MASTER DRAINAGE
STUDY FOR
SUNRISE AMENDED
(SUNDOWN SUBDIVISIONS)

PREPARED BY:

K L H Engineering Consultants, Inc.
206-208 Sutton Lane
Colorado Springs, CO 80907
KLH: JN 86 536 00

JULY 1986

SCOPE AND PURPOSE

The purpose of this report is to amend the Master Drainage Study for Sunrise Development by KLH Engineering Consultants, April 1984. It is intended that this report be attached to and become a part of that report.

Data contained herein is intended to provide the basis for an overall plan for sizing the required drainage facilities in the Amended Sundown Master Plan Area. This study provides information on total developed flows, and approximate sizing and general location of required drainage facilities. This plan should be used as a guide for the required facilities and not as an inflexible design. A more detailed examination of drainage facilities will be made in the final reports for each filing as they are platted, refer to Figure A/4.

GENERAL

This study was done to update and amend the Master Drainage Study for Sunrise Development as a result of masterplan revisions within the Sunrise Development, as well as the addition of 40 acres, more or less, to the development. Most of the additional 40 acres, more or less, that has been added to this masterplan area is contained in Lots 12, 13, 14, 15, 16 and 17 of Templeton Gap Heights Filing No. 2. A small portion (approximately 2 acres) of unplatted area has also been added which makes up the Westerly portion of the masterplanned park area. See Drainage Plan appended hereto which shows the park and attached Greenbelt/Drainageway System.

Prior to this amendment, Sunrise Development contained approximately 282 acres and was bounded within the limits indicated on Map A/1 in Appendix "A". The Easterly 90 acres of this area, plus the previously mentioned 40 acres, have been re-masterplanned to increase lot density. Street alignments have also been revised. Total acreage will now increase to approximately 322 acres. Map A/2 shows the limits of Sunrise Amended and Map A/3 shows this area superimposed over the original Sunrise Development to indicate where the overlap occurs and where the additional acreage has been added.

Land uses for Area A-12 are from the Amended Nor'wood Master Plan and from preliminary concept plans by P.G.A.V. for lands West of, and adjacent to, Powers Boulevard. Tributary area to the East of Powers Boulevard are not presently owned by Nor'wood Development Corporation, are not masterplanned, and are still zoned 5-acre agricultural; therefore, assumptions were made as to the probable land uses for these areas. See Maps A/5 and A/6. Land uses for all other offsite tributary areas were established in the original Sunrise Master Drainage Study.

The entire drainage area in this study has been placed in a single basin, Basin A. Some of the sub-basins in Basin A consist of composite basins from the previous Master Study. See the Internal Drainage section of this report, drainage calculations in Appendix "B", and the appended Drainage Plan for a more specific delineation of these composite sub-basins. Basin "A" outlets into the Nor'wood East Drainageway on the North side of Balsam Road.

SOIL TYPES

Soil types for this study area were determined from the Soil Conservation Service Soils Maps of El Paso County. Soil types included on site, as well as offsite areas, include:

1. Blakeland Sandy Loam; S.C.S. Soils Number 8 and Hydrologic Soils Group A.
2. Bresser Sandy Loam; S.C.S. Soils Number 13 and Hydrologic Soils Group B.
3. Stapleton-Bernal Sandy Loam; S.C.S. Soils Number 85 and Hydrologic Soils Group B.
4. Truckton Loamy Sand; S.C.S. Soils Number 95 and Hydrologic Soils Group B.

S.C.S. Soils Map numbers are shown on the attached Drainage Plan.

METHOD OF COMPUTATION

Runoff quantities are calculated using the Modified S.C.S. Methodology as approved by the City of Colorado Springs Engineering Division and outlined in the manual for "Determination of Storm Runoff Criteria" by the City of Colorado Springs, dated March 1977. A weighted curve number was utilized for runoff calculations which is based on soil type and land use. Runoff calculations are included in Appendix "B".

Per City of Colorado Springs Criteria, all drainage structures have been sized for the 5-year storm when peak 100-year flows are less than 500 cfs, and for the 100-year storm when 100-year flows exceed 500 cfs. Street capacities were also considered for the 100-year storm.

TRIBUTARY DRAINAGE

Much of the runoff that is conveyed across this site is generated by "offsite sub-basins". The area which is the subject of this report contains approximately 90 acres + 40 acres = 130 acres, but runoff from approximately 490 offsite acres is also routed through the site.

From the East, the site receives runoff from Area A-12. This area is presently unplatted so land use has been assumed as described in the General section of this report. A very significant Q(5) of 177 cfs and Q(100) of 467 cfs is tributary to Sunrise Amended. Topographically this area is tributary to Hatteras Drive, however, the Eastern road side ditch along Oakwood Boulevard flows North to Balsam Road. A 100-year pipe system will be extended East in Balsam Road to Oakwood Boulevard to carry the future developed 100-year flow.

From the South, runoff is received from Areas Sunr A-1 and Sunr A-22 of the original Master Drainage Study for Sunrise Development. Note that for this study these areas are relabeled as A-1 and A-26, respectively. Flow from Area A-1, which lies South of Templeton Gap Road, enters the site as pipe flow through an existing 36" CMP culvert. Storms which generate flows that are in excess of the capacity of this pipe will flow overland into Sunrise Amended in a storm drainage easement to be provided for that purpose. The existing culvert will be extended into a storm sewer system located in Sunrise Amended. An inlet was placed at the low point in

Templeton Gap, and the pipe system extension into Sunrise Amended has been oversized to help drain Templeton Gap more quickly.

From the West, Sunrise Amended receives runoff as pipe flow and surface flow from Sunrise Development areas, as well as 45 cfs that has been diverted from the Templeton Gap Drainage Basin. See letter revising the Sundown Subdivision Filing No. 1, dated June 17, 1986, in Appendix C. For this report, original Sunrise Areas Sunr 13 thru 21 inclusive, 23, 25, and 26 have been combined into Area A-23; Sunrise Areas Sunr A-27 and 28 have been combined into Area A-24; and, finally, Sunrise Areas Sunr B-1, 2, 3 and 4 have been combined into Area A-25. All of these areas discharge to the Greenbelt/Drainageway/Park System. Refer to Drainage Plans for Sunrise Development and Sunrise Amended (attached hereto) for more complete delineation of these areas. Also, note in the calculations in Appendix "B" that revisions were made to the total area in Sunr A-25 and land use in Sunr B-4 as a result in masterplan changes. Sunr A-25 was decreased in total area as a result of adjusting the greenbelt to fit the new masterplan for Sunrise Amended. Sunr B-4 originally contained a P.U.D. parcel which has since been changed to a school site.

INTERNAL DRAINAGE

Runoff generated on the Sunrise Amended site, as well as offsite contributions, will be conveyed in the streets and subsurface storm drain systems shown on the attached Drainage Plan. Routing of flows is based upon a grading plan for this site which has already been constructed. As a result, street alignments are considered to be definite. Runoff values for 5-year and 100-year storms are shown on the Drainage Plan for each sub-basin as well as for accumulative flows. Accumulative flows are based on a runoff calculation for combined sub-basins tributary to a particular design point. Upon final platting, it may be necessary to adjust pipe sizes, inlets, and locations for 8" vertical curb and gutter, to accommodate final street grades, etc.

There are three main branches of subsurface storm drain lines on this site. The first will be a 100-year pipe system in Balsam Drive extending East from the Norwood East Drainageway to Oakwood Boulevard. This pipe will act as a temporary culvert to pick up runoff from Basin A-12. It will eventually need to be extended, by others, with development of lands to the East.

The second system extends through the middle of this revised development, beginning at Balsam and the Norwood East Drainageway and extending Southeast to an existing 36" CMP culvert which drains Basin A-1 underneath Templeton Gap Road. This system was initially designed as a 5-year storm drain. However, upon investigation of the 100-year excess flows (Q100 minus Q5) it was determined that additional inlets and pipe capacity was necessary to keep said excess flow within the street Right-of-Way. On the attached drainage plan 100-year flows and capacities are tabulated, for various points, to demonstrate that the 100-year excess flow will be contained within the Right-of-Way. All lot fronts along this storm drain system must be graded from back of curb to front property line at 4% minimum. See diagram on drainage plan for street capacity. A detailed evaluation of street capacities, including curves, intersections, etc., will be required with each individual subdivision drainage report.

As Area A-1 develops, the storm drain system will need to be extended South. This will be designed and constructed by those developers.

The last "branch" of the storm system is located in the Greenbelt/Park System which forms the Westerly boundary of Sunrise Amended. This system also changes from 5-year to 100-year design along its length. The 100-year design begins just to the North of Bandanna Drive as it extends into Sunrise Amended from Sundown Filing No. 2. This system will be an open channel from Bandanna to Balsam.

All systems are combined on the South side of Balsam Road and conveyed underneath the road to the Nor'wood East Drainageway in a concrete box section.

Internal streets within Sunrise Amended, have been designed to contain 100-year excess flows within the Right-of-Ways. Lot pads will be elevated above the 100-year water surface levels. In accordance with City of Colorado Springs criteria, 5-year street flow values have been limited to acceptable values given in street capacity charts from the Runoff Criteria Manual. For storm events larger than the 5-year storm, street flows may exceed the capacity of the curb and gutter.

DRAINAGE FACILITIES COST ESTIMATE

As a result of this masterplan amendment the drainage costs must be revised. All of the storm facilities lying East of the Greenbelt/Drainageway in the Sunrise Study have been deleted. The facilities remaining are as follows (based on Revised Cost Estimate in letter dated 9/12/84).

Sunrise Development - Unchanged (Lying West of Amended Area):

18" R.C.P	610 L.F.	@ $ 23./L.F.	= $	14,030.00
21" R.C.P	350 L.F.	@ $ 30./L.F.	= $	10,500.00
24" R.C.P	605 L.F.	@ $ 35./L.F.	= $	21,175.00
30" R.C.P	855 L.F.	@ $ 42./L.F.	= $	35,910.00
36" R.C.P	850 L.F.	@ $ 50./L.F.	= $	42,500.00
42" R.C.P	980 L.F.	@ $ 63./L.F.	= $	61,740.00
48" R.C.P.	630 L.F.	@ $ 74./L.F.	= $	46,620.00
19"x 30" Horiz.- ELL R.C.P.	130 L.F.	@ $ 45./L.F.	= $	5,850.00
72" Flared End Sec.	2 Ea.	@ $1500./Ea.	= $	3,000.00
Trap. Channel b=1', z=1', d=2'	30 L.F.	@ $ 21./L.F.	= $	630.00
Manholes	13 Ea.	@ $1000./Ea.	= $	13,000.00
6' D-10R	7 Ea.	@ $1800./Ea.	= $	12,600.00
8' D-10R	16 Ea.	@ $2200./Ea.	= $	35,200.00
10' D-10R	4 Ea.	@ $2500./Ea.	= $	10,000.00
14' D-10R	3 Ea.	@ $3500./Ea.	= $	10,500.00
Curb Inlet	1 Ea.	@ $1500./Ea.	= $	1,500.00
Curb Outlet	1 Ea.	@ $1500./Ea.	= $	1,500.00
Rip Rap	45 C.Y.	@ $ 45./C.Y.	= $	2,025.00
			$	328,280.00
		5% Contingency	= $	16,414.00
		10% Engineering	= $	34,469.40
		TOTAL	= $	379,163.40

DRAINAGE FACILITIES COST ESTIMATES SUNDOWN AMENDED :

A) SYSTEM No. 1 - BALSAM SOUTH TO SUNDOWN SUB.Fi.No.2 :

ITEM	QUANITY	UNIT PRICE	UNIT	AMOUNT
18"R.C.P.	30.00	25.00	L.F.	750.00
21"R.C.P.	390.00	30.00	L.F.	11700.00
24"R.C.P.	130.00	35.00	L.F.	4550.00
48"R.C.P.	110.00	74.00	L.F.	8140.00
54"R.C.P.	490.00	92.00	L.F.	45080.00
4' D-10R	2.00	1800.00	Each	3600.00
6' D-10R	1.00	2000.00	Each	2000.00
10' D-10R	1.00	2700.00	Each	2700.00
4'x4'AreaDrn	1.00	1800.00	Each	1800.00
BOX MANHOLE	2.00	2500.00	Each	5000.00
CONC.TRAP CHANNEL				
- b=5' d=3.3	1090.00	135.00	L.F.	147150.00
			SUB-TOTAL:	232470.00
			+ 5% CONTGY:	11623.50
				244093.50
			+10% ENGRNG:	24409.35
			TOTAL:	268502.85

B) SYSTEM No. 2 - MIDDLE SYSTEM THRU SUNDOWN DEVELOPMENT REVISED :

ITEM	QUANITY	UNIT PRICE	UNIT	AMOUNT
21"R.C.P.	315.00	31.00	L.F.	9765.00
27"R.C.P.	110.00	40.00	L.F.	4400.00
30"C.M.P.	165.00	42.00	L.F.	6930.00
36"R.C.P.	180.00	51.00	L.F.	9180.00
42"R.C.P.	1670.00	65.00	L.F.	108550.00
48"R.C.P.	410.00	74.00	L.F.	30340.00
54"R.C.P.	730.00	92.00	L.F.	67160.00
60"R.C.P	310.00	125.00	L.F.	38750.00
6' D-10R	4.00	2000.00	Each	8000.00
8' D-10R	1.00	2200.00	Each	2200.00
10' D-10R	5.00	2700.00	Each	13500.00
12' D-10R	1.00	3500.00	Each	3500.00
14' D-10R	4.00	4000.00	Each	16000.00
20' D-10R	1.00	5500.00	Each	5500.00
MANHOLES	7.00	1300.00	Each	9100.00
BOX MANHOLE	6.00	2500.00	Each	15000.00
CONC.TRAP CHANNEL				
-b=5'd=4.3	460.00	155.00	L.F.	71300.00
BOX CULVERT	100.00	350.00	L.F.	35000.00
			SUB-TOTAL:	454175.00
			+ 5% CONTGY:	22708.75
				476883.75
			+10% ENGRNG:	47688.38
			TOTAL:	524572.13

C) SYSTEM No.3 - BALSAM ROAD 100yr PIPE :

ITEM	QUANITY	UNIT PRICE	UNIT	AMOUNT
60"R.C.P.	870.00	125.00	L.F.	108750.00
66"R.C.P.	970.00	145.00	L.F.	140650.00
72"R.C.P	150.00	165.00	L.F.	24750.00
BOX MANHOLE	4.00	2500.00	Each	10000.00
RIPRAP	15.00	35.00	C.Y.	525.00
			SUB-TOTAL:	284675.00
			+ 5% CONTGY:	14233.75
				298908.75
			+10% ENGRNG:	29890.88
			TOTAL:	328799.63

TOTAL SUNDOWN AMENDED

System No. 1	=	$ 268,502.85
System No. 2	=	$ 524,572.13
System No. 3	=	$ 328,779.63
TOTAL	=	$ 1,121,854.61
GRAND TOTAL FOR SUNRISE DEVELOPMENT (As amended by this study)	=	$ 1,501,018.01

DRAINAGE AND BRIDGE FEES

The Drainage and Bridge Fees for the Sunrise Development must be revised to account for 90.2 acres which has been re-masterplanned, and 40.4 acres which has been added to the Development. The values determined here are estimates only. Actual Drainage and Bridge Fees required will depend upon the size of individual parcels platted and the date of platting.

Drainage Fee:

1986 - Cottonwood Creek Drainage Basin

Re-Masterplanned	90.2 Ac.		
Add'l Masterplanned Area	40.4 Ac.		
Unchanged	185.8 Ac.		
TOTAL	316.4 Ac.	@ $3293/Ac.	= $1,041,905.20

1986 - Templeton Gap Drainage Basin

Unchanged	6.0 Ac.	@ $2558/Ac.	= $ 15,348.00

Bridge Fee:

1986 - Cottonwood Creek Drainage Basin

Re-Masterplanned	90.2 Ac.		
Add'l Masterplanned Area	40.4 Ac.		
Unchanged	185.8 Ac.		
TOTAL	316.4 Ac.	@ $151/Ac.	= $ 47,776.40

1986 - Templeton Gap Drainage Basin

Unchanged	6.0 Ac.	@ $ 28/Ac.	= $ 168.00

DRAINAGE REPORT STATEMENTS

Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by the negligent acts, errors or omissions on my part in preparing this report.

Name

Seal

Developer's Statement:

The developer has read and will comply with all of the requirements specified in this drainage report.

NORWOOD DEVELOPMENT CORP.
Business Name
By:
Title: PRESIDENT
Address: P.O. BOX 792
MANITOU SPRINGS, CO 80829

City of Colorado Springs:

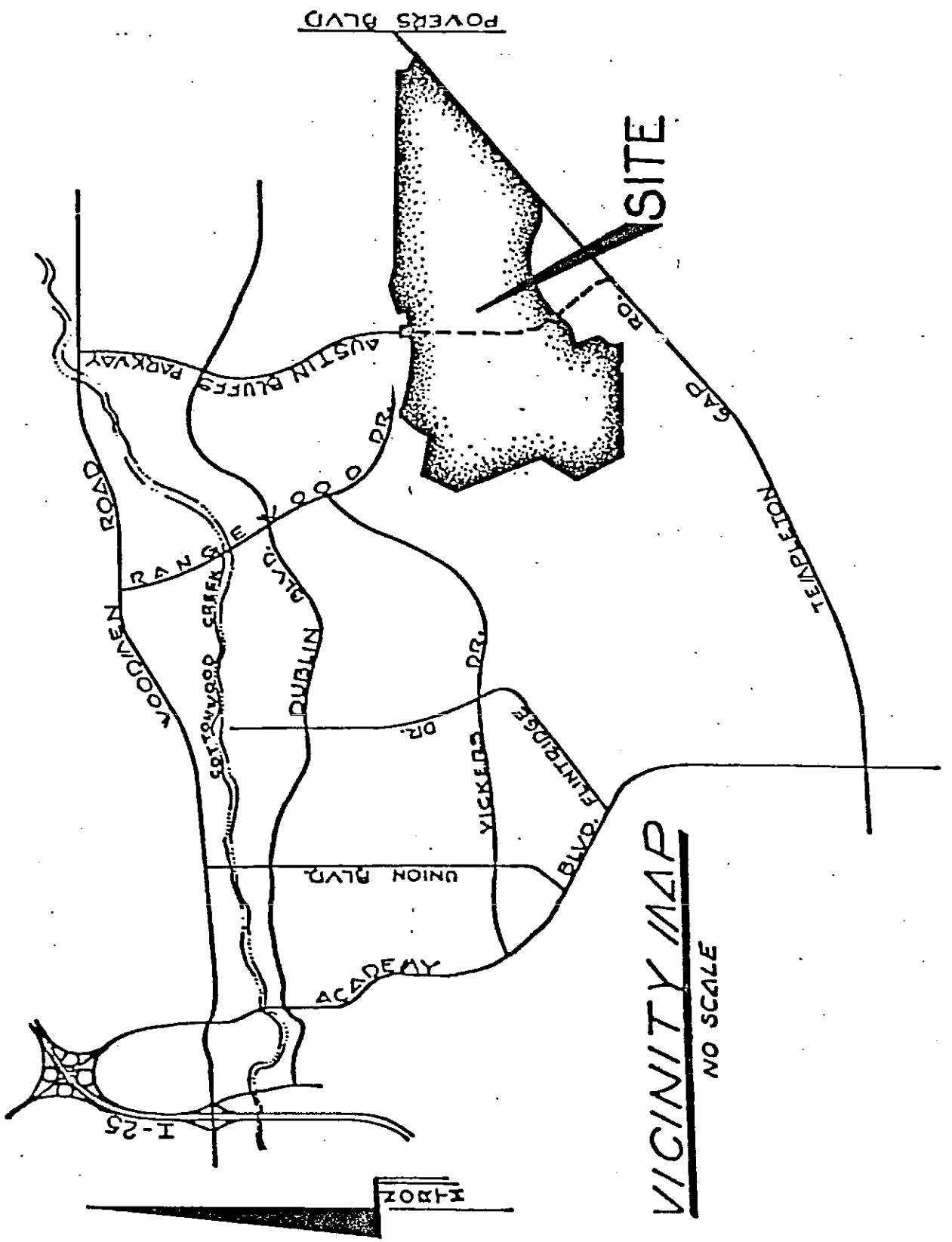
Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

City Engineer

8/26/86
Date

Conditions:

APPENDIX "A"

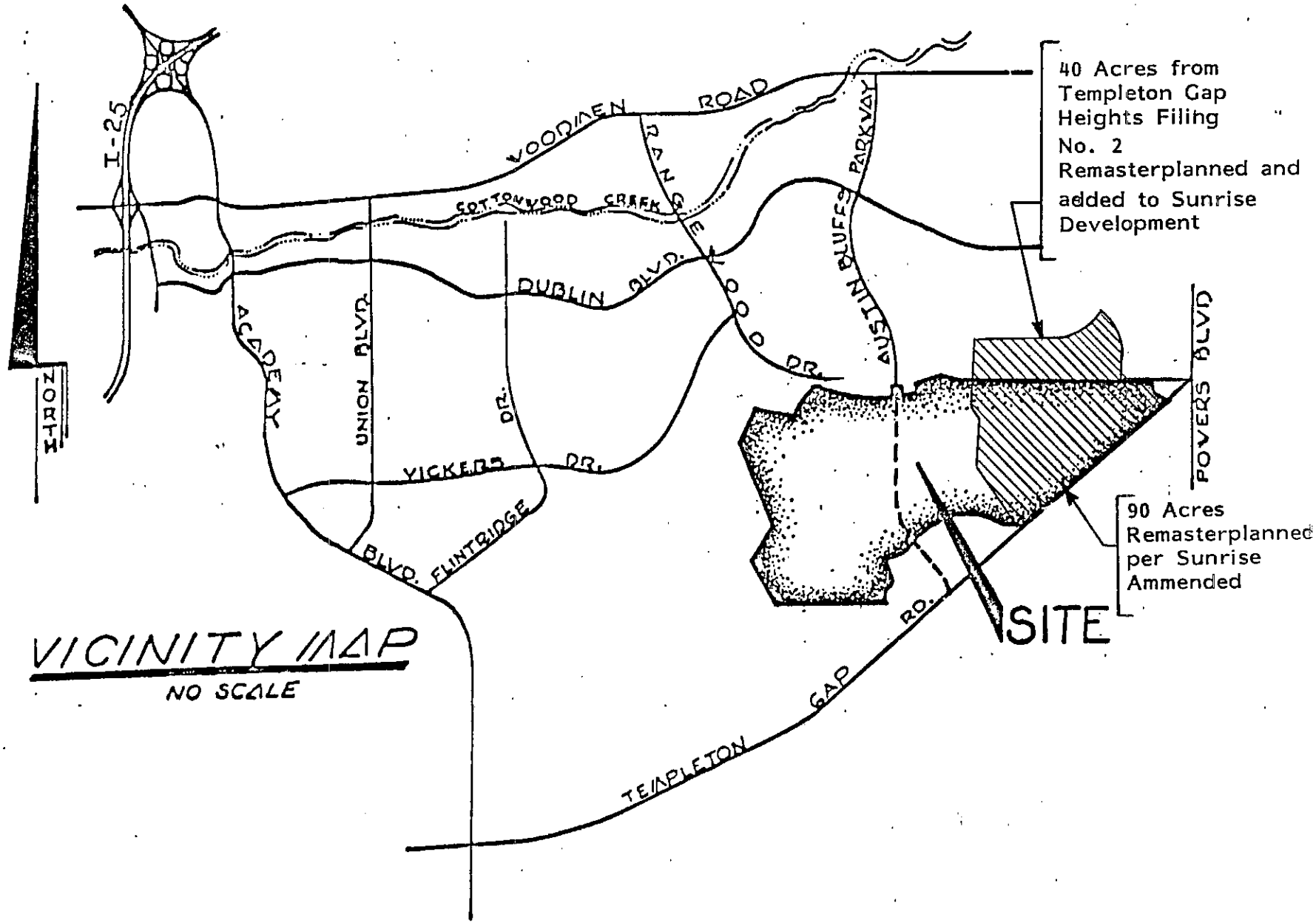


(1984) SUNRISE DEVELOPMENT

SUNRISE AMMENDED

VICINITY MAP

NO SCALE



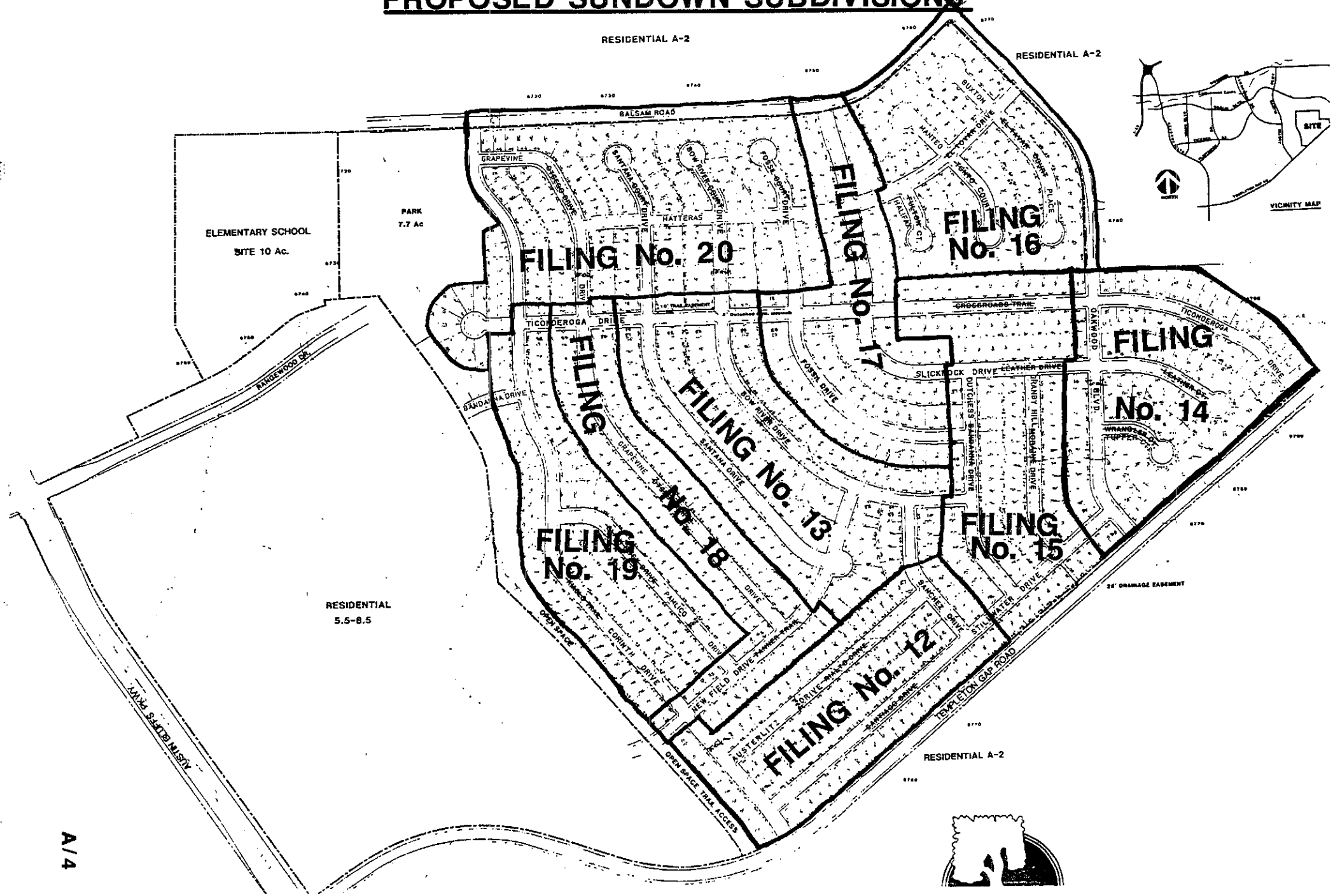
VICINITY MAP

NO SCALE

A/3

REVISED SUNRISE DEVELOPMENT

PROPOSED SUNDOWN SUBDIVISIONS



A/4

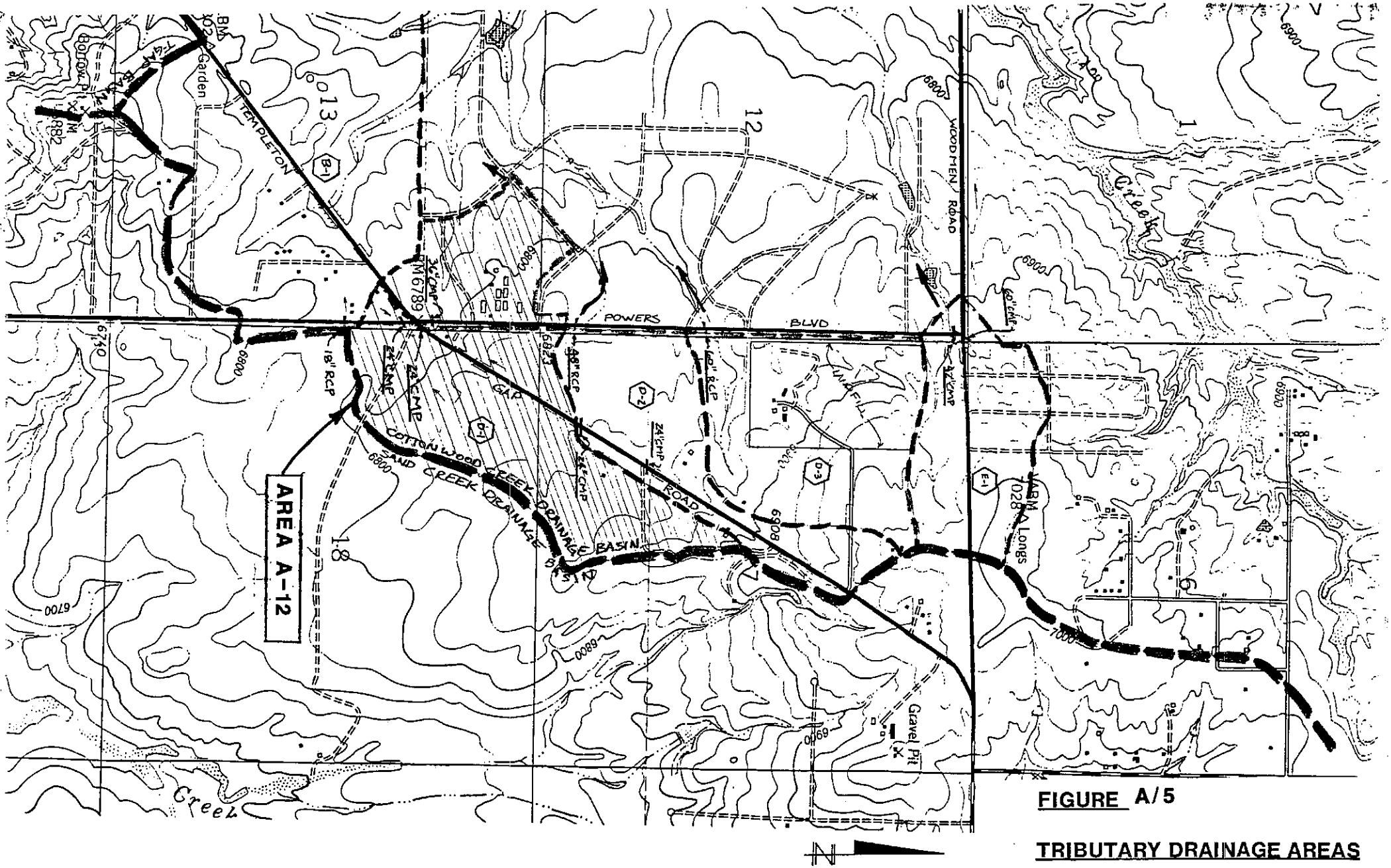


FIGURE A/5

TRIBUTARY DRAINAGE AREAS

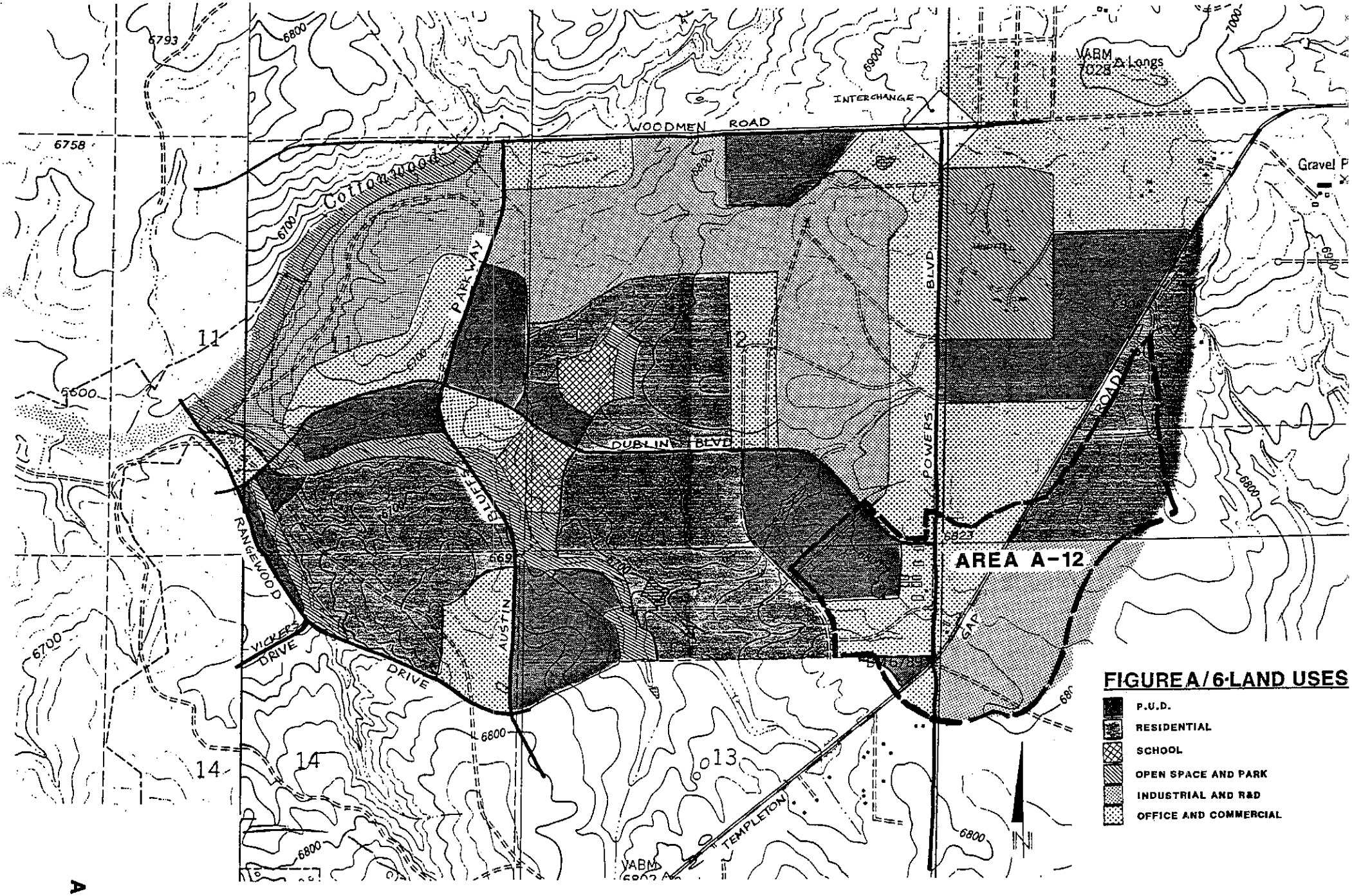


FIGURE A/6-LAND USES

- P.U.D.
- RESIDENTIAL
- SCHOOL
- OPEN SPACE AND PARK
- INDUSTRIAL AND R&D
- OFFICE AND COMMERCIAL

APPENDIX "B"

BASIN

SunD A- 1

SunD A-1 is the same as Sunr A-1 from MASTER DRAINAGE STUDY FOR SUNRISE DEVELOPMENT

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1 Ac	A	51	40.2	2052.2
37.1		RESIDENTIAL 1/5Ac	A	65	40.2	2615.5
4.3		COMMERCIAL / R&D	A	81	4.7	377.8
13.7		STREETS & WALKS	A	98	14.9	1456.2
92.2	.144				100.0	6501.6

WEIGHTED CN = 65.0

FLOW TYPE	W(ft)	L(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	12	200	.033			
STREET	61	1000	.043			
PIPE	10	1000	.036			
	83		.112	.16	1240	29.2 (5yr FLOW)
				.75		134.5 (100yr FLOW)

BASIN

SunD A- 2

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
.5		PARK / OPEN SPACE	A	39	31.3	1218.8
1.1		STREETS & WALKS	A	98	68.8	6737.5
1.6	.003				100.0	7956.3

WEIGHTED CN = 79.6

FLOW TYPE	W(ft)	L(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
STREET	25	1400	.072			
	25		.072	.61	1300	2.0 (5yr FLOW)
				1.61		5.2 (100yr FLOW)

BASIN

SunD A- 3

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
3.6		P.U.D.	A	77	78.3	6026.1
1.0		STREETS & WALKS	A	98	21.7	2130.4
4.6	.007				100.0	8156.5

WEIGHTED CN = 81.6

FLOW TYPE	W(ft)	L(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	4	90	.017			
STREET	28	1610	.084			
	32		.101	.69	1270	6.3 (5yr FLOW)
				1.75		16.0 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASIN

SunD A- 4

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
13.4		P.U.D.	A	77	82.2	6330.1
2.9		STREETS & WALKS	A	98	17.8	1743.6
16.3	.025				100.0	8073.6

WEIGHTED CN = 80.7

FLOW TYPE	W(ft)	L(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	7	650	.103			
STREET	23	1345	.072			
	30		.175	.66	1110	18.6 (5yr FLOW)
				1.69		47.8 (100yr FLOW)

BASIN

SunD A- 5

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
5.8		P.U.D.	A	77	76.3	5876.3
1.8		STREETS & WALKS	A	98	23.7	2321.1
7.6	.012				100.0	8197.4

WEIGHTED CN = 82.0

FLOW TYPE	W(ft)	L(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	4	200	.056			
STREET	19	1200	.065			
	23		.121	.71	1210	10.3 (5yr FLOW)
				1.78		25.6 (100yr FLOW)

BASIN

SunD A- 6

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
8.1		P.U.D.	A	77	81.8	6300.0
1.8		STREETS & WALKS	A	98	18.2	1781.8
9.9	.015				100.0	8081.8

WEIGHTED CN = 80.8

FLOW TYPE	W(ft)	L(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	7	190	.039			
STREET	29	1225	.055			
	36		.094	.66	1290	13.2 (5yr FLOW)
				1.70		33.8 (100yr FLOW)

BASIN

SunD A- 7

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
3.9		P.U.D.	A	77	83.0	6389.4
.1		P.U.D.	B	85	2.1	180.9
.6		STREETS & WALKS	A	98	12.8	1251.1
.1		STREETS & WALKS	B	98	2.1	208.5
4.7	.007				100.0	8029.8

WEIGHTED CN = 80.3

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	7	190	.039			
STREET	24	950	.041			
	31		.080	.64	1300	6.1 (5yr FLOW)
				1.66		15.8 (100yr FLOW)

BASIN

SunD A- 8

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
1.6		P.U.D.	A	77	32.7	2514.3
2.5		P.U.D.	B	85	51.0	4336.7
.4		STREETS & WALKS	A	98	8.2	800.0
.4		STREETS & WALKS	B	98	8.2	800.0
4.9	.008				100.0	8451.0

WEIGHTED CN = 84.5

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	6	150	.030			
STREET	14	1330	.090			
	20		.120	.84	1220	7.9 (5yr FLOW)
				1.98		18.5 (100yr FLOW)

BASIN

SunD A- 9

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
1.9		P.U.D.	A	77	39.6	3047.9
1.8		P.U.D.	B	85	37.5	3187.5
.4		STREETS & WALKS	A	98	8.3	816.7
.7		STREETS & WALKS	B	98	14.6	1429.2
4.8	.008				100.0	8481.3

WEIGHTED CN = 84.8

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	6	150	.030			
STREET	14	1210	.078			
	20		.108	.86	1250	8.1 (5yr FLOW)
				2.00		18.8 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASIN

SunD A-10

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
1.1		P.U.D.	A	77	10.8	830.4
7.2		P.U.D.	B	85	70.6	6000.0
.5		STREETS & WALKS	A	98	4.9	480.4
1.4		STREETS & WALKS	B	98	13.7	1345.1
10.2	.016				100.0	8655.9

WEIGHTED CN = 84.8

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	8	170	.031			
STREET	12	1150	.078			
	20		.108	.96	1250	19.1 (5yr FLOW)
				2.15		42.7 (100yr FLOW)

BASIN

SunD A-11

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
1.9		P.U.D.	A	77	43.2	3325.0
1.5		P.U.D.	B	85	34.1	2897.7
.5		STREETS & WALKS	A	98	11.4	1113.6
.5		STREETS & WALKS	B	98	11.4	1113.6
4.4	.007				100.0	8450.0

WEIGHTED CN = 84.5

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	3	130	.033			
STREET	21	860	.038			
	24	990	.071	.84	1300	7.5 (5yr FLOW)
				1.98		17.7 (100yr FLOW)

BASIN

SunD A-12

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
213.7		PUD/RES/COMM/IND	A	80	100.0	7960.6
213.7	.334				100.0	7960.6

WEIGHTED CN = 79.6

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	100	4	.020			
STREET	3100	30	.224			
PIPE	4130	50	.109			
	7330	84	.353	.61	870	176.5 (5yr FLOW)
				1.61		467.2 (100yr FLOW)

BASIN

SunD A-13

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
.7		P.U.D.	A	77	23.3	1796.7
1.7		P.U.D.	B	85	56.7	4816.7
.2		STREETS & WALKS	A	98	6.7	653.3
.4		STREETS & WALKS	B	98	13.3	1306.7
3.0	.005				100.0	8573.3

WEIGHTED CN = 85.7

FLOW TYPE	H ℄(ft)	L ℀(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	3	60	.010			
STREET	30	1130	.052			
	33		.063	.91	1300	5.5 (5yr FLOW)
				2.08		12.7 (100yr FLOW)

BASIN

SunD A-14

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
4.3		P.U.D.	B	85	76.8	6526.8
1.3		STREETS & WALKS	B	98	23.2	2275.0
5.6	.009				100.0	9801.8

WEIGHTED CN = 88.0

FLOW TYPE	H ℄(ft)	L ℀(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	5	140	.030			
STREET	20	750	.032			
	25	890	.061	1.05	1300	11.9 (5yr FLOW)
				2.27		25.8 (100yr FLOW)

BASIN

SunD A-15

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
2.1		P.U.D.	B	85	75.0	6375.0
.7		STREETS & WALKS	B	98	25.0	2450.0
2.8	.004				100.0	8825.0

WEIGHTED CN = 88.3

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	9	200	.040			
STREET	10	380	.016			
	19	580	.056	1.06	1300	6.0 (5yr FLOW)
				2.29		13.0 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASIN

SunD A-16

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
5.0		P.U.D.	B	85	73.5	6250.0
1.8		STREETS & WALKS	B	98	26.5	2594.1
6.8	.011				100.0	8844.1

WEIGHTED CN = 88.4

FLOW TYPE	H ℄(ft)	L ℀(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	3	100	.023			
STREET	21	910	.040			
	24		.063	1.07	1300	14.8 (5yr FLOW)
				2.31		31.9 (100yr FLOW)

BASIN

SunD A-17

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
4.7		P.U.D.	B	85	85.5	7263.6
.8		STREETS & WALKS	B	98	14.5	1425.5
5.5	.009				100.0	8689.1

WEIGHTED CN = 86.9

FLOW TYPE	H ℄(ft)	L ℀(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	8	215	.044			
STREET	14	775	.040			
	22	990	.084	.98	1300	10.9 (5yr FLOW)
				2.17		24.3 (100yr FLOW)

BASIN

SunD A-18

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
3.7		P.U.D.	B	85	86.0	7314.0
.6		STREETS & WALKS	B	98	14.0	1367.4
4.3	.007				100.0	8681.4

WEIGHTED CN = 86.8

FLOW TYPE	H ℄(ft)	L ℀(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	11	230	.041			
STREET	14	675	.032			
	25	905	.074	.97	1300	8.5 (5yr FLOW)
				2.17		18.9 (100yr FLOW)

BASIN

SunD A-19

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
2.8		P.U.D.	A	77	77.8	5988.9
.8		STREETS & WALKS	A	98	22.2	2177.8
3.6	.006				100.0	8166.7

WEIGHTED CN = 81.7

FLOW TYPE	H(ft)	L(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	3	130	.034			
STREET	16	660	.029			
	19	790	.064	.70 1.76	1300	5.1 (5yr FLOW) 12.9 (100yr FLOW)

BASIN

SunD A-20

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
5.6		P.U.D.	A	77	70.9	5458.2
2.3		STREETS & WALKS	A	98	29.1	2853.2
7.9	.012				100.0	8311.4

WEIGHTED CN = 83.1

FLOW TYPE	H(ft)	L(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	3	120	.030			
STREET	19	1080	.057			
	22		.086	.77 1.87	1300	12.4 (5yr FLOW) 30.0 (100yr FLOW)

BASIN

SunD A-21

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
5.3		P.U.D.	A	77	75.7	5830.0
1.7		STREETS & WALKS	A	98	24.3	2380.0
7.0	.011				100.0	8210.0

WEIGHTED CN = 82.1

FLOW TYPE	H(ft)	L(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	7	185	.038			
STREET	26	1600	.087			
	33		.125	.72 1.79	1200	9.5 (5yr FLOW) 23.5 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASIN

SunD A-22

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
6.5		P.U.D.	A	77	78.3	6030.1
1.8		STREETS & WALKS	A	98	21.7	2125.3
8.3	.013				100.0	8155.4

WEIGHTED CN = 81.6

FLOW TYPE	H(ft)	L(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	1	110	.061			
STREET	35	1485	.067			
	36		.128	.69 1.75	1200	10.8 (5yr FLOW) 27.2 (100yr FLOW)

BASIN

SunD A-23 21 & A-23

COMBINED Sunr A-13 thru A-22,A-25,A-26 from MASTER DRAINAGE STUDY FOR SUNRISE DVLMT
(Sunr A-25 REDUCED BY 0.5Ac AS A RESULT OF SUNRISE AMENDED

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
31.7		P.U.D.	B	85	28.0	2378.2
59.5		RESIDENTIAL 1/5Ac	B	76	52.5	4009.6
6.0		COMMERCIAL / R&D	B	92	5.3	487.2
16.1		STREETS & WALKS	B	98	14.2	1392.6
113.3	.177				100.0	8267.5

WEIGHTED CN = 82.7

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
STREET	2810	67	.163			
PIPE	1820	36	.038			
	4630	103	.201	.75 1.83	1070	141.7 (5yr FLOW) 347.3 (100yr FLOW)

BASIN

SunD A-24

COMBINED Sunr A-27 thru A-28 from MASTER DRAINAGE STUDY FOR SUNRISE DVLMT

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
8.2		RESIDENTIAL 1/5Ac	A	65	65.6	4264.0
2.4		RESIDENTIAL 1/5Ac	B	78	19.2	1497.6
.7		STREETS & WALKS	A	98	5.6	548.8
1.2		STREETS & WALKS	B	98	9.6	940.8
12.5	.020				100.0	7251.2

WEIGHTED CN = 72.5

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	125	8	.018			
STREET	1620	47	.067			
	1745	55	.085	.35 1.15	1300	3.9 (5yr FLOW) 24.2 29.2 (100yr FLOW)

BASIN

SunD A-25

COMBINED Sunr B-1 thru B-4 from MASTER DRAINAGE STUDY FOR SUNRISE DVLMT
(6.4Ac NOW MASTER PLANNED AS SCHOOL)

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
6.4		SCHOOL	A	81	21.5	1745.5
13.6		RESIDENTIAL 1/5Ac	A	65	45.3	2976.4
5.3		RESIDENTIAL 1/5Ac	B	79	17.8	1391.9
4.4		STREETS & WALKS	A	98	14.8	1451.9
29.7	.046				100.0	7565.7

WEIGHTED CN = 75.7

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	130	4	.030			
STREET	2010	67	.108			
	2140	71	.138	.45	1170	24.6 (5yr FLOW)
				1.34		72.9 (100yr FLOW)

BASIN

SunD A-26

BASIN Sunr A-22 from MASTER DRAINAGE STUDY FOR SUNRISE DVLMT

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
19.8		RESIDENTIAL 1/4Ac	B	75	65.3	4901.0
6.0		RESIDENTIAL 1/4Ac	A	61	19.8	1207.9
4.5		STREETS & WALKS	A	98	14.9	1455.4
30.3	.047				100.0	7564.4

WEIGHTED CN = 75.6

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	10	.035			
STREET	1200	24	.090			
PIPE	900	52	.035			
	2300	86	.160	.45	1130	24.3 (5yr FLOW)
				1.34		71.8 (100yr FLOW)

BASIN

SunD A-27

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
3.0		P.U.D.	A	78	28.8	2252.0
4.5		RESIDENTIAL 1/5Ac	A	68	43.3	2950.1
2.9		PARK / OPEN SPACE	A	43	27.9	1193.2
10.4	.016				100.0	6395.3

WEIGHTED CN = 64.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	4	.055			

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASIN

SunD A-27

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
3.0		P.U.D.	A	78	28.8	2252.0
4.5		RESIDENTIAL 1/5Ac	A	68	43.3	2950.1
2.9		PARK / OPEN SPACE	A	43	27.9	1193.2
10.4	.016				100.0	6395.3

WEIGHTED CN = 64.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	4	.055			
SWALE	1770	44	.098			
	1970	48	.153	.14	1140	2.7 (5yr FLOW)
				.70		13.0 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASIN

SunD A-28

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
1.4		P.U.D.	A	77	56.0	4312.0
1.1		STREETS & WALKS	A	98	44.0	4312.0
2.5	.004				100.0	8624.0

WEIGHTED CN = 86.2

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
STREET	2070	54	.088			
	2070	54	.088	.94	1300	4.8 (5yr FLOW)
				2.12		10.8 (100yr FLOW)

BASIN

SunD A-29

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
.4		P.U.D.	A	77	50.0	3850.0
.4		STREETS & WALKS	A	98	50.0	4900.0
.8	.001				100.0	8750.0

WEIGHTED CN = 87.5

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
STREET	420	8	.020			
	420	8	.020	1.02	1300	1.6 (5yr FLOW)
				2.23		3.6 (100yr FLOW)

BASIN

SunD A-30

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
1.7		P.U.D.	A	77	15.6	1200.9
1.2		RESIDENTIAL 1/5Ac	A	65	11.0	715.6
8.0		PARK / OPEN SPACE	A	39	73.4	2862.4
10.9	.017				100.0	4778.9

WEIGHTED CN = 47.8

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	140	16	.016			
SWALE	1030	21	.057			
	1170	37	.073	.00	1300	.0 (5yr FLOW)
				.14		3.1 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASINS

SunD A- 1 ,2

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1Ac	A	51	39.6	2017.2
37.1		RESIDENTIAL 1/5Ac	A	65	39.6	2570.9
4.3		COMMERCIAL / R&D	A	81	4.6	371.3
.5		PARK / OPEN SPACE	A	39	.5	20.8
14.8		STREETS & WALKS	A	98	15.8	1546.3
93.8	.147				100.0	6526.4

WEIGHTED CN = 65.3

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	12	.033			
STREET	1000	61	.043			
PIPE	1000	10	.036			
	2200	83	.112	.17	1240	30.7 (5yr FLOW)
				.76		139.0 (100yr FLOW)

BASINS

SunD A- 1 ,2 ,4

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1Ac	A	51	33.7	1718.5
13.4		P.U.D.	A	77	12.2	937.1
37.1		RESIDENTIAL 1/5Ac	A	65	33.7	2190.3
4.3		COMMERCIAL / R&D	A	81	3.9	316.3
.5		PARK / OPEN SPACE	A	39	.5	17.7
17.7		STREETS & WALKS	A	98	16.1	1575.5
110.1	.172				100.0	6755.5

WEIGHTED CN = 67.6

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	12	.033			
STREET	1000	61	.043			
PIPE	1145	13	.041			
	2345	86	.117	.22	1220	45.9 (5yr FLOW)
				.88		184.3 (100yr FLOW)

BASINS

SunD A- 1 ,2 ,3 ,4

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1Ac	A	51	32.3	1649.6
17.0		P.U.D.	A	77	14.8	1141.2
37.1		RESIDENTIAL 1/5Ac	A	65	32.3	2102.4
4.3		COMMERCIAL / R&D	A	81	3.7	303.7
.5		PARK / OPEN SPACE	A	39	.4	17.0
18.7		STREETS & WALKS	A	98	16.3	1597.7
114.7	.179				100.0	6811.7

WEIGHTED CN = 68.1

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	12	.033			
STREET	1000	61	.043			
PIPE	1325	16	.045			
	2525	89	.121	.23	1210	50.3 (5yr FLOW)
				.91		196.8 (100yr FLOW)

BASINS

SunD A- 1 ,2 ,3 ,4 ,5

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1Ac	A	51	30.3	1547.1
22.8		P.U.D.	A	77	18.6	1435.5
37.1		RESIDENTIAL 1/5Ac	A	65	30.3	1971.8
4.3		COMMERCIAL / R&D	A	81	3.5	284.8
.5		PARK / OPEN SPACE	A	39	.4	15.9
20.5		STREETS & WALKS	A	98	16.8	1642.7
122.3	.191				100.0	6897.8

WEIGHTED CN = 69.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	12	.033			
STREET	1000	61	.043			
PIPE	1705	20	.065			
	2905	93	.141	.25	1170	56.6 (5yr FLOW)
				.95		213.0 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASINS

SunD A- 1 ,2 ,3 ,4 ,5 ,6 ,7

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1Ac	A	51	27.1	1382.1
34.8		P.U.D.	A	77	25.4	1957.3
.1		P.U.D.	B	85	.1	6.2
37.1		RESIDENTIAL 1/5Ac	A	65	27.1	1761.5
4.3		COMMERCIAL / R&D	A	81	3.1	254.4
.5		PARK / OPEN SPACE	A	39	.4	14.2
22.9		STREETS & WALKS	A	98	16.7	1639.3
.1		STREETS & WALKS	B	98	.1	7.2
136.9	.214				100.0	7022.3

WEIGHTED CN = 70.2

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	12	.033			
STREET	1000	61	.043			
PIPE	2205	25	.087			
	3405	98	.163	.29	1130	69.0 (5yr FLOW)
				1.02		246.6 (100yr FLOW)

BASINS

SunD A- 1 ,2 ,3 ,4 ,5 ,6 ,7 ,8 ,9 ,10,11

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1Ac	A	51	23.0	1173.8
41.3		P.U.D.	A	77	25.6	1972.8
13.1		P.U.D.	B	85	8.1	690.8
37.1		RESIDENTIAL 1/5Ac	A	65	23.0	1496.0
4.3		COMMERCIAL / R&D	A	81	2.7	216.1
.5		PARK / OPEN SPACE	A	39	.3	12.1
24.7		STREETS & WALKS	A	98	15.3	1501.6
3.1		STREETS & WALKS	B	98	1.9	188.5
161.2	.252				100.0	7251.5

WEIGHTED CN = 72.5

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	12	.033			
STREET	1000	61	.043			
PIPE	2995	33	.118			
	4195	106	.194	.35	1080	95.4 (5yr FLOW)
				1.15		313.1 (100yr FLOW)

BASINS

SunD A- 1 ,2 ,3 ,4 ,5 ,6 ,7 ,8 ,9 ,10,11,13,14,15,16,17,18

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1Ac	A	51	19.6	1000.1
42.0		P.U.D.	A	77	22.2	1709.3
34.6		P.U.D.	B	85	18.3	1554.4
37.1		RESIDENTIAL 1/5Ac	A	65	19.6	1274.6
4.3		COMMERCIAL / R&D	A	81	2.3	184.1
.5		PARK / OPEN SPACE	A	39	.3	10.3
24.9		STREETS & WALKS	A	98	13.2	1289.7
8.7		STREETS & WALKS	B	98	4.6	450.6
189.2	.296				100.0	7473.2 WEIGHTED CN = 74.7

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	12	.033			
STREET	1000	61	.043			
PIPE	3345	38	.132			
	4545	111	.208	.42	1050	131.0 (5yr FLOW)
				1.29		398.9 (100yr FLOW)

BASINS

SunD A- 1 ,2 ,3 ,4 ,5 ,6 ,7 ,8 ,9 ,10,11,13,14,15,16,17,18,19,20

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1Ac	A	51	18.5	942.8
50.4		P.U.D.	A	77	25.1	1933.6
34.6		P.U.D.	B	85	17.2	1465.4
37.1		RESIDENTIAL 1/5Ac	A	65	18.5	1201.5
4.3		COMMERCIAL / R&D	A	81	2.1	173.5
.5		PARK / OPEN SPACE	A	39	.2	9.7
28.0		STREETS & WALKS	A	98	14.0	1367.2
8.7		STREETS & WALKS	B	98	4.3	424.8
200.7	.314				100.0	7518.6 WEIGHTED CN = 75.2

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	12	.033			
STREET	1000	61	.043			
PIPE	4450	55	.171			
	5650	128	.247	.44	990	135.8 (5yr FLOW)
				1.31		407.8 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASINS

SunD A- 23,24

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
31.7		P.U.D.	B	85	22.1	1876.4
59.5		RESIDENTIAL 1/5Ac	B	76	41.4	3143.5
6.0		RESIDENTIAL 1/4Ac	A	61	4.2	254.9
19.8		RESIDENTIAL 1/4Ac	B	75	13.8	1034.1
6.0		COMMERCIAL / R&D	B	92	4.2	384.4
4.5		STREETS & WALKS	A	98	3.1	307.1
16.1		STREETS & WALKS	B	98	11.2	1098.7
143.6	.224				100.0	8119.2 WEIGHTED CN = 81.2

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
STREET	2810	67	.163			
PIPE	2330	40	.050			
	5140	107	.213	.68	1050	159.6 (5yr FLOW)
				1.72		405.8 (100yr FLOW)

BASINS

SunD A- 14,15

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
6.4		P.U.D.	B	85	76.2	6476.2
2.0		STREETS & WALKS	B	98	23.8	2333.3
8.4	.013				100.0	8809.5

WEIGHTED CN = 88.1

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	9	.040			
STREET	820	22	.035			
	1020	31	.075	1.05	1300	18.0 (5yr FLOW)
				2.28		38.9 (100yr FLOW)

BASINS

SunD A- 13,14,15

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
.7		P.U.D.	A	77	6.1	472.8
8.1		P.U.D.	B	85	71.1	6039.5
.2		STREETS & WALKS	A	98	1.8	171.9
2.4		STREETS & WALKS	B	98	21.1	2063.2
11.4	.018				100.0	8747.4

WEIGHTED CN = 87.5

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	200	9	.040			
STREET	820	22	.035			
	1020	31	.075	1.01	1300	23.5 (5yr FLOW)
				2.22		51.5 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASINS

SunD A- 13,14,15,16

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
.7		P.U.D.	A	77	3.8	296.2
13.1		P.U.D.	B	85	72.0	6118.1
.2		STREETS & WALKS	A	98	1.1	107.7
4.2		STREETS & WALKS	B	98	23.1	2261.5
18.2	.028				100.0	8783.5

WEIGHTED CN = 87.8

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	100	3	.023			
STREET	910	21	.040			
	1010	24	.063	1.04	1300	38.3 (5yr FLOW)
				2.25		83.3 (100yr FLOW)

BASINS

SunD A- 13,14,15,16,17,18

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
.7		P.U.D.	A	77	2.5	192.5
21.5		P.U.D.	B	85	76.8	6526.8
.2		STREETS & WALKS	A	98	.7	70.0
5.6		STREETS & WALKS	B	98	20.0	1960.0
28.0	.044				100.0	8749.3

WEIGHTED CN = 87.5

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	100	3	.023			
STREET	1410	34	.056			
	1510	37	.079	1.01	1300	57.7 (5yr FLOW)
				2.22		126.5 (100yr FLOW)

BASINS

SunD A- 21,22

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
11.8		P.U.D.	A	77	77.1	5938.6
3.5		STREETS & WALKS	A	98	22.9	2241.8
15.3	.024				100.0	8180.4

WEIGHTED CN = 81.8

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	110	1	.061			
STREET	1485	35	.067			
	1595	36	.128	.71	1200	20.3 (5yr FLOW)
				1.77		50.7 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASINS

SunD A- 6 ,7

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
12.0		P.U.D.	A	77	82.2	6328.8
.1		P.U.D.	B	85	.7	58.2
2.4		STREETS & WALKS	A	98	16.4	1611.0
.1		STREETS & WALKS	B	98	.7	67.1
14.6	.023				100.0	8065.1

WEIGHTED CN = 80.7

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	190	7	.039			
STREET	1425	31	.069			
	1615	38	.108	.65	1250	18.6 (5yr FLOW)
				1.68		48.0 (100yr FLOW)

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASINS

SunD A- 23,26,27

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
3.0		P.U.D.	A	78	1.9	152.1
31.7		P.U.D.	B	85	20.6	1749.7
4.5		RESIDENTIAL 1/5Ac	A	68	2.9	199.2
59.5		RESIDENTIAL 1/5Ac	B	76	38.6	2949.9
6.0		RESIDENTIAL 1/4Ac	A	61	3.9	237.7
19.8		RESIDENTIAL 1/4Ac	B	75	12.9	964.3
6.0		COMMERCIAL / R&D	B	92	3.9	358.4
2.9		PARK / OPEN SPACE	A	43	1.9	80.6
4.5		STREETS & WALKS	A	98	2.9	286.4
16.1		STREETS & WALKS	B	98	10.5	1024.5
154.0	.241				100.0	8002.9

WEIGHTED CN = 80.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	2810	67	.163			
PIPE	2730	47	.059			
	5540	114	.222	.63	1030	155.0 (5yr FLOW) +45 = 200.0 cfs
				1.64		406.0 (100yr FLOW) +45 = 451.0 cfs

$Q_S = Q_{100} = 45$ cfs FROM T-GOP BASIN

BASINS

SunD A- 23,24,25,27,28

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
4.4		P.U.D.	A	77	2.6	200.5
31.7		P.U.D.	B	85	18.8	1594.4
12.7		RESIDENTIAL 1/5Ac	A	68	7.5	512.4
61.9		RESIDENTIAL 1/5Ac	B	78	36.6	2856.9
6.0		RESIDENTIAL 1/4Ac	A	61	3.6	216.6
19.8		RESIDENTIAL 1/4Ac	B	75	11.7	878.7
6.0		COMMERCIAL / R&D	B	92	3.6	326.6
2.9		PARK / OPEN SPACE	A	43	1.7	73.4
6.3		STREETS & WALKS	A	98	3.7	365.3
17.3		STREETS & WALKS	B	98	10.2	1003.2
169.0	.264				100.0	8028.0

WEIGHTED CN = 80.3

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
STREET	2810	67	.163			
PIPE	2810	49	.060			
	5620	116	.223	.64	1030	173.2 (5yr FLOW) +45 = 218.2 cfs
				1.66		450.5 (100yr FLOW) +45 = 495.5 cfs

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASINS

SunD A- 21,22,23,24,26,27,28,29

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
16.6		P.U.D.	A	77	9.0	690.5
31.7		P.U.D.	B	85	17.1	1455.7
12.7		RESIDENTIAL 1/5Ac	A	68	6.9	467.8
61.9		RESIDENTIAL 1/5Ac	B	78	33.4	2608.4
6.0		RESIDENTIAL 1/4Ac	A	61	3.2	197.7
19.8		RESIDENTIAL 1/4Ac	B	75	10.7	802.3
6.0		COMMERCIAL / R&D	B	92	3.2	298.2
2.9		PARK / OPEN SPACE	A	43	1.6	67.0
10.2		STREETS & WALKS	A	98	5.5	540.0
17.3		STREETS & WALKS	B	98	9.3	915.9
185.1	.289				100.0	8043.7 WEIGHTED CN = 80.4

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)	
STREET	2810	67	.163				
PIPE	3155	54	.067				
	5965	121	.230	.64	1020		189.9 (5yr FLOW) +45 cfs = 234.9 cfs
				1.67			492.0 (100yr FLOW) +45 cfs = 537.0 cfs

$Q_5 = Q_{100} = 45$ cfs FROM T-GAP BASIN

BASINS

SunD A- 21,22,23,24,25,26,27,28,29

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
6.4		SCHOOL	A	81	3.0	241.3
16.6		P.U.D.	A	77	7.7	595.1
31.7		P.U.D.	B	85	14.8	1254.4
26.3		RESIDENTIAL 1/5Ac	A	68	12.2	834.8
67.2		RESIDENTIAL 1/5Ac	B	78	31.3	2440.2
6.0		RESIDENTIAL 1/4Ac	A	61	2.8	170.4
19.8		RESIDENTIAL 1/4Ac	B	75	9.2	691.3
6.0		COMMERCIAL / R&D	B	92	2.8	257.0
2.9		PARK / OPEN SPACE	A	43	1.4	57.8
14.6		STREETS & WALKS	A	98	6.8	666.1
17.3		STREETS & WALKS	B	98	8.1	789.3
214.8	.336				100.0	7997.7 WEIGHTED CN = 80.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)	
STREET	2810	67	.163				
PIPE	3275	57	.069				
	6085	124	.232	.62	1010		211.3 (5yr FLOW) +45 = 256.3 cfs
				1.63			554.1 (100yr FLOW) +45 = 599.1 cfs

MASTER DRAINAGE STUDY - SUNDOWN AMENDED

BASINS

SunD A- 1 ,2 ,3 ,4 ,5 ,6 ,7 ,8 ,9 ,10,11,12,13,14,15,16,17,18,19,20

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1Ac	A	51	9.0	456.6
213.7		PUD/RES/COMM/IND	A	80	51.6	4105.2
50.4		P.U.D.	A	77	12.2	936.5
34.6		P.U.D.	B	85	8.3	709.7
37.1		RESIDENTIAL 1/5Ac	A	63	9.0	581.9
4.3		COMMERCIAL / R&D	A	81	1.0	84.0
.5		PARK / OPEN SPACE	A	39	.1	4.7
28.0		STREETS & WALKS	A	98	6.8	662.2
8.7		STREETS & WALKS	B	98	2.1	205.7
414.4	.648				100.0	7746.5 WEIGHTED CN = 77.5

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)	
OVERLAND	100	4	.020				
STREET	3100	30	.224				
PIPE	6030	110	.134				
	9230	144	.378	.52	840		283.2 (5yr FLOW)
				1.46			794.9 (100yr FLOW)

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BASINS

SunB A- 1 ,2 ,3 ,4 ,5 ,6 ,7 ,8 ,9 ,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
37.1		RESIDENTIAL 1Ac	A	51	5.8	295.8
213.7		PUD/RES/COMM/IND	A	80	33.4	2657.7
6.4		SCHOOL	A	81	1.0	81.0
68.7		P.U.D.	A	77	10.7	826.4
66.3		P.U.D.	B	85	10.4	880.4
64.6		RESIDENTIAL 1/5Ac	A	65	10.1	656.0
67.2		RESIDENTIAL 1/5Ac	B	78	10.5	818.9
6.0		RESIDENTIAL 1/4Ac	A	61	.9	57.2
19.8		RESIDENTIAL 1/4Ac	B	75	3.1	232.0
4.3		COMMERCIAL / R&D	A	81	.7	54.4
6.0		COMMERCIAL / R&D	B	92	.9	86.2
11.4		PARK / OPEN SPACE	A	39	1.8	69.5
42.6		STREETS & WALKS	A	98	6.7	652.2
26.0		STREETS & WALKS	B	98	4.1	398.1
640.1	1.000				100.0	7765.5

WEIGHTED CN = 77.7

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	100	4	.020			
STREET	3100	30	.224			
PIPE	6230	114	.136			
	9430	148	.380	.53	840	443.6 (5yr FLOW) +45cfs = 489
				1.47		1238.4 (100yr FLOW) +45cfs = 1283

APPENDIX "C"

KLH ENGINEERING CONSULTANTS, INC.
ENGINEERING • SURVEYING • PLANNING • CONSTRUCTION MANAGEMENT
206-208 Sutton Lane • Colorado Springs, Colorado 80907 • (303) 594-4200

June 17, 1986
KLH # 84 523 12

City of Colorado Springs
Department of Public Works
Engineering Division
30 S. Nevada - Suite 403
Colorado Springs, CO 80903

Attention: Chris Smith

Subject: Sundown Subdivision Filing No. 1

Gentlemen:

The purpose of this letter is to amend the Drainage Report for the above named subdivision.

As shown on the attached exhibit, additional runoff flow will be added to the storm drain system in this subdivision from the South. This pipe flow will originate from Old Farm Heights Subdivision at Lariat Drive. The additional flow will consist of 44.5 c.f.s. of pipe flow for both 5-year and 100-year storms. This additional flow, which is actually generated in the Templeton Gap Drainage Basin, will be diverted into this storm drain system in this subdivision which lies in the Cottonwood Creek Drainage Basin. This trans-basin diversion will help mitigate undersize drainage facility problems to the South along Templeton Gap Road. This diversion has been discussed and agreed upon between URS Engineers and the City of Colorado Springs and is outlined in a preliminary drainage report for Old Farm Heights Subdivision Master Drainage Report, October 25, 1985, prepared by URS Engineers. This increased flow has caused an increase in pipe size for the storm drain system in Templeton Gap Road and Yukon Drive within this subdivision. These pipe size increases are shown on the attached exhibit. Overland runoff flow from storms greater than the design storm will, however, be diverted South on Templeton Gap Road. The attached revised cost estimate for this subdivision does not include the cost for the 36" R.C.P. from Lariat Drive. The cost for that pipe (approx. $50,000) should be included as part of the drainage facilities for the Old Farm Subdivision.

Future downstream drainage analyses will include this additional flow and will lag the flow to determine the actual attenuation.

This letter, exhibit and revised cost estimate should be attached to the Sundown Subdivision Filing No. 1 Drainage Report and become part of said report.

If you have any further questions concerning this matter, please contact Tom McClernan or Dave Stravia.

Sincerely yours,

K L H ENGINEERING CONSULTANTS, INC.

Thomas McClernan

Thomas McClernan, P.E.

Tom C. Little, P.E.

bjm

Enc.

June 17, 1986
KLH # 84 523 12

REVISED DRAINAGE FACILITIES COST ESTIMATE:
(Based on 1984 Costs)

Public Reimburseable:

6' D-10R	3 Each @ $1800./Ea.	=	$ 5,400.00
8' D-10R	5 Each @ $2200./Ea.	=	11,000.00
14' D-10R	1 Each @ $3500./Ea.	=	3,500.00
18" R.C.P.	185 L.F. @ $ 23./L.F.	=	4,255.00
24" R.C.P.	210 L.F. @ $ 35./L.F.	=	7,350.00
36" R.C.P.	150 L.F. @ $ 50./L.F.	=	7,500.00
48" R.C.P.	570 L.F. @ $ 74./L.F.	=	42,180.00
54" R.C.P.	1030 L.F. @ $ 92./L.F.	=	94,760.00
Manholes	6 Each @ $1000./Ea.	=	6,000.00
			$181,945.00
	15% Engineering & Contingency		27,291.75
	TOTAL		$209,236.75

Temporary Non-Reimburseable:

Rip Rap	50 C.Y. @ $ 35./C.Y.	=	$ 1,750.00

AMENDMENT TO SUNDOWN NO. 1 DRAINAGE REPORT

DRAINAGE REPORT STATEMENTS

Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by the negligent acts, errors or omissions on my part in preparing this report.

Name

Seal

Developer's Statement:

The developer has read and will comply with all of the requirements specified in this drainage report.

Norwood Dev.
Business Name

By:

Title: President

Address: 4065 Sinton Rd.
Colorado Springs

City of Colorado Springs:

Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

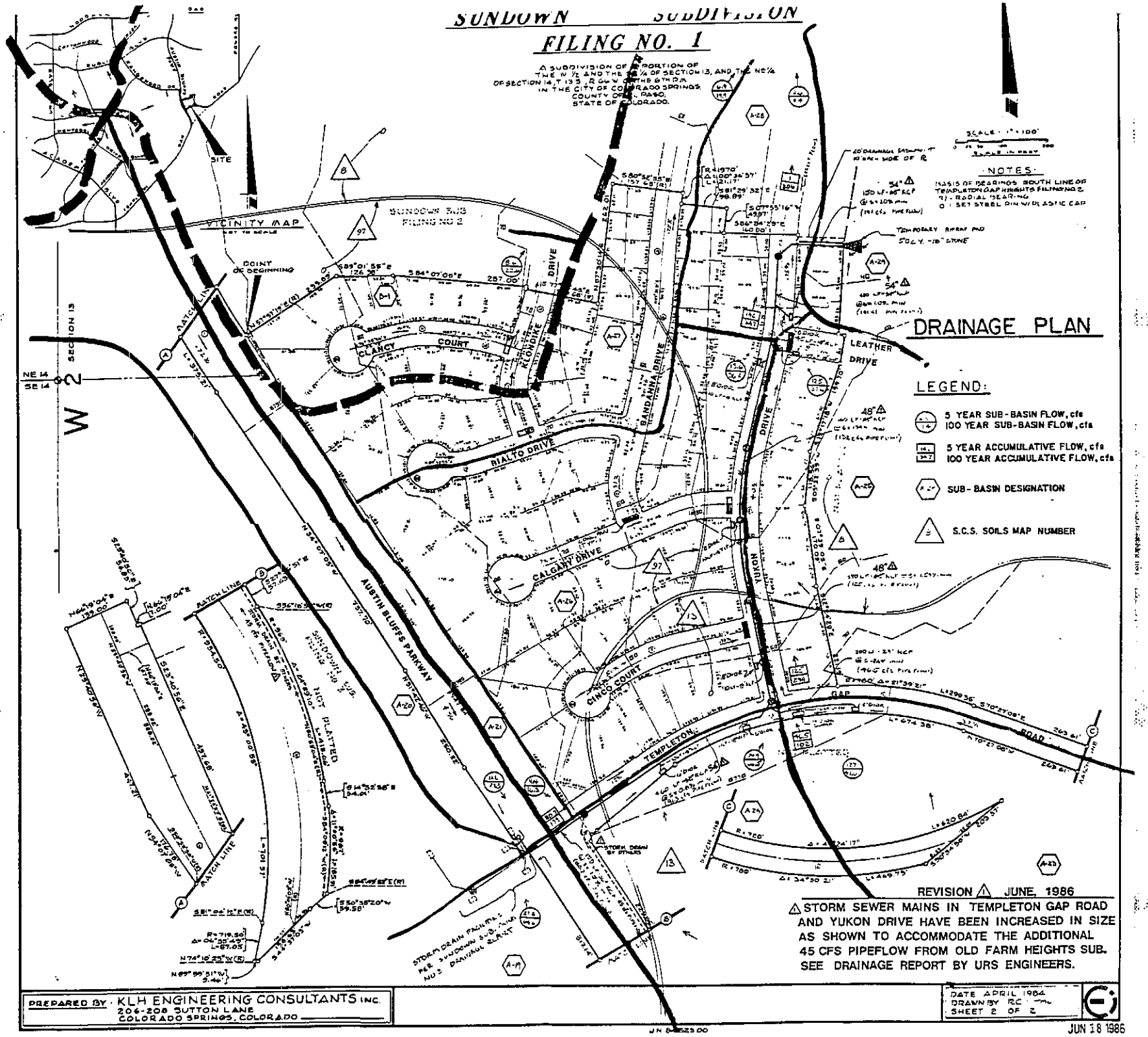
City Engineer

6/20/86
Date

Conditions:

SUNDOWN SUBDIVISION
FILING NO. 1

A SUBDIVISION OF A PORTION OF THE W ½ AND THE SE ¼ OF SECTION 13, AND THE NE¼ OF SECTION 14, T 13 S, R 66 W OF THE 6TH P.M. IN THE CITY OF COLORADO SPRINGS, COUNTY OF EL PASO, STATE OF COLORADO.



REVISION ⚠ JUNE, 1986

⚠ STORM SEWER MAINS IN TEMPLETON GAP ROAD AND YUKON DRIVE HAVE BEEN INCREASED IN SIZE AS SHOWN TO ACCOMMODATE THE ADDITIONAL 45 CFS PIPEFLOW FROM OLD FARM HEIGHTS SUB. SEE DRAINAGE REPORT BY URS ENGINEERS.

PREPARED BY: KLH ENGINEERING CONSULTANTS INC.
206-208 SUTTON LANE
COLORADO SPRINGS, COLORADO

DATE APRIL 1984
DRAWN BY RC
SHEET 2 OF 2

JN 8[illegible]523.00

JUN 18 1986