MASTER DEVELOPMENT DRAINAGE PLAN
FOR SIERRA RIDGE
July, 1994

Prepared for:

Development Management, Inc.
4065 Sinton Road, Suite 200
Colorado Springs, CO 80907

Prepared by:

Rockwell-Minchow Consultants, Inc.
2928 Straus Lane, Suite 100
Colorado Springs, CO 80907
(719) 475-2575
Project# 94-007

CITY OF COLORADO SPRINGS

CITY ENGINEERING DIVISION
Stormwater and Subdivision

August 9, 1994

Kent Rockwell
Rockwell-Minchow Consultants
FAX - 475-9223

SIERRA RIDGE FILING #2 FDR

Dear Kent,

The report is acceptable with one exception. The last ¶ in the section entitled **HYDRAULIC ANALYSIS** needs to be revised to better describe our acceptance of the Q100 overflow of Rangewood Drive.

You state that the overflow is allowed "based on the understanding that existing systems would not have to be upsized to accommodate the increased flows caused by the 1987 drainage criteria revisions." This is not the case.

First, it is my observation that the problem of excess flow at the intersection of Austin Bluffs and Templeton Gap is not entirely a result of criteria changes. Norwood accepted additional flows diverted from a different drainage basin into the system which was originally sized without these flows. The City supported this diversion in my recollection. The presence of these "diverted" flows reduced our ability to add additional Sierra Ridge flows into the existing system.

Second, the biggest problem seems to arise not so much from increased flow rates due to the 10 yr. storm, but rather from the 1987 criteria change which allows zero crossflow over a major arterial street.

Third, there is no understanding that pre-1987 systems do not need to be upsized to meet the current criteria. Each case is dealt with independently and most of the time we seek a more practical solution, but your reference to an understanding about not upsizing is not so.

Upon review of the detailed information you presented to me in our meeting , it is my opinion that the depth of flow at the "crown" of Austin Bluffs Parkway is within a reasonable depth (+/- 4") that the location does not warrant the huge cost of upsizing. As you know, the City has already been looking at relaxing the Q100 arterial crossflow criteria to be more in line with other Front Range communities. I suspect that in the near future the criteria will be changed and your intersection will meet the new criteria.

I suggest that you revise the ¶ referenced above. If you want, you can put a copy of this letter in the appendix with a reference to it to save having to add a lot of additional text.

Sincerely,

Dave Lethbridge
City Engineering

c. Bruce Thorson, Subdivision Manager

101 West Costilla, Suite 122 • TEL 719-578-6212 Stormwater Management/719-578-6208 Subdivision FAX 719-578-6161
Mailing Address: Post Office Box 1575, Mail Code 1110 • Colorado Springs, Colorado 80901-1575

MASTER DEVELOPMENT DRAINAGE PLAN FOR SIERRA RIDGE
DRAINAGE PLAN 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/County 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 any negligent acts, errors or omissions on my part in preparing this report.

Kent D. Rockwell, P.E.

July 28, 1994

COLORADO REGISTERED
KENT D. ROCKWELL
25086
PROFESSIONAL ENGINEER

DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all the requirements specified in this drainage report and plan.

DEVELOPMENT MANAGEMENT, INC.

BY: _____ DATE 7/28/94

TITLE: Development Manager - Agent for:

ADDRESS: 4065 Sinton Road, Suite 200
Colorado Springs, CO 80904

CITY OF COLORADO SPRINGS

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

_____ for: _____ 8/9/94

CITY ENGINEER DATE

Sierra Ridge
Master Development Drainage Plan

GENERAL LOCATION AND DESCRIPTION

Sierra Ridge is located in northeastern Colorado Springs. The site is situated within the southwest quarter of Section 13 and southeast quarter of 14, Township 13 South, Range 66 West of the 6th Principal Meridian, City of Colorado Springs, El Paso County, Colorado (see Exhibit 1). The site is bounded on the east by Austin Bluffs Parkway, on the north by Rangewood Drive, on the west by Dakota Ridge Filing No. 1, Deer Run Filing No. 1 and unplatted land and on the south by unplatted land.

DESCRIPTION OF PROPERTY

Sierra Ridge consists of 71.65 acres. The southern two-thirds of the site slopes to the east at grades of 3% to 6%. The northern one-third of the site slopes northerly at approximately the same grades. The eastern property line toward the north side of the project runs along a natural ridge separating Sierra Ridge from the Dakota Ridge Development. This same ridge exists just east of Sierra Ridge toward the southern portion of the site.

Currently, the site has well-established native grasses as ground cover. According to the Soil Survey of El Paso County, as prepared by the U.S. Department of Agriculture Soil Conservation Service, the underlying soil throughout the majority of the site is Truckton (Soil No. 97). Truckton is classified as a Hydrologic Group B soil. Toward the very northeast corner of the site the underlying soil is Blakeland which falls in the Hydrologic Group A soils. The location of these soil types relative to the site are depicted on Exhibit 2.

DRAINAGE CRITERIA

The current City of Colorado Springs/El Paso County Drainage Criteria was utilized in the preparation of this study. Calculations were performed to determine the runoff quantities generated during 10 year and 100 year frequency storms for both the historic and developed conditions. The Rational Method was used according to criteria for basins less than 100 acres.

The Sierra Ridge Development is located within the Cottonwood Creek Major Drainage Basin. The Master Drainage Study for Sunrise Development was also utilized as a reference for the preparation of this report.

The site is not located within a designated 100 year flood hazard area.

HISTORIC DRAINAGE PATTERNS

The historic drainage patterns, historic drainage basins and the historic runoff quantities are depicted on the Historic Drainage Plan.

The site has been divided into 4 historic basins. Basin H-1 discharges directly into Saddle Rock Drive. Basin H-2 discharges flows onto Rangewood Drive as sheet flow. This flow then continues northerly within Rangewood as street flow.

The majority of the site (Basin H-3) discharges into Austin Bluffs Parkway as sheet flow. Runoff reaching Austin Bluffs Parkway from Basin H-3 continues southerly within Austin Bluffs as street flow eventually reaching the intersection of Templeton Gap and Austin Bluffs Parkway. Existing sump inlets (1 - 6' and 2 -15') along the west side of Austin Bluffs Parkway currently collect these historic flows. The runoff collected at these inlets are conveyed easterly via an existing 36" pipe and an existing 54" pipe located within Templeton Gap Road.

Basin H-4 is a small basin located toward the southwest corner of the site that discharges runoff as sheet flow onto the property south of Sierra Ridge.

PROPOSED DEVELOPMENT

Sierra Ridge will consist of approximately 230 residential lots on 71.65 acres. Approximately 10 of the 71.65 acres will be open space, including a 2.21 acre recreation center and a 3.32 acre park located toward the northeast portion of the site. In addition, approximately 17.34 acres of streets will be constructed within the development.

DEVELOPED DRAINAGE PATTERNS

Upon development of the site, a ridge will be created from the west property line to Austin Bluffs Parkway separating the site into the northern one-third referred herein as the Northern Drainage Basin and the southern two-thirds called the Southern Drainage Basin. The area north of this ridge will flow basically in a northerly direction as street and overland flow. The area to the south will drain southeasterly toward Austin Bluffs Parkway. A more detailed sub-basin analysis follows.

South Drainage Basin

Basins D-1, D-6 and D-23 all slope easterly, with the runoff entering directly into Austin Bluffs Parkway, north of Templeton Gap Road, as sheet flow. This runoff will combine with the runoff generated from the western portion of Austin Bluffs Parkway. The total developed flow within Austin Bluffs north of Incline Drive, including the runoff generated from the west portion of Austin Bluffs Parkway is 26.2 cubic feet per second (cfs) during the 10 year storm and 44.6 cfs during the 100 year storm. This combined runoff continues southerly within Austin Bluffs Parkway as street flow.

This amount of runoff results in a water spread of approximately 20 feet from the outside curb face during the 10 year storm and 24.7 feet during the 100 year storm. At the narrowest point. Austin Bluffs Parkway has a total width of 36 feet from outside curb to the median curb. Thus, providing a 16 feet "dry" driving lane during the 10 year storm.

Basin D-13 also drains into Austin Bluffs Parkway. The combined flows from Austin Bluffs Parkway south of Templeton Gap Road and Basin D-13 amount to 20.8 cfs during the 10 year storm and 35.3 cfs during the 100 year storm. This portion of Austin Bluffs Parkway slopes to the north toward the Austin Bluffs Parkway - Templeton Gap Road intersection. The water spread within Austin Bluffs Parkway at a slope of 0.54% south of Templeton Gap is 26.7 feet during the 10 year storm, providing a 9.3 feet "dry" driving lane. During the 100 year storm, this spread increases to 33.2 feet.

Eventually, all the flows entering Austin Bluffs collect at the intersection of Templeton Gap and Austin Bluffs Parkway (See Drainage Facilities Section below).

Basin D-2 consists of the Drifter Street cul-de-sac. All the runoff generated from this basin enters Drifter Street prior to reaching the intersection of Drifter Street and Seton Drive. The flows at this point are 4.8 cfs and 8.4 cfs during the 10 and 100 year storms, respectively. This is less than the allowable street capacities (see Appendix for street capacity calculations).

Basin D-3 is located just south of Basin D-2. The flow from this basin collects within Seton Drive and flows southeasterly as street flow. The 10 year and 100 year frequency storm runoff quantities generated from this basin are 9.5 and 15.3 cfs, respectively. At a street grade of 2.0%, Seton Drive has the capacity to carry these flows.

Basin D-7 generates 3.4 cfs and 5.9 cfs during the 10 and 100 year storms. The Seton Drive cul-de-sac has the capacity to carry this flow at a grade of 1.0%.

Basin D-4 slopes to the east eventually discharging flows into Drifter Street. Runoff from this basin combines with the runoff generated from Basins D-2, D-3 and D-7 at Design Point #1. The total routed flows at Design Point #1 are 18.0 cfs during the 10 year storm and 31.3 cfs during the 100 year storm. Drifter Street, at a street slope of 1%, has the capacity to carry these flows.

Basin D-5 consists of on-site and off-site residential lots sloping toward Bootstrap Drive. The flows generated from this basin collect within Bootstrap and continue southeasterly as street flow. The flows generated from this basin are 13.1 cfs and 23.5 cfs for the 10 and 100 year storms, respectively. At a slope of nearly 5%, these flows can be conveyed within Bootstrap Drive.

Runoff generated from Basin D-8 combines with flows from Design Point # 1, Basin D-5 and Basin D-8 at Design Point #2. At this point, Bootstrap has a total street flow of 44.7 cfs during the 10 year storm and 78.2 cfs during the 100 year storm. At a slope of 3.5%, Bootstrap has a 10 year capacity of 33.2 cfs which is not adequate to convey the 10 year flows. Therefore, inlets will be placed at the Bootstrap Drive and Drifter Street intersection to reduce the street flows. Two additional inlets will be installed at the downstream side of Basin D-8 to keep the street flows within Bootstrap Drive's 10 year capacity.

A portion of the proposed recreation center, the equivalent of 11 on-site lots and approximately 500 feet of Drifter Street make up Basin D-9. Again, the street is the collection point for the runoff generated from this basin. The flows of 11.3 cfs and 19.9 cfs reaching Drifter Street can be adequately conveyed within the street. However, due to aforementioned street capacity limitations within Bootstrap Drive, an inlet will be installed south of Voyager Street on Drifter Street. The collected flow from the 3 proposed inlets at this intersection will be piped from this intersection to the intersection of Austin Bluffs Parkway and Sierra Drive.

Altitude Drive is the collection point for runoff from Basin D-11. As Altitude Drive approaches Bootstrap Drive, the street is carrying 8.9 cfs and 16 cfs during the 10 year and 100 year storms. Altitude Drive, at a proposed grade of 3.6%, has the capacity to carry these flows. Basin D-10 is located downstream of Basin D-8. To keep street flows below the 10 year street capacities, 4 additional inlets will be installed along Bootstrap Drive within Basin D-10.

Basin D-12 is a long narrow basin located along Buckaroo Drive. At the downstream end of this basin, flows of 4.2 cfs and 7.5 cfs (10 year/100 year) are collected within Buckaroo Drive. These flows can be conveyed within the street without exceeding capacity.

Just south of Basin D-12 is Basin D-17. This basin slopes easterly toward Altitude Drive. The 10 year and 100 year flows within Altitude Drive are 14.7 cfs and 25.9 cfs, respectively. Altitude Drive with a slope of 2% has a 10 year full street capacity of 25.2 cfs and a 100 year full street capacity of 38.4 cfs.

At Design Point 3, flows from Basin D-12, D-16 and D-17 converge within Buckaroo Drive. The total combined flows at this point are 19.6 cfs during the 10 year storm and 34.8 cfs during the 100 year storm. Buckaroo has a grade of 5.2% and a corresponding 10 and 100 year full street capacity of 40.4 cfs and 62.0 cfs.

Incline Drive collects all the runoff from Basin D-19. The 10 year and 100 year flows reaching Incline Drive from Basin D-19 are 4.2 cfs and 7.6 cfs, respectively. This stretch of Incline Drive also has the capacity to carry these developed flows.

The combined flows from Design Point #3, Basin D-19 and Basin D-15 converge at Design Point #4. The total routed flows at Design Point #4 are 29.4 cfs during the 10 year storm and 51.8 cfs during the 100 year storm. Again, this flow can be adequately conveyed within the streets. This flow will continue easterly as street flow to the intersection of Austin Bluffs Parkway and Incline Drive.

Basin D-21, located a the extreme southwest corner of the site, will discharge flows to the adjacent property as sheet flow.

Basin D-20 is located toward the southern portion of the development and consists of Bootstrap Drive and the adjacent lots. The runoff generated from this basin enters directly into Bootstrap as sheet flow and continues easterly within Bootstrap as street flow. The runoff quantities generated from this basin during the 10 year and 100 year storm are 10.7 cfs and 26.7 cfs, respectively. Bootstrap Drive's street capacity is adequate to carry these flows even at the eastern end where the street grades reduces to 1.3%.

Runoff generated from Basin D-18 flows to Buckaroo Drive. The flows reaching Buckaroo Drive from this basin during the 10 year and 100 year storms are 5.2 cfs and 9.3 cfs. Again, these flows can be conveyed within the street.

At Design Point 5, the flows from Basin D-18, Basin D-20 and Basin D-14 combine as street flow within Bootstrap Drive. The combined flows are 21.5 cfs during the 10 year storm and 37.9 cfs during the 100 year storm. At a slope of 1.3%, the 10 year flows just meet the 10 year street capacities. The 100 year capacity is also adequate to carry these flows; however, to limit the flows reaching Incline Drive just west of Austin Bluffs Parkway, 4 inlets will be installed along Bootstrap Drive Street just south of Incline Drive.

North Drainage Basin

The north side of the site drains in a northerly direction toward Rangewood Drive. Runoff generated from Basin D-25 flows to Bootstrap Drive and Seton Drive. The total flows from Basin D-25 reaching Seton Drive are 11.2 cfs during the 10 year storm and 20.1 cfs during the 100 year storm. Seton Drive has a 10 year street capacity of 33.2 cfs at this location.

Flows from Basins D-24 and D-26 also collect at this intersection. Basin D-24 generates 6.0 cfs and 10.7 cfs during the 10 year and 100 year storms, respectively. Basin D-26 generates 8.2 cfs during the 10 year storm and 14.5 cfs during the 100 year storm. At a slope of 1%, Seton Place has the capacity to carry these flows.

The total flows generated from Basins D-24, D-25 and D-26 converge at Design Point #7. The routed flows at this point are 24.6 cfs and 43.4 cfs. Seton Drive, at a slope of 2.5%, has a 10 year capacity of 28.0 cfs.

Flows generated from Basin D-27 combine with flows from Design Point #7 at Design Point #8 for a total flow of 39.2 cfs at the Saddle Rock Road and Seton Drive intersection during the 10 year storm and 68.7 cfs during the 100 year storm. At slopes of 6.0% to 8.0%, Seton has the capacity to carry these flows.

All these flows ultimately enter Saddle Rock Drive at the north end of Seton Drive.

Basin D-22 drains directly to Rangewood Drive. The total flows from Basin D-22 plus the runoff generated from the west side of Rangewood amount to a total flow of 13.1 during the 10 year storm and 25.4 cfs during the 100 year storm. The corresponding water spreads from the west curb line are 14.2 feet and 18.2 feet. On a 24 feet driving mat, this leaves a 9.8 feet "dry" driving lane.

OUTFALL POINTS AND PROPOSED OFF-SITE DRAINAGE FACILITIES

South Drainage Basin

As discussed above, 9 inlets will be installed from the intersection of Drifter Street and Bootstrap Drive to the intersection of Bootstrap Drive and Incline Drive. An additional 4

inlets will be placed along Bootstrap Drive south of Incline Drive. A pipe will be installed within Bootstrap to convey the flows from each of these proposed inlets to the intersection of Austin Bluffs Parkway and Incline Drive. At this point, the pipe will connect into the existing 36" diameter pipe crossing under Austin Bluffs Parkway.

The existing outfall system from this intersection, consists of a 36" diameter pipe running from the west side of Austin Bluffs Parkway to the east side of Austin Bluffs. The pipe size increases to a 54" diameter pipe just east of Austin Bluffs Parkway.

Under normal flow conditions, the 54" pipe has a capacity of 200 cfs (@ 0.9% slope). The 36" diameter pipe can convey approximately 170 cfs if the pipe operates under pressure. This amount of flow within the 36" pipe brings the hydraulic grade line to a point within 1 foot of the street elevation. (This assumes the hydraulic grade line is at the top of the 54" pipe just east of Austin Bluffs Parkway.)

The total amount of runoff generated from the Southern Drainage Basin during the 10 year reaches the Austin Bluffs Parkway and Incline Drive intersection either as street flow or as pipe flow. The pipe and street flows (non-routed) reaching Design Point # 6 during the 10 year storm are 57.1 and 6.4 cfs, respectively. The routed flows of 29.4 cfs at Design Point # 4 continue easterly within Incline Drive as street flow. At Design Point # 5, the routed flows of 21.5 cfs will be collected within pipes and conveyed to the existing outfall point as pipe flow. This amounts to a total pipe flow of 78.6 cfs and a total street flow within Incline Drive of 35.8 cfs (10 year) just west of Austin Bluffs Parkway.

Combining the 35.8 cfs street flow with the 26.2 cfs and 20.8 cfs from Austin Bluffs Parkway results in a total 10 year street flow of 82.8 cfs at the intersection of Austin Bluffs Parkway and Incline Drive. Combining pipe flow and street flow, there is a total 10 year runoff quantity of 161.4 cfs at this intersection.

Currently, there are 2 existing 15' D-11 inlets and 1 existing 6' D-10-R inlet at this intersection. The 6' inlet will collect approximately 10.6 cfs leaving 72.2 cfs reaching the 2 - 15' inlets. This will require a ponding depth at the gutter lip of 0.66 feet requiring a spread of 33 feet into Austin Bluffs Parkway during the 10 year storm. The installation of an additional 15' sump inlet at this intersection will reduce the ponding depth to 0.44 feet and a spread of 22 feet into Austin Bluffs. This would provide a "dry" lane of 14 feet on Austin Bluffs Parkway during the 10 year storm.

The total collected flows at this intersection, therefore, will be 161.4 cfs. This is less than the surcharged capacity of 170 cfs listed above for the 36" diameter pipe.

The on-site streets have the capacity to carry the 100 year flows to the intersection of Austin Bluffs and Incline Drive. Therefore, the on-site pipe, conveying runoff from the 13 proposed on-site inlets, will be designed to carry only the 10 year storm.

The total flows generated during the 100 year storm reaching the intersection of Incline Drive and Austin Bluffs Parkway including the runoff from the west side of Austin Bluffs Parkway are 245 cfs (routed). Limiting the capacity of the on-site pipe to approximately 90 cfs results in a total street flow at the intersection of Austin Bluffs and Incline Drive of 155 cfs.

The 6' inlet along Austin Bluffs Parkway will collect 16 cfs leaving 139 cfs. The maximum ponding depth at this is 0.75 feet before runoff overtops the centerline of Austin Bluffs and continues easterly within Templeton Gap Road as street flow. At this ponding depth, the 3 - 15' inlets (2 existing and 1 proposed) can collect a total of 42 cfs per inlet for a total possible collected flow of 216 cfs. However, the 36" diameter pipe has a capacity of 170 cfs; thus, limiting the amount of flow these inlets can collect.

Due to recent discussions regarding drainage criteria modifications, two alternative methods for conveying the 100 year runoff quantities from the Austin Bluffs Parkway-Templeton Gap Road intersection are currently being considered. The first alternative involves runoff overtopping the centerline of Austin Bluffs Parkway and continuing easterly as street within Templeton Gap Road.

Keeping in mind that the existing 36" diameter pipe only has a capacity of 170 cfs, the remaining 100 year flow (245 - 170 = 75 cfs) will overtop the centerline of Austin Bluffs and continue easterly within Templeton Gap. Templeton Gap at a slope of 1.25 % has a total 100 year street capacity of 218 cfs. Taking into account the flow of 34.5 cfs generated from the east side of Austin Bluffs reaching Templeton Gap Road, the total street flow within Templeton Gap will be 109.5 cfs.

These preliminary calculations indicate that the existing pipes within Templeton Gap Road may be adequate to carry the flows from the Sierra Ridge development. Allowing flows to cross Austin Bluffs Parkway during the 100 year storm is consistent with the past reports which have been prepared for this area. These calculations also indicate that during the 10 year storm, the flows generated from Sierra Ridge can be contained on the west side of Austin Bluffs Parkway, then conveyed to an appropriate outfall point utilizing existing facilities.

The entire offsite infrastructure for this development was constructed prior to the 1987 drainage criteria change. The above discussion indicates that the runoff from Sierra Ridge can be conveyed to an acceptable outfall point without adversely affecting surrounding property and allowing safe vehicular travel.

The second alternative involves the installation of a parallel system extending from the west side to the east side of Austin Bluffs Parkway. From the east side of Austin Bluffs Parkway, the runoff would be conveyed to the northeast across the proposed Antelope Meadows site. The conveyance of this runoff would be consistent with the proposed layout of Antelope Meadows.

North Drainage Basin

Like the south drainage basin, drainage facilities have been constructed near the outfall point of this development. These facilities were previously designed to convey the runoff from the site utilizing pipes, inlets and streets based on the pre-1987 criteria.

Preliminary calculations of the area contributing flows to Saddle Rock Drive from The Dakota Ridge Development indicate that approximately 56 cfs flows within Saddle Rock during the 10 year storm. Existing Saddle Rock Drive, south of Seton Drive, has the capacity to carry these flows (centerline will be inundated by 0.03' of water) during the 10 year storm.

As stated above, approximately 39.2 cfs is being discharged into Saddle Rock Drive from the Sierra Ridge Development during the 10 year storm. An analysis of the existing facilities within Saddle Rock indicate that additional inlets would be required at this intersection to meet the current City of Colorado Springs criteria.

Exhibit 3 depicts the existing and proposed inlets for this intersection. To reduce the flows reaching the Saddle Rock Drive and Seton Drive intersection, a new 10' inlet will be installed just south of the intersection. In addition, 2 inlets will be installed east of the intersection along Seton Drive. Including the 2 existing inlets south of Seton Drive, the flows reaching this intersection will be reduced to approximately 45 cfs just north of this intersection.

At this point, Saddle Rock Drive is 42.5' wide and has a grade of approximately 2%. This results in a 10 year street capacity of approximately 42.0 cfs.

An additional 10 cfs is collected at the existing inlet just north of the intersection reducing the 10 year street flow to 35.5. North of this inlet, Saddle Rock Drive is superelevated and slopes to the west. Saddle Rock Drive has a horizontal slope of 2.43% and a cross slope of 3.7% resulting in a 10 year street capacity of 33.0 cfs. The existing 8' inlet along the west side of Saddle Rock will collect an additional 16.6 cfs. The remaining 18.9 cfs will continue as street flow within Rangewood Drive. Based on normal flow calculations, all the existing pipes have the capacity to carry these collected flows except the portion of the 27" from inlet D to the manhole within Rangewood. This pipe has a normal capacity of 54 cfs while the amount of collected flow is 59.5. Therefore, this pipe will operate under pressure during the 10 year storm.

The combined 10 year street flows within Rangewood Drive west of the Saddle Rock Drive and Rangewood Drive intersection are 31.1 cfs (18.0 + 13.1). This results in a spread from face of curb of 21.7'. This equates to a water depth of 2.5" at the deepest point of the inside 12' lane.

During the 100 year storm, approximately 100 cfs approaches this intersection from the Dakota Ridge Development. The Sierra Ridge Development contributes approximately 68 cfs (see Exhibit 4). Due to the limited capacity of the existing pipes, it is anticipated that the inlets and pipes will only collect the equivalent to the 10 year storm. This will result in approximately 92 cfs entering Rangewood Drive from Saddle Rock Drive. This combined with the runoff from Rangewood east of the intersection will result in a total flow of 118 cfs in Rangewood just west of the subject intersection. The depth of flow at the face of curb will be 9" within Rangewood Drive.

The flows entering Rangewood Drive from the Dakota Ridge and Sierra Ridge Developments will flow northwesterly within the south side of Rangewood Drive. The flows will not overtop the centerline of Rangewood.

Two existing inlets (1 -8' and 1-10') located along the south side of Rangewood will collect a portion of the flows within Rangewood. The collected flows will be conveyed via an existing 36" pipe to an existing 72" pipe located on the low point within Rangewood Drive.

The resulting street flows during the 10 year and 100 year storms of 11.7 cfs and 56.3 cfs, respectively, will continue northerly within Rangewood as street flow to Vickers Drive which is the low point of Rangewood Drive. The drainage situation at the Vickers Drive and Rangewood Drive intersection is currently being analyzed as a part of the Vista Mesa Subdivision located southwest of this intersection. At this time, the additional proposed drainage facilities which will be required to collect the accumulated flow at this intersection will consists of one inlet at the Montarbor and Vickers Drive intersection, one inlet at the Vickers and Rangewood intersection and rip-rap along the north side of Rangewood.

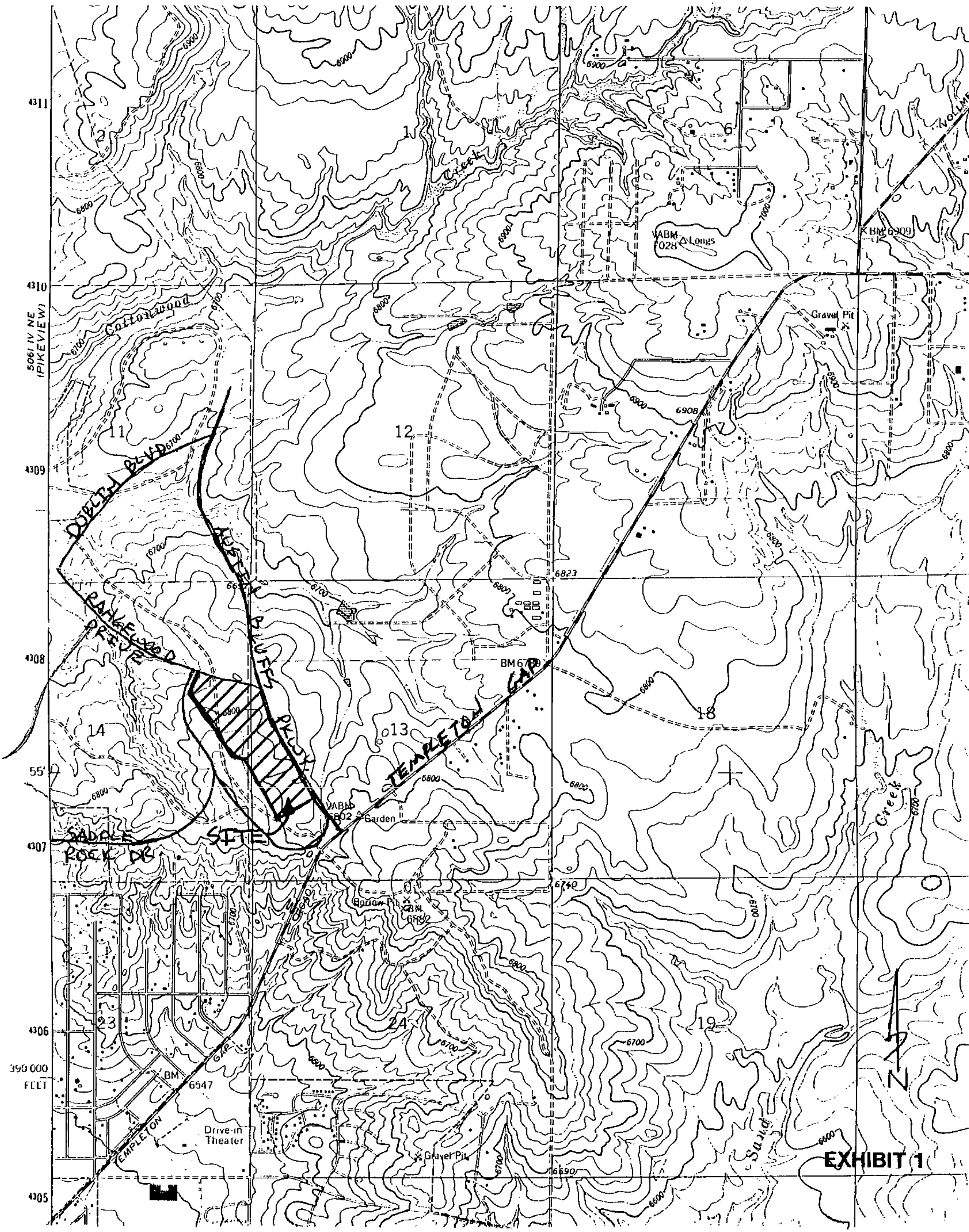
DUBLIN BLVD
RANGEWOOD DRIVE
AUSTIN BLUFFS PKWY
TEMPLETON GAP
SADDLE ROCK DR
SITE
N
Cottonwood
Creek
Gravel Pit
VABM 7028 Longs
BM 6909
VABM 6802 Garden
Drive-in Theater
Gravel Pit
Sand Creek
5061 IV NE (PIKEVIEW)
390 000 FEET
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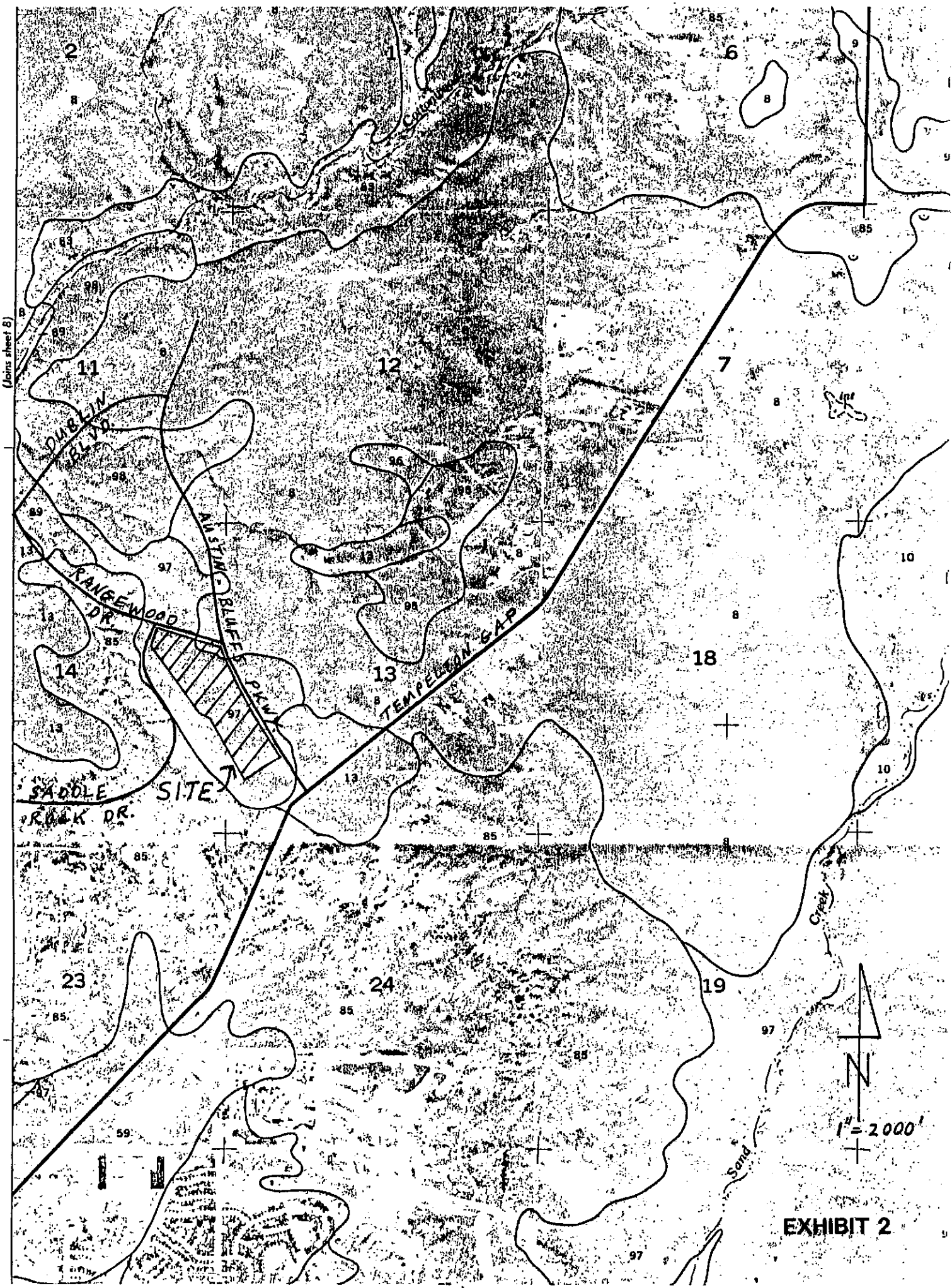
EXHIBIT 1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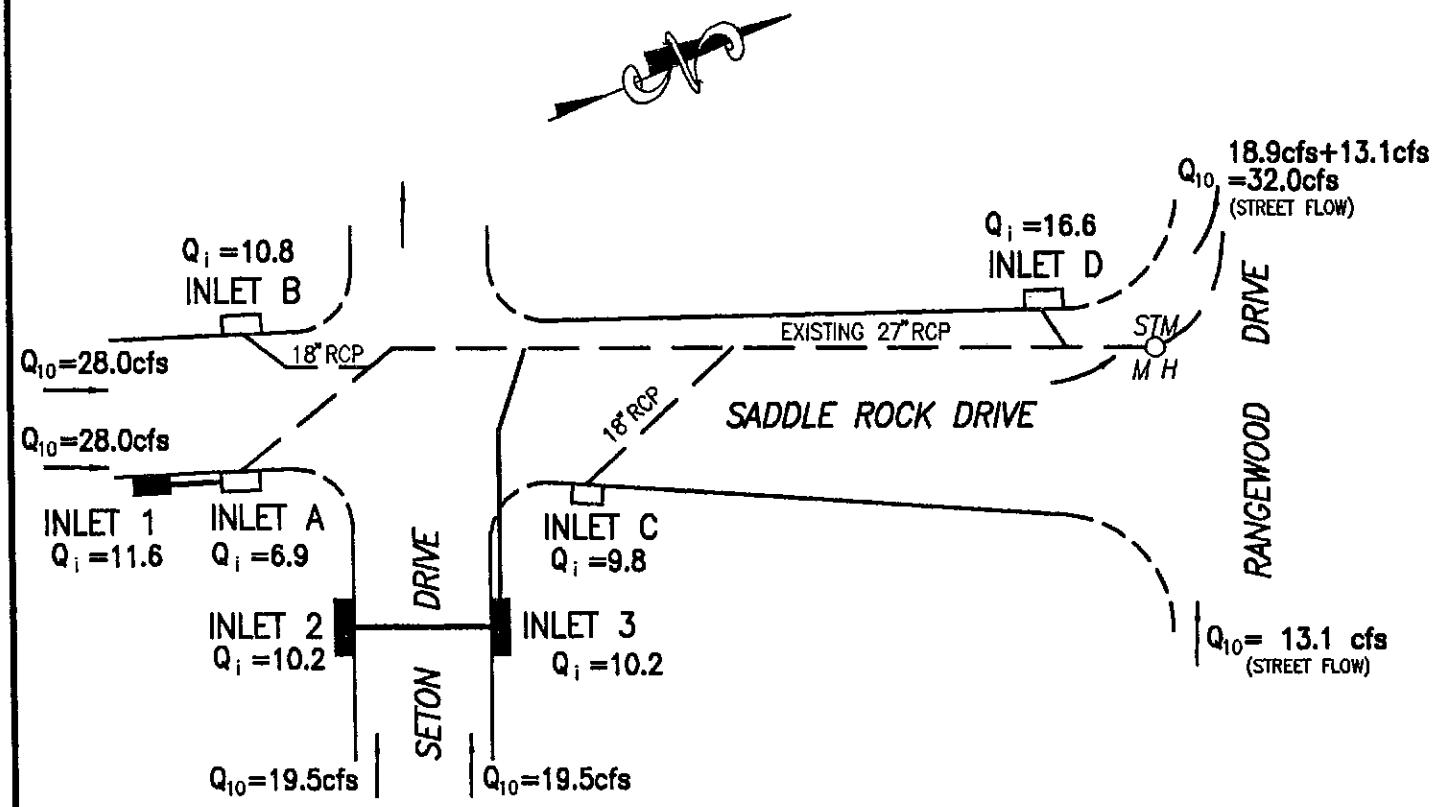
DUBLIN BLVD.
RANGEWOOD DR.
AUSTIN BLUFFS PKWY.
TEMPLETON GAP
SADDLE ROCK DR.
SITE
Sand Creek
N
1" = 2000'

EXHIBIT 2

10 YEAR FREQUENCY STORM



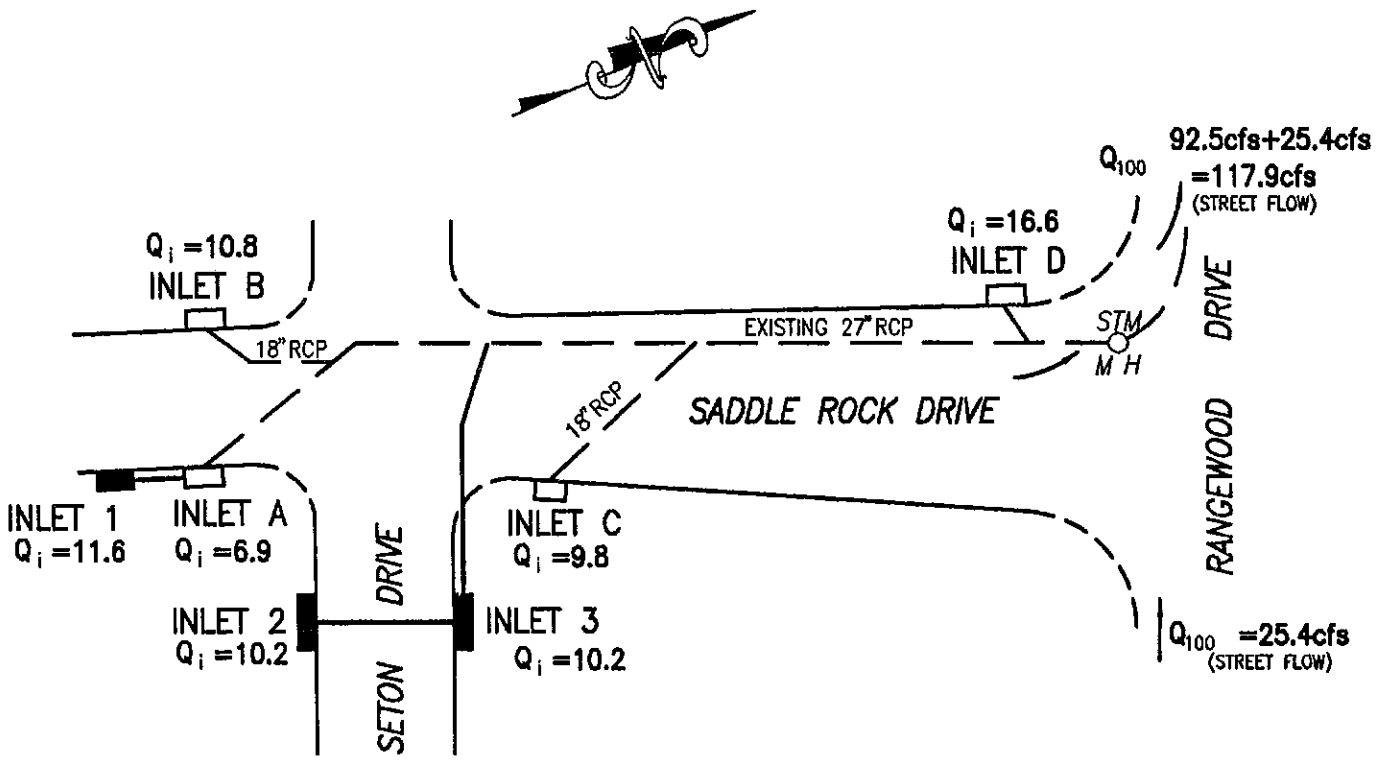
PROPOSED INLETS

EXISTING INLETS

SIERRA RIDGE
PRELIMINARY DRAINAGE REPORT
EXHIBIT 3

JOB NO. 94-007 FILE: 10 YR.DWG 6/2/94

100 YEAR FREQUENCY STORM



PROPOSED INLETS

EXISTING INLETS

SIERRA RIDGE
PRELIMINARY DRAINAGE REPORT
EXHIBIT 4

JOB NO. 94-007 FILE: 100YR.DWG 6/2/94

Hyd logy

Location: Sierra Ridge H-1
Area: 4.61 Ac.
Soil or Landuse: Truckton Series "B" soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
Pasture	0.25	0.35	87%
1/8 ac. Res	0.60	0.70	13%

Composite: C10: 0.30 C100: 0.40 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	850'	8%		22.0 min

Tc Total: 22.0

Intensity, I (inches/hr) from Fig 5-1

I10: 3.3 in/hr I100: 4.9 in/hr

Peak Flow: Q = CIA in cfs

Q10: 4.6 cfs Q100: 9.0 cfs

Hydrology

Location: Sierra Ridge H-2
Area: 12.76 Ac.
Soil or Landuse: Truckton & Blakeland Series "B & A"

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
Pasture	0.25	0.35	100%

Composite: C10: 0.25 C100: 0.35 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	900'	5%		12.8 min

Tc Total: 28 min

Intensity, I (inches/hr) from Fig 5-1

I10: 2.8 in/hr I100: 4.2 in/h

Peak Flow: Q = CIA in cfs

Q10: 8.9 cfs Q100: 18.8 cfs

Hyd logy

Location: Sierra Ridge H-3
Area: 65.07 Ac.
Soil or Landuse: Truckton & Blakeland series "B & A" soils

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
Pasture	0.25	0.35	100%

Composite: C10: 0.25 C100: 0.35 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	1000'	6%		27.8
Channel	300'	3%	4.6	1.1

Tc Total: 28.9 min

Intensity, I (inches/hr) from Fig 5-1

I10: 2.8 in/hr I100: 4.2 in/hr

Peak Flow: Q = CIA in cfs

Q10: 45.5 cfs Q100: 95.7 cfs

Hydrology

Location: Sierra Ridge H-4
Area: 0.77 Ac.
Soil or Landuse: Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
Pasture	0.25	0.35	100%

Composite: C10: 0.25 C100: 0.35 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	250'	12%		11.1 min

Tc Total: 11.1 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.5 in/hr I100: 6.8 in/h

Peak Flow: Q = CIA in cfs

Q10: 0.9 cfs Q100: 1.8 cfs

Hyd logy

Location: Sierra Ridge DP #1
Area: 7.33 Ac. (D-2, D-3, D-4, D-7)
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	130'	1%		10.7 min
Street	550'	1%	3.6	2.5 min

Tc Total: 13.2 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.1 in/hr I100: 6.1 in/hr

Peak Flow: Q = CIA in cfs

Q10: 18.0 cfs Q100: 31.3 cfs

Hydrology

Location: SIERRA RIDGE DP #2
Area: 18.62 Ac. (D-2, D-3, D-4, D-5, D-7, D-8, D-9)
Soil or Landuse: Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	130'	1%		10.7 min
Street	550'	1%	3.6 fps	2.5 min
Street	350'	3%	6 fps	1.0 min

Tc Total: 14.2 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.0 in/hr I100: 6.0 in/hr

Peak Flow: Q = CIA in cfs

Q10: 44.7 cfs Q100: 78.2 cfs

Hydrology

Location: Sierra Ridge DP #3
Area: 7.10 Ac. (D-12, D-16, D-17)
Soil or Landuse: Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	300'	7%		8.5 min
Street	300'	3%	6 fps	0.8 min
Street	250'	5%	8 fps	0.5 min

Tc Total: 9.8 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.6 in/hr I100: 7.0 in/hr

Peak Flow: Q = CIA in cfs

Q10: 19.6 cfs Q100: 34.8 cfs

Hydrology

Location: Sierra Ridge DP #4
Area: 10.88 Ac. (D-12, D-15, D-16, D-17, D-19)
Soil or Landuse: Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	300'	7%		8.5 min
Street	300'	3%	6 fps	0.8 min
Street	250'	5%	8 fps	0.5 min
Street	400'	4%	7 fps	1.0 min

Tc Total: 10.8 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.5 in/hr I100: 6.8 in/hr

Peak Flow: Q = CIA in cfs

Q10: 29.4 cfs Q100: 51.8 cfs

Hyc ology

Location: Sierra Ridge DP # 5
Area: 8.34 **Ac.** (D-14, D-18, D-20)
Soil or Landuse: Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res	0.60	0.70	

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	60'	1 %		7.2
Street	1100'	4 %	7 fps	2.6
Street	500'	1.3%	4 fps	2.1

Tc Total: 11.9 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.3 in/hr I100: 6.5 in/hr

Peak Flow: Q = CIA in cfs

Q10: 21.5 cfs Q100: 37.9 cfs

Hydrology

Location: Sierra Ridge DP # 6
Area: 23.95 **Ac.** (D-2, D-3, D-4, D-5, D-7, D-8, D-9, D
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	130'	1%		10.7 min
Street	550'	1%	3.6 fps	2.5 min
Street	350'	3 %	6 fps	1.0 min
Street	450'	3.5%	6.5 fps	1.2 min

Tc Total: 15.4 min

Intensity, I (inches/hr) from Fig 5-1

I10: 3.8 in/hr I100: 5.8 in/hr

Peak Flow: Q = CIA in cfs

Q10: 54.6 cfs Q100: 97.2 cfs

Hydrology

Location: Sierra Ridge DP #7
Area: 9.11 Ac. (D-24, D-25, D-26)
Soil or Landuse: Truckton & Blakeland Series "B & A" Soils

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 acre Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	200'	2%		10.5
Street	150'	1%	3.6 fps	0.7

Tc Total: 11.2

Intensity, I (inches/hr) from Fig 5-1

I10: 4.5 in/hr I100: 6.8 in/hr

Peak Flow: Q = CIA in cfs

Q10: 24.6 cfs Q100: 43.4 cfs

Hydrology

Location: Sierra Ridge DP #8 (DP #5 & 27)
Area: 16.35 Ac.
Soil or Landuse: A

Runoff Coefficient, C:

Area Zone	C10	C100	% Area

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	H	L(ft)	s(%)	v(fps)	Tc
DP #7					11.2
STREET	54	1200	4.5	7.0	2.8

Tc Total: 14.0

Intensity, I (inches/hr) from Fig 5-1

I10: 4.0 in/hr I100: 6.0 in/hr

Peak Flow: Q = CIA in cfs

Q10: 39.2 cfs Q100: 68.7 cfs

Hydrology

Location: Sierra Ridge D-1
Area: 0.55 Ac.
Soil or Landuse: 1/8 acre Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	135'	13		4.7 min

Tc Total: 5 min

Intensity, I (inches/hr) from Fig 5-1

I10: 6 in/hr I100: 9 in/hr

Peak Flow: Q = CIA in cfs

Q10: 2.0 cfs Q100: 3.5 cfs

Hydrology

Location: Sierra Ridge D-2
Area: 1.85 Ac.
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	130'	1%		10.7 min
street	280'	1%	3.6	1.3

Tc Total: 12 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.3 in/hr I100: 6.5 in/hr

Peak Flow: Q = CIA in cfs

Q10: 4.8 cfs Q100: 8.4 cfs

Hyc ·logy

Location: Sierra Ridge O-3
Area: 2.84 Ac.
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	170'	7		6.4 min
Street	300'	2.5 %	5.5 fps	0.9 min

Tc Total: 7.3 min

Intensity, I (inches/hr) from Fig 5-1

I10: 5.6 in/hr I100: 7.7 in/hr

Peak Flow: Q = CIA in cfs

Q10: 9.5 cfs Q100: 15.3 cfs

Hydrology

Location: Sierra Ridge O-4
Area: 1.45 Ac.
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	300'	3%		11.3
Street	200'	1%	3.6 fps	0.9

Tc Total: 12.2

Intensity, I (inches/hr) from Fig 5-1

I10: 4.3 in/hr I100: 6.5 in/hr

Peak Flow: Q = CIA in cfs

Q10: 3.7 cfs Q100: 6.6 cfs

Hydr. ogy

Location: Sierra Ridge D-5
Area: 4.86 Ac.
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	300'	5%		9.5 min
Street	400'	4.5%	7.5 fps	0.9 min

Tc Total: 10.4 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.5 in/hr I100: 6.9 in/hr

Peak Flow: Q = CIA in cfs

Q10: 13.1 cfs Q100: 23.5 cfs

Hydrology

Location: Sierra Ridge D-6
Area: 7.94 Ac.
Soil or Landuse: 1/8 acre Res Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	150'	8 %		5.8 min

Tc Total: 5.8 min

Intensity, I (inches/hr) from Fig 5-1

I10: 5.8 in/hr I100: 8.7 in/

Peak Flow: Q = CIA in cfs

Q10: 10.2 cfs Q100: 17.9 cfs

Hydrology

Location: Sierra Ridge D-7
Area: 1.19 Ac.
Soil or Landuse: 1/8 ac. Res Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v (fps)	Tc
Overland	100'	1%		9.3 min
Street	100'	1%	3.6	0.5

Tc Total: 9.8 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.7 in/hr I100: 7.1 in/hr

Peak Flow: Q = CIA in cfs

Q10: 3.4 cfs Q100: 5.9 cfs

Hydrology

Location: Sierra Ridge D-8
Area: 2.42 Ac.
Soil or Landuse: 1/8 ac Res Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v (fps)	Tc
Overland	200	3%		9.2
Street	250	3%	6 fps	0.7

Tc Total: 9.9

Intensity, I (inches/hr) from Fig 5-1

I10: 4.6 in/hr I100: 7.0 in/

Peak Flow: Q = CIA in cfs

Q10: 6.7 cfs Q100: 11.9 cfs

Hydrology

Location: Sierra Ridge D-9
Area: 4.01 Ac.
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v (fps)	Tc
Overland	300'	7%		8.5
Street	350'	3.6%	6.5 fps	0.9

Tc Total: 9.4 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.7 in/hr I100: 7.1 in/hr

Peak Flow: Q = CIA in cfs

Q10: 11.3 cfs Q100: 19.9 cfs

Hydrology

Location: Sierra Ridge D-10
Area: 2.24 Ac.
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v (fps)	Tc
Overland	250'	8 %		7.4

Tc Total: 7.4

Intensity, I (inches/hr) from Fig 5-1

I10: 5.1 in/hr I100: 7.7 in/hr

Peak Flow: Q = CIA in cfs

Q10: 6.9 cfs Q100: 12.1 cfs

Hydrology

Location: Sierra Ridge D-11
Area: 3.09 Ac.
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	180	7		6.6
Street	450'	2.8	6 fps	1.2

Tc Total: 7.8

Intensity, I (inches/hr) from Fig 5-1

I10: 4.8 in/hr I100: 7.4 in/hr

Peak Flow: Q = CIA in cfs

Q10: 8.9 cfs Q100: 16.0 cfs

Hydrology

Location: Sierra Ridge D-12
Area: 1.24 Ac.
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	80'	5%		4.9
Street	500'	5.2%	8 fps	1.0

Tc Total: 5.9

Intensity, I (inches/hr) from Fig 5-1

I10: 5.7 in/hr I100: 8.6 in/h

Peak Flow: Q = CIA in cfs

Q10: 4.2 cfs Q100: 7.5 cfs

Hydrology

Location: Sierra Ridge O-13
Area: 4.83 Ac.
Soil or Landuse: ½ ac Res Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
½ ac Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v (fps)	Tc
Overland	300	2.5		12.0

Tc Total: 12.0

Intensity, I (inches/hr) from Fig 5-1

I10: 4.3 in/hr I100: 6.5 in/hr

Peak Flow: Q = CIA in cfs

Q10: 12.5 cfs Q100: 22.0 cfs

Hydrology

Location: Sierra Ridge O-14
Area: 2.66 Ac.
Soil or Landuse: ½ ac. Res Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
½ ac. Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v (fps)	Tc
Overland	220'	3%		9.7
Street	220'	1.33%	4 fps	0.9

Tc Total: 10.6

Intensity, I (inches/hr) from Fig 5-1

I10: 4.5 in/hr I100: 6.9 in/h

Peak Flow: Q = CIA in cfs

Q10: 7.2 cfs Q100: 12.8 cfs

Hydrology

Location: Sierra Ridge D-15
Area: 2.32 Ac.
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	200'	7%		7.0
Street	300'	4%	7 fps	0.7

Tc Total: 7.7

Intensity, I (inches/hr) from Fig 5-1

I10: 5.0 in/hr I100: 7.5 in/hr

Peak Flow: Q = CIA in cfs

Q10: 7.0 cfs Q100: 12.2 cfs

Hydrology

Location: Sierra Ridge D-16
Area: 0.64 Ac.
Soil or Landuse: 1/8 ac. Res. Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	170'	8%		6.1

Tc Total: 6.1

Intensity, I (inches/hr) from Fig 5-1

I10: 5.6 in/hr I100: 8.5 in/h

Peak Flow: Q = CIA in cfs

Q10: 2.1 cfs Q100: 3.8 cfs

Hydrology

Location: Sierra Ridge D-17
Area: 5.22 Ac.
Soil or Landuse: Truckee Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	300'	7%		8.5
Street	300'	3%	6 fps	0.8

Tc Total: 9.3 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.7 in/hr I100: 7.1 in/hr

Peak Flow: Q = CIA in cfs

Q10: 14.7 cfs Q100: 25.9 cfs

Hydrology

Location: Sierra Ridge D-18
Area: 1.79 Ac.
Soil or Landuse: Truckee Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	160'	6%		6.5
Street	350	2%	5 fps	1.2

Tc Total: 7.7

Intensity, I (inches/hr) from Fig 5-1

I10: 4.8 in/hr I100: 7.4 in/h

Peak Flow: Q = CIA in cfs

Q10: 5.2 cfs Q100: 9.3 cfs

Hydrology

Location: Sierra Ridge D-19
Area: 1.46 Ac.
Soil or Landuse: Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	200'	6%		7.3
Street	250'	3%	6 fps	0.7

Tc Total: 8.0 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.8 in/hr I100: 7.4 in/hr

Peak Flow: Q = CIA in cfs

Q10: 4.2 cfs Q100: 7.6 cfs

Hydrology

Location: Sierra Ridge D-20
Area: 3.89 Ac.
Soil or Landuse: Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.....	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	60'	1%		7.2
Street	1100'	4%	7 fps	2.6

Tc Total: 9.8 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.6 in/hr I100: 7.0 in/h

Peak Flow: Q = CIA in cfs

Q10: 10.7 cfs Q100: 26.7 cfs

Hydrology

Location: Sierra Ridge D-21
Area: 0.90 Ac.
Soil or Landuse: Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	160'	10%		5.5

Tc Total: 5.5 min

Intensity, I (inches/hr) from Fig 5-1

I10: 5.8 in/hr I100: 8.7 in/hr

Peak Flow: Q = CIA in cfs

Q10: 3.1 cfs Q100: 5.5 cfs

Hydrology

Location: Sierra Ridge D-22
Area: 4.61 Ac.
Soil or Landuse: Truckton & Blakeland Series "B & A" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 acre Res.	0.60	0.70	40%
Park	0.30	0.55	60%

Composite: C10: 0.42 C100: 0.61 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	300'	3%		15.3 min

Tc Total: 15.3

Intensity, I (inches/hr) from Fig 5-1

I10: 3.8 in/hr I100: 5.8 in/h

Peak Flow: Q = CIA in cfs

Q10: 7.4 cfs Q100: 16.3 cfs

Hydrology

Location: Sierra Ridge D-23
Area: 0.78 Ac.
Soil or Landuse: Blakeland Series "A" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	100'	14%		3.9

Tc Total: 5.0 min

Intensity, I (inches/hr) from Fig 5-1

I10: 6 in/hr I100: 9 in/hr

Peak Flow: Q = CIA in cfs

Q10: 2.8 cfs Q100: 4.9 cfs

Hydrology

Location: Sierra Ridge D-24
Area: 2.24 Ac.
Soil or Landuse: Truckton & Blakeland Series "B&A" Soils

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	200'	2%		10.5
Street	150'	1%	3.6	0.7

Tc Total: 11.2 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.5 in/hr I100: 6.8 in/h

Peak Flow: Q = CIA in cfs

Q10: 6.0 cfs Q100: 10.7 cfs

Hydrology

Location: Sierra Ridge D-25
Area: 3.82 Ac.
Soil or Landuse: Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	180'	7%		6.6
Street	550'	3.5%	6.5 fps	1.4

Tc Total: 8.0 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.9 in/hr I100: 7.5 in/hr

Peak Flow: Q = CIA in cfs

Q10: 11.2 cfs Q100: 20.1 cfs

Hydrology

Location: Sierra Ridge D-26
Area: 3.05 Ac.
Soil or Landuse: Truckton Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	300'	5%		9.5
Street	350'	2%	5 fps	1.2

Tc Total: 10.7 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.5 in/hr I100: 6.8 in/h

Peak Flow: Q = CIA in cfs

Q10: 8.2 cfs Q100: 14.5 cfs

Hydr 'ogy

Location: Sierra Ridge D-27
Area: 7.24 Ac.
Soil or Landuse: Truckee Series "B" Soil

Runoff Coefficient, C:

Area Zone	C10	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C10: 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	300'	8%		8.2
Street	650'	7%	10 fps	1.1

Tc Total: 9.3 min

Intensity, I (inches/hr) from Fig 5-1

I10: 4.7 in/hr I100: 7.1 in/hr

Peak Flow: Q = CIA in cfs

Q10: 20.4 cfs Q100: 36.0 cfs

Hydrology

Location:
Area: Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C10	C100	% Area

Composite: C10: C100: 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

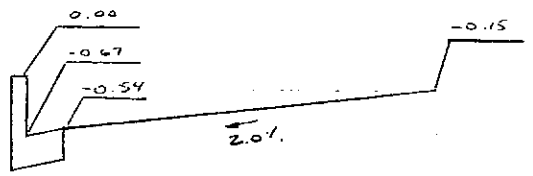
I10: in/hr I100: in/h

Peak Flow: Q = CIA in cfs

Q10: cfs Q100: cfs

SADDLEROCK STREET CAPACITY

10 YEAR



LONG SLOPE = 2%
(MIDDLE OF VERT CURVE)

$A = \frac{1}{2}(0.125)(2) + (0.38)(2) + \frac{1}{2}(0.39)(19.2) = 4.55$

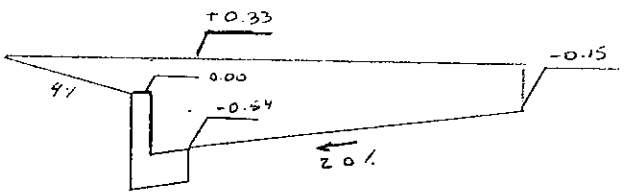
$P = 21.26 + 0.50 = 21.76$

$$Q = \frac{1.486}{0.016}(4.55)\left(\frac{4.55}{21.76}\right)^{0.67}(0.02)^{1/2}$$

$= 21.0$ /SIDE TO ℄

100 YEAR

12" DEPTH @ FACE CURB



$A = \frac{1}{2}(0.125)(2) + \frac{1}{2}(0.39)(19.2) + 2(0.375) + (0.5)(0.33) + (0.48)(19.2) + \frac{1}{2}(8.25)(0.33) =$

$A = 0.125 + 3.74 + 1.75 + 0.165 + 9.22 + 1.36$
$= 16.36$

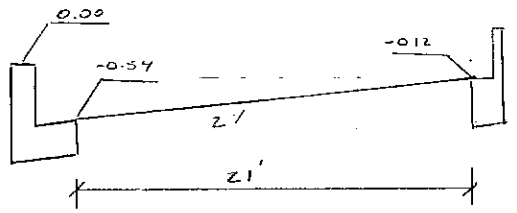
$P = 21.26 + 0.67 + 0.5 + 8.25$
$= 30.69$

$$Q = \frac{1.486}{0.016}(16.36)\left(\frac{16.36}{30.69}\right)^{0.67}(0.02)^{1/2}$$
$= 141$

RANGEWOOD CAPACITY

WEST OF SADDLEROCK

RANGEWOOD AT ITS NEAREST WIDTH = 24'



MIN SLOPE = 4.32%

$Q_{10} = 32$ cfs

TRY T = 21.7'

$$A = \tfrac{1}{2}(0.125)(2) + (19.7)(0.39)(\tfrac{1}{2}) + (2)(0.39) = 4.75$$

$$P = 22.2$$

$$Q = \frac{1.486}{0.016}(4.75)\left(\frac{4.75}{22.2}\right)^{0.67}(0.0432)^{1/2}$$

$$Q = 32.6$$

$Q_{100} = 118$

TRY DEPTH @ FC = 0.67

$$A = \tfrac{1}{2}(0.125)(2) + (0.54)(2) + \tfrac{1}{2}(0.42)(21) + (.12)(24)$$
$$= 8.50$$

$$P = 24.67$$

$$Q = \frac{1.486}{0.016}(8.50)\left(\frac{8.50}{24.67}\right)^{0.67}(0.0432)^{1/2}$$

$$= 80.36$$

TRY DEPTH = 0.72

ADD'L AREA = (0.08)(24) = 1.92

$$Q = \frac{1.486}{0.016}(10.42)\left(\frac{10.42}{24.83}\right)^{0.67}(0.0432)^{1/2}$$

$$= 113$$

EXISTING PIPE IN RANGEWOOD IS 36" @ 5.50%.

@ EXISTING INLETS

Q_{max} NORMAL FLOW CAPACITY = 168 cfs

∴ AVAILABLE CAPACITY OVER WHAT IS IN PIPE FROM SIERRA RIDGE #1 AND INLETS ALONG RANGEWOOD CAN COLLECT FLOWS FROM RANGEWOOD.

1-10' DIOR & 1-8' D-10-R

$Q_{10} = 32$

$T = 3.04 \left[\frac{32}{(0.055)^{1/2}}\right]^{3/8} = 19.2$

$F_W = 16.4 \left[(19.2 - 2)(0.02)\right]^{0.167} (0.055)^{1/2}$
$= 3.22$

$L_3 = (1.65)(19.2)(3.22) = 102$

$Q_c = \left(\frac{10}{102}\right)^{0.4} (32) = 12.6$

$Q_{FB} = 32 - 12.6 = 19.4$

$Q_{100} = 118$

$T = 3.04 \left[\frac{118}{(0.055)^{1/2}}\right]^{3/8}$
$= 31.3$

$F_W = 16.4 \left[(31.3 - 2)(0.02)\right]^{1/6} (0.055)^{1/2}$
$= 3.52$

$L_3 = (1.65)(31.3)(3.52) = 182$

$Q_c = \left(\frac{10}{182}\right)^{0.4} (118) = 37.00$

$Q_{FB} = 118 - 37 = 81$

2ND INLET

$Q_{10} = 19.4$

$T = 3.04 \left[\frac{19.4}{(0.055)^{1/2}}\right]^{0.375} = 15.90$

$F_W = 16.4 \left[(15.9 - 2)(0.02)\right]^{0.167} (0.055)^{1/2}$
$= 3.10$

$L_3 = (15.90)(3.10)(1.65) = 81.32$

$Q_c = 19.4 \left(\frac{8}{81.32}\right)^{0.4} = 7.7$

$Q_{FB} = 19.4 - 7.7 = 11.7$

2ND INLET

$Q_{100} = 81$

$T = 3.04 \left[\frac{81}{(0.055)^{1/2}}\right]^{0.375} = 27.21$

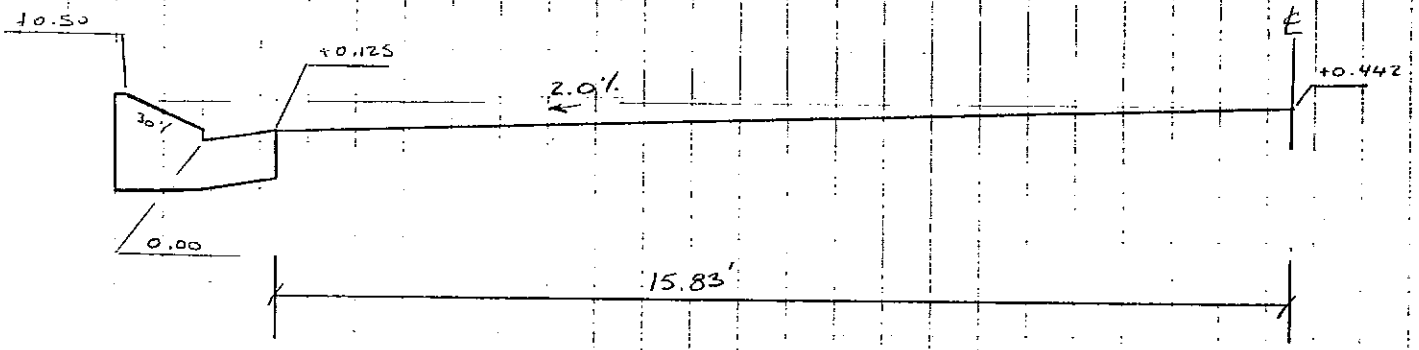
$F_W = 16.4 \left[(27.2 - 2)(0.02)\right]^{1/6} (0.055)^{1/2}$
$= 3.47$

$L_3 = (27.2)(3.47)(1.65) = 155.7$

$Q_c = 81 \left(\frac{8}{155.7}\right)^{0.4} = 24.7$

$Q_{FB} = 81 - 24.7 = 56.3$

STREET CAPACITY OF 34' WIDE STREET W/ RAMP CURB



10 YR CAPACITY TO ℄

$$A = \tfrac{1}{2}(0.317)(1.06) + \tfrac{1}{2}(0.125)\left(\tfrac{14}{12}\right) + \tfrac{14}{12}(.317) + \tfrac{1}{2}(15.83)(0.317)$$

$$= 0.1678 + 0.0729 + 0.3698 + 2.5091$$

$$= 3.12 \text{ ft}^2$$

$$P = \sqrt{(15.83)^2 + (0.317)^2} + \sqrt{(0.125)^2 + (1.1667)^2} + 0.125 + \sqrt{(.317)^2 + (1.0567)^2}$$

$$= 15.8332 + 1.1734 + 0.125 + 1.1032$$

$$= 18.2348$$

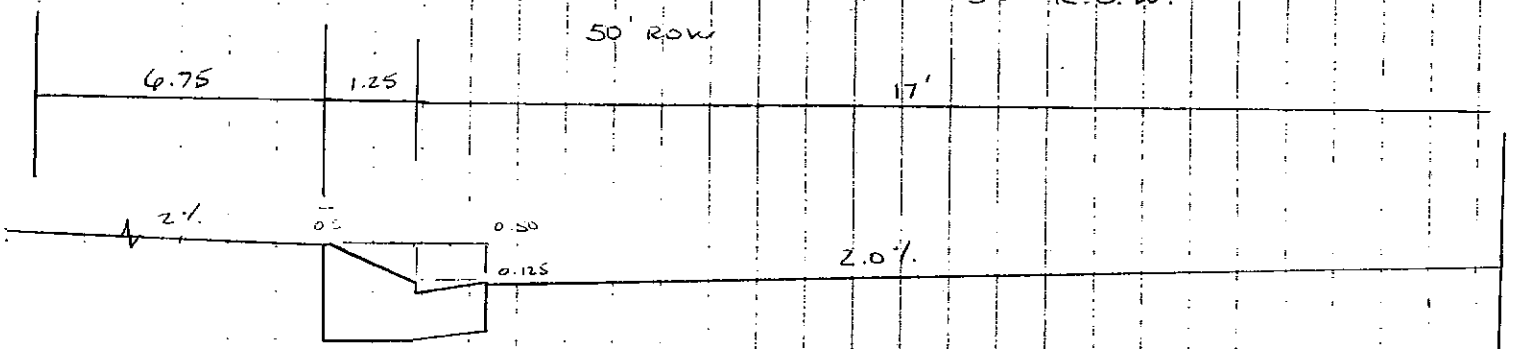
$$Q = \frac{1.486}{0.016}\left(\frac{3.12}{18.2348}\right)^{0.67} 3.12\, S^{\frac{1}{2}}$$

$$= 88.78\, S^{\frac{1}{2}}$$

S	Q_{10} (½ STREET)
1%	8.9
1.5%	10.9
2.0%	12.6
2.5%	14.0
3.0%	15.4
3.5%	16.6
4.0%	17.8
4.5%	18.8
5.0%	19.9
5.5%	20.2
6.0%	21.75

STREET CAPACITY OF 34' WIDE STREET W/ RAMP CURB

(KEEPING FLOW W/IN 50' R.O.W.)



2 SIDES $A = 2\left[\frac{1}{2}(0.125)\left(\frac{14}{12}\right) + (0.375)\left(\frac{14}{12}\right) + \left(\frac{1}{2}\right)(0.375)\left(\frac{15}{12}\right) + (.375)\left(\frac{1}{2}\right)(15.833) + (.135)\left(\frac{1}{2}\right)(6.75) + (.135)(18.25)\right]$

$A = 2\left[0.0729 + 0.4375 + 0.234 + 2.968 + 0.4556 + 2.46\right]$

$= 13.26$ ☆

$P = 2\left[\sqrt{(.135)^2 + (6.75)^2} + \sqrt{(.375)^2 + (1.25)^2} + .08 + .125 + \sqrt{(.125)^2 + \left(\frac{14}{12}\right)^2} + \sqrt{(0.375)^2 + (15.833)^2}\right]$

$= 2\left[6.7513 + 1.3050 + 0.08 + .125 + 1.1733 + 15.8344\right]$

$= 50.538$

$n = \left[2(6.7513)(0.03) + (37.035)(0.016)\right] / 50.538$

$n = 0.0197$

$Q = \frac{1.486}{0.0197}(13.26)\left(\frac{13.26}{50.538}\right)^{0.67}(S)^{\frac{1}{2}}$

$Q = 408.109\, S^{\frac{1}{2}}$

S	FULL STREET CAP (TO R.O.W.)
1.0 %	40.8
1.5 %	50.0
2.0 %	57.7
2.5 %	64.5
3.0 %	70.7
3.5 %	76.3
4.0 %	81.6
4.5 %	86.6
5.0 %	91.2

Street Capacity of 34' wide Street w/ Ramp Curb to 1' depth @ curb face w/ slope @ 2% behind curb

Full Street $A = 2\left[\frac{1}{2}(0.125)\left(\frac{14}{12}\right) + (.375)\left(\frac{14}{12}\right) + \left(\frac{1}{2}\right)(0.375)\left(\frac{15}{12}\right) + (0.375)\left(\frac{1}{2}\right)(15.83) + (0.5)(18.25) + \frac{1}{2}(25)(.50)\right]$

$A = 2\left[0.0729 + 0.4375 + 0.234 + 2.968 + 9.12 + 6.25\right]$

$A = 38.16$

$P = 2\left[\sqrt{(.5)^2 + (25)^2} + \sqrt{(.375)^2 + (1.25)^2} + .08 + 0.125 + \sqrt{.125^2 + \left(\frac{14}{12}\right)^2} + \sqrt{0.375^2 + (15.83)^2}\right]$

$= 2\left[25.005 + 1.305 + 0.08 + 0.125 + 1.1733 + 15.83\right]$

$= 87.03$

$n = \left[(25.005)(2)(.030) + (37.02)(0.016)\right] / 87.03$

$n = 0.024$

$Q = \frac{1.486}{0.024}\left(\frac{38.16}{87.03}\right)^{0.67}(38.16)(S)^{1/2}$

$= 1360\, S^{1/2}$

S	Q (Full Street)
1.0 %	136
1.5 %	166
2.0 %	192
2.5 %	215
3.0 %	235
3.5 %	254
4.0 %	272
4.5 %	288
5.0 %	304
5.2	310