PRELIMINARY
HYDROLOGY REPORT
FOR
WAL-MART SUPERCENTER #2189-02
AT
FIRECREEK CROSSING

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PRELIMINARY HYDROLOGY REPORT FOR WAL-MART SUPERCENTER #2189-02 AT FIRECREEK CROSSING

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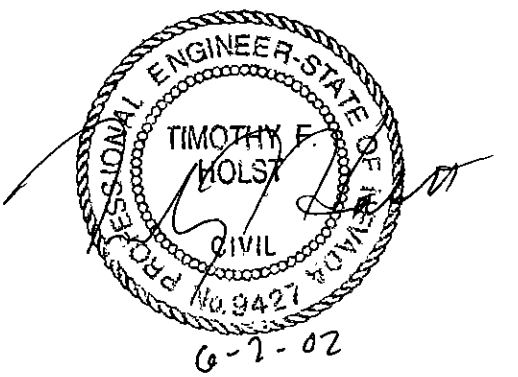

JUNE, 2002

INTRODUCTION

This report presents the preliminary hydrology study and drainage plan for the Wal-Mart Supercenter at FireCreek Crossing in the City of Reno, Nevada. The Wal-Mart Supercenter property consists of the existing Wal-Mart store, parking facilities, and infrastructure in the western portion of the shopping center. The existing store is to be expanded into a Supercenter store. The hydrology for the Wal-Mart store was previously analyzed under FireCreek Crossing Phases 1 and 2 as well as Sam's Club (see References).

SITE DESCRIPTION

The Wal-Mart Supercenter comprises 17.3 acres in the western portion of the FireCreek Crossing shopping center in Section 25, T19N, R19E. It is bounded on the south by Babies-R-Us (Phase 3), east by FireCreek Crossing (Phase 2), west by Redfield Parkway, and on the north by Sam's Club. Refer to Figure 1 – Vicinity Map.

The Wal-Mart Supercenter property consists of the existing Wal-Mart store, parking lot, and infrastructure. The existing Wal-Mart store will expand by approximately 62,000 square feet.

PROJECT DESCRIPTION

FireCreek Crossing will ultimately consist of about 750,000 square feet of commercial and retail space with associated parking and landscaping. The construction of the Wal-Mart Supercenter building, consisting of approximately 208,900 square feet total, will require the relocation of many utilities, including storm drain to the west and north of the building, as well as parking facilities.

FLOOD ZONE

The latest FEMA Flood Insurance Rate Map No. 32031C3156 E, dated September 30, 1994, indicates that the project lies mostly within a Shaded Zone X, indicating areas between the limits of the 100-year and 500-year flood, or areas of 100-year shallow flooding where the average depth of inundation is less than one foot or the contributing drainage area is less than one square mile. The other portion lies within Unshaded Zone X, indicating areas outside the 500-year

floodplain. Refer to Figure 2 - Flood Zone Map. Since site grading has significantly altered the original topography, the entire site will be analyzed for the 100-year shallow flooding.

MITIGATION OF FLOOD HAZARD

The off-site hydrology for the regional 100-year event was analyzed and discussed in the Hydrology Report for FireCreek Crossing, dated September 17, 1993, as amended by CFA, Inc (Phase 1 Hydrology Report). As suggested in the referenced report, the site grading will provide passage for the 100-year storm and the buildings will be elevated above the estimated base flood. No special flood proofing measures are proposed, other than to ensure that the site is graded as shown on the approved plans.

The Phase 1 Hydrology Report indicates that the majority of the off-site flows are coming from the south at two locations. About 250 cfs is coming through Talbot Lane and another 250 cfs is coming from across the Albertson's site.

The flow from Talbot Lane splits three ways when it reaches Redfield Parkway, which slopes slightly to the right (southeast). About 130 cfs goes down the entrance road, 80 cfs turns right away from this project, and 40 cfs spills over the high point to the left.

Under current conditions, the 40 cfs going left will be intercepted by the first driveway entrance and will flow through the parking and loading areas behind Babies-R-Us and the existing Wal-Mart building, and then return to Redfield Parkway northwest of the store. There are a few design options to be considered for this flow of 40 cfs and where it will be conveyed. The first is to keep the runoff to the rear of the building by re-grading the truck access in such a way as to provide one foot of freeboard from the finish floor elevation of the Supercenter. Another way is by intercepting the 40 cfs in a storm drain system south of the Supercenter and returning the flow to the surface where it will be conveyed by overland route to the northwest of the store. As a third option, the entrance where the 40 cfs has the potential to enter the site can be re-graded in order to keep the flow on the surface of Redfield Parkway away from the Supercenter site.

The 130 cfs that comes straight down the entrance road will flow through the parking area between the Supercenter and Phase 2 buildings. Grading in this area should remain unchanged and therefore not affect the potential runoff and the way it is conveyed. The analyses from prior drainage reports for the 130 cfs are still valid.

EXISTING DRAINAGE SYSTEM

Flows generated on the western half of the site, including the Wal-Mart Supercenter, are intercepted and conveyed by the storm drain system installed in Phase 1. This system consists of storm drain ranging from 12-inch diameter pipes at the individual catch basins to a 27-inch diameter pipe at the connection to the storm drain system on Redfield Parkway (North).

The Redfield Parkway storm drain is connected to the system at Peckham Lane through a 36-inch diameter storm drain that crosses Virginia Street and the Convention Center to Peckham Lane. The existing 36-inch storm drain system has a capacity of 64 cfs flowing just full. The Peckham Lane storm drain is an 84" RCP with a capacity of about 350 cfs.

PROPOSED DRAINAGE SYSTEM

The proposed storm water management plan is designed to the same concept as proposed in Phase 1:

(1) To provide a storm drain system to collect, store, and treat runoff from the 5-year storm,

(2) To provide short-term detention in the parking areas to reduce 5-year flows entering the storm drain, as required, and

(3) To guide surface runoff to locations where such flows can be discharged without adverse impact.

The 5-year runoff from the Wal-Mart Supercenter and the remainder of the shopping center is collected in two storm drain systems that discharge into the Redfield Parkway (North) system, which connects to the Convention Center storm drain. Storm water detention areas are provided upstream in the existing parking areas. Control is provided by orifice plates installed in the catch basins and drop inlet manholes.

The flows in the on-site storm drain system and the Redfield Parkway storm drain were estimated and discussed in the Phase 1 Hydrology Report and addenda (dated 4/20/94 & 8/24/94), the Phase II Hydrology Report, the Phase III Hydrology Report, and the Hydrology Report for Sam's

Club. Upon final design of the Supercenter, a detailed hydrology/hydraulic analysis will be provided. It is anticipated that a few modifications of the previous drainage analyses will be necessary. Impervious area of the site will essentially remain the same; therefore, no substantial increase in runoff is anticipated. The final report will demonstrate the passage of the off-site 100-year runoff through the site based on final design grades.

HYDROLOGY

Preliminary peak flows at catch basins were computed using the Rational Method for the 5-year and 100-year storms. The final hydrologic/hydraulic report will accumulate flows downstream to demonstrate that the existing system has adequate capacity.

CONCLUSIONS

1. It appears that the Wal-Mart Supercenter can be developed as planned without adverse impact to existing drainage facilities or structures.

2. Existing on-site detention will reduce peak flows and control the release of runoff in the 5-year storm so that the existing storm drain under Virginia Street will not be overloaded.

3. The site will be designed in such a way that buildings are elevated above the computed 100-year flood level.

REFERENCES

CFA, Inc., Hydrology Report for Firecreek Crossing-Sam's Club, 1/02.

CFA, Inc., Hydrology Report for Firecreek Crossing Phase 3, 1/01.

CFA, Inc., Hydrology Report for FireCreek Crossing Phase 2, 1/96.

CFA, Inc., Addendum #2 for Hydrology Report for FireCreek Crossing, 8/94.

CFA, Inc., Addendum #1 for Hydrology Report for FireCreek Crossing, 4/94.

CFA, Inc., Hydrology Report for FireCreek Crossing, 9/93.

CFA, Inc., Drainage Report for Albertson's, 2/92.

CFA, Inc., Preliminary Hydrology Report, The Meadows Marketplace, 7/92.

G. C. Wallace, Inc., Lewis Homes of Nevada, Lakeside Estates, Reno, Nevada, Flood Hazard Analysis, 9/88.

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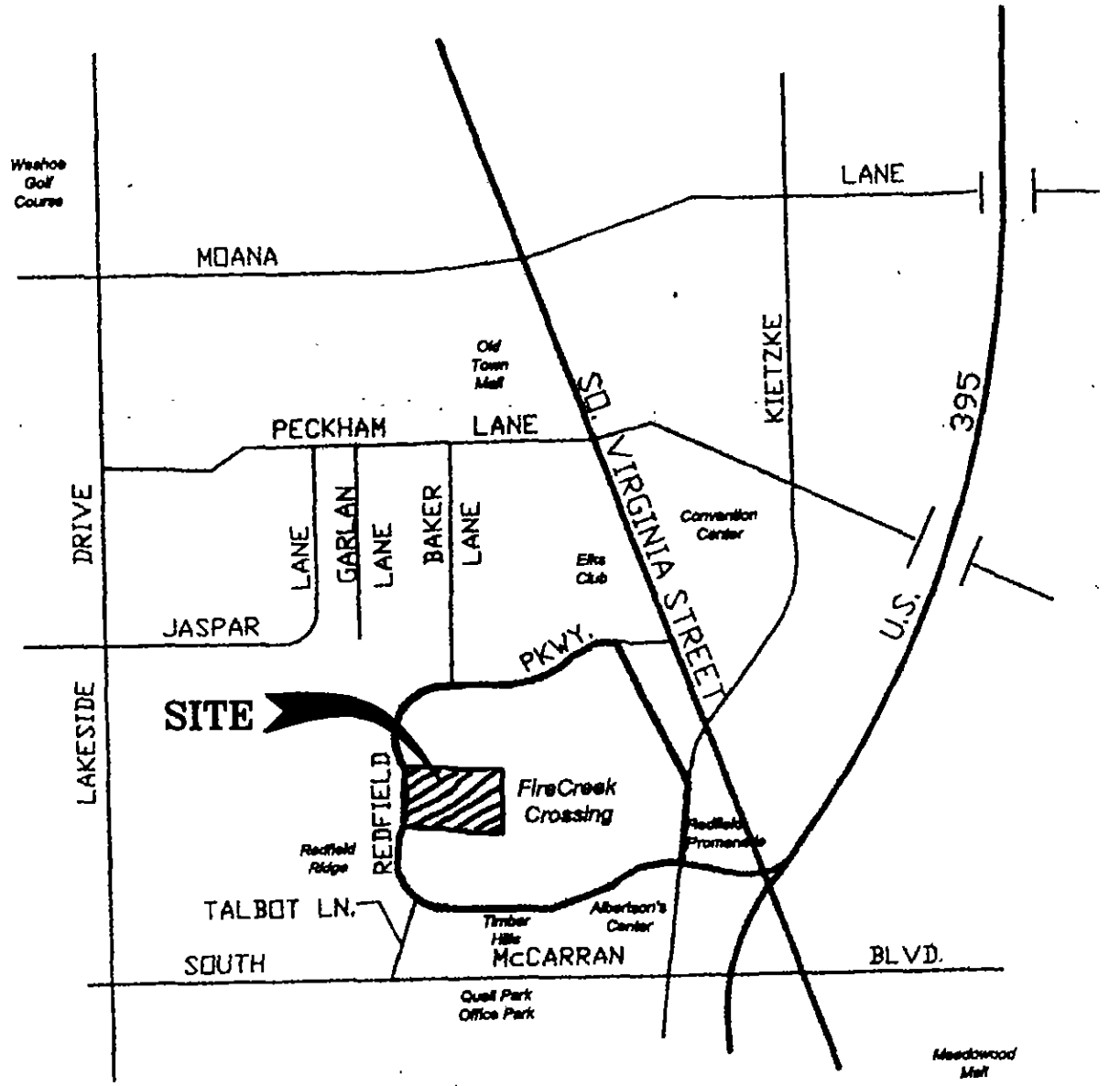

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FIGURE 1

VICINITY MAP

WALMART SUPERCENTER–FIRECREEK CROSSING

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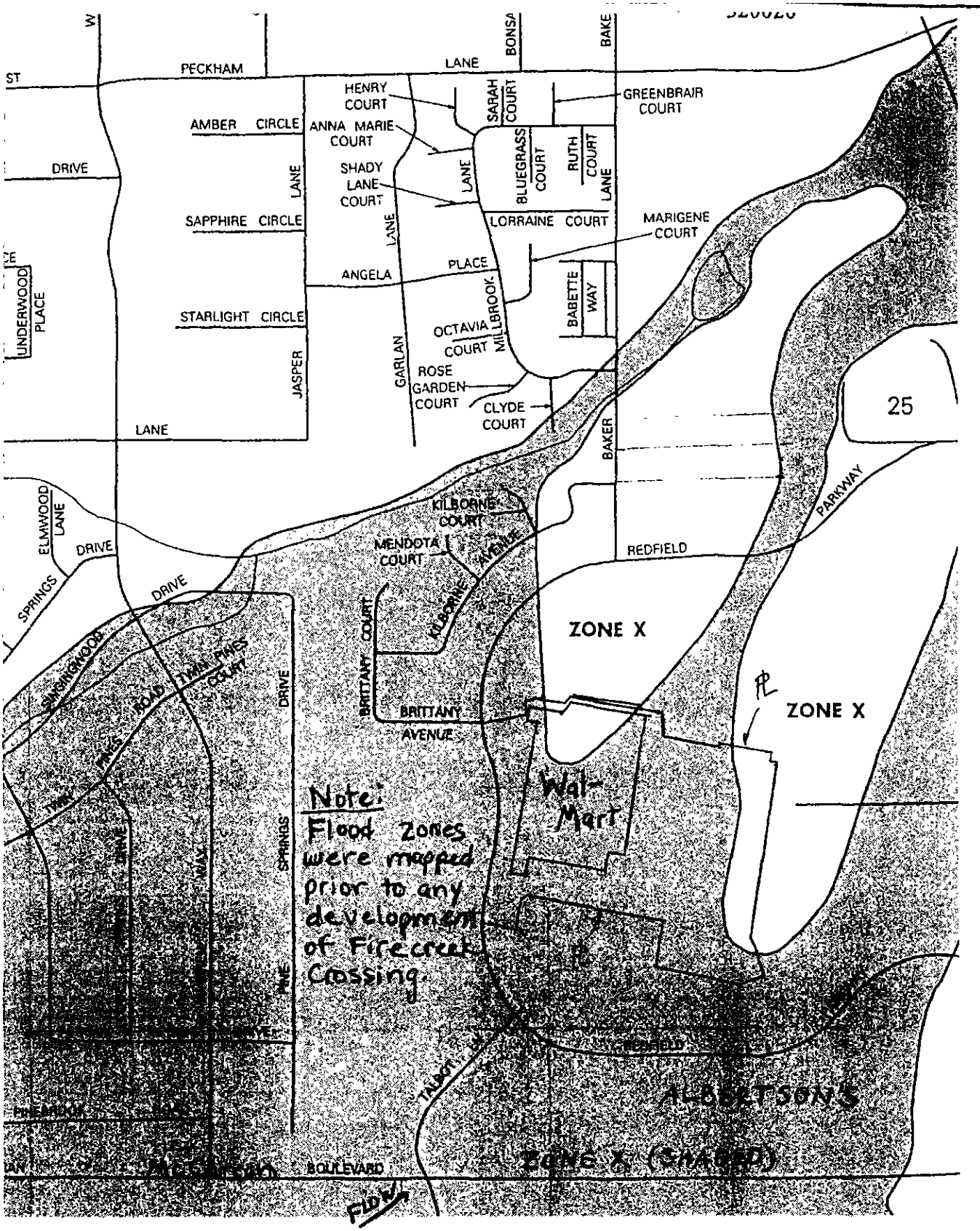

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FIGURE 2

FLOOD ZONE MAP

WALMART SUPERCENTER–FIRECREEK CROSSING

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APPENDIX A

RATIONAL METHOD

RATIONAL METHOD - CITY OF RENO

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

$$Q = C\,i\,A$$

Where
- Q = Peak rate of runoff, cubic feet per second
- C = Runoff coefficient
- i = Average rainfall intensity, inches per hour
- A = Watershed area, acres

The City of Reno allows the use of the Rational Method for urban and small watersheds 500 acres or less. Runoff computations are made using criteria provided by the City of Reno Public Works Design Manual. Runoff coefficients used are 0.30 for undeveloped areas, 0.75 - 0.85 for developed areas with landscaping, and 0.90 - 0.95 for paved areas. Rainfall intensities are determined from the rainfall intensity-duration-frequency (IDF) curves for the City of Reno. The initial time of concentration, $T_{c\,(1)}$, is calculated by the formula:

$$T_{c\,(1)} = 10 \text{ or } \frac{L}{60 \times V} \text{ (whichever is greater)}$$

where
- $T_{c(1)}$ = Initial time of concentration, minutes
- L = Length from uppermost point of watershed to design point, feet
- V = Channel or overland velocity, feet per second

Given the time of concentration at a design point, the time of concentration at the next design point is determined by adding travel time. The new time of concentration, $T_{c(n)}$, is computed as:

$$T_{c(n)} = 10 \text{ or } \sum \frac{L}{60 \times V} \text{ (whichever is greater)}$$

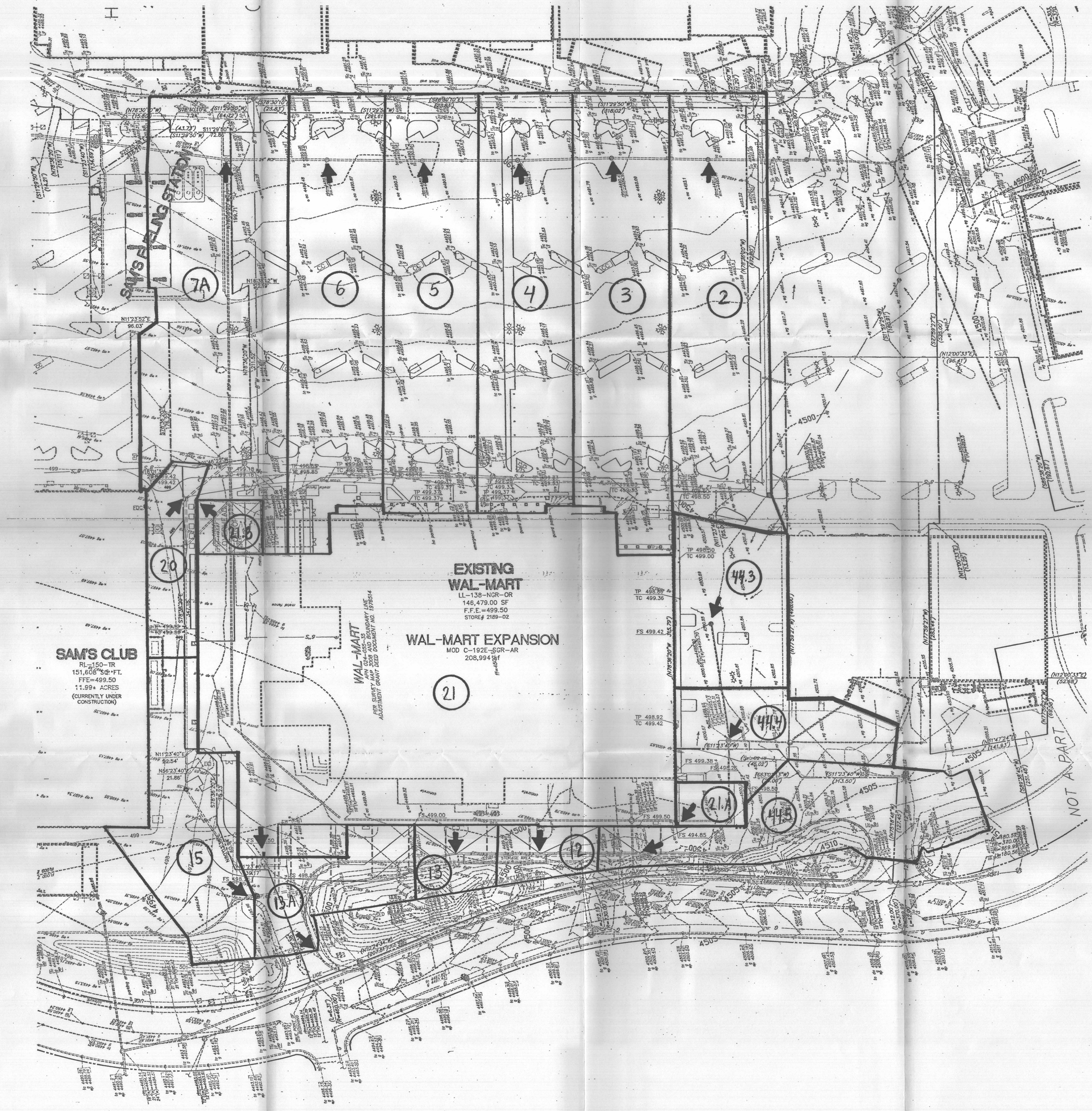
where
- $T_{c(n)}$ = Time of concentration, minutes
- $\sum \frac{L}{60 \times V}$ = Total travel time to design point, minutes
- L = Length of flow path between design points, feet
- V = Velocity, feet per second

Velocities used are 2 - 3 fps for surface flow and 3 - 5 fps for channel and conduit flow.

Rational Method calculations are performed using a spreadsheet containing the appropriate IDF curves and routing parameters. Hydrologic tabling is done in two parts. First, the peak flow for each drainage area is determined based on the runoff coefficient, initial time of concentration, and area. These flows are used to locate and size the drainage inlets. Second, flows are accumulated starting with the initial subarea and proceeding downstream. At each design point travel time is added and the peak flow is computed using the average runoff coefficient, the time of concentration at that point, and the total tributary area. These cumulative flows are used in the design of interceptor channels and storm drains where applicable.

RATIONAL METHOD HYDROLOGY
CITY OF RENO IDF CURVES
WALMART SUPERCENTER @ FIRECREEK CROSSING

DESIGN POINT	DRAINAGE SUB-AREA	AREA (acres)	RUNOFF COEFF.	WATERSHED LENGTH (ft)	VELOCITY (ft/sec)	Tc (min) actual	Tc (min) use	INTENSITY (in/hr) 5-YR	INTENSITY (in/hr) 100-YR	PEAK RUNOFF (cfs) **5-YR**	PEAK RUNOFF (cfs) **100-YR**
PART A: INDIVIDUAL DRAINAGE AREAS											
SDMH #20	2	1.50	0.90	495	2	4.13	10.00	1.40	3.80	**1.89**	**5.13**
SDMH #19	3	1.43	0.90	487	2	4.06	10.00	1.40	3.80	**1.80**	**4.89**
SDMH #18	4	1.34	0.90	435	2	3.63	10.00	1.40	3.80	**1.69**	**4.58**
SDMH #17	5	1.39	0.90	432	2	3.60	10.00	1.40	3.80	**1.75**	**4.75**
SDMH #16	6	1.40	0.90	485	2	4.04	10.00	1.40	3.80	**1.76**	**4.79**
SDMH #15	7A	1.94	0.90	497	2	4.14	10.00	1.40	3.80	**2.44**	**6.63**
lowpoint	12	0.19	0.90	82	2	0.68	10.00	1.40	3.80	**0.24**	**0.65**
lowpoint	13	0.19	0.85	93	2	0.78	10.00	1.40	3.80	**0.23**	**0.61**
CB#6	13A	0.45	0.85	240	2	2.00	10.00	1.40	3.80	**0.54**	**1.45**
CB#15SC	15	0.79	0.90	323	2	2.69	10.00	1.40	3.80	**1.00**	**2.70**
CB#19	20	0.33	0.90	225	2	1.88	10.00	1.40	3.80	**0.42**	**1.13**
ROOF	21	4.85	0.90	380	2	3.17	10.00	1.40	3.80	**6.11**	**16.59**
DOCK	21A	0.05	0.90	125	2	1.04	10.00	1.40	3.80	**0.06**	**0.17**
ROOF DRAIN #3	21B	0.12	0.90	95	2	0.79	10.00	1.40	3.80	**0.15**	**0.41**
ROOF DRAIN #4	44.3	0.61	0.90	154	2	1.28	10.00	1.40	3.80	**0.77**	**2.09**
ROOF DRAIN #5	44.4	0.59	0.90	195	2	1.63	10.00	1.40	3.80	**0.74**	**2.02**
lowpoint	44.5	1.23	0.90	438	2	3.65	10.00	1.40	3.80	**1.55**	**4.21**



HYDROLOGY LEGEND

(A2) SUBAREA

➡ DESIGN POINT

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WAL-MART SUPERCENTER-FIRECREEK CROSSING

PRELIMINARY HYDROLOGY MAP

RENO NEVADA

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