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DRAINAGE REPORT FOR CONSTRUCTION OF RIO SALADO COMMUNITY COLLEGE - AREA EAST CENTER IN THE CITY OF MESA, ARIZONA

PRELIMINARY REPORT

JULY 1987

MARICOPA COUNTY COMMUNITY COLLEGE DISTRICT

JOHN CAROLLO ENGINEERS

A024.304

PRELIMINARY COPY

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Registered Professional Engineer (Civil)
CERTIFICATE NO. 20443
IVAN ANDJELKOVIC
Date Signed 7/8/87
ARIZONA, U.S.A.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 8449
GEORGE E. SHIRLEY
Date Signed 7/8/87
ARIZONA, U.S.A.

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MARICOPA COUNTY COMMUNITY COLLEGE DISTRICT

JOHN CAROLLO ENGINEERS
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FOUNTAIN VALLEY, CA • VISALIA, CA
TUCSON, AZ • SAN DIEGO, CA
SAN BERNARDINO, CA

JOHN CAROLLO ENGINEERS

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Associates
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Allen C. Todd, P.E.
Javier N. Arriaga, P.E.
Ivan L. Waggoner, P.E.
Mary C. Lee, P.E.
Jerry S. Russell, P.E.

July 10, 1987
3043A.10

Flood Control District of Maricopa County
3335 West Duranago Street
Phoenix, Arizona 85009

Attention: Ms. Kebba Buckley

Re: Rio Salado Community College - Area Center East

Gentlemen:

Submitted herewith is one set of preliminary Plans and preliminary Drainage Report for your use in review. The project is located east of Bush Highway and south of Hermosa Vista Drive and encompasses approximately 12 acres. The area for your review should be as discussed by yourself and Ivan Andjelkovic on Thursday, July 9, 1987.

This project is a fast tracked project. A final submittal will be made July 29, 1987 and the project will go out for bids in the first week of August. Your timely response to this matter would be appreciated.

If you have any questions, please do not hesitate to call.

FLOOD CONTROL DISTRICT
RECEIVED
JUL 15
CH ENG | P & PM
DEP | HYDRO
ADMIN | LMGT
KEB
REMARKS

Very truly yours,

JOHN CAROLLO ENGINEERS

Kristi H. Dennehy

Kristi H. Dennehy

KHD:jg

Enclosure

cc: Mr. Marty Quinn, Maricopa County Community College District

CONSTRUCTION OF
RIO SALADO COMMUNITY COLLEGE IN THE
CITY OF MESA, ARIZONA

PRELIMINARY DRAINAGE REPORT

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Registered Professional Engineer (Civil) CERTIFICATE NO. 20441 ANDJELKOVIC Date Signed 7/8/87 ARIZONA, U.S.A.

Registered Professional Engineer (Civil) CERTIFICATE NO. 8449 GEORGE E. SHIRLEY Date Signed 7/8/87 ARIZONA, U.S.A.

INTRODUCTION

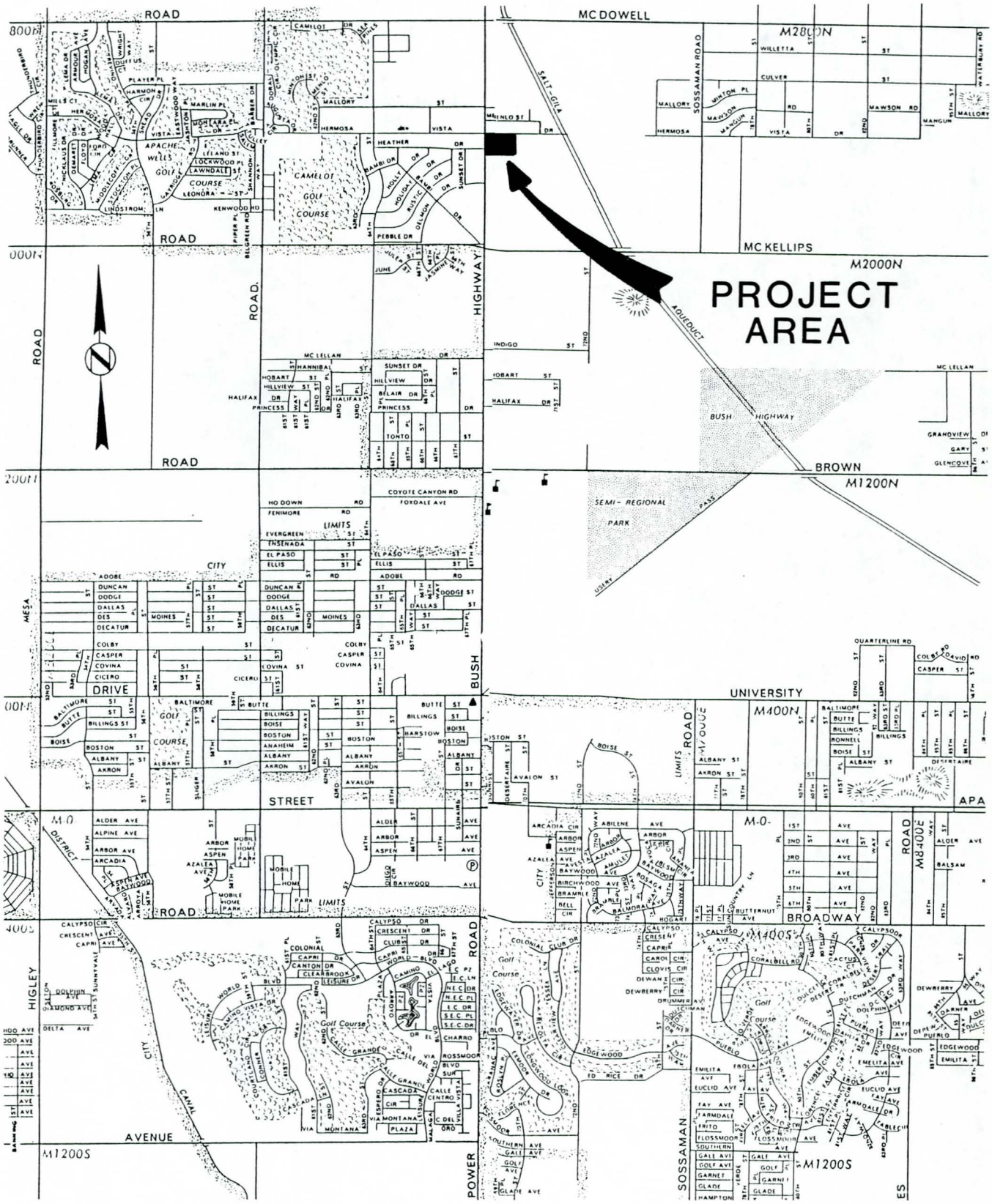
This Report has been prepared for the purpose of providing design criteria for stormwater drainage facilities related to construction of the Maricopa County Community College, Rio Salado - Area East Center in the northeast part of the City of Mesa, Arizona.

The project area is bounded by the Central Arizona Project (CAP) Salt-Gila Aqueduct on the northeast, Bush Highway on the west, Hermosa Vista Drive on the north and McKellips Road on the south. The area is more particularly described as a portion of the southwest quarter of Section 6, Township 1 north, Range 7 east at the USGS Buckhorn quadrangle map, as indicated on Figure 1 - Location Map.

Methodology applied is in compliance with the City of Mesa's "Procedure Manual - Storm Drainage Policy" dated June 1983.

EXISTING CONDITIONS

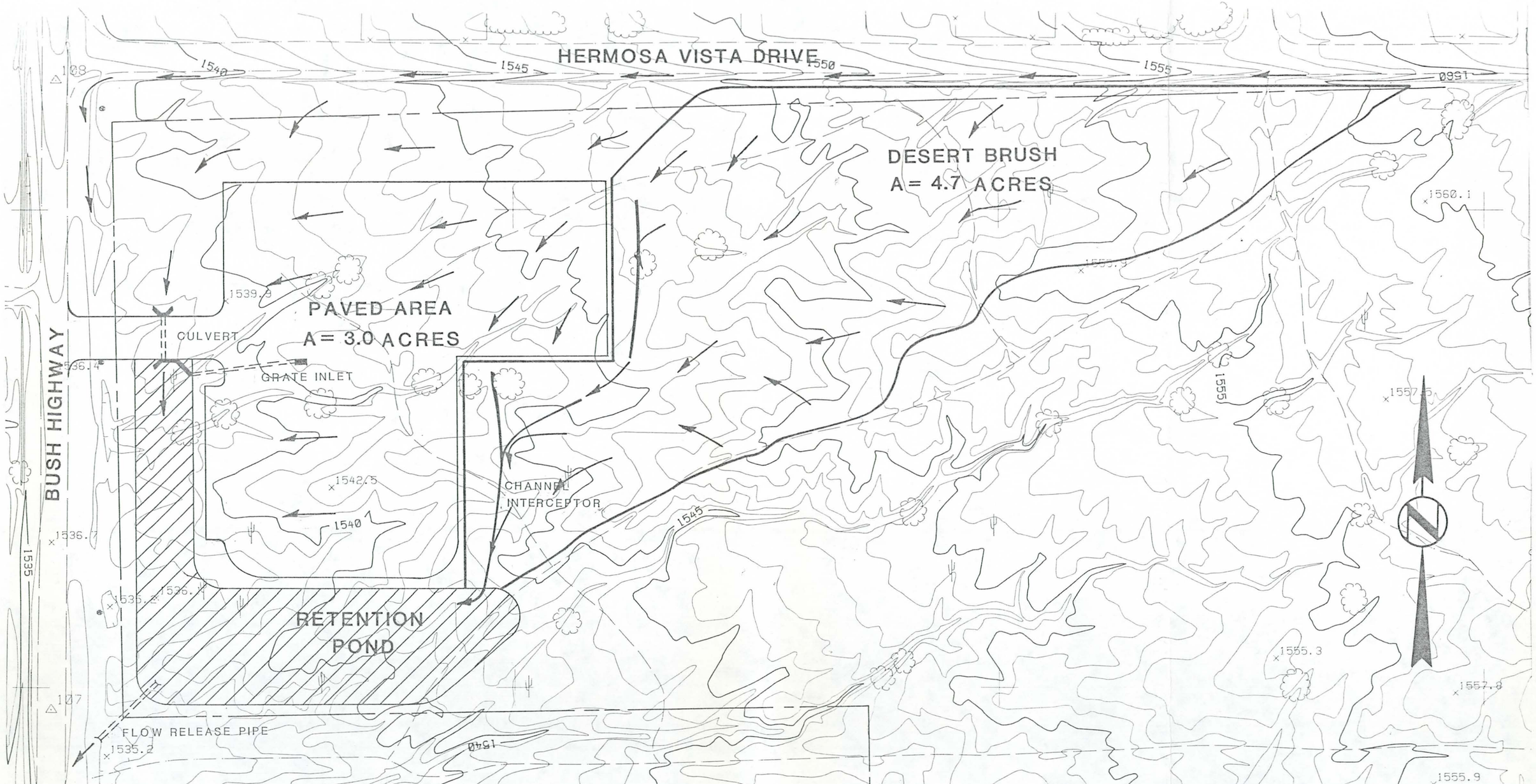
Project area is presently undeveloped. It has a uniform slope southwesterly oriented. The natural drainage pattern in the area generally consists of numerous small, low capacity washes which flow only during and immediately following heavy precipitation. As the capacity of these shallow washes is exceeded, overflow occurs and excess runoff occurs as sheet flow. There are several well-defined waterways that are intercepted by Bush Highway and man-made swales along both sides of that arterial. Figure 2 outlines the existing drainage pattern and delineates the catchment area that will be affected by proposed development. There is a man-made swale along the southern edge of Hermosa Vista Drive that intercepts all incoming flow from the north, thus



LOCATION MAP

RIO SALADO COMMUNITY COLLEGE AREA EAST CENTER

FIGURE 1



RIO SALADO COMMUNITY
COLLEGE - AREA EAST CENTER
MESA, ARIZONA
PROPOSED DRAINAGE FACILITIES

FIGURE 2

relieving the project area from any runoff that originates outside of this project's right-of-way limits.

PROPOSED DRAINAGE FACILITIES

According to the City of Mesa's Storm Drainage Policy, the project area to be developed must provide retention of stormwater generated by a 50-year design storm of 24-hour duration. Flow intercepting and conveying facilities needs to be designed upon 10-year design storm of critical-to-peak duration.

Project area of 3.0 acres in size, composed of a parking lot and classroom area, is going to be drained toward the western edge of that, nearly completely paved area. Stormwater from the parking area will be collected in a landscaped swale and directed southward into the retention pond.

CULVERT AT ENTRANCE DRIVEWAY.

Parking lot area that contributes runoff	0.70 acres
Time of concentration (L = 420', S = 1.5%)	7 minutes
Design storm duration	10 minutes
Design storm intensity	4.4 inch/hour
Peak runoff (Q = 0.85 x 0.70 x 4.4)	2.6 cfs
Design peak runoff	3.0 cfs
Culvert size	18" C.M.P. (with slotted inlet)

ON-SITE RUNOFF VOLUME.

$V_1 = C_1 \times 0.25 \times A_1 \quad (ft^3)$

$A_1 = 3 \text{ acres} = 130{,}680 \text{ ft}^2$

C_1 = 0.85 (Per City of Mesa's Procedure Manual)

$V_1 = 0.85 \times 0.25 \times 130{,}680 = 27{,}800\ ft^3$

<u>OFF-SITE RUNOFF VOLUME.</u>

$V_2 = C_1 \times 0.25 \times A_2$

A_2 = 4.7 acres = 204,732 ft^2

$C_2 = 0.70$

$V_2 = 0.70 \times 0.25 \times 204{,}732 = 35{,}800\ ft^3$

The volume of off-site runoff was checked by computing runoff hydrograph upon SCS procedure incorporated in HEC-1 computer program, based on the following input values:

Catchment area	0.0073 square miles
Design rainfall (50 year/24 hour storm)	3.2 inches
Rainfall distribution	Per Master Drainage Plan for Eastern Maricopa County
SCS curve number (CN)	85

Lag time

$$t_L = \frac{l^{0.8}\ (S + 1)^{0.7}}{1900\ \ Y^{0.5}}$$

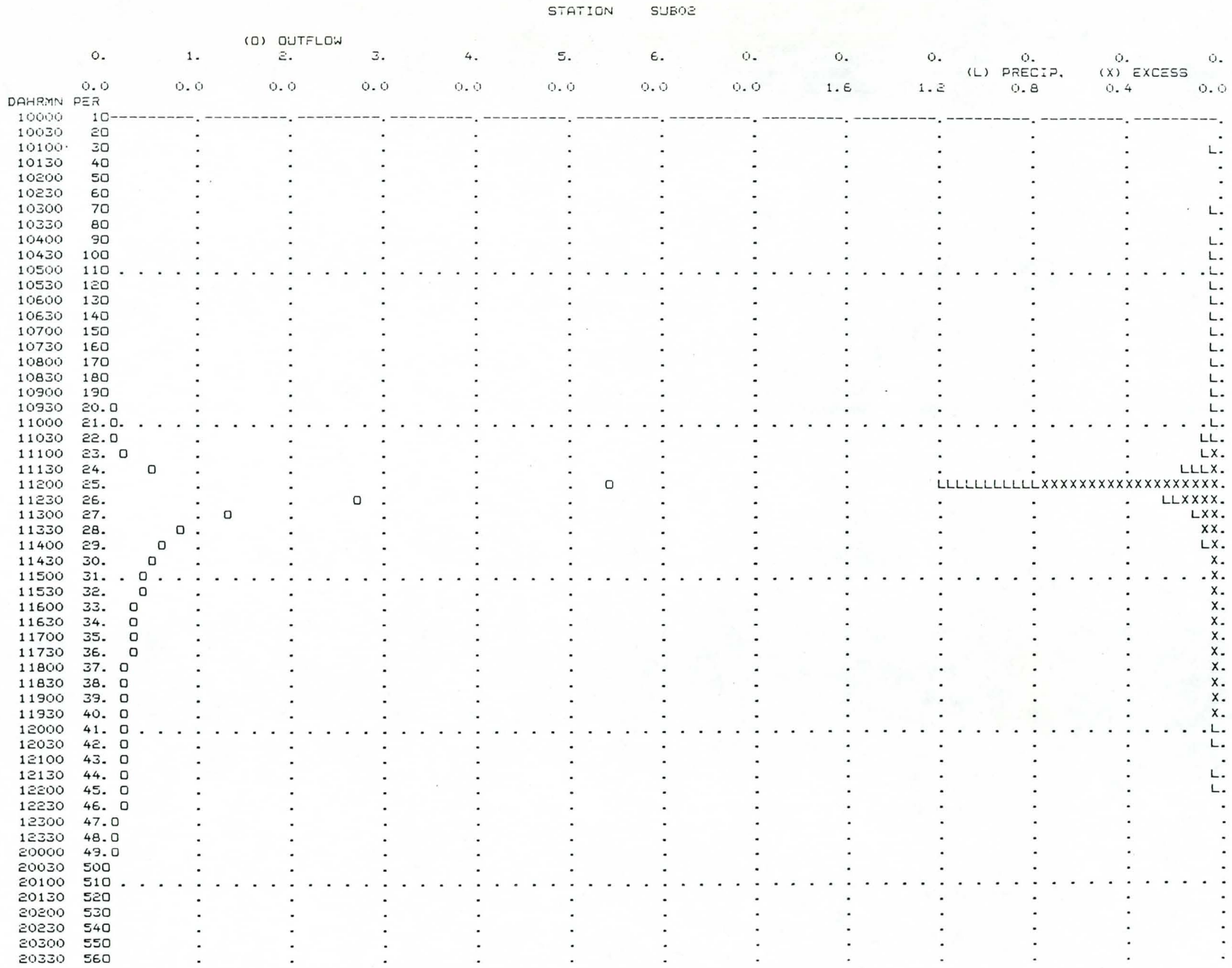
l = 1,100 feet

$$S = \frac{1{,}000}{CN} - 10 = 1.76$$

Y = 1.8%

t_L = 0.21 hours

Resulting hydrograph, presented on Figure 3, indicates that 37,000 ft^3 of stormwater may be expected to reach retention pond during design



OFFSITE DESIGN HYDROGRAPH
50 YR/24 HR STORM HEC-1

RIO SALADO COMMUNITY COLLEGE
AREA EAST CENTER MESA ARIZONA

FIGURE 3

storm, which amount is in close agreement with previously calculated magnitude V_2.

OFF-SITE RUNOFF INTERCEPTION. Off-site catchment represents an area which natural drainage pattern will be altered by developing Rio Salado Community College. In order to protect the developed area, all off-site runoff will be intercepted by a swale/channel placed along the eastern edge of the paved area and terminated at the retention pond.

Peak flow rate that can be obtained from that off-site catchment basin is estimated as follows:

$Q = C \times I \times A$ (cfs)

$C = 0.70$

$A = 4.7$ acres

From I-D-F curves from the City of Mesa's Procedure Manual it is obtained (assuming SCS methodology):

$$t_c = \frac{t_L}{0.6} = \frac{0.21 \times 60}{0.6} = 20 \text{ minutes}$$

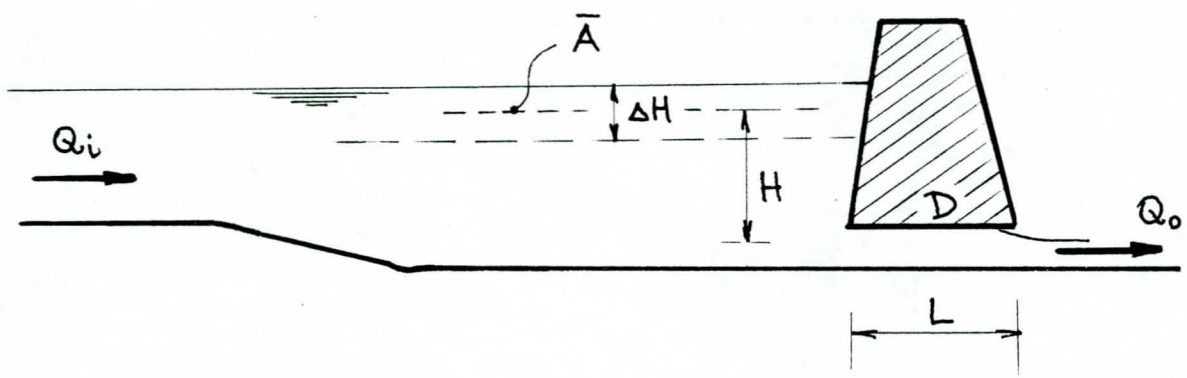
$I = 3.2$ inch/hour

$Q = 0.7 \times 4.7 \times 3.2 = 10.5$ cfs

A trapezoidal unlined channel sloped at 3 percent, having bottom width of 1 foot, water depth of 1.0 feet, and side slopes of 1:2, is proposed to handle the estimated peak flow.

RETENTION POND. Based on runoff volume calculations it follows that a storage space of approximately 64,000 ft^3 has to be provided in order to retain the stormwater intercepted during design storm. Proposed retention pond is located at the southern and southwestern part of the area to be developed. Its maximum water depth ranges between 1.5

feet and 2.0 feet, and its shape reflects the premise of allowing the adjacent natural drainage pattern to remain unaffected by the construction of Rio Salado Community College. The pond has an emergency spillway located near its southeast corner in order to localize the outflow during conditions that are more severe than the design ones. Regular draining of the pond will be performed through a 12-inch corrugated metal pipe placed at the bottom of the pond (elevation 1536.50) at its southwestern corner. This pipe will allow complete draining of the pond within 36 hours, as required by the City of Mesa's Storm Drainage Policy. The last conclusion is supported with the following analysis:



The equation that describes the process of pond draining has the following form:

$$(Q_o - Q_i)\ \Delta t = \bar{A}\ \ \Delta H$$

$$Q_o = C_d\ \ a\sqrt{2gH}$$

$$C_d = \frac{1}{\sqrt{1 + K_e + \frac{29\ n^2\ L}{R^{1.33}}}}$$

Hence, for complete drawdown:

$$t = \frac{V}{C_d\ \ a\sqrt{2gH} - Q_i} \times \frac{1}{3{,}600} \qquad \text{(hours)}$$

$V = 64{,}000\ ft^3$

$D = 12" = 1.0'$

$a = \frac{D^2\pi}{4} = 0.785\ ft^2$

$n = 0.024$

$L = 60$ feet

$R = \frac{D}{4} = 0.25$ feet

$K_e = 0.30$

$C_d = 0.36$

$H = 1.0$ feet (mean water depth at pipe inlet during period t)

$Q_i = 0.5$ cfs (mean inflow to the pond during period t)

Finally,

$$t = \frac{64{,}000}{0.36 \times 0.785\ \sqrt{2 \times 32.2 \times 1.0} - 0.5} \times \frac{1}{3{,}600}$$

$t = 10.0$ hours

Proposed 12-inch CMP has somewhat higher capacity than required for emptying the pond in 36 hours. However, bearing in mind that future extension of the pond in eastward direction will increase volume of stormwater to be released, such size of pipe seems to be adequate.

GRATE INLET AT THE PARKING LOT.

Parking lot area that contributes runoff	0.30 acres
Time of concentration (L = 380' S = 1.5%)	6 minutes
Design storm duration	10 minutes
Design storm intensity	4.4 inch/hour
Peak runoff (Q = 0.85 x 0.3 x 4.4)	1.1 cfs

Type of inlet	MAG standard catch basin - Type "E"
Connector pipe	12" diameter C.M.P.

All proposed drainage facilities are outlined on Figure 2.

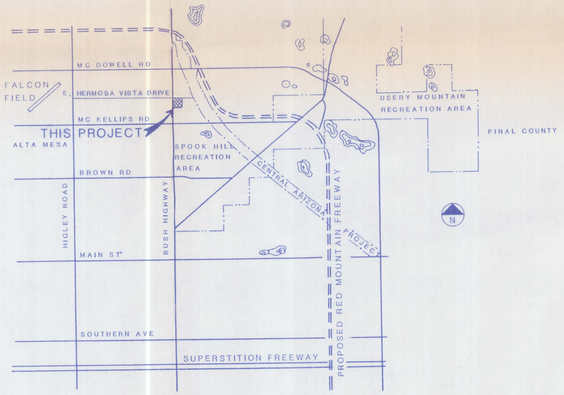
SITE DEVELOPMENT PLAN
FOR
RIO SALADO COMMUNITY COLLEGE
AREA EAST CENTER

MARICOPA COUNTY COMMUNITY COLLEGE
GOVERNING BOARD ACTING FOR AND IN
BEHALF OF THE STATE BOARD OF DIRECTORS
FOR COMMUNITY COLLEGES OF ARIZONA

APPROVED:

MARICOPA COUNTY HEALTH DEPARTMENT
DIVISION OF ENVIRONMENTAL SANITATION

BY:_____DATE:_____



VICINITY MAP

NO.	DESCRIPTION
1	COVER SHEET
2	SITE PLAN
3	PAVING, GRADING & DRAINAGE - GENERAL SITE
4	PAVING, GRADING & DRAINAGE - PATIO
5	SITE UTILITIES
6	PROFILES
7	LANDSCAPE - GENERAL SITE
8	LANDSCAPE - PATIO
9	MISCELLANEOUS DETAILS
10	ELECTRICAL DETAILS
11	FOUNDATION DETAILS
12	FOUNDATIONS

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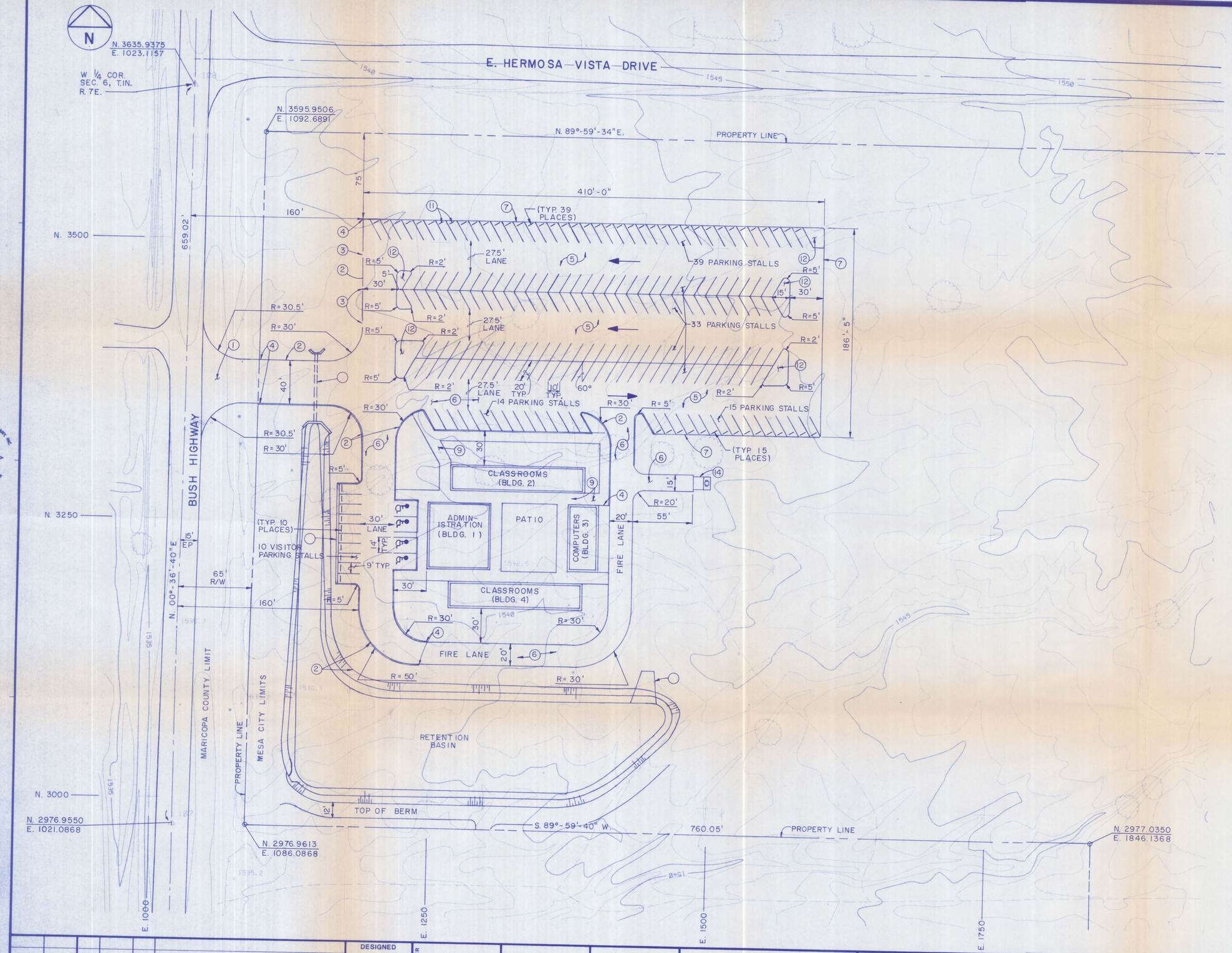
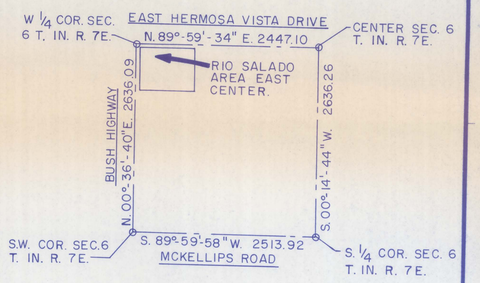
SCHEMATIC - NOT FOR CONSTRUCTION USE

JUL 13 1987



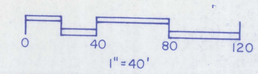
NOTES

1. Install paved turnout per MAG Std. Det. 205, Type "C"
2. Install single concrete curb per MAG Std. Det. 222, Type "A"
3. Install curb opening per detail, see Sheet 9
4. Terminate curb per MAG Std. Det. 222
5. Install 2" AC on 6" ABC
6. Install 2" AC on 6" ABC
7. Pavement termination per MAG Std. Det. 201, Type "B"
8. Install 4" thick gravel roadway
9. Install sidewalk per MAG Std. Det. 230
10. Install ramp per detail, see Sheet 9
11. Install precast safety curb per MAG Std. Det. 150, Type B3
12. Paint striping per Specifications
13. Install 2' high parapet wall per detail, see Sheet 9
14. Install trash bin receptacle per City of Mesa Std. Det. M62.2



SECTION TIE

N.T.S.



TB	REV.	DATE	BY	DESCRIPTION

CL Q&N
CBOIN

DESIGNED
DRAWN G.P.B.
CHECKED
DATE

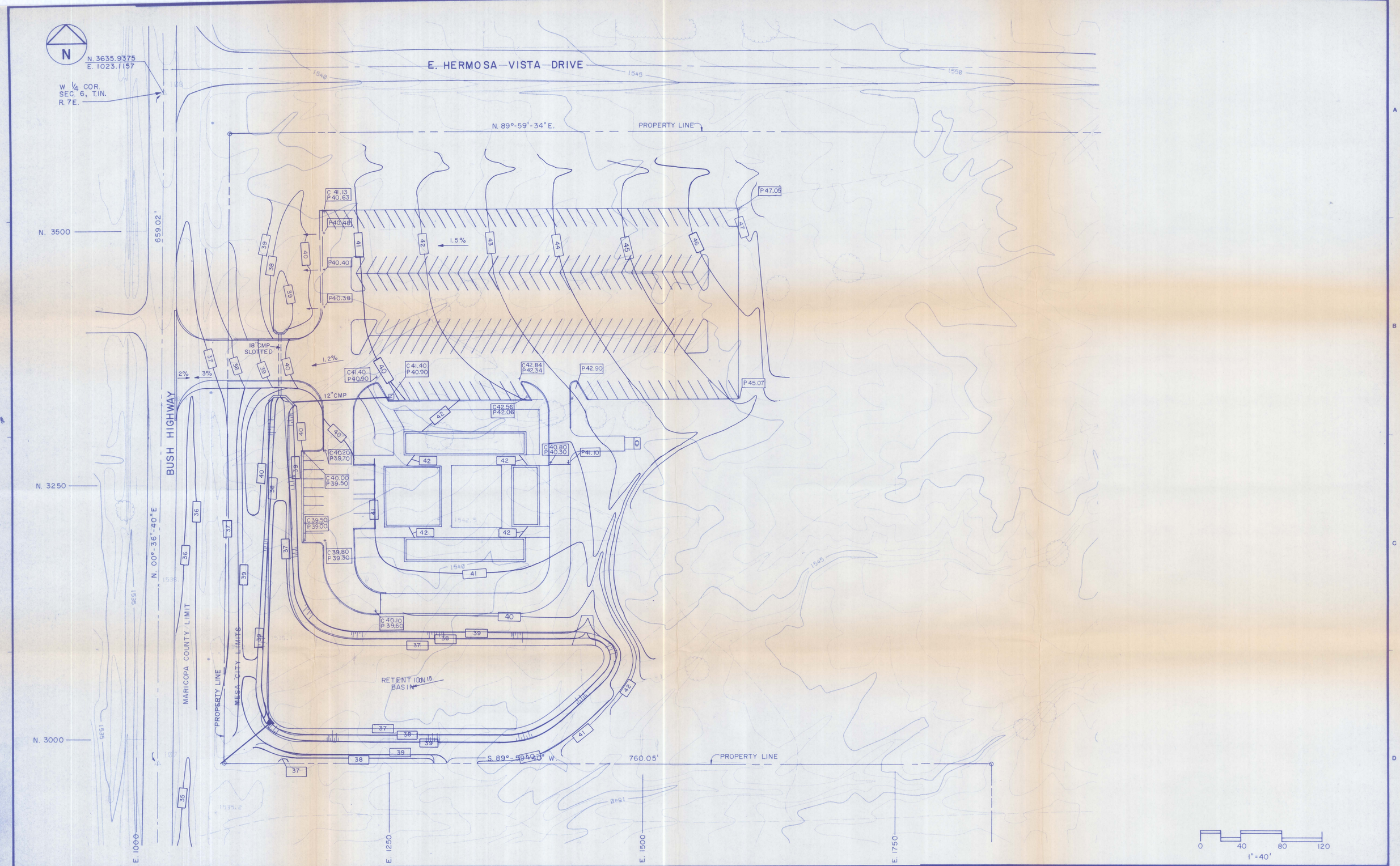
DISCIPLINE ENGINEER
PROJECT ENGINEER
PARTNER

JOHN CAROLLO ENGINEERS
PHOENIX, AZ • WALNUT CREEK, CA
FOUNTAIN VALLEY, CA • VISALIA, CA
TUCSON, AZ • SAN DIEGO, CA
SAN BERNARDINO, CA

RIO SALADO COMMUNITY COLLEGE - AREA EAST CENTER
MARICOPA COUNTY COMMUNITY COLLEGE DISTRICT
SITE PLAN

JUL 13 1987

JOB NO.
DRAWING NO.
SHEET NO. 2 OF



CL02N					
CB0IN					
	TB	REV.	DATE	BY	DESCRIPTION

DESIGNED
DRAWN
CHECKED
DATE

DISCIPLINE ENGINEER | PROJECT ENGINEER | PARTNER

JOHN CAROLLO ENGINEERS
PHOENIX, AZ • WALNUT CREEK, CA
FOUNTAIN VALLEY, CA • VISALIA, CA
TUCSON, AZ • SAN DIEGO, CA
SAN BERNARDINO, CA

RIO SALADO COMMUNITY COLLEGE AREA EAST CENTER

MARICOPA COUNTY COMMUNITY COLLEGE DISTRICT

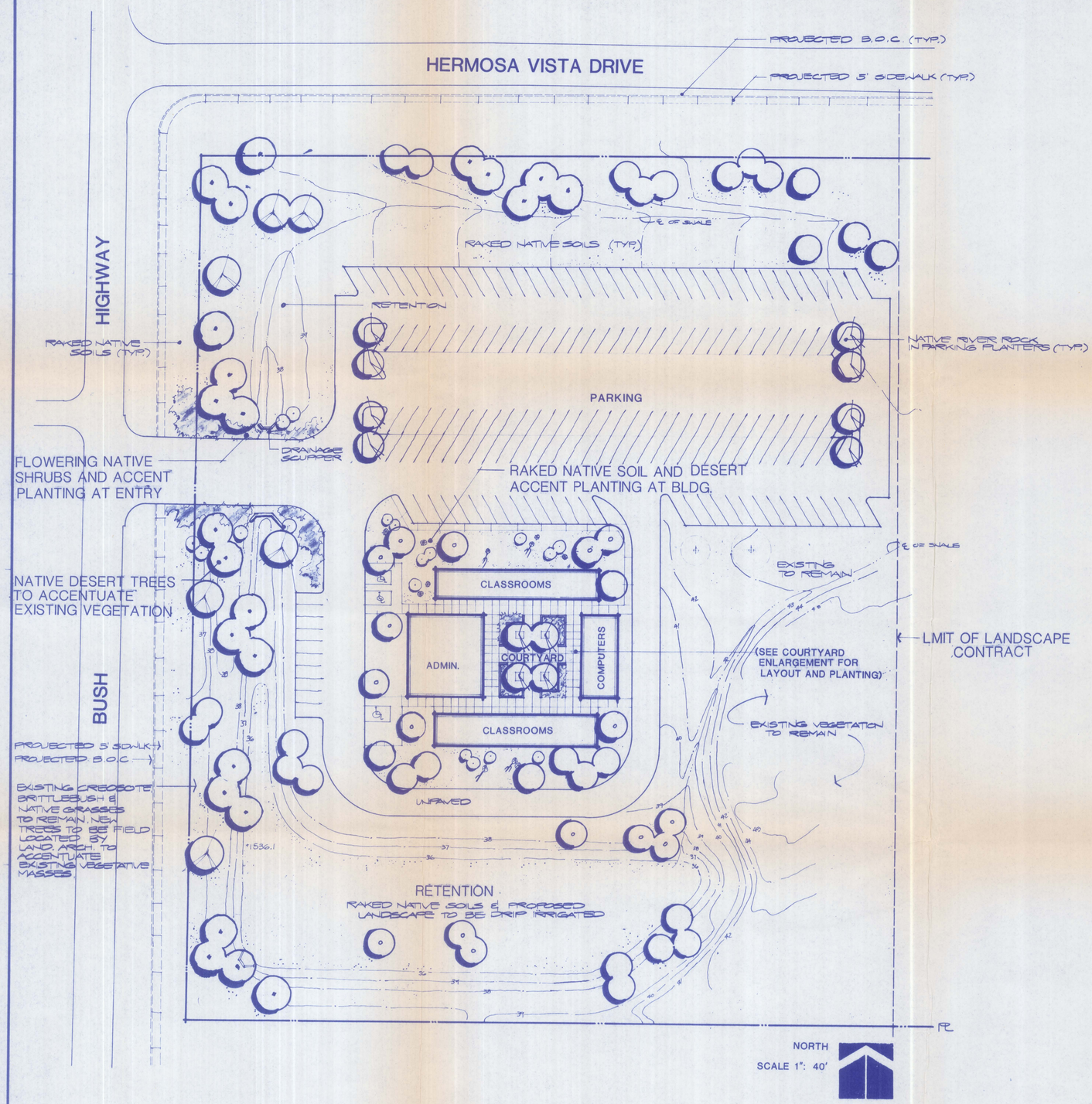
PAVING, GRADING, & DRAINAGE - GENERAL SITE

JOB NO.
DRAWING NO.
SHEET NO.
3 OF

AERIAL MAPPING COMPANY, INC. PHOENIX, ARIZONA

ABCDEFGHJKLMNPQRSUVWXYZ

JUL 13 1987



PLANT LEGEND

SYMBOL	DESCRIPTION
	TREES
	ARGENTINE MESQUITE
	BLUE PALO VERDE
	CHILEAN MESQUITE
	FOOTHILL PALO VERDE
	IRONWOOD
	SHRUBS
	OCOTILLO
	CACTUS VARIETIES: 5'-8' SAGUARO; 1'-3' BARREL CACTUS
	BRITTLEBUSH
	CASSIA (THREADLEAF)
	PURPLE LANTANA

GENERAL NOTES:

- ALL LANDSCAPE AREAS SHALL HAVE AN AUTOMATIC UNDERGROUND DRIP IRRIGATION SYSTEM. (NEW)
- GRADES INDICATED ARE SCHEMATIC ONLY NOT FOR CONSTRUCTION REFER TO CIVIL ENGINEERING DWGS. FOR FINAL GRADES.
- PLANT LOCATIONS & QUANTITIES ARE CONCEPTUAL, ACTUAL LOCATIONS TO BE DETERMINED IN FIELD BY L.A.
- ALL PLANT SPECIES TO BE IN CONFORMANCE W/- CITY OF MESA & MARICOPA COUNTY STANDARDS.
- ALL BLDGS, WALKS, DRIVES ETC. ARE SCHEMATIC ONLY. REFER TO ARCHITECTURAL & ENGINEERING DWGS FOR ACTUAL DIMENSIONS & LOCATIONS.

Ind - N	TB	REV.	DATE	BY	DESCRIPTION

DESIGNED BLR
DRAWN
CHECKED JB
DATE 7 JULY 1987
DISCIPLINE ENGINEER
PROJECT ENGINEER
PARTNER

JOHN CAROLLO ENGINEERS
PHOENIX, AZ • WALNUT CREEK, CA
FOUNTAIN VALLEY, CA • VISALIA, CA
TUCSON, AZ • SAN DIEGO, CA
SAN BERNARDINO, CA

ROGERS GLADWIN & HARMONY, INC.
LANDSCAPE ARCHITECTURE AND PLANNING
2432 W. Peoria, Suite 1065
Phoenix, Arizona 85029
602/944-9627

CONCEPTUAL LANDSCAPE DEVELOPMENT PLAN FOR:
Rio Salado Center East

7/7/87

JOB NO. 87045D14
DRAWING NO.
SHEET NO. 7 OF