HYDROLOGY L13/D1 TWO PLANS

L13-01

2 PLANS

LEVERTON - DENNEY ENGINEERS, Inc.

5643 PARADISE BLVD., N.W.
ALBUQUERQUE, NEW MEXICO 87114
(505) 898-2457

January 6, 1975

Mr. R. S. (Cy) Nanninga, Manager
Middle Rio Grande Conservancy District
P. O. Box 581
Albuquerque, New Mexico 87103

Re: Sunset Plaza Shopping Center

Dear Mr. Nanninga:

This letter is to request license to discharge storm water from the site of the subject project into the Ranchos de Atrisco Ditch.

Attached is the Drainage Plan and Report for Sunset Plaza Shopping Center. The Plan centers on pumping storm water into the Ranchos de Atrisco Ditch. The following are considerations which were made a part of the plan:

1. The pumps selected will deliver a maximum of 4.03 cfs to the lateral. The pumping rate was calculated to drain the 100 year - 6 hour storm from the site in a period of 6 hours.

2. A skimmer was designed as a part of the pump station to prevent pumping floating pollutants into the lateral.

3. A ditch level control is planned to stop both pumps to prevent overflowing the lateral.

4. Erosion protection is provided above and below the pump outlet.

5. Cross-sections and slopes of the lateral indicate that the maximum pumping of 4.03 cfs will raise the ditch level approximately 2 inches.

6. The site grading is planned to preclude extraneous storm water from entering the site.

Although the design was based on severe conditions, it must be recognized that the smaller storms will cause the most use of the system. The controls will be set so the pumps will start in sequence in accord with the level of water in the holding pond. This will minimize the use of both pumps at once and the discharge into the lateral.

We will appreciate your reviewing this material and issuing such license or permit as is appropriate.

Very truly yours,

Louis W. Gross

LWG:jk

Attachments

MIDDLE RIO GRANDE CONSERVANCY DISTRICT
POST OFFICE BOX 581
ALBUQUERQUE, NEW MEXICO 87103

January 30, 1975

Leverton - Denney Engineers, Inc.
8643 Paradise Blvd., N.W.
Albuquerque, New Mexico 87114

Attention: Louis W. Gross

Gentlemen:

Enclosed herewith are three copies of license to install and maintain a collection and pump system to discharge storm water into the Ranchos de Atrisco Ditch at a point near the southeast corner of Tract 262D, Map 41.

Also enclosed is a copy of a letter from Mr. R. E. Rowen, Acting Project Superintendent, Bureau of Reclamation. Please note the two conditions this license is subject to, as stated in Mr. Rowen's letter.

Please have the owner or responsible party for Sunset Plaza Shopping Center sign all three copies of the license, retain the original and return two copies to this office.

Sincerely yours,

R. S. Nanninga

Robert S. Nanninga
General Manager
MIDDLE RIO GRANDE CONSERVANCY DISTRICT

RSN/mr

Enclosures

RECEIVED
JAN 31 1975
LEVERTON - DENNEY ENGINEERS, INC.

LEVERTON - DENNEY ENGINEERS, Inc.

5643 PARADISE BLVD., N.W.
ALBUQUERQUE, NEW MEXICO 87114
(505) 898-2457

January 22, 1975

SUNSET PLAZA SHOPPING CENTER

DRAINAGE REPORT

1. PURPOSE: The purpose of this report is to present the results of an analysis of drainage requirements and a plan to provide for storm water runoff generated within the subject area.

2. GENERAL: This project is located on the southeast quadrant of the intersection of Bridge Blvd. and Sunset Road. The general area is typical Rio Grande Valley bottom with very little slope. The soil within the site is classified as silty or sandy clay (See Exhibit 1) and the water table on November 8, 1974, was at 8 feet. The percolation rates of the soil are shown on page 2, Exhibit 1. The interior drainage area is 11.915 acres. Approximately 90% of this area will be paved parking lots, streets, sidewalks and building sites.

3. DRAINAGE PLAN: The general objective of the drainage plan is to preclude any extraneous flood water from entering the site and to manage the flood flows generated within the site in a manner such that flooding of buildings will be precluded and disruption of shopping center activity will be minimized. To this end the following scheme has been developed. Storm water in the subject area will be collected within the parking lots and routed through a storm drain to a ponding basin. Roof drainage and area to the rear of buildings will be routed overland to the ponding basin. Two pumps, producing 2000 gpm, will drain the ponding basin into the Ranchos de Atrisco Ditch east of and adjacent to the tract. Although planters and the ponding area will allow some percolation, it was not considered in the design. Test holes 2 and 3 showed percolation rates of 17 min. and 11 min. from standard percolation tests. The soil is very fine and will soon be clogged by debris (oils, dust, etc.) from the roofs and parking areas.

The grading plans preclude any extraneous storm water flows from entering the site. However, flood water can leave the site without flooding buildings if a storm of greater than 100 year magnitude occurs or in the event of pump failure. The pumps and pond were sized to provide for the 100 year - 6 hour storm of 2.2" of precipitation. Skimmers are planned in the intake of the pump station to prevent the pumping of floating pollutants into the ditch. (See Exhibit III).

4. ANALYSIS AND COMPUTATIONS:

A. Pump Sizing:

(1) Total Area Draining to Pumps = 11.915 Ac.

(2) Due to high percentage of paving, sidewalks, and roofs a runoff factor of 0.90 is used.

(3) Concentration times are computed using a velocity of 2 feet per second.

(4) Computations:

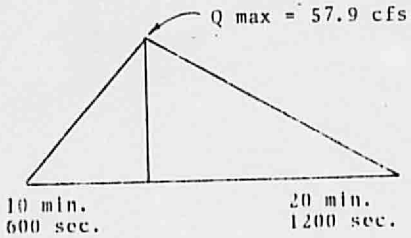
T_c = 1100/2 = 550 sec. = 9.17 min.
USE 10 min.

For 10 min. - 100 year (City of Albuquerque Master Plan of Drainage, 1963) I = 5.4

Using Rational Formula Q max = AIR

Q max = 11.915 X 5.4 X .9 = 57.9 cfs.

Volume from triangular hydrograph:



$V = \frac{1}{2} \times 57.9 \times 1800 = 52{,}110$ cf

10 min. - 100 yr. V = 52,110 cf

For 6 hr. - 100 yr.:

$V = 2.2/12 \times 11.915 \times 43{,}560 \times 0.9 = 85{,}638$ cf

To drain site in 6 hours:

$Q = 85{,}638/ (6 \times 3600) = 3.96$ cfs or 1779 gpm

B. Capacity of Ranchos de Atrisco Ditch: Cross-sections of the Ranchos de Atrisco Ditch were taken at the southeast corner of the tract. The average slope and smallest cross-sectional area was used for computations. The value of 0.027 for "n" in Mannings Formula was used.

Full Channel:

$A = 25.6\ ft^2$ $\qquad P = 14.2$

$R = 1.80$ $\qquad S = 0.0014$

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$$Q = \frac{1.486}{0.027} \times 25.6 \times 1.5 \times 0.037 = 78.2 \text{ cfs}$$

Channel - 1.0 foot Freeboard:

$A = 15.6$ $\qquad P = 10.9$

$R = 1.43$ $\qquad S = 0.0014$

$$Q = \frac{1.486}{0.027} \times 15.6 \times 1.3 \times 0.037 = 41.3 \text{ cfs}$$

Pumping 4.46 cfs into the ditch would increase the flow of 41.3 cfs by 11%. The percentage increase in flow does not portray a true account of the effect on the ditch. Computing the ditch capacity allowing 0.8 foot freeboard will show increased flow capability and the effect of the 4.46 cfs additional flow.

Channel - 0.8 foot Freeboard:

A = 17.46 P = 11.4

R = 1.53 S = 0.0014

$$Q = \frac{1.486}{0.027} \times 17.46 \times 1.33 \times 0.037 = \underline{\underline{47.3 \text{ cfs}}}$$

Raising of waterlevel of 0.2 foot increases ditch flow by 6.0 cfs.

From these computations it is seen that the ditch level will be raised less than 0.20 foot with the additional maximum flow of 4.46 cfs. Erosion protection at the pump outlets will be provided as shown on Exhibit III.

C. Drainage Volumes and Drain Sizing:

(1) Compartment No. 1:

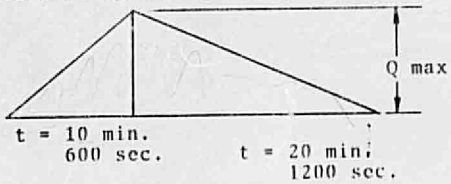
A = 305,772 sq. ft. = 7.02 Acres

100 year - 10 minute: I = 5.4

R = 0.9

Q max = 7.02 X 5.4 X 0.9 = 34.12 cfs

Volume using triangular hydrograph:



V = 1/2 X 1800 X Q max = 900 Q max.

V = 900 X 34.12 = 30,708 cf (100 yr. - 10 min.)

100 year - 6 hour:

Volume = 2.2/12 X 305,772 X 0.9 = 50,452 cu. ft.

12" A.C. Drain - Catch Basin #1 - #3

15" A.C. Drain - Catch Basin #3 - #5

Use Mannings Equation:

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

S = Slope for all drains = 0.002

$S^{1/2} = 0.045$

A = 1.227 R = 0.313

n = 0.012

$$Q = \frac{1.486}{0.012} \times 1.227 \times 0.461 \times 0.045 = \underline{\underline{3.152 \text{ cfs}}}$$

Time required to drain Compartment #1:

100 yr. - 10 min.

T = 30,708/3.152 = <u>2.7 hrs.</u>

100 yr. - 6 hrs.

T = 50,452/3.152 = <u>4.4 hrs.</u>

D. <u>Overland Flows</u>:

(1) Compartment No. 2:

A_2 = 91,290 sq. ft. = 2.096 Acres

100 yr. - 10 min.

Length = 810 Use V = 2 fps

T_c = 810/2 = 6.75 min. Use T_c = 10 min.

Q = AIR = 2.096 X 5.4 X .9 = 10.19 cfs

Volume = 900 X 10.19 = <u>9,171 cf</u>

100 yr. - 6 hr.

Volume = 2.2/12 X 91,290 X 0.9 = <u>16,736 cf</u>

(2) Compartment No. 3:

A_3 = 122,460 sq. ft. = 2.811 Acres

100 yr. - 10 min.

Q = 2.811 X 5.4 X .9 = 13.66 cfs

Volume = 900 X 13.66 = <u>12,294 cf</u>

100 year - 6 hour

Volume = 2.2/12 X 122,460 X 0.9 = 20,206 cf

Total Overland Flows to Pond:

100 yr. - 10 min.

V = 21,465 cf

100 yr. - 6 hr.

V = 36,942 cf

E. Storage Capacity:

Compartment 1	(to 44.5 Contour)	114,865 cf
Total in Parking Lot		114,865 cf when filled to 44.5 contour.
Pond		28,500 cf
Behind Building (to 44 Contour)		104,560 cf
	Total	133,060 cf
TOTAL STORAGE		247,925 cf

5. CONCLUSIONS:

A. The site constructed in accordance with the drainage plan (Exhibit II) will contain storm waters of the 100 yr. - 6 hr. storm from within the site.

B. Two 1,000 gallon per minute pumps are adequate to drain the 100 yr. - 6 hr. runoff from the site within 6 hours.

C. The water level in the Ranchos de Atrisco Ditch will be raised less than 0.2 feet by the addition of the 2,000 gallon per minute flow.

D. The skimmer trough (See Exhibit III) will essentially preclude floating pollutants entering the Ranchos de Atrisco Ditch.

E. A 6' high chain link fence around the Ponding Area (Exhibit II) is essential for safety purposes.

F. Finish floor and entrance driveway elevations, as shown on the Drainage Plan (Exhibit II), prevent building flooding in the event of greater than 100 year-6 hour storms and preclude extraneous flood water from entering the site.