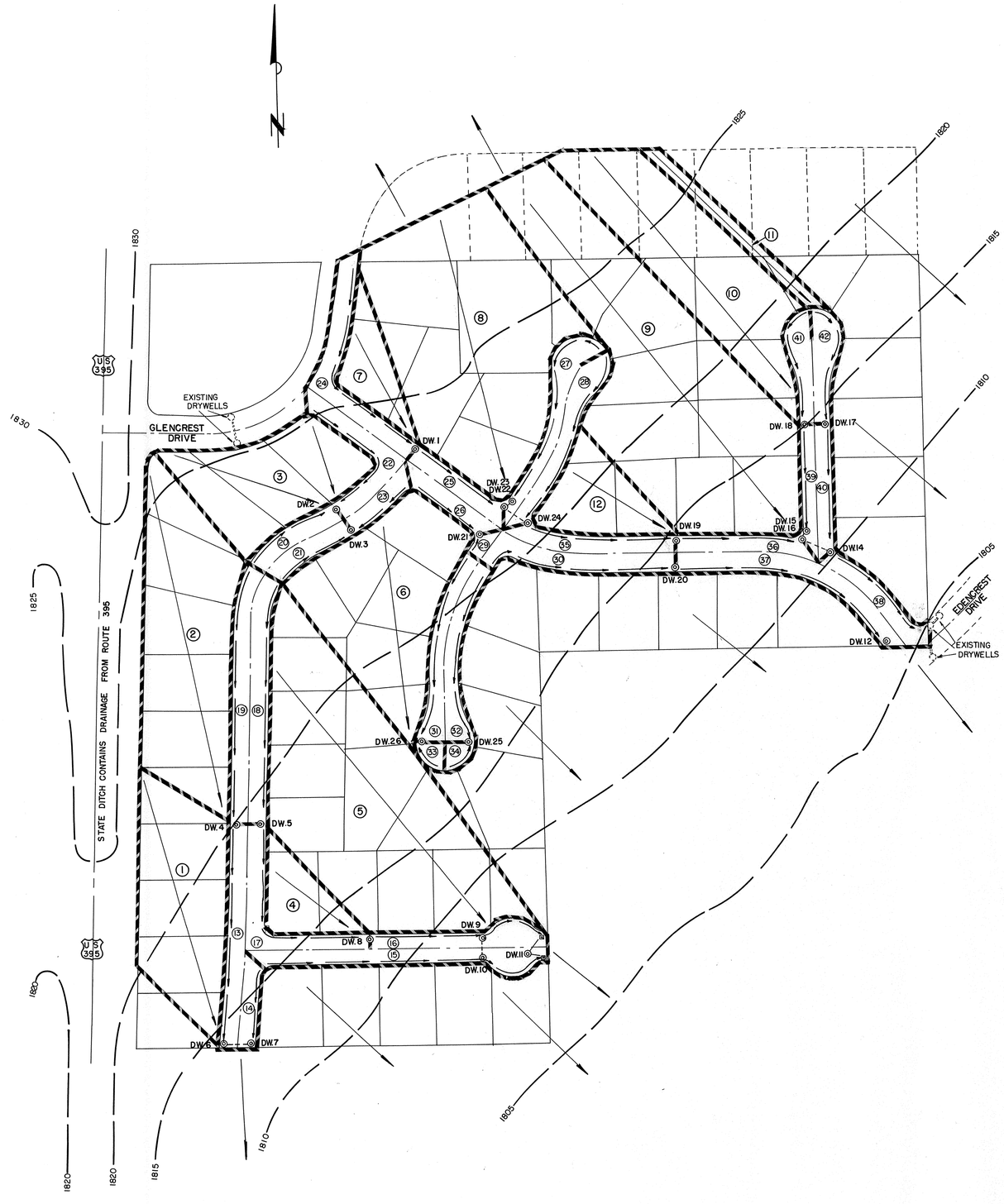


DRAINAGE CALCULATIONS

THE FOLLOWING PORTION OF THESE CALCULATIONS COMBINES AREAS OF LAND AND PAVEMENT USING 0.25 AS A RUNOFF FACTOR. THIS BEING DETERMINED BY THE DWELLING UNIT/GROSS ACRE FIGURE. [LOW POINTS USE 50 YEAR FREQUENCY]

AREA 1+13	$T_c = 0.15(540 \times 0.300\sqrt{0.019})^{0.6} = 10.427$	R = 2.18 [10 yr F]	Q = 1.505 × 0.25 × 2.18 =	0.820
AREA 2+19	$T_c = 0.15(680 \times 0.300\sqrt{0.010})^{0.6} = 14.517$	R = 1.80 ["]	Q = 1.904 × 0.25 × 1.80 =	0.857
AREA 3+20+22	$T_c = 0.15(790 \times 0.300\sqrt{0.009})^{0.6} = 16.390$	R = 2.30 [50 yr F]	Q = 1.148 × 0.25 × 2.30 =	0.660
AREA 5+16	$T_c = 0.15(750 \times 0.300\sqrt{0.019})^{0.6} = 12.699$	R = 1.95 [10 yr F]	Q = 3.113 × 0.25 × 1.95 =	1.518
AREA 6+31+33	$T_c = 0.15(500 \times 0.300\sqrt{0.019})^{0.6} = 12.070$	R = 2.83 [50 yr F]	Q = 1.902 × 0.25 × 2.83 =	1.346
AREA 8+25+27	$T_c = 0.15(1070 \times 0.300\sqrt{0.009})^{0.6} = 19.666$	R = 1.48 [10 yr F]	Q = 3.001 × 0.25 × 1.48 =	1.110
AREA 9+36+39	$T_c = 0.15(1150 \times 0.300\sqrt{0.019})^{0.6} = 16.411$	R = 1.65 ["]	Q = 3.650 × 0.25 × 1.65 =	1.506
AREA 10+41	$T_c = 0.15(600 \times 0.300\sqrt{0.020})^{0.6} = 10.938$	R = 2.14 ["]	Q = 1.696 × 0.25 × 2.14 =	0.907

THE FOLLOWING PORTION OF THESE CALCULATIONS COMBINES AREAS OF LAND AND PAVEMENT WITH A RUNOFF FACTOR OF 0.25, AND COMPARES THEM WITH PAVEMENT ONLY PORTIONS, HAVING A RUNOFF FACTOR OF 0.90. [HIGHEST Q TAKEN]

AREA 4+17	$T_c = 0.15(350 \times 0.300\sqrt{0.018})^{0.6} = 8.170$	R = 2.45 [10 yr F]	Q = 0.52 × 0.25 × 2.45 =	0.318
17 [PAVEMENT ONLY]	$T_c = 0.10(375 \times 0.016\sqrt{0.020})^{0.6} = 0.947$	R = 3.18 ["]	Q = 0.118 × 0.90 × 3.18 =	0.538
AREA 7+24	$T_c = 0.15(410 \times 0.300\sqrt{0.010})^{0.6} = 10.716$	R = 2.16 ["]	Q = 0.583 × 0.25 × 2.16 =	0.315
24 [PAVEMENT ONLY]	$T_c = 0.10(410 \times 0.016\sqrt{0.010})^{0.6} = 1.231$	R = 3.18 ["]	Q = 0.193 × 0.90 × 3.18 =	0.552
AREA 11+42	$T_c = 0.15(590 \times 0.300\sqrt{0.019})^{0.6} = 10.996$	R = 2.12 ["]	Q = 0.299 × 0.25 × 2.12 =	0.158
42 [PAVEMENT ONLY]	$T_c = 0.10(215 \times 0.016\sqrt{0.019})^{0.6} = 0.689$	R = 3.18 ["]	Q = 0.069 × 0.90 × 3.18 =	0.197
AREA 12+35	$T_c = 0.15(250 \times 0.300\sqrt{0.027})^{0.6} = 5.91$	R = 2.92 ["]	Q = 0.590 × 0.25 × 2.92 =	0.431
35 [PAVEMENT ONLY]	$T_c = 0.10(250 \times 0.016\sqrt{0.027})^{0.6} = 0.678$	R = 3.18 ["]	Q = 0.110 × 0.90 × 3.18 =	0.315

THE FOLLOWING AREAS ARE PAVEMENT ONLY.

AREA 14	$T_c = 0.10(170 \times 0.016\sqrt{0.019})^{0.6} = 0.599$	R = 3.18 [10 yr F]	Q = 0.073 × 0.90 × 3.18 =	0.209
AREA 15	$T_c = 0.10(510 \times 0.016\sqrt{0.017})^{0.6} = 1.196$	R = 3.18 [10 yr F]	Q = 0.220 × 0.90 × 3.18 =	0.658
AREA 18	$T_c = 0.10(440 \times 0.016\sqrt{0.009})^{0.6} = 1.325$	R = 3.18 [" "]	Q = 0.192 × 0.90 × 3.18 =	0.550
AREA 21+23	$T_c = 0.10(280 \times 0.016\sqrt{0.010})^{0.6} = 0.979$	R = 4.57 [50 yr F]	Q = 0.158 × 0.90 × 4.57 =	0.650
AREA 26+29	$T_c = 0.10(180 \times 0.016\sqrt{0.010})^{0.6} = 0.751$	R = 4.57 [" "]	Q = 0.120 × 0.90 × 4.57 =	0.494
AREA 28	$T_c = 0.10(360 \times 0.016\sqrt{0.010})^{0.6} = 1.138$	R = 3.18 [10 yr F]	Q = 0.220 × 0.90 × 3.18 =	0.630
AREA 30	$T_c = 0.10(250 \times 0.016\sqrt{0.027})^{0.6} = 0.679$	R = 3.18 [" "]	Q = 0.117 × 0.90 × 3.18 =	0.335
AREA 32+34	$T_c = 0.10(410 \times 0.016\sqrt{0.011})^{0.6} = 1.196$	R = 4.57 [50 yr F]	Q = 0.165 × 0.90 × 4.57 =	0.679
AREA 37	$T_c = 0.10(450 \times 0.016\sqrt{0.023})^{0.6} = 1.014$	R = 3.18 [10 yr F]	Q = 0.242 × 0.90 × 3.18 =	0.693
AREA 38	$T_c = 0.10(200 \times 0.016\sqrt{0.026})^{0.6} = 0.601$	R = 3.18 [" "]	Q = 0.101 × 0.90 × 3.18 =	0.289
AREA 40	$T_c = 0.10(250 \times 0.016\sqrt{0.019})^{0.6} = 0.754$	R = 3.18 [" "]	Q = 0.184 × 0.90 × 3.18 =	0.527

GRATE CALCULATIONS

USING THE FORMULA $Q = 0.56(\frac{2}{3})S^{1/2} d^{8/3}$

FOR D/W 1. 0.552 = $0.56(\frac{40}{0.016})0.012^{1/2} d^{8/3}$ d = 0.121. W = 4.84 76% RETAINED = 0.420 0.132 ON TO D/W 22

FOR D/W 22/23 1.110 + 0.132 FROM D/W 1. = 1.242

FOR D/W 24. 0.630 = $0.56(\frac{30}{0.016})0.009^{1/2} d^{8/3}$ d = 0.140 W = 5.04 71.5% RETAINED Q = 0.451 0.161 ON TO D/W 19

FOR D/W 19. 0.431 + 0.161 FROM D/W 24 = 0.592 = $0.56(\frac{30}{0.016})0.025^{1/2} d^{8/3}$ d = 0.108 82% RETAINED Q = 0.485 0.107 ON TO D/W 16

FOR D/W 18. 0.907 = $0.56(\frac{30}{0.016})0.019^{1/2} d^{8/3}$ d = 0.139 W = 5.00 75% RETAINED Q = 0.680 0.227 ON TO 15/16

FOR D/W 15/16 1.506 + 0.107 (FROM D/W 19) + 0.227 (FROM D/W 18) = 1.840

FOR D/W 17 0.197 = $0.56(\frac{30}{0.016})0.019^{1/2} d^{8/3}$ d = 0.079 W = 2.82 96% RETAINED Q = 0.189 0.008 ON TO D/W 14.

FOR D/W 14 0.527 + 0.008 (FROM D/W 17) = 0.535 = $0.56(\frac{30}{0.016})0.020^{1/2} d^{8/3}$ d = 0.113 84% RETAINED Q = 0.449 0.086 ON TO D/W 13.

FOR D/W 13 0.289 + 0.086 (FROM D/W 14) = 0.375 ABSORBED BY EXISTING D/WELLS*

*COMBINED AREAS 10+41 AND 11+42 (ACCOUNTING FOR 1.098 Q) DIVERT FLOW FROM EXISTING D/WELLS ON EDENCREST DRIVE. ANY DRAINAGE PAST DRY WELL 14 (0.375 Q) WILL THEN EASILY BE ABSORBED BY EXISTING DRY WELLS. PLEASE SEE COPIES (ENCLOSED) OF PREVIOUS GLENEDEN 4TH CALCULATIONS.

FOR D/W 20 0.385 = $0.56(\frac{30}{0.016})0.025^{1/2} d^{8/3}$ d = 0.088 W = 3.50 90% RETAINED Q = 0.302 0.033 ON TO D/W 12

FOR D/W 12 0.693 + 0.033 (FROM D/W 20) = 0.726 = $0.56(\frac{30}{0.016})0.019^{1/2} d^{8/3}$ d = 0.123 76% RETAINED Q = 0.551 0.174 OFF PLAT.

FOR D/W 4 0.857 = $0.56(\frac{30}{0.016})0.009^{1/2} d^{8/3}$ d = 0.151 W = 6.03 68% RETAINED Q = 0.583 0.274 ON TO D/W 6

FOR D/W 6 0.274 + 0.820 (FROM D/W 4) = 1.094 = $0.56(\frac{30}{0.016})0.019^{1/2} d^{8/3}$ d = 0.144 70% RETAINED Q = 0.765 0.329 OFF PLAT.

FOR D/W 7 0.209 = $0.56(\frac{30}{0.016})0.019^{1/2} d^{8/3}$ d = 0.077 W = 3.09 94.5% RETAINED Q = 0.198 0.011 OFF PLAT.

FOR D/W 5 0.550 = $0.56(\frac{30}{0.016})0.009^{1/2} d^{8/3}$ d = 0.128 W = 5.11 74% RETAINED Q = 0.407 0.143 ON TO D/W 8.

FOR D/W 8 0.538 + 0.143 (FROM D/W 5) = 0.681 = $0.56(\frac{30}{0.016})0.017^{1/2} d^{8/3}$ d = 0.128 80% RETAINED Q = 0.545 0.136 ON TO D/W 9.

FOR D/W 9 0.136 (FROM D/W 8) + 1.518 = 1.654 = $0.56(\frac{30}{0.016})0.009^{1/2} d^{8/3}$ d = 0.199 W = 7.16 60% RETAINED Q = 0.992 0.662 OFF PLAT

FOR D/W 10 0.658 = $0.56(\frac{30}{0.016})0.013^{1/2} d^{8/3}$ d = 0.133 W = 4.78 77.5% RETAINED Q = 0.510 0.148 OFF PLAT.

ASSUMING WATER IS PONDED ON GRATE FOR D/W 2, D/W 3, DW 21, DW 26 AND DW 25.
Q = CFS/SEC P = PERIMETER = 6.28' for 2' GRATE.

FOR D/W 2	Q/P = 0.660 ÷ 6.28 = 0.105	HEAD = 0.107	USING TABLE 'CAPACITY OF GRATE INLET IN SUMP - WATER PONDED ON GRATE' BUREAU OF PUBLIC ROADS DIV. TWO WASH D.C.
FOR D/W 3	Q/P = 0.650 ÷ 6.28 = 0.104	HEAD = 0.105	
FOR D/W 21	Q/P = 0.494 ÷ 6.28 = 0.079	HEAD = 0.104	
FOR D/W 25	Q/P = 0.679 ÷ 6.28 = 0.108	HEAD = 0.113	
FOR D/W 26	Q/P = 1.346 ÷ 6.28 = 0.214	HEAD = 0.172	

BASED ON THE ABOVE CALCULATIONS THE FOLLOWING DRYWELLS WOULD BE SINGLE OR DOUBLE.
SINGLE 1. 3. 5. 7. 8. 10. 14. 17. 19. 20. 21. 23. 24.
DOUBLE 2. 4. 6. 9. 11. 12. 15. 16. 18. 22. 25. 26.

J. PAUL RAMER
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER AND LAND SURVEYOR

REVISIONS	GLENEDEN 5TH ADDITION
	DRAINAGE PLAN AND CALCULATIONS

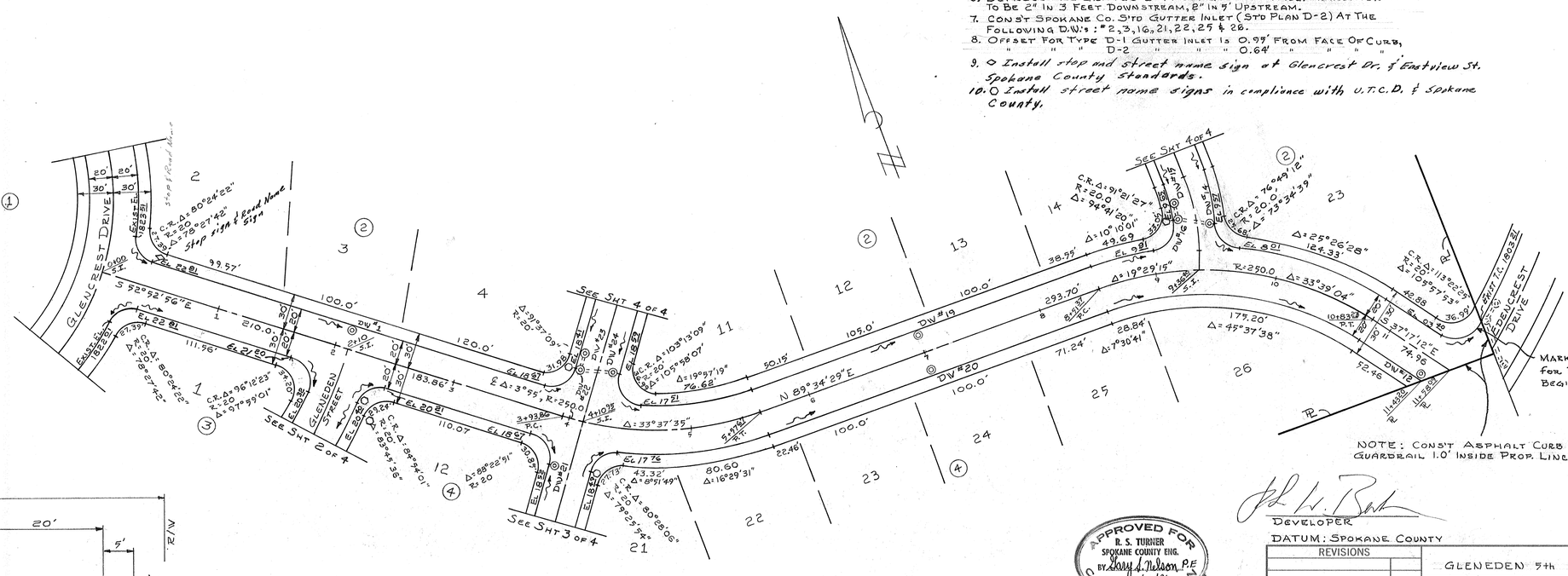
Date 15TH MAY 1980
Drawn R.M.D.
Checked
Field Book
SCALE Horizontal 1" = 100' Vertical

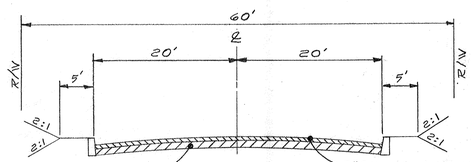
SARGENT, RAMER & ASSOC., INC.
CIVIL ENGINEERS & LAND SURVEYORS
N. 10115 NEWPORT HWY. PH: 487-1658
SPOKANE, WASHINGTON 99208

Project No. 79007
Sht 1 of 1

NOTES:

1. CONS'T SPOKANE CO. STD CURBS.
2. PLACE PRECAST STD DRYWELL @ #1, 3, 5, 7, 8, 10, 14, 17, 19, 20, 21, 23 & 24
3. PLACE PRECAST D'BL DRYWELL @ #2, 4, 6, 9, 11, 12, 15, 16, 18, 22, 25 & 26
   24, 25, & 26.
4. CONS'T SPOKANE CO. ST'D GUTTER INLETS (STD PLAN D-1) EXCEPT AT D.W. #11 CONS'T STD M.H. COVER, AND EXCEPT AT LOW POINTS (SEE NOTE 7)
5. STORM DRAIN PIPE SHALL BE 10" C.M.P. W/2' MIN. COVER.
6. DEPRESS ALL GRATES 2" FROM GUTTER GRADE. TRANSITION TO BE 2" IN 3 FEET DOWNSTREAM, 2" IN 5' UPSTREAM.
7. CON'S'T SPOKANE CO. S'TD GUTTER INLET (STD PLAN D-2) AT THE FOLLOWING D.W.'S: #2, 3, 16, 21, 22, 25 & 26.
8. OFFSET FOR TYPE D-1 GUTTER INLET IS 0.99' FROM FACE OF CURB,
   " " " D-2 " " " 0.64' " " " "
9. ○ Install stop and street name sign at Glencrest Dr. & Eastview St. Spokane County standards.
10. ○ Install street name signs in compliance with U.T.C.D. & Spokane County.





* 4" COMPACTED DEPTH CRUSHED SURFACING TOP COURSE, W.S.H.D. SPEC.

60' R/W TYPICAL SECTION NOT TO SCALE

2" COMPACTED DEPTH CLASS "B" A.C., W.S.H.D. SPECS.

* IF SILTY SOIL CONDITIONS ARE ENCOUNTERED ADDITIONAL SURFACING SHALL BE USED AS DIRECTED BY CO. ENG.

TBM "X" R/R SPIKE IN 10" PINE, LOT 22, BK 4 EL 1819.10.

APPROVED FOR CONSTRUCTION
R. S. TURNER
SPOKANE COUNTY ENG.
BY Gary J. Nelson P.E.
3/27/81

PERMIT REQUIRED!
NOTIFY THE PERMIT ENGINEER
456-3600
24 HRS. PRIOR TO CONSTRUCTION

DEVELOPER

DATUM: SPOKANE COUNTY

REVISIONS	

GLENEDEN 5th STREET PLANS

EASTVIEW STREET

Date 3/80
Drawn DK
Checked
Field Book

SCALE
Horizontal 1" = 50'
Vertical 1" = 10'

SARGENT, RAMER & ASSOC., INC.
CIVIL ENGINEERS & LAND SURVEYORS
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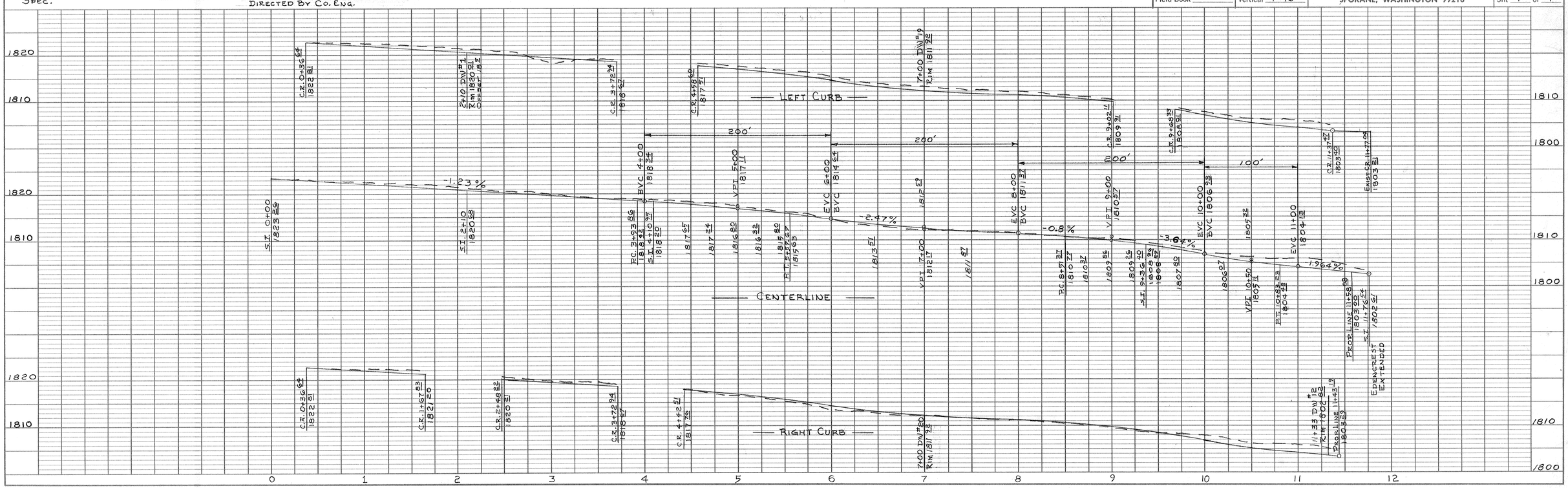
Project No. 79007

Sht 1 of 4



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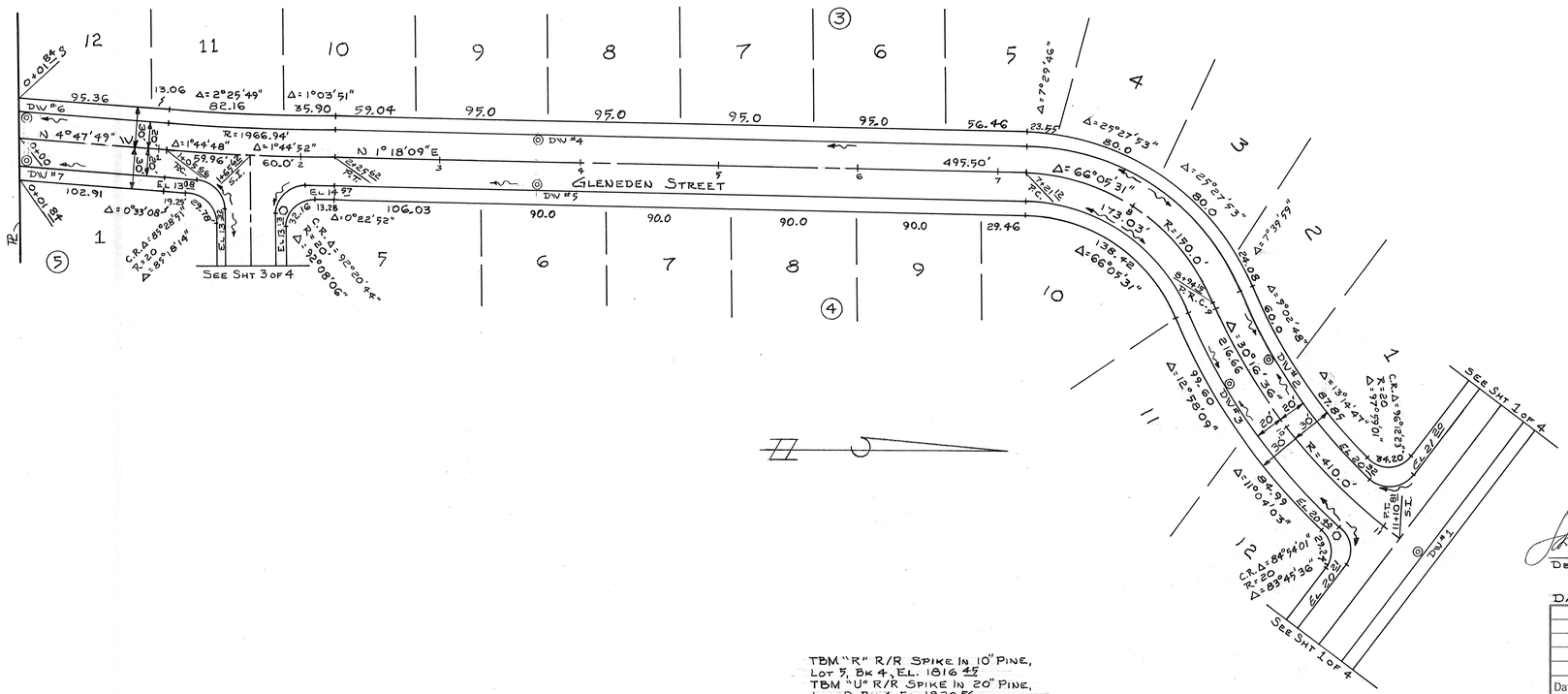

TBM "R" R/R SPIKE IN 10" PINE, LOT 5, BK 4, EL. 1816.45
TBM "U" R/R SPIKE IN 20" PINE, LOT 9, BK 4, EL. 1820.86

APPROVED FOR CONSTRUCTION
R. S. TURNER
SPOKANE COUNTY ENG.
BY Gary L. Nelson P.E.
3/27/81

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J. PAUL RAMER
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR

DEVELOPER

DATUM: SPOKANE COUNTY

REVISIONS	

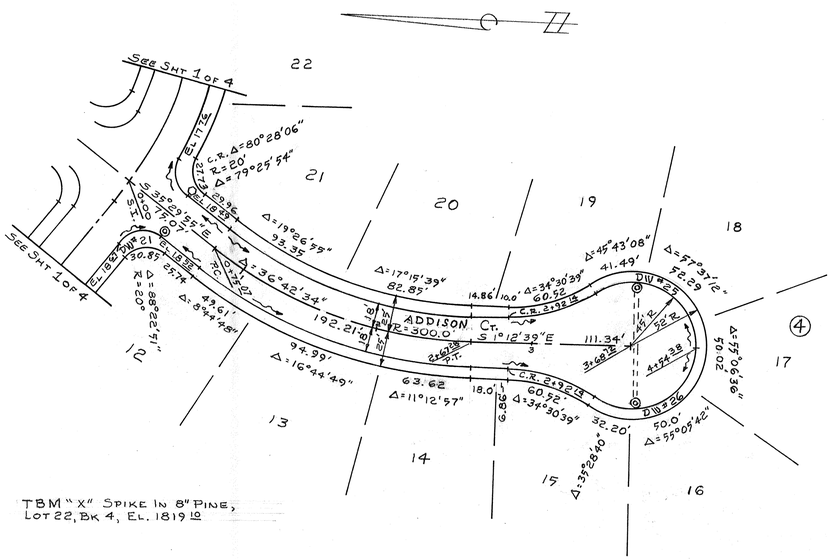
GLENEDEN 5th STREET PLANS

GLENEDEN STREET

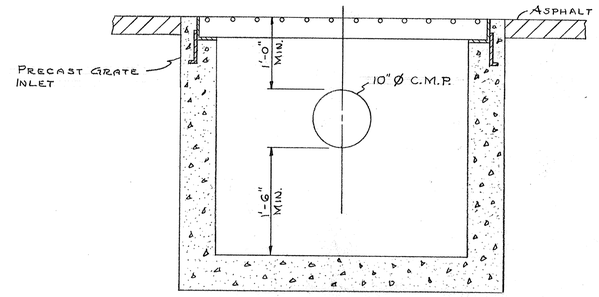
Date 3/80	SCALE	SARGENT, RAMER & ASSOC., INC.
Drawn DK	Horizontal 1"=50'	CIVIL ENGINEERS & LAND SURVEYORS
Checked	Vertical 1"=10'	N.10115 NEWPORT HWY. PH: HU 7-1658
Field Book		SPOKANE, WASHINGTON 99218

Project No. 79007

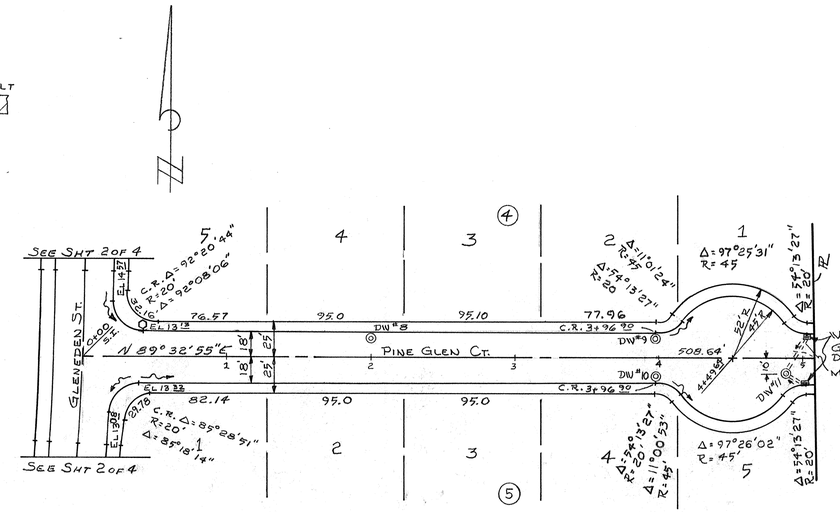
Sht 2 of 4



TBM "X" SPIKE IN 8" PINE,
LOT 22, BK 4, EL. 1819.10

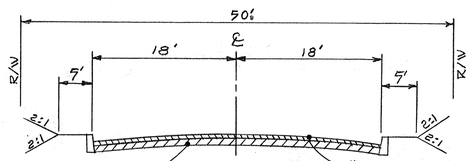


W.S.H.D. STD B-26a1 GRATE INLET
SCALE: 1" = 1'-0"



TBM "R" SPIKE IN 10" PINE,
LOT 5, BK 4, EL. 1816.45

NOTE: CONS'T ASPHALT CURB & GUARD RAIL 1.0' INSIDE PROP. LINE



*4" COMPACTED DEPTH CRUSHED SURFACING TOP COURSE, W.S.H.D. SPEC.

50' R/W TYPICAL SECTION NOT TO SCALE

2" COMPACTED DEPTH CLASS "B" A.C., W.S.H.D. SPECS.

*IF SILTY SOIL CONDITIONS ARE ENCOUNTERED ADDITIONAL SURFACING SHALL BE USED AS DIRECTED BY CO. ENG.

DEVELOPER

APPROVED FOR CONSTRUCTION
R. S. TURNER
SPOKANE COUNTY ENG.
BY Gary L. Nelson P.E.
3/27/80

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24 HRS. PRIOR TO CONSTRUCTION

PAUL RAMER
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR

DATUM: SPOKANE COUNTY

REVISIONS	

GLENEDEN 5th STREET PLANS

ADDISON COURT & PINE GLEN COURT

Date	3-80
Drawn	DK
Checked	
Field Book	

SCALE
Horizontal 1" = 50'
Vertical 1" = 10'

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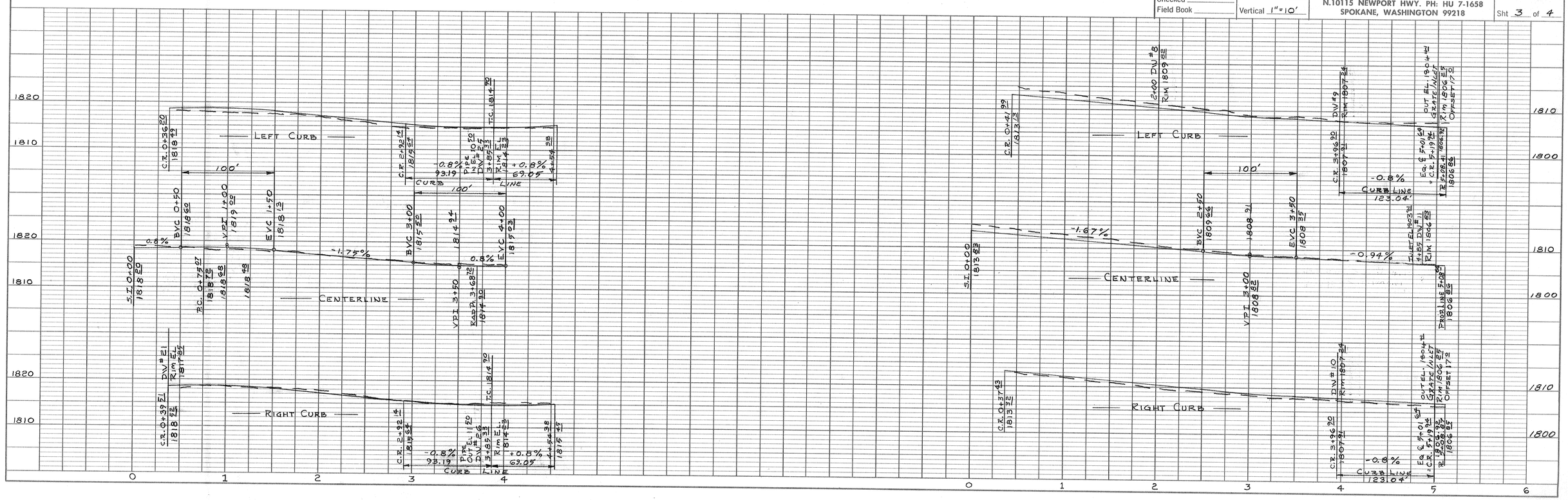
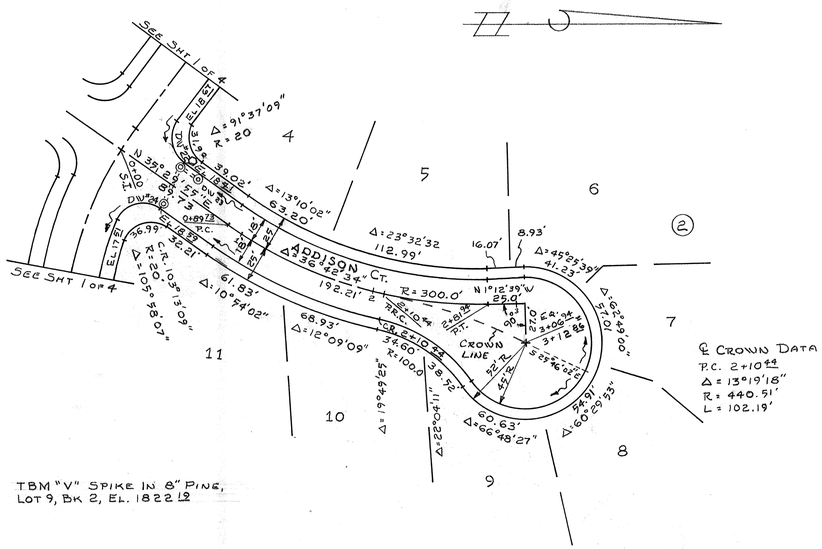
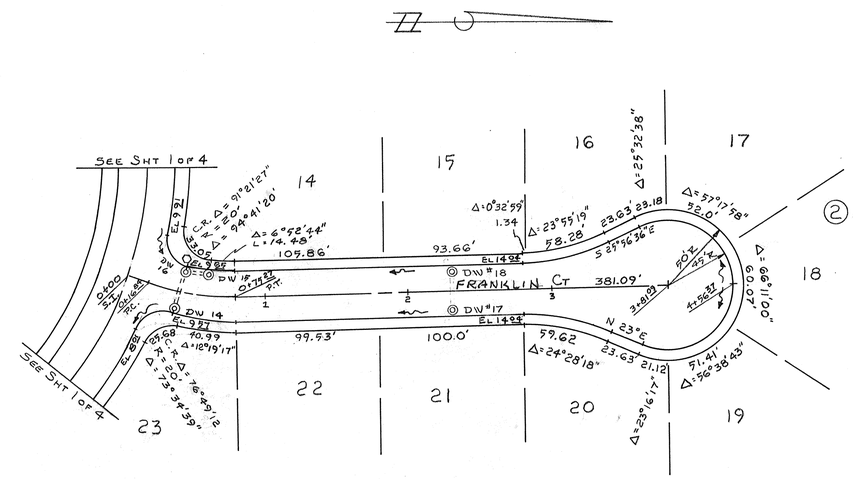
Project No. 79007

Sht 3 of 4







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STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR

DATUM: SPOKANE COUNTY

REVISIONS	

GLENEDEN 5th STREET PLANS

ADDISON COURT & FRANKLIN COURT

Date 3-80
Drawn DK
Checked
Field Book

SCALE
Horizontal 1" = 50'
Vertical 1" = 10'

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SPOKANE, WASHINGTON 99218

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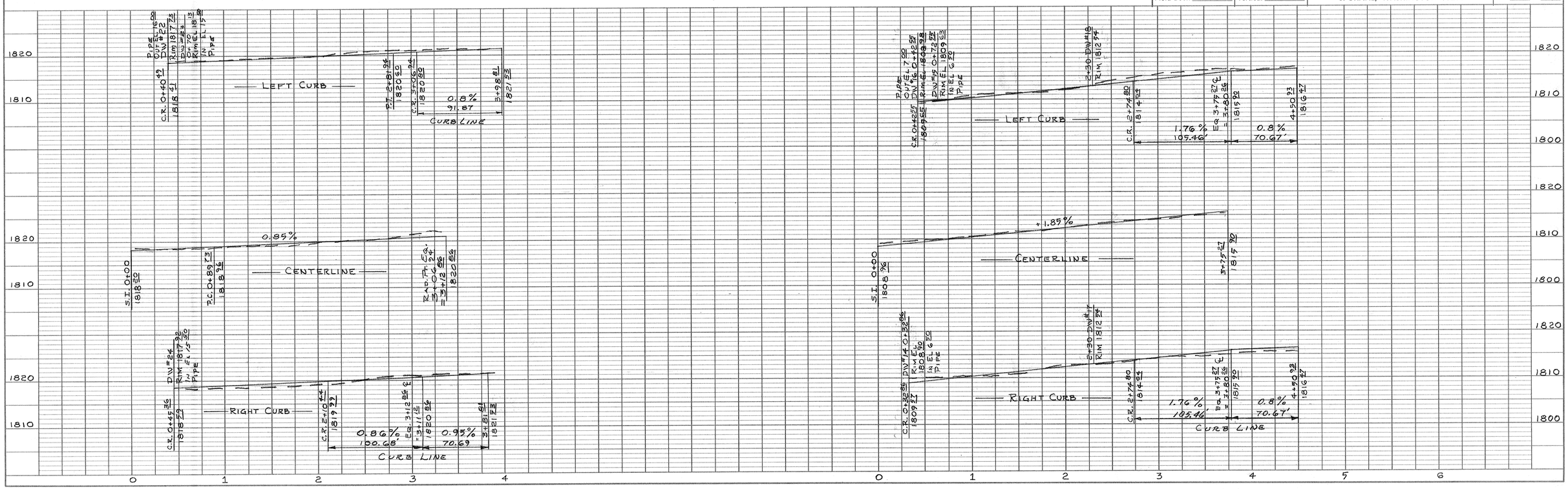
Sht 4 of 4