

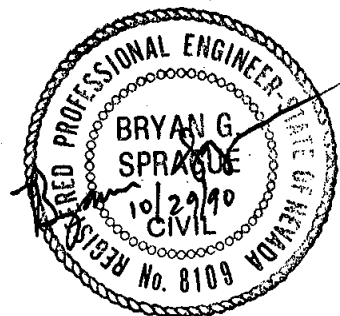
HYDROLOGY REPORT  
FOR  
PDQ FOOD STORE AND CAR WASH  
RENO, NEVADA

Prepared For:

PDQ Food Stores of Nevada  
1105 Terminal Way, #211  
Reno, Nevada 89502

Prepared By:

CFA, Inc.  
1150 Corporate Boulevard  
Reno, Nevada 89502



October 1990  
Project No. 90-001.01

## **INTRODUCTION**

This report presents the drainage plan for the proposed PDQ Food Store and Car Wash at Rock and McCarran Boulevards, Reno, Nevada. The site lies within a recognized flood hazard zone. Irrigation water currently crosses the site. Design considerations include flood protection and perpetuation of historic water courses.

## **SITE DESCRIPTION**

The 1.76 acre site is located at the northwest corner of South Rock Boulevard and South McCarran Boulevard. Annexation to the City of Reno has previously been approved. A PDQ convenience store with six gasoline pump islands, plus a self-service car wash with five bays, is proposed for the site. The street grades in Rock Boulevard and McCarran Boulevard are two to four feet higher than the existing ground on the PDQ site. The site will be filled to match the street grades as well as for flood proofing purposes.

The existing ground is flat and currently used as pasture. An abandoned residence lies on the southwest corner. The Back Ditch (18" deep) runs west to east outside the north property line, crossing McCarran Boulevard via two 24" x 36" RCP culverts. One of these culverts is boarded up. In addition, a smaller drainage/irrigation ditch (12" deep) traverses the PDQ site from west to east, crossing McCarran Boulevard via a 12" RCP culvert. The northeast portion of the site is often inundated during watering. One provision of the PDQ grading plan is the perpetuation of irrigation supply and drainage across the site so that upstream and downstream property owners are not adversely impacted by the proposed development. In addition, the proposed grading and drainage plan has no effect on the adjacent Back Ditch, except for strictly emergency drainage as described in PROPOSED DRAINAGE.

## **FLOOD HAZARD**

According to the Flood Insurance Rate Map, Panel 1453, dated April 16, 1990, published by the Federal Emergency Management Agency, the PDQ site lies within Flood Zone B. A Zone B designation indicates that the area is within the limits of the 100-year and 500-year flood. Accordingly, the proposed finish floor elevations are set a minimum of two feet (2') above adjacent existing undisturbed ground in compliance with RMC 12.24, "Flood Hazard Areas".

Although the PDQ site is designated Zone B, the area east of McCarran Boulevard is Zone A9 with a 100-year base flood elevation of 4392. Since the culverts in McCarran Boulevard are below the 100-year flood level, there is a possibility that the same base flood elevation could occur on the PDQ site. The proposed building pad elevations are more than one foot (1') above the base flood elevation in accordance with City ordinance for Zone A properties.

The surrounding area is subject to a known base flood elevation. The flood level achieved is widespread and thus independent of local variations in ground contour. Therefore, placing of fill on the PDQ site has very little effect on the base flood elevation applicable to the area.

## **HISTORIC DRAINAGE**

The PDQ site lies on nearly level terrain which drains easterly to Steamboat Creek. The site drains by way of the single 12" RCP culvert under McCarran Boulevard. The Back Ditch is separated from the PDQ site by a 6" berm; thus the two areas drain independently. Historically, much of the surrounding area is subject to periodic shallow flooding.

## **PROPOSED DRAINAGE**

Storm runoff on the PDQ site will be collected in a storm drain system and connected to the existing storm drain in McCarran Boulevard. Flows originating off-site, whether irrigation water or storm runoff, will be piped through the site independently of the storm drain, and connected to the existing 12" culvert in McCarran Boulevard.

Peak runoff rates were estimated using the rational method as adopted by the City of Reno (see RATIONAL METHOD). The site was divided into three drainage subareas (see Drainage Plan Insert) and the 5-year, 10-year, and 100-year flow were computed for each subarea. The increase in 5-year runoff was also calculated. Results are summarized in a table on the Drainage Plan.

All on-site catch basins are in a sump condition, thus requiring an overland drainage escape route per city standard. The site is designed to permit emergency drainage to Rock Boulevard and to the McCarran Boulevard right-of-way in the event the catch basins back up during a major storm.

## **CONCLUSIONS**

The benefits of the proposed PDQ development are the removal of storm runoff by the proposed underground storm drain, and the flood protection to the property.

Development of the PDQ site has very little effect on the base flood elevation for adjacent properties.

Existing irrigation and drainage crossing the site is piped to the existing culvert at McCarran Boulevard, in order to perpetuate existing flow routes. Drainage on the property to the north could be significantly improved by removing the boards currently blocking one of the 24 x 36 culverts crossing McCarran Boulevard.

## RATIONAL METHOD

The Rational Method is used to estimate the peak runoff resulting from a rain storm of given intensity falling on a specific watershed. The peak flow is expressed as:

$$Q = CiA$$

where  $Q$  = Peak runoff, cubic feet per second

$C$  = Runoff coefficient

$i$  = Average rainfall intensity in inches per hour

$A$  = Watershed area in acres

Calculations are made using criteria provided by the City of Reno Public Works Design Manual. Runoff coefficients used are 0.25 for undeveloped areas and 0.85 for built-up areas. Rainfall intensities are determined from the rainfall intensity-duration-frequency (IDF) curves for the City of Reno. The initial time of concentration ( $T_c$ ) is calculated by the formula:

$$T_c = 10 \text{ or } \frac{L}{60 \times V} \text{ (whichever is greater)}$$

where  $T_c$  = Time of concentration in minutes

$L$  = Watershed length in feet.

$V$  = Velocity in feet per second

Velocities used are 2 fps for swale and gutter flow and 5 fps for pipe flow.

The time of concentration at successive points downstream is determined by adding travel time to the upstream time of concentration. Travel time ( $T_t$ ) is computed as:

$$T_t = \frac{L}{V \times 60}$$

where  $L$  = Length of flow path within subarea

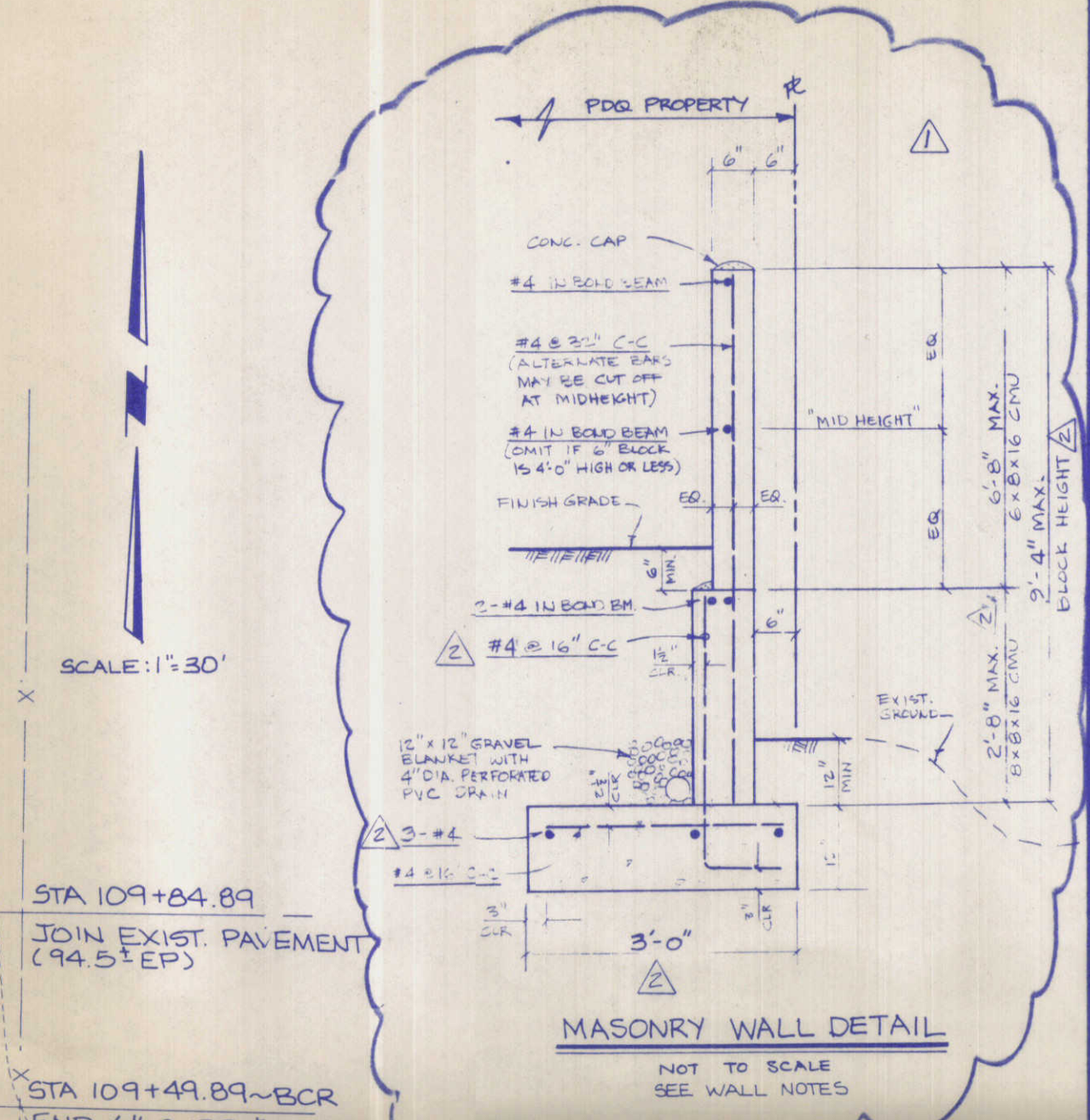
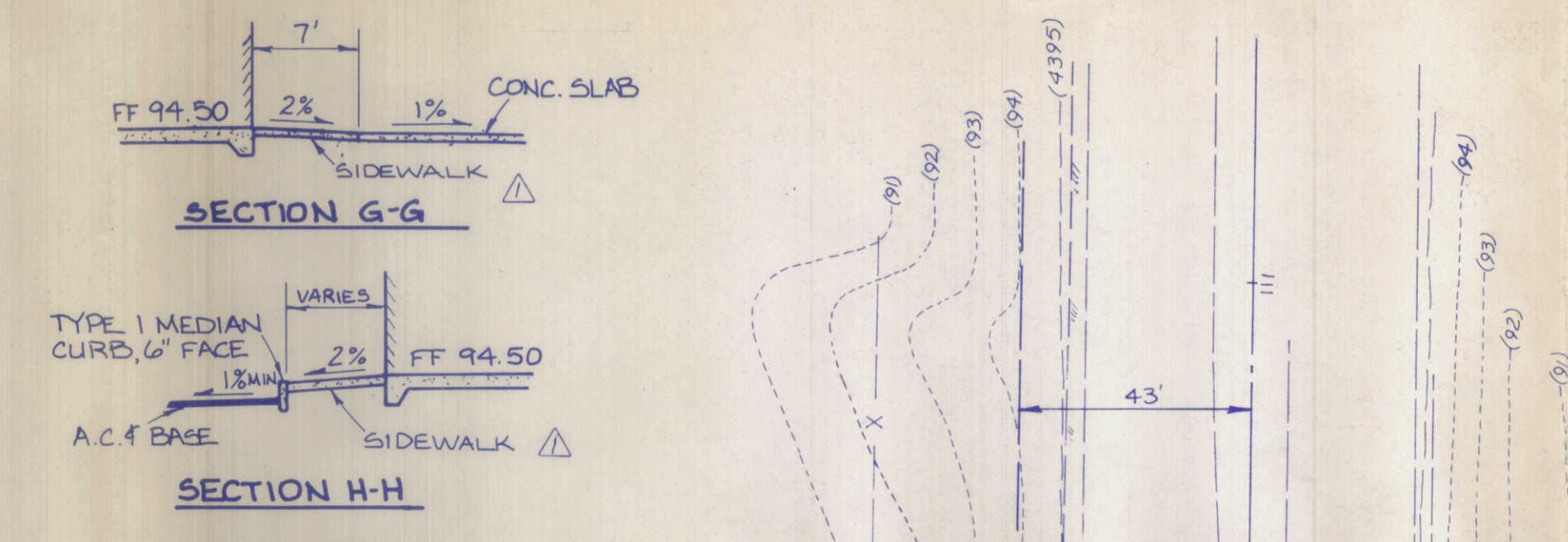
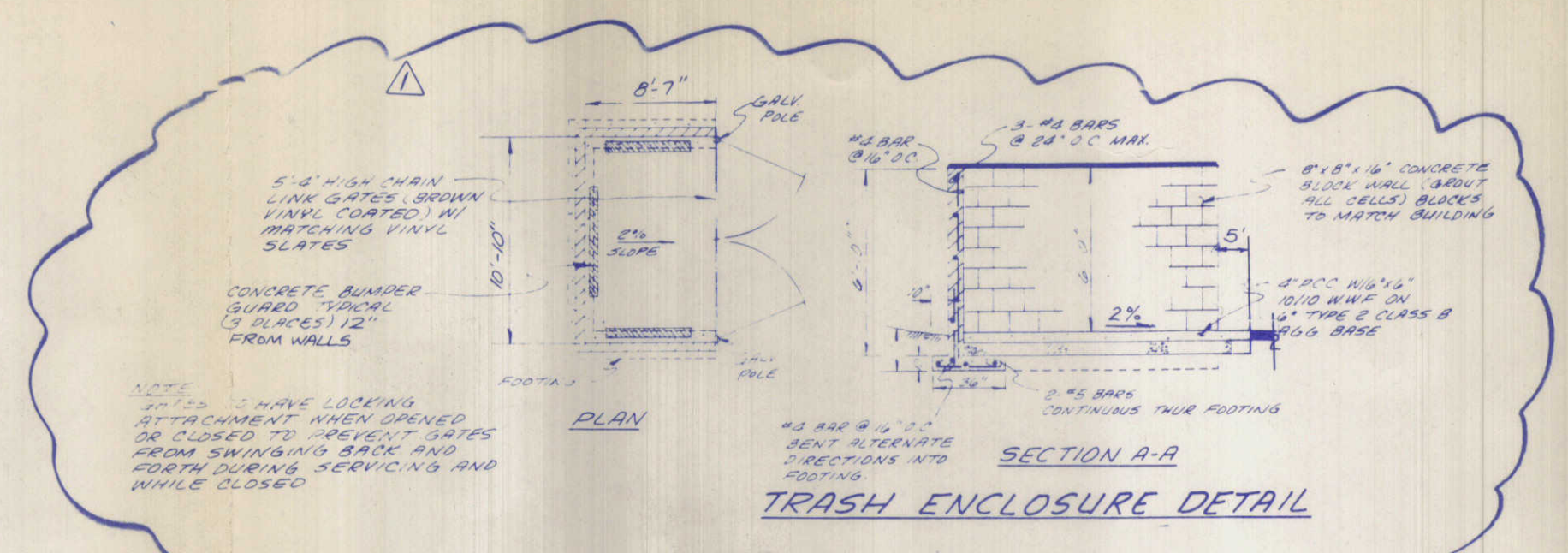
Hydrologic tabling is done in two parts. First, the peak flow for each drainage area is determined using the corresponding time of concentration. Second, flows are accumulated starting with the most upstream subarea and proceeding downstream. At each point of interest the total time of concentration is calculated and the peak flow is computed using the total tributary area, the cumulative average runoff coefficient, and the intensity corresponding to the total time of concentration at that point.

LOG OF BORING 1	
Depth (ft)	Remarks
0	DARK BROWN CLAYEY SILT (ML) with sand, stiff, moist, porous
8	WATER LEVEL - 6/6/90 - NOT STABILIZED
8	GREY SILTY SAND (SH) loose
10	With gravel and cobbles below 12.0'
15	GREY SAND (SP) with gravel, dense

LOG OF BORING 2	
Depth (ft)	Remarks
0	DARK BROWN CLAYEY SILT (ML) stiff, moist, with roots, porous
7	Color change to grey with sand below 4.0'
7	DARK GREY SILTY SAND (SH) loose, wet
15	WATER LEVEL - 6/6/90 - NOT STABILIZED

PEZONETKA & ASSOCIATES, INC. CONSULTING ENGINEERS AND GEOTECHNICAL ENGINEERS



**BORING LOGS**

- WALL NOTES:**
- THE FOLLOWING MINIMUM MATERIAL STRENGTHS SHALL BE USED:
 

CONCRETE	F <sub>C</sub> = 3,000 PSI
MASONRY	F <sub>M</sub> = 1,500 PSI
REINFORCEMENT	F <sub>y</sub> = 40,000 PSI
  - MORTAR SHALL BE TYPE M OR S.
  - GROUT ALL CELLS BELOW FINISH GRADE.
  - GROUT ALL CELLS CONTAINING REINFORCING.
  - LAP SPLICES SHALL BE 40 DIAMETERS.
  - BOTTOM OF FOOTING SHALL BE PLACED A MINIMUM OF 24" BELOW LOWEST FINISH GRADE.
  - BACKFILL SHALL BE SELECT MATERIAL CONFORMING TO THE FOLLOWING:
 

100%	PASS #6 SIEVE
70% TO 100%	PASS #4
50% TO 100%	PASS #4
10% TO 35%	PASS #200
  - PROVIDE ANCHORAGE BETWEEN THE TOP OF FOOTING AND FIRST COURSE OF BLOCK BY EITHER:
    - EMBEDMENT OF BLOCK
    - 2 X 4 MORTAR KEY
  - BACK FACE OF WALL SHALL BE WATERPROOFED.

**RATIONAL METHOD HYDROLOGY**  
CITY OF RENO IDF CURVES  
PDQ FOOD STORE & CAR WASH  
EXIST. RUNOFF COEFF. = 0.25

DRAINAGE AREA (ACRES)	WATERSHED LENGTH (FT)	VELOCITY (FT/SEC)	TIME OF CONC (MIN)	RUNOFF COEFF.	RAINFALL INTENSITY (in/hr)			DEVELOPED FLOWRATE (cfs)			5-YR. INCREASED FLOWRATE (cfs)			
					5-YEAR	10-YEAR	100-YEAR	5-YEAR	10-YEAR	100-YEAR	5-YEAR	10-YEAR	100-YEAR	
0.2	105	2	10.00	0.85	1.40	1.86	3.80	0.24	0.32	0.85	0.17			
2	215	2	10.00	0.85	1.40	1.86	3.80	0.71	0.95	1.94	0.50			
3	240	2	10.00	0.85	1.40	1.86	3.80	1.07	1.42	2.91	0.76			
1-3	395	5	10.00	0.85	1.40	1.86	3.80	2.02	2.69	5.49	1.43			

- NOTES**
- SEE SHEET C-1 OF 11 FOR GENERAL NOTES.
  - ALL BUILDINGS, FENCES, AND STRUCTURES WITHIN CONSTRUCTION AREA TO BE REMOVED FROM SITE UNLESS OTHERWISE NOTED.
  - SEE UTILITY PLAN FOR SEWER, WATER, STORM DRAIN, IRRIGATION, AND MISCELLANEOUS UTILITIES.



**PDQ FOOD STORE & CAR WASH DRAINAGE PLAN**

DESIGNED BY: TEF  
DRAWN BY: RCP/RT  
CHECKED BY: BGS  
APPROVED BY: [Signature]

DATE SURVEYED: August 1990  
DATE AUGUST 1990  
DATE AUGUST 1990  
DATE AUGUST 1990

REVISIONS

RENO NEVADA

JOB NO. 80-001.01  
DATE AUG 1990  
SHEET C3A  
OF 11