter, whichever is smaller.

2. The corrugated pipe shall be laid on grade, on a layer of bedding material as shown for the two types of installations. If native soil is used as the bedding and backfill material, it shall be well compacted in six inch layers under the haunches, around the sides and above the pipe to the recommended minimum height of cover.

3. Either crushed aggregate or flexible (asphalt) pavement may be included as part of the minimum cover requirements.

4. Site conditions and availability of bedding materials often dictate the type of installation method used.

5. The load bearing capability of flexible conduits is dependent on the type of backfill material used and the degree of compaction achieved. Crushed stone and gravel backfill materials typically reach a compaction level of 90-95% AASHTO standard density without compaction. When native soils are used as backfill material, a compaction level of 85% is required. This minimum compaction can be achieved by either hand or mechanical tamping.

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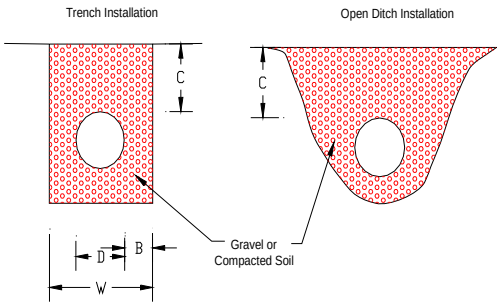
MINIMUM DIMENSIONS
Trench or Open Ditch Installation



Nominal Diameter	Minimum Thickness	Minimum Cover	Min. Trench Width
D	B	C	W
18"	6"	12"	36"
24"	6"	12"	42"
30"	6"	12"	48"
36"	6"	12"	54"

FOREST ACCESS ROAD MAINTENANCE SPECIFICATIONS
Page 1 of 2

Cuts and Fills

- Maintain slope lines to a stable gradient compatible with the construction materials.
- Remove slides from ditches and the roadway.
- Repair fill-failures with selected material or material approved by the Contract Administrator.
- Remove overhanging material from the top of cut slopes.
- Waste material from slides or other sources shall be placed and compacted in stable locations identified in the road plan or approved by the Contract Administrator, so that sediment will not deliver to any streams or wetlands.
- Slide material and debris shall not be mixed into the road surface materials, unless approved by the Contract Administrator.

Surface

- Grade, shape, and compact the road surface, cutouts, and shoulders to the original shape on the TYPICAL SECTION SHEET to provide a smooth, rut-free traveled surface and maintain surface water runoff in an even, unconcentrated manner.
- Blading shall not undercut the backslope, cut into geotextile fabric on the road.
- If required by the Contract Administrator, water shall be applied as necessary to control dust and retain fine surface rock.
- Surface material shall not be bladed off the roadway.
- Replace surface material when lost or worn away, or as directed by the Contract Administrator.
- Remove shoulder berms, created by grading, to facilitate drainage, except as marked or directed by the Contract Administrator.
- For roads with geotextile fabric: spread surface aggregate to fill in soft spots and wheel ruts (barrel spread) to prevent damage to the geotextile fabric.

Drainage

- Prevent silt bearing road surface and ditch runoff from delivering sediment to any streams or wetlands.
- Maintain rolling dips and drivable waterbars as needed to keep them functioning as intended.
- Maintain headwalls to the road shoulder level with material that will resist erosion.
- Maintain energy dissipaters at culvert outlets with non-erodible material or rock.
- Keep ditches, culverts, and other drainage structures clear of obstructions and functioning as intended.
- Inspect and clean culverts at least monthly, with additional inspections during storms and periods of high runoff. This shall be done even during periods of inactivity.

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FOREST ACCESS ROAD MAINTENANCE SPECIFICATIONS
Page 2 of 2

Preventative Maintenance

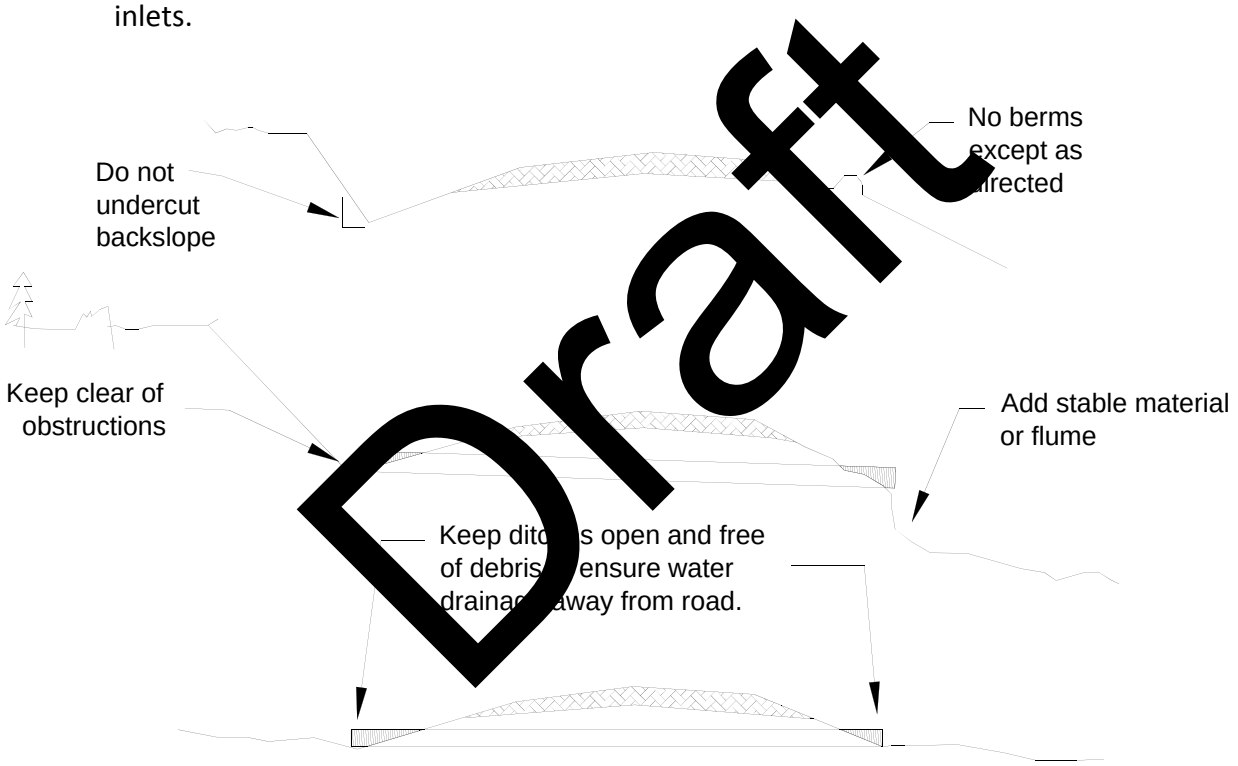
- Perform preventative maintenance work to safeguard against storm damage, such as blading to ensure correct runoff, ditch and culvert cleaning, and waterbar maintenance.

Termination of Use or End of Season

- At the conclusion of logging operations, ensure all conditions of these specifications have been met.

Debris

- Remove fallen timber, limbs, and stumps from the slopes, roadway, ditchlines, and culvert inlets.



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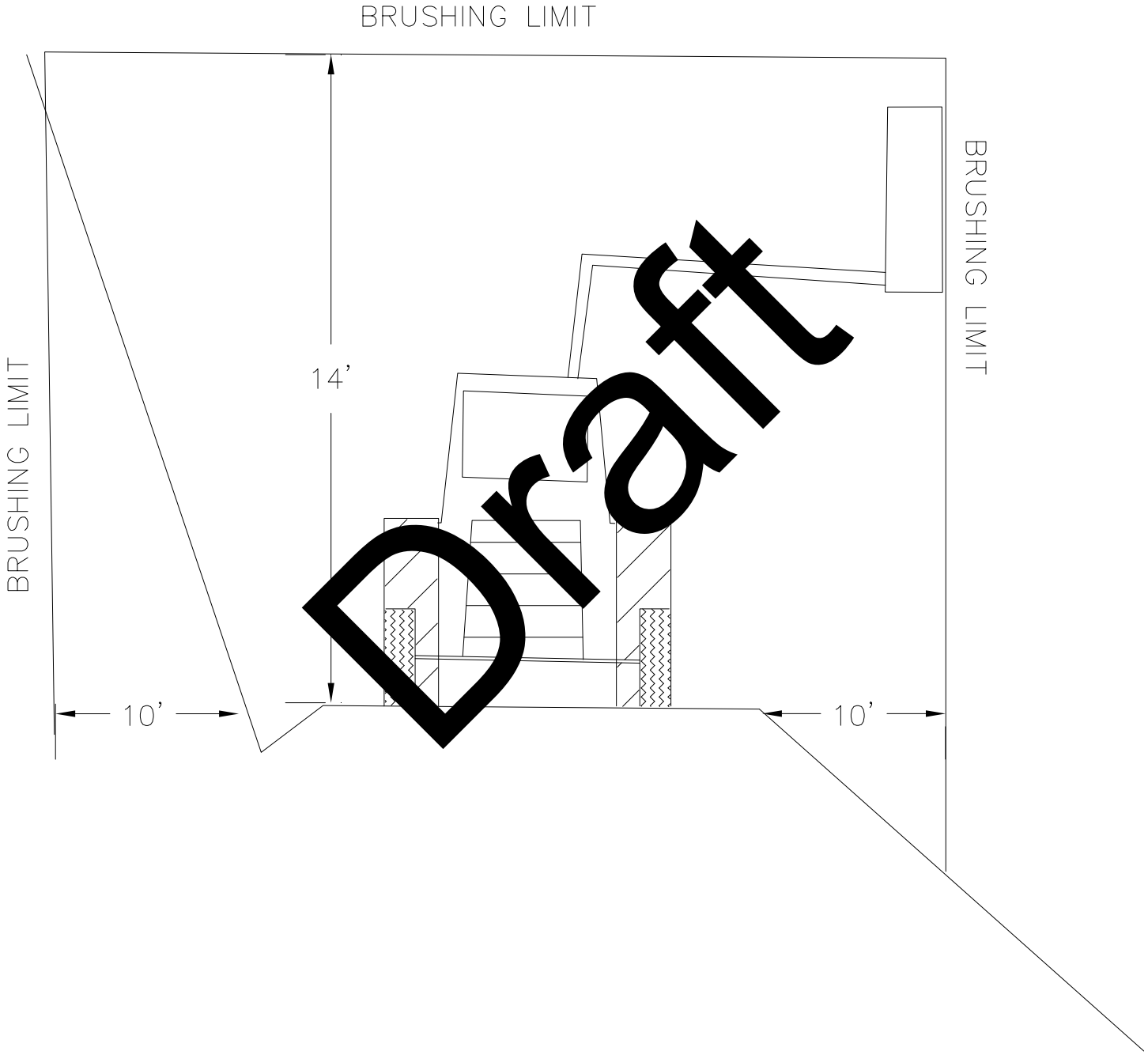
BRUSHING SECTION DETAIL



DEPARTMENT OF NATURAL RESOURCES

SUMMARY - Road Development Costs

REGION: PACIFIC CASCADE

DISTRICT: LEWIS

SALE/PROJECT NAME: GEM TWIST

CONTRACT NUMBER: 30-094429

LEGAL DESCRIPTION: Sec 32 T15R03W

ROAD NUMBER:

Required: D-3600, D-3700, D-3720

Optional: D-3600B, D-3620, Spur A, D-3722, D-3724

ROAD STANDARD:	Construction	Reconstruction	Pre-haul maintenance
NUMBER OF STATIONS:	47.70		91.00
SIDESLOPE:	25%		20%
CLEARING AND GRUBBING:	$5,400		
EXCAVATION AND FILL:	$10,251		
MISC. MAINTENANCE:	$300		$8,513
ROCK TOTALS:			
Required:	$193,716		$34,038
Optional:	$0		$0
Total:	$193,716		$34,038
CULVERTS AND FLUMES:	$3,600		$0
PAVING:	$0		$ -
GENERAL EXPENSES:	$19,194		$3,416
MOBILIZATION:	$1,493		$1,493
TOTAL COSTS:	$233,953		$42,859
COST PER STATION:	$4,905		$471

ROAD DEACTIVATION AND ABANDONMENT COSTS: _____

NOTE: Profit and risk are included in equipment rates used for this appraisal.

TOTAL (All Roads) = **$276,813**

TOTAL w/o Optional Rock (All Roads) = **$276,813**

SALE VOLUME MBF = **5,466**

TOTAL COST PER MBF = **$50.64**

TOTAL COST PER MBF w/o Optional Rock = **$50.64**

Compiled by: Chris Werner

Date: 09/07/16

Plans to be furnished by:

Draft

PACIFIC CASCADE REGION - ROAD COST ESTIMATE - CONSTRUCTION

SALE NAME: GEM TWIST CONTRACT NUMBER: 30-094429 Road No. 0 Stations: 47.7 Date: 09/07/16

I. CLEARING AND GRUBBING:

Flat Rate -	% Side Slope	MBF/ac	Disposal Factor	Production Factor	Cost/ Station	Width Factor	Total Stations	Sub Total
D-3600B	20	20.0	1.00	2.00	$45	1.00	11.71	$1,054
D-3620	20	20.0	1.00	2.00	$45	1.00	9.92	$893
Spur A	20	20.0	1.00	2.00	$45	1.00	1.69	$152
D-3722	20	20.0	1.00	2.00	$45	1.00	5.88	$529
D-3724	35	20.0	1.00	3.33	$45	1.00	18.50	$2,772

II *** Required Construction** Total Stations= 47.70

Required Stations= 0.00 Required Clear and Grub Sub-total= $ -
Optional Stations= 47.70 Optional Clear and Grub Sub-total= $5,400
Total Stations = 47.70 Clear and Grub TOTAL = $ 5,400.23

Flat Rate -	% Side Slope	Exc. Type Fact.	Production Factor	Cost/ Station	Width Factor	Total Stations	Sub Total
D-3600B	20	1.0	2.00	$90	1.00	11.71	$2,108
D-3620	20	1.0	2.00	$90	1.00	9.92	$1,786
Spur A	20	1.0	2.00	$90	1.00	1.69	$304
D-3722	20	1.0	2.00	$90	1.00	5.88	$1,058
D-3724	35	1.0	3.00	$90	1.00	18.50	$4,995

Total Stations= 47.7

IV. CULVERTS AND FLUMES:

*End Haul, Over Haul, Large Fills/Cuts

	Estimated Vol. (cy)	No. of Equip. Days	Cost/day	Sub Total
End Haul/ Over Haul				$0
Large Fills/ Cuts				$0

Required Stations= Required Excavation Sub-total= $
Optional Stations= 47.7 Optional Excavation Sub-total= [illegible]
Excavation TOTAL = $ 10[illegible]

Required

Description	Qty.	Gauge	Diameter	No/Length	Installed Cost/ft	Sub-total
CPP	6		18	30	$20.00	$3,600
						$0
						$0
						$0
Bands & Gaskets						$0

Required Culvert Subtotal = $3,600

Optional

Description	Qty.	Gauge	Diameter	No/Length	Installed Cost/ft	Sub-total
CPP						$0
						$0
						$0
						$0
						$0
						$0
Bands & Gaskets						$0

Optional Culvert Subtotal = $0

Culvert Total = $3,600

V

Description	Type	Width	Length	Cost/ft.	Sub-total
					$0
					$0
					$0

Structure Total = $0

Required		
Pounds	$/lb	Sub-total
100	$3.00	$300

Optional		
Pounds	$/lb	Sub-total
	$3.00	$0

III. BALLAST AND SURFACING :

Required Rock

Ballast source:	Commercial
Surface source:	Commercial
Landing source	Commercial
Culvert source	Commercial
Riprap source :	Commercial
Stockpile source:	Commercial
R.T. Miles =	35.0
Ave. Speed =	35
Delay (Hrs.)=	0.5
Cost / Hour =	$100.00
CY / Load =	10

UNIT COSTS	Ballast	Surfacing	Landing	Culvert	Riprap
Drill & Shoot					
Dig and load					
Crushing					
Purchase	$9.65	$10.64	$9.65	$11.30	
Haul *	$15.00	$15.00	$15.00	$15.00	$15.00
Spread	$1.00	$1.00	$1.00	$1.00	
Compact	$1.00	$1.50	$1.00		
Strip					
Reclamation					
Use tax	$0.08	$0.08	$0.08	$0.08	$0.08
TOTAL ($/cy)	$28.78	$30.39	$28.78	$29.48	$16.20

* Haul Formula: (R.T.Miles/MPH+Delay)($/hr / Cy/load)

Item	Description	Cubic Yards					
Ballast	4" Jaw Run	4,865	4865	Cu. yds @	$28.78	/cu. yd =	$140,024
Surfacing	2" Minus	100	100	Cu. yds @	$30.39	/cu. yd =	$3,039
Landings	4" Jaw Run	825	825	Cu. yds @	$28.78	/cu. yd =	$23,745
Culverts	Quarry Rock	6	6	Cu. yds @	$29.48	/cu. yd =	$177
Inter/TO/TA/C	4" Jaw Run	1,650	1650	Cu. yds @	$16.20	/cu. yd =	$26,730
Stockpile			0	Cu. yds @	$30.39	/cu. yd =	$0

Total Rock= [illegible] Required Rock total = $193,716

Optional Rock

Ballast source:	
Surface source:	
Landing source	
Culvert source	
Riprap source :	
Stockpile source:	
R.T. Miles =	3.5
Ave. Speed =	19
Delay (Hrs.)=	0.2
Cost / Hour =	$90.00
CY / Load =	10

UNIT COSTS	Ballast	Surfacing	Landing	Culvert	Riprap
Drill & Shoot					
Dig and load	$2.50		$2.50	$3.00	
Crushing					
Purchase					
Haul *	$3.46		$3.46	$3.46	
Spread	$2.00		$2.00	$2.00	
Compact	$1.50		$1.50		
Strip	$1.00		$1.00		
Reclamation					
Use tax					
TOTAL ($/cy)	$10.46	$0.00	$10.46	$8.46	$0.00

* Haul Formula: (R.T.Miles/MPH+Delay)($/hr / Cy/load)

Item	Description	Cubic Yards					
Ballast			Ballast	0	Cu. yds @	$10.46	/cu. yd = $0
Surfacing			Surfacing	0	Cu. yds @	$0.00	/cu. yd = $0
Landings			Landings	0	Cu. yds @	$10.46	/cu. yd = $0
Culverts			Culverts	0.0	Cu. yds @	$8.46	/cu. yd = $0.00
Turn Arounds			Turn Arounds	0	Cu. yds @	$10.46	/cu. yd = $0
Stockpile			Stockpile	0	Cu. yds @	$0.00	/cu. yd = $0

Total Rock= 0 Optional Rock total = $0

Rock Total= $193,716

Required Construction= $3,900
Optional Construction= $15,651
Required Rock= $193,716
Optional Rock= $0

Required Sub-total= $ 197,615.60
Optiona Sub-TOTAL= $ 15,651.23
Sub-TOTAL = $213,267

VI. GENERAL EXPENSES:

Overhead & General Exp. Add 9% $19,194

VII. MOBILIZATION:

Total Mobilization = $2,985 Mobilization sub-total = $1,492.50

SHEET TOTAL = $233,953

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PACIFIC CASCADE REGION - ROAD COST ESTIMATE - PRE-HAUL MAINTENANCE

SALE NAME: GEM TWIST CONTRACT NUMBER: 30-094429

Total stations Pre-Haul Maintenance = 91.00

I. MISC. MAINTENANCE ITEMS:

	Cost/ Station	Total Stations	Sub Total
mechanical brushing ($/sta) =	30.00	91.00	$2,730
hand brushing =			$0
ditch cleaning ($/sta) =			$0
Sediment Traps (ea.) =			$0
grading ($/sta) =	8.00	91.00	$728
compacting ($/sta) =	5.00	91.00	$455

Misc TOTAL = $3,913

III. BALLAST AND SURFACING :

Ballast source: Commercial
Surface source: Commercial
Riprap source : Commercial

UNIT COSTS	Ballast	Surfacing	Quarry Spalls
Drill & Shoot			
Dig & Load			
Crush			
Purchase		$10.64	
Haul		$15.00	
Spread		$1.00	
Compact		$1.50	
Stockpile			
Rec[illegible]n			
Use tax	$0.08	$0.08	$0.08
TOTAL ($)	$0.00	$30.39	$0.00

Description	cu.yds/sta x stations =	cubic yards
Ballast (4" Jaw Run)		0
Surfacing (2"Minus)		0
Stockpile (2 1/2"-)		

* Haul Formula: (R.T.Miles/MPH+Delay)($/hr / Cy/load)

R.T. Miles =	35.0
Ave. Speed =	35
Delay (Hrs.)=	0.5
Cost / Hour =	$100.00
CY / Load =	10

Ballast (4" Jaw Run)	Cu. yds @	$0.00	/cu. yd =	$0
Surfacing (2"Minus)	112 Cu. yd	$30.39	/cu. yd =	$34,038
Quarry Spalls	Cu. yd @	$0.00	/cu. yd =	$0

Rock total = $34,038

IV. CULVERTS AND FLUMES:

Description	Gauge	Diameter	No/Length (ft)	Installed Cost/ft	Sub-total
CPP				$20.00	$0
					$0
					$0
					$0
					$0
Bands & Gaskets					$0

Culvert total = $0

V. STRUCTURES

Description	Type	Width	Length	Cost/ft.	Sub-total
					$0
					$0
					$0

HMA Paving total = $0

Sub-TOTAL = $37,951

VI. GENERAL EXPENSES: Overhead & General Exp. Add 9% $3,416

VII. MOBILIZATION: Total Mobilization = $2,985 Mobilization sub-total = $1,492.50

Road No. 0
Standard: Pre-haul maintenance
Stations: 91.00
By: Chris Werner

SHEET TOTAL = $42,859

Sheet 3 of 4 Date: 09/07/16

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VII. MOBILIZATION:	Description	$ per Move	# of Moves	Sub-total
	Dump Trucks	100	3	$300
* Move in costs	Grader	160	1	$160
are averaged over	Compactor	450	1	$450
all three sheets.	Excavator	450	2	$900
	Dozer (D8)	450	1	$450
	Front end loader	450	1	$450
	Rock crusher	$4,000		$0
	Drill	$1,000		$0
	Dozer (D5)	$275	1	$275

Construction Mobilization sub-total = [illegible]

Reconstruction Mobilization sub-total = [illegible]

Pre-haul Mobilization sub-total = [illegible]92.50

Total Mobilization = [illegible]

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