

## GENERAL

The 25th Street Drainage Basin is a relatively small enclosed basin in West Colorado Springs containing approximately 500 acres. It is bounded on the South by Fountain Creek, on the East by 20th Street extended along the ridge through Friendship Lane up to Mesa Road, and on the West along 27th Street extended along the ridge through Pioneer Lane and Crown Ridge Drive up to Mesa Road.

Topographically, the basin is an elongated, steep sided bowl. The upper end has a relatively level portion in the center with high steep hills on the West, North, and East sides. The lower end widens out and has flatter grades on the East side.

A small detention reservoir exists at the intersection of King Street and 25th extended. It is assumed that this reservoir will stay in place as a safety valve until such time as the drainage facilities below there are constructed. This reservoir now has less than one half of its original capacity since the developer above here has filled in King Street and all the land above King Street. The drainage system has been designed on the basis of the reservoir being eliminated.

Runoff in the basin is high and rapid due to the steep slopes and the relatively impervious character of the underlying soil. Nearly all of the development found in this basin is in the low relatively flat areas. Practically no development has taken place on the steep slopes and this report assumes that when it does develop it will be on the basis of large lots. The flatter undeveloped land will probably develop into standard subdivision lots.

This area has a history of flood damage to homes and the reservoir was constructed for flood control purposes. There has been flood damage even after the reservoir was constructed.

## INTERNAL DRAINAGE

The upper end of the basin will be considered that portion above Cache La Poudre Street. There is approximately 150 CFS developed in this area and one street will not have the capacity to carry all of this flow. The valley is fairly narrow through this area, and if it is not possible to plat two parallel streets to carry the water, it will be necessary to construct storm sewer or an open ditch. Drainage easements will be needed from the upper Mesa to route the water into the streets.

A drainage channel now exists from the reservoir outlet to St. Vrain Street. With the elimination of the reservoir, this channel will need to be platted as a drainage easement and will need to be enlarged and improved.

INTERNAL DRAINAGE - Cont'd.

A storm sewer system exists at Thorndale Park which presently drains the area including the existing drainage ditch. It is proposed to construct a completely new underground system from the outfall of the ditch at St. Vrain Street and carry this down 24th Street to Fountain Creek. The existing system from Thorndale Park, which comes down 23rd Street, will be utilized to drain the area adjacent to it.

A new underground system will need to be installed down 20th Street to intercept the drainage from the Eastern end of the lower drainage basin.

OUTFALL POINTS

Outfall points will be at the intersections of 24th Street, 23rd Street, and 20th Street with Fountain Creek. The major flow will be down 24th Street since it collects water from the upper basin as well as the lower basin.

COST ESTIMATE

<u>Item</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
15" RCP	545 L.F.	\$ 5.81	\$ 3,166.45
21" RCP	530	8.69	4,605.70
74" RCP	445	10.04	4,467.80
27"	950	11.59	11,010.50
36"	290	18.44	5,347.60
42"	320	23.16	7,411.20
48"	670	29.40	19,698.00
54"	1780	32.70	58,206.00
60"	330	42.13	13,902.90
66"	990	59.54	58,944.60
Paved Slabs	150	40.00	6,000.00
Trickle Culverts	150	3.45	517.50
Asphalt Replacement	7807 sq. yds.	2.00	15,614.00
M. H. Std.	5	350.00	1,750.00
M.H. Special	6	600.00	3,600.00
Inlets	32	300.00	9,600.00
Ditch Headwalls	1	750.00	750.00
Ditch, Concrete lined	1600	9.00	14,400.00
			<hr/>
		Sub Total	\$238,992.25
		Plus 10% Contingency	<u>23,899.22</u>
		Total Basin Cost	\$262,891.47

This cost is based upon the streets carrying all of the water in the upper basin.

$$\frac{\$262,891.47}{500 \text{ acres}} = \$525.00 \text{ per acre}$$

The lower basin is primarily a platted area with about 70% of the land already developed. This is the area where most of the new construction would need to take place and the land would not be subject to drainage fees.

Considering the upper part of the basin as a unit, the unit costs would be much less than that for the entire basin. If this area is platted with dual drainage streets, the costs could be estimated as follows:

900' concrete ditch @ \$9.00	=	\$8,100.00
Misc. drainage Easement Improvement	=	<u>1,900.00</u>
		\$10,000.00

$\frac{\$10,000.00}{125 \text{ acres}} = \$ 80.00 \text{ per acre}$

The actual costs on this could be lower, depending upon the method and route the developer uses to carry his water.

If the area cannot be platted with two streets to carry the water, additional ditch or piping would need to be installed.

900' concrete lined ditch @ 9.00	=	\$ 8,100.00
2000' concrete " " @ 5.00	=	10,000.00
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$\frac{\$20,000.00}{125 \text{ acres}} = \$160.00 \text{ per acre}$

Final cost estimates cannot be made until the area is platted and the developer submits a drainage report for his area. I would recommend that the developer be held responsible to install any drainage facilities that fall within the upper basin. The cost estimates would be a part of his drainage report, which would be approved prior to City Council approval of his subdivision.

Since the method of platting is unknown at present, it is recommended that the fee be fixed at \$160/acre.



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12	15	18	21	24	27	30	33	36	42	48	54	60	66	72	78	84	90	96	Inlets	Mt			
																			L	-	Std	Sp	

Totals

Scheme \_\_\_\_\_

Date \_\_\_\_\_

R.C.P. STORM DRAIN  
(Includes Inlet Piping)

Quantity

Unit - L.F.

Unit  
price

Amount

12"

15"

18"

21"

24"

27"

30"

33"

36"

39"

42"

48"

54"

60"

66"

72"

78"

84"

90"

96"

Asphalt Replacement

Manholes Std.

Manholes Special

Inlets

Inlet Extensions

Ditch Headwalls

Ditch Concrete Lined

Ditch - Greenbelt

Reservoirs

Box Culverts

Contingencies

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Topographically, the basin is an elongated, steep sided bowl. The upper end has a relatively level portion in the center with high steep hills on the West, North, and East sides. The lower end widens out and has flatter grades on the East side.

A small detention reservoir exists at the intersection of King Street and 25th extended. It is assumed that this reservoir will stay in place as a safety valve until such time as the drainage facilities below there are constructed. This reservoir now has less than one half of its original capacity since the developer above here has filled in King Street and all the land above King Street. The drainage system has been designed on the basis of the reservoir being eliminated.

Runoff in the basin is high and rapid due to the steep slopes and the relatively impervious character of the underlying soil. Nearly all of the development found in this basin is in the low relatively flat areas. Practically no development has taken place on the steep slopes and this report assumes that when it does develop it will be on the basis of large lots. The flatter undeveloped land will probably develop into standard subdivision lots.

This area has a history of flood damage to homes and the reservoir was constructed for flood control purposes. There has been flood damage even after the reservoir was constructed.

## INTERNAL DRAINAGE

The upper end of the basin will be considered that portion above Cache La Poudre Street. There is approximately 150 CFS developed in this area and one street will not have the capacity to carry all of this flow. The valley is fairly narrow through this area, and if it is not possible to plat two parallel streets to carry the water, it will be necessary to construct storm sewer or an open ditch. Drainage easements will be needed from the upper Mesa to route the water into the streets.

A drainage channel now exists from the reservoir outlet to St. Vrain Street. With the elimination of the reservoir, this channel will need to be platted as a drainage easement and will need to be enlarged and improved.

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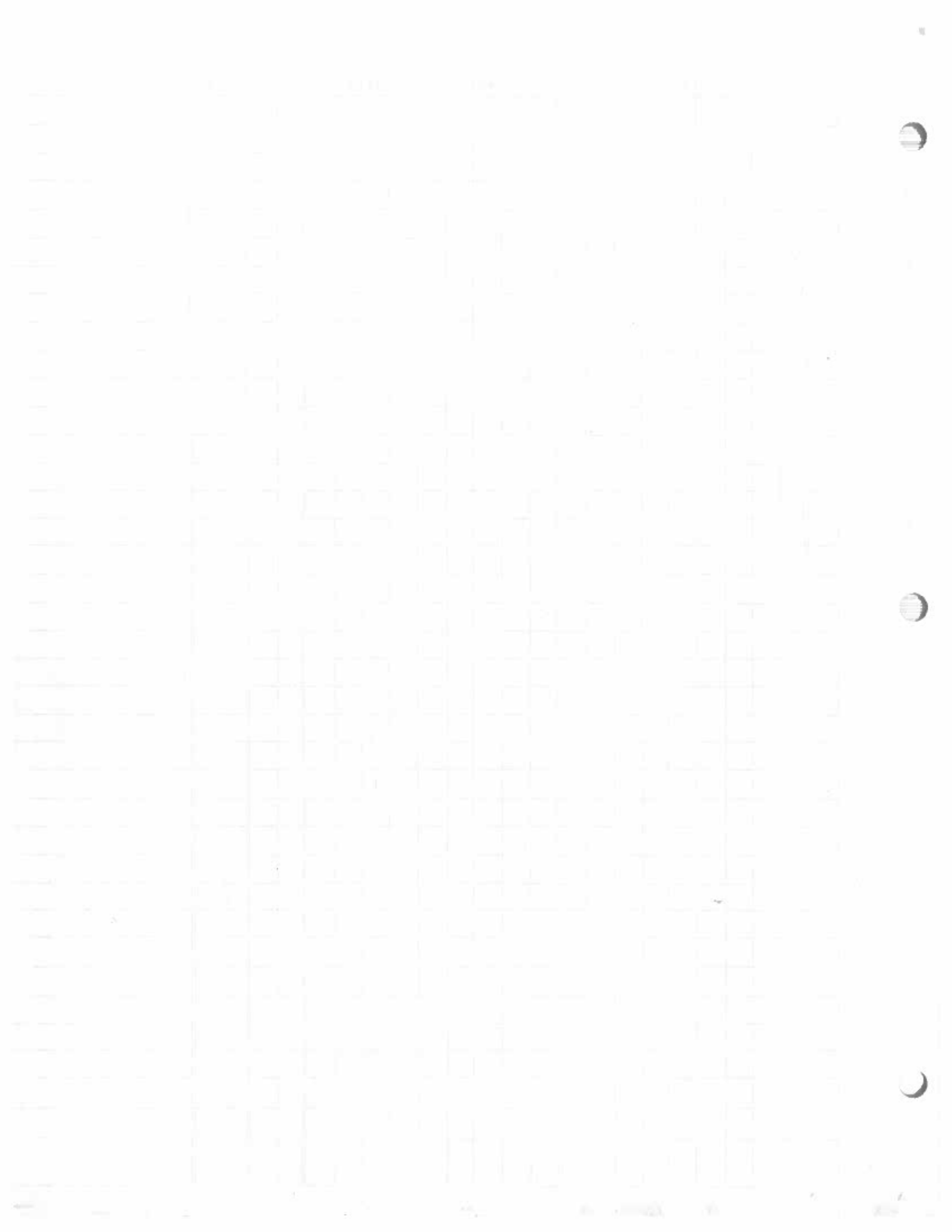


Fig		ACRE	$Q = C \cdot I \cdot A$	2" cfs	3" cfs
1	$\frac{5400}{23560} =$ $46.69 \times 9182736$	42.87	$12 \times 42.87 =$	51.4	
2	42.52 "	39.04	$12 \times 39.04 =$	46.8	6
3	40.94 "	37.59	$12 \times 37.59 =$	45.1	
4	7.26 "	<del>6.67</del> 6.67	$12 \times 6.67 =$	151 8.0	227
5	7.00 "	6.43	$12 \times 6.43 =$	7.7	
6	2.69 "	2.47	$12 \times 2.47 =$	3.0	
7	5.06 "	4.65	$12 \times 4.65 =$	5.6	
8	4.34 "	3.99	$12 \times 3.99 =$	4.8	
9	1.87 "	1.72	$12 \times 1.72 =$	2.1	
10	3.94 "	3.62	$12 \times 3.62 =$	4.3	
11	3.40 "	3.12	$12 \times 3.12 =$	3.7	
12	11.10 "	10.19	$12 \times 10.19 =$	12.2	
13	4.64 "	4.26	$12 \times 4.26 =$	5.1	
14	2.07 "	1.90	$12 \times 1.90 =$	2.3	
15	2.50 "	2.30	$12 \times 2.30 =$	2.8	
16	2.95 "	2.71	$12 \times 2.71 =$	3.3	
17	5.37 "	4.93	$12 \times 4.93 =$	5.9	
17A	3.35 "	3.08	$12 \times 3.08 =$	3.7	
17B	4.37 "	4.01	$12 \times 4.01 =$	4.8	

$Q = C \cdot I \cdot A$

C = Run-off Factor  
I = Rain fall per hour  
A = Acres.

C = .17-.19 downtown areas  
.15-.17 dense residential areas  
.125-.15 less built up residential  
.11-.125 Park & undeveloped

Fig		ACRE	Q = C I A	2" cfs	3" cfs
17C	1.30 x 9182736	1.19	1.2 x 1.19 =	1.4	
17D	2.91 "	2.67	1.2 x 2.67 =	3.2	
18	7.73 "	7.10	1.2 x 7.10 =	8.5	
19	2.24 "	2.06	1.2 x 2.06 =	2.5	
20	6.07 "	5.57	1.2 x 5.57 =	6.7	
21	2.34 "	2.15	1.2 x 2.15 =	2.6	
22	3.38 "	3.10	1.2 x 3.10 =	3.7	
23	2.32 "	2.13	1.2 x 2.13 =	2.6	
24	2.70 "	2.48	1.2 x 2.48 =	3.0	
25	6.00 "	5.51	1.2 x 5.51 =	6.6	
26	2.44 "	2.24	1.2 x 2.24 =	2.7	
27	3.46 "	3.18	1.2 x 3.18 =	3.8	
28	2.73 "	2.51	1.2 x 2.51 =	3.0	
29	5.80 "	5.33	1.2 x 5.33 =	6.4	
30	2.35 "	2.16	1.2 x 2.16 =	2.6	
31	4.28 "	3.93	1.8 x 3.93 =	7.1	
32	2.41 "	2.21	1.8 x 2.21 =	4.0	
33	4.42 "	4.06	1.8 x 4.06 =	7.3	
34	4.45 "	4.09	1.8 x 4.09 =	7.4	

Q = C I A

C = Run-off Factor  
 I = Rainfall per hour  
 A = Acres.

C = .17-.19 downtown areas  
 .15-.17 dense residential areas  
 .12-.15 less built up residential  
 .1-.25 Park & undeveloped

Fig		ACRES	$Q = C I A$	2" cfs.	3" cfs.
35	5.79 x 9.82736	5.32	1.2 x 5.32 =	6.4	
36	5.79 "	5.32	1.2 x 5.32 =	6.4	
37	4.78 "	4.39	1.2 x 4.39 =	5.3	
38	1.66 "	1.52	1.2 x 1.52 =	1.8	
39	2.80 "	2.59	1.8 x 2.59 =	4.6	
40	5.64 "	5.18	1.2 x 5.18 =	6.2	
41	4.00 "	3.67	1.2 x 3.67 =	4.4	
42	4.31 "	3.96	1.2 x 3.96 =	4.8	
43	5.55 "	5.10	1.2 x 5.10 =	6.1	
44	4.26 "	3.91	1.2 x 3.91 =	4.7	
45	2.94 "	2.70	1.2 x 2.70 =	3.2	
46	7.23 "	6.64	1.2 x 6.64 =	8.0	
47	4.32 "	3.97	1.2 x 3.97 =	4.8	
48	4.37 "	4.01	1.2 x 4.01 =	4.8	
49	3.94 "	3.62	1.2 x 3.62 =	4.3	
50	3.98 "	3.65	1.2 x 3.65 =	4.4	
51	4.20 "	3.86	1.2 x 3.86 =	4.6	
52	4.27 "	3.92	1.2 x 3.92 =	4.7	

$Q = C I A$

C = Run-off Factor  
 I = Rain fall per hour  
 at ACRES.

C = .17-.19 downtown areas  
 .15-.17 dense residential areas  
 .125-.15 less built up residential  
 .1-.125 Park & undeveloped

FIG		ACRE	$Q = C \cdot I \cdot A$	2" cfs	3" cfs
53	4.3 ✓ x 9.182736	3.97	1.2 x 3.97 =	4.8	
54	4.40 "	4.04	1.2 x 4.04 =	4.8	
55	4.49 "	4.12	1.2 x 4.12 =	4.9	
56	4.80 "	4.41	1.2 x 4.41 =	5.3	
57	4.67 "	4.29	1.2 x 4.29 =	5.1	
58	4.23 "	3.88	1.2 x 3.88 =	4.7	
59	4.10 "	3.76	1.2 x 3.76 =	4.5	
60	3.50 "	3.21	1.2 x 3.21 =	3.8	
61	4.00 "	3.67	1.2 x 3.67 =	4.4	
62	6.02 "	5.53	1.2 x 5.53 =	6.6	
63	4.30 "	3.95	1.8 x 3.95 =	7.1	
64	3.89 "	3.57	1.8 x 3.57 =	6.4	
65	1.70 "	1.56	1.8 x 1.56 =	2.8	
66	2.19 "	2.01	1.8 x 2.01 =	3.6	
67	3.38 "	3.10	1.8 x 3.10 =	5.6	
68	3.82 "	3.51	1.8 x 3.51 =	6.3	
69	3.85 "	3.54	1.8 x 3.54 =	6.4	
70	4.44 "	4.08	1.8 x 4.08 =	7.3	
71	5.85 "	5.37	1.8 x 5.37 =	9.7	

$Q = C \cdot I \cdot A$

C = Run-off Factor  
 I = Rain fall per hour  
 A = ACRES.

C = .17-.19 downtown areas  
 .15-.17 dense residential areas  
 .125-.15 less built up residential  
 .1-.125 Park & undeveloped



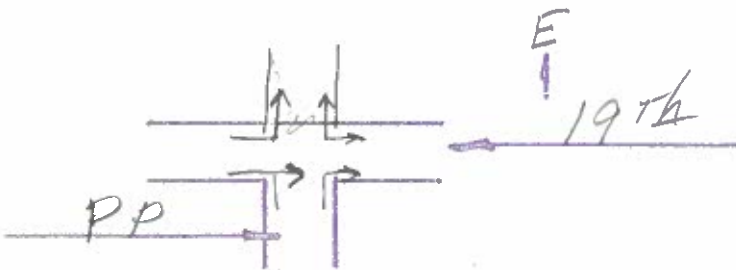
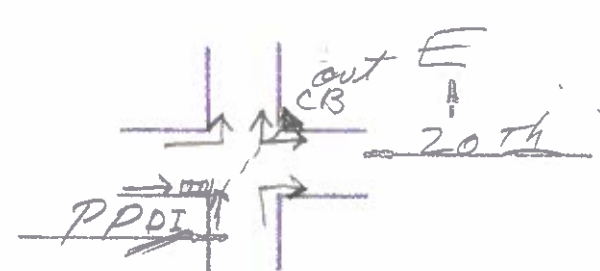
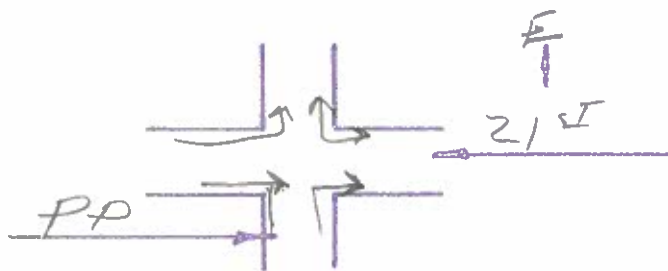
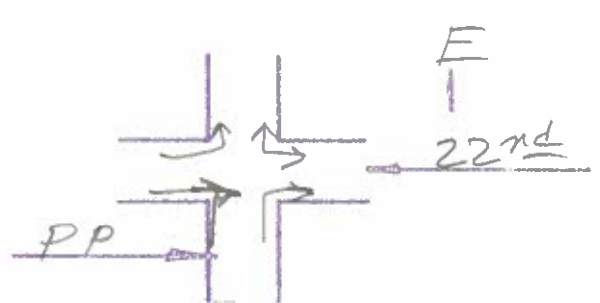
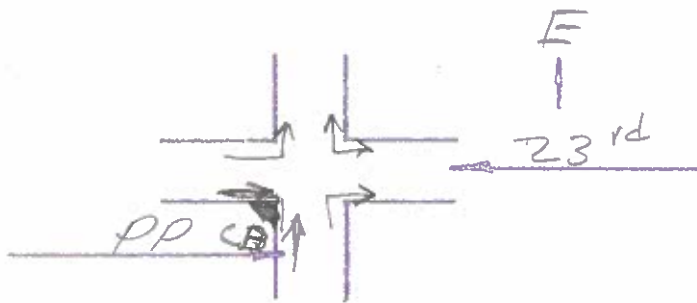
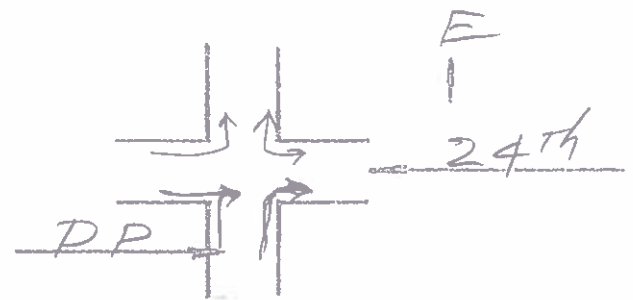
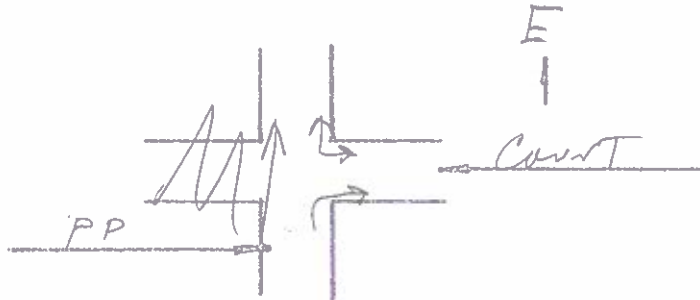
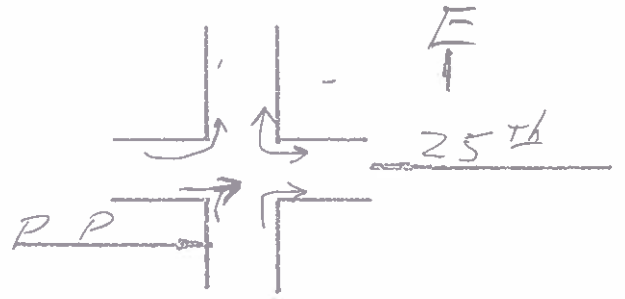
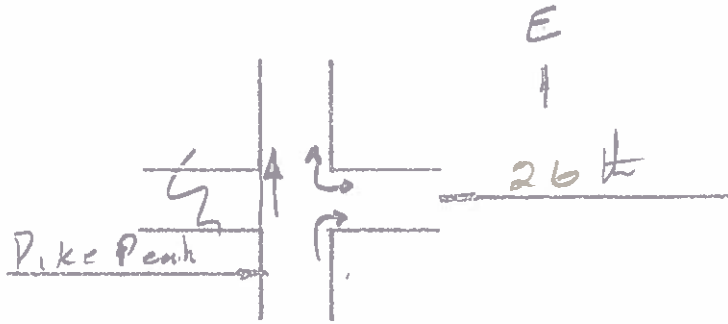
Fig		ACRE	Q = C I A	2" cfs	3" cfs
72	5.25 x .9182736	4.82	18 x 4.82 =	8.6	
73	5.21	4.78	18 x 4.78 =	8.6	
74	4.50	4.13	18 x 4.13 =	7.4	
75	5.13	4.71	18 x 4.71 =	8.5	
76	5.23	4.80	18 x 4.80 =	8.6	
77	5.34	4.90	18 x 4.90 =	8.8	
78	6.89	6.33	18 x 6.33 =	11.4	
79	2.40	2.20	18 x 2.20 =	4.0	
80	2.50	2.30	18 x 2.30 =	4.1	
81	4.66	4.28	18 x 4.28 =	7.7	
82	4.32	3.97	18 x 3.97 =	7.1	
83	3.60	3.31	18 x 3.31 =	6.0	
84	4.02	3.69	18 x 3.69 =	6.6	
85	3.73	3.43	18 x 3.43 =	6.2	
86	2.61	2.40	18 x 2.40 =	4.3	
87	3.18	2.92	18 x 2.92 =	5.3	

Q = C I A

C = Run-off Factor  
 I = Rain fall per hour  
 A = Acres.

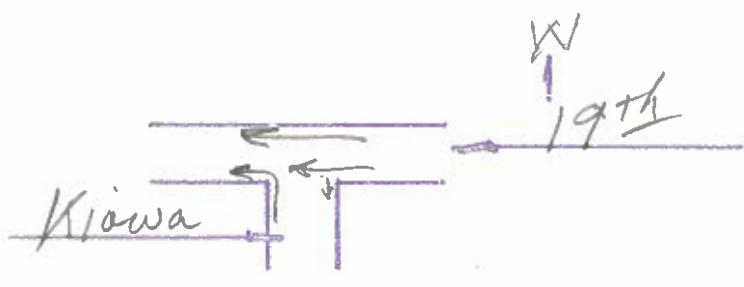
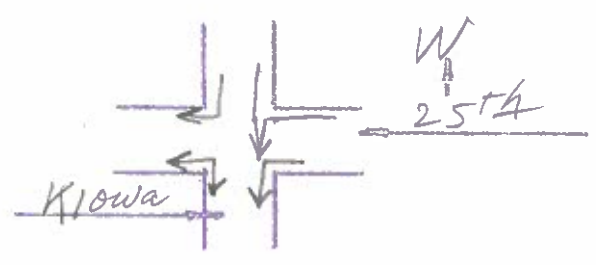
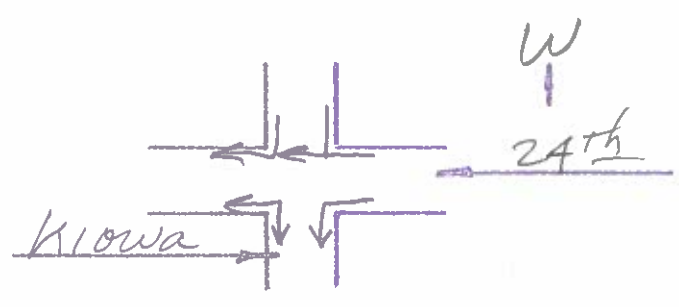
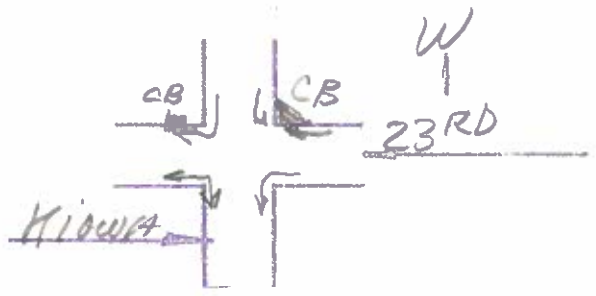
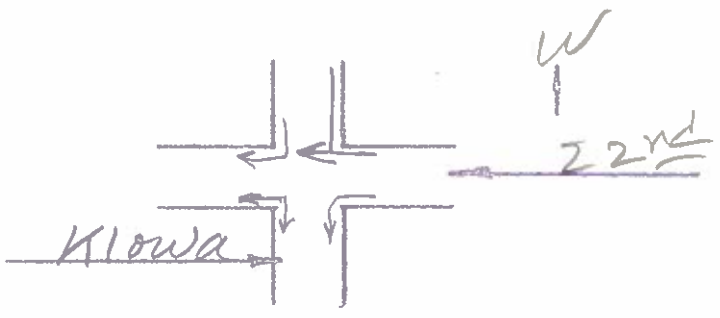
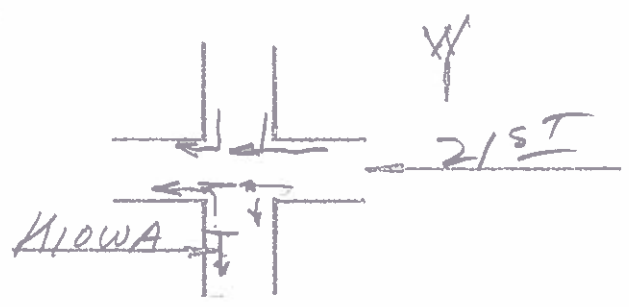
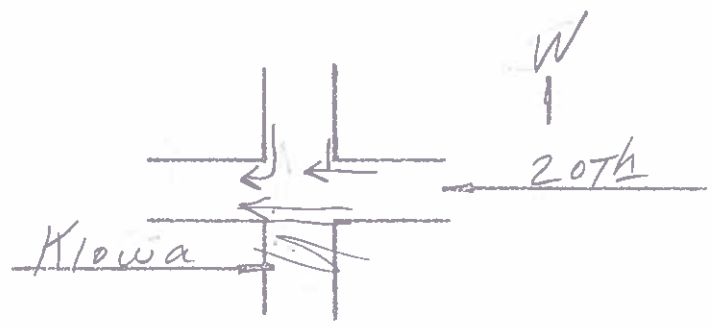
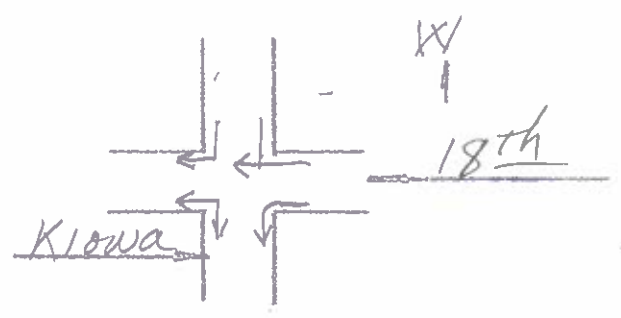
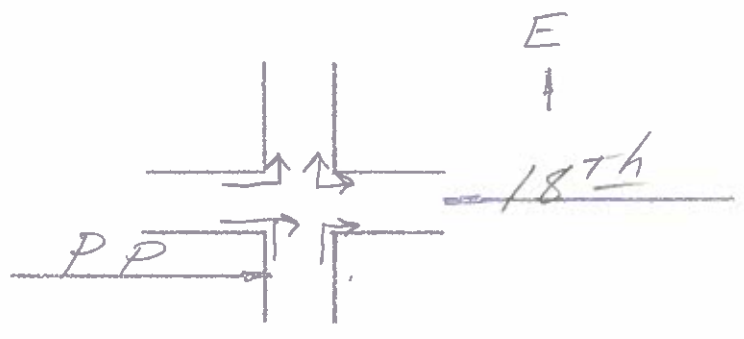
C = .17-.19 downtown areas  
 .15-.17 dense residential areas  
 .125-.15 less built up residential  
 .1-.125 Park & undeveloped

DRAINAGE DISTRICT 20-24 Streets



DATE 8-6-65

DRAINAGE DISTRICT \_\_\_\_\_

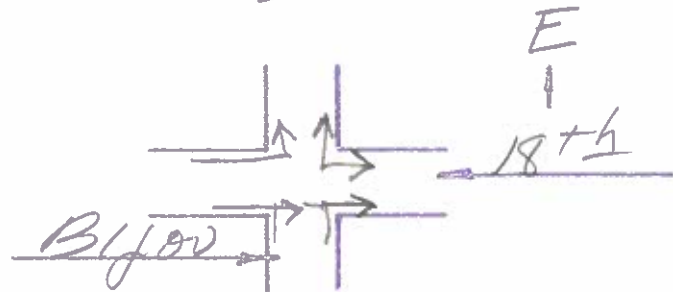
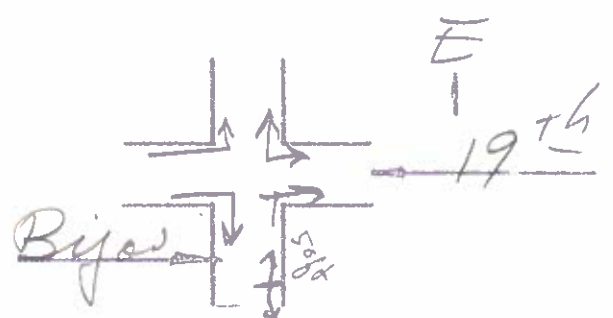
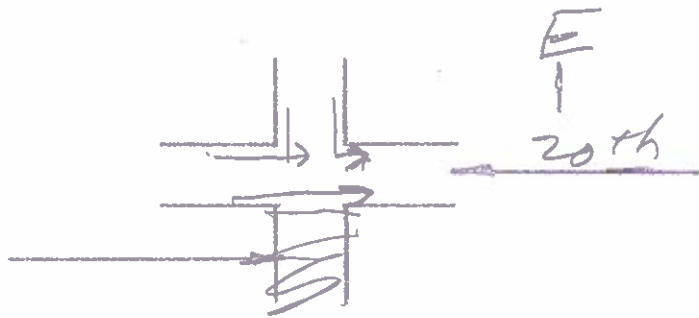
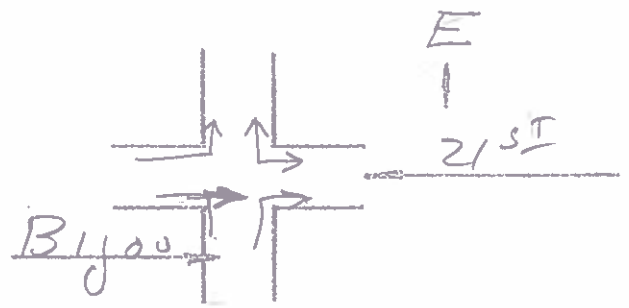
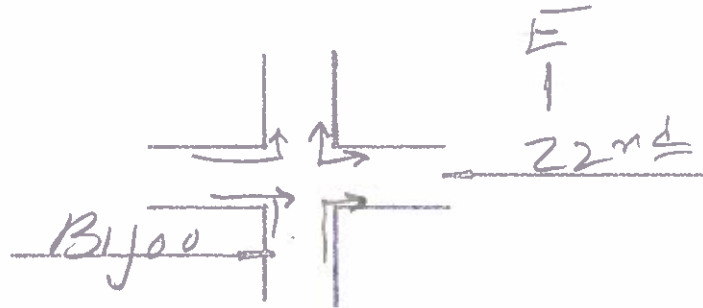
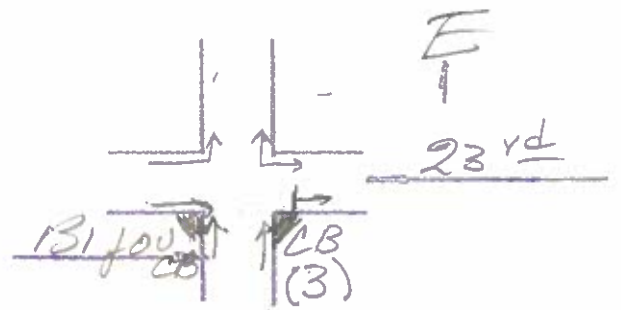
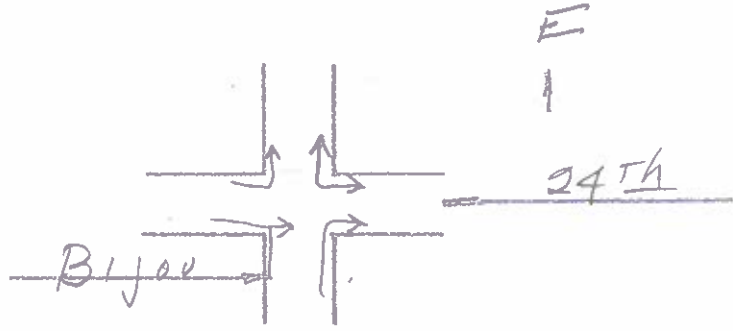


2610 W Kiowa  
High Point

DATE 8-6-65



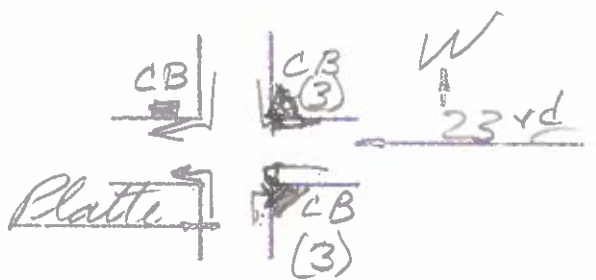
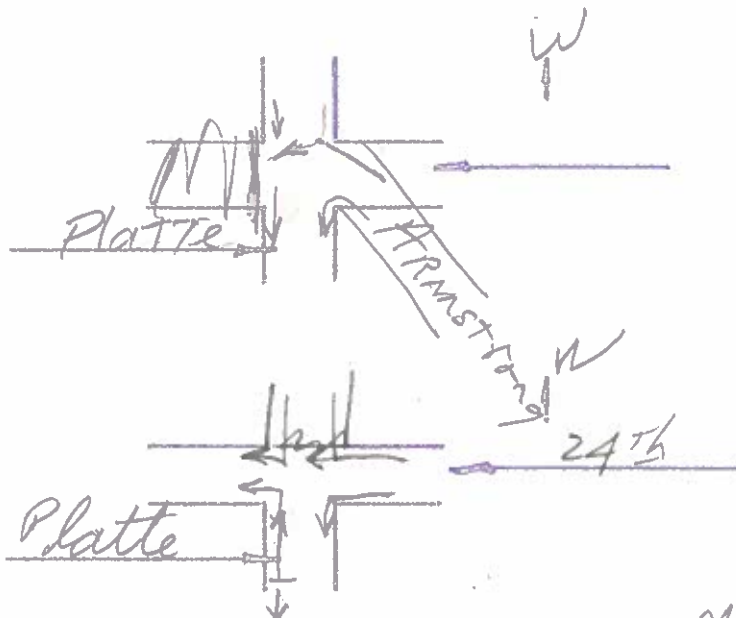
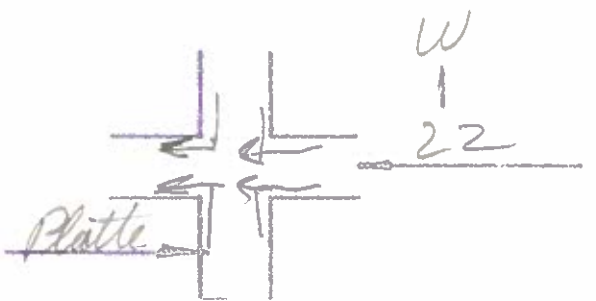
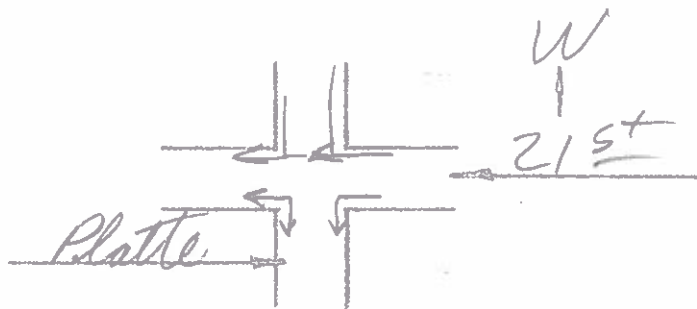
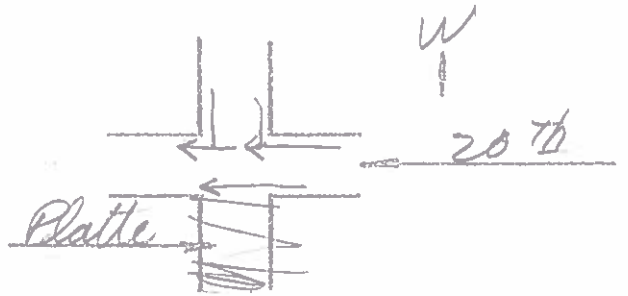
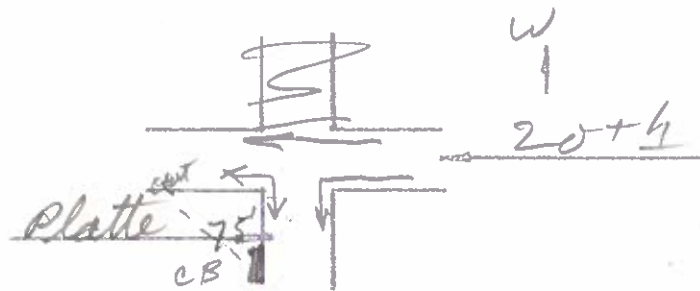
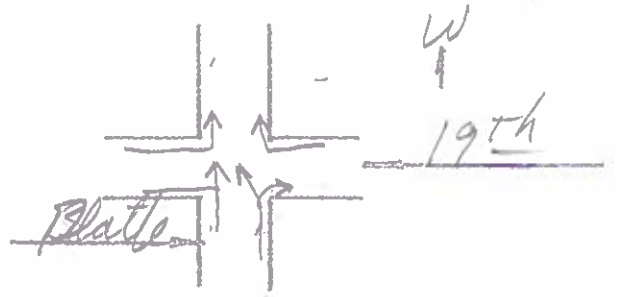
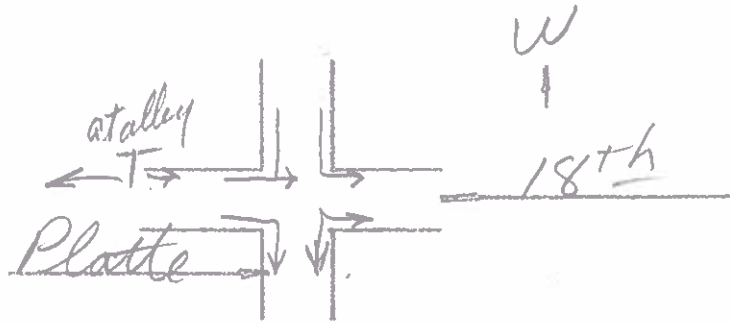
DRAINAGE DISTRICT



2621 W Bijou High Pt.

DATE 8-6-65

# DRAINAGE DISTRICT



1824 W Platte  
High Pt.

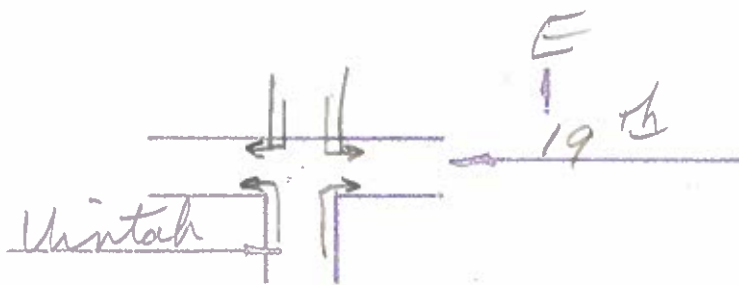
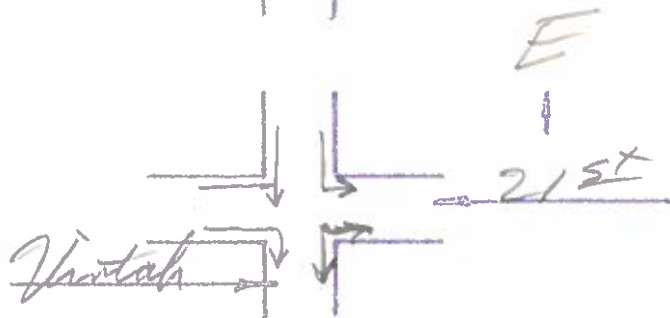
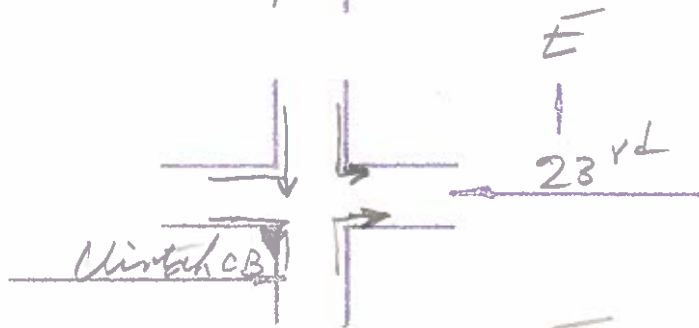
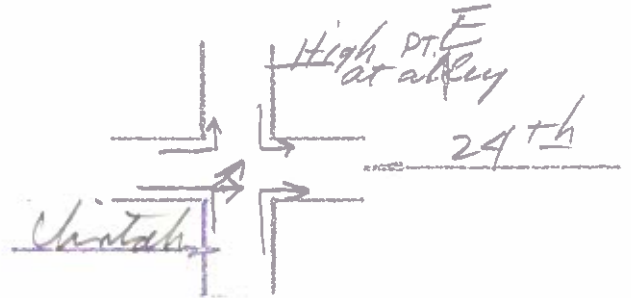
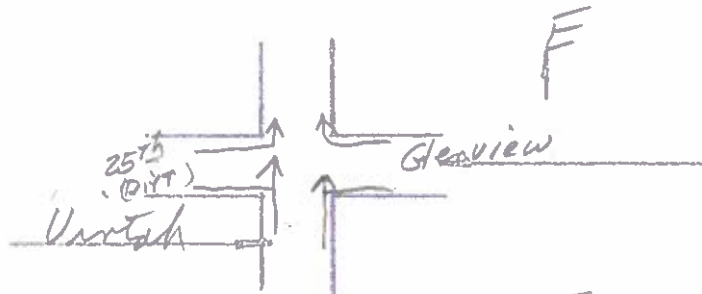
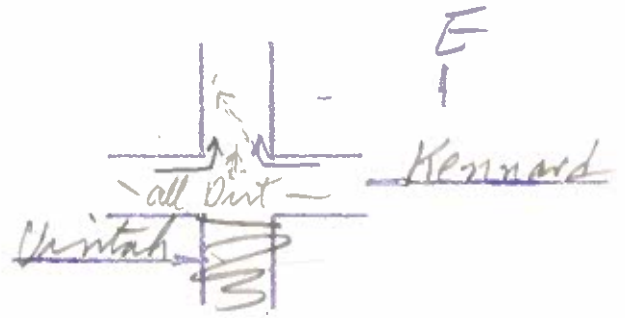
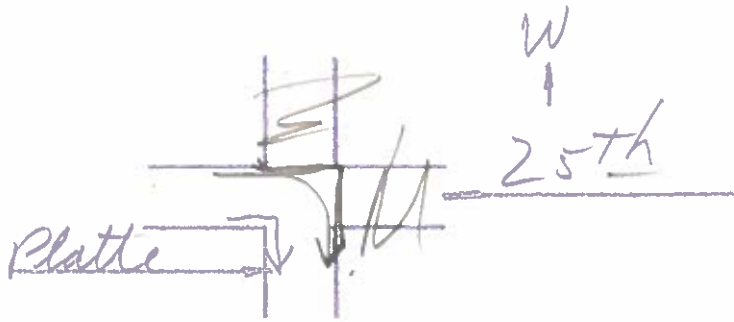
(N side) 2206 W Platte  
High Point.

2126 W. Platte  
High Point

(S side) 2213 W. Platte  
High Point

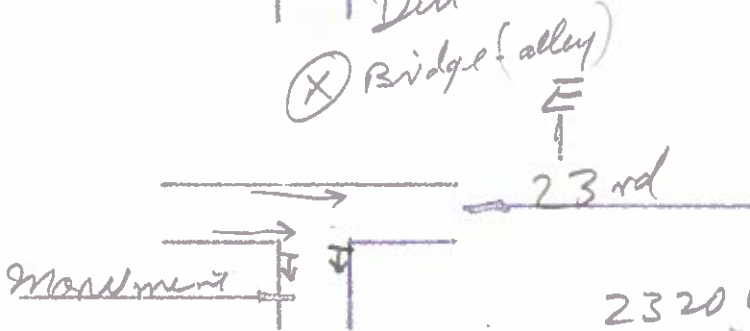
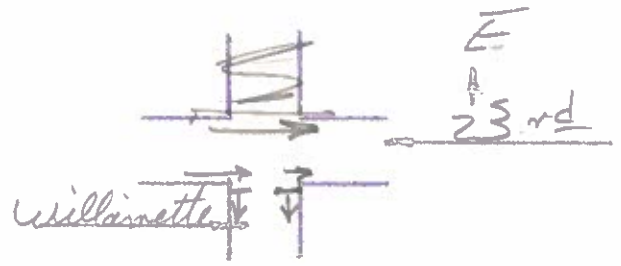
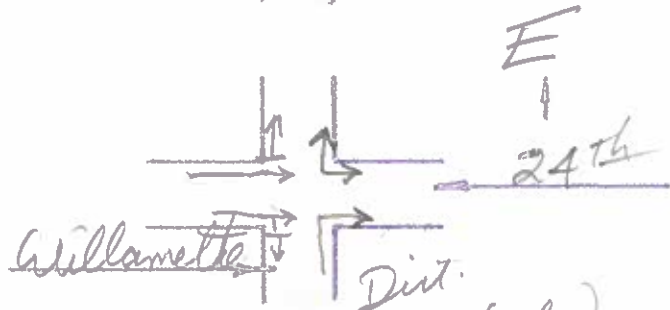
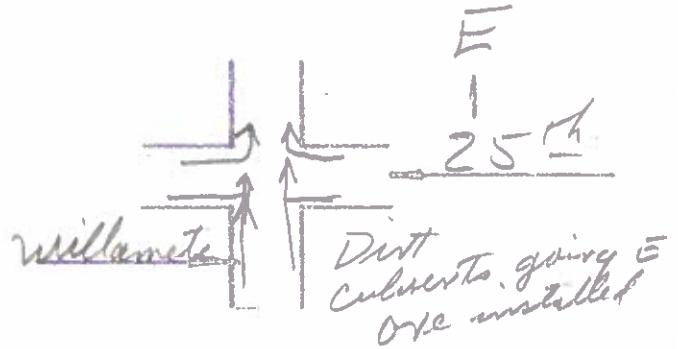
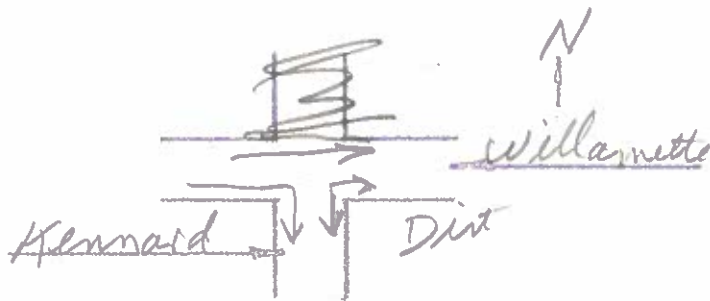
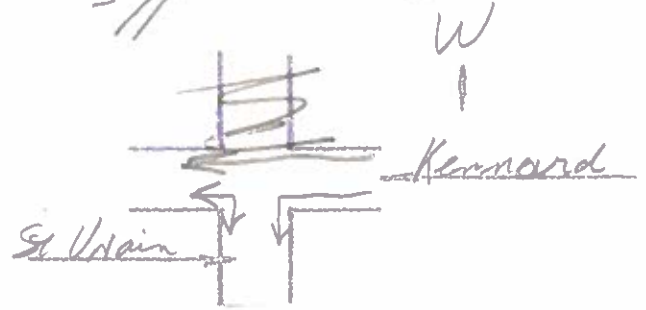
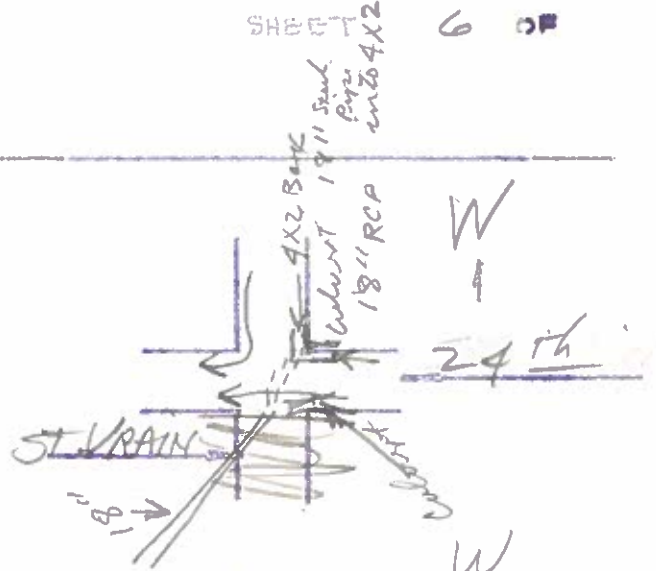
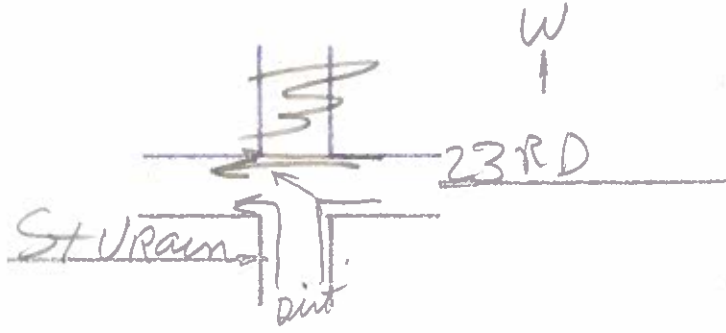
DATE 8-6-65

# DRAINAGE DISTRICT



High PTS:  
 2026 W Vintah  
 1914 " "

# DRAINAGE DISTRICT



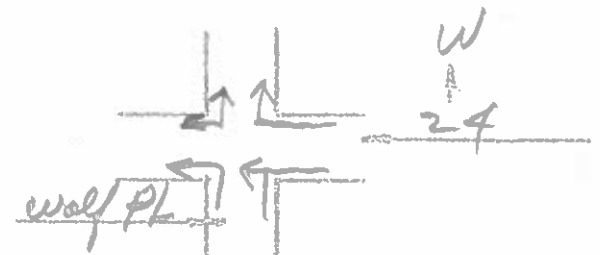
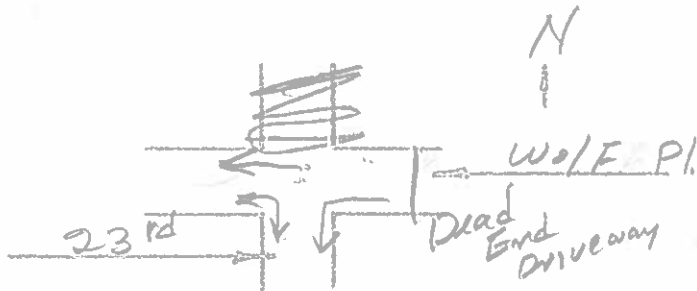
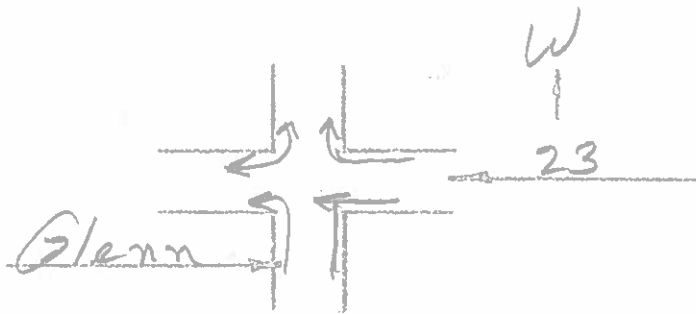
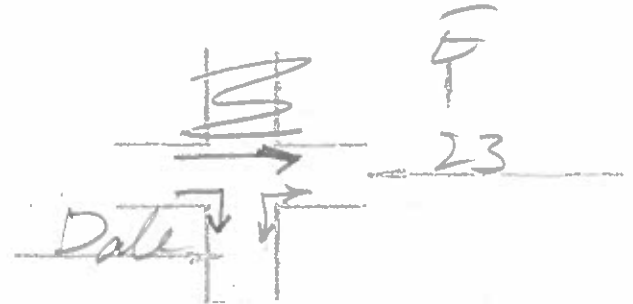
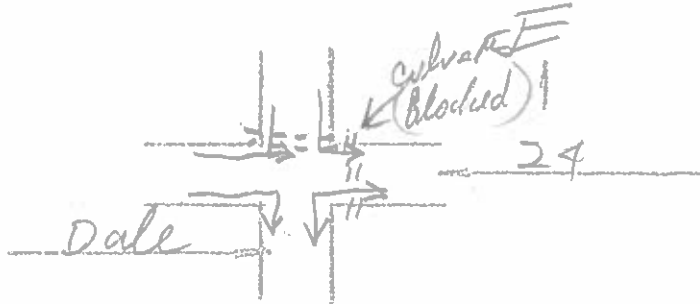
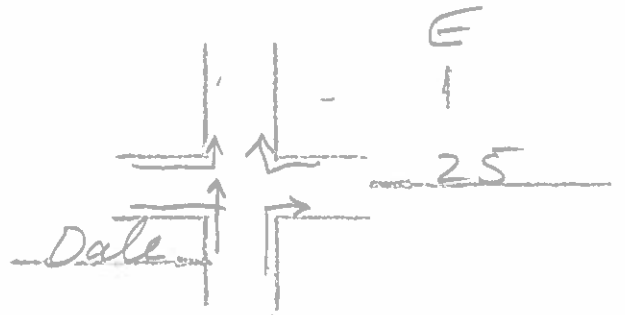
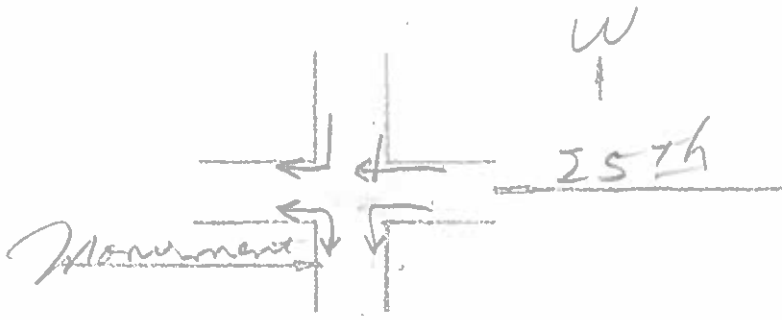
2320 W. Monument  
High pt

2323 W. Willamette  
low pt - ditch on  
W side of House

2310 W. Monument  
low pt.

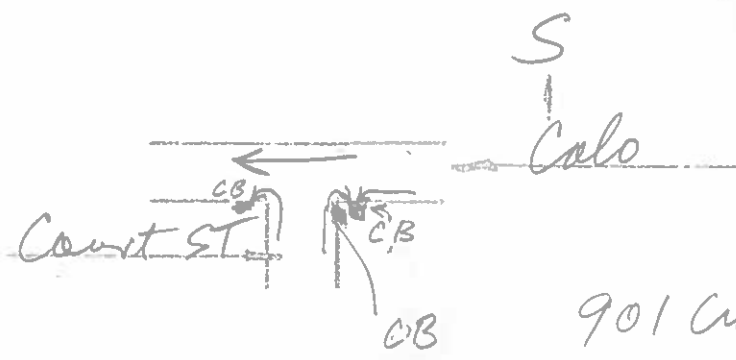
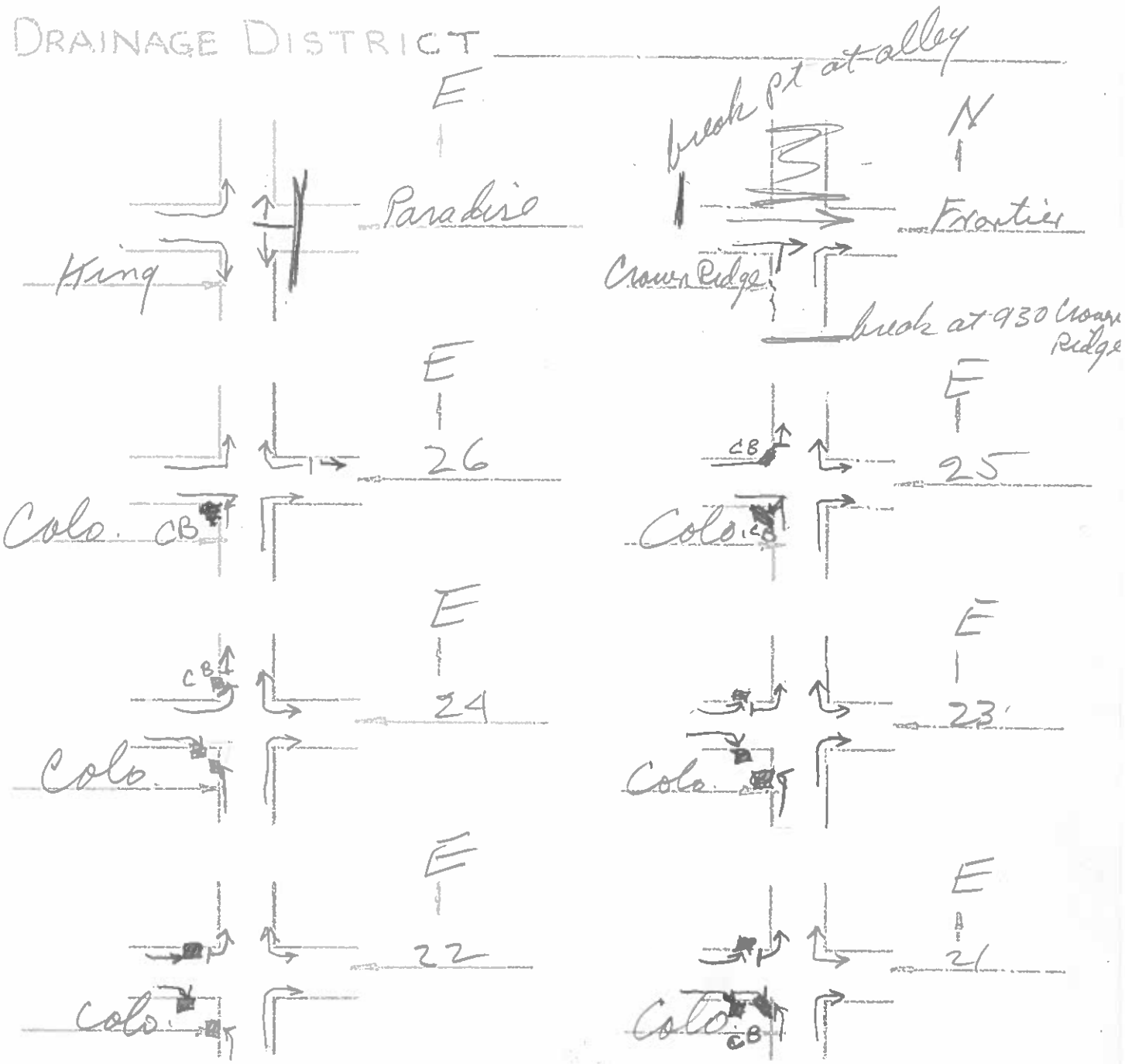
DATE 8-6-65

# DRAINAGE DISTRICT



Low Pt: alley between 24 & 23  
High pt: 2226 Glenn

# DRAINAGE DISTRICT



High Pt: 720  
 Pioneer  
 901 Crown Ridge  
 742 Crown Ridge

DATE 8-6-65

# DRAINAGE DISTRICT

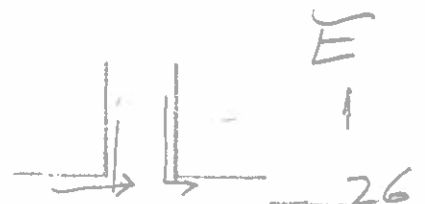


DATE \_\_\_\_\_

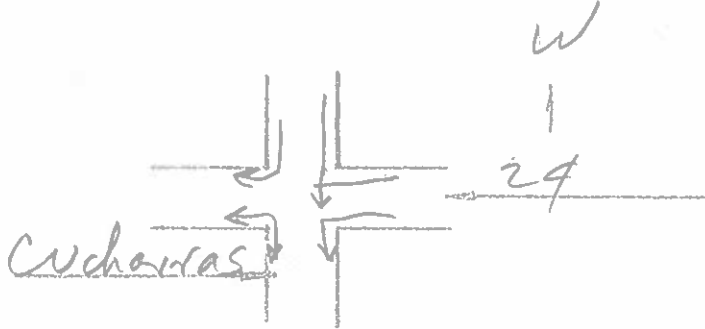
# DRAINAGE DISTRICT



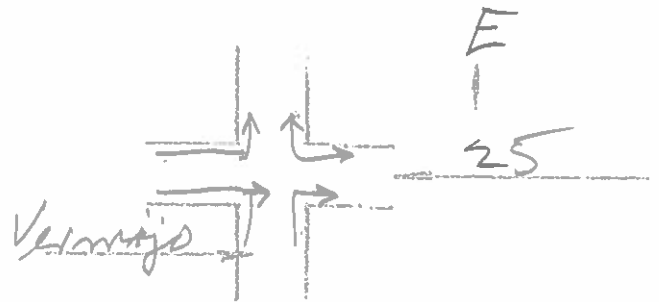
Cucharas



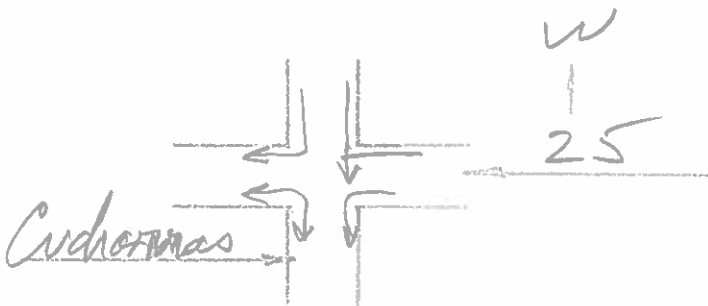
Vermija High Pt. 25 20 w Vermija



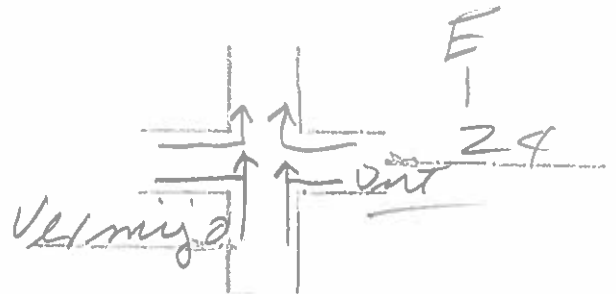
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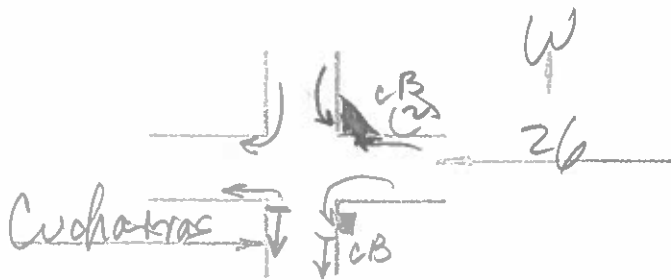
Vermija



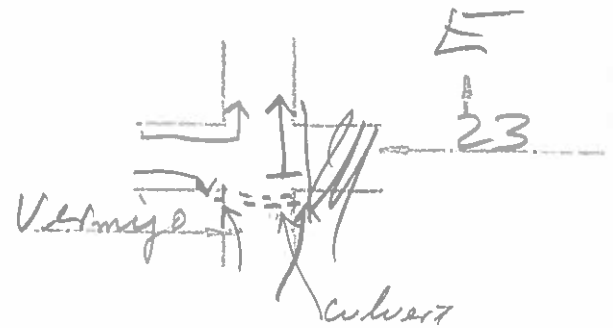
Cucharas



Vermija

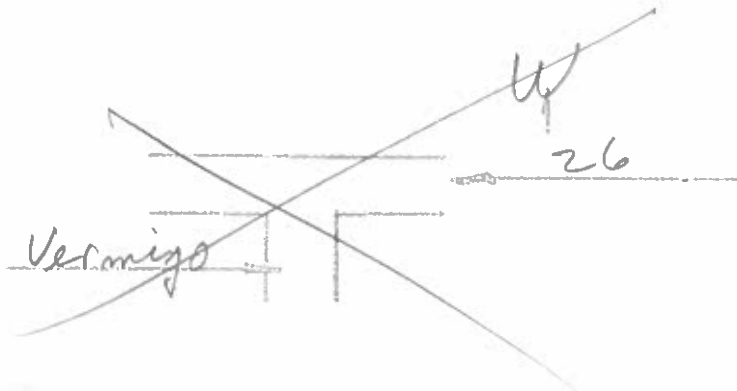


Cucharas



Vermija

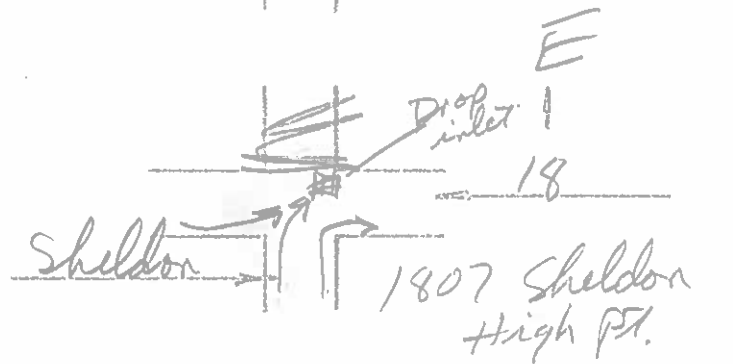
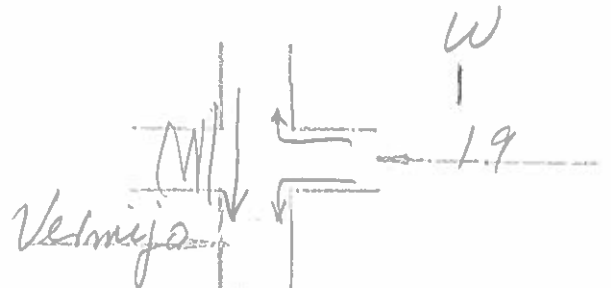
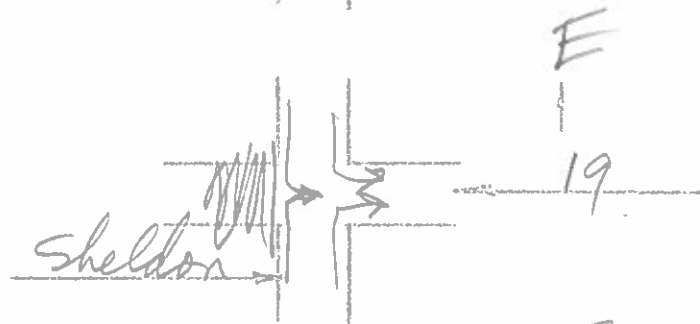
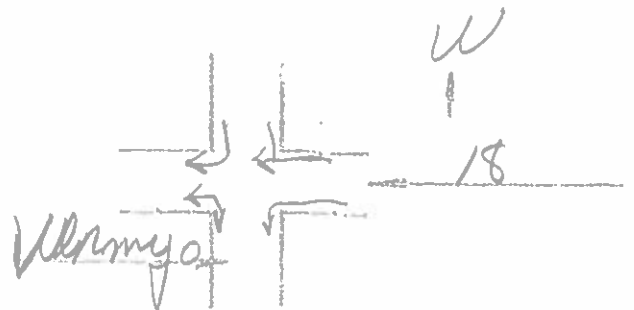
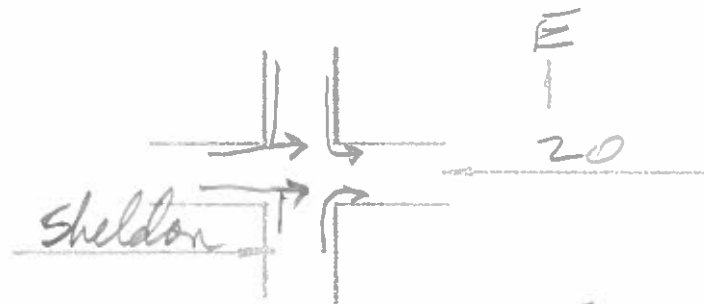
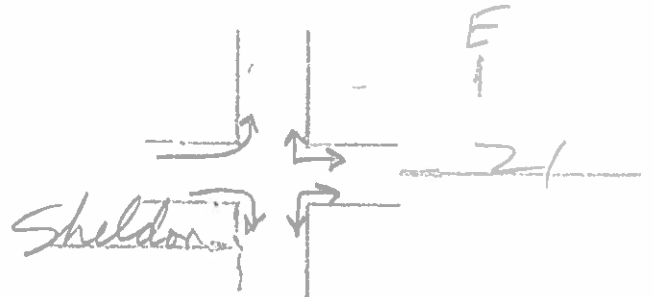
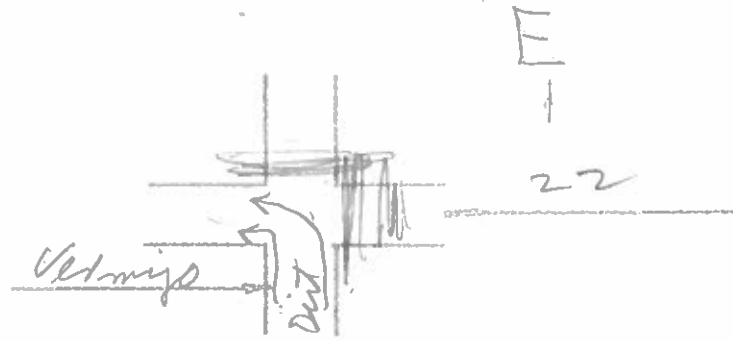
Culvert



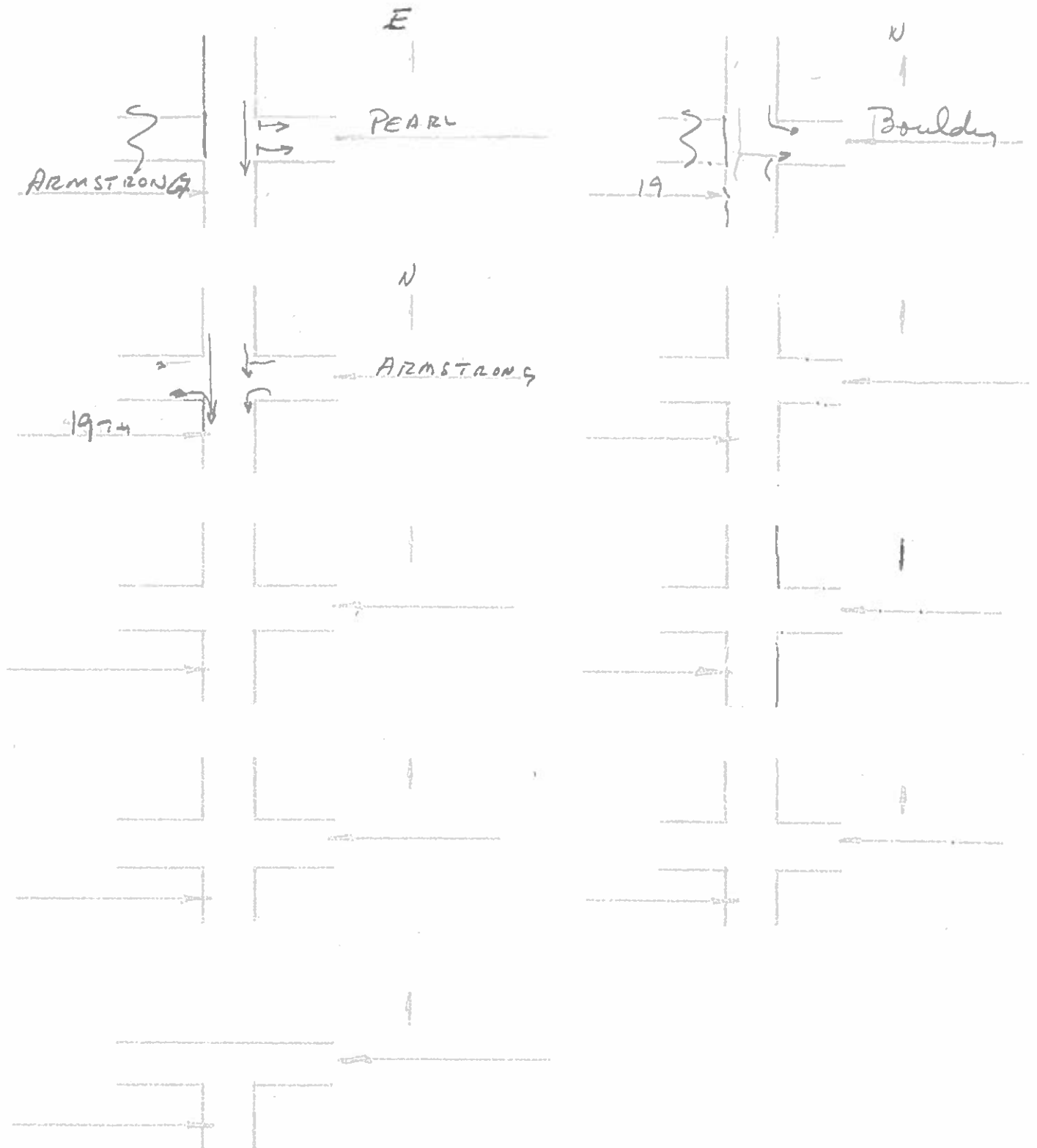
Vermija



# DRAINAGE DISTRICT

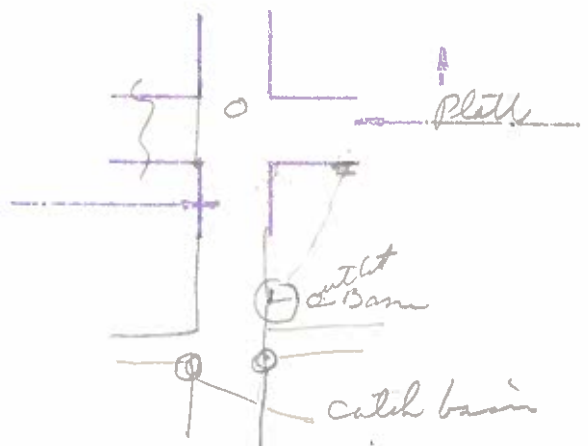
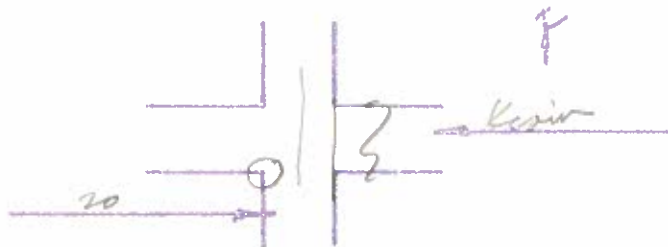
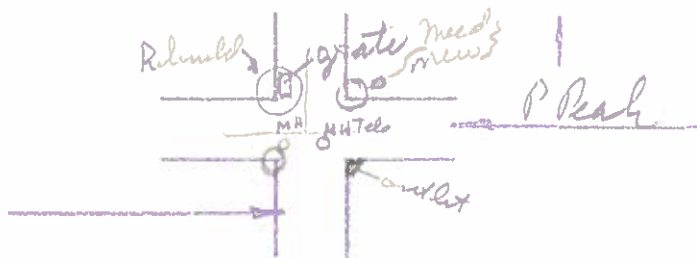
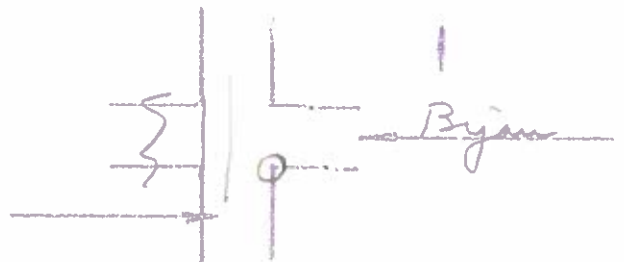
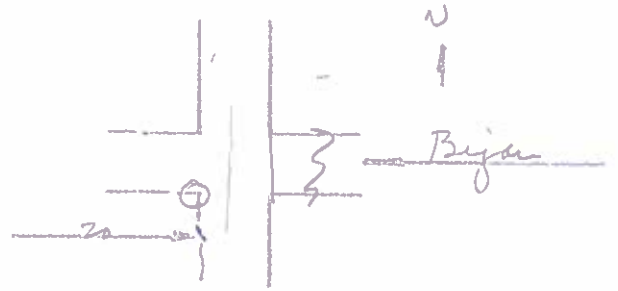
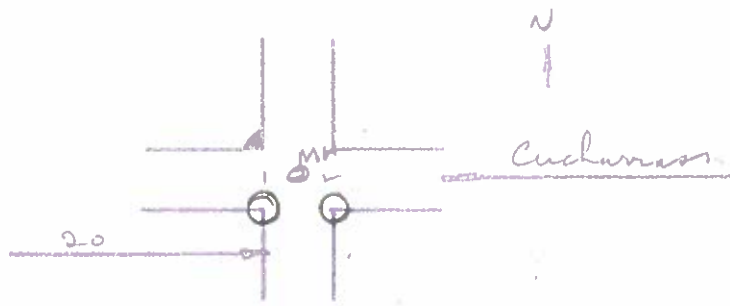


# DRAINAGE DISTRICT



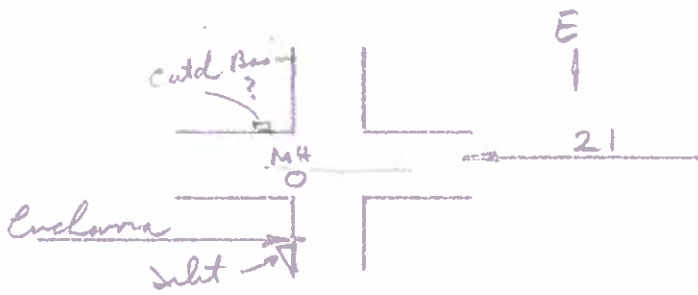
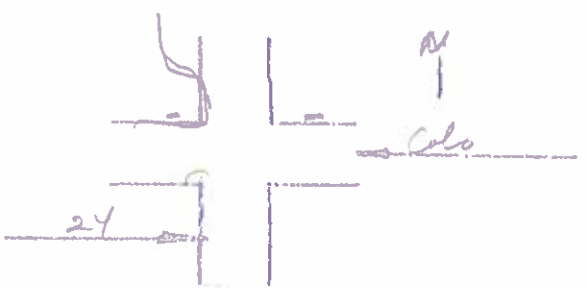
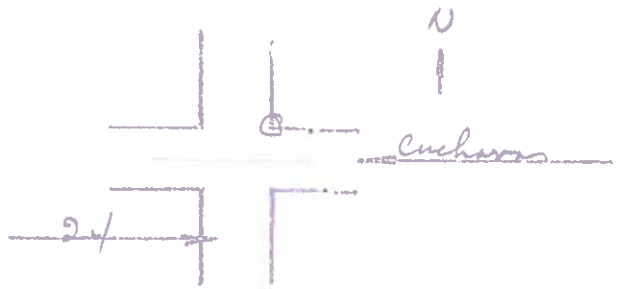
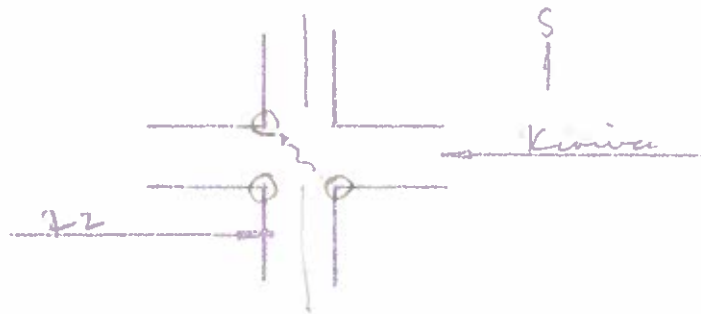
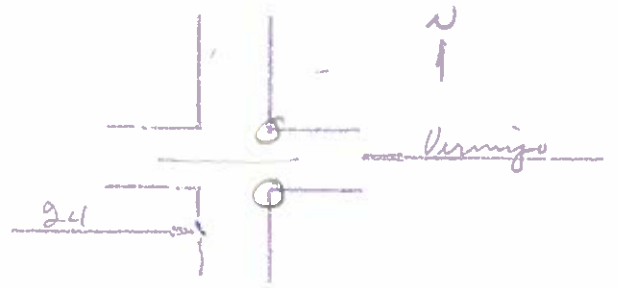
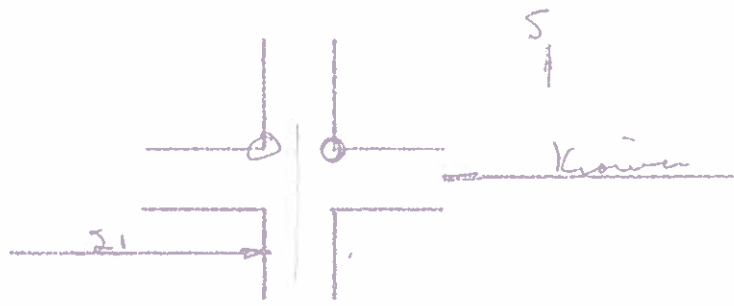
# DRAINAGE DISTRICT

20th



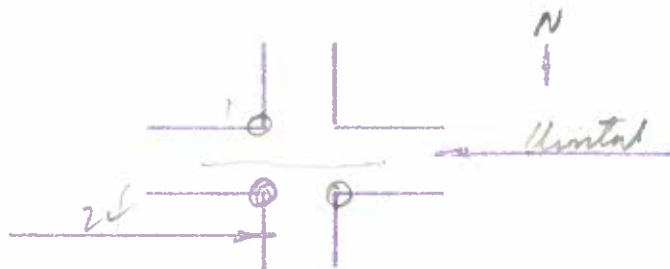
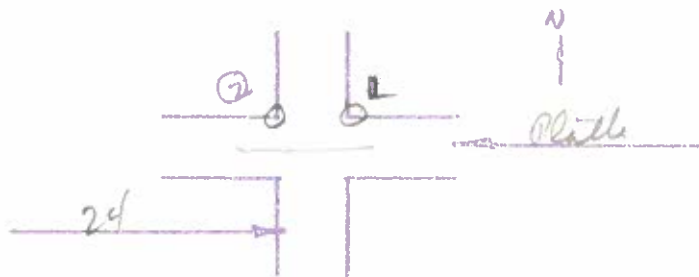
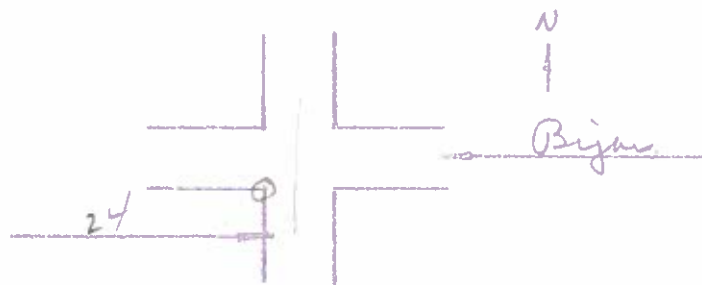
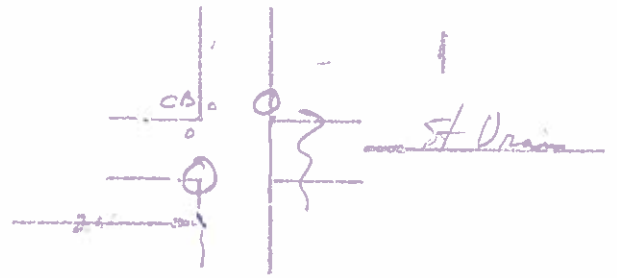
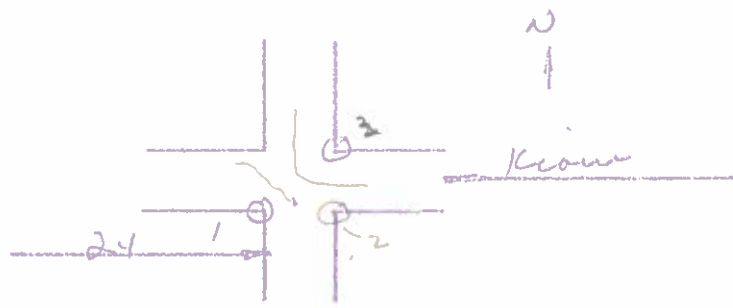
DATE

# DRAINAGE DISTRICT



DATE \_\_\_\_\_

# DRAINAGE DISTRICT \_\_\_\_\_









Hand Bks  
 Prod 12

24 th street

DISTRICT

12	15	18	21	24	27	30	33	36	42	48	54	60	66	72	78	84	90	96	Inlets	Mt		
																			1	5	1	
									500	500												Reservoir to St Drain
									370	300									4	1		St Drain to Unitat
	60								350	350									1	1		Unitat to Platte
	15								330	330									1	1		Platte to Bijou
	15								300	300									1	1		Bijou to Kiowa
	15								290	290									1	1		Kiowa to Pikes Peak
	30								340	340									1	1		Pikes Peak to Colorado
	15								350	350									1	1		Colorado to Cucharras
	30								300	300									2	1		Cucharras to Vermigo
																						Vermigo to Creek

23 rd street

	30																		1	1	1	@ 24th
	30		125																1	1	1	St Drain to Park
	15																		1			Unitat

20th Street

	30		320																2	1		Platte - Bijou
	50		450																2	1		Bijou - Kiowa
	15						290												1	1		Kiowa - Pikes Peak
	30						320												2	1		Pikes Peak - Colorado
	60								390										2	1		Colorado - Cucharras
	30								280										2	1		Cucharras - Vermigo
										40												Sheldon Ave
																						D + R G trench

Kiowa St.

	30		530																2	1		22nd to 21st
	30		500																2	1		21st to 20th

150  
 1150

									320	670	1780	330	990						1	440		
	545	530	445	950			290	470	1590	990	70								29	3	5	11



20<sup>th</sup> 24<sup>th</sup> Streets

IF RESERVOIR IS DELETED

Scheme \_\_\_\_\_

Date 8-19-65

RC.P. STORM DRAIN (Includes Inlet Piping)	Quantity	Unit - L.F	Unit Price	Amount
12"				
15"	545	LF	5.81	3166.45
18"				
21"	530		8.69	4605.70
24"	445	LF	10.04	4467.80
27"	950	LF	11.59	11010.50
30"				
33"				
36"	290	LF	18.44	5347.60
39"				
42"	<del>1470</del> 320	LF	23.16	<del>34045.20</del> 7411.20
48"	<del>670</del> 1590	LF	29.40	<del>19658.00</del> 46746.00
54"	<del>1780</del> 990	LF	32.70	<del>57586.00</del> 32373.00
60"	<del>330</del> 460	LF	42.13	<del>13902.90</del> 16359.80
66"	990	LF	59.54	58944.60
72"				
78"				
84"				
90"				
96" Paved Ford	150	LF	40.00	6000.00
Culvert under Fords.	150	LF	3.45	517.50
Asphalt Replacement <sup>2100 20 2100 150 14</sup>	7807	S y	2.00	15614.00
Manholes Std.	5	EA	350.00	1750.00
Manholes Special	6	EA	600.00	3600.00
Inlets	32	EA	300.00	9600.00
Inlet Extensions				
Ditch Headwalls	1	EA	750.00	750.00
Ditch Concrete Lined	1150	LF	9.00	10350.00
Ditch - Greenbelt	440	LF	1.00	440.00
Reservoirs				
Box Culverts				235,382.25
Contingencies 10%				17,537.40
				23,537.23
				141,500.00
Totals				<del>210706.60</del> 258,920.48