



Denver Engineering Corporation

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DESIGN CALCULATIONS

Project MADISON / WASHATCH

Detail OFFSITE BASIN A-A

Designer WJH

Date 10/16/85

Sheet 1 of 15

Checker _____

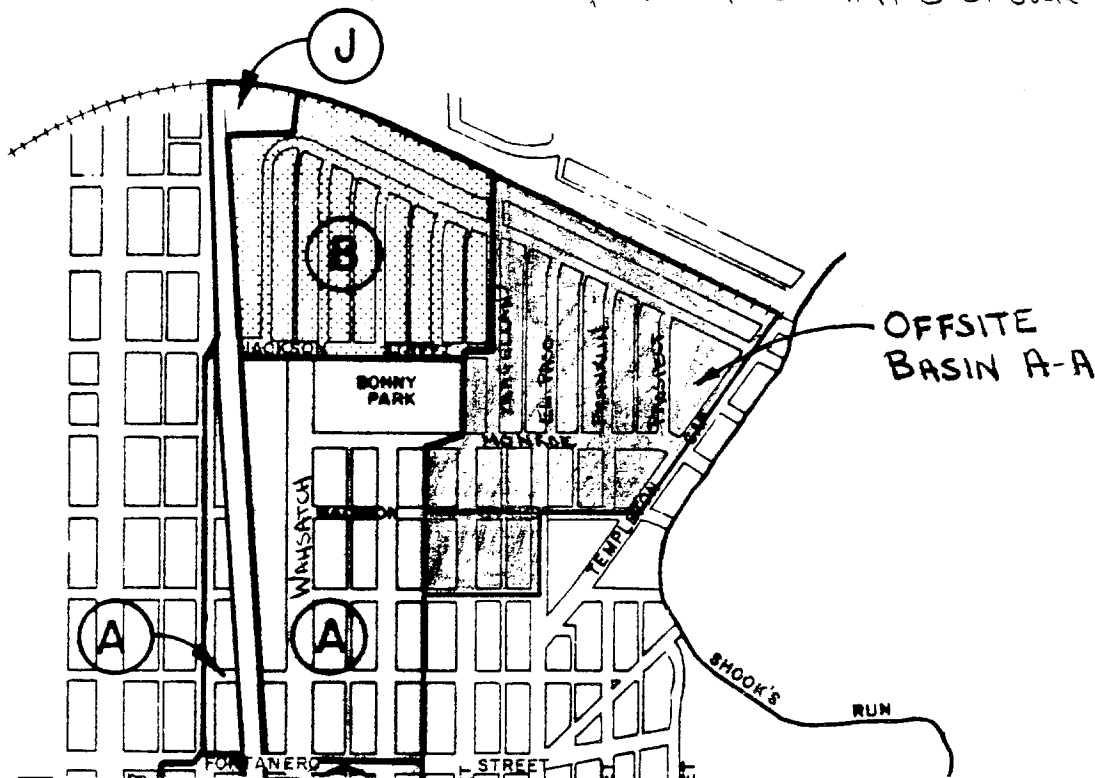
Date _____

Job No. 307.001

OFFSITE BASIN A-A

OFFSITE BASIN A-A HAS BEEN ANALYZED BECAUSE ITS FLOWS DIRECTLY CONTRIBUTE TO THE FLOODING OF THE MADISON / WASHATCH INTERSECTION.

THE LOCATION OF OFFSITE BASIN A-A IS SHOWN BELOW



SCALE: 1" = 1/4 MI.

THE MAJOR INTERSECTIONS INCLUDE:

- FRANKLIN + MONROE
- EL PASO + MONROE
- MAGELLAN + MONROE
- JACKSON + MAGELLAN
- ROYER + MONROE
- EL PASO & MADISON
- ROYER & MADISON.

THE 100 YEAR FLOWS CALCULATED FROM THIS BASIN ARE LARGE AND MUST BE INTERCEPTED BEFORE REACHING THE MADISON / WASHATCH INTERSECTION.



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OFFSITE BASIN A-A

AREA = 51.17 ACRES = 0.0799 SQ MILES

AREA STREETS = .0079 SQ MILES

AREA RESID. = .0623 SQ MILES

AREA RAILROAD ROW = 0.0097 SQ MILES (12%)

SOIL GROUP B

RESID CURVE NO = 75 PASTURE CURVE NO = 79

BASIN	AREA (SM)	SOIL TYPE	LAND USE	CURVE NO.	BASIN HT (F)	BASIN LENGTH	t_c (HRS)	$\frac{CSM}{IN}$	5YR RUNOFF	100Y RUNOFF
054	.0799	B	88% RES 12% PAST	75.5	32	2100	0.243	1005	0.4	1.3

DEL	LENGTH	SLOPE	VELOCITY (FPS)	t_c (HRS)
32	2100	1.52%	2.4 FPS (FIGURE)	0.243

$$Q_5 = (AREA \text{ SM}) (CSM/IN) (5YR \text{ RUNOFF})$$

$$Q_5 = (.0799)(1005)(0.4) = 32.1 \text{ CFS}$$

$$Q_{100} = (.0799)(1005)(1.38) = 110.8 \text{ CFS}$$

OFFSITE BASIN B-B

AREA TOTAL = 0.0422

100% RESID

SOIL TYPE B

CURVE NO = 75

BASIN	AREA (SM)	SOIL TYPE	LAND USE	CURVE NO.	BASIN HT	BASIN LENGTH	t_c	$\frac{CSM}{IN}$	5YR RUNOFF	100Y RUNOFF
052	.0422	B	100% RES	75	20'	2000	.278	960	0.4	1.3

DEL	LENGTH	SLOPE	VELOCITY	t_c
20	2000	1.0%	2.0 FPS	0.278



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$$Q_s = (.0482 \text{ SM})(960 \text{ csm/in})(0.4) = 16.20 \text{ CFS}$$

$$Q_{100} = (.0482 \text{ SM})(960 \text{ csm/in})(1.35) = 54.69 \text{ CFS}$$

OFFSITE BASIN BB FLOWS EAST AND DOESN'T CONTRIBUTE TO FLOODING
IN MADISON/WASHINGTON DRAINAGE STUDY
CHECK CURB CAPACITY OF MADISON ST FOR OFFSITE BASIN A-A
@ ROYER

30' WIDE @ 0.3% CURB HT = 7"

$$Q_{100} = 110.8 \text{ CFS}$$

CAPACITY OF MADISON

$$\begin{matrix} 0.3\% \\ 30' \text{ WIDE} \\ 7" \end{matrix} = 8.9 \text{ CFS}$$

8.9 < 110.8 No GOOD

THIS FLOW MUST BE INTERCEPTED BY INLETS
AND A SYSTEM OF STORM SEWER PIPE PRIOR TO
REACHING MADISON + ROYER

OFFSITE BASIN AA MUST BE BROKEN UP INTO SUB
BASINS CONTRIBUTING TO EACH SEPARATE INTERSECTION

BASIN MUST BE BROKEN UP INTO SUB-BASINS

SB-1 @	PROSPECT + MONROE	= .0151 SM	.0014 SM PASTURE
SB-2	FRANKLIN + MONROE	= .0134 SM	.0014 SM PASTURE
SB-3	EL PASO + MONROE	= .0151 SM	.0013 SM PASTURE
SB-4	MAGELLAN + MONROE	= .0185 SM	.0013 SM PASTURE

BASIN	AREA (SM)	SOIL TYPE	LAND USE	CURVE No.	BASIN HT	BASIN LENGTH	t_c	$\frac{\text{CSM}}{\text{IN}}$	ST ROWOFF	100 YR RUNOFF
SB-1	.0151	B	90% PAS 10% RES	75.4	18'	1000	0.107	1270	0.4	1.36
SB-2	.0134	E	10% PAS 90% RES	75.4	18'	1100	0.122	1240	0.4	1.36
SB-3	.0151	B	8.6% PAS 91.4% RES	75.4	18'	1200	0.139	1200	0.4	1.36
SB-4	.0182	B	7.1% PAS 92.9% RES	75.3	19'	1400	0.169	1140	0.4	1.35

TRY AS	10% PAS	90% RES	75.4	30'	1800	0.200	1100	0.4	1.36
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BASIN	BASIN HT	BASIN LENGTH	SCOPE	VEL	t_c (HR)
SB-1	18	1000	1.80%	2.6fps	0.107
SB-2	18	1100	1.64%	2.5fps	0.122
SB-3	18	1200	1.50%	2.4fps	0.139
SB-4	19	1400	1.36%	2.3fps	0.169
AS 1 BASIN	30'	1800	1.61%	2.5fps	$t_c = 0.200$

$$\begin{aligned} \text{SB-1} \quad 5 \text{ YR FLOW} &= (0.0151)(1270)(0.4) = 7.67 \text{ CFS} \\ 100 \text{ YR FLOW} &= (0.0151)(1270)(1.36) = 26.10 \text{ CFS} \end{aligned}$$

$$\begin{aligned} \text{SB-2} \quad 5 \text{ YR FLOW} &= (0.0134)(1240)(0.4) = 6.65 \text{ CFS} \\ 100 \text{ YR FLOW} &= (0.0134)(1240)(1.36) = 23.60 \text{ CFS} \end{aligned}$$

$$\begin{aligned} \text{SB-3} \quad 5 \text{ YR FLOW} &= (0.0151)(1200)(0.4) = 7.25 \text{ CFS} \\ 100 \text{ YR FLOW} &= (0.0151)(1200)(1.36) = 24.64 \text{ CFS} \end{aligned}$$

$$\begin{aligned} \text{SB-4} \quad 5 \text{ YR FLOW} &= (0.0182)(1400)(0.4) = 10.19 \text{ CFS} \\ 100 \text{ YR FLOW} &= (0.0182)(1400)(1.36) = 34.40 \text{ CFS} \end{aligned}$$

$$\begin{aligned} \text{AS 1 BASIN} \quad 5 \text{ YR FLOW} &= (0.0618)(1100)(0.4) = 27.19 \text{ CFS} \\ &= (0.0618)(1100)(1.36) = 92.45 \text{ CFS} \end{aligned}$$

$$\begin{aligned} \text{CAPACITY OF MONROE @ PROSPECT} \\ 40' \text{ WIDE } 0.7\% \text{ } 8" \text{ VC} &= 24.5 \text{ CFS} \end{aligned}$$

$$\begin{aligned} 24.5 > 7.67 \text{ CFS } 5 \text{ YR OK} \\ 24.5 < 26.10 \text{ CFS } 100 \text{ YR OK} \end{aligned}$$

THERE WILL BE SOME CURB
OVERTOPPING BUT NOT ENOUGH
TO WARRANT AN INLET AT
THIS INTERSECTION

MONROE @ FRANKLIN

$$\begin{aligned} \text{SB-2 } t_c &= 0.122 \\ + t_c \text{ in CURB FROM SB-1} \\ \text{Slope} &= 1.5\% \quad \text{Vel} = 2.4 \text{ fps} \\ t_c &= \frac{1550}{2.4(3600)} = 0.179 \text{ HRS} \end{aligned}$$

$$\begin{aligned} \text{TOTAL AREA} \\ &= 0.0151 + 0.0134 = .02' \\ &\text{SB-1 + SB-2} \end{aligned}$$

$$\begin{aligned} t_c &= 0.179 + 0.122 = 0.301 \\ \text{CSM/IN} &= 920 \quad 5 \text{ YR MONROE} = 0.4 \end{aligned}$$



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© MONROE + FRANKLIN

$$Q_5 = (.0285 \text{ sm})(920 \text{ csm/in})(0.4) = 10.49 \text{ CFS}$$

$$Q_{100} = (.0285 \text{ sm})(920)(1.36) = 35.66 \text{ CFS}$$

ALL FLOW WILL BE COMING FROM SB-1 DOWN MONROE

CAPACITY OF MONROE @ FRANKLIN

$$40' \text{ WIDE @ } 0.7\% \text{ 8" CURB} = 24.5 \text{ CFS}$$

$$24.5 > 10.49 (Q_5) \text{ OK}$$

$$24.5 < 35.66 (Q_{100}) \text{ NO GOOD}$$

ADD INLET @ NE CORNER MONROE + FRANKLIN

12' DIOR on .7% CONTINUOUS GRADE WILL
INTERCEPT 9.4 CFS

$$Q_{100} = 35.66 - 9.4 = 26.26 \text{ Flows BY}$$

$$Q_5 = 10.49(.60) = 6.30 \text{ INTERCEPTED} = 4.19 \text{ Flows BY}$$

$$24.5 < 26.26 \text{ NO GOOD}$$

ADD INLET @ NW CORNER

4' DIOR INTERCEPTS 7.2 CFS

$$Q_{100} = 26.26 - 7.2 = 19.06 \text{ Flows BY}$$

$$Q_5 = 4.19(.60) = 2.5 \text{ INTERCEPTED} = 1.69 \text{ Flows BY}$$

$$CAP = 24.5 > 19.06 \text{ OK}$$

© MONROE + EL PASO

$$\begin{aligned} \text{SB-3: } 5 \text{ YR} &= 7.25 + 1.69 \text{ FROM SB2} = 8.92 \text{ CFS} \\ 100 \text{ YR} &= 24.64 + 19.06 = 43.70 \text{ CFS} \end{aligned}$$

CAPACITY OF MONROE @ EL PASO

$$40' \text{ WIDE @ } 0.7\% \text{ 8" CURB} = 24.5 \text{ CFS}$$

$$Q_5 \quad 24.5 > 8.92 \text{ CFS OK}$$

$$Q_{100} \quad 24.5 < 43.70 \text{ CFS NO GOOD}$$



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INSTALL INLET @ NE CORNER EL PASO + MONROE

14' DIOR WILL INTERCEPT 10.34 CFS

Q_{100} 43.70 - 10.34 = 33.36 CFS Flows BY
 Q_5 8.92 (.60) 5.35 INTERCEPTED 3.57 Flows BY

24.5 < 33.36 NO GOOD
24.5 > 3.57 OK

INSTALL INLET @ NW CORNER EL PASO + MONROE

14' DIOR WILL INTERCEPT 10.34 CFS

Q_{100} 33.36 - 10.34 = 23.02 Flows BY
 Q_5 3.57 (.60) = 2.14 INTERCEPTED 1.43 Flows BY

24.5 > 23.02 OK
24.5 > 1.43 OK



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@ MONROE MAGELLAN

$$SB-4 \quad Q_5 = 10.19$$

$$Q_{100} = 34.40$$

Plus flow coming down Monroe from El Paso

$$Q_5 = 10.19 + 1.43 = 11.62 \text{ CFS}$$

$$Q_{100} = 34.40 + 23.02 = 57.52 \text{ CFS}$$

THERE IS A PAN LOCATED @ MAGELLAN + MONROE
WHICH WILL CARRY FLOW ACROSS MONROE AND
THEN DOWN ROYER.

CAPACITY OF MONROE @ THIS PT

$$40' \text{ WIDE SLOPE} = 0.7\% \text{ CURB} = 8''$$

$$= 24.5 \text{ CFS}$$

$$24.5 > 16.44 \text{ CFS } Q_5 \text{ OK}$$

$$24.5 < 55.64 \text{ CFS } Q_{100} \text{ No Good}$$

SUB-BASIN 4 WILL BE SPLIT IN HALF. INLETS
WILL BE INSTALLED AT JACKSON + MAGELLAN AND
MONROE + MAGELLAN

$$\text{AREA SB-4A} = .0102 \text{ SM} \quad .0013 \text{ PAVEMENT}$$

$$\text{AREA SE-4B} = .0080 \text{ SM}$$

BASIN	AREA (SM)	SOIL TYPE	LAND USE	CURVE NO.	BASIN Ht.	BASIN LENGTH	VEL FPS	t_c (HRS)	CSW IN	STRIKOFF	100' RORO
SB-4A	.0102	B	13% PAV 87% RES	75.6	10'	900	2.0	0.125	1300	0.4	1.38
SB-4B	.0080	B	RES	75	7'	600	2.0	0.083	1400	0.4	1.3'

$$SB-4A \quad Q_5 = (.0102)(1300)(0.4) = 5.30$$

$$Q_{100} = (.0102)(1300)(1.38) = 18.30$$

$$SB-4B \quad Q_5 = .0080(1400)(0.4) = 4.48$$

$$Q_{100} = .0080(1400)(1.37) = 15.34$$



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INSTALL INLET ON MAGELLAN AT INTERSECTION OF JACKSON + MAGELLAN

12' DIOR INTERCEPT 11.12 CFS Q_{100} Flow by = 7.18
3.18 CFS Q_5 = 2.12

CHECK STREET CAPACITY OF MONROE @ MAGELLAN
CAP = 20.7 CFS

CHECK CAPACITY OF MAGELLAN = 1.2%
40' WIDE = 32.1 CFS
8" VC.

CHECK CAPACITY OF ROYER
0.7%
8" VC = 24.5 CFS
50' WIDE

CHECK CAPACITY OF MONROE @ ROYER + MAGELLAN
40' WIDE
0.5% = 20.7 CFS
8" VC

INTERSECTION OF MAGELLAN + MONROE

TOTAL FLOW Q_{100}	
= 7.18 (Flow by from JACKSON)	Q_5 2.12
+ 15.34 (Flow from SB-4B)	4.48
+ 23.02 (Flow by from EL PASO)	1.43
$Q_{100} = 45.54$ CFS	$Q_5 = 8.03$ CFS

* INSTALL 12' DIOR ON MAGELLAN @ MONROE
@ 1.2% INTERCEPT 11.12 CFS Q_{100}

* INSTALL 12' DIOR ON MONROE
@ 0.7% INTERCEPT 9.4 CFS Q_{100}

TOTAL $Q_{100} = 20.52$ CFS

TOTAL Q_5 INTERCEPTED = .60(8.03) = 4.82 CFS

* INSTALL 2 INLETS - 1 ON EACH SIDE OF EXISTING PAN



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Flow By Down Pan to Rayer =

$$45.54 - 20.52 = 25.02 \text{ CFS } Q_{100}$$

$$8.03 - 4.82 = 3.21 \text{ CFS } Q_5$$

A 20' DIOR INLET WILL BE INSTALLED AT THE LOWER
END OF THE CROSS PAN LOCATED AT MAGELLAN AND MONROE.

THE 100 YR FLOW DEPTH IN THIS PAN WILL BE
0.4' DEEP. THE DIOR WILL BE 20' WIDE TO INTERCEPT
ALL OF THE FLOW AT THIS POINT.



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LOWER 1/2 OF SUB BASIN 1 Flow TO MADISON + ROYER

BASIN	AREA	SOIL TYPE	LAND USE	CURVE NO.	BASIN HE	BASIN LEN	VEL (fps)	t_c (HRS)	5 YR Runoff	100 YR Runoff
lower 1/2 SB-1	.0181	B	RES	75	12	1300	2.0	0.181	1130 0.4	1.37

$$Q_5 = (.0181)(1130)(0.4) = 8.18 \text{ CFS}$$

$$Q_{100} = (.0181)(1130)(1.37) = 28.02 \text{ CFS}$$

TOTAL FLOW @ MADISON + ROYER

$$Q_5 = 8.18 + 0.51 = 8.69 \text{ CFS}$$

$$28.02 + 7.61 = 35.63 \text{ CFS}$$

CAPACITY OF MADISON

0.39%

30' WIDE

8" UC

$$= 8.9 \text{ CFS} < 35.63 \text{ CFS}$$

CAPACITY OF ROYER
50' WIDE
8" UC
= 18.5 CFS

Flow MUST BE INTERCEPTED FARTHER UP

SPLIT UP LOWER 1/2 OF SUBBASIN 1 INTO 3 BASINS

$$\text{AREA} = \text{LSB-1} = .0040$$

$$\text{AREA} = \text{LSB-2} = .0073$$

$$\text{AREA} = \text{LSB-3} = .0068$$

BASIN	AREA	SOIL TYPE	LAND USE	CURVE NO.	BASIN HE	BASIN LEN	VEL fps	t_c	C_{SW} m	5 YR Runoff	100 YR Runoff
LSB-1	.0040	B	RES	75	4	600	1.6	0.104	1250	0.4	1.37
LSB-2	.0073	B	RES	75	4	600	1.6	0.104	1250	0.4	1.37
LSB-3	.0068	B	RES	75	5	600	1.8	0.093	1300	0.4	1.37

$$\text{LSB-1 } Q_5 = (.0040)(1250)(0.4) = 2.0 \text{ CFS}$$

$$\text{LSB-2 } Q_5 = (.0073)(1250)(0.4) = 3.65 \text{ CFS}$$

$$\text{LSB-3 } Q_5 = (.0068)(1300)(0.4) = 3.54 \text{ CFS}$$

$$Q_{100} = .0040(1250)(1.37) = 6.85 \text{ CFS}$$

$$Q_{100} = .0073(1250)(1.37) = 12.50 \text{ CFS}$$

$$Q_{100} = .0068(1300)(1.37) = 12.11 \text{ CFS}$$



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CAPACITY OF MADISON @ FRANKLIN

$$\text{LSB-1} \quad Q_5 = 2.0 \text{ CFS}$$

$$Q_{100} = 6.85 \text{ CFS}$$

$$\begin{array}{l} 40' \text{ WIDE} \\ 0.7\% \\ 8" \text{ VC} \end{array} = 24.5 \text{ CFS} > 6.85 \quad \text{OK}$$

LSB-1 AND 2

$$\text{TOTAL AREA} = .0113$$

CONSIDERED AS 1 BASIN

$$t_c \text{ LSB-2} = 0.104$$

TRAVEL TIME IN CURB FROM LSB-1

$$t_t = \frac{850}{1.7 (3600)} = 0.139$$

$$\begin{array}{l} \text{SLOPE} = 0.7\% \\ \text{VEL} = 1.7 \end{array}$$

$$t_c = 0.104 + 0.139 = 0.243 \text{ HRS}$$

$$\text{New } \frac{\text{CSM}}{\text{in}} = 1000$$

$$\begin{array}{l} 5 \text{ YR RUNOFF} = 0.4 \\ 100 \text{ YR RUNOFF} = 1.37 \end{array}$$

$$\begin{array}{l} Q_5 = (.0113)(1000)(0.4) = 4.52 \text{ CFS} \\ Q_{100} = (.0113)(1000)(1.37) = 15.48 \text{ CFS} \end{array}$$

$$\text{CAPACITY OF STREET} = 24.5 > 15.48 \quad \text{OK}$$

MADISON + ROYER

$$Q_{100} = 28.02 + 7.61 = 35.63$$

→ FLOW MUST BE INTERCEPTED BEFORE IT REACHES
MADISON + ROYER

INSTALL 12 DIOR @ ^{NE CORNER} EL PASO + MADISON

$$\begin{array}{l} \text{FLOW INTERCEPTED} = 9.44 \text{ CFS } Q_{100} \\ = 4.52 (.60) = 2.71 \text{ } Q_5 \end{array}$$

$$\begin{array}{l} \text{FLOW PASSING BY INLET} = 15.48 - 9.44 = 6.04 \text{ CFS } Q_{100} \\ = 4.52 - 2.71 = 1.81 \text{ CFS } Q_5 \end{array}$$



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TOTAL Q_{100} @ NE CORNER ROYER AND MADISON

$$\begin{array}{rcl} Q_{100} & = & 12.11 \text{ USB-3} \\ & + & 6.04 \text{ Flow By From EL PASO} \\ \hline & & 18.15 \text{ CFS} \end{array} \quad \begin{array}{rcl} Q_5 & = & 3.54 \text{ USB-3} \\ & + & 1.81 \text{ Flow By From EL PASO} \\ \hline & & 5.35 \text{ CFS} \end{array}$$

CAPACITY OF MADISON

$$\begin{array}{l} 30' \text{ WIDE} \\ 0.3\% \\ 7" \text{ V.C.} \end{array} = 8.9 \text{ CFS} < 18.15 \text{ CFS No GOC}$$

Flow MUST BE INTERCEPTED BY INLETS BEFORE IT IS CARRIED DOWN TO MADISON

$$18.15 - 8.9 = 9.25 \text{ CFS MUST BE INTERCEPTED}$$

INSTALL 12' DIOR

INTERCEPT 9.44 CFS

$$18.15 - 9.44 = 8.71 \text{ Flow By}$$

$$\text{MADISON CAP} = 8.9 > 8.71_{Q_{100}} \text{ OK}$$

$$Q_5 = 5.35(.60) = 3.21 \text{ CFS INTERCEPTED}$$

$$2.14 \text{ CFS Flow By}$$



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@ MADISON/CORONA

Block 56

$$Q_5 = 1.8 \text{ cfs}$$

$$Q_{100} = 5.6 \text{ cfs}$$

FROM SINGLE BASIN CALCS

$$Q_5 = 1.8 + 2.14 = 3.94$$

$$Q_{100} = 5.6 + 8.71 = 14.31$$

↑ FROM MADISON + ROYER

INSTALL 12' DIOR @ SE CORNER CORONA + MADISON

$$\text{Flow Intercepted} = 8.16 \text{ cfs } Q_{100}$$

$$\text{AND } 3.94 (.60) = 2.36 \text{ } Q_5$$

$$Q_{100} \quad 14.31 - 8.16 = 6.15 \text{ Flow BY DOWN CORONA}$$

$$Q_5 \quad 3.94 - 2.36 = 1.58 \text{ cfs}$$

CAPACITY OF CORONA

$$50' \text{ WIDE } 0.5\% \text{ } 8" \text{ VC} = 20.7 \text{ cfs}$$

$$20.7 > 6.15 \text{ OK}$$

FROM BASIN A CALCS (SHEET

CHECK INTERSECTION OF FONTANERO + CORONA FOR CURB

CAPACITY BLOCKS 56-59 + OVERFLOW FROM MADISON + ROYER

$$Q_{100} = 16.0$$

SEE BASIN A CALCS

$$+ 1.55$$

$$= 16.55$$

← DIFFERENCE IN FLOW FROM BASIN 51 AND BASIN 56 + OFFSITE FLOW W/INLET

CHECK CURB CAPACITY

$$0.7\% \text{ } 60' \text{ WIDE CORONA } 9" @ 0.7\% = 35.9 > 16.55 \text{ OK}$$

FONTANERO

60' WIDE

$$8" \text{ VC} = 29.3 > 16.55 \text{ OK}$$

@ 1.0%



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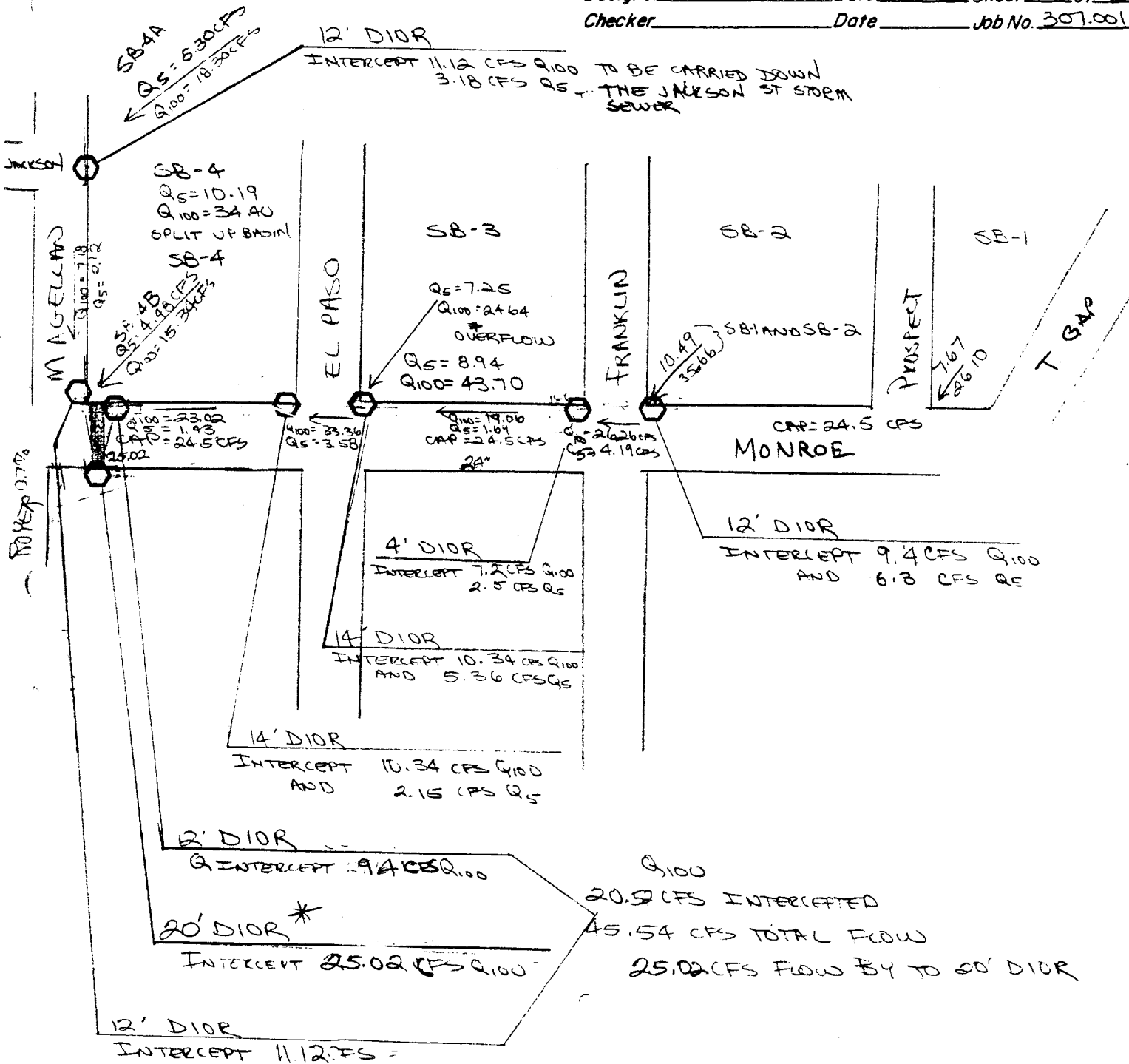
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*NOTE: A 20' DIOR IS USED TO INTERCEPT ALL OF THE FLOW COMING FROM THE UPPER HALF OF OFFSITE BASIN NO. 1. A STORM SEWER SYSTEM WILL BE INSTALLED TO CARRY THIS FLOW TO THE PROPOSED LINE IN MADISON



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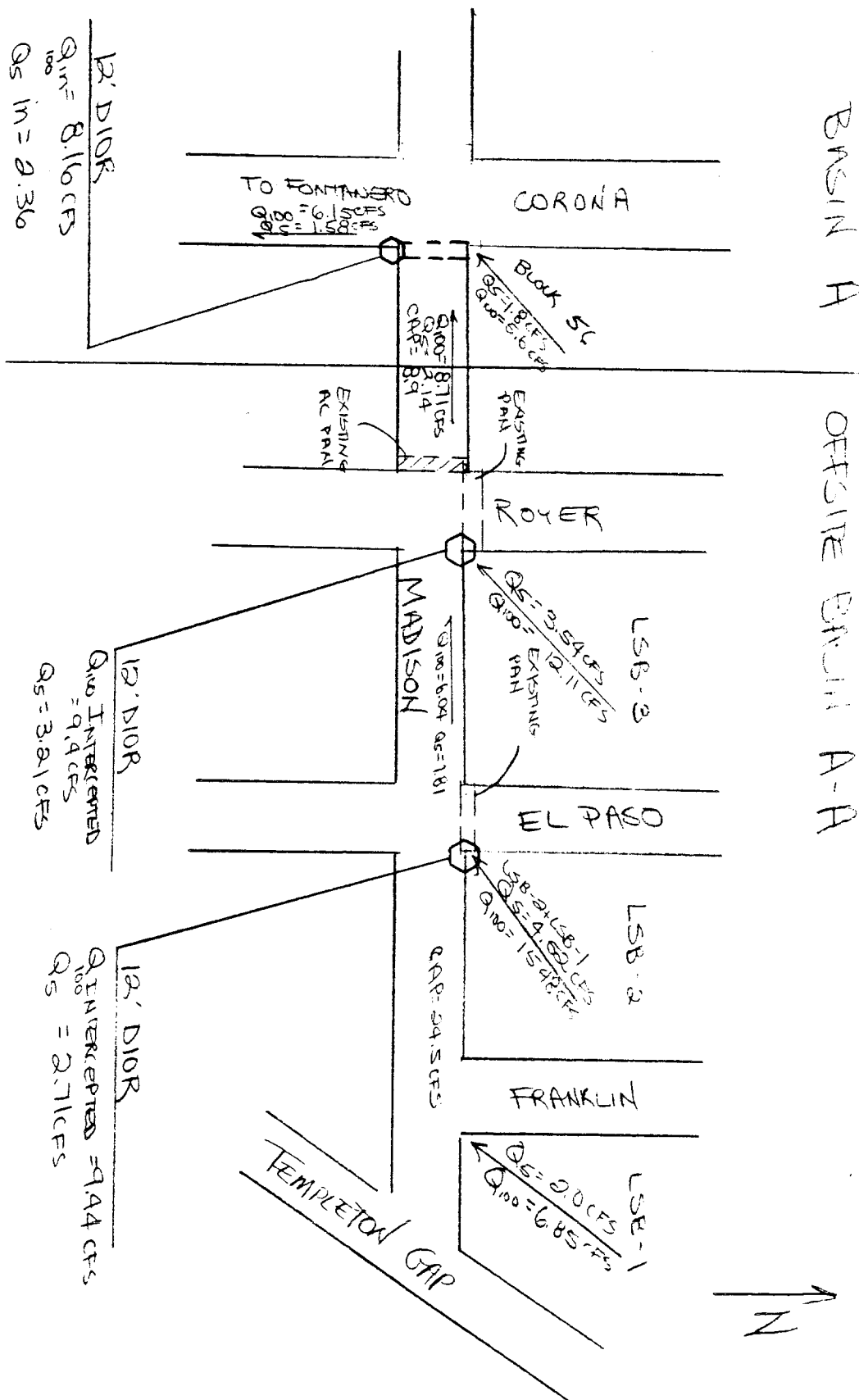
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DESIGN CALCULATIONS

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INLET CAPACITIES.

Q_{ST} = 100-YEAR DESIGN FLOW IN STREET SECTION
UPSTREAM OF THE INLET

Q_{IN} = PORTION OF 100-YEAR DESIGN FLOW THAT
FLOWS INTO THE INLET

$Q_{ST,1}$ = REMAINING PORTION OF Q_{100} THAT PASSES
DOWNSTREAM IN STREET GUTTER TO NEXT
INLET.

$\therefore Q_{ST} = Q_{IN} + Q_{ST,1}$
0.8% S. = 0.8% GUTTER SLOPE

SUBBASIN	LOCATION	TYPE INLET	Q_{ST} (CFS)	Q_{IN} (CFS)	$Q_{ST,1}$ (CFS)	EXIST. CURB & G. CAPACITY (CFS)
A	NE CORNER MADISON/WASHINGTON	4' DIOR ON 0.8% S	10.0	6.0	4.0	14.5
	SE CORNER MADISON/WASHINGTON	4' DIOR ON 0.8% S	6.1	3.7	2.4	14.5
	W SIDE MADISON/WASHINGTON	6' DIOR ON 0.8% S	21.5	7.7	13.8	14.5
	NE CORNER WASHINGTON/WASHINGTON	10' DIOR ON 0.8% S	22.4	9.0	13.4	14.5
	SE CORNER WASHINGTON/WASHINGTON	8' DIOR ON 0.8% S	13.4	8.0	5.4	14.5
	NW CORNER WASHINGTON/WASHINGTON	14' DIOR ON 0.8% S	18.1	10.5	7.6	14.5
	NE CORNER FONTANUE/WASHINGTON	22' DIOR ON 1.0% S	25.6	14.7	10.9	29.3
	NW CORNER FONTANUE/WASHINGTON	22' DIOR ON 1.1% S	27.3	14.9	12.4	30.8
	N. SIDE FONTANUE @ RR ROW	4' DIOR @ 1.2% S	12.4	7.4	5.0	32.1
	NE CORNER WEAVER/FONTANUE	8' DIOR - SUMP	14.0	14.0	0.0	33.4
	S SIDE FONTANUE @ RR ROW	4' DIOR @ 1.2% S	1.0	1.0	0.0	23.1



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SUBBASIN	LOCATION	TYPE INLET	Q_{ST} (cfs)	Q_{IN} (cfs)	Q_{ST} (cfs)	EXIST CUL & GUTTER CAPACITY (cfs)
B	NW COR ROYCE/JACKSON	10' DIOR @ 0.4% S	12.9	7.7	5.2	7.1
	NE COR CORONA/JACKSON	20' DIOR @ 0.4% S	26.6	12.2	14.4	18.5
	NW COR CORONA/JACKSON	12' DIOR @ 0.4% S	14.4	8.6	5.8	18.5
	NE COR BALBOA/JACKSON	20' DIOR @ 0.4% S	21.8	12.2	9.6	18.5
	NW COR BALBOA/JACKSON	4' DIOR @ 0.4% S	9.6	5.7	3.9	18.5
	NE COR WASHATCH/JACKSON	20' DIOR @ 0.4% S	21.3	12.2	9.1	18.5
	NW COR WASHATCH/JACKSON	20' DIOR @ 0.4% S	21.7	12.2	9.5	18.5
	N SIDE JACKSON/RR ROW	6' DIOR - SUMP	9.5	9.5	0.0	10.4
	S SIDE JACKSON/RR ROW	4' DIOR - SUMP	1.0	1.0	0.0	18.5
C	NE COR WASHATCH/ESPANOLA	6' DIOR - SUMP	8.2	8.2	0.0	45.0
	MEDIAN WASHATCH/ESPANOLA	BUBBLE TO GRAVELL DRIP INLET - SUMP	1.0	1.0	0.0	15.4
	N SIDE ESPANOLA/RR ROW	4' DIOR - SUMP	2.5	2.5	0.0	15.4
	S SIDE ESPANOLA/RR ROW	4' DIOR - SUMP	1.0	1.0	0.0	15.4



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SUBBASIN	LOCATION	TYPE INLET	Q _{ST} (cfs)	Q _{IN} (cfs)	Q _{ST} (cfs)	EXIST CURB & GUTTER CAPACITY (cfs)
D	MEDIAN WASHATCH/ALL MOORE	EXIST 2.5' INLET - SUMP	1.0	1.0	0.0	22.9
	NE COR. WASHATCH/ALL MOORE	BUBBLER TO GUTTER DRAIN INLET - SUMP	6.0	6.0	0.0	22.9
	NW COR. WASHATCH/CARADUNA	EXIST 2'-3" INLET - SUMP	1.2	1.2	0.0	5.1
	NORTH MEDIAN WASHATCH/CARADUNA	EXIST 2.5' INLET - SUMP	1.0	1.0	0.0	12.5
	NE COR. WASHATCH/CARADUNA	6' DIOR - SUMP	10.3	10.3	0.0	25.1
	SOUTH MEDIAN WASHATCH/CARADUNA	EXIST 2'-3" INLET - SUMP	1.0	1.0	0.0	12.5
	SW SIDE BUENA VENTURA	BUBBLER TO CURB INLET - SUMP	3.4	3.4	0.0	35.9
E	NW COR. CORONA/COLUMBIA	4' DIOR - SUMP	1.6	1.6	0.0	32.1
	SE COR. COLUMBIA/COLUMBIA	8' DIOR - SUMP	16.2	16.2	10.0	22.6
	S SIDE COLUMBIA	4' DIOR - SUMP	1.0	1.0	0.0	12.5
F	NW COR. WISER/VINTAGE	EXIST 11.5' INLET - SUMP	19.9	19.9	0.0	65.9
	NE COR. WISER/VINTAGE	EXIST 13' INLET @ 1.2% S	13.8	11.3	2.5	65.9
	NW COR. WASHATCH/VINTAGE	EXIST 11.5' INLET - SUMP	11.0	11.0	0.0	12.5
	NR COR. WASHATCH/VINTAGE	EXIST 12' INLET @ 0.6% S	4.9	4.9	0.0	12.5
	ALL WASHATCH MEDIAN	EXIST 2.5' INLET - SUMP	1.0	1.0	0.0	—
	NW COR. CORONA/VINTAGE	EXIST 11' INLET - SUMP	6.3	6.3	0.0	47.0
	NE COR. CORONA/VINTAGE	EXIST 12' INLET - SUMP	7.5	7.5	0.0	47.0



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SUBDIVISION	LOCATION	TYPE INLET	Q _{ST} (cfs)	Q _{IN} (cfs)	Q _{ST} (cfs)	EXIST CURB & GUTTER CAPAC (cfs)
F	NW COR EL PASO/VINTAGE	EXIST 12' INLET - SUMP	27.5	23.5	0.0	22.2
	NE COR EL PASO/VINTAGE	EXIST 13' INLET - SUMP	2.2	2.2	0.0	7.1
	NW COR FRANKLIN/VINTAGE	EXIST 11' INLET @ 1.12% S	12.7	12.7	0.0	17.0
	NE COR FRANKLIN/VINTAGE	EXIST 13' INLET @ 1.12% S	3.6	3.4	0.0	17.0
	NW COR PROSPECT/VINTAGE	EXIST 9' INLET - SUMP	5.1	5.1	0.0	20.0
	NW COR PROSPECT/VINTAGE	EXIST 9' INLET @ 1.57% S	3.1	3.1	0.0	20.0
G	NO INLETS EXISTING OR REQUIRED					
H	NE COR WEBER/YAMPA	EXIST DOUBLE 2.5' INLETS - SUMP	9.6	9.6	0.0	18.5
	NW COR WEBER/YAMPA	EXIST DOUBLE 2.5' INLETS @ 0.49% S	5.5	5.5	0.0	18.5
	SW COR WEBER/YAMPA	EXIST 2.5' INLET @ 0.32% S	1.0	1.0	0.0	10.0
	NE COR WEBER/CACHE POND	EXIST DOUBLE 2.5' INLETS - SUMP	5.8	5.8	0.0	30.5
	NW COR WEBER/CACHE POND	EXIST DOUBLE 2.5' INLETS @ 0.59% S	2.9	2.9	0.0	13.4
	NW COR WAHATCH/SAN RAFAEL	BUBBLER TO GRATE INLET - SUMP	2.9	2.9	0.0	17.0
	NE COR WAHATCH/SAN RAFAEL	BUBBLER TO GRATE INLET - SUMP	3.6	3.6	0.0	6.4
	NW COR WAHATCH/YAMPA	BUBBLER TO GRATE INLET - SUMP	2.8	2.8	0.0	11.4
	NE COR WAHATCH/YAMPA	EXIST DOUBLE 2' INLETS @ 0.5% S	2.6	2.4	0.0	4.3
	NW COR WAHATCH/CACHE POND	EXIST 3'-3" INLET - SUMP	2.8	2.8	0.0	13.4
	ALL WAHATCH MEDIAN	EXIST 2.5' INLET - SUMP	1.0	1.0	0.0	—



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DESIGN CALCULATIONS

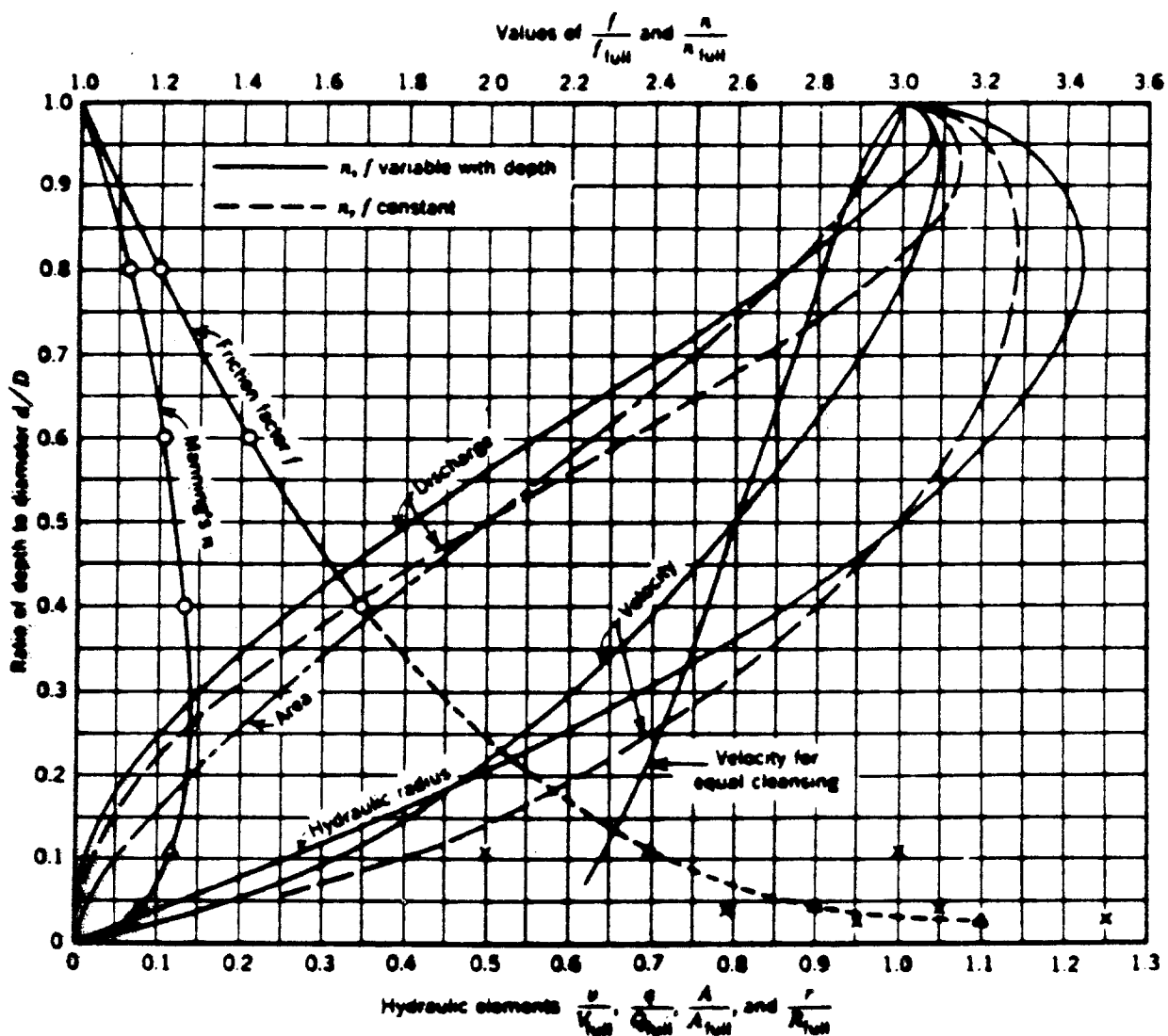
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SUBBASIN	LOCATION	TYPE INLET	Q_{IT} (cfs)	Q_{IN} (cfs)	Q_{JT} (cfs)	EXIST CURB & GUTTER CAPACITY (cfs)
I	NW COR CACANA/CACHE POWDER	8' DIOR - sump	10.0	10.0	0.0	60.1
	NW COR ROYER/CACHE POWDER	EXIST DOWNSIDE 3' INLETS - sump	6.2	6.2	0.0	7.5
	NE COR ROYER/CACHE POWDER	EXIST DOWNSIDE 3' INLETS @ 2.0% S	8.4	2.0	6.4	14.3
	NW COR EL PASO/CACHE POWDER	6' DIOR - sump	8.8	8.8	0.0	8.6
	NE COR EL PASO/CACHE POWDER	EXIST 3' INLETS @ 8% S	3.2	0.5	2.7	24.0
OFFSITE BASIN A-A	NE CORNER FRANKLIN/ MONROE	12' DIOR	35.66	9.4	26.26	24.5
	NW COR FRANKLIN/MONROE	4' DIOR	26.26	7.2	19.06	24.5
	NE CORNER EL PASO/MONROE	14' DIOR	43.70	10.34	33.36	24.5
	NW CORNER EL PASO/MONROE	14' DIOR	33.36	10.34	23.02	24.5
	EAST SIDE MAGELLAN @ JACKSON	12' DIOR	18.30	11.12	7.18	32.1
	EAST SIDE MAGELLAN @ MONROE	12' DIOR	22.77	11.12	11.65	} 25.02 CROSS PAN
	NORTH SIDE MONROE @ MAGELLAN	12' DIOR	22.77	9.4	13.37	
	SOUTH SIDE MAGELLAN @ MONROE @ LOWER END OF CROSS PAN	20' DIOR	25.02	25.02	0	
	NE CORNER EL PASO + MADISON	12' DIOR	15.48	9.44	6.04	24.5
	NE CORNER ROYER + MADISON	12' DIOR	18.15	9.4	8.75	8.9
	SE CORNER CORONA + MADISON	12' DIOR	14.31	8.16	6.15	20.7

MADISON/WAHSATCH DRAINAGE IMPROVEMENT STUDY

APPENDIX E

PROPOSED STORM SEWER IMPROVEMENTS AND HYDRAULICS



v = Actual velocity of flow (fps)

v_{full} = Velocity flowing full (fps)

q = Actual quantity of flow (cfs)

Q_{full} = Capacity flowing full (cfs)

A = Area occupied by flow (ft²)

A_{full} = Area of pipe (ft²)

r = Actual hydraulic radius (ft.)

R_{full} = Hydraulic radius of full pipe (ft.)

FIGURE 9

HYDRAULIC ELEMENTS OF CIRCULAR CONDUITS



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DESIGN CALCULATIONS

Project MADISON/W ANSATCH

Detail STORM SEWER SIZING IN JACKSON

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JACKSON ST TO RAILROAD ROW

LOCATION	SLOPE %	Q in CFS	DIA in	Q _{full} CFS	V _{Q_s}	V _{V_s}	V _f	V _{fps}	LENGTH ft	SUBRENS B NOTES n = .013
EAST SIDE MAGELMAN @ JACKSON TO MH @ ROYER + JACKSON	0.4	<u>11.1*</u>	24"	14.31	.78	.98	4.55	4.5	380	FROM OFFSET FLOWS 12' D10R Q _m = 11.1 cfs
INLET NW COR. ROYER TO MH @ ROYER + JACKSON	1.0	+7.7	18"	10.50	.73	.965	5.94	5.7	20	10' D10R Q _m = 7.7 cfs
TO MH @ CORONA + JACKSON	0.4	<u>18.8*</u>	30"	25.94	.72	.965	5.28	5.1	300'	1-4' φ MANHOLE
INLET @ NE CORNER CORONA + JACKSON TO	1.0	12.2	21"	15.85	.77	.98	6.59	6.46	30	20' D10R Q _m = 12.2 cfs
INLET @ NW CORNER CORONA + JACKSON TO	1.0	+8.6	24"	22.62	.92	1.02	7.20	7.34	20	12' D10R Q _m = 8.6
MH @ CORONA + JACKSON TO	0.4	<u>39.6*</u>	36"	42.18	.94	1.03	5.97	6.1	320	1-4' φ MANHOLE
MH @ BALBOA + JACKSON										
INLET @ NE CORNER BALBOA + JACKSON TO	1.0	12.2	21"	15.85	.77	.98	6.59	6.46	30	20' D10R Q _m = 12.2 cfs
INLET @ NW CORNER BALBOA + JACKSON		+5.7								4' D10R Q _m = 5.7 cfs

TO
(SEE NEXT SHEET)

* NOTE: REPRESENTS TOTAL FLOW IN MAIN LINE OF JACKSON STORM SEWER



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TO	SCOPE	Q _{in}	DIA	Q _{full}	Q/Q _f	V/V _f	V _f	V	LENGTH	NOTES
MH @ BALBOA + JACKSON	1.0	17.9	24"	22.62					20	
TO	0.4	<u>57.5*</u>	42"	63.63	.90	1.02	6.61	6.7	320	
MH @ WAHATCH + JACKSON										1-4' DIOR
INLET @ NE CORNER WAHATCH + JACKSON										20' DIOR Q _{in} = 12.2 cf
TO	1.0	12.2	21"	15.85	.77	.98	6.59	6.5	30	
INLET @ NW CORNER WAHATCH + JACKSON		+12.2								20' DIOR Q _{in} = 12.20
TO	1.0	24.4	27"	30.97	.79	.98	7.79	7.6	20	
MH @ WAHATCH + JACKSON										
TO	0.4	<u>81.9*</u>	48"	90.85	.90	1.02	7.23	7.4	170	
MH @ RR ROW AND JACKSON										

* NOTE: REPRESENTS TOTAL FLOW IN MAIN LINE OF JACKSON STORM SEWER

INLET @ RR ROW + JACKSON	1.0	11.1	18"						70'	6' DIOR Q _{in} = 9.5
INCLUDING YARD INLETS TO	1.0	<u>16.1</u> 9.5	21"	15.85	.98	1.04	6.59	6.9	30'	
MH @ RR + JACKSON		15.6								4' DIOR Q _{in} = 1.0
TOTAL @ RR ROW + JACKSON		<u>97.5*</u>								

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MADISON ST INCLUDING STORM SEWER IN OFFSITE
BASIN A-A

LOCATION	SLOPE %	Q _{in} CFS	DIA in	Q _{full} CFS	Q/Q _s	V/V _s	V _s	V fps	LENGTH ft	OFFSITE NOTES n=.013
INLET @ NE CORNER FRANKLIN + MONROE										12' DIOR Q _{in} =9.4 cfs
TO	1.0	9.4	18"	10.50	.90	1.02	5.94	6.1	40	
INLET @ NW CORNER FRANKLIN + MONROE		+7.2								4' DIOR Q _{in} =7.2 cfs
TO	1.0	16.6	24"	22.62	.73	.96	7.20	6.9	20	
MH @ FRANKLIN + MONROE										1-4' ϕ Man Hole
TO	0.7	<u>16.6*</u>	24"	18.93	.88	1.01	6.02	6.1	320	
MH @ EL PASO + MONROE										1-4' ϕ Man Hole
INLET NE CORNER EL PASO + MONROE										14' DIOR Q _{in} =10.34
TO	1.0	10.34	21"	15.85	.65	.93	6.59	6.1	40	
INLET NW CORNER EL PASO + MONROE		+10.34								14' DIOR Q _{in} =10.34
TO	1.0	20.68	24"	22.62	.91	1.02	7.20	7.3	20	
MH @ EL PASO + MONROE										
TO	0.7	<u>37.28*</u>	33"	44.25	.84	1.00	7.45	7.5	320	
MANHOLE @ MAGELAN + MONROE										Box Manhole

NOTE: * REPRESENTS TOTAL FLOW IN MAIN LINE OF MONROE STORM SEWER



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DESIGN CALCULATIONS

Project MADISON / WASHATCH

Detail STORM SEWER SIZING IN OFFSITE BAS

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LOCATION	SLOPE %	Q _{in} CFS	DIA in	Q _{full} CFS	Q/Q _s	V/V _s	V _s	V fps	LENGTH ft	NOTES n=.013
INLET NORTH SIDE MONROE @ MAGELLAN TO	1.0	9.4	18"	10.50	.90	1.02	5.94	6.1	30	12' DIOR Q _{in} =9.4 CF
INLET EAST SIDE MAGELLAN @ MONROE TO	1.0	18.2	24"	22.62	.80	.98	7.20	7.1	30	12' DIOR Q _{in} =8.8
MH @ MAGELLAN + MONROE										
INLET SOUTH SIDE MONROE @ MAGELLAN TO	1.0	25.02	27"	30.97	.81	.98	7.79	7.6	20	20' DIOR Q _{in} =25.02
MANHOLE @ MAGELLAN + MONROE TO	0.6	<u>80.50*</u>	48"	111.27	.72	.95	8.85	8.4	150	
MH @ MAGELLAN + ROYER TO	0.7	<u>80.50*</u>	48"	120.18	.67	.93	9.56	8.90	400	Box MANHOLE
MH @ ROYER AND MADISON										
INLET @ NE CORNER EL PASO @ MADISON TO	1.0	9.44	18"	10.50	.90	1.02	5.94	6.1	30	Box MANHOLE 12' DIOR Q _{in} =9.44
MH @ EL PASO + MADISON TO	0.7	9.44	21"	13.26	.71	.95	5.51	5.2	400	1-4' DIA MANHOLE
MH @ ROYER + MADISON										

* V_s = 4.08 ft/s (12.44 ft/s) = 12.44 ft/s



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DESIGN CALCULATIONS

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Detail STORM SEWER SIZING IN MADISON

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LOCATION	SLOPE %	Q _{in} CFS	DIA in	Q _{full} CFS	Q/Q _s	V/V _s	V _s	V fps	LENGTH ft	NOTES n=.013
INLET @ NE CORNER MADISON + ROYER TO MANHOLE @ MADISON + ROYER TO MANHOLE @ CORONA AND MADISON	1.0 0.3	9.44 <u>99.38</u> *	18" 54"	1050 107.71	.90 .92	1.02 1.025	5.94 6.77	6.1 6.9	30' 440'	12' DIOR Q _{in} =9.44 Box MANHOLE
INLET @ SE CORNER CORONA + MADISON TO MH @ CORONA + MADISON TO MH @ MADISON + WAHSATCH	1.0 0.3	8.16 <u>107.54</u> *	18" 54"	1050 107.71	.78 1.0	.98 1.04	5.94 6.77	5.8 7.0	30' 470'	12' DIOR Q _{in} =8.16 Box MANHOLE
SUB-BASIN A INLET @ NE CORNER MADISON + WAHSATCH TO MANHOLE @ MADISON + WAHSATCH	1.0	6.0	18"	10.5	.57	.88	5.94	5.2	30'	4' DIOR Q _{in} =6.00

* NOTE: REINTEREST POINT FOUND IN MAIN CONCRETE PIPE IN MADISON



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DESIGN CALCULATIONS

Project MADISON / WAHSAATCH

Detail STORM SEWER SIZING 11.5 M.F. L.S.

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LOCATION	SLOPE %	Q _{in} CFS	DIA in	Q _{full} CFS	Q/Q _s	V/V _s	V _s	V fps	LENGTH ft	NOTES n=.013
INLET @ SE CORNER MADISON & WAHSAATCH										4' DIOR Q _{in} = 3.7
TO MH @ MADISON & WAHSAATCH	1.0	3.7	18"	10.50	.35	.77	5.94	4.6	30'	
TO INLET ON WEST SIDE WAHSAATCH 11 M.F. S.O.D.	0.4	117.24	54"	124.3	.94	1.03	7.82	8.1	80'	6' DIOR Q _{in} = 7.1
TO MH LOCATED IN R.R. ROW	0.5	124.94	54"	139.05	.90	1.02	8.74	8.9	290'	



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DESIGN CALCULATIONS

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WASHINGTON / WASHATCH TO RR ROW

SUB-BASIN F

LOCATION	SLOPE %	Q _{in} CFS	DIA in	Q _{total} CFS	Q/Q _s	V/V _s	V _s	V fps	LENGTH ft	NOTES n = .013
INLET @ NE CORNER WASHINGTON + WASHATCH										10' DIOR Q _{in} = 9.0
TO	1.0	9.0	18"	10.50	.86				35'	
INLET @ SE CORNER WASHINGTON + WASHATCH		+8.0								8' DIOR Q _{in} = 8.0
INLET AT NW CORNER, WASHINGTON WASHATCH MOVE INTO LINE FROM EAST SIDE		+10.5	18"						20'	14' DIOR Q _{in} = 10.5
TO	0.3	<u>27.5</u>	33	28.97	0.95	1.03	4.88	5.0	300'	
11' IN RAILROAD RIGHT-OF-WAY										

NOTE: * REPRESENTS TOTAL FLOW IN MAIN LINE OF WASHINGTON

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SUB BASIN D

[illegible]



DESIGN CALCULATIONS

Project: MADISON/WANSHATCH

Detail STORM SEWER SIZING. IN ESPAÑOL

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ESPAÑOLA + RAILROAD ROW

SUB BASIN C

[illegible]



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DESIGN CALCULATIONS

Project MADISON / WAHSATCH

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DEL NORTE + RAILROAD ROW

SUB BASIN D

LOCATION	SLOPE %	Q _{in} CFS	DIA in	Q _{out} CFS	Q/Q _s	V ₁	V ₂	V fps	LENGTH ft	NOTES # .01
INLET @ NE CORNER WAHSATCH + DEL NORTE TO EXISTING SS IN WAHSATCH	1.4	6.0	18"	12.43	0.48	0.85	7.03	6.0	50'	CONVERTED GRATE INLET
2 YARD INLETS IN ROW TO MANHOLE IN ROW	1.0	2.2	18"	10.50	.21	.66	5.94	3.9	40'	TOTAL FLOW ENTERING MAIN LINE AT DEL NORTE + RAILROAD ROW
		<u>2.2 CFS</u>								
CARAMILLO + EXISTING STORM SEWER IN WAHSATCH										
INLET @ NE CORNER CARAMILLO + WAHSATCH AND CONVERTED INLET @ SAME CORNER TO EXISTING STORM SEWER IN WAHSATCH	1.0	10.3	18"	10.5	.98	1.04	5.94	6.2	80'	4' DIOR Q _{in} = 7.9 CONVERTED GRATE INLET Q _{in} = 2.1
2 YARD INLETS IN ROW TO MH IN ROW	1.0	<u>2.5</u>	18"	10.5	.24	.69	5.94	4.1	30'	
BUENA VENTURA + STORM SEWER IN ROW										
INLETS TO MANHOLE IN ROW	1.0	<u>3.4</u>	18"	10.5	.32	.74	5.94	4.4	20'	CONVERTED CURB INLET Q _{in} = 3.4



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DESIGN CALCULATIONS

Project MADISON / WASHATCH
Detail STORM SEWER SIZING IN CORONA
Designer NJH Date 10/15/85 Sheet 11 of 2
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CORONA AND RR ROW

SUB BASIN E

LOCATION	SLOPE %	Q _{in} CFS	DIA in	Q _{out} CFS	Q ₁ /Q ₂	V ₁ /V ₂	V ₁	V ₂	LENGTH ft	NOTES n=0.01
INLET @ NW CORNER CORONA & COLUMBIA TO SS IN ROW	1.0	1.6	18"	10.50	.15	.60	5.94	3.6	30'	4' DIOR Q _{in} =1.6
INLET @ SW CORNER CORONA & COLUMBIA TO YARD INLET	1.0	1.0	18"	10.50	.10	.54	5.94	3.2	60'	4' DIOR Q _{in} =1.0
TO STORM SEWER IN ROW	1.0	+1.5 2.5	18"	10.50	.24	.69	5.94	4.1	40'	
INLET @ SE SIDE CORONA @ COLUMBIA WYE INTO STORM SEWER	1.0	16.2	24"	22.62	.72	.965	7.20	6.9	20'	8' DIOR Q _{in} =16.2
20.3 = TOTAL FLOW ENTERING STORM SEWER IN ROW FROM CORONA										
YARD INLETS @ SAN MIEGEL & ROW	1.0	8.8	18"	10.50	.84	1.0	5.94	5.9	50	
YARD INLETS @ UINTAH + ROW	1.0	1.7	18"	10.50	.16	.60	5.94	3.6	50	



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DESIGN CALCULATIONS

Project MADISON/WANSATCH

Detail SIZING OF STORM SEWAGE IN ROW

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INTERSECTION OF JACKSON AND RAILROAD ROW

AREA CONTRIBUTING

OFFSITE BASIN SB4A	.0102	75.5
BASIN-20	.0069	75
20A	.0058	79
21	.0085	75
22	.0096	75
23	.0114	75
24	.0130	75
25	.0097	75
26	.0067	79
	<u>.0818</u>	

WEIGHTED CN=76

$$t_c \text{ IN BASIN 23 PLUS TIME OF TRAVEL IN PIPE } \left(\frac{380}{4.5} + \frac{200}{5.1} + \frac{320}{6.1} \right)$$

$$t_c = 0.267 + 0.654 = 0.321$$

@ $t_c = 0.321$ CSM/IN = 910 FIGURE 6

@ CN=76 100 YR RUNOFF = 1.32 IN FIGURE 7

$$Q_{100} = (\text{AREA})(\text{CSM/IN})(100 \text{ YR RUNOFF})$$

$$= (0.0818)(910)(1.31) = 97.5 \text{ CFS}$$

* Q _{DP}	DIA	Q _{full}	Q/Q _{full}	V/V _{full}	V _{full}	V	LENGTH	SLOPE
97.5	48"	128.48	0.76	0.98	10.22	10.0	940'	0.80
							TO MADISON	

$$\text{New } t_c = 0.321 + \frac{940}{(10.0)(3600)} = 0.347$$

* Q_{DP} = 100 YR FLOW @ THE DESIGN POINT IN RAILROAD ROW

DESIGN CALCULATIONS

Project M/W
Detail STORM SEWER SIZING 1st ROW
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INTERSECTION OF MADISON + RAILROAD ROW

	AREA	CN
JACKSON	00818	76
OFFSIDE A-A	$\begin{matrix} .0799 \\ -.0102 \end{matrix} = .0697$	75.5
MADISON	BASIN	AREA
	32 A	.0054 SM
	36	.0011
	37	.0009
	45	.0156
	46	.0066
		.1811 SM

TOTAL = 0 10 12 SM

$$t_c \text{ CALCULATED AT THIS INTERSECTION} = 0.347$$

@ $t_c = .347$ $ESM/in = 880$ FIGURE 6

(WEIGHTED) CURVE NUMBER JACKSON = 76

32A (0054)(98)
36 +(0011)(61)
37 +(0009)(61)
45 +(0156)(61)
46 +(0006)(75)

32A $(.0054)(98)$
 36 $+(.0011)(61)$
 37 $+(.0009)(61)$
 45 $+(.0156)(61)$
 46 $+(.0006)(75)$

 $2.0978 / .0296 = 71$ $75.5(\text{amt}) + 71(.0296) + 74(.0818)$
 $= 13.58 / .1811 = 75$

WEIGHTED CN = 75

① CURVE NUMBER = 75

100 Yr RUNOFF = 1.3 Figure 7

$$Q_{100} = (.1811)(1.3)(880) = 207.2 \text{ FS}$$

Q_{DD} 207.2	DIA 60"	Q_{well} 232.95	Q/Q_+ 0.89	V/V_+ 1.02	V_+ 11.86	V 12.1	LENGTH 980 TO WELL HEAD	SLOPE 0.8
-------------------	------------	----------------------	-----------------	-----------------	----------------	-------------	-------------------------------	--------------

$$\text{New } T_c = 0.347 + \frac{980}{(1215 \times 3600)} = 0.369$$



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DESIGN CALCULATIONS

Project M/W

Detail SEWER SYSTEM

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INTERSECTION OF WASHINGTON + RR R/W

AREA CONTRIBUTING

OFFSITE BASIN A-A

0.0697

JACKSON (BASIN B)

0.0818

MADISON (BASIN A)

0.0296

WASHINGTON	27	.0157 SM
	32	.0024 SM
	48	.0074
	47	.0074
	34	.0010
	38	.0011
	<u>0.0350</u>	

TOTAL AREA = 0.2134 SM

@ $t_c = 0.369$

CSM/in = 850

FIGURE 6

WEIGHTED CIRCLE NUMBER

.0157(74)	+ .0010(8)
+ .0074(75)	+ .0011(8)
+ .0074(75)	
+ .0074(75)	
<u>2.0350</u>	<u>0.0350</u>
	= 76

OFFSITE AA = 75.5

(.0697 SM)

BASIN B = 76

(.0818 SM)

BASIN A = 71

(.0296 SM)

BUILD CONT. = 76

(.0350 SM)

WEIGHTED CN = 76

100 YR RUNOFF = 1.35

FIGURE

$$Q_{100} = (.2134)(1.35)(850) = 244.88 \text{ CFS}$$

Q _{DP}	DIA	Q _{MIN}	Q ₁₀₀	V/V ₁	V	V	Level	
244.9	60"	260.45	0.94	13.26	1.03	13.7	470'	1.00

TO FORTWAVER

$$\text{NEW } t_c = 0.369 + \frac{470}{(13.7)(24500)} = 0.379 \text{ HR}$$



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DESIGN CALCULATIONS

Project M/W

Detail Storm Sewer and Inlet Load

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Job No. 3051-001

FONTANERO + STORM SEWER IN ROW

OFFSITE A-A	0.0697	75.5
FREP - JACKSON	0.0818	76
MADISON	0.0296	71
WASHBURN	0.0329	76

	AREA	CN
FONTANERO	56	.0039
	57	.0048
	58	.0047
	59	.0043
	49	.0077
	10	.0102
	28	.0074
	33	.0074
	40	.0011
		<u>.0415</u>

WEIGHTED CN =

$$\text{TOTAL AREA} = 0.2555 \text{ S.M.}$$

$$f_c = 0.379 \quad \text{CSM/IN} = 840 \quad \text{FIGURE 6}$$

WEIGHTED CN FOR ENTIRE DRAINAGE AREA

$$\frac{(75.5)(.0697) + 76(.0818) + 71(.0296) + 76(.0329) + 71(.0415)}{0.2555} = 74.5$$

$$100 \text{ YR RUNOFF @ CN} = 74.5 = 1.30 \text{ in. T.W.}$$

$$Q_{100} = (.2555)(840)(1.30) = 279.0$$

Q_{100}	DIA	Q_{100}	Q/Q_c	V/V_c	V_c	V	LENGTH	C_{100}
279.0	60"	362.2	0.79	.99	14.82	14.7	510	1.190
							TO ESTIMATE	

$$\text{New } f_c = 0.379 + \frac{510}{147(5100)} = 0.389 \text{ HR}$$



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DESIGN CALCULATIONS

Project M/W

Detail STORM SEWER STAINC IN ROW

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INTERSECTION OF ESPANOLA AND STORM SEWER IN ROW

AREA	OFFSITE A-A	0.0697	75.5
	JACKSON	0.0818	76
	MADISON	0.0296	71
	WASHINGTON	0.0329	76
	FONTANERO	0.0415	71

ESPANOLA AREAS			CN
29	.0029		79
34	.0026		68
41	.0011		39
50	.0081		61
60	.0045		61
	<u>.0186</u>		

WEIGHTED CN = 63

TOTAL AREA = 0.2741

@ $t_c = 0.389$ CSM/in = 830 FIGURE 6

WEIGHTED CN FOR ENTIRE BASINS CONTRIBUTING

$$\frac{(75.5)(.0697) + (76)(.0818) + (71)(.0296) + 76(.0329) + 71(.0415) + 63(.0186)}{0.2741} = 73.7$$

100 YR RUNOFF = 1.25 in

FIGURE 7

$$Q_{100} = 0.2741 (1.25)(830) = 284.4 \text{ CFS}$$

Q_{DR}	DIA	Q_{full}	Q/Q_c	V/V_c	V_c	V	LENGTH	SLOPE
284.4	66"	382.89	0.74	.97	16.12	15.6	500'	1.3%
							TO DEL NORTE	

$$\text{NEW } t_c = 0.389 + \frac{500}{(15.6)(3600)} = 0.399 \text{ HR}$$



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DESIGN CALCULATIONS

Project M/W
Detail STORM SEWER SIZING IN ROW
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INTERSECTION OF DEL NORTE + STORM SEWER IN ROW

YARD INLET CONTRIBUTES ONLY
THE FLOW IN INTERSECTION OF WASHATCH + DEL NORTE
WILL BE CARRIED IN EXISTING STORM SEWER
DOWN WASHATCH

<u>AREA</u>	OFFSITE A-A		
	JACKSON	.0697	75.5
	JACKSON	.0818	76
	MADISON	.0296	71
	WASHINGTON	.0329	76
	FONTANERO	.6415	71
	ESPAÑOLA	.0186	63
	BASIN	AREA	CN
DEL NORTE	30	.0022	68

TOTAL AREA 0.2763 SM

@ $t_c = 0.399$ CSM/in = 820 FIGURE 6

WEIGHTED CN FOR ENTIRE BASINS CONTRIBUTING = 73.6

100 YR RAINFALL = 1.2 in FIGURE 7

$$Q_{100} = (0.2763)(820)(1.2) = 271.88 \text{ CFS}$$

Q_{100}	DIA	Q_{100}	Q/Q_c	V/V_c	V_c	V	LENGTH	SLOPE
271.88	66"	318.58	0.85	1.00	13.41	13.4	550'	0.90
							TO CARAMILLO	

$$\text{NEW } T_c = 0.399 + \frac{550}{(13.4)(3600)} = 0.410 \text{ HR}$$



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DESIGN CALCULATIONS

Project M/W

Detail Storm Sewer Sizing in ROW

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INTERSECTION OF CARAMILLO + RAILROAD ROW

Flow at Intersection of CARAMILLO + WAHSATCH WILL BE INTERCEPTED BY EXISTING STORM SEWER

THE ONLY FLOW INTERCEPTED BY PROPOSED STORM SEWER IS FROM YARD INLET BASIN 31

AREA	BASIN A-A	.0697	75.5
	JACKSON	.0818	76
	MADISON	.0296	71
	WASHINGTON	.0329	76
	FOUNTAIN	.0415	71
	ESPAÑOLA	.0186	63
	DEL NORTE	.0022	68

CARAMILLO $\frac{.0029}{0.2792}$ 64.5

@ $t_c = 0.410$ CSM/in = 800

FIGURE 6

WEIGHTED CN VALUE FOR CONTRIBUTING BASINS = 73.6

100 YR RUNOFF = 1.25 IN FIGURE 7

$$Q_{100} = (0.2792)(800)(1.25) = 279.2 \text{ CFS}$$

Q_{100}	DIA	Q_{full}	Q/Q_c	V/V_c	V_c	V	LENGTH	SLOPE
279.2	66"	352.20	.79	.98	14.82	14.5	480	1.1%
TO BUENA VENTURA								

$$\text{New } t_c = 0.410 + \frac{480}{(14.5)(3000)} = 0.419 \text{ HRS}$$



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DESIGN CALCULATIONS

Project MADISON/WASHINGTON
Detail 500MM COVER STAINLESS STEEL
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INTERSECTION OF BUENA VENTURA RAILROAD ROW

AREA	BASIN A-A	.0697	75.5
	JACKSON	.0818	76
	MADISON	.0296	71
	WASHINGTON	.6329	76
	FOSTERBERG	.0415	71
	ESPANOLA	.0186	63
	DEL NORTE	.0022	68
	CARAMILLO	.0029	64.5

BUENA VENTURA .0095 61
TOTAL .2837

@ $t_c = 0.419$ CSM/in = 795 FIGURE 6

WEIGHTED CN VALUE FOR CONTRIBUTING BASINS = 73.4

100 YR RUNOFF = 1.2 in FIGURE 7

$$Q_{100} = (.2808 \times 1.2 \times 795) = 267.9 \text{ CFS}$$

Q_{dp}	DIA	Q_{sub}	Q/Q_s	V/V_c	V_s	V	LENGTH	SLOPE
267.9	66"	352.20	.76	.98	14.82	14.5	750	1.1%
							TO CORDA	

$$\text{New } t_c = 0.419 + \frac{750}{(14.5 \times 3600)} = 0.438 \text{ HRS}$$



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DESIGN CALCULATIONS

Project M/W

Detail STORM SEWER SIZING - 11/1/00

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INTERSECTION OF CORONA AND RAILROAD ROW

AREA				
JACKSON	.0818	76	BASIN A-A	.0697
MADISON	.0296	71		CORNER
WASHINGTON	.0339	76		
FONTANERO	.0415	71		
ESPINOLA	.0186	63		
DEL NORTE	.0022	68		
CARAMILLO	.0029	64.5		
BUENA VENTURA	.0045	61		
CORONA	55	.0021	61	
	54	.0021	61	
	63	.0077	61	
	64	.0069	61	
	66	.0137	61	
		.0325	SM	

$$\text{TOTAL AREA} = 0.3162 \text{ SM}$$

$$@ t_c = 0.433 \text{ HR} \quad \text{CSM/IN} = 790 \quad \text{FIGURE 6}$$

$$\text{WEIGHTED CN VALUE FOR CONTRIBUTING BASINS} = 72.1$$

$$100 \text{ YR RUNOFF} = 1.15 \text{ IN} \quad \text{FIGURE 7}$$

$$Q_{100} = (0.3162)(1.15)(790) = 287.3 \text{ CFS}$$

$Q_{D.R.}$	DIA	Q_{full}	Q/Q_f	V/V_f	V_f	V	LENGTH	SLOPE
287.3	66"	352.2	.82	1.00	14.82	14.8	2800	1.1
							TO SHOOK'S	
							RUN	

$$\text{New } t_c = 0.433 + \frac{2800}{(14.8)(3600)} = 0.486$$

$$\underline{Q_{100} @ \text{OUTFALL}} = 287.3 \text{ CFS}$$



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DESIGN CALCULATIONS

Project MADISON / WASHATCH

Detail STORM SEWER SIZING IN CACHE LA POUDE

Designer NJM Date 1/31/86 Sheet 1 of 1

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CACHE LA POUDE

n = .013

LOCATION	SLOPE	Q _{in} CFS	DIA	Q _{sul} CFS	Q/Q _s	V _n	V _f	V fps	LENGTH
8' DIOR INLET @ NW CORNER CACHE LA POUDE + CORONA									
TO INTERSECTION OF ROAD + CACHE LA POUDE	0.90%	10 +6.2	21"	15.03	0.67	0.86	6.25	5.38	450'
TO INTERSECTION OF EL PASO + CACHE LA POUDE	.83%	18.2 +9.3	24"	20.61	0.88	1.01	6.56	6.62	450
TO ARLH CULVERT (6 STRIDES RUN)	1.67%	27.5	24"	29.23	0.94	1.03	9.31	9.59	360



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DESIGN CALCULATIONS

Project MADISON WASHATCH DRAINAGE IMPROVEMENTS

Detail CACHE LA Poudre Culvert

Designer BDP Date 10-17-85 Sheet 1 of 2

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CHECK FOR INLET OR OUTLET CONTROL

IF NORMAL DEPTH $D/S < \text{CRITICAL DEPTH}$,
INLET CONTROL GOVERNS

USE Manning furnished by CITY for CHANNEL PARAMETERS

$$\left. \begin{array}{l} n = 0.040 \text{ (FIELD REVIEW)} \\ S = 0.01 \text{ FT/FT} \\ B = 10 \text{ FT} \\ Z = 2 \\ Q = 2196.5 \text{ CFS} \end{array} \right\} \text{MAN} \left\{ y_n = 8.17 \text{ FT} \right.$$

USE "YCRIT" HPLC PROGRAM

$$\begin{array}{l} Q = 2196.5 \text{ CFS} \\ \alpha = 1.3 \\ Z = 441 \end{array} \quad (\text{CHOW pg 28})$$

$$y_c = 7.84 \text{ FT}$$

SINCE $y_c \approx y_n$, INLET CONTROL CALCULATION
STANDARD GIVE Q_{GOOD} APPROXIMATION OF Q_{ACTUAL} .

1



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DESIGN CALCULATIONS

Project MADISON WATCH DRAINAGE IMPROVEMENT

Detail CACHE LA Poudre CULVERT

Designer BSP Date 10-17-85 Sheet 2 of 2

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$$Q = C_d A_o \sqrt{2gH} \quad \text{FOR INLET CONTROL}$$

$$0.98 C_c \geq C_d \geq 0.95 C_c$$

$$\text{USE } C_d = 0.95 C_c$$

ASSUME SQUARE EDGE OPENING $\therefore C_c = 0.82$

$$\therefore C_d = 0.95 (0.82) = 0.78$$

$A_o = 211$ SF (PLANIMETER OF SCALE DRAWING)

$$H = 12.5 \text{ FT} \quad (H_w/D = 1)$$

$$Q = 0.78 (211) \sqrt{2 (32.2) (12.5)} = \underline{\underline{4,669 \text{ cfs}}}$$

$\therefore$ CACHE LA Poudre CROSSING CAPACITY OK

MADISON/WAHSATCH DRAINAGE IMPROVEMENT STUDY

APPENDIX F

COST ESTIMATE

MADISON/WAHSATCH DRAINAGE IMPROVEMENTS

COST ESTIMATE SUMMARY SEPTEMBER 1985

<u>SUBBASIN</u>	<u>COST (\$)</u>
A	\$200,965
B	363,090*
C	36,080
D	88,160*
E	16,570
F	48,220
G	5,000
H	28,000
I	180,610
J (Storm Sewer Trunk Line)	1,382,680
Offsite Basin AA	<u>442,370*</u>
Subtotal	2,791,745
Contingencies (10 Percent)	<u>279,175</u>
Total Estimated Cost**	\$3,070,920

*See Subbasin Cost Estimate

**NO utility relocation costs are included.

SUBBASIN	ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST (\$)	COST (\$)
A	1.	4 Foot D10R Inlet	4	EA	2,000.00	8,000
	2.	6 Foot D10R Inlet	1	EA	2,500.00	2,500
	3.	8 Foot D10R Inlet	2	EA	3,000.00	6,000
	4.	10 Foot D10R Inlet	1	EA	3,500.00	3,500
	5.	14 Foot D10R Inlet	1	EA	4,200.00	4,200
	6.	22 Foot D10R Inlet	2	EA	5,200.00	10,400
	7.	18 Inch RCP	145	LF	25.00	3,625
	8.	21 Inch RCP	100	LF	27.00	2,700
	9.	24 Inch RCP	260	LF	30.00	7,800
	10.	27 Inch RCP	210	LF	38.00	7,980
	11.	33 Inch RCP	300	LF	50.00	15,000
	12.	54 Inch RCP	370	LF	118.00	43,660
	13.	48 Inch Manhole	1	EA	1,800.00	1,800
	14.	Box Base Manhole	1	EA	3,500.00	3,500
	15.	30 Foot Concrete Crossspan	1	EA	1,000.00	1,000
	16.	Remove Bubbler Inlet	4	EA	1,000.00	4,000
	17.	Road Base (Class 5)	1500	Ton	15.00	22,500
	18.	Asphalt Paving	1100	Ton	48.00	<u>52,800</u>
		Subtotal				\$200,965

SUBBASIN	ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST (\$)	COST (\$)
B	1.	4 Foot D10R Inlet	2	EA	2,000.00	4,000
	2.	6 Foot D10R Inlet	1	EA	2,500.00	2,500
	3.	10 Foot D10R Inlet	1	EA	3,000.00	3,000
	4.	12 Foot D10R Inlet	1	EA	4,000.00	4,000
	5.	20 Foot D10R Inlet	4	EA	5,000.00	20,000
	5.	18 Inch RCP	20	LF	25.00	500
	6.	21 Inch RCP	90	LF	27.00	2,430
	7.	24 Inch RCP	40	LF	30.00	1,200
	8.	27 Inch RCP	20	LF	38.00	760
	9.	30 Inch RCP	300	LF	42.00	12,600
	10.	36 Inch RCP	320	LF	58.00	18,560
	11.	42 Inch RCP	320	LF	80.00	25,600
	12.	48 Inch RCP	170	LF	98.00	16,660
	13.	48 Inch Manhole	2	EA	1,800.00	3,600
	14.	Box Base Manhole	3	EA	3,500.00	10,500
	15.	30 Foot Concrete Crossspan	3	EA	1,000.00	3,000
	16.	8 Inch Curb & Gutter	145	LF	12.00	1,740
	17.	6 Inch Ramp Curb & Gutter	4200	LF	10.00	42,000
	18.	Road Base (Class 5)	3800	Ton	15.00	57,000
	19.	Asphalt Paving	2780	Ton	48.00	<u>133,440</u>
		Subtotal				\$363,090

Note: If non-uniform street sections are not installed in Corona and La Salle Streets the estimated subtotal cost is \$190,890.

SUBBASIN	ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST (\$)	COST (\$)
C	1.	6 Foot D10R Inlet	1	EA	2,500.00	2,500
	2.	Convert Bubbler to Grated Drop Inlet	1	EA	1,000.00	1,000
	3.	18 Inch RCP	290	LF	25.00	7,250
	4.	48 Inch Manhole	1	EA	1,800.00	1,800
	5.	60 Foot Concrete Crosspan	1	EA	1,650.00	1,650
	6.	Remove Bubbler Inlet	4	EA	1,000.00	4,000
	7.	Road Base (Class 5)	360	Ton	15.00	5,400
	8.	Asphalt Paving	260	Ton	48.00	<u>12,480</u>
		Subtotal				\$ 36,080

SUBBASIN	ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST (\$)	COST (\$)
D	1.	6 Foot D10R Inlet	1	EA	2,500.00	2,500
	2.	Convert Bubbler to Grated Drop Inlet	1	EA	1,000.00	1,000
	3.	Convert Bubbler to Curb Opening Inlet	2	EA	1,000.00	2,000
	4.	18 Inch RCP	150	LF	25.00	3,750
	5.	30 Foot Concrete Crossspan	1	EA	1,000.00	1,000
	6.	50 Foot Concrete Crossspan	3	EA	1,450.00	4,350
	7.	Remove Bubbler Inlet	3	EA	1,000.00	3,000
	8.	8 Inch Curb & Gutter	530	LF	12.00	6,360
	9.	Road Base (Class 5)	1250	Ton	15.00	18,750
	10.	Asphalt Paving	900	Ton	48.00	<u>43,200</u>
		Subtotal				\$ 88,160

Note: If paving of Buena Ventura Street is not part of the improvements, reduce Subbasin D Subtotal estimated cost to \$34,650.

E	1.	4 Foot D10R Inlet	2	EA	2,000.00	4,000
	2.	8 Foot D10R Inlet	1	EA	3,000.00	3,000
	3.	18 Inch RCP	40	LF	25.00	1,000
	4.	24 Inch RCP	20	LF	27.00	540
	5.	Road Base (Class 5)	150	Ton	15.00	2,250
	6.	Asphalt Paving	110	Ton	48.00	<u>5,280</u>
		Subtotal				\$ 16,570

SUBBASIN	ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST (\$)	COST (\$)
F	1.	6 Foot D10R Inlet	2	EA	2,500.00	5,000
	2.	18 Inch RCP	30	LF	25.00	750
	3.	24 Inch RCP	80	LF	30.00	2,500
	4.	30 Foot Concrete Crosspan	5	EA	1,000.00	5,000
	5.	50 Foot Concrete Crosspan	4	EA	1,450.00	5,800
	6.	Remove Bubbler Inlet	16	EA	1,000.00	16,000
	7.	Road Base (Class 5)	500	Ton	15.00	7,500
	8.	Asphalt Paving	290	Ton	48.00	<u>13,920</u>
		Subtotal				\$ 48,220
G	1.	Grouted Riprap Rundown	1	EA	5,000.00	<u>5,000</u>
		Subtotal				\$5,000
H	1.	Convert Bubbler to Grated Drop Inlet	3	EA	1,000.00	3,000
	2.	18 Inch RCP	150	LF	25.00	3,750
	3.	48 inch Manhole	2	EA	1,800.00	3,600
	4.	50 Foot Concrete Cross Pan	2	EA	1,450.00	2,900
	5.	Remove Bubbler Inlet	8	EA	1,000.00	8,000
	6.	Road Base (Class 5)	130	Ton	15.00	1,950
	7.	Asphalt Paving	100	Ton	48.00	<u>4,800</u>
		Subtotal				\$ 28,000

SUBBASIN	ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST (\$)	COST (\$)
I	1.	4 Foot D10R Inlet	1	EA	2,000.00	2,000
	2.	6 Foot D10R Inlet	1	EA	2,500.00	2,500
	3.	8 Foot D10R Inlet	1	EA	3,000.00	3,000
	4.	18 Inch RCP	50	LF	25.00	1,250
	5.	21 Inch RCP	450	LF	27.00	12,150
	6.	24 Inch RCP	810	LF	30.00	24,300
	7.	48 Inch Manhole	3	EA	1,800.00	5,400
	8.	50 Foot Concrete Cross Pan	5	EA	1,450.00	7,250
	9.	Remove Bubbler Inlet	10	EA	1,000.00	10,000
	10.	Convert Bubbler to Curb Opening Inlet	2	EA	1,000.00	2,000
	11.	Road Base (Class 5)	2200	TON	15.00	33,000
	12.	Asphalt Paving	1620	TON	48.00	<u>77,760</u>
		Subtotal				\$180,610
J	1.	18 Inch RCP	800	LF	25.00	20,000
	2.	48 Inch RCP	940	LF	98.00	92,120
	3.	60 Inch RCP	1450	LF	130.00	188,500
	4.	66 Inch RCP	5590	LF	150.00	838,500
	5.	Yard Inlet	21	EA	2,000.00	42,000
	6.	Box Base Manhole	19	EA	3,500.00	66,500
	7.	8" Curb & Gutter	360	LF	12.00	4,320
	8.	Road Base (Class 5)	1200	Ton	15.00	18,000
	9.	Asphalt Paving	900	Ton	48.00	43,200
	10.	Asphalt Bike Path	2250	LF	10.00	22,500

SUBBASIN	ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST (\$)	COST (\$)
	11.	Drilled Seeding	63,600	SY	0.40	25,440
	12.	Grass Sod	74,400	SF	0.25	18,600
	13.	Irrigation System	1	LS	3,000.00	<u>3,000</u>
		Subtotal				\$1,382,680

SUBBASIN	ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST (\$)	COST (\$)
OFFSITE BASIN AA	1.	4 Foot DIOR Inlet	1	EA	2,000.00	2,000
	2.	12 Foot DIOR Inlet	7	EA	4,000.00	28,000
	3.	14 Foot DIOR Inlet	2	EA	4,200.00	8,400
	4.	20 Foot DIOR Inlet	1	EA	5,000.00	5,000
	5.	18 Inch RCP	190	LF	25.00	4,750
	6.	21 Inch RCP	440	LF	27.00	11,880
	7.	24 Inch RCP	770	LF	30.00	23,100
	8.	27 Inch RCP	20	LF	38.00	760
	9.	33 Inch RCP	320	LF	50.00	16,000
	10.	48 Inch RCP	550	LF	98.00	53,900
	11.	54 Inch RCP	910	LF	118.00	107,380
	12.	48 Inch Manhole	3	EA	1,800.00	5,400
	13.	Box Base Manhole	4	EA	3,500.00	14,000
	14.	30 Foot Concrete Crosspan	1	EA	1,000.00	1,000
	15.	Road Base (Class 5)	3200	TON	15.00	48,000
	16.	Asphalt Paving	2350	TON	48.00	<u>112,800</u>
		Subtotal				\$442,370

Note: If these improvements are not installed, flooding will continue to occur for higher frequency design storms on Wahsatch Avenue between Madison Street and Fontanero Street.

MADISON/WAHSATCH DRAINAGE IMPROVEMENT STUDY

APPENDIX G

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