HYDROLOGY K25/D1 2 PLANS

K25/D1

2 Plans

FILE COPY

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
KEN SCHULTZ

CHIEF ADMINISTRATIVE OFFICER
GENE ROMO

DEPUTY CAO PUBLIC SERVICES
FRANK MARTINEZ

DEPUTY CAO PLANNING/DEVELOPMENT
BILL MUELLER

March 1, 1988

Tom Martinez
Post Office Box 556
Cedar Crest, New Mexico 87008

RE: DETERMINATION OF 100 YEAR FLOW FOR DRB-87-719

Dear Mr. Martinez:

As per your request, I have reviewed our drainage plans to determine the 100 year flow through your property. Attached is part of a drainage plan from Resource Technology. Analysis point number 3 determines what the discharge is through your property (2900 cfs).

For future reference, use [redacted] titled Three Springs Subdivision.

Should you have any questions, please call me at 768-2650.

Cordially,

Carlos A. Montoya

Carlos A. Montoya, P.E.
City/County Floodplain Administrator

Enclosure

CAM/bsj

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

DESIGN HYDROLOGY SECTION
123 Central NW, Albuquerque, NM 87102
(505) 766-7644

October 16, 1985

Mr. Elvido Diniz
Resource Technology Inc.
7800 Marble NE, #5
Albuquerque, NM 87110

REF: CONCEPTUAL DRAINAGE REPORT FOR THREE SPRINGS SUBDIVISION (K25-D1)
RECEIVED JULY 1, 1985

Dear Mr. Diniz:

I have reviewed the reference submittal and forward the following recommendations:

1. We are reviewing the report for sketch plat approval and not for site development plan as indicated on the information sheet.
2. The floodplain area should be dedicated to the county. All the major floodplain that enter the site should be dedicated. An example of an area that was not indicated for dedication was area E with a discharge of 1160 c.f.s. for the 100 year flood.
3. The Right-of-Way lines are incomplete for proposed ROW dedication below area G8. Also, the existing floodplain extends beyond the ROW limits.
4. A "prudent line" should be established to restrict development in this area. The "prudent area" will include the following:
   a. Floodplain.
   b. Erosion potential area.
   c. The area should include areas where the floodplain is going to be modified by new improvements. These improvements may include bridges culverts, and roads.
5. The downstream capacity should be evaluated and downstream drainage easements obtained.

If you have any questions, please contact this office at 776-7644.

Sincerely,

Carlos A. Montoya
City/County Flood Plain

cc:
Richard Dineen,
Chairman DRB
John Taschek

Transmittal

RESOURCE TECHNOLOGY, INCORPORATED

From: Elvidio Diniz 266-3320
7800 Marble Avenue NE, Suite 5
Albuquerque, New Mexico 87110

To: City of Albuquerque
Hydrology

Date: 1 July 1985

Our Project No. 85-060

Attn:

Re:

IF MATERIAL RECEIVED IS NOT AS LISTED, PLEASE NOTIFY US AT ONCE

RECEIVED
JUL 01 1985
HYDROLOGY SECTION

WE ARE SENDING YOU

- [x] ATTACHED
- [ ] UNDER SEPARATE COVER VIA
- [ ] SHOP DRAWINGS
- [ ] TRACINGS
- [ ] PRINTS
- [ ] CATALOGS
- [x] DOCUMENTS
- [ ] COPY OF LETTER
- [ ] SPECIFICATIONS
- [ ]

COPIES	DATE	ITEM
1	1 July 85	Conceptual Drainage Plan for Three Springs Subdivision w/ Information Sheet

REMARKS

COPY TO

K25/D1

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Three Springs Subdivision ZONE ATLAS/DRNG. FILE #: ~~K-25, L-25~~

LEGAL DESCRIPTION: Three Springs Subdivision, Bernalillo County, NM

CITY ADDRESS: —

ENGINEERING FIRM: Resource Technology Inc. CONTACT: Elvidio Diniz

ADDRESS: 2800 Marble NE #5 87110 PHONE: 266-3320

OWNER: MJB Partnership CONTACT: M. Jafari

ADDRESS: 10804 Menaul NE Suite E 87112 PHONE:

ARCHITECT: Mazcia Associates Inc. CONTACT: Ed. Mazcia

ADDRESS: P.O. Box 8380 Sante Fe, NM 87504 PHONE: 988-5309

SURVEYOR: Knogle and Paule Engineering CONTACT:

ADDRESS: 8338-A Comanche NE PHONE: 294-5051

CONTRACTOR: not available CONTACT:

ADDRESS: PHONE:

RECEIVED
JUL 01 1985
HYDROLOGY SECTION

PRE-DESIGN MEETING:

___ YES

X NO

___ COPY OF CONFERENCE RECAP SHEET PROVIDED

DRB NO. ___

EPC NO. ___

PROJ. NO. ___

TYPE OF SUBMITTAL:

X DRAINAGE REPORT

___ DRAINAGE PLAN

X CONCEPTUAL GRADING & DRAINAGE PLAN

___ GRADING PLAN

___ EROSION CONTROL PLAN

___ ENGINEER'S CERTIFICATION

CHECK TYPE OF APPROVAL SOUGHT:

___ SKETCH PLAT APPROVAL

___ PRELIMINARY PLAT APPROVAL

X SITE DEVELOPMENT PLAN APPROVAL

___ FINAL PLAT APPROVAL

___ BUILDING PERMIT APPROVAL

___ FOUNDATION PERMIT APPROVAL

___ CERTIFICATE OF OCCUPANCY APPROVAL

___ ROUGH GRADING PERMIT APPROVAL

___ GRADING/PAVING PERMIT APPROVAL

___ OTHER _____ (SPECIFY)

DATE SUBMITTED: 1 July 1985

BY: Elvidio Diniz

Route 5, Box 5454
Albuquerque, N. M. 87123
March 24, 1985

Mr. Randy Traynor
Chairman
Development Review Board
Planning Division
P. O. Box 1293
Albuquerque, N.Mex. 87103

Re: Proposed Three Springs Village Subdivision
PRB 85 - 206 Item #22

Dear Mr. Traynor:

The purpose of this letter is to express our objections and to bring to your attention several matters that in our opinion still remain unresolved in connection with the consideration of the proposed Three Springs Village Subdivision.

On March 18, 1985 the representatives of the Monticello Neighborhood Association met with the representatives for the proposed Three Springs Village Subdivision development. The Developer (Three Springs Limited Partnership) representatives included Mr. Morteza Jafari, the principal; Mr. Jon Davis, the proposed builder; Mr. Ed Mazria, the proposal architect; Mr. Elvidio Diniz, the proposal engineer; and Mr. Charlie Davis.

During this meeting we presented to the developer representatives our positions as to what would constitute acceptable means or methods of addressing our major concerns.

Our objections and matters of concern are as follows:

I. First and foremost, we are opposed to the development of ANY subdivision in the area. We base this opposition on the fact that the proposed subdivision lies within the area designated as proposed major public open space. The Plan for Major Open Space as approved by the City

Council and Board of County Commissioners in August, 1975 provided "that the set of open areas described in the Plan for Major Open Spaces and generally designated on its accompanying maps, when taken together, shall become the regional network of open space" and that this regional network of open space shall become the basis for the protection, preservation, acquisition, and coordination of open space to meet the present and future space needs of all residents of the city/county and surrounding area. In the Plan, this area is one that is designated for public ownership as it is a highly scenic area containing woods and brushy areas, many with steep slopes, and provides valuable wildlife habitat and recreation areas. It is perhaps the only area within the 5-mile radius of the city that possesses such unique environmental characteristics.

II. We have repeatedly expressed our concern over the availability of water in Tres Pistoles Canyon and the problems that exist with wells and water supplies. Our concern is generated by the data available in studies and reports made by noted geologists, hydrologists and water resources specialists which question the "abundant" supply of water as claimed by others to be available here in the canyon. All of these reports were presented to the County Planning Commission during hearings on the previous subdivision development proposal for this area and was primarily the basis for that body's refusal of the proposal.

Since the time those reports were generated, there have been several additional households added to the canyon population, and a potential exists for many more. The present land platting within the canyon, done before modern planning was adopted, would permit approximately 200 more houses to be built, roughly doubling the population not including this new proposed 224 home subdivision. We are deeply concerned that the available water simply will not be adequate at all times for a triple or quadruple population which could be foreseen for the canyon within the next 20 or so years. The availability of city supplied water would alleviate this concern.

III. Water quality and the ever increasing nitrate levels appearing in wells within the canyon and down Tijeras Arroyo are matters of grave concern. We have expressed doubts that the proposed split flow septic system for gray/black water would be adequate to prevent most of the additional nitrates generated within this proposed subdivision from percolating down to further contaminate the water in the canyon, down Tijeras arroyo, even to the South Valley area. Certainly no septic system can prevent nitrate contamination from fertilizers.

Our specific points of concern regarding the split flow system are:

1. Can the gray water be filtered prior to returning it to the canyon aquifier?
2. How can we be assured that the black water system will be maintained as required?
3. Has there been a thorough study of each lot's terrain with regard to its meeting the requirements for disposal of gray water (as Mr. Clements stated he would require before he could grant approval for a split flow system)?

IV. The primary access into the new subdivision is shown on the plan as beginning at the frontage road and going through a 300'-400' right of way on the east side of Monticello Subdivision and into the development. The secondary access goes through Monticello Subdivision, loops through the new subdivision and connects with the new primary road.

This secondary access uses narrow (20') roads which already produce traffic problems since these roads serve as access for school children and other pedestrians. Along the proposed route through Monticello Subdivision there are many grades in excess of 10°. In bad weather these inclines create major traffic problems. Residents are often unable to negotiate the narrow, icy roads and must park their vehicles along the highway frontage road and walk to their homes. The winter road conditions have frquently caused cars to slide into deep ditches or become stuck in the road thus blocking the way for other vehicles, even those with four-wheel or front-wheel drive. In time

of need, even emergency vehicles would find it difficult to gain access under these conditions. Increased numbers would only compound the problem.

We object to the secondary access road going through Monticello Subdivision and request that the following options be seriously considered.

Two 2-way roads with a median between be constructed in the 300'-400'right of way. They would enter the development, divide, and loop the subdivision. This would satisfy the 2-road acess requirement into new subdivision developments.

If these proposed two (2-lane) roads in and out are used, then the road known as Tres Pistolas Trail could be barricaded, and only emergency vehicles would be allowed access. These roads would alleviate the problem of excess traffic through Monticello Sub-Division.

During these discussions we again called to the attention of the developer representatives that the residents of Monticello are not the only occupants of Tres Pistoles canyon; that indeed we comprise less than one quarter of the residents which will be affected by this proposed subdivision. We again urged that the developer include these other residents in their considerations and consultations, something the developer had not done as of the time of the meeting.

Our association does not and can not speak for these other canyon residents. These residents might not find our positions acceptable on the issues discussed, particularly in view of the potential costs to be associated with the making available city supplied water and the hook-up costs. The proposed access might also be unacceptable to them. We do believe, however, based on their stated positions and expressions of interest during the hearings on the previous subdivision proposal, that their fears and concerns are substantially identical to ours.

Yours Sincerely,

Terence I. Baggett, Jr.
Acting Chairman
Monticello Residents Committee

cc:Jon Ertsgard,Water Resources
Fred Aguirre,City Engineer
Bob Fasnaugh,Traffic Engineer
Marty Valdez,Parks and Recreation
Rex King, Chairman,City/County Planning Dept.

LEGAL DESCRIPTION - PROPOSED THREE SPRINGS SUBDIVISION

PARCEL NO. 1

A certain parcel of land, situate within Sections 19 and 30 Township 10 North, Range 5 East of the New Mexico Principal Meridian, Bernalillo County, New Mexico, being more particularly described by metes and bounds as follows:

Beginning at the Northwest corner of Section 19 said Township and Range,
Thence N.89°20'00"E. 5,134.47 feet to the Northeast corner of said Section 19;
Thence S.00°19'00"W. 4,897.60 feet to the Southeast corner of said Section 19;
Thence S.00°07'00"W. 430.24 feet to a point on the Northerly boundary of the Canon de Carnue Grant;
Thence N.47°57'00"W. 613.14 feet on said Grant boundary;
Thence N.47°57'00"W. 1,948.32 feet on said Grant boundary;
Thence N.47°55'00"W. 1,496.88 feet on said Grant boundary;
Thence S.75°45'00"W. 1,498.20 feet on said Grant boundary;
Thence S.10°00'00"W. 2,162.82 feet on said Grant boundary;
Thence S.10°00'00"W. 106.92 feet on said Grant boundary;
Thence S.09°46'00"W. 861.30 feet on said Grant boundary;
Thence S.84°32'00"W. 104.94 feet on said Grant boundary;
Thence N.00°04'00"E. 951.89 feet on the West line of said Section 30 to the Southwest corner of said Section 19;
Thence N.00°05'00"W. 2,536.84 feet on the West line of said Section 19 to the West 1/4 corner thereof;
Thence N.00°03'00"E. 2,523.64 feet on the West line of said Section 19 to the Point of Beginning.

Parcel contains 436.17 Acres, more or less.

PARCEL NO. 2

All of Lot B of Summit Ridge Estates in Sections 19 and 30, Township 10 North, Range 5 East, New Mexico Principal Meridian, Bernalillo County, New Mexico as recorded on January 10, 1979, in Instrument No. 79-2274, Land Division No. SP-79-15, Records of said County.

Lot contains 12.12 Acres, more or less.

Parcel No. 1	456.17	Acres
Parcel No. 2	12.12	Acres
	448.29	Total Acres

CONCEPTUAL DRAINAGE PLAN FOR THREE SPRINGS SUBDIVISION BERNALILLO COUNTY, NEW MEXICO

prepared for

MJB Partnership

by

Resource Technology, Incorporated
7800 Marble Avenue NE, Suite 5
Albuquerque, New Mexico 87110

June 1985

CONCEPTUAL DRAINAGE PLAN FOR THREE SPRINGS SUBDIVISION BERNALILLO COUNTY, NEW MEXICO

prepared for

MJB Partnership

RECEIVED
JUL 01 1985
HYDROLOGY SECTION

by

Resource Technology, Incorporated
7800 Marble Avenue NE, Suite 5
Albuquerque, New Mexico 87110

June 1985

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PLATE

1. On-Site Drainage Map - fold-out in back of report

INTRODUCTION

This report presents the existing and proposed drainage conditions at Three Springs Subdivision, Bernalillo County, New Mexico. On-site topographic information was obtained from ortho-photo mapping by Koogle and Poulsen Engineering Inc. Topographic information for the entire drainage area was obtained from U.S. Geological Survey 7.5 minute topographic maps.

This report has been prepared in accordance with the criteria set forth in the Bernalillo County Flood Control Ordinance.

SITE LOCATION AND DESCRIPTION

The 446 acre site lies east of Albuquerque on the north slope of Tijeras Canyon in the Sandia Mountains as shown on the location map, Figure 1. It is bounded on the north, west and east by the Cibola National Forest. Monticello Subdivision lies to the south. Access to the subdivision will be provided by a new road from U.S. Highway 66 to be constructed east of Monticello Subdivision.

Elevations in the watershed range from 9,360 feet above m.s.l. to 7,000 feet along the north subdivision boundary and 6,300 feet along the south boundary. The sides of the watershed are very steep with slopes averaging 50 percent. The valley bottom is also relatively steep with slopes averaging 10 percent. Development will only occur on these less steep slopes.

With the exception of Three Gun Springs and other smaller springs and short reaches of arroyo downstream from the springs, there are no perennial water courses in the watershed. However there are numerous arroyos which only carry water after intense thunder showers. Most snowmelt infiltrates above elevation 7,000 feet into the underlying aquifer.

Figure 2 is a soils map of the watershed. As shown on this map, the drainage area is divided by the U.S. Soil Conservation Service into two soil types. In the steep, rocky areas the soil is classified as Rock Outcrop in the Orthids complex (ROF) with 40 percent rock outcrop. It falls within Hydrologic

Soil Group D, and no development will occur on this soil. In this report, soils in this group are considered 40 percent impervious. The soil in the lower areas is classified as Tessjo (Te) in Hydrologic Soil Group A. It is made up of very gravelly loam and very gravelly loamy sand. The SCS classifies this soil as having 20 percent rock outcrop but based on on-site inspections, RTI has placed the rock outcrop at 5 percent. Therefore this soil is considered 5 percent impervious in the undeveloped condition, and increasing to 25 percent after development of the subdivision.

The ROF soils range at elevations from 6,000 to 8,000 feet on 30 to 80 percent slopes. The rock outcrops are limestone, schist, or granite which has been exposed through faulting, uplifting, or geologic erosion. There is little or no vegetation on these soils and runoff is very rapid. The Te soils are derived from decomposed, coarse grained granitic rocks on alluvial fans. They are located at elevations ranging from 6,000 to 7,000 feet. The native vegetation is black grama, blue grama, sand dropseed, sacahuista, oneseed juniper, and soapweed.

PROPOSED DEVELOPMENT

There are no existing paved roads, structures, or utilities on the site. No development is proposed on slopes exceeding 15 percent; therefore, only 172 acres of the total 448 acres will be developed. Plate 1 shows the entire subdivision area with proposed development.

As shown on Plate 1, development will occur east and west of a centrally located north-south oriented ridge. The project is planned to be developed in phases with the eastern portion being the first phase. The development will consist of single family homes grouped in clusters from 3 to 16 homes on loop or cul-de-sac roads. A group of town homes is to be located on the east side of the development along with more cluster - type single family homes.

In order to preserve the natural landscaping and rural character of the area and to minimize water use, subdivision covenants will not allow outdoor watering for landscaping, and lot grading will be confined to the house pad and driveway areas only.

Grades do not allow this in all cases

The roof, driveway and, if practical, the front yards will drain to the inside of the loop roads which will be excavated as detention ponds for the local flow. Off-site flows will drain through or around the detention ponds in the loop roads and continue through their existing flow paths. Low earth berms will be used in certain places to protect individual lots. Whenever possible, excavation of channels will be avoided.

All roads will be paved and have a slope not exceeding 10 percent with a minimal amount of cut and fill and roadside ditches. Right-of-way widths and pavement widths for the roads will be as follows:

Type	ROW Width ft.	Pavement Width ft.
Main access	60	32
Residential Street	50	26
Cul-de-sac & loop roads	40	20

Road grades will be reduced by using alignments paralleling contour lines whenever possible. This will also reduce the amount of cut and fill required. Road alignments will correspond to the natural ground contours and will avoid desirable natural features such as rock outcroppings. To maintain sight distances and to provide pedestrian safety, 6-foot wide gravel shoulders will be provided along the main access and residential streets. All road design construction will be based on minimum criteria presented by the State of New Mexico in "Road Construction and Maintenance Practices to Reduce Erosion From Low Volume Unpaved Rural Roads in New Mexico" and to the satisfaction of the Bernalillo County Road Department. Figure 3 is a typical road cross section.

Existing drainageways will remain as they are as much as possible by using culverts or dip crossings in the roads. Corrugated metal pipe culverts will be used as necessary to keep the flow in its existing flow path. Rip-rap will be used for erosion control on both ends of the culverts.

Roadside swales will provide diversion of local flows to the culverts or dip crossings. Because lot grading will be minimized to the full extent possible, existing flow paths across adjacent lots will also be preserved as long as a building and driveway pad out of the flow path is available. Where such is not the case, minor drainage improvements such as swales and diversion berms will be constructed. Therefore, lot drainage will be designed on a lot-by-lot basis. Drainage easements across all lots will be provided by covenant.

Plate 1 shows the proposed roads and lots with proposed diversions. These diversions are described in more detail later in this report.

OFF-SITE FLOWS

Four large arroyos flow through the project area with tributary arroyos draining into them. To allow proper analysis the total drainage area was divided into Basins A through I as shown in Figure 4. Figure 5 shows how these basins were further divided to allow more accurate on-site drainage analysis. Within the project area these basins were divided into smaller drainage sub-areas, as shown on Plate 1. These divisions were made using the same notation used for the overall drainage area. For example, Basin D refers to the total area including sub-areas D1, D2 and D3.

Table 1 lists the general hydrologic information used in this report. Table 2 shows the developed and undeveloped runoff rates based on the Rational Formula for the 100-year, 10-year, and 2-year frequencies for basins A through I. Because basins A, E, H, I and portions of basins B, C, D and G are located outside the subdivision and within the Cibola National Forest, only undeveloped condition runoff is expected from these areas. Analysis points, as shown on Figure 4, were used to determine runoff rates at specific locations. Table 3 lists the flows at each of the analysis points shown on Figure 4.

The Muskingum method for flood routing and the HEC-1 computer program were used to calculate flowrates at each analysis point as follows:

Flows from basins A and I were combined and routed to Analysis Point 1 where they were combined with Basin H flows. These flows were then routed to Analysis Point 3 where Basin G flows were added. Flows from Sub-area B1 were calculated at Analysis Point 2 and routed to Point 3 where they were combined with flows from the rest of Basin B. Combined and routed flows from basins A, I, H and G which had also been routed to Point 3 were combined with flows from Basin B because immediately downstream of Analysis Point 3 the two arroyos come together.

Flow routing was not required in the rest of the basins because they drain directly into the subdivision. Table 4 presents the existing condition flowrates and volumes at the Forest Service boundary which is also the point where off-site flows enter the subdivision.

ON-SITE FLOWS

Table 5 presents the existing and developed condition flowrates and volumes for the on-site sub-areas at the analysis points located on Plate 1. This table also shows how sub-areas from different basins combine under existing conditions and how they may be diverted to combine with other sub-areas under developed conditions.

Where it is not feasible to drain to the inside of the loop roads, as previously described, because some of the lots would be downhill from the pond nearest to them, roof runoff would be directed downstream to the next downstream pond. In the case of lots on the southern boundary, runoff from roofs and driveways would be allowed to flow into the arroyo with no detention; but when considering the drainage area as a whole, this increase in runoff is minimal as shown in Table 2, which shows undeveloped and developed flow conditions for individual watershed areas as shown in Figure 4.

Figure 6 is a plan view of a typical detention pond and earth berm location. Figure 7 is a typical cross section through a pond and berm. If a lot is within the 100-year flood plain the pad and driveway areas will be filled to one foot above the flood elevation and protected from erosion. The rest of the lot would remain in its present condition.

The following paragraphs describe existing and developed drainage plans for each basin. Basins which are totally off-site are not listed.

BASIN B

Sub-area B1 is the upper watershed of one of the main arroyos and is located within the Cibola National Forest. Sub-area B2 is the lower watershed of the arroyo which is the part that lies within this development. A drainage right-of-way approximately 200 feet wide will allow it to remain in its existing channel. Berms and/or fill, as shown on Plate 1, will be needed in some locations to protect development sites on the lots. Runoff in Sub-area C2 will follow a north-south road and will be diverted into the arroyo within Sub-area B2 at a cul-de-sac road using a low point in the north-south road. It will flow out the cul-de-sac at Analysis Point 15 and down a paved rundown/walkway as shown on Plate 1.

BASIN C

Runoff in this area will generally follow the existing arroyo. Several lots along the arroyo will need a berm to protect development on the lots. Otherwise, flow will continue out of the subdivision in the same arroyo as in the undeveloped condition.

BASIN D

This area also has a large arroyo which flows through the subdivision in Sub-area D3 and collects runoff from offsite sub-areas D1 and D2. A road will be constructed through the central portion of Sub-area D3 along with single family custom designed homes. Runoff from sub-area D1, along with the single

family lot runoff will be directed down the road using roadside ditches to keep it from spreading over the entire area of each lot. A berm will also be constructed on the east subdivision boundary to protect the lots from off-site flow from Sub-area D2. These two flows converge at the central part of D3 along the road. The road will also be protected from flooding. In the southern portion of D3 the flow converges with off-site Area E, and then flows out of the subdivision through the arroyo that it flows through in the undeveloped condition.

BASIN F

Most of the drainage in Sub-area F1 will have to be diverted around the community facilities, buildings and parking areas. The flow could be routed around the west and south sides of this area through a paved or earth swale as shown on Plate 1. However, a detailed drainage plan will be necessary before construction. This plan would state exactly how the flow would be handled.

The rest of the runoff will flow across the east-west road and down an existing arroyo to the subdivision boundary.

The main drainageway in the central portion of Sub-area F3 will continue to generally flow along the same path that it currently takes. Berms or swales will be used to confine the flow to a part of the lots and allow for a safe place to construct the building pads. Runoff from the rest of Sub-area F3 will be directed along the roads as shown in Plate 1, then directed to the main drainage way where it again flows out of the subdivision using the same route it takes in the undeveloped condition.

Sub-area F4 will also generally flow along the existing flow path and out the same drainage path as in the existing condition.

BASIN G

Basin G contains a portion of one of the major arroyos with several tributary arroyos. Therefore, it was divided into several smaller analysis areas.

A drainage right-of-way, approximately 200 feet wide, will allow the arroyo to remain in its existing channel.

Runoff from sub-areas G3 and G7 will be conveyed to the main arroyo via a loop road as shown on Plate 1. A roadside channel will be necessary to carry the flow. The rest of the sub-areas in Basin G will drain through the development generally in the same manner they do in the undeveloped state except for roof and driveway runoff which will drain to a detention pond as previously described. In some instances the flow will be confined by a swale or berm because in the undeveloped condition the arroyo is not a well defined channel and runoff spreads over a wide area.

FLOOD PLAIN DELINEATION

The HEC-2 computer program was used to determine the 100-year flood plains for the arroyos flowing through Basin G, and sub-areas B2 and C4. Flow data for these runs are listed in Tables 6, 7 and 8. Manning's roughness values used in this study are 0.025 for the channel and 0.05 for the overbanks, where a 10-foot wide, sandy bottom, and 1-foot deep low-flow channel was defined as the channel and the remainder of the arroyo was in the overbank area. Topography used for determination of cross sections is shown on Plate 1, with the low-flow channel superimposed on the cross section at, and 1-foot below, its low point.

?

why?

Because the channel slope is so steep, extremely high velocities, 10 to 20 fps, will be experienced during a 100-year flow. In addition, natural rock outcrops force the arroyos through narrow channels at the south end of the study reaches where the 100-year velocities will reach 30 fps. No development is proposed in these areas because of the rock outcrops, and all roads running parallel to the arroyos will be located away from any flood hazard. One dip crossing of the westernmost arroyo will be required for the emergency road through Monticello Subdivision.

The limits of 100-year flooding as determined from the HEC-2 runs are shown on Plate 1. Flood plains are shown only for the area within the

subdivision boundary. In Sub-area C3 where the arroyo flows through a developed area, the flood plain was not calculated because the lots there will be custom designed. The flood plain limit will be determined at the time of design. Flood plain limits were not shown in Sub-area D3 for this same reason.

Tables 6, 7, and 8 also show the summary printout tables generated by the HEC-2 program.

SLOPE STABILITY

All cut and fill slopes will be at a 3H:1V slope. Adequate erosion protection will be provided as specified in the New Mexico State Highway Department Specifications Sections 2.11 and 2.12.

TABLE 1

GENERAL INFORMATION

TIME OF CONCENTRATION

Sub Area	Drainage (ac)	Length (ft)	Slope (ft/ft)	Tc (min)	Vel (ft/sec)
A	275	7,392	0.344	11.21	10.99
B	336	7,920	0.318	12.18	10.84
C	135	5,280	0.206	10.54	8.35
D	142	6,600	0.309	10.70	10.27
E	333	7,920	0.313	12.26	10.77
F	102	3,168	0.136	8.34	6.33
G	295	5,280	0.284	9.31	9.45
H	183	3,696	0.350	6.53	9.43
I	164	5,280	0.231	10.08	8.73

Assume Tc = 10 minutes

RAINFALL DATA

6-Hour Rainfall Depth

100-year = 2.60 in
10-year = 1.71 in
2-year = 1.16 in

Rainfall Intensity

100-year = 5.50 in/hr
10-year = 3.61 in/hr
2-year = 2.45 in/hr

SOILS INFORMATION AND "C" FACTORS

Undeveloped Conditions

Type A soil is 5% impervious with a "C" Factor of 0.18
Type D soil is 40% impervious with a "C" Factor of 0.70

Developed Conditions

Type A soil is 25% impervious with a "C" Factor of 0.28
Type D soil does not change. All development assumed to be on Type A soil only because soil division boundary approximately follows development area boundary.

TABLE 2

TOTAL DRAINAGE AREA HYDROLOGY

Watershed Area	Drainage Area (ac)		C	100-yr Frequency Q (cfs)	100-yr Frequency Vol (ac ft)	10-yr Frequency Q (cfs)	10-yr Frequency Vol (ac ft)	2-yr Frequency Q (cfs)	2-yr Frequency Vol (ac ft)
A	275	Undeveloped	.66	998	40.52	655	25.86	445	17.54
			Off-Site Area will not be developed						
B1	336	Undeveloped	.59	1,090	42.95	716	28.25	486	19.16
			Off-Site Area will not be developed						
B2	39	Undeveloped	.18	39	1.53	25	1.01	17	.68
		Developed	.25	54	2.11	35	1.39	24	.94
C	135	Undeveloped	.47	348	13.71	229	9.02	155	2.12
		Developed	.51	378	14.91	249	9.81	168	6.66
D	152	Undeveloped	.57	474	18.66	311	12.27	211	8.34
		Developed	.59	493	19.43	324	12.78	220	8.67
E	319	Undeveloped	.66	1,160	45.68	761	30.04	517	20.38
F	102	Undeveloped	.35	195	7.70	129	5.06	87	3.43
		Developed	.42	236	9.28	155	6.10	105	4.14
G	256	Undeveloped	.59	845	33.28	554	21.89	376	14.85
H	183	Undeveloped	.55	554	21.80	363	14.34	247	9.73
			Off-Site Area will not be developed						
I	164	Undeveloped	.63	568	22.39	373	14.72	253	9.99
			Off-Site Area will not be developed						

* See Figure 4 for location of basins

TABLE 3

RUNOFF RATES AND VOLUMES AT SELECT ANALYSIS POINTS
AS SHOWN IN FIGURE 3

Analysis Point	Contributing Basins	Drainage Area (ac)		100-yr Frequency Q (cfs)	100-yr Frequency Vol (ac ft)	10-yr Frequency Q (cfs)	10-yr Frequency Vol (ac ft)	2-yr Frequency Q (cfs)	2-yr Frequency Vol (ac ft)
1*	A, I, H	622	Undeveloped	1,514	84.71	993	54.93	674	37.26
			Off-Site Area will not be developed						
2	B1		Undeveloped	1,090	42.95	716	28.25	486	19.16
3*	A, I, H	1,253	Undeveloped	2,887	161.92	1,895	105.71	1,287	71.71
	B, G		Developed	2,913	163.05	1,912	106.48	1,298	72.22
4	C	135	Undeveloped	348	13.71	229	9.02	155	6.12
			Developed	387	15.24	254	10.02	172	6.80
5	F	102	Undeveloped	195	7.70	129	5.06	87	3.43
			Developed	215	8.51	142	5.60	517	3.80
6	E	319	Undeveloped	1,160	45.68	761	30.04	517	20.38
			Off-Site Area will not be developed						
7	D, E	471	Undeveloped	1,634	64.38	1,072	42.31	728	28.47
			Developed	1,646	64.84	1,081	42.64	734	28.93

See Figure 4 for location of contributing basins.

* Muskingum Routing used to compute flow for all frequencies

See Table 2 for individual area computations

TABLE 4

RUNOFF RATES AND VOLUMES AT FOREST SERVICE BOUNDARY

Sub-Area	Drainage Area (ac)	C	100-yr Frequency Q (cfs)	100-yr Frequency Vol (ac ft)	10-yr Frequency Q (cfs)	10-yr Frequency Vol (ac ft)	2-yr Frequency Q (cfs)	2-yr Frequency Vol (ac ft)
C1	52	.57	163	6.42	107	4.22	73	2.87
D1	28	.70	108	4.25	71	2.79	48	1.89
D2	57	.70	219	8.64	144	5.69	98	3.86
G1	43	.62	147	5.78	96	3.80	65	2.58
G2	13	.70	50	1.97	33	1.30	22	0.88
G3	36	.70	139	5.46	91	3.59	62	2.44
G4	36	.70	139	5.46	91	3.59	62	2.44

TABLE 5

ON-SITE AREA HYDROLOGY

Analysis Point	Contributing Sub-Areas	Drainage Area (ac)		100-yr Frequency Q (cfs)	100-yr Frequency Vol (ac ft)	10-yr Frequency Q (cfs)	10-yr Frequency Vol (ac ft)	2-yr Frequency Q (cfs)	2-yr Frequency Vol (ac ft)
8	G4, G9	58.81	Undeveloped	195	7.68	128	5.20	87	3.52
	G4, G9		Developed	201	7.90	132	5.19	89	3.52
9	G3, G7, G8	67.64	Undeveloped	224	8.82	147	5.80	100	3.93
	G8	2.96	Developed	5	.18	3	.12	2	.08
10	G3, G7	64.68	Developed	221	8.69	145	5.71	98	3.88
11	G2, G5, G6	37.25	Undeveloped	177	6.49	116	4.57	79	3.10
			Developed	179	7.02	117	4.62	80	3.13
12	A, I, H*	6.22	Undeveloped	1,514	84.71	993	54.93	674	37.26
13	A, I, H, G*	8.78	Undeveloped	2,016	117.44	1,323	76.45	899	51.86
	A, I, H, G*		Developed	2,026	117.99	1,329	76.84	903	52.11
14	B1	3.36	Undeveloped	1,090	42.95	716	28.25	486	19.16
15	C2	10.67	Undeveloped	23	.90	15	.59	10	.40
			Developed	26	1.04	17	.68	12	.46
16	B1, B2*	3.75	Undeveloped	879	44.49	577	29.26	391	19.85
	B1, B2, C2*	3.86	Developed	898	45.06	589	29.64	400	20.11
17	C6	5.30	Undeveloped	5	.21	4	.14	2	.09
			Developed	6	.23	4	.15	3	.10
18	C1, C3	92.24	Undeveloped	290	11.39	190	7.49	129	5.08
			Developed	294	11.57	193	7.61	131	5.16

TABLE 5

(Continued)

Analysis Point	Contributing Sub-Areas	Drainage Area (ac)		100-yr Frequency Q (cfs)	100-yr Frequency Vol (ac ft)	10-yr Frequency Q (cfs)	10-yr Frequency Vol (ac ft)	2-yr Frequency Q (cfs)	2-yr Frequency Vol (ac ft)
19	C5	4.66	Undeveloped	5	.18	3	.12	2	.08
			Developed	6	.25	4	.17	3	.11
20	C1, C3, C4, C5	77.89	Undeveloped	360	14.19	236	9.33	161	6.33
			Developed	377	14.83	247	9.75	1[illegible]8	6.62
21	F1 + F2	18.98	Undeveloped	53	2.88	48	1.89	33	1.28
22	F1	29.88	Undeveloped	77	3.04	51	1.89	34	1.36
	F1 + F2	32.37	Developed	91	3.57	60	2.35	40	1.60
23	4.25 ac of F1	4.25	Undeveloped	4	1.63	3	.11	2	.07
24	F3	10.86	Undeveloped	41	1.63	27	1.07	18	.73
25	F2 + F3	43.91	Undeveloped	92	2.62	60	2.38	41	1.61
	F3	41.42	Developed	84	3.32	55	2.18	38	1.48
26	F4	15.74	Undeveloped	16	.61	10	.40	7	.27
			Developed	22	.85	14	.56	10	.38

* Muskingum Routing used to compute flows.

TABLE 6

THIS RUN EXECUTED 24 APR 85 15:03:53

```
*************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982
 ERROR CORE -  01,02,03,04,05
 MODIFICATION -  50,51,52,53,54,55
*************************************************
```

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

ARROYO B - 100-YR FLOOD

SUMMARY PRINTOUT TABLE 150

Superseded

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
*	1.000	0.00	0.00	0.00	480.00	1090.00	481.80	481.80	482.51	171.[illegible]1	11.50	193.04	83.33
*	2.000	610.00	0.00	0.00	430.00	1090.00	430.93	431.09	431.67	466.43	12.19	172.36	50.47
*	3.000	330.00	0.00	0.00	399.00	1090.00	400.40	401.10	403.53	965.26	23.10	112.69	35.08
*	4.000	380.00	0.00	0.00	365.00	1090.00	365.83	366.15	366.92	781.49	14.67	142.26	38.99
	5.000	265.00	0.00	0.00	340.00	1090.00	340.83	341.30	342.44	1103.88	17.36	118.47	32.81
	6.000	460.00	0.00	0.00	300.00	1090.00	301.08	301.60	302.79	766.64	17.35	118.77	39.37
	7.000	200.00	0.00	0.00	285.00	1090.00	286.16	286.83	288.39	839.38	19.08	104.77	37.62
	8.000	285.00	0.00	0.00	260.00	1090.00	261.26	262.06	263.97	870.85	20.52	96.60	36.94
*	9.000	205.00	0.00	0.00	240.00	1090.00	242.44	244.64	252.96	815.70	30.74	59.96	38.16
*	10.000	135.00	0.00	0.00	230.00	1090.00	231.52	232.32	234.47	764.56	21.72	107.55	39.42

TABLE 7

THIS RUN EXECUTED 24 APR 85 15:04:04

```
*************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982

  ERROR CORR -  01,02,03,04,05
  MODIFICATION -  50,51,52,53,54,55
*************************************************
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

ARROYO - C 100-YR FLOOD

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
*	5.000	0.00	0.00	0.00	375.00	290.00	375.76	375.76	376.14	244.60	7.77	68.20	18.54
*	6.000	335.00	0.00	0.00	336.00	290.00	337.60	338.46	340.98	939.57	24.99	29.98	9.46
*	7.000	410.00	0.00	0.00	295.00	290.00	295.37	295.60	296.17	1534.56	11.97	45.06	7.40
	8.000	190.00	0.00	0.00	275.00	348.00	275.89	276.38	277.51	692.50	14.43	41.72	13.22
*	9.000	320.00	0.00	0.00	246.00	348.00	248.13	249.25	252.47	734.14	26.69	32.37	12.84
*	10.000	260.00	0.00	0.00	220.00	348.00	221.18	222.34	226.87	1089.41	21.88	24.95	10.54
*	11.000	350.00	0.00	0.00	190.00	348.00	190.58	190.75	191.19	604.21	10.22	62.73	14.16

TABLE 8

THIS RUN EXECUTED 24 APR 85 15:03:31

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*************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982
 ERROR CORR -  01,02,03,04,05
 MODIFICATION -  50,51,52,53,54,55
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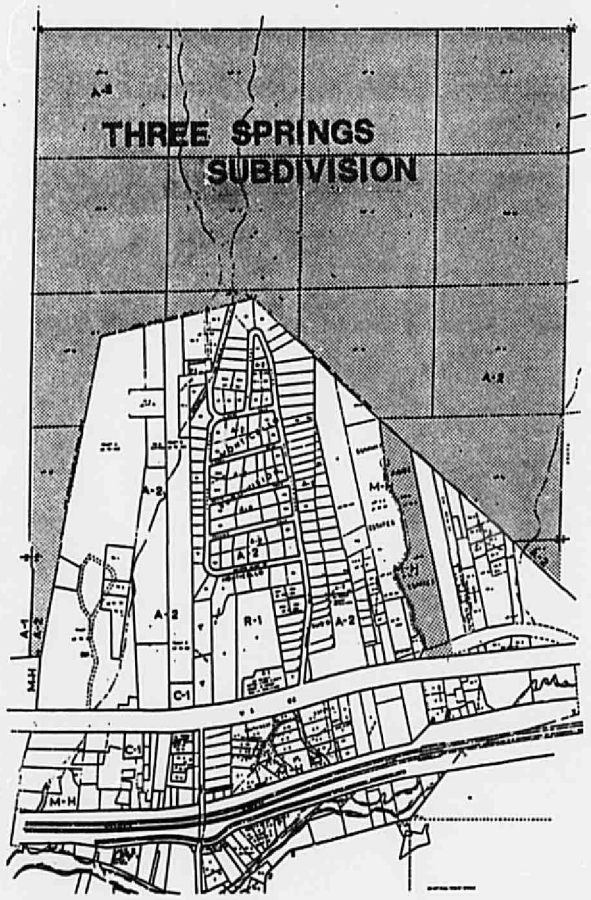
NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

ARROYO - G 100-YR FLOOD

SUMMARY PRINTOUT TABLE 150

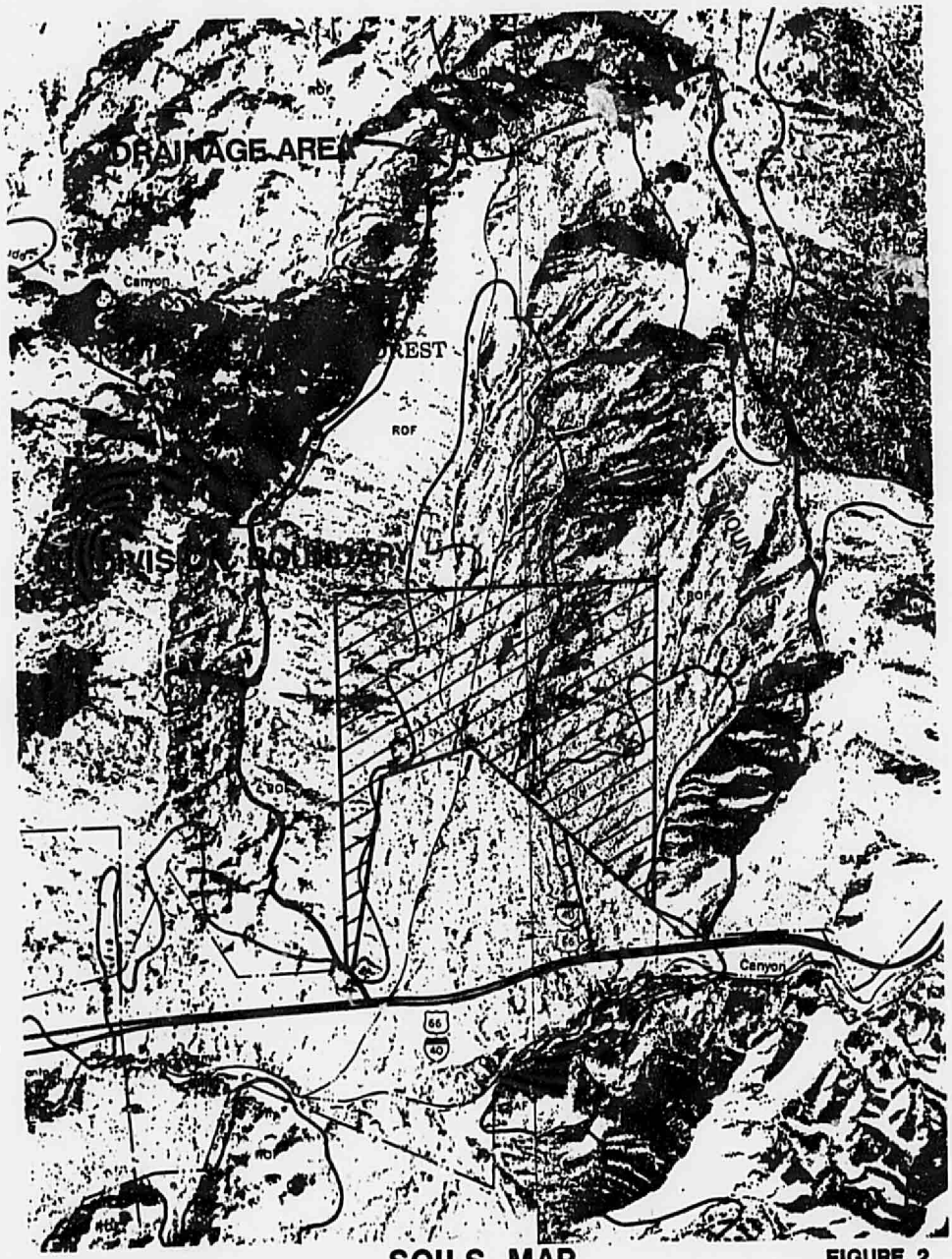
	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
*	1.000	0.00	0.00	0.00	470.00	1514.00	471.64	471.64	472.41	216.03	12.16	241.01	103.01
*	2.000	280.00	0.00	0.00	450.00	1514.00	451.35	452.08	453.77	785.82	20.39	138.73	54.01
	3.000	270.00	0.00	0.00	425.00	1514.00	426.05	426.81	428.74	1311.58	22.28	132.26	41.81
	4.000	650.00	0.00	0.00	370.00	1786.00-	371.41	371.99	373.30	638.19	18.88	182.92	70.70
	5.000	450.00	0.00	0.00	335.00	1786.00	335.83	336.33	337.53	1290.38	18.81	183.81	49.72
*	6.000	425.00	0.00	0.00	300.00	2016.00	301.61	302.96	306.63	1196.19	28.23	130.84	58.29
*	7.000	305.00	0.00	0.00	270.00	2016.00	273.05	275.71	286.23	889.42	37.34	105.32	67.60
*	8.000	305.00	0.00	0.00	246.00	2016.00	250.16	252.25	259.31	639.13	38.86	76.89	79.74
*	9.000	290.00	0.00	0.00	220.00	2016.00	222.62	225.30	233.38	1012.04	35.85	106.72	63.37

1

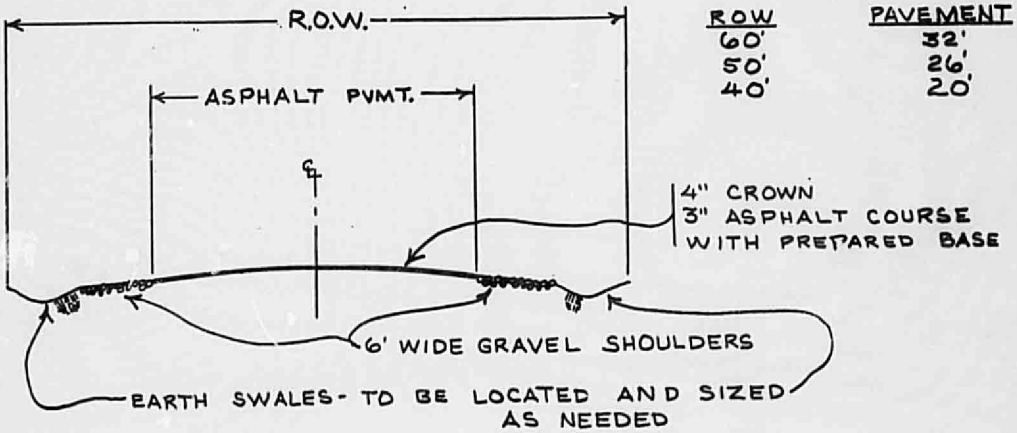


LOCATION MAP

FIGURE 1



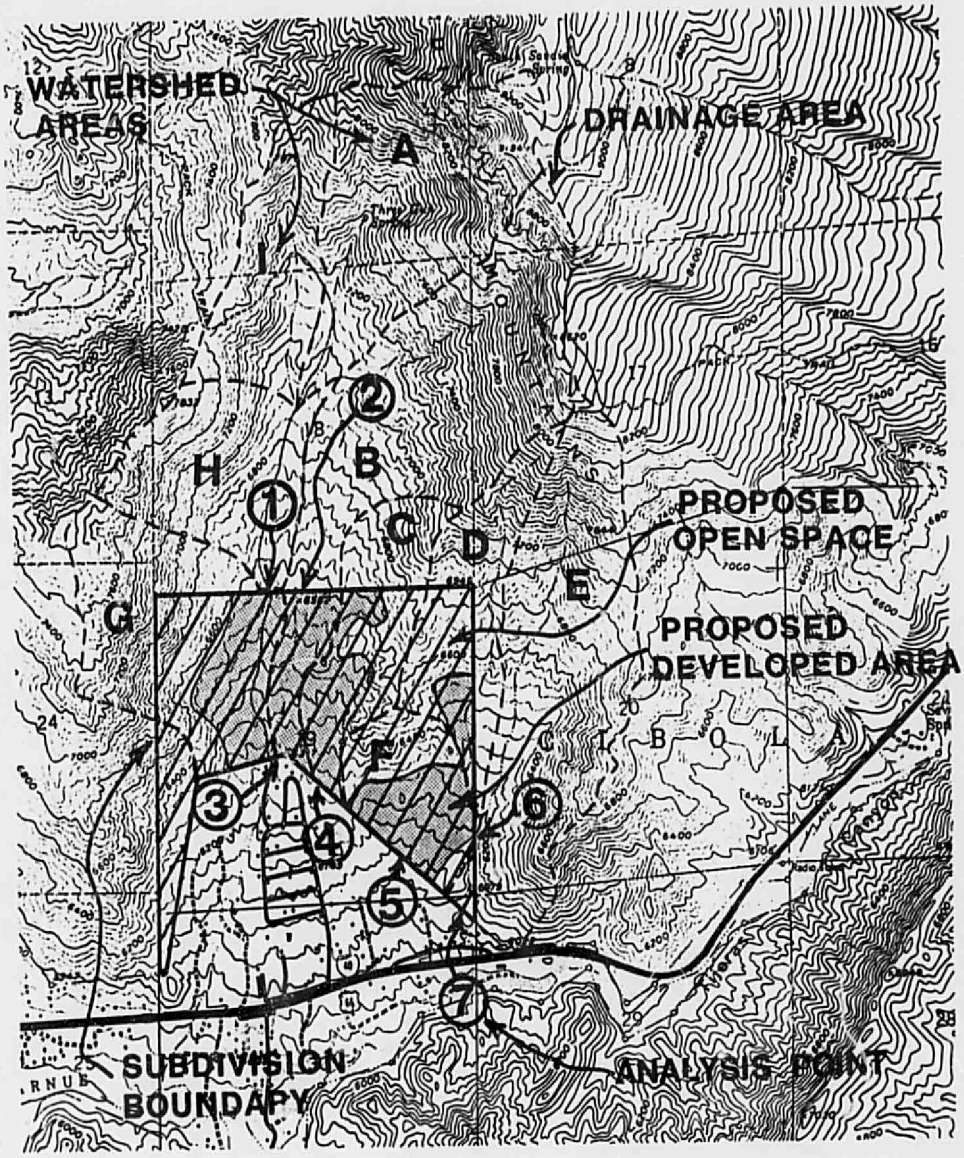
SOILS MAP **FIGURE 2**



ROW	PAVEMENT
60'	32'
50'	26'
40'	20'

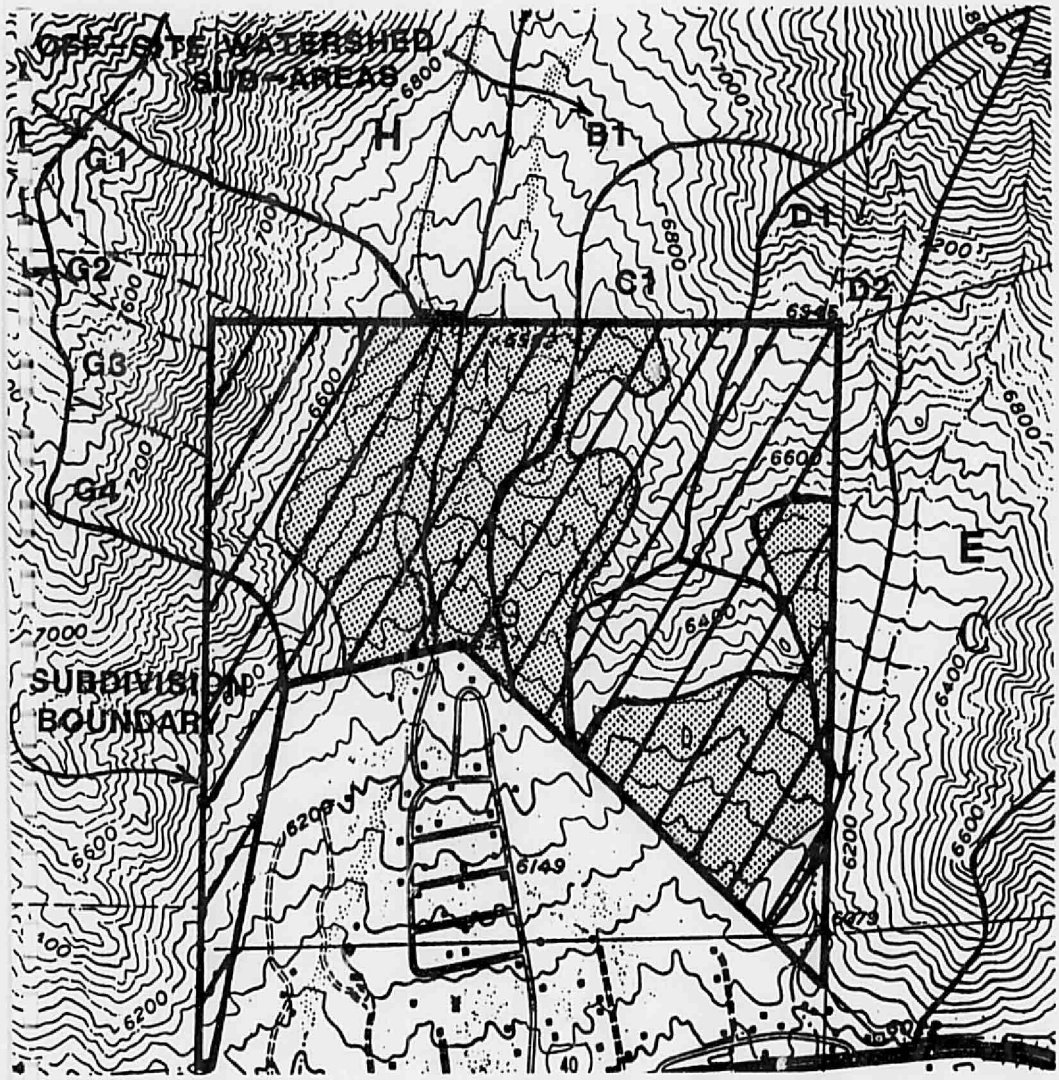
TYPICAL ROAD SECTION

FIGURE 3



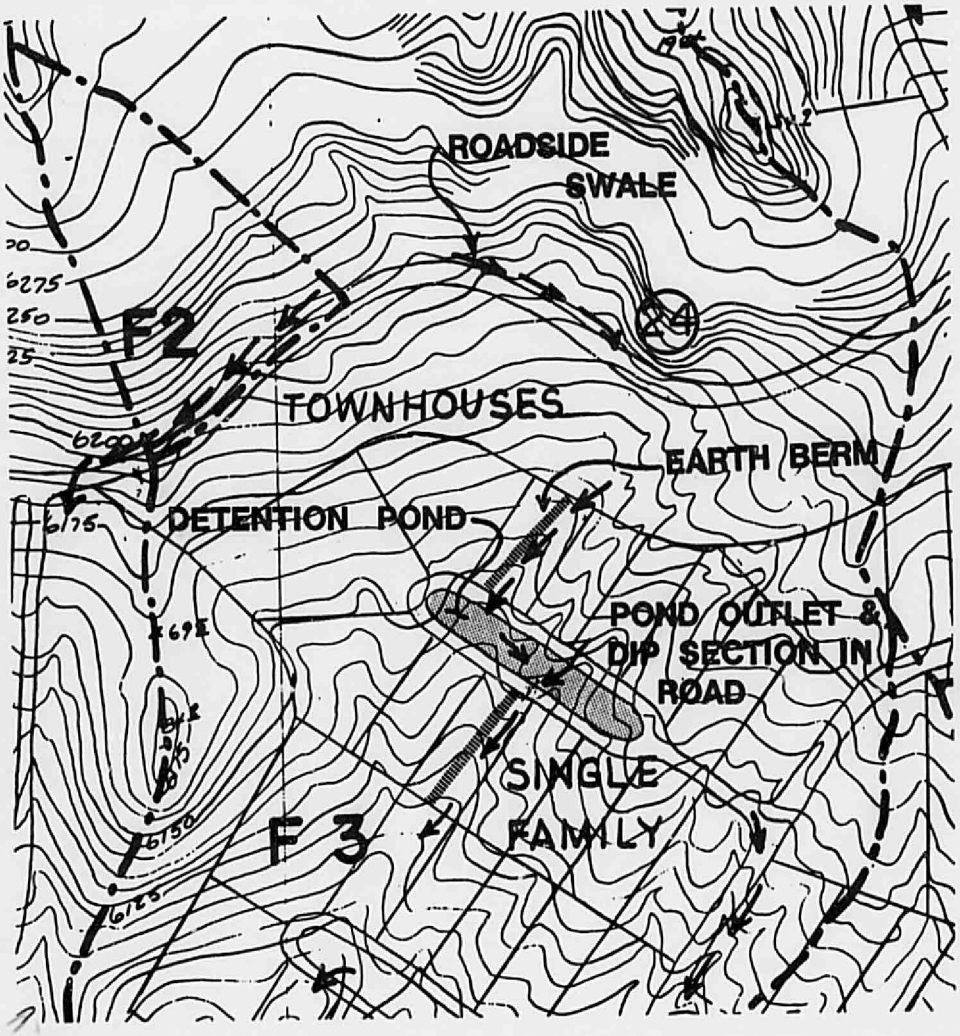
MAIN WATERSHED AREAS

FIGURE 4



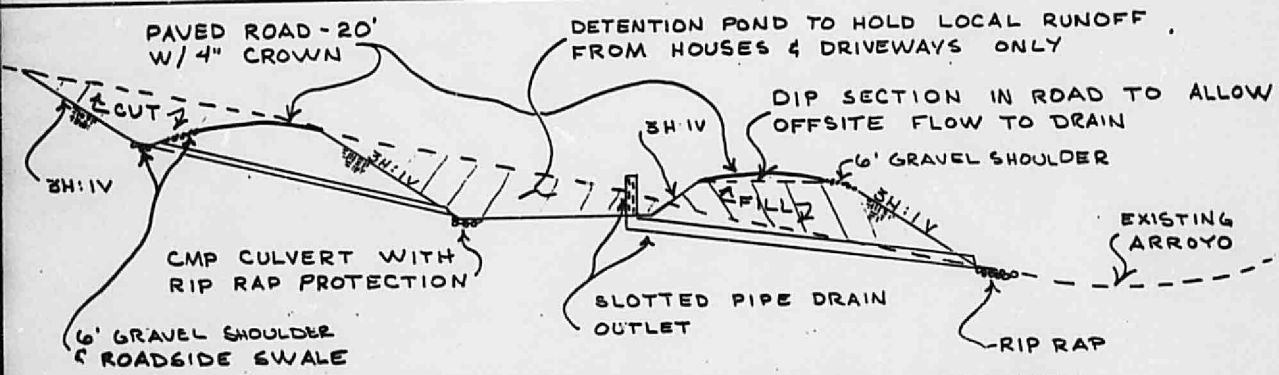
OFF—SITE SUB—AREA WATERSHEDS

FIGURE 5

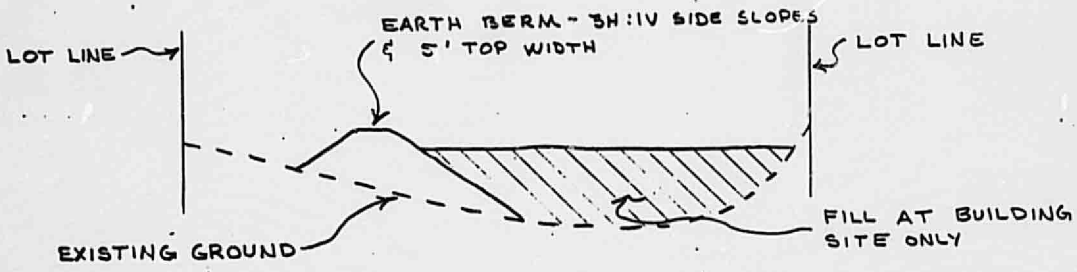


TYPICAL LAYOUT OF
DETENTION POND AND EARTH BERM

FIGURE 6



TYPICAL DETENTION POND SECTION



TYPICAL EARTH BERM SECTION

FIGURE 7