community sciences corporation

DRAINAGE REPORT

FOR

PALOMA DEL SOL SUBDIVISION
(MAP #A-12)

PREPARED FOR

THE STROSNIDER COMPANY
6121 INDIAN SCHOOL ROAD, NE, SUITE 275
ALBUQUERQUE, NM 87110

PREPARED BY

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SURVEYING
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I. PURPOSE AND SCOPE

The Strosnider Company is currently planning for the development of Paloma Del Sol. The proposed development consists of approximately 36.0 acres and is to be subdivided into 65 residential lots and 1 tract for drainage purposes.

This report presents an overall Drainage Management and Conceptual Grading Plan for approval by the City of Albuquerque in order that subsequent subdivision and development may commence.

II. SITE DESCRIPTION AND HISTORY

The project site is located at the southeast corner of Bandelier Drive and McMahon Boulevard (see Vicinity Map-Plate 1). The site is approximately 36 acres, bounded by: on the north by McMahon Boulevard; on the south by the Calabacillas Arroyo; on the west by Bandelier Drive; and on the east by an existing Apartment Complex. This property is formerly subdivided by Horizon Corp., as Tract 1A of Paradise North.

The existing topography is steeply sloping (in excess of 4:1) from McMahon Boulevard down to a flatter area (10:1) above the Calabacillas Arroyo. The Paloma del Sol property is above the 100yr flood zone of the Calabacillas Arroyo.

The Paloma del Sol property will be divided into 65 residential lots, that will be larger than the average lot in the area. Grading philosophy for these lots will be to try and match as much of the existing terrain as possible, allowing the future home builder more latitude in the construction of a residence on these lots. There is an adjacent subdivision planned to the west, the Tuscany Subdivision, that will construct Bandelier Drive and a half arterial section for McMahon Boulevard, adjacent to this property.

Historically drainage across this property has been sheet flow, uninterrupted from McMahon Boulevard to the Calabacillas Arroyo. With proposed developments to north and west some flows will now be concentrated at outfall points on the property. When McMahon Boulevard is constructed three, (3), such points are proposed, these outfalls will be intercepted by a future/proposed storm drain system through Paloma del Sol. Off-site flow from Bandelier Drive will be minimal and collected in San Timoteo Avenue and conveyed to the future/proposed storm drain system. AMAFCA has been informed of future construction of outfalls to the Calabacillas from Paloma del Sol, and will be part of review process of final plans, when they are prepared.

III. DESIGN CRITERIA

A. Flood Control Regulations

The drainage plan presented in this report has been designed to comply with AMAFCA resolution 80-15, which requires that proposed land development projects be designed such that no flooding of private properties will occur during any storm up to and including the 100-year frequency event. Additionally, this drainage plan has been designed to comply with current "City of Albuquerque Drainage Ordinance" and Chapter 22 of the Development Process Manual (DPM), and subsequently adopted general policies of the City of Albuquerque.

1. 100-year storm:

a. Stormwater flow depth not to exceed the top of curb in any street.

b. Jump depth to be contained within right-of-way.

2. 10-year storm:

a. Local street - velocity times depth less than 6.5

b. Arterial streets:

i. Flow not to exceed a depth of 0.50
ii. Velocity times depth less than 6.5
iii. One driving land in each direction free of stormwater

B. Engineering Parameters

In accordance with AMAFCA criteria, all hydrological analysis is based on the 100-year frequency, 6-hour duration storm, as represented in Section 22.2, Hydrology, of the "Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, New Mexico, January 1993".

Ten-year, 6-hour values were also used for subcatchments, in accordance with City drainage policies regarding street flow.

The four rainfalls pertinent to the study are as follows:

	10-year	100-year
One-hour	_____	1.95"
Six-Hour	_____	2.27"

IV. COMPUTATIONAL PROCEDURES

The analysis approach follows standard engineering practice. Key points of confluence were selected and the associated individual and aggregate contributing basins were subsequently defined.

Hydrological computations were accomplished by means of the April 1994 version of AHYMO Computer Program as developed by AMAFCA. The input parameters and resulting flows for the basins are summarized on Table 1. Summary and detailed AHYMO printouts are contained in Appendix A.

Times of concentration were estimated using the Upland Method and then converted to times to peak (Lg), in accordance with the above referenced Section 22.2 which also establishes the minimum time of concentration as 12 minutes.

Flow characteristics for conveyance swales, channels, and streets were analyzed based on the Manning equation for uniform flow. Streets are assumed to have a 2% cross slope from lip of gutter to crown and a curb and gutter per City of Albuquerque Standard details. Finished grade at the right-of-way is 0.33' above top of curb.

V. OFF-SITE DRAINAGE

Off-site drainage will be coming from two (2) directions: From the west, 1/2 street drainage from Bandelier Drive and from the north, drainage from McMahon Boulevard right-of-way, three outlets onto the Paloma del Sol property. No off-site drainage is anticipated from apartments to east, and all drainage goes across south boundary to the Calabacillas Arroyo.

Drainage from west, Bandelier Drive, will be about 2 cfs, this will combine with on-site flows in San Timoteo Avenue and be conveyed to the sump point at the middle of the project and then conveyed via storm drain system to the Calabacillas Arroyo. (See Plate 2)

Drainage from north, McMahon Boulevard, will enter property from three(3) points. Two of these outlets are located about the middle of the project, between Bandelier Drive and Calle Contento (Red Bud Avenue). The most westerly outlet will deliver about 35.3 cfs and the easterly outlet about 13.0 cfs. These two outlets and the 36" pipes that convey the flows will be intercepted on-site and a storm drain will convey the combined flows to the Calabacillas Arroyo. The third outlet will be at Calle Contento, this drain picks up flows from the sump point in McMahon Boulevard east of Calle Contento, the flow anticipated form this drainage area is about 36.8 cfs. This pipe will be intercepted and a storm drain provided in Calle Contento from McMahon Boulevard to the Calabacillas Arroyo, near the easterly side of the project. These basins are identified in the Smith Engineering Report for McMahon Boulevard (dated May 1995). We are coordinating with Smith Engineering Company concerning these flows and the storm drain system they are designing, so as to allow for appropriate connections to Paloma del Sol's on-site storm drain system.

All off-site flows will be taken into consideration in the design of the final storm drain system.

VI. ON-SITE DRAINAGE

Flow in San Timoteo Avenue from the westerly boundary (including off-site surface flow), Bandelier Drive, will be combined with flows from Los Suenos Court and Madrina Court and from a high point west of Aventura Court and flow to low point at the approximate center of the property. These flows will be collected in inlets and conveyed to the Calabacillas Arroyo via a storm drain. (Basins 100.1, 110.1-110.5, 120.1-120.4, 170.1, 170.2, 170.3, & 130.2-130.2) (See Plate 2). Approximately 56.7 cfs will reach this sump point. All facilities will be sized accordingly.

Drainage to east from the high point, west of Aventura Court, via San Timoteo Avenue, and from McMahon Boulevard, via Calle Contento, will concentrate a low point between Lots 20 and 21 of Block No. 1, and at that low point these flows will be picked up in inlets and conveyed to the arroyo via storm drain. (Basins 140.1-140.3, 150.1-150.3 & 160.1-160.3). Approximately 50.5 cfs will reach this sump point. All facilities will be sized accordingly.

Lots 23, 24, 25, 26 and 27 of Block No. 1, will have rear yard private ponds for rear lot drainage. These ponds are designed per DPM Section 22.

Lots 1 to 23 of Block No. 1, will have from 30 feet drain to San Timoteo Avenue, along

with the future roof water from proposed homes. The rear of these lots will surface drain, sheet flow to the Calabacillas Arroyo. For the purposes of this report, these flows are included in the sump calculations.

Outfall structures for the storm drain system will be designed in conjunction with AMAFCA policies and will be reviewed and approved by AMAFCA.

Storm drain system will be designed to take off-site flows from McMahon Boulevard and route through Paloma del Sol. At the westerly sump point off-site flows that will be considered will amount to approximately 48.3 cfs (35.3 & 13.0 cfs - see off-site Section V.) This flow will combine with the on-site flow of about 56.7 cfs for a total in the system of approximately 105.0 cfs. At the easterly sump point offsite flow collected in McMahon Boulevard will amount to approximately 36.3 cfs and will be routed through project. This flow will combine with on-site flow of about 50.5 cfs, total in system will be approximately 86.8 cfs.

Storm drain plans will be part of the DRC improvement plans, final HGL calculations will be provided at time of final design.

VII. EROSION CONTROL

Control of excessive soil erosion into City streets and drainage improvements during construction will be accomplished by use of temporary lot line, water-trap berms. These will be windrowed into place following mass grading operations and left in place until each home is constructed and sold. Plate 3 illustrates the dimensions of these berms, and they will be located along those boundaries of each lot which are common to City rights-of -way or public easements.

TABLE 1

PROPOSED DEVELOPMENT CONDITIONS

AS PER PRELIMINARY GRADING PLAN

				Land Treatment				Incremental	Future Total
Basin I. D.	Area (Sq.Mi.)	Contr. Basin	Sum Area (Sq.Mi.)	A	B	C	D	Q100 (cfs)	Q100 (cfs)
100.1	0.0007	---	---	---	---	12	88	1.98	1.98
110.3	0.0011	---	---	---	38	37	25	2.18	2.18
110.4	0.0005	110.3	0.0016	---	---	22	78	1.37	3.54
110.5	0.0016	110.1-110.3	0.0039	---	38	37	25	3.16	8.27
110.1	0.0074	---	---	---	38	37	25	14.53	14.53
110.2	0.0006	110. & 110.5	0.0119	---	---	23	77	1.63	24.04
120.2	0.0021	---	---	---	38	37	25	4.14	4.14
120.3	0.0016	120.2	0.0037	---	---	22	78	4.34	8.47
120.4	0.0035	120.3 & 110.2	0.0191	---	38	37	25	6.88	36.49
120.1	0.0034	120.4	0.0225	---	38	37	25	6.69	43.16
130.1	0.0016	120.1	0.0241	---	38	37	25	3.16	45.95
130.2	0.0003	130.1	0.0244	---	---	22	28	0.83	46.74
170.3	0.0021	---	---	---	38	37	25	4.14	4.14
170.1	0.002	170.3	0.0041	---	38	37	25	3.94	8.08
170.2	0.0008	170.1	0.0049	---	---	22	78	2.18	10.25
*At west sump point - Basins 170.2+130.2									
170.2	---	130.2	0.0293					---	56.70*
140.1	0.0058	---	---	---	38	37	25	11.39	11.39
140.2	0.0038	140.1	0.0096	---	38	37	25	7.47	18.86
140.3	0.0016	140.2	0.0112	---	---	22	78	4.34	23.20
160.1	0.0009	---	---	---	38	37	25	1.78	1.78
160.2	0.0001	160.1	0.0019	---	---	22	78	2.72	4.50
160.3	0.0069	160.2	0.0088	---	38	37	25	13.55	18.05
150.1	0.0025	---	---	---	38	37	25	4.92	4.92
150.2	0.001	150.1	0.0035	---	---	22	78	2.72	7.64
150.3	0.0016	150.2	0.0051	---	38	37	25	3.16	10.79
** 150.3	---	160.3	0.0139					---	27.99
**At east sump point - Basins 150.3+140.3									
150.3	---	140.3	0.0251					---	** 50.53

TABLE 2

FLOW CHARACTERISTICS AT KEY POINTS

Street Name	Type C&G	Location (Station)	Street Width (ft)	Slope (%)	Q100 (cfs)	Dn (ft)	Dc (ft)	Vn (fps)	Vc (fps)	Area (sf)	Top Width (ft)	F	Pool* Depth (ft)	E.G.(ft)
Los Suenos Court	MT.	San Timoteo Ave.	25	4	15.79	0.29	0.38	4.56	2.71	3.46	25.82	2.2	0.52	0.61
Madrina Court	MT.	San Timoteo Ave.	25	4	6.66	0.22	0.28	3.58	2.06	1.84	19.86	2.33	0.36	0.42
Aventura Court	MT.	San Timoteo Ave.	25	4	16	0.29	0.38	4.59	2.72	3.49	25.83	2.2	0.52	0.61
San Timoteo Ave.	MT.	14+95	27	8	20.04	0.28	0.41	6.11	2.87	3.28	26.63	3.13	0.57	0.86
San Timoteo Ave.	STD.	19-32	28	0.85	43.16	0.59	0.63	4.09	3.69	10.56	28.3	1.01	0.89	0.85
San Timoteo Ave.	STD.	20+60	28	0.85	46.74	0.61	0.66	4.22	3.79	11.08	28.31	1.01	0.94	0.89
San Timoteo Ave.	MT.	22+00	27	1	10.25	0.31	0.32	2.45	2.3	4.18	28.07	1.12	0.42	0.40
San Timoteo Ave.	MT.	26+30	27	2.87	18.05	0.32	0.4	4.21	2.75	4.29	28.1	1.9	0.55	0.59
San Timoteo Ave.	STD.	30+00	28	0.6	27.99	0.54	0.53	3.1	3.2	9.02	28.27	0.97	0.73	0.69
San Timoteo Ave.	STD.	30+70	28	0.5	23.2	0.52	0.49	2.73	3.02	8.51	28.26	0.88	0.67	0.64
San Timoteo Ave.	MT.	33+00	27	3.87	16.07	0.29	0.38	4.42	2.66	3.64	27.88	2.15	0.52	0.59

*Pool Depth = Dc+1.25(vc^2)/2g

Where did this come from?

ADDENDUM TO DRAINAGE REPORT
FOR
PALOMA DEL SOL
(JUNE, 1995)

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NOVEMBER 15, 1995

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I. INTRODUCTION:

This addendum to the June, 1995 Drainage Report for Paloma del Sol (approved for Preliminary Plat and for Rough Grading) is prepared for the purpose of pointing out changes between the earlier report and the Final Design of Infrastructure Plans. This report addendum has simplified the Drainage Basin Map, as well as the AHYMO calculations. This report addendum will present the final design of the project, including HGL Calculations; Inlet Sizing Calculations; and POND Calculations for some lots that will have private ponds.

This report addendum is presented as an addition to the earlier report, and NOT as a replacement.

Site Description, Drainage Criteria, Computational Procedures and Erosion Control have not changed. The June 1995 Report describes these items in detail, copies are provided in the Appendix C.

II. OFF-SITE DRAINAGE

Off-site drainage has not changed between this addendum and the June, 1995 Drainage Report. Only basin designations have changed. (see revised Drainage Basin Map). The section below is the revised part of the June, 1995 Report (changes are in italics):

(V). OFF-SITE DRAINAGE (Revised)

Off-site drainage will be coming from two (2) directions: From the west, 1/2 street drainage from Bandelier Drive and from the north, drainage from McMahon Boulevard right-of-way, three outlets onto the Paloma del Sol property. No off-site drainage is anticipated from apartments to east, and all drainage goes across south boundary to the Calabacillas Arroyo.

Drainage from west, Bandelier Drive, will be about 2 cfs, this will combine with on-site flows in San Timoteo Avenue and be conveyed to the sump point at the middle of the project and then conveyed via storm drain system to the Calabacillas Arroyo. (See Revised Plate 2, Basin # 100.1).

Drainage from north, McMahon Boulevard, will enter property from three (3) points. Two of these outlets are located about the middle of the project, between Bandelier Drive and Calle Contento (Red Bud Avenue). The most westerly outlet will deliver about 35.3 cfs and the easterly outlet about 13.0 cfs. These two outlets and the 36" pipes that convey the flows will be intercepted on-site and a storm drain will convey the combined flows to the Calabacillas Arroyo. The third outlet will be at

III. ON-SITE DRAINAGE

On-site Drainage patterns have not been changed between the June, 1995 Drainage Report and this addendum. Basins have been combined and new basin designations assigned.

Surface drainage still flows to the two (2) Sump Points within the Tract, and will be intercepted into storm drain system and conveyed to Calabacillas Arroyo.

Rear yard drainage for Lots #1 to #23 of Block #1, will flow to private retention ponds, sized for the individual lot. All house pad, front yard and roof drainage will be conveyed to the street, for the above lots.

Rear yard ponds will also be provided for Lots #24 to #27 of Block #1, but these ponds are sized only for the portions of the rear yards that drain to pond, the lot drainage to the street is otherwise conventional.

The storm drain system outlined in the June, 1995 Drainage Report is essentially unchanged. The final HGL Calculations are provided with this addendum.

Outfalls were designed with scour taken into account.

(VI).ON-SITE DRAINAGE (Revised)

Flow in San Timoteo Avenue from the westerly boundary (including off-site surface flow), Bandelier Drive, will be combined with flows from Los Suenos Court and Madrina Court and from a high point west of Aventura Court and flow to low point at the approximate center of the property. These flows will be collected in inlets and conveyed to the Calabacillas Arroyo via a storm drain. (Basins 101.1, 101.2 & 101.3) (See Revised Plate 2). Approximately 56.7 cfs will reach this sump point. All facilities will be sized accordingly.

Lots 23, 24, 25, 26 and 27 of Block No. 1, will have rear yard private ponds for rear lot drainage. These ponds are designed per DPM Section 22.

Lots 1 to 23 of Block No. 1, pads will be 25 feet from San Timoteo Avenue, and will be required to drain future roof watre from proposed homes and the front 30 feet of the lot to San Timoteo Avenue. The rear of these lots will surface drain, to rear yard ponds and have overflows to the Calabacillas Arroyo. For the purposes of this report, these flows are included in the sump calculations. Sump basin size information is provided in this report.

Outfall structures for the storm drain system will be designed in conjunction with AMAFCA policies and will be reviewed and approved by AMAFCA.

Storm drain system will be designed to take off-site flows from McMahon Boulevard and route through Paloma del Sol. At the westerly sump point off-site flows that will be considered will amount to approximately 48.3 cfs (35.3 & 13.0 cfs - see off-site Section V). This flow will combine with the on-site flow of about 56.7 cfs for a total in the system of approximately 105.0 cfs. At the easterly sump point off-site flow collected in McMahon Boulevard will amount to approximately 36.3 cfs and will be routed through project. This flow will combine with on-site flow of about 50.5 cfs, total in system will be approximately 86.8 cfs.

Storm drain plans will be part of the DRC improvement plans, final HGL calculations will be provided at time of final design (with this Report).

IV. CONCLUSIONS

This addendum should address the comments previously mentioned in the letter from the City of Albuquerque dated July 18, 1995, and in the letter from AMAFCA dated July 14, 1995.

Drainage patterns stated in the June, 1995 Drainage Report have not been altered, but we have simplified the Drainage Basin Map.

The off-site flows from McMahon per the Smith Engineering Co. Drainage Report for C.P.N. 5208.90 and the proposed outfalls onto the Paloma del Sol project have been incorporated into the design of the storm drain system proposed for this project.

Details of the outfall structures and the spillways are provided in the infrastructure plans for the Paloma del Sol project (CPN 5300.90), concurrently under review by the DRC.

TABLE 1

PROPOSED DEVELOPMENT CONDITIONS
AS PER FINAL GRADING PLAN

				LAND TREATMENT				INCREMENTAL	FUTURE TOTAL
Basin I.D.	Area (Sq.Mi.)	Cont. Basin	Sum Area (Sq.Mi.)	A	B	C	D	Q100 (cfs)	Q100 (cfs)
100.1	0.00070	---	----	0	0	12	88	1.98	1.98
101.1	0.00694	100.1	0.00764	0	36	36	28	13.91	15.89
101.2	0.01014	101.1	0.01778	0	36	36	28	20.32	36.21
101.3	0.00289	101.2	0.02067	0	36	36	28	5.80	42.01*
* San Timoteo Avenue surface flow at sump Station 20+85									
Off-site flow from McMahon Boulevard									48.3
Total storm drain discharge to Calabacillas Arroyo									90.3
102.1	0.00901	---	---	0	36	36	28	18.06	18.06
102.2	0.00423	102.1	0.01324	0	36	36	28	8.49	26.54
102.3	0.00539	---	---	0	36	36	28	10.81	10.81
102.4	0.00536	122.3	0.01075	0	36	36	28	10.75	21.56
		102.2	0.02399						48.10**
** San Timoteo Avenue surface flow at sump Station 30+45									
Off-site flow from McMahon Boulevard									36.3
Total storm drain discharge to Calabacillas Arroyo									84.4
103.1	0.00323	---	---	0	50	50	0	Vol=0.152 ac ft	5.33
103.2	0.00401	---	---	0	50	50	0	Vol=0.188 ac ft	6.61
103.3	0.00201	---	---	0	50	50	0	Vol=0.094 ac ft	3.32
103.4	0.00054	---	---	0	50	50	0	Vol=0.025 ac ft	0.90
103.5	0.00003	---	---	0	50	50	0	Vol=0.001 ac ft	0.06
Total flow to rear yard ponds (Basins 103.1 to 103.5)								Vol=0.461 ac ft	16.22
104.1	0.00246	---	---	0	50	50	0	---	4.06***
*** Total sheet flow discharge to Calabacillas Arroyo									

COMPUTER PERCENT IMPERVIOUS

N = 65 DU/29 acres = 2.24

$$\%D = 7(N^2 + 5N)^{0.5}$$
$$= 7(2.24^2 + 5(2.24))^{0.5}$$
$$= 28\%$$

TABLE 2

STREET FLOW CHARACTERISTICS

STREET	WIDTH	CURB TYPE	LOCATION	SLOPE %	Q	Dn	Dc	Vn	Vc	EG	F	*POOL DEPTH
LOS SUENOS	25 FT	MNT	11+00	0.65	8.35	0.22	0.30	4.55	2.21	0.54	2.97	0.39
SAN TIMOTEO	27 FT	MNT	13+00	8.00	7.54	0.20	0.29	4.79	2.06	0.56	3.50	0.37
SAN TIMOTEO	27 FT	MNT	26+29	3.23	18.06	0.31	0.40	4.37	2.75	0.61	2.01	0.55
SAN TIMOTEO	27 FT	MNT	35+10	8.00	10.81	0.23	0.33	5.25	2.33	0.65	3.36	0.44
SAN TIMOTEO	28 FT	STND	13+85	8.00	15.89	0.31	0.43	5.90	2.67	0.85	3.37	0.57
SAN TIMOTEO	28 FT	STND	20+85	0.60	5.80	0.31	0.32	2.20	2.04	0.38	1.27	0.40
SAN TIMOTEO	28 FT	STND	20+85	1.12	26.54	0.51	0.52	3.18	3.15	0.67	1.03	0.71
SAN TIMOTEO	28 FT	STND	30+45	0.70	21.56	0.47	0.48	3.10	2.91	0.61	1.10	0.64
SAN TIMOTEO	28 FT	STND	30+45	0.84	36.21	0.59	0.59	3.43	3.45	0.78	0.99	0.82

* POOL DEPTH = Dc + 1.25(Vc^2)/(2g)

COMPARISON OF DRAINAGE BASIN AREAS

June 1995 Report Basin Designations		November 15, 1995 Revised Drainage Basin Designations
110.1	=	100.1
110.1, 110.2, 110.3 110.4 & part of 110.5	=	101.1
120.1, 120.2, 120.3 portion of 120.4, 130.1 & 130.2	=	101.2
170.1 (portion), 170.2 (portion) & 170.3	=	101.3
portions of 170.1, 170.2 & 160.1 and all of 160.2 & 160.3	=	102.1
portions of 150.3 and all of 150.1 & 150.2	=	102.2
portions of 140.1, 140.2 and 140.3	=	102.4
other portion of 140.1, 140.2 and 140.3	=	102.3
portions of 110.5, 120.4 170.1, 160.1, 150.3 & 140.1	=	103.1, 103.2 & 103.3