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File CUP-1995-137

Date 9/24/99

Present	Scanned	
		A few items are denoted with an asterisk (*), which means they are to be scanned for permanent record on the ISYS retrieval system. In some instances, not all entries designated to be scanned, are present in the file. There are also documents specific to certain files, not found on the standard list. For this reason, a checklist has been included. **Remaining items, (not selected for scanning), will be marked present on the checklist. This index can serve as a quick guide for the contents of each file.** **Files denoted with (**) are to be located using the ISYS Query System. Planning Clearance will need to be typed in full, as well as other entries such as Ordinances, Resolutions, Board of Appeals, and etc.**
X	X	***Summary Sheet – Table of Contents**
X	X	Application form
		Receipts for fees paid for anything
X	X	***Submittal checklist**
		***General project report**
		Reduced copy of final plans or drawings
X	X	Reduction of assessor's map
		Evidence of title, deeds
X	X	***Mailing list**
		Public notice cards
		Record of certified mail
X	X	Legal description
		Appraisal of raw land
		Reduction of any maps – final copy
		***Final reports for drainage and soils (geotechnical reports)**
		Other bound or nonbound reports
		Traffic studies
		Individual review comments from agencies
X	X	***Consolidated review comments list**
X	X	***Petitioner's response to comments**
X	X	***Staff Reports**
		***Planning Commission staff report and exhibits**
X	X	***City Council staff report and exhibits**
		***Summary sheet of final conditions**
		***Letters and correspondence dated after the date of final approval (pertaining to change in conditions or expiration date)**

DOCUMENTS SPECIFIC TO THIS DEVELOPMENT FILE:

X		Commitment for Title Insurance	X		Posting of Public Notice Signs
X	X	Letter from Phil Hart to Planning Commission - 8/1/95	X		E-mail from Jody Kliska to Michael Drollinger – 9/22/95
X		Letter from Donald McBee to Ron Maupin - 9/7/95	X		Letter from Ken Jacobson to Jim Cook re: wetland delineation– 9/20/95
X	X	Subsurface Soils Exploration – 12/5/94	X		Letter from Michael Drollinger to Donald McBee – 9/14/95
X	X	Preliminary Master Drainage Study – 2/94	X		Letter from Michael Drollinger to Thomas Logue – 8/8/95
X		Environmental Site Assessment	X		Appraisal – 2/27/95
X		Traffic Impact Analysis			
X		Appraisal, Inc.			
X	X	Proposed Utility Plan			
X	X	Signage Plan			
X	X	Aerial Map – Conditional Use			
X		Proposed Lane Configuration and Intersection Controls			
X	X	Site Plan			
X		Handwritten Notes			
X	X	Letter from Philip Scott to Philip Hart – 8/31/95			
X	X	Signage Guidelines – 2/27/95			
X		Letter to Ron Maupin from Donald McBee – 9/7/95			
X	X	Letter from Michael Drollinger to John Rubenstein – 1/24/96			
X	X	Planning Commission – ** - 9/5/95			

SUBMITTAL CHECKLIST

~~SITE PLAN REVIEW~~ CONDITIONAL USE

Location: ______________________

Project Name: Retail Center

ITEMS		DISTRIBUTION																						
DESCRIPTION Cup-95-137	SSID REFERENCE	● City Community Development	● City Dev. Eng.	● City Utility Eng.	● City Property Agent	● City Parks/Recreation	● City Fire Department	● City Attorney	○ City Downtown Dev. Auth.	● County Planning	● County Bldg. Dept.	● Irrigation District - Grand Valley	● Drainage District - Grand Jct.	● Water District - Ute	○ Sewer District	● U.S. West	● Public Service	○ GVRP	● CDOT	● Corps of Engineers	○ Walker Field	● City Police Dept.	● Persigo WW	TOTAL REQ'D
● Application Fee	VII-1	1																						
● Submittal Checklist*	VII-3	1																						
● Review Agency Cover Sheet*	VII-3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	/	1	
~~● Planning Clearance*~~	VII-3	1																						
● 11"x17" Reduction of Assessor's Map	VII-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	/	1	
● Evidence of Title	VII-2	1			1			1																
● Appraisal of Raw Land	VII-1	1			1	1																		
[redacted]	VII-1	1			1			1																
[redacted]	VII-2	1	1	1	1			1																
○ [redacted]	VII-1	1			1			1																
[redacted]	VII-3	1	1	1	1			1																
[redacted]	VII-2	1	1	1				1																
[redacted]	VII-3	1	1																					
[redacted]	VII-4	1		1																			1	
● General Project Report	X-7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	/	1	
[redacted]	IX-13	1	1																					
● Site Plan	IX-29	2	2	1	1	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	1	
● 11"x17" Reduction of Site Plan	IX-29					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	/		
● Grading and Drainage Plan	IX-16	1	2										1							1				
● Storm Drainage Plan and Profile	IX-30	1	2										1			1	1	1						
● Water and Sewer Plan and Profile	IX-34	1	2	1			1							1	1	1	1	1					1	
● Roadway Plan and Profile	IX-28	1	2										1											
● Road Cross-Sections	IX-27	1	2																					
[redacted]	IX-12	1	2																					
● Landscape Plan	IX-20	2	1	1																				
● Geotechnical Report	X-8	1	1								1													
[redacted]	X-5,6	1	2										1											
[redacted]	X-14	1	2										1							1				
○ Phase I and II Environmental Report	X-10,11	1	1																					
● Traffic Impact Study	X-15	1	2																1					
● Names and Addresses		1																						
● Legal Description		1			1																			
● Plat		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

NOTES:
1) An asterisk in the Item description column indicates that a form is supplied by the City.
2) Required submittal items and distribution are indicated by filled in circles, some of which may be filled in during the pre-application conference. Additional items or copies may be subsequently requested in the review process.
3) Each submitted item must be labeled, named, or otherwise identified as described above in the description column.

DEVELOPMENT APPLICATION

Community Development Department
250 North 5th Street Grand Junction, CO 81501
(303) 244-1430

Receipt _____
Date _____
Rec'd By _____

File No. _____

We, the undersigned, being the owners of property situated in Mesa County, State of Colorado, as described herein do hereby petition this:

PETITION	PHASE	SIZE	LOCATION	ZONE	LAND USE
[ ] Subdivision Plat/Plan	[ ] Minor [ ] Major [ ] Resub		SW 25½ Rd & Highway 6 & 50	C-2	RETAIL SHOPS
[ ] Rezone				From: To:	
[ ] Planned Development	[ ] ODP [ ] Prelim [ ] Final & REVISION				
[X] Conditional Use					
[ ] Zone of Annex					
[ ] Text Amendment					
[ ] Special Use					
[ ] Vacation					[ ] Right-of-Way [ ] Easement

[X] PROPERTY OWNER [X] DEVELOPER [ ] REPRESENTATIVE

HIGH PLAINS LAND CO		LANDESIGN LLC S/PHILP
Name	Name	Name
10955 LOWELL SUITE 930		200 N 6TH SUITE 102
Address	Address	Address
OVERLAND PARK KS 66210-2335		GRAND JUNCTION CO 81501
City/State/ZIP	City/State/Zip	City/State/Zip
913 345 2359		244 9180 / 245 4099
Business Phone No.	Business Phone No.	Business Phone No.

NOTE: Legal property owner is owner of record on date of submittal.

We hereby acknowledge that we have familiarized ourselves with the rules and regulations with respect to the preparation of this submittal, that the foregoing information is true and complete to the best of our knowledge, and that we assume the responsibility to monitor the status of the application and the review comments. We recognize that we or our representative(s) must be present at all hearings. In the event that the petitioner is not represented, the item will be withdrawn from the agenda. and an additional fee charged to cover rescheduling expenses before it can again be placed on the agenda.

Signature of Person Completing Application — Date 7/31/95

X _____, CFO 8/1/95
Signature of Property Owner(s) - Attach Additional Sheets if Necessary

August 1, 1995

City of Grand Junction
City Council
Planning Commission
250 North 5th Street
Grand Junction, CO 81501

RE: RIMROCK MARKETPLACE

Dear Members:

Accompanying is a modification to the existing Conditional Use permit issued by the City some months ago for the Rimrock Marketplace shopping facility. The site is located south of Highway 50 and west of 25 1/2 Road.

There have been some changes made to the site development plan since the acceptance of the Conditional Use permit by the City. Additionally, there has been a change in the ownership of the development. The current owner is now Mr. James Cook president of High Plains Land Company.

The modified proposal does not include major changes to the overall traffic circulation as proposed originally. The proposal still incudes the extension of a new frontage road between Independent Avenue along Highway 50 to Mulberry Street. The previously submitted Traffic Analysis has been modified to reflect the changes within this application.

Prior to review of the attached Site Plan we would encourage the reader to review the Staff Report and General Project Report which were submitted as part of the original Conditional Use application.

The major change to the Site Plan is the elimination of approximately 10 acres near the northwest corner of the development. This part of the site is currently occupied by the Hansen Equipment Company. Other changes are presented in a tabular format, which follows:

COMPARISON CHART		
USE	PREVIOUS	CURRENT
Building Area	529,000 sf	360,000 sf
Parking Spaces	1873	1560
Pad Area	5.5 ac	6.5 ac
TOTAL	52.0 ac	42.0 ac

As a result of the proposed changes to the site development plan and ownership of the property, the applicant is prepared to submit new preliminary and final plans together with the necessary review documents required for the planning clearance from the City in order that they may begin site construction sometime late this fall. Expected opening of the facility would most likely occur sometime beginning in the spring of 1996.

It is the applicants understanding that all other elements of the previous approvals consistent with the modified plan will continue to apply as a condition of this application.

The petitioner will be present at the scheduled public hearing to discuss the proposed modifications to the plan and answer any questions which may arise.

Respectfully,
LANDesign, LLC.

Phil Hart P.E., president

xc: Jim Cook, High Plains Land Co.

HARSHMAN, MCBEE & COFFMAN
ATTORNEYS AT LAW
1021 MAIN STREET
POST OFFICE BOX 2682
GRAND JUNCTION, COLORADO 81502-2682

T.J. HARSHMAN
DONALD L. McBEE
KAY SNIDER COFFMAN*
BRUCE R. RAAUM
*ALSO ADMITTED IN WYOMING

TELEPHONE
(970)243-7887
FAX
(970)245-5566

City Council
Larry Timm
Jim Spehar
David Varley
Dan Wilson
9/7/95 9/7/95 cm

September 7, 1995

RECEIVED GRAND JUNCTION
PLANNING DEPT
SEP 8 REC'D

Hon. Ron Maupin
City of Grand Junction
250 N. 5th St
Grand Junction, CO 81501

Re: City Planning Commission
Rimrock Marketplace
CUP-95-137

Dear Mr. Maupin:

I have been retained by Harold R. Woolard to appeal the decision of the Grand Junction Planning Commission decision to approve the Conditional Use Permit and Site Plan for the Rimrock Marketplace.

The basis for the appeal is that the site plan eliminates the present access to the front of Mr. Woolard's business, the Corner Store. This access has been in continuous use by Mr. Woolard and his predecessors in business on the site for many years. It will be particularly injurious to Mr. Woolard because he sells large trailers and associated equipment, as well as requiring access for semi-trailer trucks. His customers and suppliers currently use Independent Avenue and the south frontage road for ingress and egress to the Corner Store. The site plan proposes to eliminate this access and leave Mr. Woolard with only a driveway off of Highway 50 which will require a turn that cannot be accommodated by semi-trailer trucks. It will also make it almost impossible for his customers to exit the property and turn left.

We believe that this action, if it is approved by the City Council, will be the equivalent of a condemnation of Mr. Woolard's property, and destroy most of the value of his property and his business. Please accept this letter as notice of our position and the potential claim against the City of Grand Junction.

We request that the City Council direct the Planning Commission to revise the site plan to leave the frontage road from Mr. Woolard's property to Independent Avenue intact so that traffic into and out of Mr. Woolard's property can use the frontage road and its intersection with Independent Avenue to access Hwy 50.

Sincerely Yours,

Donald L. McBee

c: Dan Wilson, Esq.
Harold Woolard

SIGNAGE GUIDELINES FOR:
RIMROCK MARKETPLACE

February 27, 1995

All signage must meet the requirements contained within Section 5-7 of the latest *City of Grand Junction Zoning and Development Code*. In addition to the requirements of the sign code the following standards will be a part of the signage plan for Rimrock Marketplace.

- Three general identification sign along the proposed Frontage Road one of which will be near the primary entrance to the site. The applicant may reduce the total signage square footage at one location and increase the allotment at an other. In no case will the aggregate allotment exceed that currently allowed for within the Code.

- Only "monument type" signs will be permitted for identification of the future uses on the pad sites shown on the development plans.

- Wall mounted signs will be permitted in accordance with the sign code

- No roof top signage will be permitted.

- Traffic control signs will require the acceptance of the City's Development Engineer.

SIGNAGE PLAN
RIMROCK MARKETPLACE

All Signage must meet the requirements contained in Section 5-7 of the Zoning and Development Code (ZDC), as amended. In addition, the following provisions will be part of the signage plan for Rimrock Marketplace:

1. One project identification sign may be located along each roadway frontage. For the purposes of this approval, the project identification sign may be located at the Hwy. 6&50 frontage (as identified on the attached site plan) rather than having to be located along the relocated frontage road. The project identification sign along Hwy 6&50 may be a freestanding sign, not to exceed 25 ft. in height and 300 square feet in area. The project identification sign along the 25 1/2 Road frontage shall be limited to a monument signs, not to exceed 6 feet in height and 150 square feet in area.

2. Only monument signs (in addition to wall signs), not to exceed 6 feet in height and 150 square feet in area are permitted for identification of uses on the pad sites as identified on the attached site plan.

3. Wall mounted signs are permitted in accordance with the sign code. For purposes of signage allowance calculations, the retail center must utilize the relocated frontage road rather than Highway 6&50.

4. No roof signs are permitted anywhere in the development.

5. Traffic control signs require the approval of the City Development Engineer.

h:\cityfil\1995\95-1374.wpd

CUP-95-137

18

Larry Beckner
PO Box 220
City 81502

Harold Woolard
2541 Hgw 6 & 50
City 81505

United
618 Dike Rd.
City 81503

John Starks
12537 State Hwy 82
Carbondale, CO 81623

Anna Co.
PO Box 489
City 81502

Clarabelle McElley
2509 Hwy 6 & 50
City 81505

Frostline USA
2525 River Rd.
City 81505

P. Lloyd
640 26 Rd.
City 81506

Michael Gregg
241 North Ave.
City 81501

C R Brown Oil Co.
703 23 1/2 Rd.
City 81505

Albino Venegas
PO Box 1883
City 81502

Gamble Ent., Inc.
PO Box 2906
City 81520

JIM COOK
HIGH PLAINS LAND CO.
10955 LOWELL, STE#930
OVERLAND PARK, KS 66210

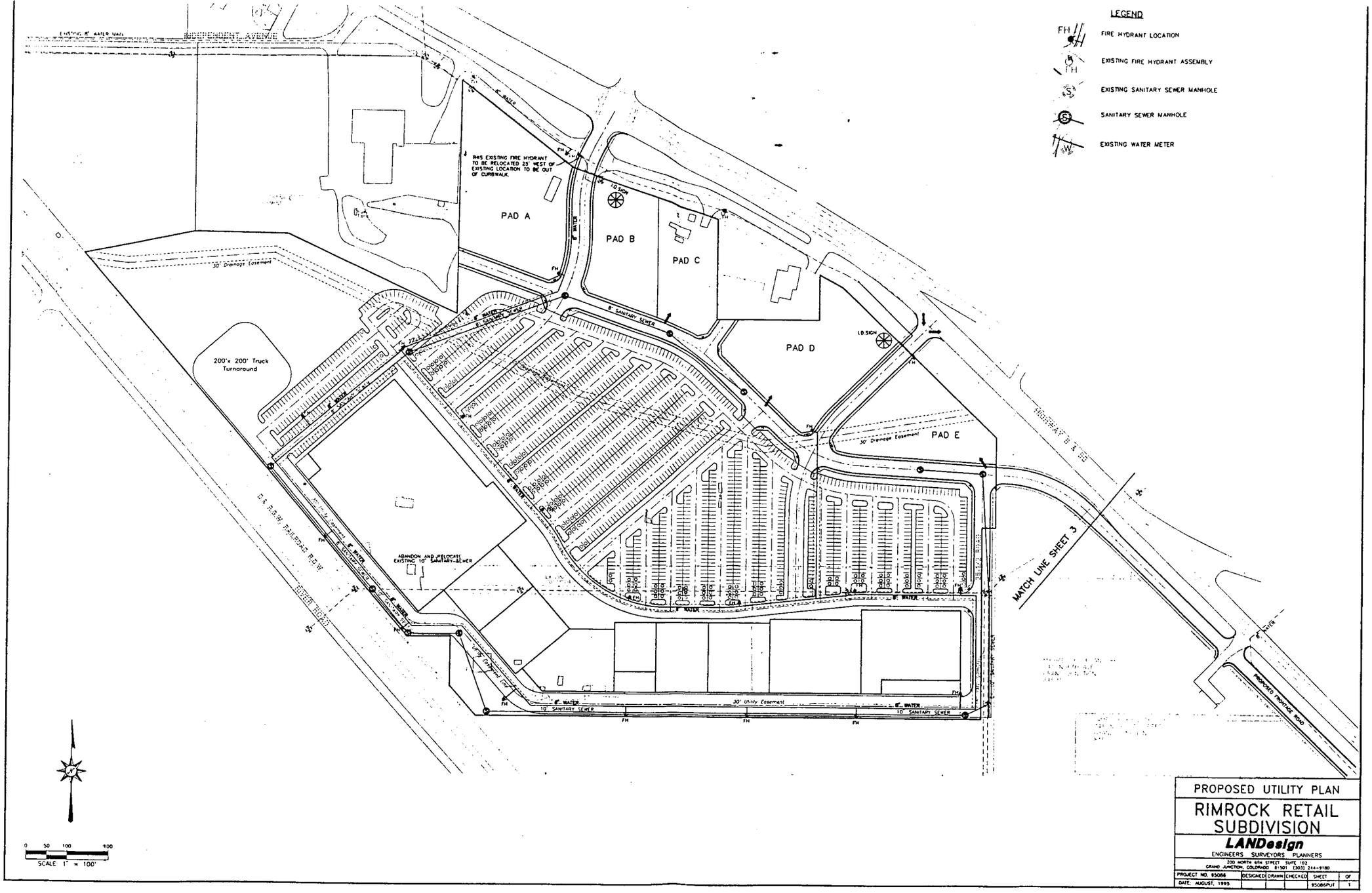
Edward Armstrong
PO Box 1681
City 81502

LANDESIGN
200 N. 6TH ST.
GRAND JUNCTION, CO 81501

Walmart
702 SW 8th St., # 6360
Bentonville, AR 72716

CITY OF GRAND JUNCTION
COMMUNITY DEVELOPMENT DEPT.
250 N. 5TH ST.
GRAND JUNCTION, CO 81501

Robert Wilson
PO Box 60221
City 81506

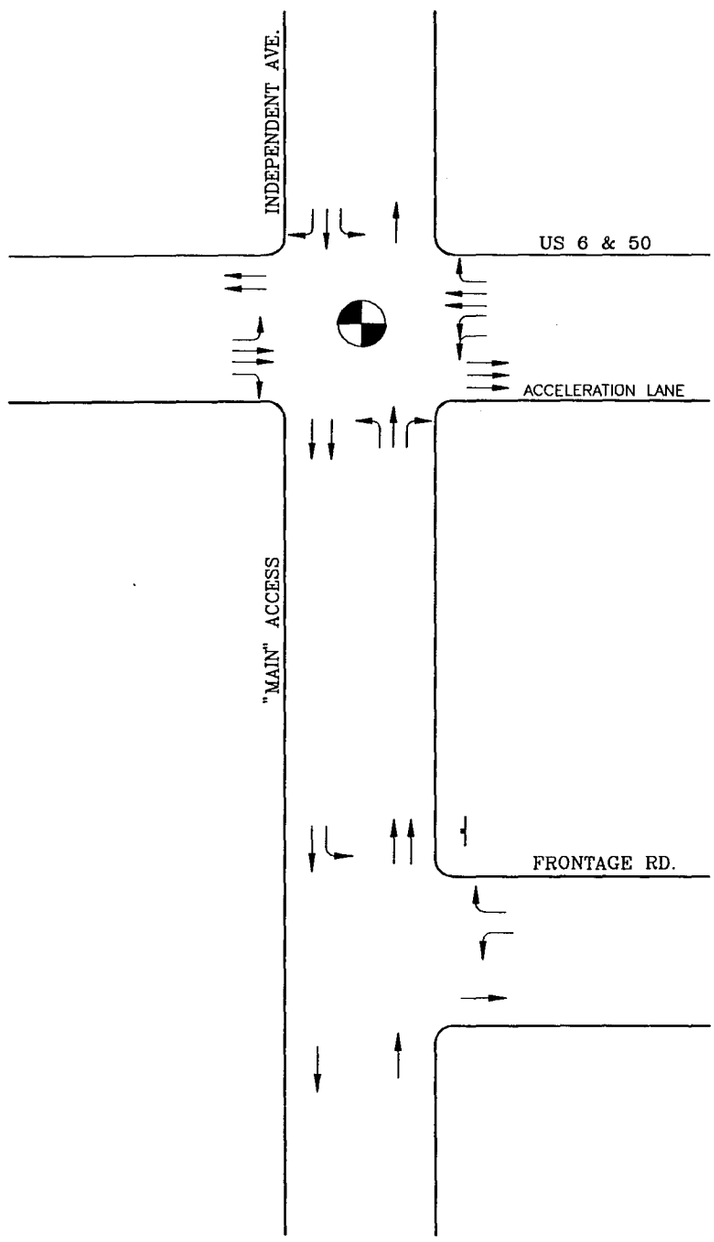


PROPOSED UTILITY PLAN

RIMROCK RETAIL SUBDIVISION

LANDesign
ENGINEERS SURVEYORS PLANNERS
200 NORTH 6TH STREET SUITE 103
GRAND JUNCTION, COLORADO 81501 (303) 244-9180

PROJECT NO. 93086	DESIGNED	DRAWN	CHECKED	SHEET	OF
DATE: AUGUST, 1995				93086PUT	1



NOT TO SCALE

LEGEND:

= TRAFFIC SIGNAL

= STOP SIGN

FIGURE 14

PROPOSED LANE CONFIGURATION AND INTERSECTION CONTROLS

REVISED: 9/1/95

LEIGH, SCOTT & CLEARY, INC.

PHASE I
ENVIRONMENTAL SITE ASSESSMENT

50 Acres
U. S. Highway 6 & 50
Grand Junction, Colorado 81505

Prepared for:

Denver Holdings, Inc.
10065 East Harvard Avenue, Suite 803
Denver, Colorado 80231

Prepared by:

STATESWEST ENVIRONMENTAL CORPORATION
875 Kendall Street
Lakewood, Colorado 80214
(303) 232-5898

December 30, 1994

Project No.: 94-1354

TABLE OF CONTENTS

PHASE I
ENVIRONMENTAL SITE ASSESSMENT

50 Acres
U. S. Highway 6 & 50
Grand Junction, Colorado 81505

EXECUTIVE SUMMARY

Summary of Findings.

The following Phase I Environmental Site Assessment was conducted in order to identify any environmental concerns related to the subject site and the surrounding area. The findings of the assessment identified no concerns related to the history of the site or the surrounding area, however, concerns were identified with the building/ structures, operational activities, and waste management. There are no concerns related to radon, however, due to the age of the structures, there are concerns related to asbestos, lead-based paint, and PCB's.

The site assessment concerns regarding waste management and work practices are related to Hanson Equipment, Inc. The facility has been used for truck sales and service. Indications of past releases of substances into the environment on exterior soil surfaces and via cracks in the concrete floor of the service area were observed. Above ground storage tanks and all equipment are to be removed prior to the future development of the property.

Twelve-inch floor tiles, drop-in acoustical ceiling panels and wall texture were observed throughout the showroom and offices of Hanson Equipment, Inc. Due to the age of the building, the potential exists for these materials to be asbestos-containing. Fluorescent lights were observed throughout the Hanson Equipment, Inc., facility. In addition, on-site personnel indicated the presence of two underground hydraulic lifts which are currently not in use. Due to the age of the facility, the potential exists for

There appeared to be no concerns with regard to the parcel owned by Alvis D. Fetter, which is an arroyo wash with intermittent stream referred to as the Ligrani Ditch.

Conclusions.

The Phase I site assessment is a qualitative evaluation. No sampling and analysis was been performed to quantify the presence of contamination. The findings of the assessment indicate there are presently potential environmental concerns on the subject site and the surrounding area which would require further investigation and/or appropriate actions prior to the development of the property. They are as follows:

- Poor work practices with regard to storage of scrap parts, used batteries, empty drums, used oil filters and other activities at Hanson Equipment, Inc. have resulted in significant soil staining in several exterior locations.

- Poor work practices within the service area have resulted in pooling of waste oil and other substances and significant staining of the concrete floor surface. Also of concern are several cracks in the concrete floor which would allow the substances to seep through to the soil surface below.

- Although the AST systems are to be removed from the site upon relocation, significant soil staining was observed in the vicinity of these systems.

- Reportedly, a 550-gallon UST is present in the area occupied by the former mobile home sales office. A vent pipe and fill port were observed in this area.

- Due to the age of all structures on the Site, the potential exists for asbestos-containing materials. Suspect materials observed included 12" floor tiles, drop-

in acoustical ceiling panels, wall texture material, non-friable cementeous exterior siding, and composition roofing materials.

- Due to the age of all structures on the Site, the potential exists for lead-based paints.

- Due to the age of all structures on the Site, the potential exists for PCBs in fluorescent lights, hydraulic equipment and pole-mounted electrical transformers.

It is StatesWest's opinion that environmental concerns are present which would require additional investigation in the form of a comprehensive asbestos survey, a comprehensive lead-based paint survey, subsurface investigation for petroleum hydrocarbons and/or PCBs from hydraulic fluids, and verification of PCBs in pole-mounted electrical transformers.

This environmental site assessment was performed in accordance with the ASTM Standard E-1527-93.

Respectfully submitted,
STATESWEST ENVIRONMENTAL CORPORATION

Submitted by:
Terri A. Pratt
Environmental Analyst
Certified Hazardous Materials
Technician

Reviewed by:
Charles W. Cooke
President
Registered Environmental Property
Assessor REPA #1689

I. INTRODUCTION

Mr. Lee Richardson, Denver Holdings, Inc., authorized StatesWest Environmental Corporation to conduct a Phase I Environmental Site Assessment pursuant to SWEC Project No. 94-1354. The subject property and its improvements are hereinafter referred to as the "Site".

A. Purpose

The purpose of the Phase I assessment is to determine if environmental concerns may exist at the Site which could impact the value of the property. It is understood by StatesWest that the intended use of the findings of this study is to make decisions regarding the financing and/or due diligence for assignees of approximately 50 acres located at Highway 6 & 50, Grand Junction, Colorado.

B. Scope of Work

This Phase I environmental site assessment consists of the following:

1. **Property Description.** This encompasses a general understanding of the Site and its environmental setting, describing the exact location and physical description of the property. A history of the Site is reconstructed using aerial photographs and interviews.

2. **Records Review.** The purpose of this review is to determine the potential impact of hazardous substances on the Site or the area within a reasonable distance of the Site as a result of either past or present activities. Standard sources available through the federal, state, and local governmental agencies were reviewed. These sources may include, but are not limited to the following:

Federal and State sources

- National Priority List (NPL)
- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)
- Resource Conservation and Recovery Act (RCRA)
- Emergency Response Notification System (ERNS)

- Superfund Amendments and Reauthorization Act Title III Notifiers (SARA)
- State Leaking Underground Storage Tanks (LUST)
- State Underground Storage Tanks (UST)
- State Abandoned Landfills (CAL)

The following agencies were contacted or visited to obtain pertinent information regarding hazardous incidents or other conditions that could potentially affect the environmental status of the Site.

- Environmental Protection Agency
- Natural Resources Conservation Service
- Colorado Department of Health
- Colorado Department of Labor
- Colorado State Geological Survey

Local Sources

- Mesa County Assessor
- Mesa County Clerk and Recorder
- Mesa County Health Department
- City of Grand Junction Building and Zoning Departments
- Grand Junction Fire Department
- Grand Junction Water and Sanitation District
- Colorado Aerial Photograph Service

3. Site Reconnaissance. The goal of the site reconnaissance and interviews is to assess conditions which suggest that hazardous substances are present on or have the potential of migration to the Site. The Site and structures on or near the Site are visually inspected from both exterior and the interior where possible. The objective is to identify the environmental concerns related to operational activities, buildings and materials, waste management practices, hazardous substance storage and handling, and surrounding properties. Other potential environmental concerns related to asbestos, lead-

based paint, radon, methane, and PCB's. No sampling and analysis is conducted in this Phase I Environmental Site Assessment.

4. **Supplemental Information and Documentation.** The appendices include documentation gathered in the development of this assessment. The data includes maps, figures, photographs, ownership documents, regulatory information, interview documentation, owner/operator questionnaire, bibliography, and qualifications of the assessor.

5. **Special Terms and Conditions.** This environmental site assessment was conducted in accordance with the ASTM Standard E-1527-93. The intent of the Standard is to bring uniformity to environmental site assessments and to permit the user to qualify for the "innocent landowner" defense to Superfund liability. This assessment goes beyond Superfund concerns and considers the other environmental issues related to asbestos, lead-based paint, radon, methane, and PCB's. It should be noted that an environmental site assessment is not a certification that the Site is free of hazardous substance contamination.

C. Limitations

This report is based on the results of the investigation described in the Scope of Work. Information not presented to StatesWest during the study or not obtainable within this scope is not the responsibility of StatesWest.

StatesWest is not responsible for independent conclusions, opinions or recommendations made by others based on field observations and laboratory test data presented in this report.

All surficial environmental investigations are inherently limited in the sense that conclusions are drawn and recommendations developed from information obtained

from limited research and site evaluation. The passage of time may result in a change in the environmental characteristics at this site and surrounding properties.

StatesWest has completed this Phase I assessment with a level of care and skill consistent with current professional practices in these matters. Moreover, StatesWest's reporting and documentation in this matter is solely with respect to the date of this investigation. Future use of this report shall be subject to verification or adaptation by StatesWest.

II. PROPERTY DESCRIPTION

A. Site Location and Property Profile

The Site is located in the State of Colorado, County of Mesa. The site consists of four properties. Those with street addresses are identified as: **2523 Highway 6 & 50, 2526 River Road, and 2536 River Road, Grand Junction, CO 81505. The remain -ing property consists of an arroyo wash and intermittent stream identified as the Ligrani Ditch which is located between Hanson Equipment, Inc., and the Ligrani property.** The legal descriptions of the properties are included in Appendix B.

See Site Map, Appendix A and Title Commitments- Appendix B.

B. Site Characteristics.

1. **Physical Description of Site**. The Site contains four properties and approximately 50 acres. It is bounded by a gasoline service station facility and E 1/4 Road on the north. U.S. Highway 6 & 50 traverses from the northwest to the southeast. It is bounded by a dirt road and The Corner Store on the east, and vacant land to the south. The Denver and Rio Grande Western Railroad Right-of-Way and River Road traverses the west-southwest portion of the property. Beyond River Road is the United Companies Asphalt Batch

Plant. The Site is accessible from River Road from the southwest, and E 1/4 Road from the west. There is one retail equipment/service center building on the northwestern portion of the Site. Other structures included two single family residential dwellings and associated out-buildings in the southwestern portion of the site, and a small abandoned office building located on the northeastern portion of the Site. The Hanson Equipment property also includes concrete and asphalt pads. The remainder of the Site consists of vacant land and a wash with an intermittent stream. The Hanson Equipment portion of the Site contains two above ground storage tanks. Reportedly, a 550-gallon underground storage tank is present near the small abandoned office building which was formerly utilized for mobile home sales. A concrete slab is present near the abandoned office building to the south.

See Figure 1: Site Map, Appendix A.

2. **Climate**. The climate in Grand Junction, Colorado is semi-arid. The coldest month is January which averages 37 degrees and the hottest month is July which averages 93 degrees. The annual precipitation is approximately 9 inches. Grand Junction annually has an average of 300 days of sunshine.

3. **Topography**. The Site is relatively flat lying while gently sloping to the west-southwest toward the Colorado River, which is located approximately 0.3-mile west of the Site. An intermittent stream, known as the Ligrani Ditch divides the property. The city Flood Insurance Rate Map (Panel 080117 0006E, Panel 6 of 9) prepared by the Federal Emergency Management Agency (FEMA) indicates that the Site is in a Zone X designated area which corresponds to an area outside the 500-year flood plain. The surface elevation at the Site is approximately 4545 feet above sea level. See Flood Insurance Rate Map and Topography Map, Appendix A.

4. **Surface water**. According to the city engineer, storm water runoff and surface drainage in the area of the Site is towards the Ligrani Ditch, which divides the property. Runoff and surface drainage ultimately discharges into the Colorado River located approximately 0.3-mile west of the Site.

5. **Geology/Hydrogeology.** The area of the site consists of unconsolidated surficial deposits and rocks of Quaternary Age which includes gravels and alluviums (Pinedale and Bull Lake Age) and includes Broadway and Louviers Alluviums (U.S.G.S. Geologic Map of Colorado). Soils consist primarily of Green River very fine sandy loam, deep over gravel, with 0 to 2 percent slopes. This soil occurs along the Gunnison and Colorado Rivers. The surface soil, a pale-brown or light brownish-gray very fine sandy loam, contains numerous small fragments of mica. Below depths of 10 to 12 inches, the very fine sandy loam has a brighter pale-brown or very pale-brown color, and at depths of 24 to 30 inches it grades into similarly textured soil material that shows light-gray and reddish brown specks or very small spots. Below depths of 3 or 4 feet, textural variations are common, but fine sandy loam is dominant (U.S.D.A. Natural Resources Conservation Service, formerly known as the Soil Conservation Service). This area is identified as a strongly saline or saline-alkali area,which would indicate that there may be ground water at a relatively shallow depth. The regional ground water flow direction is assumed to be to the west-southwest toward the Colorado River.

7. **Fill.** According to on-site sources, the Ligrani, Venegas, and Fetter sites have received no fill dirt, however, a facility representative for Hanson Equipment, Inc. indicated that two stockpiles of soil on the southern portion of the property is clean fill dirt. Originally, there were plans to expand the facility to the south. Over the past year clean fill dirt has been brought into this area of the property. According to the facility representative, to the best of

his knowledge it has been clean fill dirt. There is no indication that fill dirt is an environmental concern.

8. Utilities. The Site is served with natural gas and electricity from the Public Service Company of Colorado. One pad-mounted electrical transformer was observed on the east side of Hanson Equipment, Inc., and was labelled as non-PCB containing. Three pole-mounted transformers were observed on the Site, however there was no labelling of these transformers. At the time of this report, verification had not been received from Public Service of Colorado with regard to PCB content or ownership and maintenance responsibility. Verification by the electric utility company is recommended prior to development of the Site. The building is connected to the City of Grand Junction Water and Sanitation District systems.

C. Site History

Current owner/operators of Hanson Equipment, Inc., Mr. Bob Hanson and Mr. Rob Hanson, property owners Mr. Fred Ligrani and Mr. Roxy Ligrani, and city and county employees were interviewed; and aerial photographs were researched to determine the past land uses of the Site. The owners of the other two parcels in this transaction, Mr. Venegas and Mr. Fetter, were not available. The majority of the Site was homesteaded and utilized for vegetable crops by the Ligrani family since the early 1900's, with the exception of the southernmost parcel and the wash area. Hanson Equipment purchased the original Ligrani homestead site situated in the northwest portion of the Site, and constructed their present facility in 1977. The facility has been mixed-use retail operations mostly associated with truck repair, sales, and parts and general office use. The remainder of the Ligrani parcel has remained either vacant land or agricultural. There are no indications that there have been ponds, lagoons, or disposal areas on the Site. According to individuals interviewed, there have been no

previous Phase I Environmental Site Assessments conducted on the Site, however, Mr. Fred Ligrani indicated that uranium mill tailings had been removed from the site, and subsequently, a 550-gallon UST. According to documentation provided by Mr. Ligrani, correspondence from the Department of Energy dated June 28, 1991 indicates that 253 cubic yards of material in a 331 square meter area was removed. According to the correspondence, the Ligrani property has been cleared of residual radioactive contamination to the extent required by the Environmental Protection Agency (EPA) standards (40 CFR 192). There is no mention of the 550-gallon UST in the documentation, however, as explained by Mr. Ligrani, the uranium mill tailings were used as fill at the time of the installation of the UST, and therefore the UST was removed at the time of the uranium mill tailings remediation.

Additionally, Mr. Bob Hanson provided documentation to StatesWest personnel dated January 30, 1986 indicating that an evaluation of the Hanson Equipment site did not reveal the presence of residual radioactive material in excess of standards established by the EPA, and therefore, did not require remedial action. See Regulatory Information, Appendix C.

1. **Aerial Photographs.** Four historical aerial photographs were provided by a private aerial photographic service, and one historical aerial photograph was obtained from the City of Grand Junction. They were examined under stereoscope magnification to determine previous use and historical development of the Site and surrounding area. The aerial photographs studied by StatesWest were:

Aerial Photographic Date

1.) May 21, 1950

2.) August 17, 1957

3.) Date Unknown, 1965

4.) March 12, 1979

5.) September 16, 1994

The 1950 through 1965 aerial photographs showed the property to be primarily agricultural in use. The 1979 aerial photograph showed the presence of the Hanson Equipment facility and the mobile homes sales facility. The remainder of the site remained primarily agricultural in use. The above ground storage tanks were visible at the adjacent gasoline service station. No landfills were apparent in the area.

In summary the aerial photographs appear to verify the information provided by the current owner and the city and county records. There are no indications of lagoons, ponds, disposal areas, on the Site or the adjoining properties. The area within a mile radius of the Site is primarily commercial retail, residential, and industrial. See Aerial Photograph, Appendix A. The area is further examined in the following section.

III. RECORDS REVIEW

A. Federal Records

1. NPL

The National Priority List (NPL) contains the names of sites that have been evaluated by the EPA and found to be so contaminated that they are scheduled for further characterization and mitigation. These sites are referred to as "Superfund" sites. A review of this list dated November 15, 1994, indicates that there are no NPL sites within a one-mile search distance from the Site.

2. CERCLIS

The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) is a database that identifies, describes, and determines the impact of abandoned or inactive facilities that may be of consequence to the Site. A review of CERCLIS dated November 16, 1994, indicates that there is one CERCLIS sites within a half-mile search distance from the Site. The site is identified as Grand Junction Projects Office, located at 2597 B 3/4 Road, and situated approximately 2.5 miles southeast of the Site. An investigation of this facility by the U.S. Department of Energy (DOE) is focused on remedial action to stabilize and control uranium mill tailings and related contaminated material. This facility lies within the flood plain of the Gunnison River and is separated by the river by an earthen flood-control dike. Based on the distance and location relative to the Site, it is unlikely that past activities at this facility have impacted environmental conditions at the subject property.

3. RCRA TSD

The Resource Conservation and Recovery Act (RCRA) list contains names of facilities that have notified the EPA or the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management that they treat, store, and dispose (TSD) of hazardous waste. A review of the RCRA Facility Listing dated November 16, 1994, indicates that there are no RCRA TSD facilities within a one-mile search distance from the Site. *However, the Hanson Equipment, Inc. truck repair operation is a RCRA Notifier as a small quantity generator of hazardous waste. This indicates that Hanson Equipment, Inc. generates about 25 to 300 gallons of hazardous waste per month and has notified under RCRA in compliance with federal regulations. Auto repair operations generate hazardous waste as a result of*

using solvents for parts washing. Solvent wastes are stored in self-contained wash units and waste is picked up and transported for recycling and disposal by an EPA approved transporter, Safety-Kleen Corp. There appears to be minimal concern at the Site regarding this issue.

B. State and Local Records

1. ERNS

The Emergency Response Notification System (ERNS) list contains hazardous materials spill notifications assembled by the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division. A review of the ERNS listing dated October 18, 1994 indicates that there has been no notification of a spill at the Site.

2. LUST

The list of reported Leaking Underground Storage Tanks (LUST) is compiled by the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division. A review of these lists dated October 17, 1994, indicates that there are three (3) LUST sites within a half-mile search distance from the Site. They are as follows:

(Map No.) Facility/ Location/ Date of Notification(s)

(1) Mesa Auto Plaza, 2566 Highway 6 & 50, Closed

The Mesa Auto Plaza is situated approximately 1/4-mile east and upgradient from the site. A review of the file at the Colorado Department of Public Health and Environment reviewed by StatesWest personnel indicated that a Closure Report and Environmental Assessment for the UST closure for the Mesa Auto Plaza was submitted to the CDH on July 29, 1994. Based upon information submitted, it appears that appropriate actions have been taken to remove the source of contamination and to reduce the potential for further impacts to occur as a result of the contamination at the facility. The CDH

does not require any further investigations or remedial actions at this time. Additionally, information within the CDH file indicated groundwater flow direction to be south-southwest, toward the Colorado River, and crossgradient from the subject Site. Due to favorable geologic/hydrogeologic conditions, it is unlikely that past activities have impacted environmental conditions at the Site.

(2) *Amoco Oil #3029, 1105 N. 1st Street*
(3) First & North Texaco, 101 North Avenue

Amoco Oil #3029 and First & North Texaco, are situated approximately 0.65-mile east and topographically upgradient from the Site. Based on the location and distance from the Site, and favorable hydrogeologic conditions, it is unlikely that past activities from these facilities have impacted environmental conditions at the Site.

See Record Review Map, Appendix A - Sites #1, 2, & 3, and Appendix C - Regulatory Information.

3. UST

The Colorado Department of Labor Oil Inspection Division provides a list of registered Underground Storage Tanks (UST) that are either in use or have been temporarily or permanently closed. According to these data there are four (4) UST sites that are currently in use at the Site or an adjoining property. They are:

(Map No.)/ Facility/ Location/ # of Tanks/ Status

(1) Go-Fer Foods #101, 2515 Highway 6 & 50, 4 ASTs In-use
(2) Western Slope Chrysler, 2578 Highway 6 & 50, 2 In-use
(3) Holly Brownson, 930 Independent Avenue, 1 In-use
(4) Mesa Auto Plaza, 2566 Highway 6 & 50, 2 Permanently closed.

The facility identified as Go-Fer Foods, located at 2515 Highway 6 & 50 is situated adjacent to the northwest and topographically crossgradient of the

Site. Four above ground storage tanks (ASTs) at this site are within secondary containment.

The facility identified as Western Slope Chrysler, located at 2578 Highway 6 & 50 is situated approximately 0.30-mile east and upgradient of the Site.

The facility identified as Holly Brownson, located at 930 Independent Avenue, is situated approximately 0.20-mile north and upgradient of the Site.

No reported releases were found associated with the above petroleum storage tanks in the CDH database listing.

The facility identified as Mesa Auto Plaza is included in the above LUST discussion.

See Record Review Map, Appendix A - Sites #1, 2, & 3, and Appendix C - Regulatory Information.

In addition, as previously mentioned in this report, a 6,000-gallon diesel fuel AST and a 1,000 - 1,500-gallon waste oil tank are located at Hanson Equipment, Inc. These tanks are to be removed from the site upon relocation of Hanson Equipment Inc., however, soil staining associated with these ASTs was observed.

A 550-gallon UST is present near the northeast corner of the Site, near the small structure utilized as a mobile home office, according to the current owner of the property. Associated vent pipe and fill port were observed at this location by StatesWest personnel. Removal of this UST and associated piping in accordance with all federal, state, and local regulations is recommended prior to development of the Site.

4. SOLID WASTE SITES

The list of operating solid waste sites is compiled by the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division. A review of this list dated December 27, 1993 indicates there are no active solid waste landfill sites within a one-mile search distance from the Site.

5. ABANDONED LANDFILLS

The list of abandoned landfills are compiled by the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division. A review of this list indicates there is one (1) abandoned landfill within a half-mile search distance from the Site. It is identified as:

Map No./ Facility/ Location

(1) First Sheet, located 1/2 mile west of First Street.

Based on interviews with city and county employees, review of aerial photographs, and StatesWest reconnaissance of the area surrounding the subject site, it does not appear that this facility is near the Site.

6. **Building Permits.** Due to the record keeping practices of the City of Grand Junction Building Department, StatesWest was unable to review any permit files that may exist for the Site..

7. **Fire Department.** The Grand Junction Fire Department reported no hazardous material spills or violations at the Site.

IV. SITE RECONNAISSANCE

A. Building/Structures

Hanson Equipment, Inc.

The building construction is a combination single-story for the retail/office portion on the north end, and a single-story warehouse-type for the truck repair shop on the south side. Building area size was not available. The office/retail building is brick construction with a flat roof. The truck service building is metal. Roof structure of the service area is a steel joist structure with metal decking. The office walls are brick

or drywall and light texture. Floors in the retail/office portion are either concrete, brick, carpet or twelve inch floor tiles. Ceilings are drop-in acoustical ceiling panels. Lighting is by fluorescent lights throughout the retail/office and service area. Heating for the offices and parts department is by a natural gas forced air system. Cooling is by ceiling mounted swamp coolers. Heating for the service area is provided by the ceiling mounted Reznor waste oil burner. Cooling is not provided in the service area. Pipes wrapped with suspect thermal insulation or sprayed-on insulation on the decking in the service area was not observed.

Hanson Equipment, Inc., sells and services trucks. Truck service includes all types of vehicle maintenance and repairs. Various fuels, lubricants and solvents have been used at the facility. Bulk petroleum products are stored in the service area in an above ground tank or drums.A 500-gallon above ground oil tank is located in the shop area and is dispensed to various stations within the service area. Additionally, according to on-site personnel, two underground hydraulic lifts are present in the service area. The lifts have been out of use for some time but were never removed.
The floors were observed to have significant oil staining. Several cracks were noted in the concrete floor. The exterior portion of the property has an asphalt paved parking area on the north side of the property used for truck parking, and a concrete pad on the east side of the service bays. Parking on the east and west sides of the facility is on the ground surface. During the site inspection, the east yard was used for vehicle and equipment storage, empty drum storage, used battery storage, and used and scrap part storage. The trash dumpsters are located to the east of the building. The west yard was used for vehicle and equipment storage and cargo tank storage. According to a facility representative, the cargo tanks were utilized for water.

Environmental concerns related to the building structures include suspect asbestos containing materials in twelve-inch floor tiles, drop-in ceiling panels, drywall and wall texture; the potential for lead-based paints, and potential PCB's in fluorescent lights and underground hydraulic equipment. See Photos 1 - 10, Appendix A.

Ligrani Property

Structures on the Ligrani property include a small frame structure with composition roof, previously utilized as a mobile home sales office which is located in the northeastern portion of the property. The interior of the structure was not accessible. The age of the structure is unknown, therefore, the possibility exists for asbestos-containing materials and/or lead-based paint. Also observed at this location was a concrete slab to the south of the office structure, and a mobile home to the west of the office structure, which was reported by the owner of property as being temporarily stored there. Additionally, a vent pipe and fill port were observed near the northeast corner of the sales office structure. Reportedly, the mobile home sales facility utilized a 550-gallon UST.

An occupied single family residential dwelling and other structures are located in the southwestern portion of the property. Portions of the property are utilized for junk car and equipment storage and storage of farm equipment and non-operational vehicles. The single family dwelling is of frame construction with concrete slab foundation and composition roof. The interior of the single family residence was not accessible. According to the owner, the structure dates to 1900, and the interior materials consists of ceilings and walls of lath and plaster and drywall, and floors of carpet and linoleum. The linoleum was installed prior to 1985. The exterior walls of the structure appeared to be covered with a non-friable cementeous asbestos siding.

Two storage sheds and the packing shed were observed to have deteriorating painted exterior surfaces. The exterior walls of the shed adjacent to the packing shed were covered with composition roofing shingles. The interiors of the packing shed and the adjacent shed did not appear to have any suspect asbestos containing materials within their interiors. The interior of the shed on the easternmost portion of the property was not accessible. Based on the age of the structure, the potential exists for asbestos-containing materials to be present in the interior and exterior materials of the structure, as well as the potential for the presence of lead-based paint. Prior to demolition, renovation, or remodeling of this structure, a comprehensive asbestos survey and lead-based paint survey should be conducted to confirm the presence or absence of these materials. See Photos 11 - 15, Appendix A.

Venegas Property.

An occupied single family residential dwelling and other deteriorating structures were present on the property. Abandoned vehicles were observed on the property. The interior of the dwelling and the other structures were not accessible for inspection. Information with regard to the construction materials or the construction date was not available. However, based on visual observation, the age of the dwelling appears to be such that the potential exists for the presence of asbestos-containing materials and/or lead based paint. Prior to demolition, renovation, or remodeling of this structure, a comprehensive asbestos survey and lead-based paint survey should be conducted to confirm the presence or absence of these materials. The occupant of the dwelling indicated that he was not aware of any above or below ground storage tanks. See Photos 16 - 17, Appendix A.

C. Waste Management Practices.

The waste management concerns are related to the generation of waste related to solvents for parts washing, battery exchange, oil changing operations, scrap parts and metals, and oily sand from the sand traps. The service area floors are concrete with several cracks and significant staining and pooled substances from current operations. The shop is equipped with a slotted-drain system for floor cleaning purposes. This drain discharges to a concrete chambered grease interceptor on the east side of the exterior of the building and through a dual sand trap system before it is discharged to the sanitary sewer system. Liquid from the steam cleaning system is also discharged to the floor drain system. The oil, water, and sediment in the floor drain system are removed on an as needed basis by Goodwins Septic Tank Service. Wastewater passing through the sand trap system is subsequently discharged to the sanitary sewer system. The waste water entering the sand trap is generated from all floor areas within the shop and the concrete pad on the east side of the service area. There is potential for oils, grease, fuels, antifreeze, cleaning chemicals and solvents to be discharged into the floor drain system.

An oil burner utilized for the combustion of the waste oil is currently being used in the service area. Waste oil is pumped from the outside AST to a holding tank in the service area and subsequently pumped to a ceiling mounted Reznor oil burner. Significant soil staining and a small pool of standing oil were observed below the holding tank. Facility personnel and a representative with the installer/servicer of the oil burning equipment have indicated that permitting for air emissions is not required on this equipment.

Abutting the service building to the south is an above ground 1,000 - 1,500-gallon waste oil tank which is secured within a below grade concrete block containment.

Dark liquid with a sheen was present within the lower portion of the containment area. Significant staining of gravel and soil was observed in the area around the concrete block containment. Waste oil from the AST is pumped to the holding tank within the service shop and subsequently pumped to the Reznor oil burner. According to facility personnel, the waste oil AST is emptied by Approved Oil Service, Inc., when the oil burner is non-operational or being serviced, which occurs approximately on a quarterly basis

The site inspection revealed several areas that exhibited soil staining from improper storage practices with regard to used parts and oil filters. Although many of the used parts in the east yard were stored on wooden pallets, many were placed directly on the ground surface, allowing residual oils and/or solvents to drain onto the ground surface, resulting in significant staining of the gravel and soil. All of the used parts in the east yard are exposed to weather conditions, resulting in the potential for soil and groundwater contamination. During the inspection, StatesWest personnel noted potential areas of concern that may impact the storm water runoff from the facility. Oil staining around the waste oil containment area and in the east yard may be incorporated into the runoff, particularly near a drainage conduit immediately adjacent to an area of improperly stored used parts with significant oil staining. The potential exists for contamination from runoff from this area to the discharge point of the conduit. Due to inclement conditions, the point of discharge for the conduit could not be determined. Most used batteries were stored off the ground and protected from the weather, however, two batteries were observed on a wooden pallet and exposed to weather conditions. Also noted were several drums, some with unknown contents with missing bung caps that were exposed to weather conditions. The Hanson Equipment facility appears to maintain poor housekeeping and work practices with several

indications of staining from spills or improper storage of waste. See Photos 20 - 31, Appendix A.

D. Hazardous Substances Storage and Handling.

The current storage and handling of hazardous substances at the Site is related to solvents, batteries, anti-freeze, and the above ground storage tank systems. The service area does not store quantities of bulk lubricants and solvents other than those currently in use. Materials are replenished on an as needed basis through the parts department. Lubricants and cleaning solvents are used throughout the shop area and various work stations. A 500-gallon aboveground oil tank is located in the shop area . Oil from the tank is dispensed to work stations in the service area. Lubricants such as gear grease and HD 80W90 are in drums and centrally located in the shop area. The facility is equipped with four Safety Kleen self contained parts solvent bath cleaning systems which are serviced approximately every eight weeks. The facility does not store any solvents for this equipment on the premises. All fresh solvent solutions and used solvents are stored, removed, and transferred by Safety Kleen.

A 6000-gallon diesel fuel AST and dispenser is currently in use and located to the south of the waste oil AST. The diesel AST is contained within a lined pit, however, deterioration of the lining was observed. In addition, some soil staining was observed around the dispenser and AST area.

A steam cleaner for engine cleaning is located within the shop area. On-site personnel indicated that the fluids are replenished by the servicer and none are stored on-site. Liquids from the use of the steam cleaner are discharged to the floor drain system.

The facility has several registered technicians for servicing truck air conditioning systems. The facility has a Freon extraction and filtering system which is used to

service the air conditioning systems. A facility representative indicated that all Freon removed from the truck air conditioning systems is reused. New Freon containers are destroyed when emptied and disposed of as scrap metal.

There were no observable indications that the shop materials were stored improperly. There were no violations of hazardous substance storage practices or spills reported by the local fire department, however, significant staining and pooled oil were observed on the shop floor. Several cracks in the concrete floor were also observed. Material Data Safety Sheets (MSDS) are available to employees and were available for review by States West personnel.

Reportedly, a 550-gallon UST is present in the northeast portion of the Ligrani Property, near the structure previously used for mobile home sales. A vent pipe and fill port were observed at this location.

See Photos 32 - 35, Appendix A.

E. Adjoining Properties Review.

The land use at contiguous properties around the subject site consists of the following:

1. **North**. To the north a convenience store and gasoline service station facility. This property is located topographically crossgradient from the Site.
2. **East**. To the east is a retail store and vacant land. This property is located upgradient the Site.
3. **South**. To the south/southwest is a railroad right-of-way and River Road. These properties are located downgradient from the Site.

4. West. To the west is a railroad right-of-way and vacant land. These properties are located downgradient to the Site.

The environmental considerations are as follows:

1. North. Minimal.
2. East. Minimal
3. South. Minimal
4. West. Minimal

F. Other Potential Environmental Concerns.

1. Asbestos. Construction materials containing asbestos have been used extensively in schools and other buildings. The concern about exposure to asbestos in these buildings is based on evidence linking various respiratory diseases with occupational exposure in the shipbuilding, mining, milling, and fabricating industries. The presence of asbestos in a building does not mean that the health of the building occupants is endangered. If asbestos containing materials (ACM) remains in good condition and is unlikely to be disturbed, exposure will be negligible. However, when ACM is damaged or disturbed - for example, by maintenance, repairs, or renovation conducted without proper controls - asbestos fibers are released. These fibers can create a potential hazard for the building occupants. The EPA has published regulations to reduce asbestos exposure. The first EPA regulations were issued in 1973 which partially banned spray-applied ACM in new buildings. The regulations were revised in 1975 and 1978 to cover building renovations and the use of all types of insulating ACM in new buildings. *All structures on the Site were constructed prior to 1978. Therefore, the potential exists for ACM. A visual inspection identified suspect surfacing materials and miscellaneous ACM at*

Hanson Equipment, Inc., and the structures located on the Ligrani and Venegas properties. It is recommended that prior to demolition and development of the property that a comprehensive asbestos survey be performed to identify all ACMs present.

2. **Radon Survey**. Radon is a radioactive gas which is released by soil or rock containing trace amounts of radium or uranium, as these elements decay. Radon itself then decays into "daughter products", some of which attach themselves to small particles in the air, and can be inhaled deep into the lungs. Radon can be transported in water or in natural gas into buildings. Indoor concentrations of radon can range from the same as outdoor levels to several hundred times higher in situations where it has accumulated inside. Radon is a pollutant that has been linked to lung cancer in uranium miners. A radon study conducted by the Colorado Geological Survey, 1991, records average concentrations of radon in the area of the Site of 2.97 pCi/L. *Radon appears to be a minimal concern at the Site.*

3. **Methane.** Methane is a colorless, odorless, flammable gaseous hydrocarbon, present in natural gas and formed by the decomposition of organic matter, in landfills, marshes, and mines. Methane is an environmental hazard when it is allowed to migrate into an enclosed area, concentrate, and ignite. *The Site is not located in close proximity of an abandoned landfills that could impact the Site.*

4. **PCB's.** Polychlorinated biphenyls (PCBs) are pathogenic and teratogenic industrial compounds used a heat-transfer agents from 1929 until it was banned in 1979. *StatesWest personnel observed one pad-mounted electrical transformer at Hanson Equipment, Inc., and three pole-mounted transformers located throughout the site. The transformers were observed to be in generally good condition. The pad-mounted electrical transformer at*

Hanson Equipment, Inc., was labelled as non-PCB, however, at the time of this report, a response had not been received from Public Service Company of Colorado with regard to the pole-mounted transformers. Without specific content information, the equipment must be classified as PCB-contaminated in accordance with EPA regulation 40 CFR 761. StatesWest assumes that the utility company accepts full responsibility for the operation and maintenance of its transformers, and would assume full responsibility in the event of a spill. It is recommended that PCB content be verified with the electric utility prior to development of the Site.

Fluorescent light fixtures were observed throughout Hanson Equipment Inc. U.S. EPA regulations prohibit the use of PCBs as a dielectric fluid in fluorescent light ballasts manufactured after 1979. Because the building is older, original or replacement ballasts could potentially have been installed which could contain PCBs. In the event of demolition or renovation resulting in disposal of a large quantity of ballasts, the labels should be checked to ensure that they are property disposed of.

According to on-site personnel, two out-of-service underground hydraulic lifts are present in the service area. Due to the age of the building, the hydraulic equipment could potentially contain PCBs. Prior to demolition it is recommended that the hydraulic oil be tested for PCB content, and disposed of and disposed of in accordance with all applicable federal, state, and local guidelines and regulations. See Photos 36 - 39, Appendix A.

5. **Lead-Based Paint.** Inorganic lead is ubiquitous in the environment as result of industrialization. It has no human physiological value and is toxic to humans in small amounts. Children are particularly vulnerable and may be

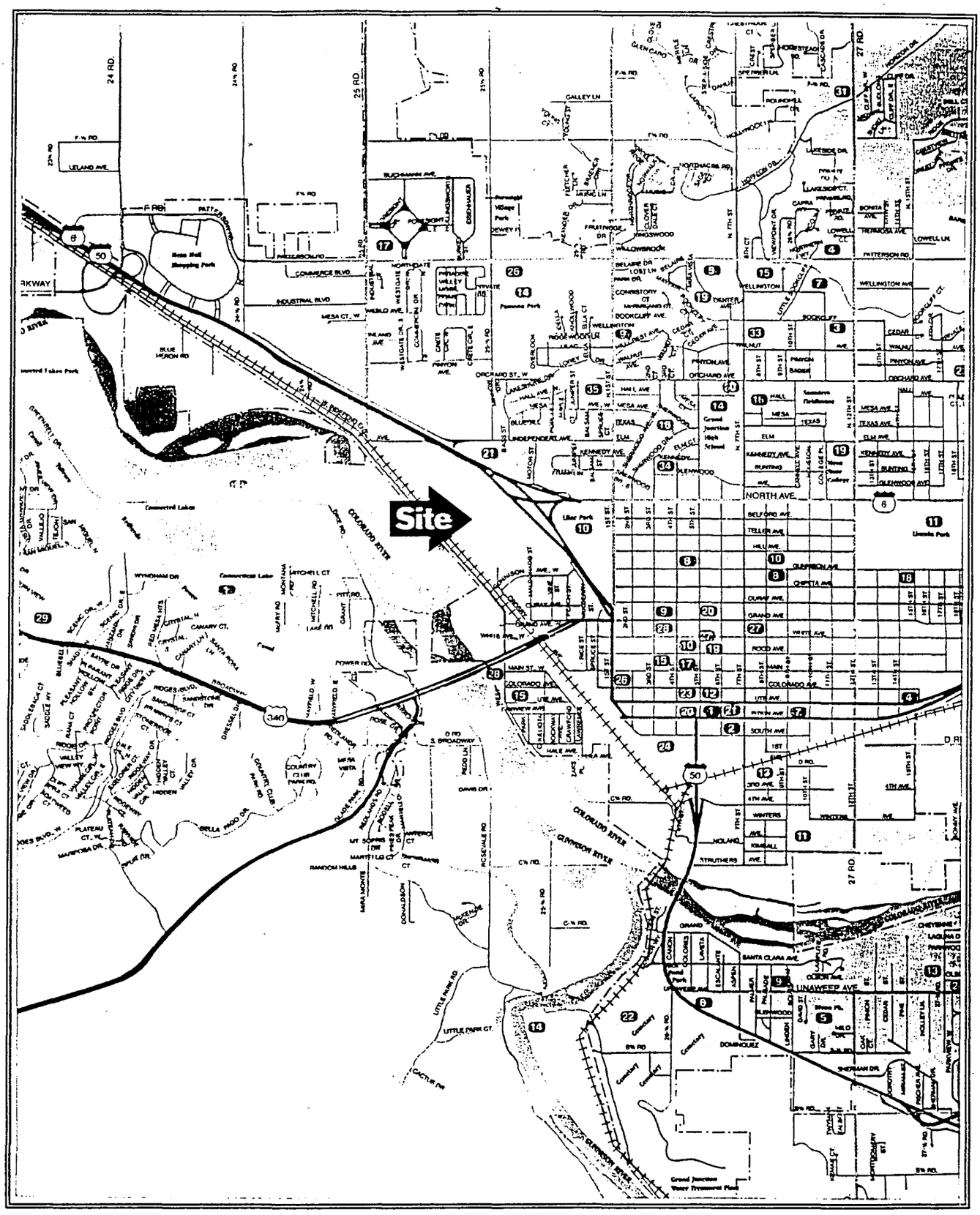
permanently impaired as a result of significant lead exposure. Lead-based paint was banned in 1978 and, therefore, most buildings constructed prior to 1978 contain lead-based paint. The lead-based paint hazard is defined as a condition causing exposure to lead from dust, soil, or paint that is deteriorated or present in accessible, friction, or impacted surfaces that would result in adverse health effects. *Structures on the Site were constructed prior to 1978, therefore, the potential exists for lead-based paint on all painted surfaces at the Site. It is recommended that prior to demolition of any structures, that a comprehensive lead-based paint assessment be performed.*

6. **Radioactive Materials**. According to documentation provided by Mr. Ligrani, correspondence from the Department of Energy dated June 28, 1991 indicates that 253 cubic yards of material in a 331 square meter area was removed. According to the correspondence, the Ligrani property has been cleared of residual radioactive contamination to the extent required by the Environmental Protection Agency (EPA) standards (40 CFR 192). There is no mention of the 550-gallon UST in the documentation, however, as explained by Mr. Ligrani, the uranium mill tailings were used as fill at the time of the installation of the UST, and therefore the UST was removed at the time of the uranium mill tailings remediation.

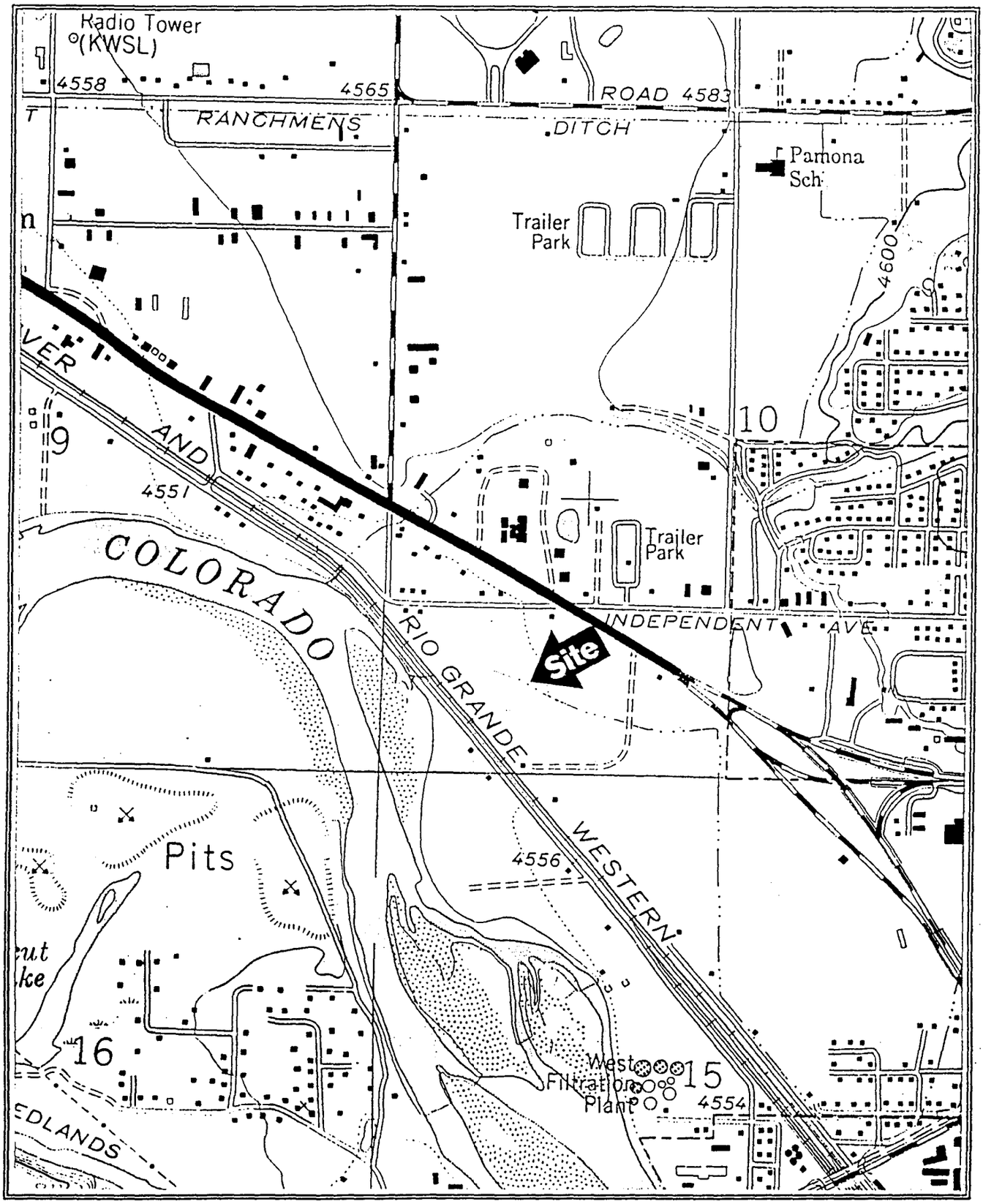
Additionally, Mr. Bob Hanson provided documentation to StatesWest personnel dated January 30, 1986 indicating that an evaluation of the Hanson Equipment site did not reveal the presence of residual radioactive material in excess of standards established by the EPA, and therefore, did not require remedial action. See Regulatory Information, Appendix C

APPENDIX A

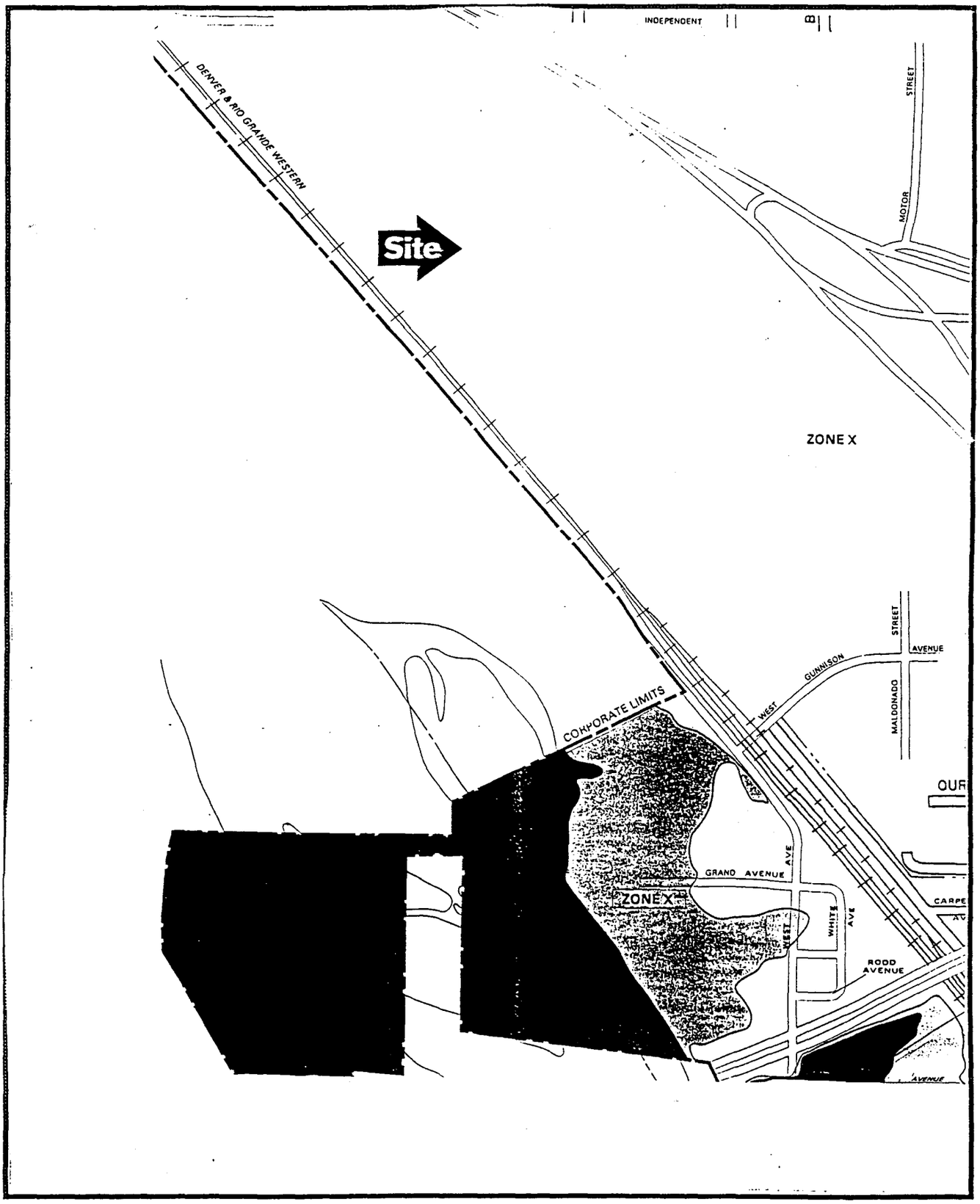
MAPS, FIGURES, PHOTOS



LOCATION MAP	StatesWest Environmental Corporation ENVIRONMENTAL SITE ASSESSMENTS



TOPOGRAPHIC MAP	StatesWest Environmental Corporation ENVIRONMENTAL SITE ASSESSMENTS



FLOOD PLAIN MAP	StatesWest Environmental Corporation ENVIRONMENTAL SITE ASSESSMENTS

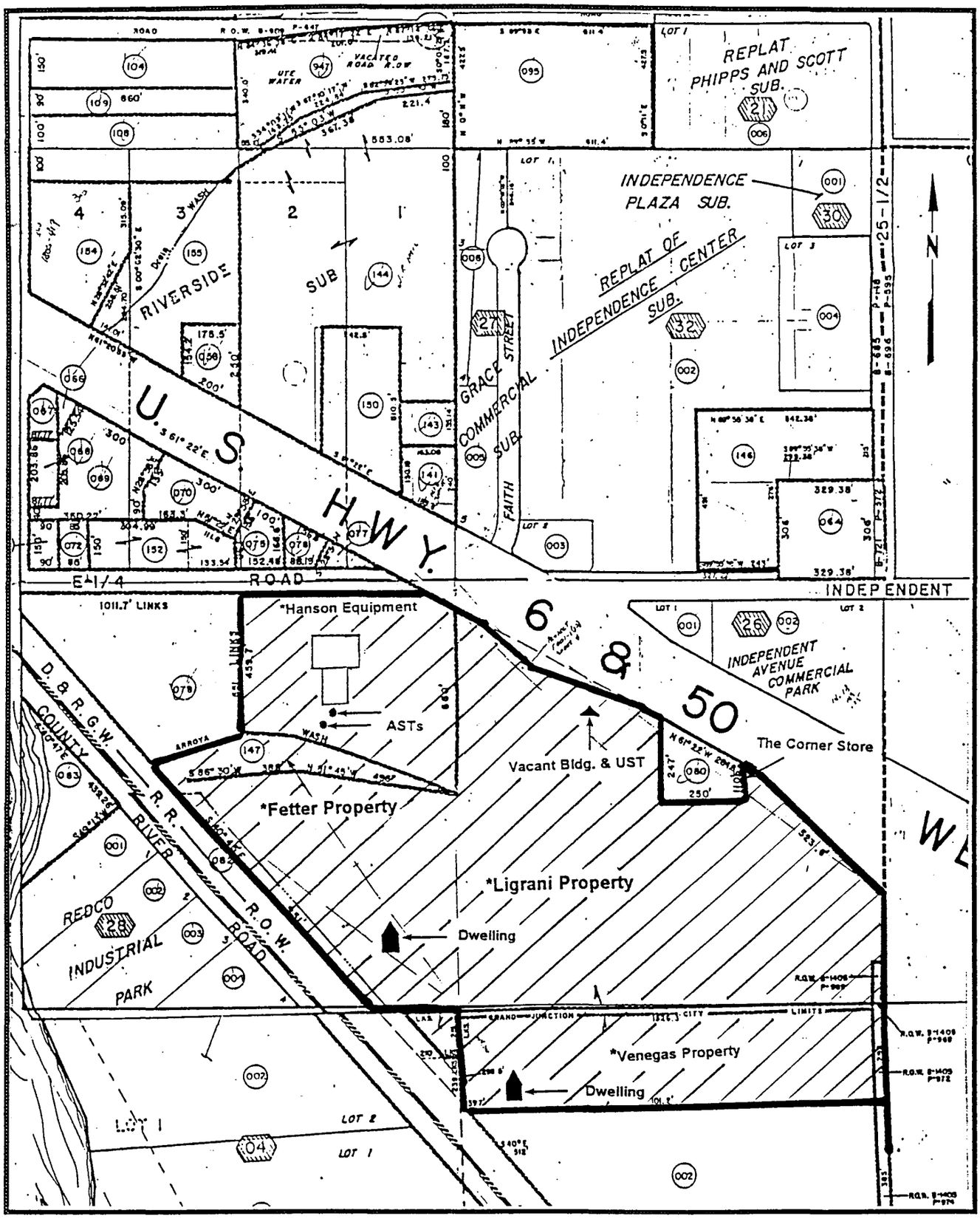
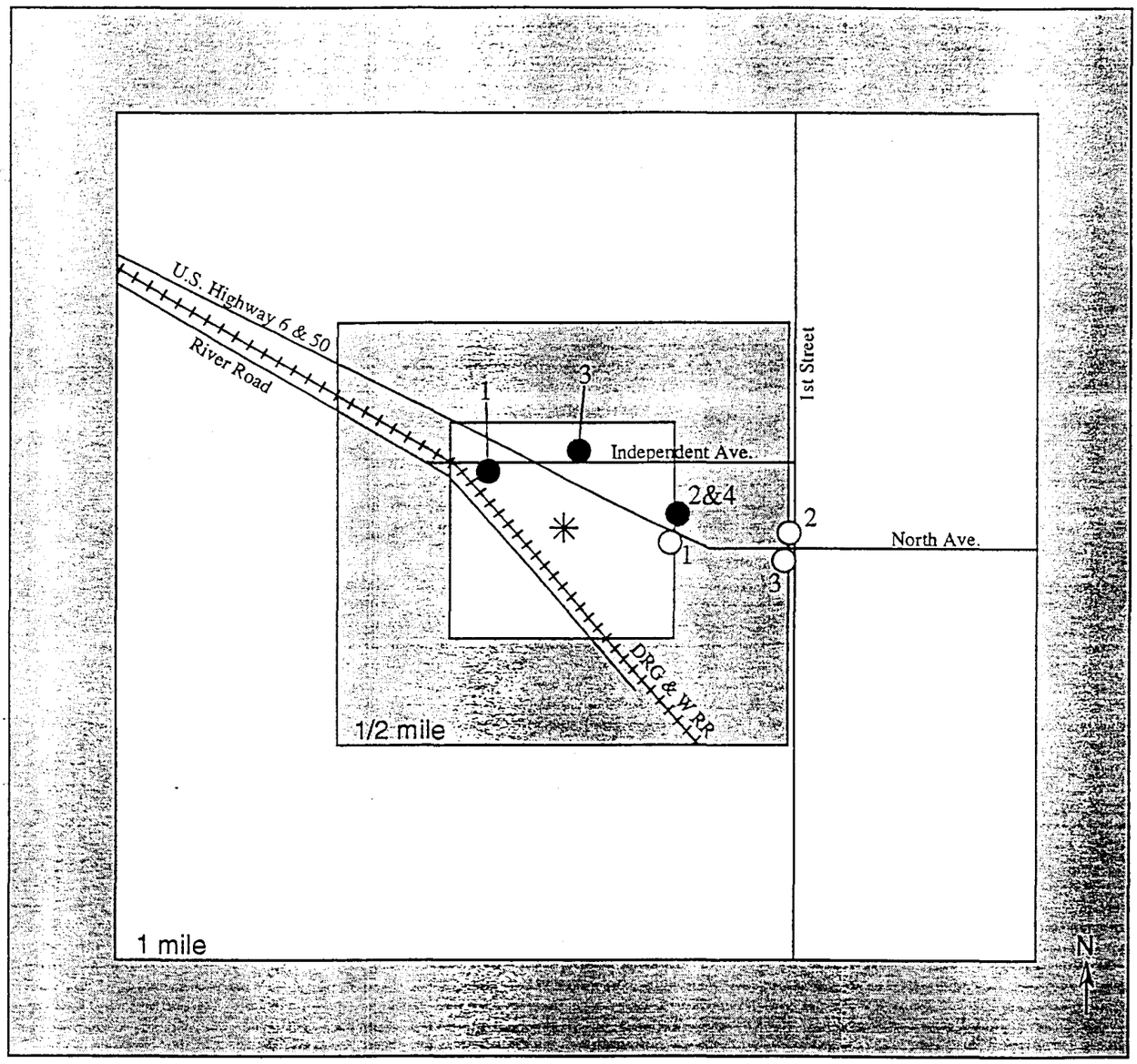


Figure 1: Site Map (No Scale) ***Site: Highway 6 & 50**	**StatesWest Environmental Corporation** ENVIRONMENTAL SITE ASSESSMENTS



NPL CERCLA UST LUST RCRA TSD Landfill

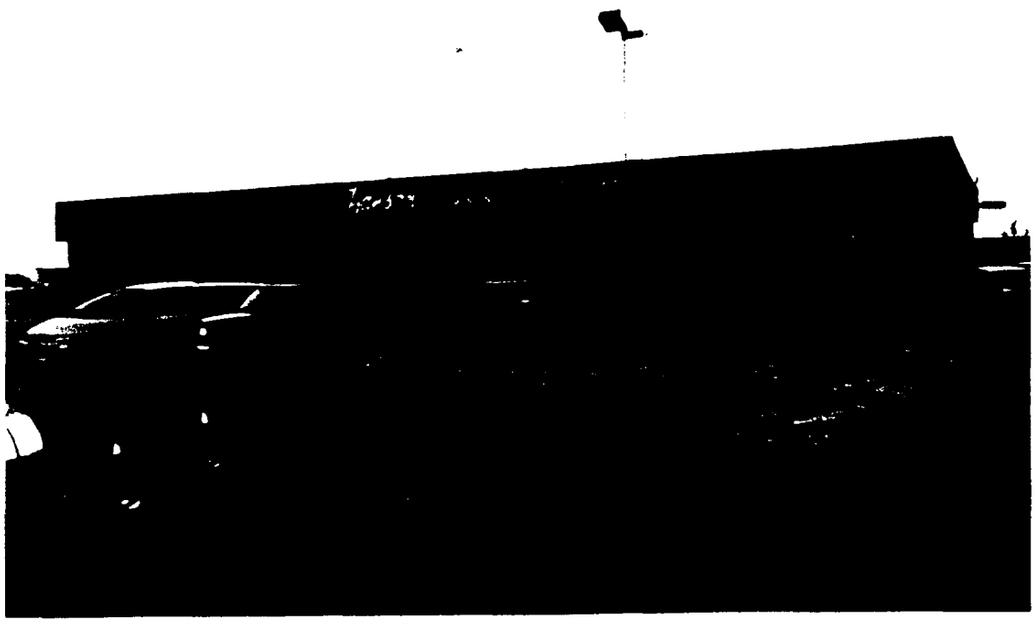
Figure 2: Record Review Map	States West
* Site: U.S. Highway 6 and 50, Grand Junction, CO	Date: 12/30/94

1965 AERIAL PHOTOGRAPH	StatesWest Environmental Corporation ENVIRONMENTAL SITE ASSESSMENTS

PHOTOLOG KEY

Photo No.	Description
1.	Hanson Equipment, Inc. property: View from the north.
2.	Hanson Equipment, Inc. service area: View from the east.
3.	Interior of Hanson Equipment, Inc. sales, offices, and parts departments. Note 12" floor tile, fluorescent lights, and drop-in ceiling panels.
4.	Parking area in east yard. View to the northeast.
5.	A portion of the parts storage in east yard area.
6.	Trash dumpsters located on east side of building.
7.	Parking area in west yard of Hanson Equipment, Inc. View to the northwest.
8.	Empty cargo tanks stored in west yard area.
9.	500-gallon oil AST located in service area.
10.	Central location of lubricants and gear grease. Note staining of concrete floor.
11.	Building located on northeastern portion of Ligrani property previously used for mobile home sales. Note vent pipe to UST to the right of the structure.
12.	Concrete slab and mobile home located near mobile home sales office. View to the west.
13.	Single family residence located on Ligrani property in southern portion of the Site. View to the west.
14.	Junk car storage area on Ligrani property.
15.	Storage sheds on Ligrani property. View to the southwest.
16.	Single family dwelling on Venegas property.
17.	Junk car storage and storage buildings on Venegas property.
18.	Intermittent stream (Ligrani Ditch) located on Fetter property. View is to the west.
19.	View of Fetter property to the east.
20.	Interior of service area and concrete floor at Hanson Equipment, Inc. Note oil staining and cracks in concrete.
21.	View of interior of Hanson Equipment, Inc., service area. Note floor drain vertically through center of photo and significant oil staining on shop floor.
22.	Concrete chambered grease and wastewater interceptor on east side of service bays.

23. View of waste oil holding tank (center of photo) located in service area. Note pooling of oil beneath tank.
24. View of ceiling mounted Reznor waste oil burner located in service area.
25. View of waste oil tank and below grade concrete block containment abutting the south end of service building. Note dark liquid in bottom of containment.
26. View of oil staining around waste oil containment area. Drums hold used oil filters.
27. View of scrap parts in east yard area. Note significant soil staining and drain conduit behind scrap pile.
28. Storage of used vehicle batteries in east yard.
29. Drum and miscellaneous storage in east yard area. Note missing bung cap on drum and used batteries exposed to weather. Soil staining was present around the area.
30. One of four self-contained parts washing units located in service area, which are serviced by Safety-Kleen.
31. 6,000 gallon diesel AST and associated dispenser. Note staining around dispenser.
32. View of lined pit and 6,000 gallon diesel AST.
33. View of steam cleaning equipment in service area. Note floor staining.
34. Pad-mounted electrical transformer located on east side of Hanson Equipment, Inc. Note blue non-PCB label.
35. Typical pole-mounted transformer located on the Site.
36. One of two underground hydraulic lift areas located in the service area.



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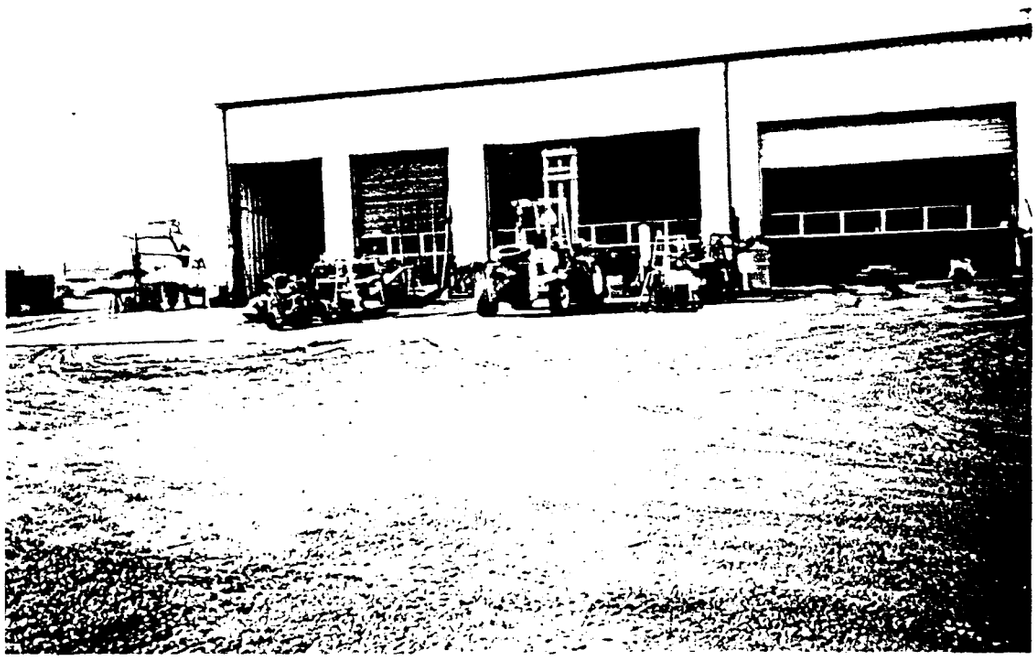


PHOTO NO: 2

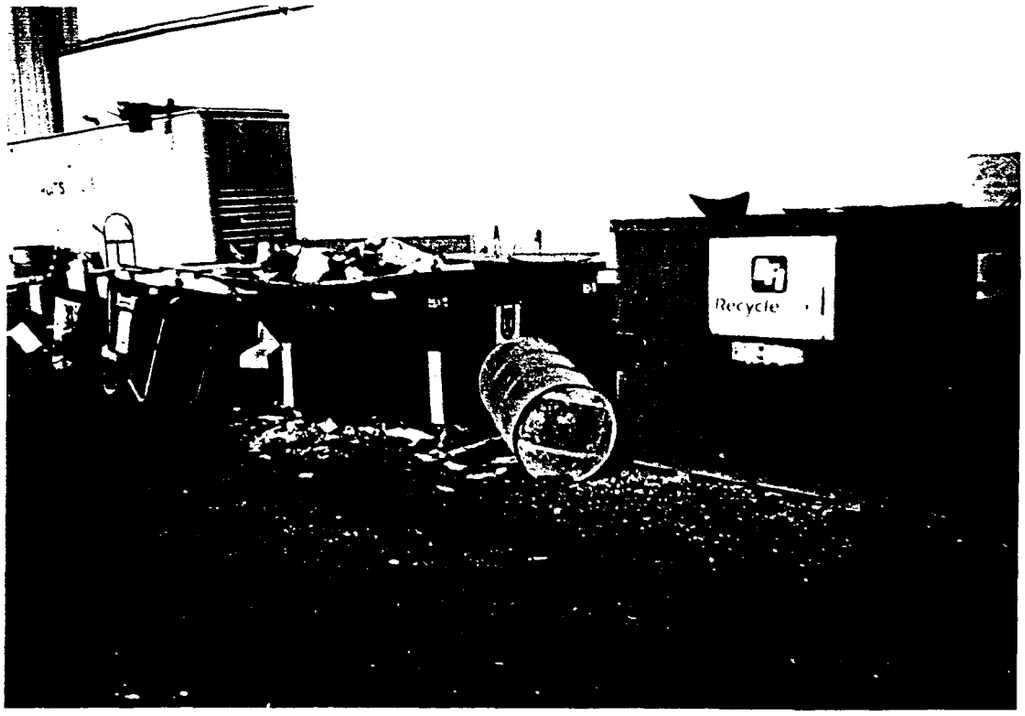
SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 3

PHOTO NO: 4

SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 5



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SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 7

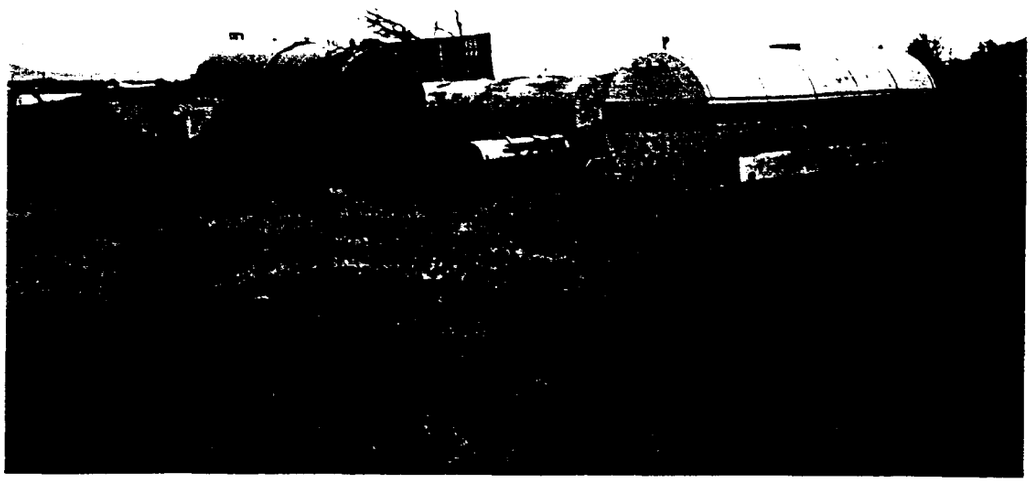


PHOTO NO: 8

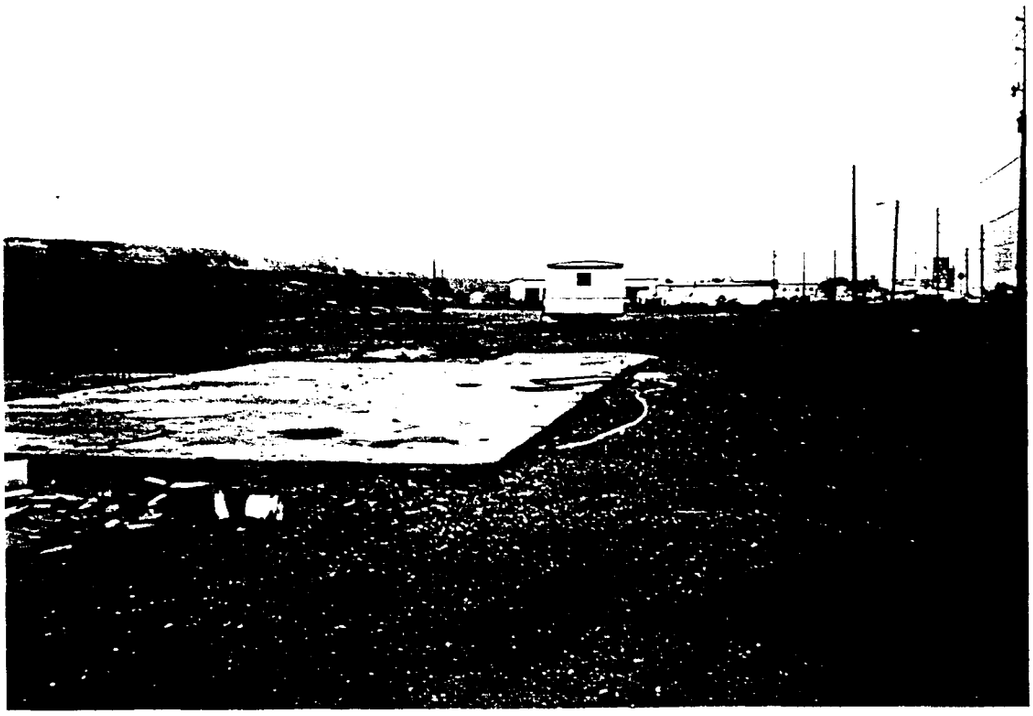
SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 9

PHOTO NO: 10

SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: //



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SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 13

PHOTO NO: 14

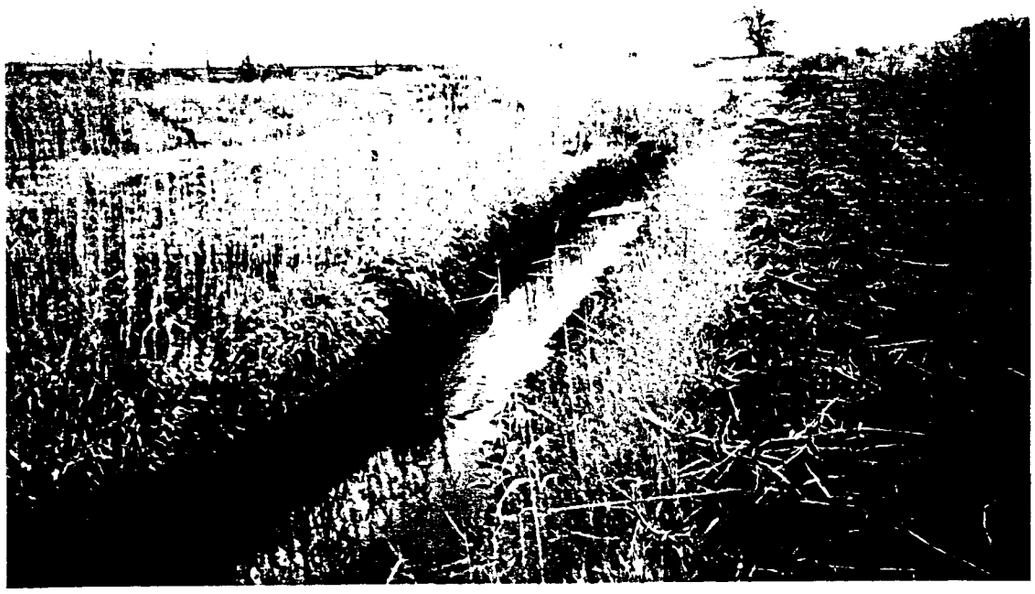
SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 15

PHOTO NO: 16

SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 17



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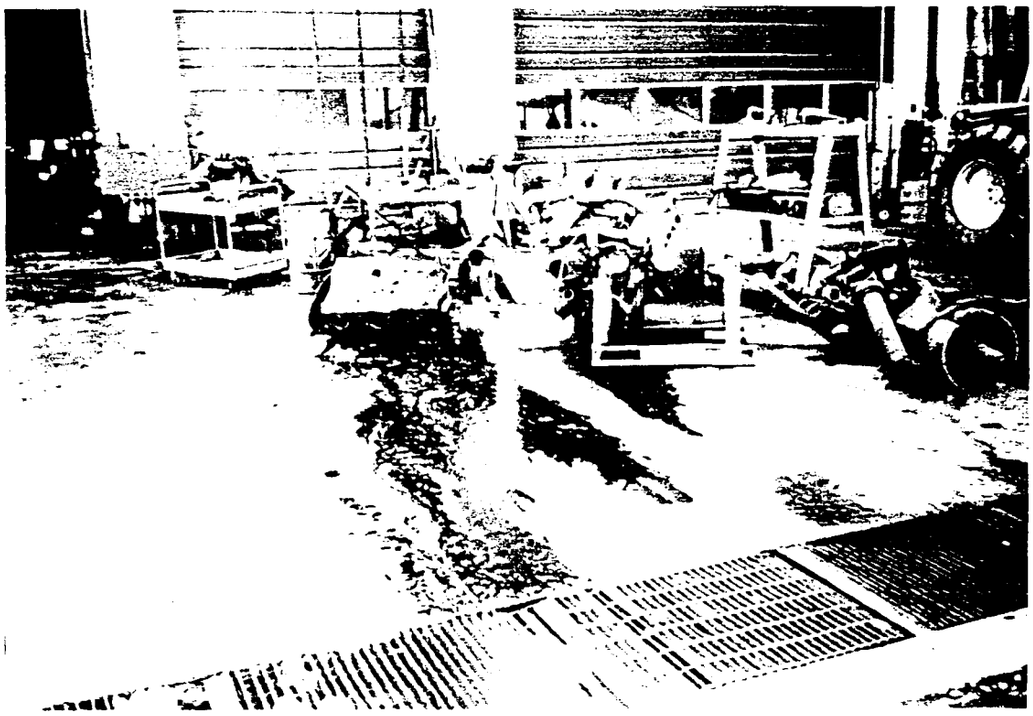
SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 19

PHOTO NO: 20

SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 21



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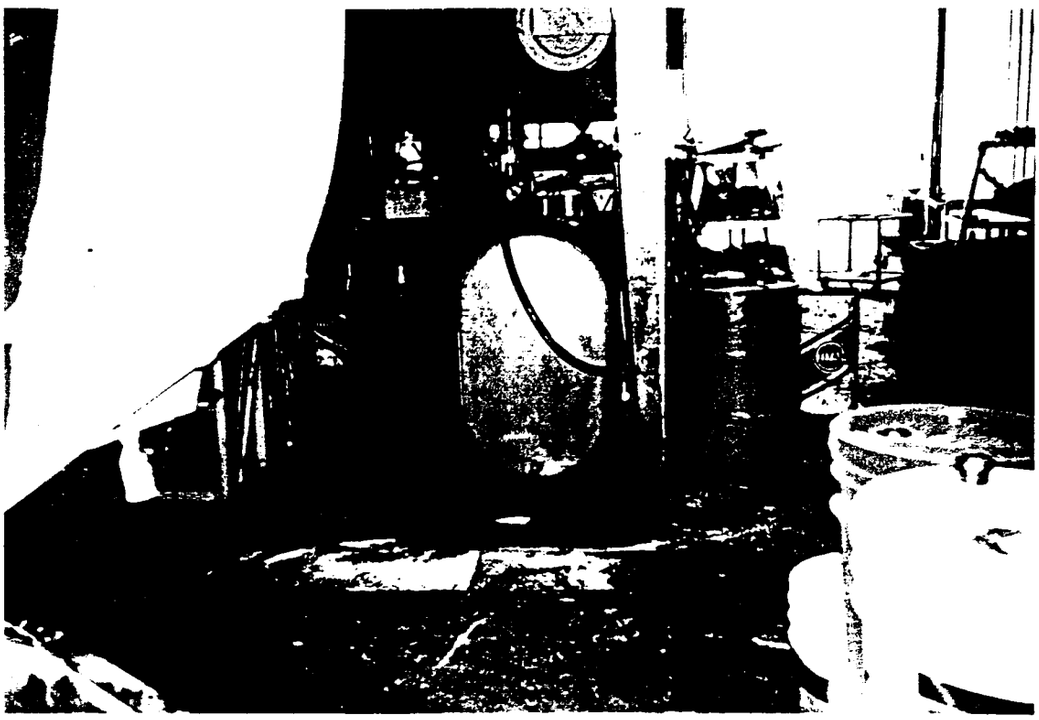
SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94



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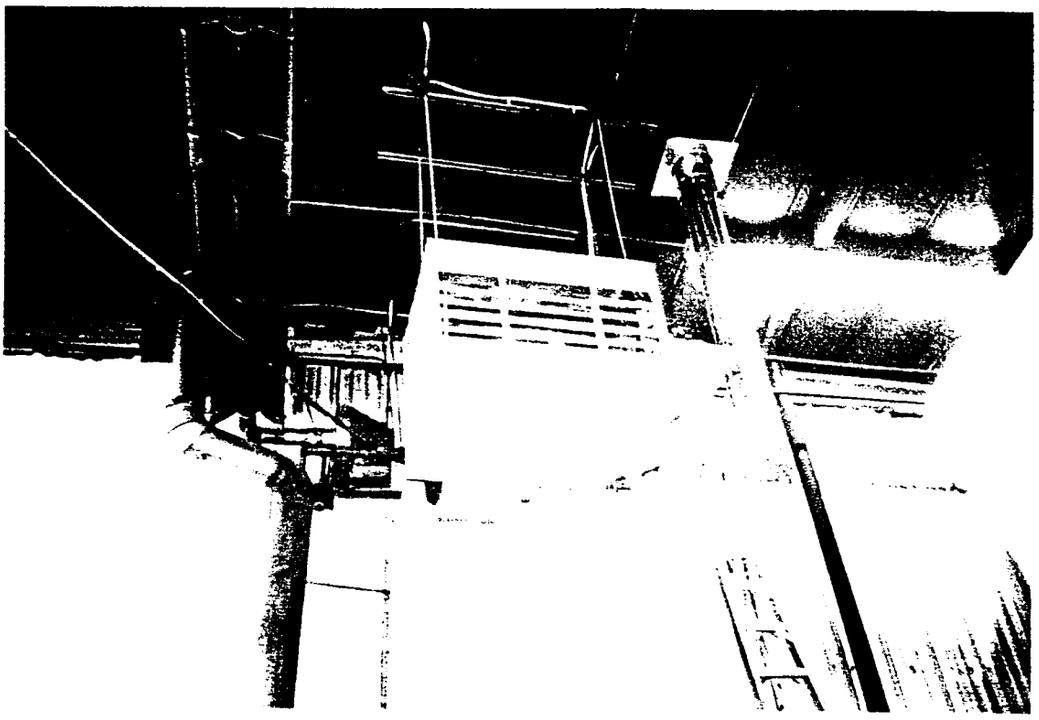

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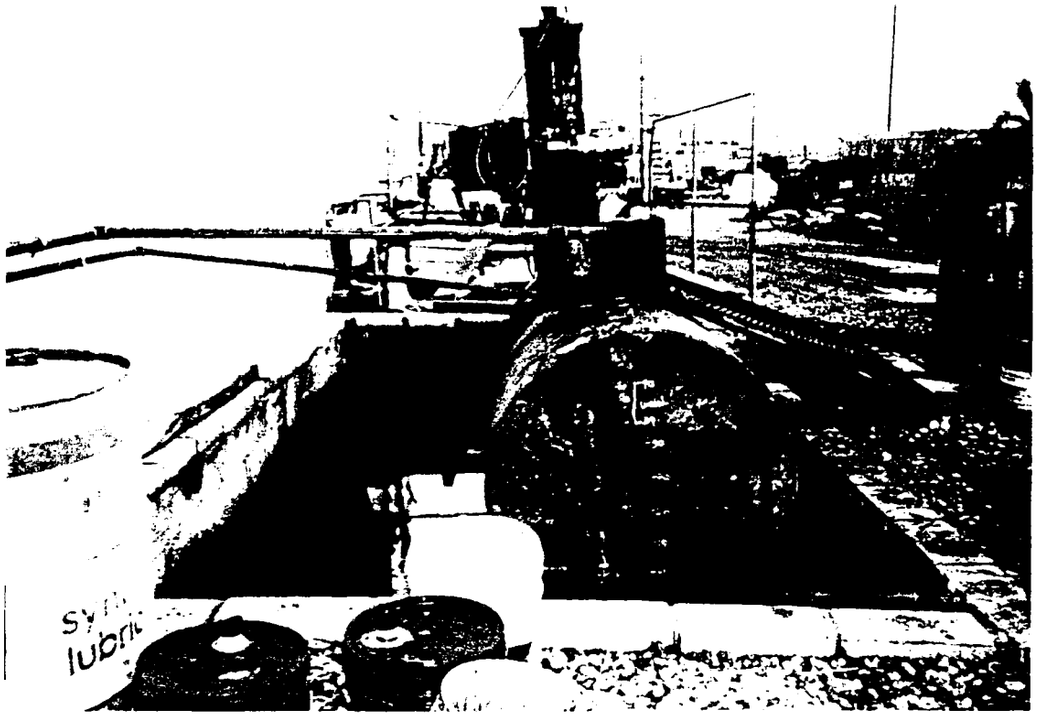
SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94



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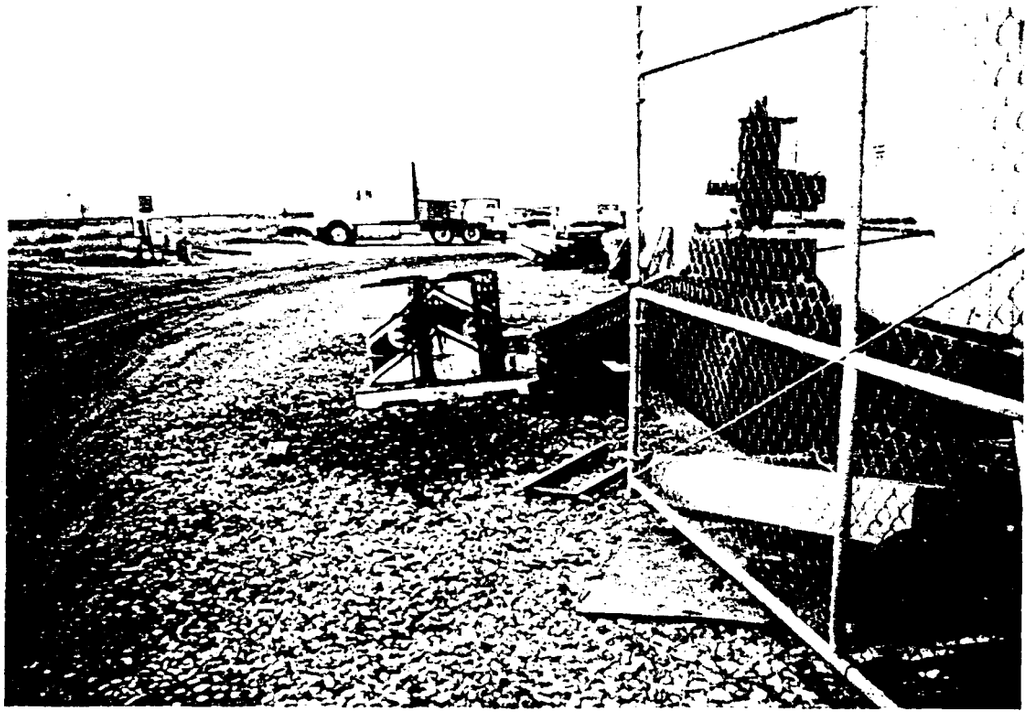

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SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	**Environmental Corporation**	12/30/94

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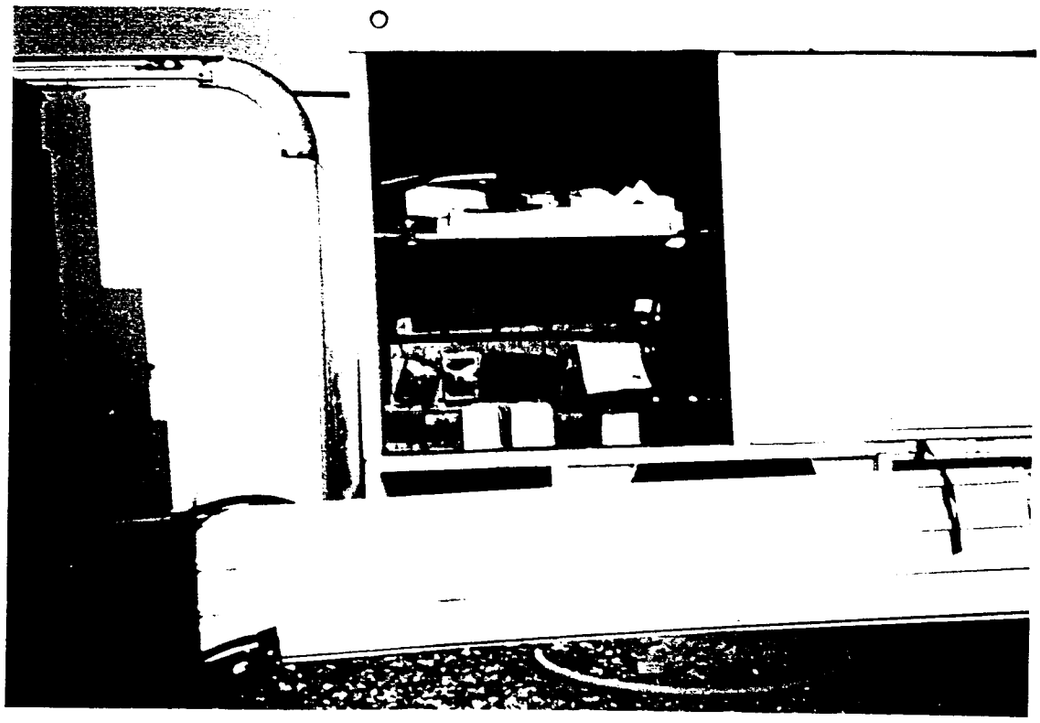

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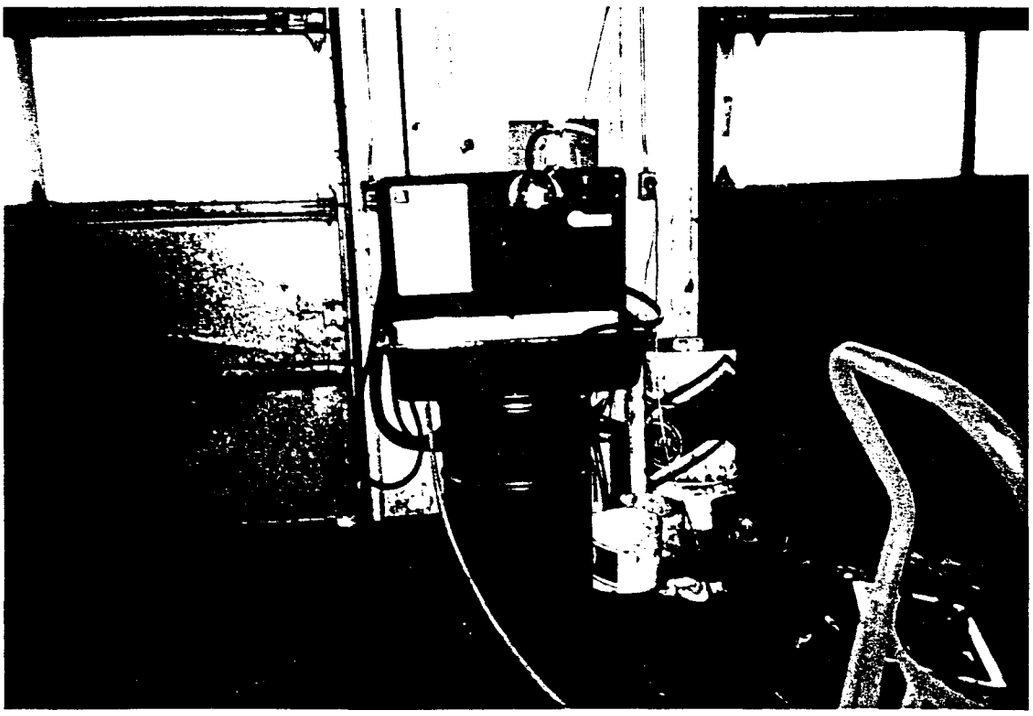
SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 29



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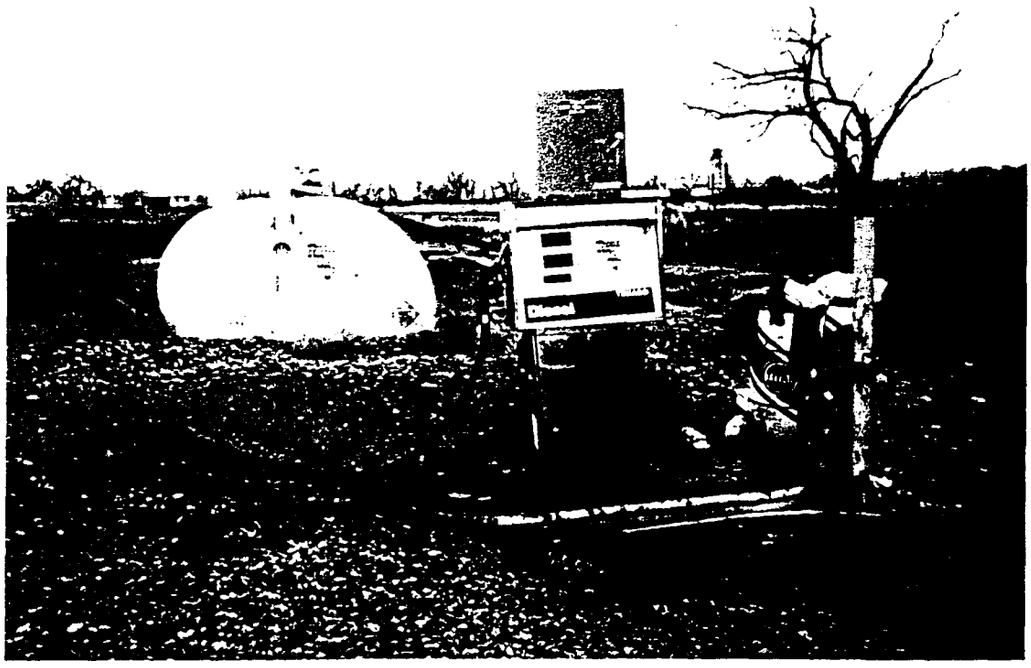
SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94



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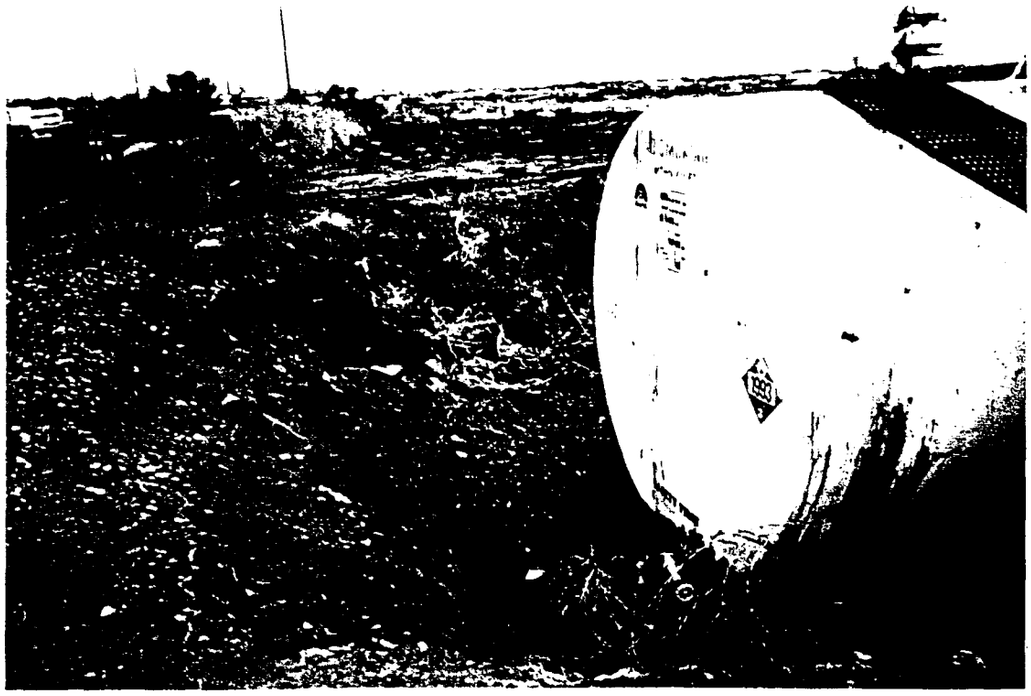

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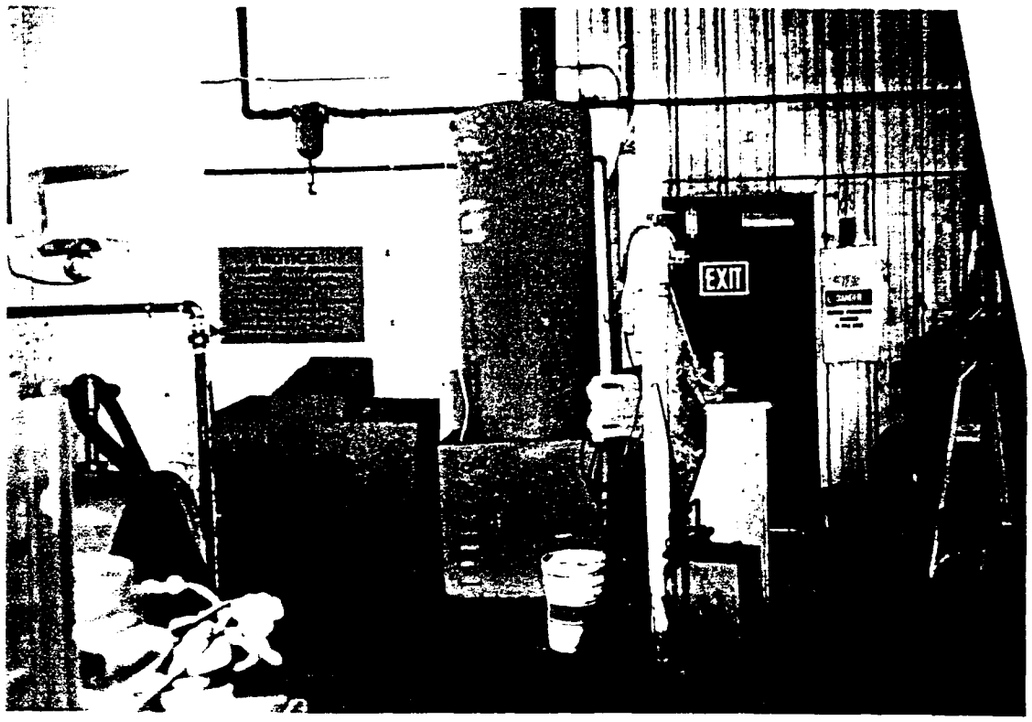
SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94



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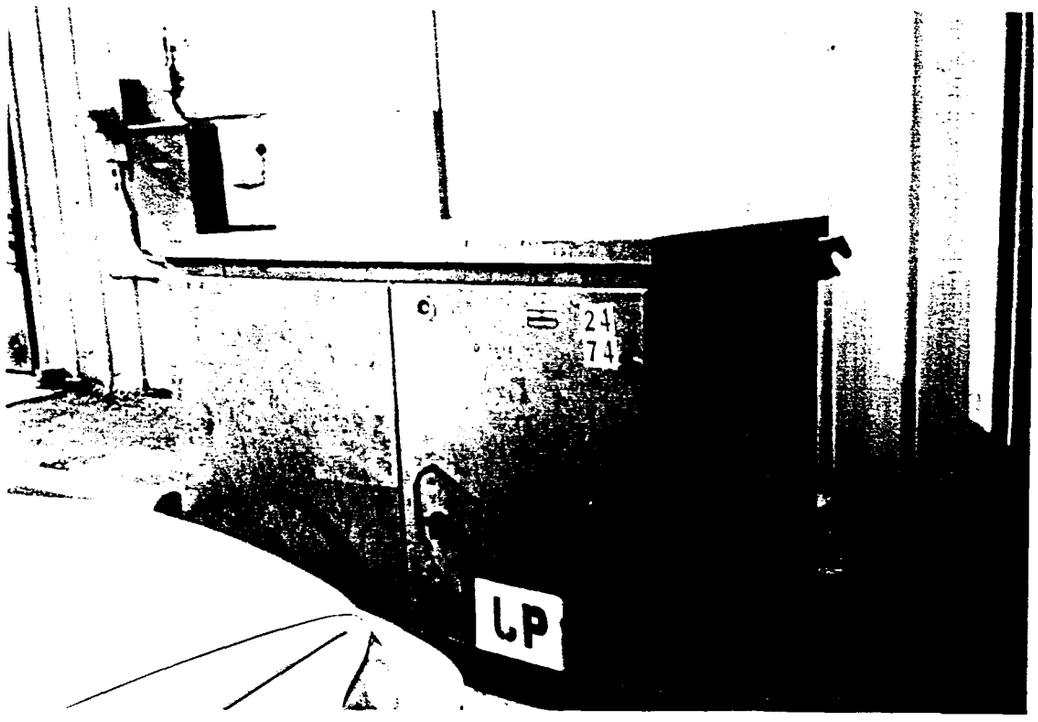

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SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

PHOTO NO: 35

PHOTO NO: 36

SITE PHOTOLOG	StatesWest	Phase I ESA
Site:Hwy. 6 & 50, Grand Junction, Colorado	Environmental Corporation	12/30/94

APPENDIX B

OWNERSHIP DOCUMENTATION

WESTERN COLORADO TITLE CO.
P.O. BOX 178
521 ROOD AVENUE
GRAND JUNCTION, CO 81502-0178

CHICAGO TITLE INSURANCE COMPANY
COMMITMENT FOR TITLE INSURANCE

Purported Street Address: 2526 RIVER ROAD, GRAND JUNCTION, CO 81505

Order File Number: 94-10-36K

TAX SCHEDULE NO.: 2945-103-00-081

Customer Service: KARIN

SCHEDULE A

1. Effective date of this Commitment is October 7, 1994 at 8:00 a.m.

2. The estate or interest in the land described or referred to in this Commitment and covered herein is fee simple and title thereto is at the effective date hereof vested in:

   FRED LIGRANI AND ROXY LIGRANI

3. Policy or policies to be issued:

	AMOUNT	PREMIUM
(a) ALTA Owner's Policy Proposed Insured	$ 2,591,820.00	$ 5,010.50
DHI GROUP, L.L.C., A DELAWARE LIMITED LIABILITY COMPANY		
(b) ALTA Loan Policy Proposed Insured		

TAX CERTIFICATE AMOUNT $10.00
ENDORSEMENT FORMS

Order File Number: 94-10-36K

4. The land referred to in this Commitment is described as follows:

All that part of the SE 1/4 SW 1/4 of Section 10, Township 1 South, Range 1 West lying South and West of Highway 6 & 50,
EXCEPT from the Southeast Corner of the SE 1/4 SW 1/4 of Section 10, Township 1 South, Range 1 West of the Ute Meridian, thence North 509.5 feet, thence North 61°22' West 491.7 feet to the Point of Beginning, thence North 61°22' West 284.8 feet, thence South 247 feet, thence East 250 feet, thence North 110.6 feet to the Point of Beginning, Less and Except a tract of land conveyed to the Department of Highways, State of Colorado by instrument recorded June 4, 1956 in Book 686 at Page 237,

AND EXCEPT that part conveyed to City of Grand Junction and County of Mesa by instrument recorded December 20, 1982 in Book 1405 at Page 969,

AND all that part and portion of the S 1/2 SW 1/4 SW 1/4 Section 10, Township 1 South, Range 1 West, Ute Meridian, lying North and East of the Railroad tracks of the Denver & Rio Grande Railroad Company, now the Rio Grande Western Railroad Company and more particularly described as follows: Commencing at the Northeast Corner of NW 1/4 NW 1/4 Section 15 said Township and Range, running thence North 40 roads, thence North 81°45' West (variance 15° East) 496 feet, thence South 86°30' West 388 feet, thence South 40°45' East 951 feet, thence East 345 feet to the Place of Beginning,

AND ALSO a strip of land described as follows: Beginning at the Northeast Corner of NW 1/4 Section 15, Township 1 South, Range 1 West, Ute Meridian, running thence South 8 1/4 feet, thence West 1320 feet, thence North 8 1/4 feet, thence East 1320 feet to the Place of Beginning,

AND ALSO a tract of land in the NW 1/4 Section 15, Township 1 South, Range 1 West, Ute Meridian and described as follows: Beginning at point on the North line of right of way of the Rio Grande Western Railway, 364 links West of the Northeast Corner of NW 1/4 NW 1/4 said Section, from thence East 364 links to said Northeast Corner of NW 1/4 NW 1/4 said Section, thence South 219 links to tract owned by E. A. McKinney, thence West 210 links to said right of way, thence along said right of way to the Place of Beginning,

MESA COUNTY, COLORADO.

CONTINUED NEXT PAGE

WESTERN COLORADO TITLE CO.
P.O. BOX 178
521 ROOD AVENUE
GRAND JUNCTION, CO 81502-0178

CHICAGO TITLE INSURANCE COMPANY
COMMITMENT FOR TITLE INSURANCE

Purported Street Address: 2523 HWY 6 & 50, GRAND JUNCTION, COLORADO 81505

Order File Number: 94-12-8K

TAX SCHEDULE NO.: 2945-103-00-079

Customer Service: KARIN

SCHEDULE A

1. Effective date of this Commitment is November 29, 1994 at 8:00 a.m.

2. The estate or interest in the land described or referred to in this Commitment and covered herein is fee simple and title thereto is at the effective date hereof vested in:

   H. N. L. COMPANY, A PARTNERSHIP

3. Policy or policies to be issued:

	AMOUNT	PREMIUM
(a) ALTA Owner's Policy Proposed Insured	$ TO BE DETERMINED	00.00
(b) ALTA Loan Policy Proposed Insured		

TAX CERTIFICATE AMOUNT
ENDORSEMENT FORMS

CONTINUED NEXT PAGE

Order File Number: 94-12-8K

4. The land referred to in this Commitment is described as follows:

Beginning at the Southeast Corner of the NE 1/4 SW 1/4 SW 1/4 of Section 10, Township 1 South, Range 1 West of the Ute Meridian; thence North 560.90 feet to the Southerly right of way of the highway; thence North 52°50' West 56.70 feet along said right of way; thence North 61°22' West 135.33 feet to the North boundary of said NE 1/4 SW 1/4 SW 1/4; thence West 488.32 feet; thence South 459.66 feet; thence South 89°02' East 229.87 feet; thence South 65°03'30" East 465.89 feet to the point of beginning; EXCEPT the North 30.00 feet thereof for county road purposes,

Mesa County, Colorado.

Continued Next Page

WESTERN COLORADO TITLE CO.
P.O. BOX 178
521 ROOD AVENUE
GRAND JUNCTION, CO 81502-0178

CHICAGO TITLE INSURANCE COMPANY
COMMITMENT FOR TITLE INSURANCE

Purported Street Address: VACANT, GRAND JUNCTION, COLORADO 81505

Order File Number: 94-12-13K

TAX SCHEDULE NO.: 2945-152-00-001

Customer Service: KARIN

SCHEDULE A

1. Effective date of this Commitment is December 2, 1994 at 8:00 a.m.

2. The estate or interest in the land described or referred to in this Commitment and covered herein is fee simple and title thereto is at the effective date hereof vested in:

   JUAN F. VENEGAS

3. Policy or policies to be issued:

	AMOUNT	PREMIUM
(a) ALTA Owner's Policy Proposed Insured	$ TO BE DETERMINED	00.00
A BUYER TO BE DETERMINED		
(b) ALTA Loan Policy Proposed Insured		

TAX CERTIFICATE AMOUNT
ENDORSEMENT FORMS

SCHEDULE A (CONT.)

Order File Number: 94-12-13K

4. The land referred to in this Commitment is described as follows:

Beginning at a point 8.25 feet South of the NE Corner of the NW 1/4 of Section 15, Township 1 South, Range 1 West of the Ute Meridian, thence West 1326.3 feet, thence South 298.5 feet, to the right-of-way of the Rio Grande Western Railway, thence Southeasterly along said right-of-way 39.7 feet to a point 329 feet South and 1301.2 feet West of the place of beginning, thence East 1301.2 feet, thence North to the place of beginning, EXCEPT that part conveyed to the City of Grand Junction and Mesa County by instrument recorded December 20, 1982 in Book 1405 at Page 972.

Mesa County, Colorado.

Continued Next Page

WESTERN COLORADO TITLE CO.
P.O. BOX 178
521 ROOD AVENUE
GRAND JUNCTION, CO 81502-0178

CHICAGO TITLE INSURANCE COMPANY
COMMITMENT FOR TITLE INSURANCE

Purported Street Address: VACANT, GRAND JUNCTION, COLORADO 81505

Order File Number: 94-12-7K

TAX SCHEDULE NO.: 2945-103-00-147

Customer Service: KARIN

SCHEDULE A

1. Effective date of this Commitment is November 29, 1993 at 8:00 a.m.

2. The estate or interest in the land described or referred to in this Commitment and covered herein is fee simple and title thereto is at the effective date hereof vested in:

   ALVIS D. FEITER

3. Policy or policies to be issued:

	AMOUNT	PREMIUM
(a) ALTA Owner's Policy Proposed Insured	$ TO BE DETERMINED	00.00
A BUYER TO BE DETERMINED		
(b) ALTA Loan Policy Proposed Insured		

TAX CERTIFICATE AMOUNT
ENDORSEMENT FORMS

SUBSURFACE SOILS EXPLORATION

2525 HIGHWAY 6 & 50

GRAND JUNCTION, COLORADO

Prepared For:

DENVER HOLDINGS, INC.
1045 E. Harvard Ave., Suite 803
Denver, Colorado

Prepared By:

LINCOLN-DeVORE, INC.
1441 Motor Street
Grand Junction, CO 81505

December 5, 1994

Lincoln DeVore, Inc.
Geotechnical Consultants
1441 Motor St.
Grand Junction, CO 81505

TEL: (303) 242-8968
FAX: (303) 242-1561

December 5, 1994

DENVER HOLDINGS INC.
10045 E. Harvard Ave., Ste 803
Denver, Colorado 80123

Re: SUBSURFACE SOILS EXPLORATION

2525 Highway 6 & 50

Grand Junction, Colorado

Dear Sir:

Transmitted herein are the results of a Subsurface Soils Exploration for the proposed retail shopping complex which will include several small to medium sized commercial structures.

If you have any questions after reviewing this report, please feel free to contact this office at any time. This opportunity to provide Geotechnical Engineering services is sincerely appreciated.

Respectfully submitted,

LINCOLN-DeVORE, INC.

By: Edward M. Morris
Edward M. Morris, E.I.T.
Western Slope Branch Manager
Grand Junction, Office

Reviewed by: George D. Morris 12/5/95
George D. Morris, P.E.
Colorado Springs Office

GEORGE D. MORRIS
REGISTERED
20511
PROFESSIONAL
ENGINEER
STATE OF COLORADO

LDTL Job No. 81775-J

EMM/bh

TABLE OF CONTENTS

INTRODUCTION

PROJECT DESCRIPTION

This report presents the results of our geotechnical evaluation performed to determine the general subsurface conditions of the site applicable to construction of a retail shopping complex which will include several small to medium sized commercial structures. A vicinity map is included in the Appendix of this report.

To assist in our exploration, we were provided with a planning map prepared by Land Design of Grand Junction, Colorado. The Boring Location Plan attached to this report is based on that plan provided to us.

We understand that the proposed structures will probably consist of single story, wood and masonry framed structures with concrete slabs on grade. It is not anticipated either half or full basements will be constructed on this site. Lincoln DeVore has not seen any building plans, but structures of this general type typically develop wall loads on the order of 1000-3000 plf and column loads on the order of 15-40 kips. Interior floor loads on the concrete slabs can range from 100-1000 psf depending upon types of interior storage and product displays.

The characteristics of the subsurface materials encountered were evaluated with regard to the type of construction described above. Recommendations are included herein to match the described construction to the soil characteristics found. The information contained herein may or may not be valid for other purposes. If the proposed site use is changed or

types of construction proposed, other than noted herein, Lincoln DeVore should be contacted to determine if the information in this report can be used for the new construction without further field evaluations.

PROJECT SCOPE

The purpose of our exploration was to evaluate the surface and subsurface soil and geologic conditions of the site and, based on the conditions encountered, to provide recommendations pertaining to the geotechnical aspects of the site development as previously described. The conclusions and recommendations included herein are based on an analysis of the data obtained from our field explorations, laboratory testing program, and on our experience with similar soil and geologic conditions in the area.

The scope of our geotechnical exploration consisted of a surface reconnaissance, subsurface exploration, obtaining representative samples, laboratory testing, analysis of field and laboratory data, and a review of geologic literature.

Specifically, the intent of this study is to:

1. Explore the subsurface conditions to the depth expected to be influenced by the proposed construction.
2. Evaluate by laboratory and field tests the general engineering properties of the various strata which could influence the development.
3. Define the general geology of the site including likely geologic hazards which could have an effect on site development.
4. Develop geotechnical criteria for site grading and earthwork.

5. Identify potential construction difficulties and provide recommendations concerning these problems.

6. Recommend an appropriate foundation system for the anticipated structure and develop criteria for foundation design.

FIELD EXPLORATION AND LABORATORY TESTING

A field evaluation was performed on November 25 & 26, 1994,and consisted of a site reconnaissance by our geotechnical personnel and the drilling of 9 shallow exploration borings. These shallow exploration borings were drilled within the proposed building footprints and beneath the proposed parking pavement section near the locations indicated on the Boring Location Plan. The exploration borings were located to obtain a reasonably good profile of the subsurface soil conditions. All exploration borings were drilled using a CME 45-B, truck mounted drill rig with continuous flight auger to depths of approximately 18-24 feet. Samples were taken with a standard split spoon sampler, California Lined Sampler, thin walled shelby tubes, and by bulk methods. Logs describing the subsurface conditions are presented in the attached figures.

Laboratory tests were performed on representative soil samples to determine their relative engineering properties. Tests were performed in accordance with test methods of the American Society for Testing and Materials or other accepted standards. The results of our laboratory tests are included in this report. The in-place soil density, moisture content and the standard penetration test values are presented on the attached drilling logs.

FINDINGS

SITE DESCRIPTION

The project site is located in the South 1/2 of the Southwest Quarter of Section 10, Township 1 South, Range 1 West of the Ute Principal Meridian, Mesa County, Colorado. More specifically the site is located South of the Highway 6 & 50 right of way, immediately South of the intersection of highway 6 &50 and Independent Avenue. The site is approximately 1 mile Northwest of the downtown business district of the city of Grand Junction and is within the Grand Junction city limits.

The topography of the site is relatively flat, being located on an alluvial plain of the Colorado River. An irrigation ditch runs from East to West across the site, forming a small ridge which bisects the property. A large drain ditch is located near the Southern property line. The ground surface in the vicinity of the site has an overall gradient to the South Southwest. The Northern part of the tract is a topographic low except for the fills constructed on this site for previous construction, the highway fill and the irrigation ditch fill. The exact direction of surface runoff on this site will be controlled to an extent by the proposed new construction and will be variable. Surface and subsurface drainage on this site can be described as poor.

GENERAL GEOLOGY AND SUBSURFACE DESCRIPTION

The geologic materials encountered under the site consist of Alluvial soils which overly the Mancos Shale Formation which is considered to be bedrock in this area. The Mancos Shale is a part of a thick sequence of sedimentary beds which are gently dipping to the North Northeast. The geologic and engineering properties of the materials found in our 9 shallow exploration borings will be discussed in the following sections.

The soils on this site consist of an alluvial deposit placed by the action of the Colorado River, covered with thin alluvium/colluvium transported by mud flows from the hills to the North. This stratification of upper soils results in a layered system of silts and clays with thin, interbedded sand lenses overlying a sand/gravel deposit. Generally, the silts and clays are soft, wet and of low density. Soil density decreases and the moisture content increases with increasing depth. The upper 1-3 feet of the soil profile are sometimes stiffer and relatively dry due to surface desiccation.

The surface soils were found to contain large amounts of organic material in some areas and very high amounts of soluble sulfate salts. Much of this site is probably quite soft during periods of high precipitation and may collect runoff which drains into the ground or by means of surface drainage features very slowly.

At the time of our exploration, the surface soils were fairly moist, soft and care was utilized

during the mobilization of the drill rig to avoid becoming stuck. The Northern portion of the site has been utilized for commercial sales and a thin cobble and gravel fill has been placed which has stabilized the travel surface.

Four soil types were encountered during the exploration program. The first 3 soil types are typical of the softer, recent Alluvial soils. These soils types may be quite interbedded in some areas, which is representative of the depositional processes which have been active in the past. Soil Type I is representative of the surface soils and is primarily the effect of ancient debris fan/debris flow activity from the Bookcliffs to the North. These soils appear to represent the extreme margins of the debris flow activity in this particular area. These soils may contain significant amounts of organic material, particularly near the ground surface. This organic material is probably the result of poor surface drainage in this area, allowing boggy conditions to exist during some seasons of the year.

This Soil Type was classified as a sandy silt (ML) under the Unified Classification System. This material is of low to very low plasticity, of low to moderate permeability, and was encountered in a low density, moist to wet condition. These soils were found to contain thin strata of very clean, fine grain sand. This soil will settle after being loaded. The maximum allowable bearing capacity for this soil was found to be 700 psf, with no minimum dead load pressure required. Many strata in this soil may have metastable characteristics or, due to being wetted have undergone initial collapse but are still of extremely

low density and must be considered unstable. The addition of any extra loading, in the form of buildings or man-made fill, may cause significant settlement of this soil strata. The finer grained portion of Soil Type No. I contains sulfates in detrimental quantities.

The Colorado River terrace deposits in this area are composed of coarse grained sands & sandy gravels and cobbles. The majority of the gravels are quite silty however, some clay strata exists. The deposit with primarily silty fines have been designated Soil Type II in this report and represent the majority of the deposit.

This Soil Type is classified as a silty sandy gravel and cobble (GM) of course grain size under the Unified Classification System. This soil type is non plastic and of medium density. This soil will have virtually no tendency to expand upon the addition of moisture. Settlement will be minimal under the recommended foundation loads. This soil will undergo elastic settlement upon application of static foundation pressures. Such settlement is characteristically rapid and should be virtually complete by the end of construction. If the recommended allowable bearing values are not exceeded, and if all other recommendations are followed, differential movement will be within tolerable limits. At shallow foundation depths this soil was found to have an average allowable bearing capacity of 3500 psf. A deep foundation system, such as driven piles, typically penetrates the majority of this deposit and end bearing capacities of in excess of 80 kips total is commonly achieved.

The portions of the terrace deposit

which has clay or plastic fines is somewhat unusual in the Grand Junction area. It is believed these clay-gravels are representative of geologic processes involving deposition of the terrace gravels and cobbles at the same time as ongoing debris flow activity from the Bookcliffs to the North. It is believed these 2 depositional processes are somewhat mixed in this area, resulting in the clayey gravels which are not characteristic of the Colorado River terrace deposit. Theses clayey gravels are designated as Soil Type III, in this report.

This Soil Type is classified as a clay silty sandy gravel and cobble (GC) of course grain size under the Unified Classification System. This soil type is of low plasticity and of medium density. This soil will have virtually no tendency to expand upon the addition of moisture. Settlement will be minimal under the recommended foundation loads. This soil will undergo elastic settlement upon application of static foundation pressures. Such settlement is characteristically rapid and should be virtually complete by the end of construction. If the recommended allowable bearing values are not exceeded, and if all other recommendations are followed, differential movement will be within tolerable limits. At shallow foundation depths this soil was found to have an average allowable bearing capacity of 3000 psf. Driven piles characteristically develop a total end bearing capacity of in excess of 60 kips however the majority of the gravel deposit is commonly penetrated by driven piles.

The surface soils are deposited over

the dense formational material of the Mancos Shale of Cretaceous Age. The Mancos Shale is described as a thinbedded, drab, light to dark gray marine shale, with thinly interbedded fine grain sandstone and siltstone layers. Some portions of the Mancos Shale are bentonitic, and therefore, are highly expansive. The majority of the shale, however, has only a low to moderate expansion potential. The formational shale was encountered in Test Boring Nos. 3,8 & 9 at a depth of 21-21 1/2 feet. It is anticipated that this formational shale will affect the construction and the performance of deep foundation systems on this tract.

The Mancos Shale Formation is often highly fractured, with fillings of soluble sulfate salts being very common. The samples obtained in this drilling program indicated many of the fractured faces and bedding planes in the shale contain sulfate salt deposits. Some seams of sulfate salts up to 1/16 inch thick were observed.

Sulfate Salts exhibit variable strength, depending upon surrounding moisture conditions and their chemistry as related to water. In addition, Sulfate Salts are soluble and may be physically removed from the soil by ground moisture conditions. Such removal may leave significant amounts of void areas within the Mancos Shale, which may affect the load bearing capacity of the formation. Many of the fractures in the Mancos Shale Formation are open, allowing the rapid transmission of water to occur. Some sandstone and siltstone strata within the Mancos Shale Formation also exhibit elevated permeability.

The soils of the Mancos Shale Formation have been designated Soil Type IV type was classified as a low plastic clay (CL) under the Unified Classification System. The Standard Penetration Tests ranged from 41 blows per foot to 60 blows per foot. Penetration tests of this magnitude indicate that the soil is relatively hard and of high density. The moisture content varied from 14.2 % to 18.2 %, indicating a relatively moist soil. This soil is plastic and is sensitive to changes in moisture content. With decreased moisture, it will tend to shrink, with some cracking upon desiccation. Upon increasing moisture, it will tend to expand. Expansion tests were performed on typical samples of the soil and expansive pressures on the order of 1600 psf were found to be typical. The allowable maximum bearing value was found to be in excess of 12000 psf near the Shale surface. Deep foundation systems, such as driven piles, typically develop end bearing capacities in excess of 80-100 kips. A minimum dead load of 1800 psf will be required. This soil was found to contain sulfates in detrimental quantities.

Exploration boring #9 was placed South of the Hansen Equipment building. The exploration boring was placed near the edge of the existing structural fill. The structural fill was found to be of medium to medium high density and composed of gravels and cobbles, with silty sand fines. The fill surface was noted to be quite stable and is representative of the desired construction outlined in this report under the Structural Fill section.

The lines defining the change between soil types or rock materials on the attached boring logs and soil profiles are determined by interpolation and therefore are approximations. The transition between soil types may be abrupt or may be gradual.

The boring logs and related information show subsurface conditions at the date and location of this exploration. Soil conditions may differ at locations other than those of the exploratory borings. If the structure is moved any appreciable distance from the locations of the borings, the soil conditions may not be the same as those reported here. The passage of time may also result in a change in the soil conditions at the boring locations.

GROUND WATER:

A free water table came to equilibrium during drilling at 3-6 feet below the present ground surface. This is probably not a true phreatic surface but is an accumulation of subsurface seepage moisture (perched water). In our opinion the subsurface water conditions shown are a permanent feature on this site. The depth to free water would be subject to fluctuation, depending upon external environmental effects.

Because of capillary rise, the soil zone within a few feet above the free water level identified in the borings will be quite wet. Pumping and rutting may occur during the excavation process, particularly if the bottom of the foundations are near the capillary fringe. Pumping is a temporary,

quick condition caused by vibration of excavating equipment on the site. If pumping occurs, it can often be stopped by removal of the equipment and greater care exercised in the excavation process. In other cases, geotextile fabric layers can be designed or cobble sized material can be introduced into the bottom of the excavation and worked into the soft soils. Such a geotextile or cobble raft is designed to stabilize the bottom of the excavation and to provide a firm base for equipment.

Data presented in this report concerning ground water levels are representative of those levels at the time of our field exploration. Groundwater levels are subject to change seasonally or by changed environmental conditions. Quantitative information concerning rates of flow into excavations or pumping capacities necessary to dewater excavations is not included and is beyond the scope of this report. If this information is desired, permeability and field pumping tests will be required.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL DISCUSSION

No geologic conditions were apparent during our reconnaissance which would preclude the site development as planned, provided the recommendations contained herein are fully complied with. Based on our investigation to date and the knowledge of the proposed construction, the site condition which would have the greatest effect on the planned development is the very low density surface soils and high water table.

Since the exact magnitude and nature of the foundation loads are not precisely known at the present time, the following recommendations must be somewhat general in nature. Any special loads or unusual design conditions should be reported to Lincoln DeVore so that changes in these recommendations may be made, if necessary. However, based upon our analysis of the soil conditions and project characteristics previously outlined, the following recommendations are made.

OPEN FOUNDATION OBSERVATION

Since the recommendations in this report are based on information obtained through random borings, it is possible that the subsurface materials between the boring points could vary. Therefore, prior to placing forms or pouring concrete, an open excavation observation should be performed by representatives of Lincoln DeVore. The purpose of this observation is to determine if the subsurface soils directly below the proposed foundations are similar to those encountered in our exploration borings. If the materials below the proposed founda-

tions differ from those encountered, or in our opinion, are not capable of supporting the applied loads, additional recommendations could be provided at that time.

Due to the soft soils encountered in the upper portion of the exploration borings and the relatively high ground water levels, it is believed a significant amount of structural fill will be placed on this site. The fill will be required to provide a stable surface for construction traffic, will be incorporated into the structural sections for the roads and parking areas and also will be utilized beneath concrete slabs on grade to improve their stability and performance. It is believed significant amounts of geotextile fabrics, placed at the base of the fills will be required as separation elements and some geotextiles & geogrid materials will be used as reinforcement elements. Actual design of the geotextile & structural fill sections will be dictated by the actual building types, building uses and anticipated traffic loads.

EXCAVATION & STRUCTURAL FILL:

Since no site grading plan was made available at the time of writing this report, the extent of site grading and the proposed footing elevations is not known. Therefore, these grading recommendations must be considered preliminary until Lincoln DeVore has had the opportunity to review the site grading plans.

Subgrade

Site preparation in all areas to receive structural fill should begin with the removal of all topsoil, vegetation, and other deleterious materials. Prior to placing any fill, the subgrade should be observed by representatives of Lincoln DeVore to determine if the existing vegetation has been adequately removed and that the subgrade is capable of supporting the proposed fills. The subgrade should then be scarified to a depth of 10 inches, brought to near optimum moisture conditions and compacted to at least 90% of its maximum modified Proctor dry density [ASTM D-1557]. The moisture content of this material should be within + or - 2% of optimum moisture, as determined by ASTM D-1557. If the surface soils are determined to be too soft, or unstable due to the very shallow ground water conditions, compaction of the subgrade may not be possible.

It is recommended the soil surface be carefully prepared during the removal of topsoil vegetation other deleterious materials and that a geotextile fabric be placed and utilized as a separation element. It is generally recommended that if free water is not encountered during the preparation process that a woven fabric, with characteristics similar to or stronger than Mirafi 500-X be utilized. If free water or very wet conditions are encountered, a non-woven fabric, with strength and permeability characteristics similar to or better than Mirafi 140-N.

To reduce the amount of Gravel and Pit Run required for subgrade stabilization, a Geogrid material (Tensar BX1100, for example) can be placed at or near the bottom of the fill section. Actual design of fill sections utilizing Geotextile and Georgrids can be provided, if required. Designs for soil stabilization are based upon many assumptions regarding soil consistency, soil uniformity, ground water elevation, methods of subgrade preparation and material placement methods. All designs for soil improvement may require modification during the construction process.

Structural Fill

In general, we recommend all structural fill in the area beneath any proposed structure or roadway be compacted to a minimum of 90% of its maximum modified Proctor dry density (ASTM D1557). We recommend that fill be placed and compacted at approximately its optimum moisture content (+/-2%) as determined by ASTM D 1557. Structural fill should be a granular, coarse grained, non-free draining, non-expansive soil. This structural fill should be placed in the overexcavated portion of this site in lifts not to exceed 6 inches after compaction. This Structural Fill must be brought to the required density by mechanical means. No soaking, jetting or puddling techniques of any type should be used in placement of fill on this site.

Non-Structural Fill

We recommend that all backfill placed around the exterior of the buildings, and in utility trenches which are outside the perimeter of the buildings and not located beneath roadways or parking lots, be compacted to a minimum of 80% of its maximum modified Proctor dry density (ASTM D-1557).

Fill Limits

To provide adequate lateral support, we recommend that the zone of overexcavation extend at least 3 feet beyond the perimeter of the buildings on all sides. The Structural Fill should be a minimum of 3 feet in final compacted thickness.

No major difficulties are anticipated in the course of excavating into the surficial soils on the Northern portion of the tract. The Southern portion of the tract is quite soft and mobilization of excavating equipment and material hauling may be quite difficult on the native soils. It is probable that safety provisions such as sloping or bracing the sides of excavations over 4 feet deep will be necessary. Any such safety provisions shall conform to reasonable industry safety practices and to applicable OSHA regulations. The OSHA Classification for excavation purposes on this site is Soil Class C.

Field Observation & Testing:

During the placement of any structural fill, it is recommended that a sufficient amount of field

tests and observation be performed under the direction of the geotechnical engineer. The geotechnical engineer should determine the amount of observation time and field density tests required to determine substantial conformance with these recommendations. It is recommended that surface density tests be taken at maximum 2 foot vertical interval.

The opinions and conclusions of a geotechnical report are based on the interpretation of information obtained by random borings. Therefore the actual site conditions may vary somewhat from those indicated in this report. It is our opinion that field observations by the geotechnical engineer who has prepared this report are critical to the continuity of the project.

Slope Angles

Allowable slope angle for cuts in the native soils is dependent on soil conditions, slope geometry, the moisture content and other factors. Should deep cuts be planned for this site, we recommend that a slope stability analysis be performed when the location and depth of the cut is known.

DRAINAGE AND GRADIENT:

Adequate site drainage should be provided in the foundation areas both during and after construction to prevent the ponding of water and the saturation of the subsurface soils. We recommend that the ground surface around the structures be graded so that surface water will be carried quick-

ly away from the building. The minimum gradient within 10 feet of the building will depend on surface landscaping. We recommend that paved areas maintain a minimum gradient of 2%, and that landscaped areas maintain a minimum gradient of 8%. It is further recommended that roof drain downspouts be carried across all backfilled areas and discharged at least 10 feet away from the structure. Proper discharge of roof drain downspouts may require the use of subsurface piping in some areas. Planters, if any, should be so constructed that moisture is not allowed to seep into foundation areas or beneath slabs or pavements.

Due to the shallow ground water conditions encountered on this site, we recommend that basements not be utilized. Half basement type construction could be utilized but would require peripheral and under slab drains.

If half basement construction is utilized, the high water level found on this site should be controlled to prevent large upward fluctuations of this water surface. For this purpose, we recommend that this be accomplished by construction of an area drain beneath the building area. To control water surface movement, it is recommended that the drain outfall in a free gravity drain. If a gravity outfall is not possible, a sealed sump and pump is recommended to remove the water.

The existing drainage on the site must either be maintained carefully or improved. We recommend that water be drained away from structures as rapidly as possible and not be allowed to stand or pond near the building. We recommend that water removed from one building not be directed onto the backfill areas of adjacent buildings. We recommend that a hydrologist or drainage engineer experienced in this area be retained to complete a drainage plan for this site.

Should an automatic lawn irrigation system be used on this site, we recommend that the sprinkler heads be installed no less than 5 feet from the building. In addition, these heads should be adjusted so that spray from the system does not fall onto the walls of the building and that such water does not excessively wet the backfill soils..pa

FOUNDATIONS

Assuming that some amount of differential movement can be tolerated, then a conventional shallow foundation system, underlain by structural fill, placed in accordance with the recommendations contained within this report may be utilized. The foundation would consist of continuous spread footings beneath all bearing walls and isolated spread footings beneath all columns and other points of concentrated load. Such a shallow foundation system, resting on the properly constructed structural fill, a minimum of 3' thick, may be designed on the basis of an allowable bearing capacity of 2200 psf maximum. The structural fill should consist of a course grained, non-expansive, non-free draining material imported to the site.

The placement of textile fabric for separation between the native soils and the structural fill is recommended to aid the fill placement and to improve the stability of the completed fill.

Recommendations pertaining to balancing, reinforcing, drainage, and inspection are considered extremely important and must be followed. Contact stresses beneath all continuous walls should be balanced to within + or - 200 psf at all points. Isolated interior column footings should be designed for contact stresses of about 150 psf less than the average used to balance the continuous walls. The criteria for balancing will depend somewhat on the nature of the structure. Single-story,

slab-on-grade structures may be balanced on the basis of dead load only. Multi story structures may be balanced on the basis of dead load plus one half live load, for up to three stories.

If the design of the upper structure is such that loads can be balanced reasonably well, or if some amount of differential movement can be tolerated, a floating structural slab type of foundation could be used on this site. Such a slab would require heavy reinforcing to resist differential bending along the rim wall. It is possible to design such a slab either as a thickened edge only, a solid or a ribbed slab. A rim wall must be used for confinement purposes. Any such slab must be specifically designed for the anticipated loading.

Such a foundation system may settle to some degree, however, the use of a structural fill placed according to recommendations contained in this report at least 2 feet thick, beneath the slab and rim wall will help reduce settlement and hold differential movement to a minimum. Relatively large slabs will tend to experience minor cracking and heave of lightly loaded interior portions, unless the slabs are specifically designed with this movement in mind.

The placement of a geotextile fabric for separation between the native soils and the structural fill may be required to aid the fill placement and to improve the stability of the completed fill.

When the structural fill is completed, an allowable bearing capacity of 1800 psf maximum may be assumed for proportioning the footings or loadbearing portions of the slab.

The placement of the structural fill a minimum of 2 feet beyond the edge of the structural slab should provide additional support for the eccentrically placed wall loads on the slab edges.

The structural fill should be placed in accordance with the recommendations contained in the structural fill section of this report. The placement of a structural fill a minimum of 3 feet beyond the edge of the structural slab should provide additional support for the eccentricity placed wall loads on the slab edges.

SETTLEMENT:

Close estimates of total and differential settlement will not be provided in this report since Lincoln DeVore has not been given exact foundation loads. Upon completion of the structural plans, the predicted settlements can be supplied upon request.

FROST PROTECTION

We recommend that the bottom of all foundation components rest a minimum of 1 1/2 feet below finished grade or as required by the local building codes. Foundation

components must not be placed on frozen soils.

Structural slab-on-grade (Monolithic) foundation systems typically have an effective soil cover of less than 12 inches. Under normal use, the building and foundation system radiates sufficient heat that frost heave from the underlying soils is not normally a problem. However, additional protection can be provided by applying an insulation board to the exterior of the foundation and extending this board to approximately 18 inches below the final ground surface grade. This board may be applied either prior to or after the concrete is cast and it is very important that all areas of soil backfill be compacted. Local building officials should be consulted for regulatory frost protection depths.

DEEP FOUNDATIONS:

Under some loading conditions, and due to the relatively soft soils and high ground water levels, a deep foundation system consisting of either drilled piers or driven piles could be used to carry the weight of the proposed structures. Deep foundations must extend through the low density, upper low plastic silt materials and into the underlying gravels of the Colorado River Terrace and possibly into the underlying Mancos Shale Formation. Both types of foundation have advantages and disadvantages with respect to this site. Due to the very high ground water conditions and problems encountered during our exploration drilling on this site with flowing sands, it is believed a driven pile foundation system will be the most practi-

cal on this site.

DRIVEN PILES:

We recommend that driven piles bear in the competent materials of the underlying gravel terrace and Mancos Shale Formation. We anticipate that pile driving refusal will be encountered at a depth of 10-15' into the gravels or within a few feet of penetration into the Mancos Shale Formation. Based on a static analysis, piles driven to refusal may be designed for an allowable tip bearing capacity of 70 to 100 tons psf. To determine the bearing area of the pile, the area including the space between the flanges may be included. For example, an HB-12 pile may be assumed to have an end area of approximately 1 square foot. A round, closed-end pipe pile bearing area would be the area of the pile end plate. Pile driving refusal should be determined by our representative in the field. Generally, pile driving refusal is taken as a maximum of 15 blows per inch. If pile groups are used, the overall capacity of the pile group should be reduced in accordance with the appropriate efficiency formula (such as the Converse-Labarre method). If bearing capacities greater than those recommended above are necessary, we recommend that the pile bearing capacity be determined on the basis of static load tests.

It is anticipated that steel piling (either 'H' sections or concrete filled pipe) will be utilized in this construction. The following recommendations will assume the use of these materials. If wood or concrete piling are anticipat-

ed, recommendations can be readily provided.

Driving hammers should be of such size and type to consistently deliver effective dynamic energy suitable to the piles and materials into which they are to be driven. Hammers should operate at manufacturer's recommended speeds and pressures. We recommend that a pile driving hammer be used which is rated at least 19,000 feet pounds. However, driving energy should not be so large that pile damage occurs.

Piles must be used in groups to provide for eccentricities in loading. The group capacity will be less than the summation of the individual pile capacities, depending upon the relative spacing of the piles. A conservative estimate of group capacity is two-thirds of the summation of the individual pile capacities.

We recommend that minimum spacing of the piles be twice the average pile diameter or 1.75 times the diagonal dimension of the pile cross-section, but no less than 24 inches. It is recommended that the tops of the piles extend a minimum of 4 inches into the pile cap. Based on the exploration borings no pile shorter than 22 feet is recommended unless proper pile capacity is verified by field inspection by the Geotechnical Engineer. Vertical piles should not vary more than 2% from the plumb position. We further recommend that eccentricity of reaction on a pile group with respect to the load resultant not exceed a dimension that would produce overloads of more than 10% in any one pile.

Since the underlying bedrock is moderately expansive, we recommend a minimum of permanent pressure be maintained on each pier. The minimum pressure should be designed based on a tip uplift pressure of 2000 psf. The area used to consider the uplift pressure should be width times the depth of the pile section used when considering H piles. Round pipe piles will require an end uplift pressure of 2000 psf and a side uplift of 500 psf for the portion of the side wall in contact with the expansive formation.

Based on our analyses, a standard 10-3/4inch diameter, 1/4 inch wall, pipe pile driven to refusal may be designed for an allowable capacity of 70 to 100 tons. On this site the capacity of the pile will govern allowable load. Pile driving refusal required to obtain the recommended capacity was taken as 7 blows per inch with a 19 foot kip hammer. Driving hammers should be of such size and type to consistently deliver effective energy suitable to the piles and materials into which they are driven. Final pile driving refusal should be determined by representatives of Lincoln DeVore in the field.

DRIVEN PILE OBSERVATION:

Continuous observation of the pile driving operations and a pile load test, if required, should be performed by Lincoln DeVore as a representative of the owner. A continuous log should be maintained on the number of blows per foot required to drive each pile. Driving should be completed

without interruption (except for splicing) and without jetting or pre-drilling unless the geotechnical engineer has been contacted for further recommendations.

GRADE BEAMS:

A reinforced concrete grade beam is recommended to carry the exterior wall loads in conjunction with the deep foundation system. We recommend that this grade beam be designed to span from bearing point to bearing point and not be allowed to rest on the ground surface between these points. We recommend a void space be left between the bottom of the grade beam and the subgrade below due to the expansive nature of the subgrade soils.

Large horizontal loads are not anticipated on this site. However, if horizontal loads exist and exceed 1000 pounds per pile, batter piles will be required. It is recommended that hammer and cushioning be matched to the chosen pile type to provide design load capacity during driving.

We recommend that the horizontal thrust generated at the foundation line by rigid frame buildings not be resisted by "hairpins" embedded into the floor slabs, unless the slab is an integral part of the foundation system. It is recommended that this horizontal force be resisted by either threaded tie rods or reinforcing bars extending from pier to opposite pier below the finished floor slab line. We recommend that all such connectors be either encased in concrete or covered with a heavy coat of bituminous paint to ensure long-term stability.

CONCRETE SLABS ON GRADE

Slabs could be placed directly on the natural soils or on a structural fill. We strongly recommend that structural fill be placed beneath all slabs, due to the very soft soils encountered over much of this site. We recommend that all non-structural slabs on grade be constructed to act independently of the other structural portions of the building. One method of allowing the slabs to float freely is to use expansion material at the slab- structure interface.

It is recommended that slabs on grade be constructed over a capillary break of approximately 6 inches in thickness. We recommend that the material used to form the capillary break be free draining, granular material and not contain significant fines. A free draining outlet is also recommended for this break so that it will not trap water beneath the slab. A vapor barrier is recommended beneath the floor slab and above the capillary break. To prevent difficulty in finishing concrete, a 2 inch sand layer should be placed above the break. An alternate method of reducing finishing problems would be to place the vapor barrier beneath approximately 6 inches of a minus 3/4 inch gravel fill. This method must be very carefully accomplished to minimize excessive puncturing and tearing of the vapor barrier.

It is recommended that floor slabs on grade be constructed with control joints placed to divide the floor into sections not exceeding 360 to 400 square feet, maximum. Also, additional control joints are recommended at all

inside corners and at all columns to control cracking in these areas.

Problems associated with slab 'curling' are usually minimized by proper curing of the placed concrete slab. This period of curing usually is most critical within the first 5 days after placement. Proper curing can be accomplished by continuous water application to the concrete surface or, in some instances by the placement of a 'heavy' curing compound, formulated to minimize water evaporation from the concrete. Curing by continuous water application must be carefully undertaken to prevent the wetting or saturation of the subgrade soils.

If the interior floor slabs are to receive heavy loads due to:

wheel loads of industrial vehicles such as fork lifts or straddle carriers
2) concentrated static loads of racks or
3) heavy distributed stacked loads

then the slabs classify as industrial and we recommend they be designed in accordance with methods outlined in the PCA publication, "Slab Thickness Design for Industrial Concrete Floor Slabs on Grade". For design purposes, the modulus of subgrade reaction for the native silt soils (Soil Type I) may be taken as 60 pci. The modulus of subgrade reaction for a properly placed and compacted structural fill using granular materials may be taken as 300 pci.

REACTIVE SOILS

Since groundwater in the Grand Junction area typically contains sulfates in quantities detrimental to a Type I cement, a Type II or Type I-II or Type II-V cement is recommended for all concrete which is in contact with the subsurface soils and bedrock. Calcium chloride should not be added to a Type II, Type I-II or Type II-V cement under any circumstances.

EARTH RETAINING STRUCTURES

The active soil pressure for the design of earth retaining structures may be based on an equivalent fluid pressure of 48 pounds per cubic foot. The active pressure should be used for retaining structures which are free to move at the top (unrestrained walls). For earth retaining structures which are fixed at the top, such as basement walls, an equivalent fluid pressure of 60 pounds per cubic foot may be used. It should be noted that the above values should be modified to take into account any surcharge loads, sloping backfill or other externally applied forces. The above equivalent fluid pressures should also be modified for the effect of free water, if any.

The passive pressure for resistance to lateral movement may be considered to be 231 pcf per foot of depth. The coefficient of friction for concrete to soil may be assumed to be 0.27 for resistance to lateral movement. When combining frictional and passive resistance, the latter must be reduced by approximately 1/3.

PAVEMENTS

Samples of the surficial native soils at this property that may be required to support pavements have been evaluated using the Hveem-Carmany method (ASTM D-2844) to determine their support characteristics. The results of the laboratory testing are as follows:

AASHTO Classification - A-4(6) Unified Classification - ML

R =	15
Expansion @ 300 psi =	3.60
Displacement @ 300 psi =	4.54

Displacement values higher than 4.00 generally indicate the soil is unstable and may require confinement for proper performance.

No estimates of traffic volumes have been provided to Lincoln DeVore.

Based upon the existing topography, the anticipated final road grades and the anticipated future ground water levels in the local area, a Drainage Factor of 0.6 (1986 AASHTO procedure) should be utilized for the section analysis, unless a specific subgrade soil or subbase design utilizing Geotextiles or Geogrids is prepared.

Due to the possibility of very high soil moisture in the subgrade soils, the use of a Geotextile Fabric for separation and minor reinforcement (such as Mirafi 500-X or 140-N), placed beneath the Aggregate Base Course, may be required in some areas on this site.

PAVEMENT SECTION CONSTRUCTION

We recommend that any asphaltic concrete pavement meet the State of Colorado requirements for a Grade C mix. In addition, the asphaltic concrete pavement should be compacted to a minimum of 95% of its maximum Hveem density. The aggregate base coarse should meet the requirements of State of Colorado Class 5 or Class 6 material, and have a minimum R value of 78. We recommend that the base coarse be compacted to a minimum of 95% of its maximum Modified Proctor dry density (ASTM D-1557), at a moisture content within + or -2% of optimum moisture. The native subgrade shall be scarified and recompacted to a minimum of 90% of their maximum Modified Proctor day density (ASTM D-1557) at a moisture content within + or -2% of optimum moisture.

All pavement should be protected from moisture migrating beneath the pavement structure. If surface drainage is allowed to pond behind curbs, islands or other areas of the site and allowed to seep beneath pavement, premature deterioration or possibly pavement failure could result.

Concrete Pavement

We recommend that any rigid concrete pavement have a minimum flexural strength (F_t) of 650 psi at 28 days. This strength requirement can be met using Class P or AX or A or B Concrete as defined in Section 600 of the Standard Specifications for Road and Bridge Construction, Colorado DOT. It is recommended that field control of the concrete mix be made utilizing compressive strength criteria.

Flexural Strength should only be used for the design process. Concrete with a lower flexural strength may be allowed by the agency having jurisdiction however, the design section thicknesses should be confirmed. In addition, the final durability of the pavement should be carefully considered.

Control joints should be placed at a minimum distance of 12 feet in all directions. If it is desired to increase the spacing of control joints, then 66-66 welded wire fabric should be placed in the mid-point of the slab. If the welded wire fabric is used, the control joint spacing can be increased to 40 feet. Construction joints designed so that positive joint transfer is maintained by the use of dowels is recommended.

The concrete should be placed at the lowest slump practical for the method of placement. In all cir-

cumstances, the maximum slump should be limited to 4 inches. Proper consolidation of the plastic concrete is important. The placed concrete must be properly protected and cured.

LIMITATIONS

This report is issued with the understanding that it is the responsibility of the owner, or his representative to ensure that the information and recommendations contained herein are brought to the attention of the individual lot purchasers for the subdivision. In addition, it is the responsibility of the individual lot owners that the information and recommendations contained herein are brought to the attention of the architect and engineer for the individual projects and the necessary steps are taken to see that the contractor and his subcontractors carry out the appropriate recommendations during construction.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in acceptable or appropriate standards may occur or may result from legislation or the broadening of engineering knowledge. Accordingly, the findings of this report may be invalid, wholly or partially, by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of 3 years.

The recommendations of this report pertain only to the site investigated and are based on the assumption that the soil conditions do not deviate from those described in this report. If any variations or undesirable

conditions are encountered during construction or the proposed construction will differ from that planned on the day of this report, Lincoln DeVore should be notified so that supplemental recommendations can be provided, if appropriate.

Lincoln DeVore makes no warranty, either expressed or implied, as to the findings, recommendations, specifications or professional advice, except that they were prepared in accordance with generally accepted professional engineering practice in the field of geotechnical engineering.

SOILS DESCRIPTIONS:

SYMBOL	USCS	DESCRIPTION
		Topsoil
		Man-made Fill
	GW	Well-graded Gravel
	GP	Poorly-graded Gravel
	GM	Silty Gravel
	GC	Clayey Gravel
	SW	Well-graded Sand
	SP	Poorly-graded Sand
	SM	Silty Sand
	SC	Clayey Sand
	ML	Low-plasticity Silt
	CL	Low-plasticity Clay
	OL	Low-plasticity Organic Silt and Clay
	MH	High-plasticity Silt
	CH	High-plasticity Clay
	OH	High-plasticity Organic Clay
	Pt	Peat
	GW/GM	Well-graded Gravel, Silty
	GW/GC	Well-graded Gravel, Clayey
	GP/GM	Poorly-graded Gravel, Silty
	GP/GC	Poorly-graded Gravel, Clayey
	GM/GC	Silty Gravel, Clayey
	GC/GM	Clayey Gravel, Silty
	SW/SM	Well-graded Sand, Silty
	SW/SC	Well-graded Sand, Clayey
	SP/SM	Poorly-graded Sand, Silty
	SP/SC	Poorly-graded Sand, Clayey
	SM/SC	Silty Sand, Clayey
	SC/SM	Clayey Sand, Silty
	CL/ML	Silty Clay

ROCK DESCRIPTIONS:

SYMBOL	DESCRIPTION
	SEDIMENTARY ROCKS
	CONGLOMERATE
	SANDSTONE
	SILTSTONE
	SHALE
X X X X X X	CLAYSTONE
	COAL
	LIMESTONE
	DOLOMITE
	MARLSTONE
	GYPSUM
	Other Sedimentary Rocks
	IGNEOUS ROCKS
	GRANITIC ROCKS
+ + + + + +	DIORITIC ROCKS
	GABBRO
	RHYOLITE
	ANDESITE
	BASALT
	TUFF & ASH FLOWS
	BRECCIA & Other Volcanics
	Other Igneous Rocks
	METAMORPHIC ROCKS
	GNEISS
	SCHIST
	PHYLLITE
	SLATE
	METAQUARTZITE
	MARBLE
	HORNFELS
	SERPENTINE
	Other Metamorphic Rocks

SYMBOLS & NOTES:

SYMBOL	DESCRIPTION
	9/12 Standard penetration drive Numbers indicate 9 blows to drive the spoon 12" into ground.
	ST 2-1/2" Shelby thin wall sample
	W_o Natural Moisture Content
	W_x Weathered Material
Free water	Free water table
	γ^o Natural dry density
	T.B. – Disturbed Bulk Sample
	② Soil type related to samples in report
15' W_x / Form.	Top of formation
	Test Boring Location
	Test Pit Location
	Seismic or Resistivity Station. Lineation indicates approx. length & orientation of spread (S = Seismic, R = Resistivity)

Standard Penetration Drives are made by driving a standard 1.4" split spoon sampler into the ground by dropping a 140 lb. weight 30". ASTM test des. D-1586.

Samples may be bulk, standard split spoon (both disturbed) or 2-1/2" I.D. thin wall ("undisturbed") Shelby tube samples. See log for type.

The boring logs show subsurface conditions at the dates and locations shown, and it is not warranted that they are representative of subsurface conditions at other locations and times.

LINCOLN DeVORE INC.

COLORADO SPRINGS
PUEBLO – GRAND JUNCTION

EXPLANATION OF BOREHOLE LOGS AND LOCATION DIAGRAMS

BORING NO. 1

DEPTH (FT.)	SOIL LOG	BORING ELEVATION: DESCRIPTION					BLOW COUNT	SOIL DENSITY pcf	WATER %
		Slightly Organic		Very High Sulfates					
		Low Plastic Silt	Low Density		Very Moist				
			Alluvial						
		ML	Sandy Silt	Compressible		Wet	ST	88.7	36.4%
5		I	occ. Clayey		Sulfates		5		
		Free Water ▼		Increasing Sand					
		GC	Clayey, Sandy Gravel				BULK		32.7
		III		Low Plastic Fines					
10		GM	Silty, Sandy Gravel and Cobble			CS	10	19/6	104.8	10.3%
		II	Alluvial Terrace Gravels		Medium Density			26/12	
				Flowing into Hole				51/18	
			Non-Plastic Fines		Medium Density				
		GC	Clayey, Sandy Gravel and Cobble						
15		III	Medium Density		Low Sulfates		15		
				Some Strata of Flowing Sands					
			Very poor recovery of cuttings						
		GM	Silty, Sandy Gravel and Cobble				BULK		33.8%
		II							
20							20		
			TD @ 18'						
25							25		
30							30		

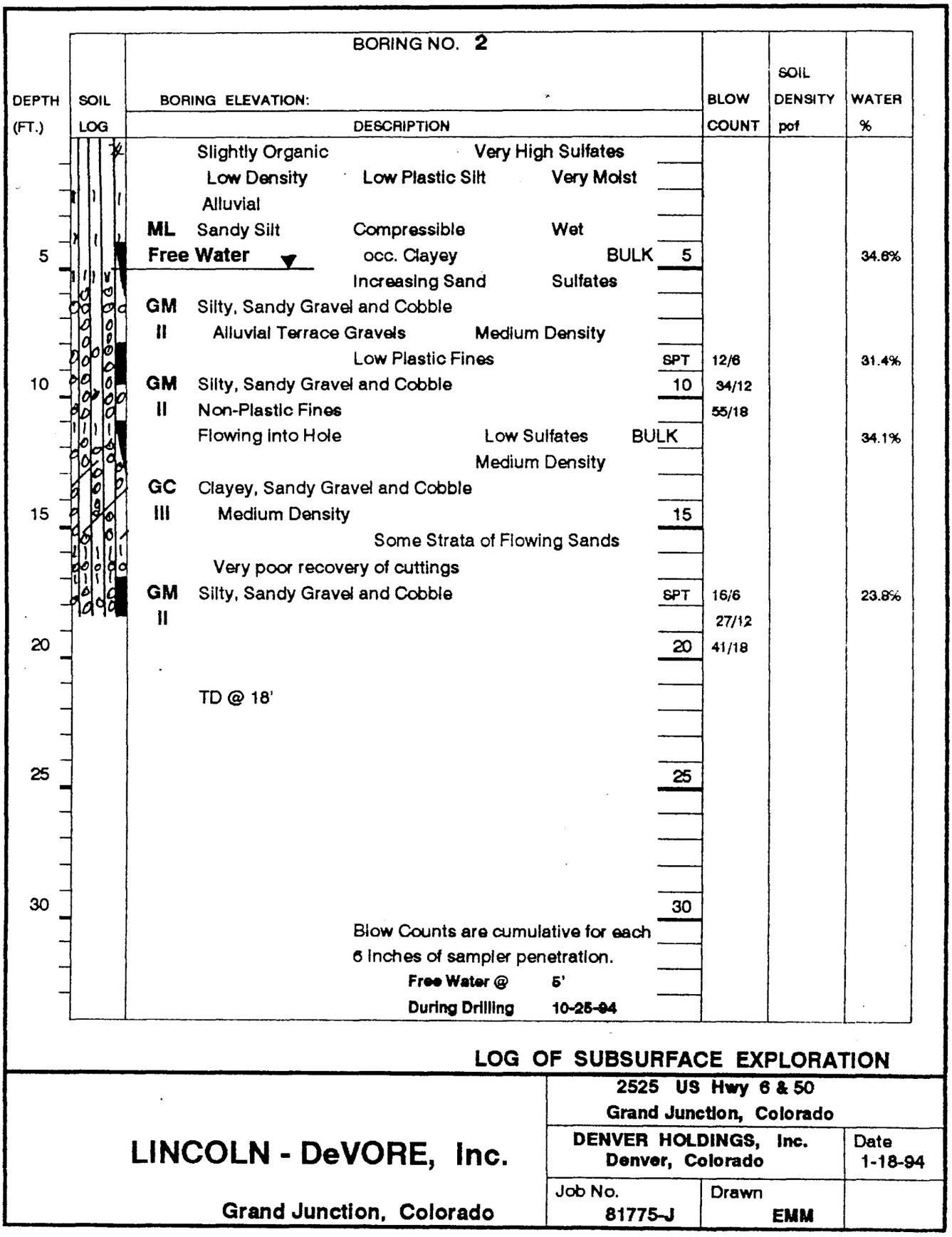
Blow Counts are cumulative for each 6 inches of sampler penetration.

Free Water @ 6'

During Drilling 10-26-94

LOG OF SUBSURFACE EXPLORATION

LINCOLN - DeVORE, Inc.	**2525 US Hwy 6 & 50** **Grand Junction, Colorado**	
	DENVER HOLDINGS, Inc. **Denver, Colorado**	Date 1-18-94
Grand Junction, Colorado	Job No. **81775-J**	Drawn **EMM**



LOG OF SUBSURFACE EXPLORATION

LINCOLN - DeVORE, Inc.	2525 US Hwy 6 & 50 Grand Junction, Colorado	
	DENVER HOLDINGS, Inc. Denver, Colorado	Date 1-18-94
Grand Junction, Colorado	Job No. 81775-J	Drawn EMM

BORING NO. 3

DEPTH (FT.)	SOIL LOG	BORING ELEVATION: DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
		Organic	Clayey	Very High Sulfates				
		Alluvial	Low Density	Wet				
		Low Plastic Silt		Soft to Drill	ST		95.6	24.3%
		Free Water ▼	Compressible					
5		**ML** Sandy Silt		Sulfates	5			
		Stratified	Very Sandy	We	BULK			27.5%
		GM Very Sandy Gravel and Cobble		Medium Density				
		II Alluvial Terrace Gravels						
10				Non-Plastic Fines	10			
		Rapidly Flowing into Hole						
		Non-Plastic Fines		Medium Density				
		GM Silty, Sandy Gravel and Cobble			SPT	7/6		19.4%
15		**II** Medium Density		Low Sulfates	15	23/12		
			Some Strata of Flowing Sands			67/18		
		Very poor recovery of cuttings						
		GC Clayey, Sandy Gravel and Cobble						
		III Medium Density		Low Plastic Fines				
20					20			
		Mancos Shale		Firm				
		IV Expansive	Very Silty Clay		BULK			16.7%
		Increasing Density w/ Depth		V. Moist	SPT	14/6		14.2%
		Decreasing Moisture w/ Depth		Sulfates		43/12		
25		TD @ 23'			25			
30					30			

Blow Counts are cumulative for each 6 inches of sampler penetration.

Free Water @ 4'

During Drilling 10-26-94

LOG OF SUBSURFACE EXPLORATION

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

2525 US Hwy 6 & 50
Grand Junction, Colorado

DENVER HOLDINGS, Inc.
Denver, Colorado

Date 1-18-94

Job No. **81775-J**

Drawn **EMM**

BORING NO. 4

DEPTH (FT.)	SOIL LOG	BORING ELEVATION: DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
		Slightly Organic		Very High Sulfates				
		Low Plastic Silt	Low Density		Very Moist			
			Alluvial			ST	90.2	26.0%
		Free Water ▼	Compressible		Wet			
5		ML Sandy Silt		Sulfates		5		
		I occ. Clayey	Increasing Sand					
			Low Density			BULK		22.9%
		GM Silty, Sandy Gravel and Cobble		Non-Plastic Fines				
10		II Alluvial Terrace Gravels				10		
		Flowing into Hole		Medium Density				
		GC Clayey, Sandy Gravel and Cobble						
		III Medium Density		Low Sulfates				
		Very poor recovery of cuttings				SPT	23/6	18.9%
15		Very Sandy Cobbles		Non-Plastic Fines		15	50/12	
			Some Strata of Flowing Sands				77/18	
		GM Silty, Sandy Gravel and Cobble				BULK		29.8%
		II						
20						20		
		TD @ 18'						
25						25		
30						30		

Blow Counts are cumulative for each 6 inches of sampler penetration.

Free Water @ 4'

During Drilling 10-26-94

LOG OF SUBSURFACE EXPLORATION

LINCOLN - DeVORE, Inc.	**2525 US Hwy 6 & 50** **Grand Junction, Colorado**	
	DENVER HOLDINGS, Inc. **Denver, Colorado**	Date 1-18-94
Grand Junction, Colorado	Job No. **81775-J**	Drawn **EMM**

BORING NO. 5

DEPTH (FT.)	SOIL LOG	DESCRIPTION					BLOW COUNT	SOIL DENSITY pcf	WATER %
		BORING ELEVATION:							
		Slightly Organic	Clayey	Very High Sulfates					
		Alluvial, Low Plastic Silt			Wet	ST		95	24.2%
			Low Density						
		ML Sandy Silt	Compressible		Wet				22.1%
5		**Free Water ▼**		Sulfates		5			
		GC Clayey, Sandy Gravel							
		III	Low Plastic Fines			BULK			23.4%
		Very Stratified		Medium Density					
			Low Plastic Fines						
10		GM Silty, Sandy Gravel and Cobble				BULK 10			31.8%
		II Alluvial Terrace Gravels							
		Sand Strata	Some Strata of Flowing Sands						
		Non-Plastic Fines		Medium Density					
		GC Clayey, Sandy Gravel and Cobble				SPT			21.8%
15		III Medium Density		Low Sulfates		15			
									22.1%
		Very poor recovery of cuttings							
		GM Silty, Sandy Gravel and Cobble				BULK			31.6%
		II							
20						20			
		TD @ 18'							
25						25			
30						30			
		Blow Counts are cumulative for each 6 inches of sampler penetration.							
		Free Water @ 5'							
		During Drilling 10-26-94							

LOG OF SUBSURFACE EXPLORATION

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

2525 US Hwy 6 & 50
Grand Junction, Colorado

DENVER HOLDINGS, Inc.
Denver, Colorado

Date 1-18-94

Job No. **81775-J**

Drawn **EMM**

BORING NO. 6

DEPTH (FT.)	SOIL LOG	BORING ELEVATION: DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
		Slightly Organic	Silt	Very High Sulfates				
		Compressible	Low Density	Wet	ST		89.2	28.5%
		Free Water ▼	Alluvial		BULK			32.9%
		ML Sandy Silt	Gravelly Strata	Wet				
5		I Sand Strata		Low Sulfates	5			
		GC Clayey, Sandy Gravel		Low Plastic Fines				
		III			BULK			26.4
		Sand Strata	Medium Density					
			Low Plastic Fines					
10		GM Silty, Sandy Gravel and Cobble			10			
		II Alluvial Terrace Gravels		Low Sulfates	SPT	6/6		14.9%
		Some Strata of Flowing Sands				21/12		
		Non-Plastic Fines		Medium Density		34/18		
		GM Silty, Sandy Gravel and Cobble			SPT			16.2%
15		II Sand Strata		Low Sulfates	15	17/6		
			Some Strata of Flowing Sands			39/12		
		Very poor recovery of cuttings				51/18		
		GM Silty, Sandy Gravel and Cobble						
		II						
20					20			
		TD @ 18'						
25					25			
30					30			
		Blow Counts are cumulative for each						
		6 inches of sampler penetration.						
		Free Water @ 9'						
		During Drilling 10-26-94						

LOG OF SUBSURFACE EXPLORATION

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

2525 US Hwy 6 & 50
Grand Junction, Colorado

DENVER HOLDINGS, Inc.
Denver, Colorado

Date 1-18-94

Job No. **81775-J**

Drawn **EMM**

BORING NO. 7

DEPTH (FT.)	SOIL LOG	BORING ELEVATION: DESCRIPTION					BLOW COUNT	SOIL DENSITY pcf	WATER %
		Slightly Organic		Very High Sulfates					
		Low Plastic Silt	Low Density		Very Moist				
		ML Sandy Silt	Alluvial			CS	3/6	92.3	30.1%
		I occ. Clayey	Compressible		Wet		5/12		
5		Free Water ▼		Sulfates		5	8/18		
		Sand and Gravel	Stratified			BULK			31.4%
		Non-Plastic Fines		Alluvial Terrace Gravels					
		GC Clayey, Sandy Gravel		Low Plastic Fines					
		III Hole Caving	Medium Density						
10		GM Silty, Sandy Gravel and Cobble				10			
		II Many Strata of Flowing Sands							
		Very poor recovery of cuttings							
		Non-Plastic Fines		Only Sands & Silts					
		GM Silty, Sandy Gravel and Cobble			Recovered				
15		III Medium Density		Low Sulfates		15			
		Many Strata of Flowing Sands							
		Hole Caving							
		GM Silty, Sandy Gravel and Cobble							
		II							
20						20			
		TD @ 18'							
25						25			
30						30			

Blow Counts are cumulative for each 6 inches of sampler penetration.

Free Water @ 5'

During Drilling 10-25-94

LOG OF SUBSURFACE EXPLORATION

LINCOLN - DeVORE, Inc.	2525 US Hwy 6 & 50 Grand Junction, Colorado	
	DENVER HOLDINGS, Inc. Denver, Colorado	Date 1-18-94
Grand Junction, Colorado	Job No. 81775-J	Drawn EMM

BORING NO. 8

BORING ELEVATION:

DEPTH (FT.)	SOIL LOG	DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
		Organic Clays and Silts		Very High Sulfates				
			Low Density	Wet				
		ML Very Sandy Silt		Very Soft to Drill	SPT	2/6		19.7%
		I	Compressible			4/12		
5		Free Water ▼	Sand Strata	Flowing into Hole	5			
		Very Stratified	Very Sandy					
				Sulfates				
		GM Very Sandy Gravel and Cobble		Medium Density				
		II Alluvial Terrace Gravels		Hole Caving				
10				Non-Plastic Fines	10			
		Sands Rapidly Flowing into Hole						
		Non-Plastic Fines		Medium Density				
		GM Silty, Sandy Gravel and Cobble						
15		II Medium Density		Low Sulfates	15			
			Some Strata of Flowing Sands					
		Very poor recovery of cuttings			BULK			31.5%
		GC Clayey, Sandy Gravel and Cobble						
		III Medium Density		Low Plastic Fines				
20					20			
		Mancos Shale		Firm				
		IV Expansive	Very Silty Clay					
		Increasing Density w/ Depth		V. Moist				
		Decreasing Moisture w/ Depth		Sulfates	SPT	19/6		15.7%
25		TD @ 24'			25	41/12		
						87/18		
30					30			

Blow Counts are cumulative for each 6 inches of sampler penetration.

Free Water @ 5'

During Drilling 10-25-94

LOG OF SUBSURFACE EXPLORATION

LINCOLN - DeVORE, Inc.	2525 US Hwy 6 & 50 Grand Junction, Colorado	
	DENVER HOLDINGS, Inc. Denver, Colorado	Date 1-18-94
Grand Junction, Colorado	Job No. 81775-J	Drawn EMM

BORING NO. 9

BORING ELEVATION:

DEPTH (FT.)	SOIL LOG	DESCRIPTION					BLOW COUNT	SOIL DENSITY pcf	WATER %
		Gravel and Cobble Fill		Very High Sulfates					
		Medium Density		Moist to Very Moist					
			Stratified	Soft to Drill at Base					
		ML Sandy Silt	Compressible	Organic	Wet	ST		88.7	30.4%
5		I Very Sandy Strata		Sulfates		5			
		Free Water ▼	Non-Plastic Fines						
		Sand and Some Gravel		Flowing Into Hole					
		GM Very Sandy Gravel and Cobble			Medium Density				
		II Alluvial Terrace Gravels							
10						10			
		Rapidly Flowing into Hole		Sands & Silts		BULK			34.7%
		Very poor recovery of cuttings							
		Non-Plastic Fines		Medium Density					
		GM Silty, Sandy Gravel and Cobble							
15		II Medium Density		Low Sulfates		15			
		Some Strata of Flowing Sands							
			Very poor recovery of cuttings						
		GM Sandy Gravel and Cobble							
		III Medium Density		Non-Plastic Fines					
20						20			
		Mancos Shale		Firm					
		IV Expansive	Very Silty Clay						
		Increasing Density w/ Depth			V. Moist				
		Decreasing Moisture w/ Depth			Sulfates	SPT	24/6		18.2%
25						25	58/12		
							83/18		16.5%
		TD @ 24'							
30						30			

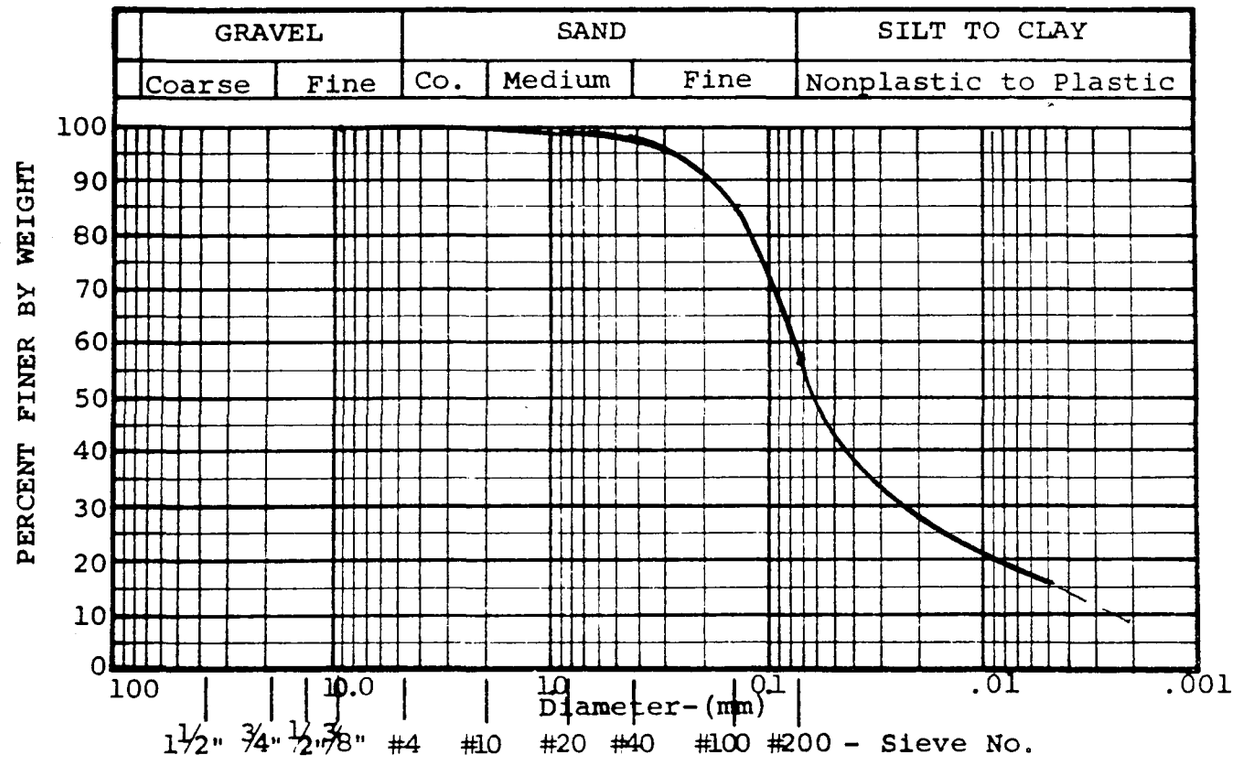
Blow Counts are cumulative for each 6 inches of sampler penetration.

Free Water @ 6'

During Drilling 10-25-94

LOG OF SUBSURFACE EXPLORATION

LINCOLN - DeVORE, Inc.	2525 US Hwy .6 & 50 Grand Junction, Colorado	
	DENVER HOLDINGS, Inc. Denver, Colorado	Date 1-18-94
Grand Junction, Colorado	Job No. 81775-J	Drawn EMM



Soil Sample SANDY SILT (ML) Sample Location TB 1 @ 4'

Sample No. I

Specific Gravity

Moisture Content 36.4%

Effective Size 0.0025 mm

Cu 3

Cc 2.7

Fineness Modulus

L.L. % P.I. NP %

Bearing psf

Sulfates 1000 ppm

Sieve Size	% Passing
1-1/2"	
1"	
3/4"	
1/2"	
3/8"	100
#4	99
#10	99
#20	99
#40	98
#100	85
#200	56.6
0.0200	28
0.0050	16

Lincoln DeVore, Inc.
Geotechnical Consultants

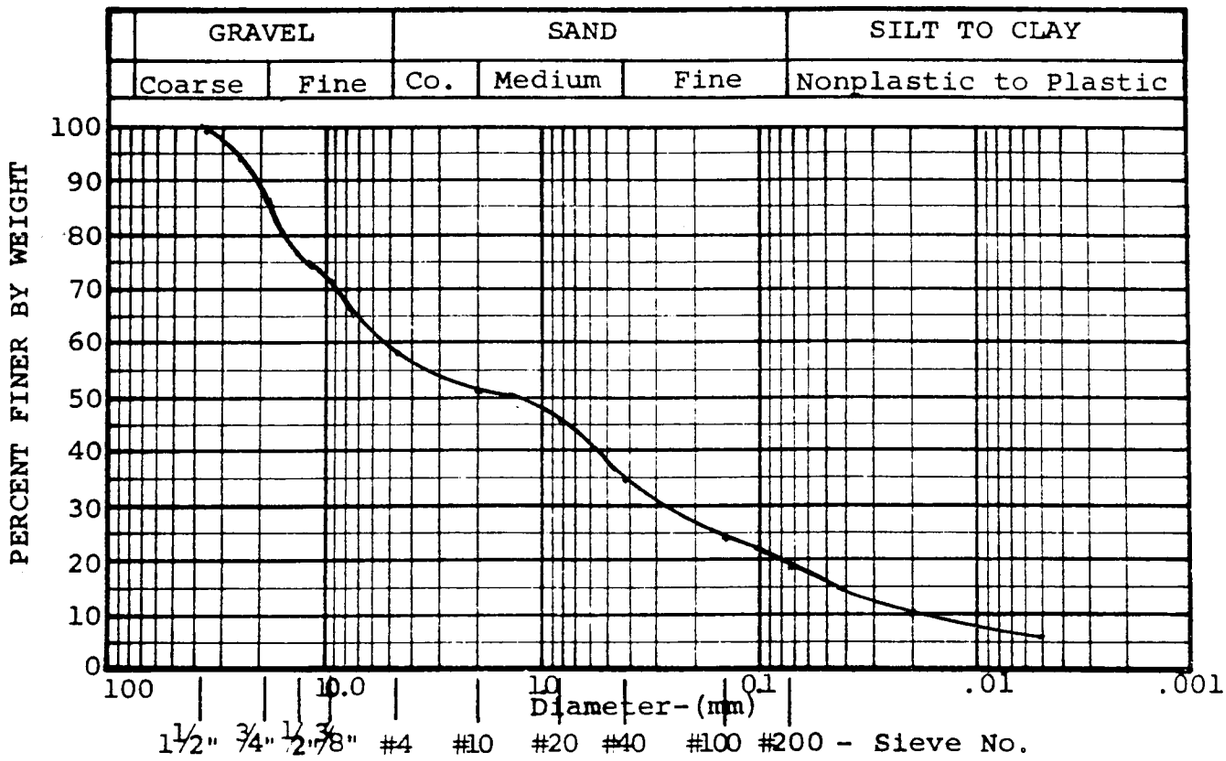
≈ 2525 Hwy 6+50, GRAND JUNCTION, Co

DENVER HOLDINGS

DATE 10-31-94

JOB NO. 91775-J

DRAWN EMM



FINE PORTION ONLY

Soil Sample SILTY, SANDY GRAVEL (GM) Sample Location TB 6@13'

Sample No. II

Specific Gravity

Moisture Content 14.9%

Effective Size 0.02 mm

Cu 265

Cc 0.7

Fineness Modulus

L.L. % P.I. NP %

Bearing 3500 psf

Sulfates 100 ppm

Sieve Size	% Passing
1-1/2"	100
1"	94
3/4"	84
1/2"	77
3/8"	71
#4	58
#10	51
#20	46
#40	34
#100	24
#200	18.7
0.0200	10
0.0050	6

Lincoln DeVore, Inc.
Geotechnical Consultants

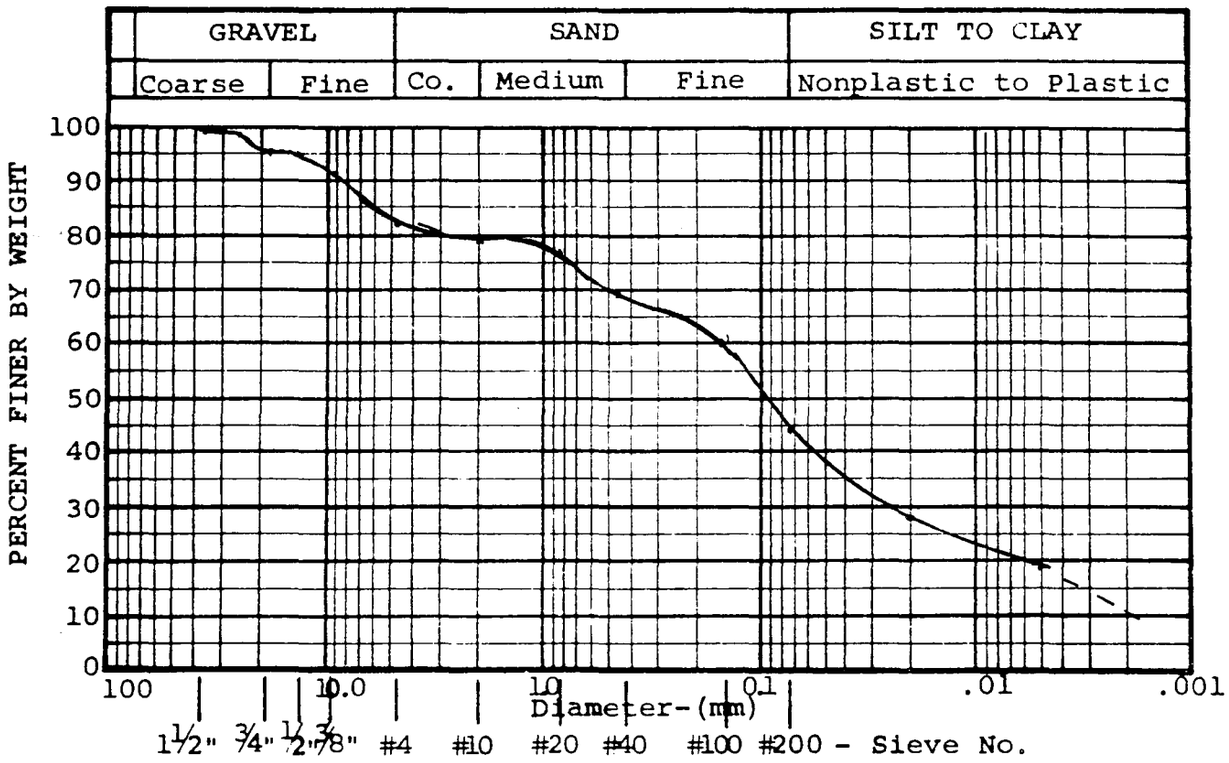
≈ 2525 HWY 6450, GRAND JUNCTION, CO.

DENVER HOLDINGS

DATE 10-31-94

JOB NO. 81775-J

DRAWN EHM



FINE PORTION ONLY

Soil Sample CLAYEY, SANDY GRAVEL (GC) Sample Location TB 1 @ 9'

Sample No. III

Specific Gravity

Moisture Content 32.7%

Effective Size ≈ 0.002 mm

Cu 75

Cc 1.9

Fineness Modulus

L.L. 27 % P.I. 9 %

Bearing 3000 psf

Sulfates 1000 ppm

Sieve Size	% Passing
1-1/2"	100
1"	98
3/4"	95
1/2"	95
3/8"	91
#4	82
#10	79
#20	77
#40	69
#100	60
#200	44
0.0200	28
0.0050	19

Lincoln DeVore, Inc.
Geotechnical Consultants

≈ 2525 Hwy 6&50, GRAND JUNCTION, CO.

DENVER HOLDINGS

DATE 10-31-94

JOB NO. 81775-J

DRAWN EMM

SUMMARY SHEET

Soil Sample WEATHERED MANCOS SHALE SANDY CLAY (CL) Km

Location ≈ 2525 Hwy 6450, GRD Jct- Colo

Boring No. 8 Depth 24'

Sample No. IV

Test No. 81775-J

Date 10-31-94

Test by LRS

Natural Water Content (w) 15.7 %

Specific Gravity (Gs) _____

In Place Density (γ_o) _____ pcf

SIEVE ANALYSIS:

Sieve No.	% Passing
1 1/2"	
1"	
3/4"	
1/2"	
4	
10	100
20	97
40	94
100	79
200	70.8

HYDROMETER ANALYSIS:

Grain size (mm)	%
0.02	67
0.005	56

Plastic Limit P.L. 16 %

Liquid Limit L. L. 29 %

Plasticity Index P.I. 13 %

Shrinkage Limit _____ %

Flow Index _____

Shrinkage Ratio _____ %

Volumetric Change _____ %

Lineal Shrinkage _____ %

MOISTURE DENSITY: ASTM METHOD

Optimum Moisture Content - w_o _____ %

Maximum Dry Density - γ_d _____ pcf

California Bearing Ratio (av) _____ %

Swell: 1 Days _____ %

Swell against _____ psf Wo gain _____ %

BEARING:

Housel Penetrometer (av) 4500 psf

Unconfined Compression (qu) _____ psf

Plate Bearing: _____ psf

Inches Settlement _____

Consolidation % under psf

PERMEABILITY:

K (at 20°C) _____

Void Ratio _____

Sulfates 1500 ppm.

SOIL ANALYSIS

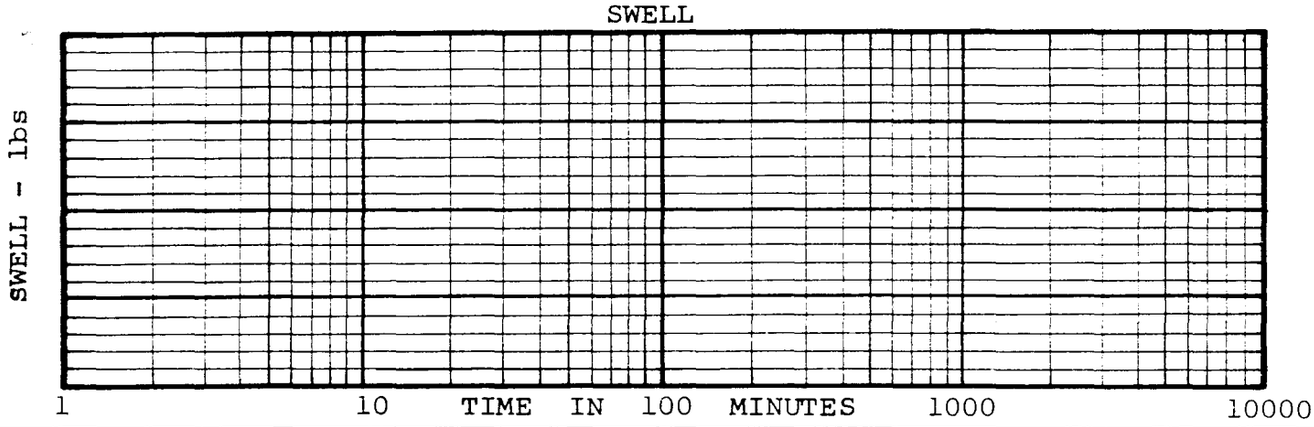
LINCOLN-DeVORE TESTING LABORATORY
COLORADO SPRINGS, COLORADO

SOIL SAMPLE SANDY SILT (ML) Test No. 81775-J

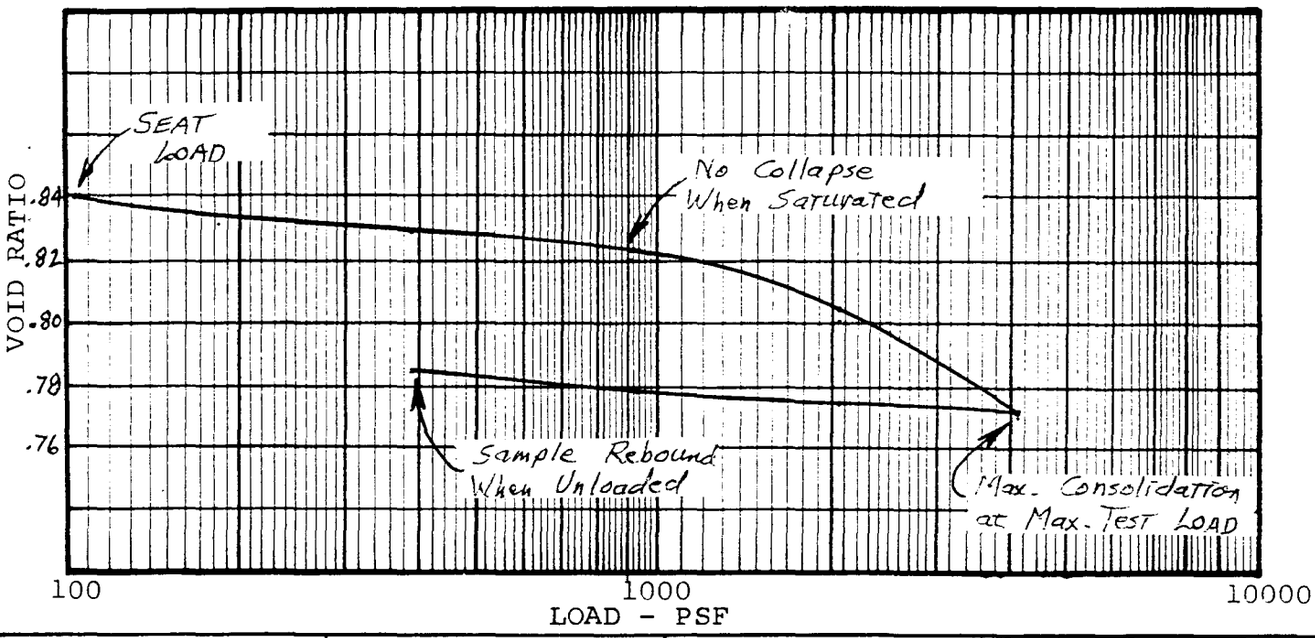
Project ≈2525 Hwy 6+50 GD. Jct. Date 11-4-94

Sample Location TB 4@2' Test by RL

SWELL



CONSOLIDATION



Sample Conditions	Initial	Maximum Load	Expanded
Dry Density	90.2 pcf	93.6 pcf	93.2 pcf
% Moisture	26.0 %	29.05 %	29.6 %
% Saturation	82 %	100 %	100 %
Void Ratio	.840	.773	.7843

Specific Gravity 2.66

Maximum Load used 4069 lb. Ring Number 143.14

Apparatus Densoil 2 Volume 2.5" Ring .002841 cu. ft.

LOAD - CONSOLIDATION

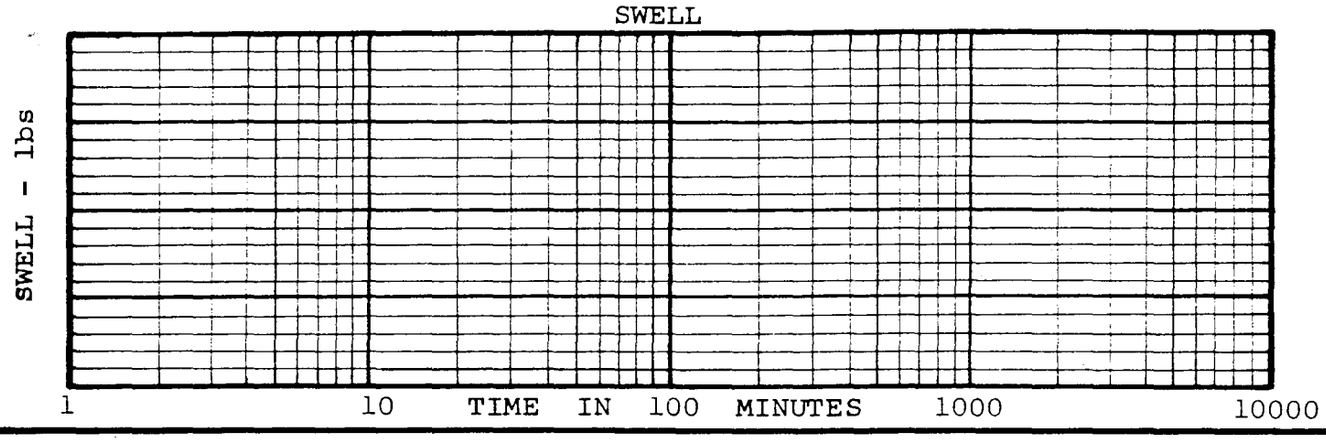
LINCOLN-DeVORE, INC.
COLORADO SPRINGS, COLORADO

SOIL SAMPLE SANDY SILT (ML) Test No. 81775-J

Project ≈2525 Hwy 6&50, Gd. Jct. Date 10-31-94

Sample Location TB 5@2' Test by LRS

SWELL



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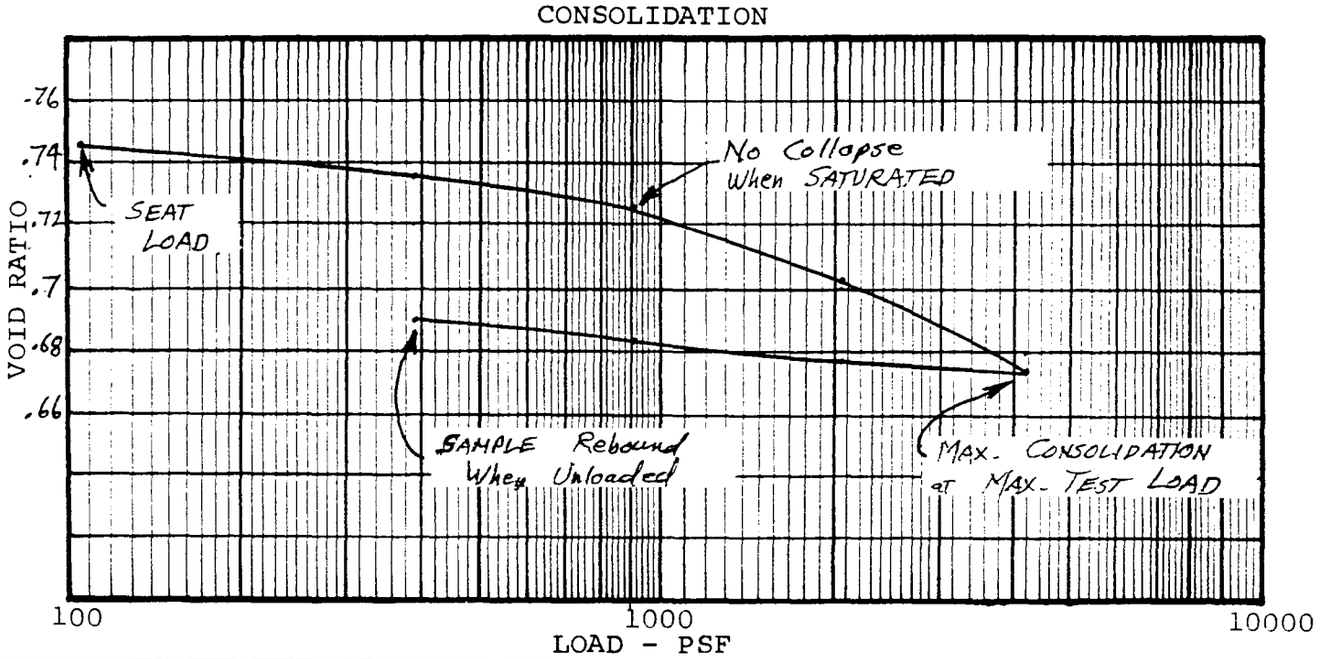


Sample Conditions	Initial	Maximum Load	Expanded
Dry Density	95.0 pcf	99.1 pcf	98.2 pcf
% Moisture	24.6 %	25.4 %	25.7 %
% Saturation	88 %	100 %	100 %
Void Ratio	.746	.674	.691

Specific Gravity 2.66

Maximum Load used 4210 lb. Ring Number 144-1

Apparatus Densoil 4 Volume 2.5" Ring .002841 cu. ft.

LOAD - CONSOLIDATION

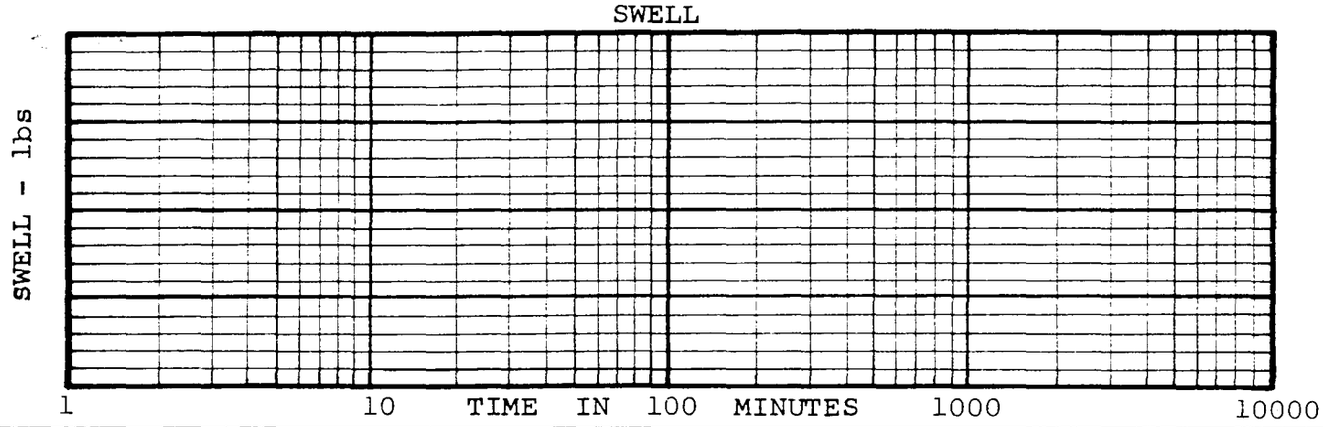
LINCOLN-DeVORE, INC.
COLORADO SPRINGS, COLORADO

SOIL SAMPLE SANDY SILT (ML) Test No. 81775-J

Project ≈2525 Hwy 6+50 60. Jct. Date 11-4-94

Sample Location TB 6 @ 2' Test by LRS

SWELL



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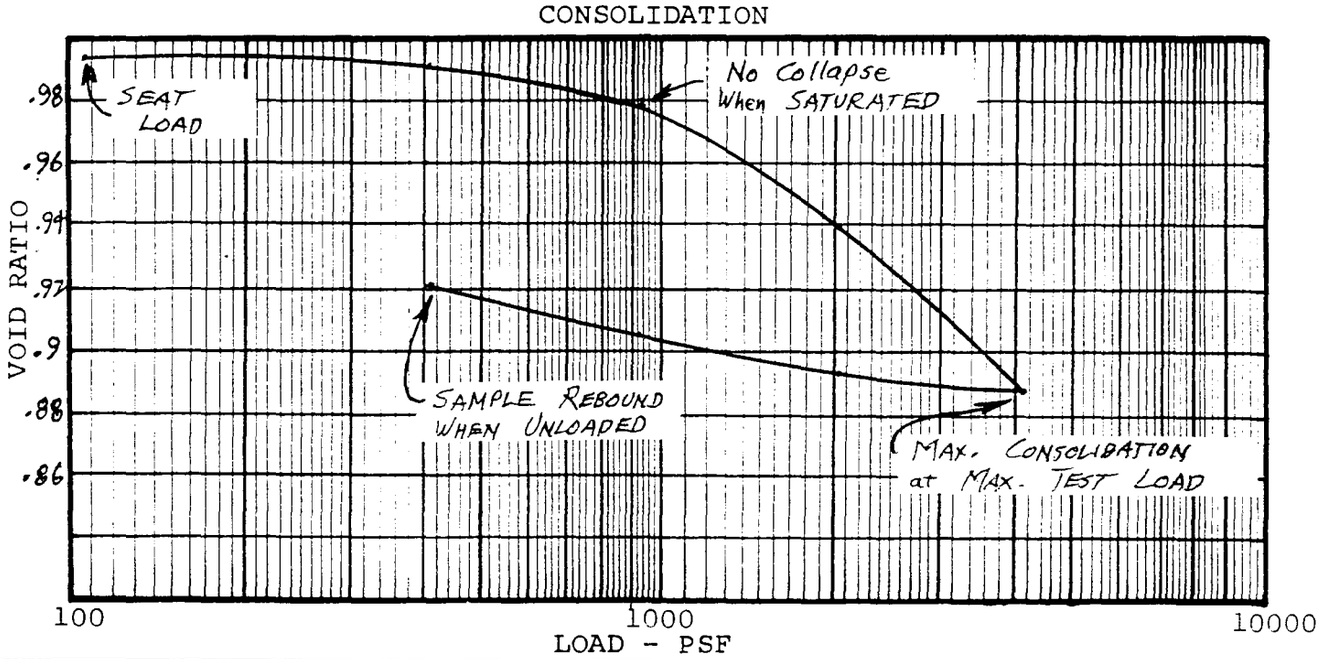


Sample Conditions	Initial	Maximum Load	Expanded
Dry Density	83.2 pcf	87.9 pcf	86.4 pcf
% Moisture	28.5%	33.4%	34.6%
% Saturation	76.7%	100%	100%
Void Ratio	.995	.887	.921

Specific Gravity 2.66

Maximum Load used 4116 lb. Ring Number 143-8

Apparatus Densoil 3 Volume 2.5" Ring .002841 cu. ft.

LOAD - CONSOLIDATION

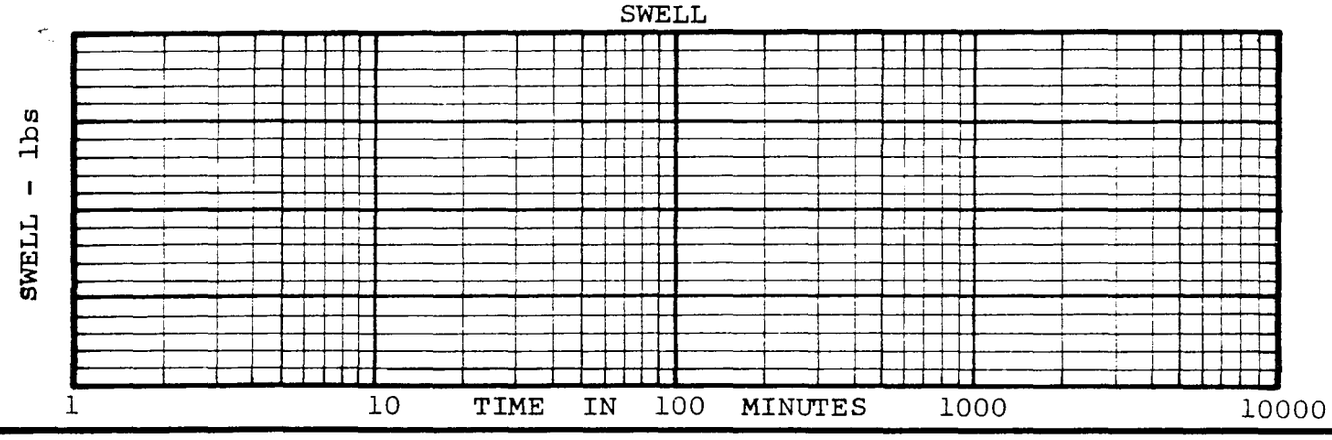
LINCOLN-DeVORE, INC.
COLORADO SPRINGS, COLORADO

SOIL SAMPLE SANDY SILT (ML) sl. organic Test No. 81775-J

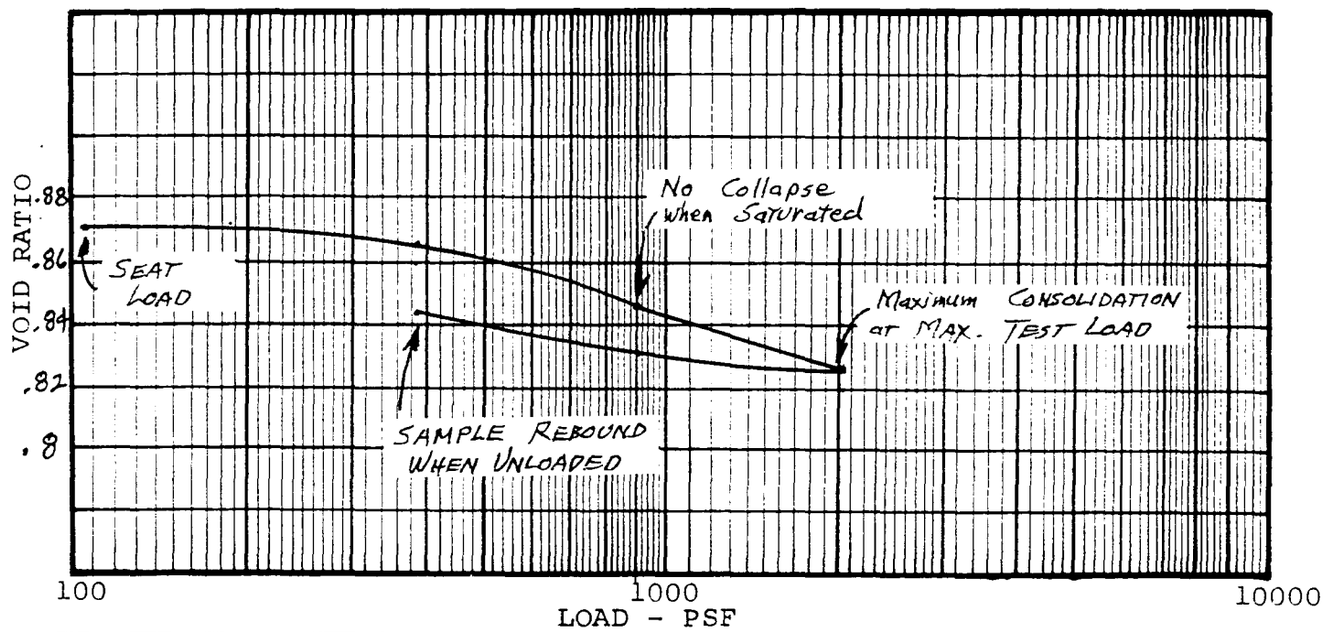
Project ≈2525 Hwy 6&50 GD. Jct. Date 10-26-94

Sample Location TB 9@ 4' Test by LRS

SWELL



CONSOLIDATION



Sample Conditions	Initial	Maximum Load	Expanded
Dry Density	88.7 pcf	90.8 pcf	90.1 pcf
% Moisture	30.4 %	31.1 %	31.7 %
% Saturation	92 %	100 %	100 %
Void Ratio	.871	.828	.843

Specific Gravity 2.65

Maximum Load used 2007 lb. Ring Number 144-1

Apparatus Denson 1 Volume 2.5" Ring .002841 cu.ft.

LOAD - CONSOLIDATION

LINCOLN-DeVORE, INC.
COLORADO SPRINGS, COLORADO

TRAFFIC IMPACT ANALYSIS

RIMROCK SHOPPING CENTER

GRAND JUNCTION, COLORADO

Leigh, Scott & Cleary, Inc.

LEIGH, SCOTT & CLEARY
TRANSPORTATION PLAN
& TRAFFIC ENGINEERING CONSULT

1889 York
Denver, CO
(303) 33
FAX (303) 33

August 10, 1995

Mr. Philip M. Hart, P.E.
LANDesign
200 North 6th Street, Suite 102
Grand Junction, CO 81501

Re: Rimrock Shopping Center
Grand Junction, CO
(LSC #941420)

Dear Mr. Hart:

We are pleased to submit our revised report of the traffic impacts of the proposed Rimrock Shopping Center in Grand Junction, Colorado.

The traffic impact study first provides a summary of existing roadway and traffic conditions in the vicinity of the proposed site. It then provides estimates of the amount and directional distribution of traffic that will be generated. Finally, the impacts of the project-generated traffic are evaluated and recommendations are made regarding roadway improvements. An important component of the study is the location and design guidelines for access points that will be necessary to serve this development from the adjacent arterial roadways.

We trust that our findings and recommendations will assist in obtaining approval of the Rimrock Shopping Center. Please call if we can be of additional assistance.

Respectfully submitted,

LEIGH, SCOTT & CLEARY, INC.

By: _____
Philip N. Scott III, P.E.

PNS/wd

C:\PROJECTS\941420\RIMROCK.RPT

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SECTION A
Introduction

The Rimrock Shopping Center is a proposed development to be located along the southerly side of US Highway 6 and 50 and west of 25 1/2 Road (extended) in Grand Junction, Colorado. This 42-acre development will contain approximately 400,000 square feet of retail space upon buildout.

LANDesign, has retained Leigh, Scott & Cleary, Inc. to prepare a traffic impact analysis of the development. This report was prepared in accordance with the requirements of the City of Grand Junction. The purpose of this study is to determine the effects on the safety and capacity of surrounding roadways and intersections due to the construction and operation of the Rimrock Shopping Center. Specific steps taken in this analytic process are described as follows:

- A review and analysis of present roadway and traffic conditions in the vicinity of the site. This task included the review of intersection turning movement counts conducted at the intersections of Independent Avenue with US 6/50 and Sam's Club as well as at the Mulberry and Grand Avenue intersection, and a 24-hour machine traffic count on US 6/50, east of Independent Avenue. In addition, an evaluation of the 1991 through 1994 traffic accident history was made.

- A determination of the amount of daily and peak-hour traffic that would be generated by buildout of the proposed development and an analysis of the directional distribution of the proposed traffic on the surrounding roadway system.

- A projection of future background traffic volumes on the adjacent street system for Years 1995 and 2015.

- A determination of future traffic impacts associated with the proposed development. These impacts are based upon estimates of the total amount of traffic on the surrounding roadway system and the resulting Levels of Service (LOS) at the key intersections in the vicinity of the development.

- A determination of street and access improvements that will be necessary to mitigate the traffic impacts associated with the proposed development.

SECTION B

Roadway and Traffic Conditions

The location of the proposed Rimrock Shopping Center is shown in Figure 1. The site is bordered on the northeast and east by the US Route 6 & 50, on the southeast and south by the D & RGW Railroad and undeveloped land, and on the northwest by Independent Avenue. The area surrounding the proposed site is generally comprised of commercial and light industrial uses.

Area Roadways

Major roadways in the vicinity of the site are also illustrated in Figure 1. These roadways are described below along with a brief discussion of anticipated future roadway construction and improvements.

- US Route 6 & 50 is a four-lane, undivided roadway which extends from points west to just east of the subject site where the roadway diverges into its individual components. Both of these components and the joint roadway are classified as Principal Arterials in this area. US 6 continues easterly through the central business district where it eventually bisects Interstate 70 on the eastern side of Grand Junction. US Route 6 and Interstate 70 then shadow each other across the state to where they once again diverge just west of Denver. US Route 50 continues southerly along the west side of Grand Junction towards Montrose where it turns easterly and proceeds across the state. The main access for the proposed shopping center is to be located at the Independent Avenue signalized intersection with US 6/50 (adjacent to Sam's Club). West of Independent Avenue, there are frontage roads located both north and south of US Route 6 & 50. These frontage roads parallel US 6 & 50 in close proximity along this area. East of the southerly extension of Independent Avenue, the south frontage road is proposed to be relocated southerly to a maximum offset of approximately 350 feet. Independent Avenue will be extended to this maximum point and continue into the proposed site. The frontage road will then meander back toward a parallel position along US 6 & 50 and will eventually tie into Mulberry Street at Grand Avenue to the south. The US 6/50 intersections with Independent Avenue (Sam's Club), 25 Road, 24 1/2 Road, and the "McDonald's" entrance are all presently controlled by traffic signals as is the Mulberry intersection with Grand Avenue. All other accesses in the immediate area are Stop sign controlled.

- Independent Avenue is a two-lane undivided collector route which extends westerly from 1st Street across US 6 & 50 to 24 3/4 Road. 24 3/4 Road is

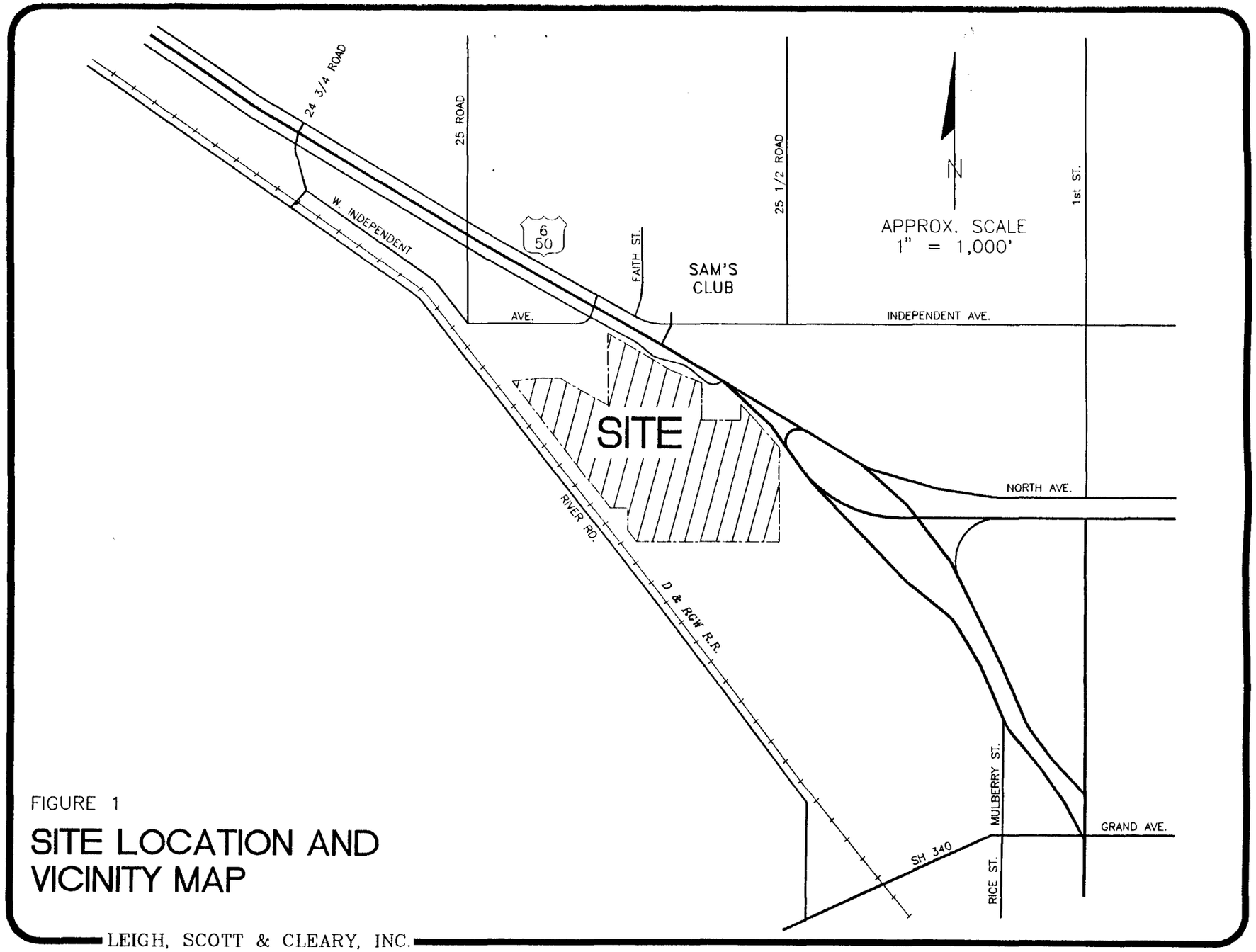


FIGURE 1

SITE LOCATION AND VICINITY MAP

LEIGH, SCOTT & CLEARY, INC.

located approximately one mile west of the proposed main access to the development.

- "Frontage Road:" The existing south frontage road presently ends just east of the signalized Independent Avenue with US 6 & 50. As described above, it is planned to parallel US 6 & 50 and eventually tie into Mulberry Street at Grand Avenue. This new section of the frontage road is expected to be constructed with a two-lane cross-section plus left-turn bays where needed.

- Mulberry Street: This two-lane, north/south roadway presently connects between the southeastbound lanes of US 6 & 50 and Grand Avenue/SH 340. South of Grand Avenue, Mulberry has direct continuity with Rice Street, a two-lane local access roadway.

Present Traffic Volumes

Peak-hour and daily traffic counts were conducted by Counter Measures, Inc. on December 15 & 17, 1994 in the vicinity of the development site. Figures 2 and 3 summarize the results of these counts. Intersection turning movement counts at the intersections of US 6 & 50 with the northern and southern extensions of Independent Avenue as well as at the accompanying frontage roads were conducted during the morning and evening weekday peak travel periods of 6:30 to 8:30 AM and 4:00 to 6:00 PM, respectively. The actual peak-hours occurred from 7:30 to 8:30 AM and from 4:30 to 5:30 PM. Intersection turning movement counts were also conducted during a Saturday peak travel period between the hours of 11:00 AM and 1:00 PM. The actual Saturday peak-hour occurred from 12:00 to 1:00 PM. Twenty-four hour machine counts were conducted on US 6 & 50 between the two Independent Avenue intersections during both the weekday and Saturday mentioned previously. The results of the counts indicate that US 6 & 50 carries approximately 33,000 vehicles per day in the vicinity of the development on a weekday and approximately 32,000 vehicles per day on a Saturday.

Proposed Access Plan

As part of the Rimrock development plan, the short section of South Frontage Road, which currently is routed southeasterly from the Independent/US 6 & 50 West intersection, is to be realigned and extended to connect with Mulberry Street. As a result, there will be a continuous route between the South Frontage Road/Independent Avenue and Mulberry/Grand Avenue intersections. Direct access to the Rimrock Shopping

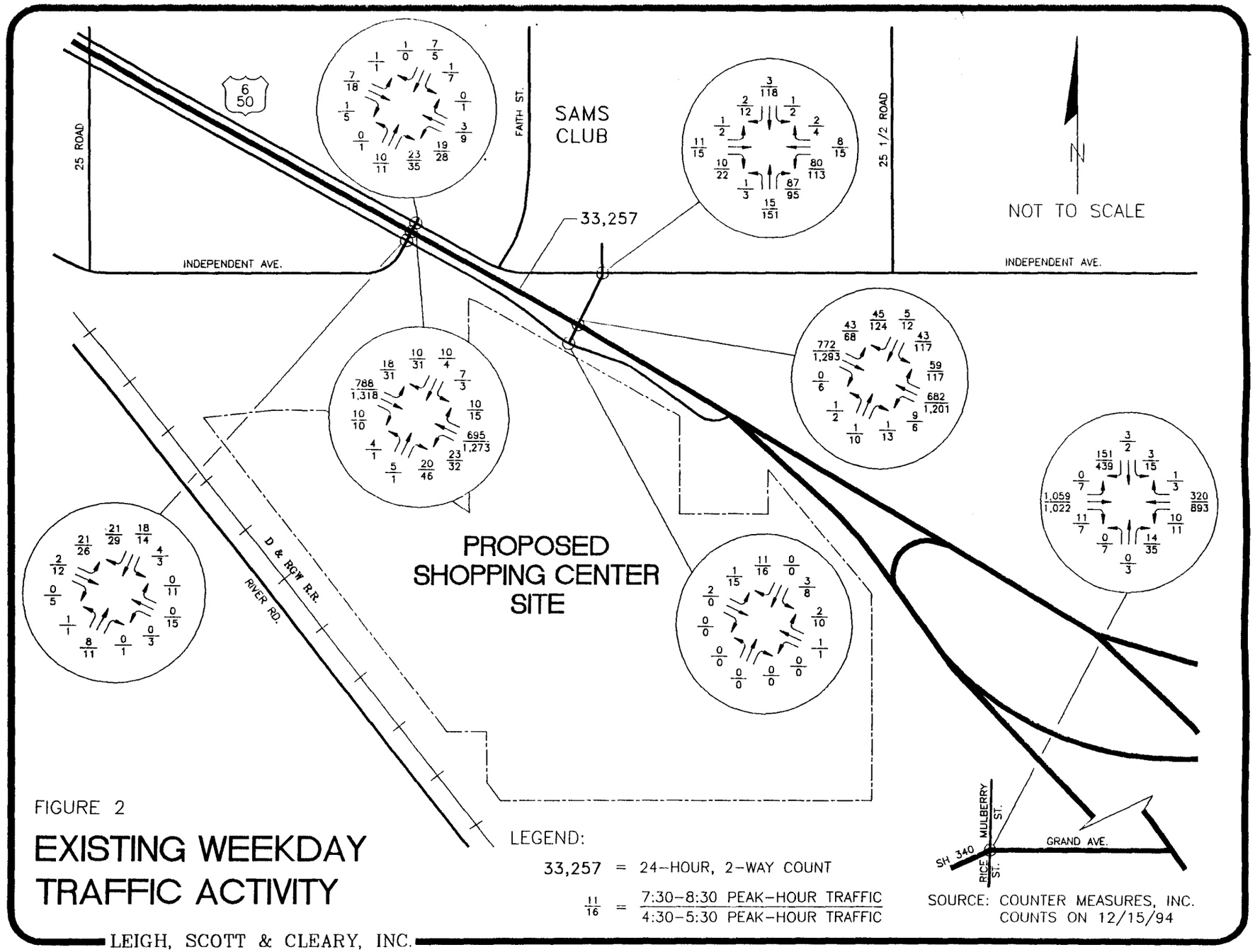


FIGURE 2

EXISTING WEEKDAY TRAFFIC ACTIVITY

LEIGH, SCOTT & CLEARY, INC.

LEGEND:

33,257 = 24-HOUR, 2-WAY COUNT

$\frac{11}{16}$ = $\frac{\text{7:30-8:30 PEAK-HOUR TRAFFIC}}{\text{4:30-5:30 PEAK-HOUR TRAFFIC}}$

SOURCE: COUNTER MEASURES, INC. COUNTS ON 12/15/94

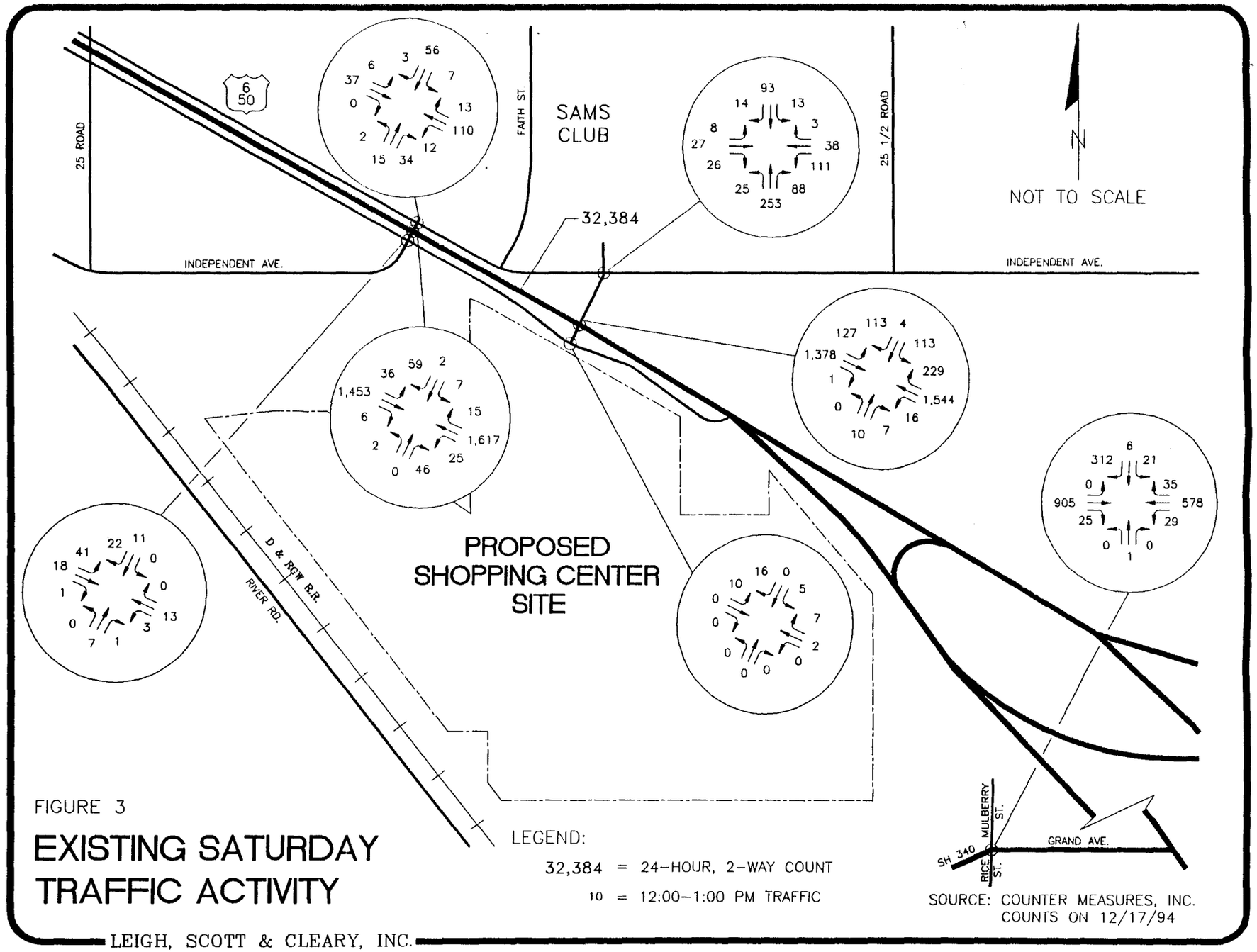


FIGURE 3

EXISTING SATURDAY TRAFFIC ACTIVITY

LEGEND:

32,384 = 24-HOUR, 2-WAY COUNT

10 = 12:00-1:00 PM TRAFFIC

SOURCE: COUNTER MEASURES, INC. COUNTS ON 12/17/94

LEIGH, SCOTT & CLEARY, INC.

Center will be via this new continuous frontage road route at three somewhat equally-spaced access points (see Figure 4). The westernmost of these access points will align with a 400-foot long road connection to the existing US 6 & 50 traffic signal at the East Independent Avenue intersection near Sam's Club.

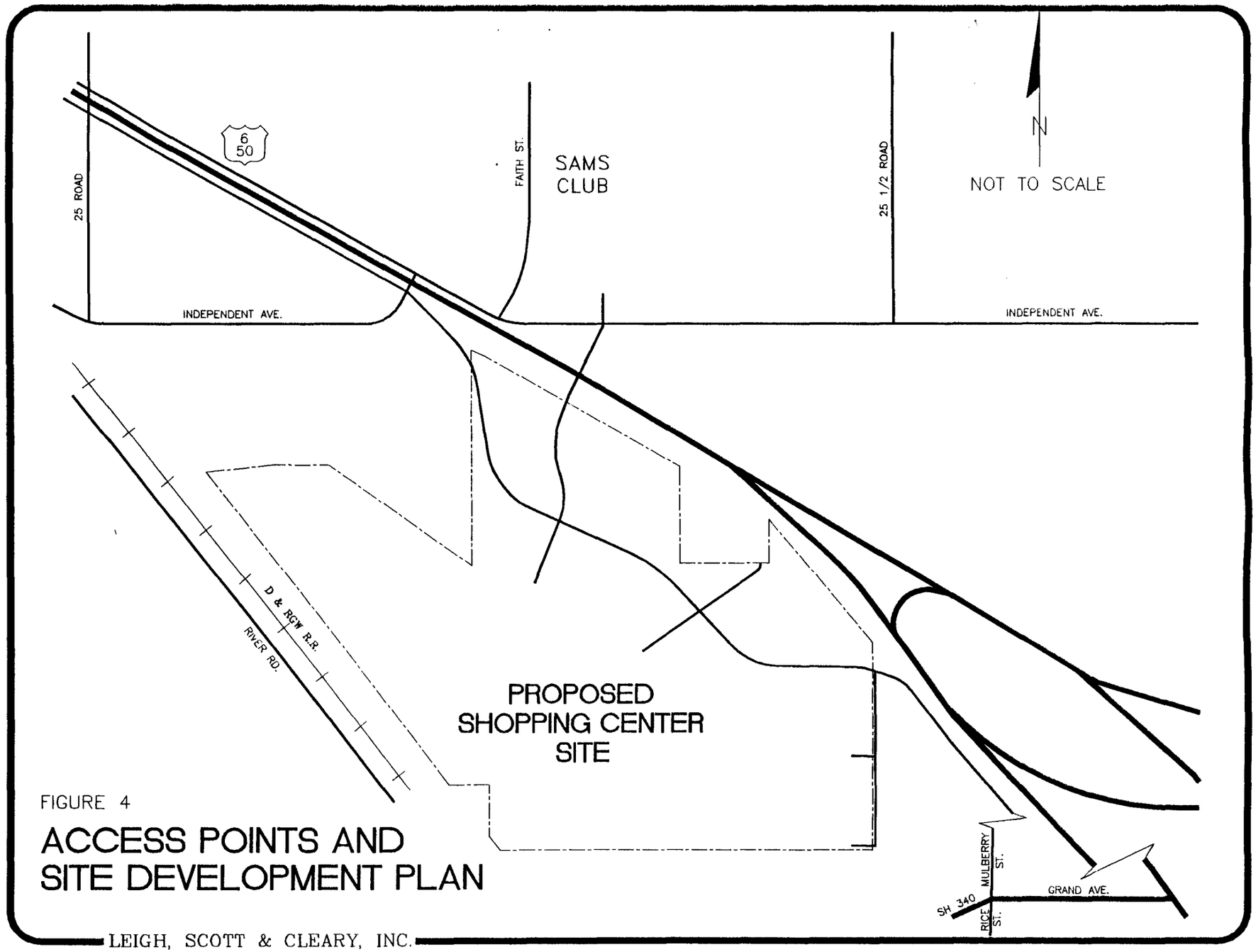


FIGURE 4

ACCESS POINTS AND SITE DEVELOPMENT PLAN

LEIGH, SCOTT & CLEARY, INC.

SECTION C
Traffic Generation

The amount of traffic to be generated by the Rimrock Shopping Center has been determined using trip generation rates published by the Institute of Transportation Engineers (ITE) in its report, "*Trip Generation*", 5th Edition, 1991. The resulting forecasts are given in Table 1 which shows the number of vehicle-trips expected to be generated by the proposed shopping center at full buildout. The gross leasable area is the basis for the trip-generation estimate.

Table 1
TRIP GENERATION ESTIMATE
Rimrock Shopping Center
Grand Junction, Colorado
Weekdays & Saturdays

			Weekday Trip Generation					Saturday Trip Generation		
				Trips/Hour @ Peak-Hour					Trips/Hour @ Peak-Hour	
ITEM	Acres	Quantity	Trips/Day Weekday	AM In	AM Out	PM In	PM Out	Trips/Day Saturday	In	Out
Shopping Center	42	400 KGLA[1]	16,810 [2]	232	136	793	793	21,840	1,073	1,073

[1] 1,000 Square feet of Gross Leasable area
[2] From "Trip Generation", 5th Edition, Institute of Transportation Engineers (ITE), Land Use #820.

Based on these parameters and the ITE trip generation rates, the proposed development will generate approximately 16,800 vehicle-trips per day on the average weekday and 21,800 vehicles per day on the average Saturday. During the morning peak hour of the average weekday, there will be about 232 "entering" vehicles and about 136 "exiting" vehicles. During the evening peak hour of the average weekday, there will be about 793 "entering" vehicles and about 793 "exiting" vehicles. During the peak hour of the average Saturday, there will be about 1,073 "entering" vehicles and about 1,073 "exiting" vehicles.

SECTION D

Traffic Distribution and Assignment

Traffic Distribution

The directional distribution of generated vehicular traffic on the roadways providing access to and from the proposed Rimrock Shopping Center is one of the most important elements in planning its specific access requirements and in determining its traffic impacts on surrounding roadways and intersections. Major factors which have influenced the traffic distribution assumptions include:

- The location of the development with respect to its planned land uses, nearby residential areas, and other activity and employment centers. (In this instance, the site is located in the southwestern corner of the Grand Junction area and most resultant travel will be to and from the north, the northeast, and the east.)

- The roadway network serving the site. (The primary roadway network serving the site will be US 6 & 50, Independent Avenue, and the proposed extension of the south frontage road.)

- The planned access system within the site. (The site will have eight access points; two for service vehicles only and six to serve as customer access only.)

- The existing traffic distribution system as evidenced by counts conducted on December 15 and 17, 1994 by Counter Measures, Inc.

- The types of land uses to be constructed. (This development will be a single use development consisting of 400,000 square feet of gross leasable retail space.)

- Recent computer modelling efforts by Mesa County staff which reflect future traffic projections for the study area.

After considering the combined effects of these factors, specific distribution estimates have been made. The results of these estimates and the percent of development-generated traffic on the surrounding roadway system are shown in Figure 5. The percentages shown are descriptive of the traffic during the evening peak-hour, which is the highest traffic period in the day.

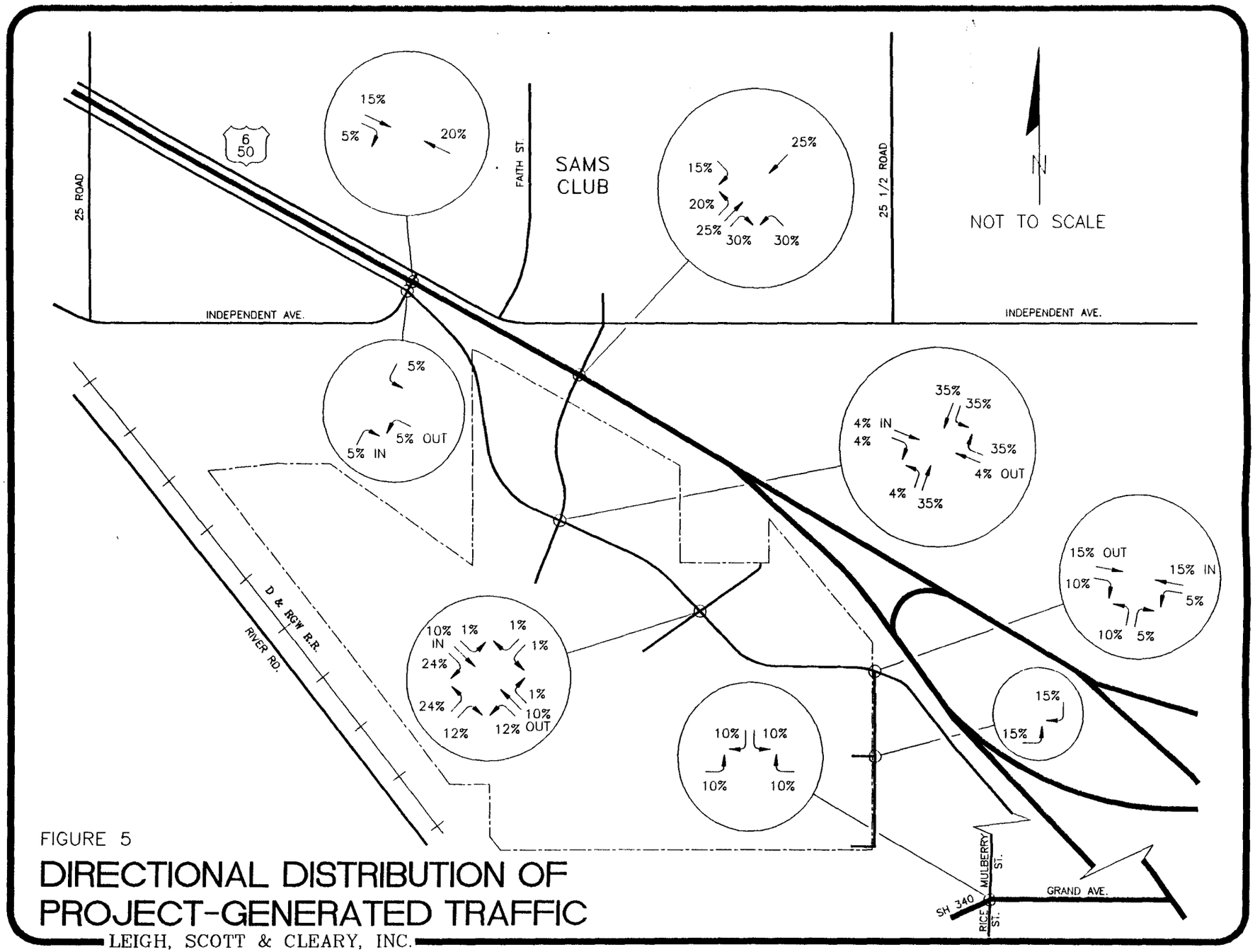


FIGURE 5

DIRECTIONAL DISTRIBUTION OF PROJECT-GENERATED TRAFFIC

LEIGH, SCOTT & CLEARY, INC.

Assignment of Project-Generated Traffic

The assignment of project-generated traffic to the surrounding street system and to the access points is shown in Figure 6 for the morning and evening weekday peak-hour periods and Figure 7 for the Saturday peak-hour period. These assignments are made by applying the trip generation estimates of Table 1 to the trip distribution percentage factors of Figure 5. The peak-hour traffic volumes are in vehicle-trips per hour. As shown, an estimated 25 percent of the generated traffic will access the site from the Independent Avenue, 30 percent will access the site from eastern US 6 & 50, 20 percent will access the site from western US 6 & 50, five percent will access the site from the southern extension of Independent Avenue, and 20 percent will access the site from the proposed easterly extension of the southern frontage road.

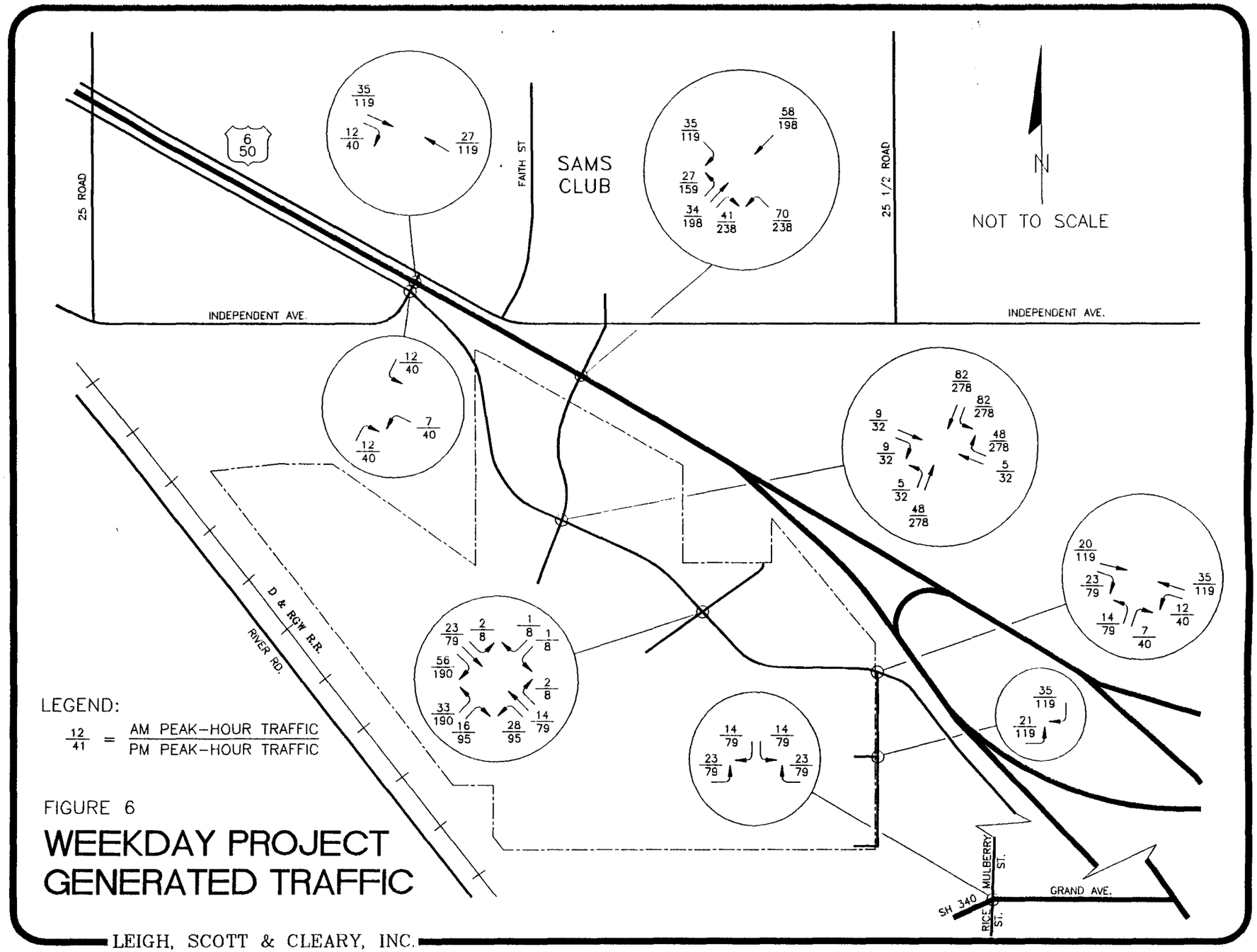


FIGURE 6

WEEKDAY PROJECT GENERATED TRAFFIC

LEIGH, SCOTT & CLEARY, INC.

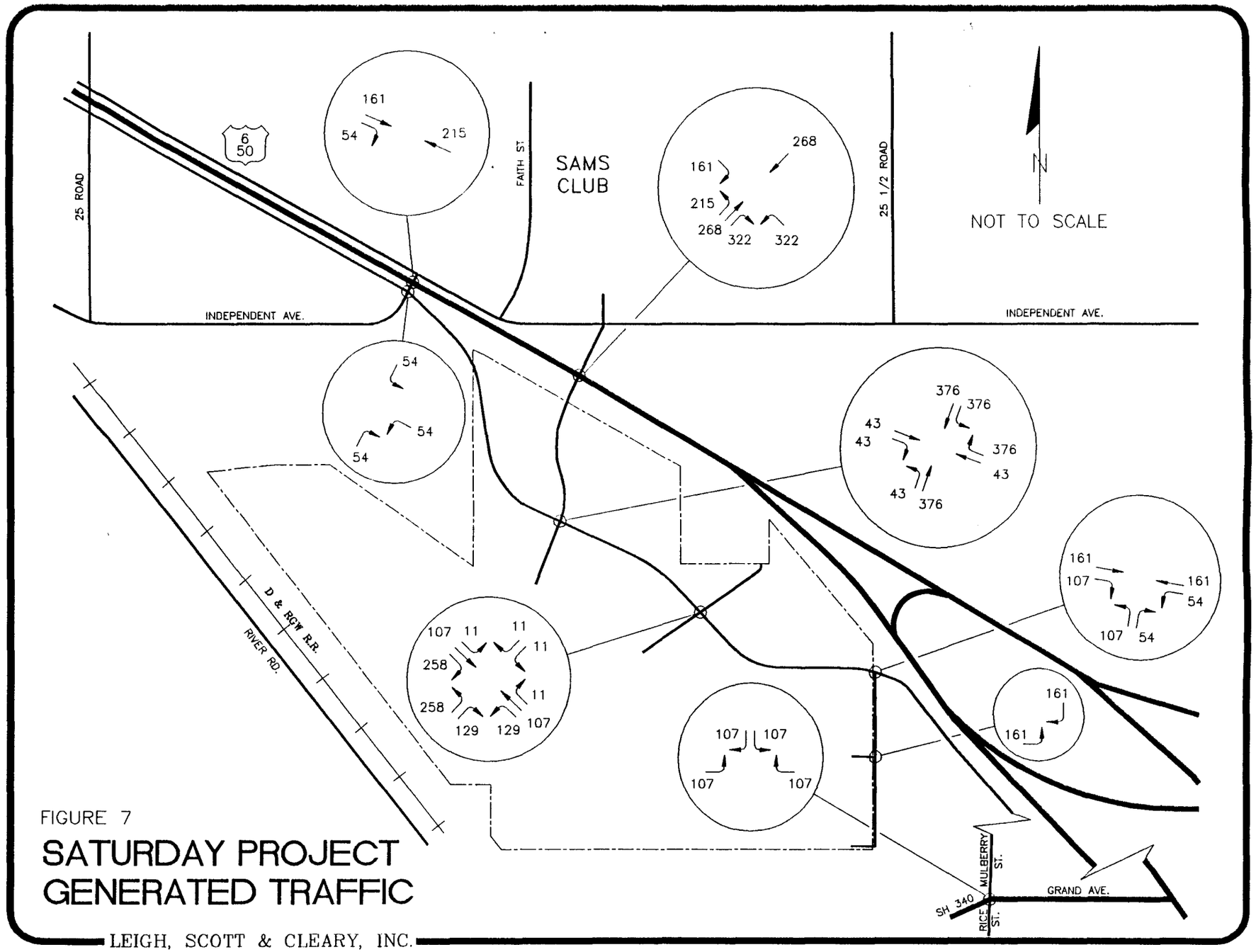


FIGURE 7

SATURDAY PROJECT GENERATED TRAFFIC

LEIGH, SCOTT & CLEARY, INC.

SECTION E
Traffic Impacts

In this report, traffic impacts are expressed in terms of future intersection operational analyses and in terms of project-generated traffic as an increment of future total traffic. Future total traffic volumes in the vicinity of the Rimrock Shopping Center will be the sum of the project-generated traffic and the future "background traffic" which consists of all other traffic that would be on the street system without any development on the subject site.

Background Traffic

The estimates of future weekday and Saturday peak-hour background traffic are shown in Figures 8 and 9 for the Year 2015, respectively. The 1995 background traffic volumes are shown in Figures 2 and 3. The 2015 traffic volumes estimates are based upon a review of past traffic volume forecasts, traffic volumes on the present roadway system, and MINUTP future traffic projections supplied by the Mesa County Department of Land Use and Transportation. Future 2015 average weekday traffic volumes are, for the most part, based upon existing traffic volumes that have been expanded in accordance with projected traffic patterns in the MINUTP run. Existing vehicles travelling along US 6 & 50 were expanded by a 1.10 growth factor and existing vehicles travelling along Independent Avenue were expanded by a 1.40 growth factor. For the forthcoming analyses, it was assumed that by the end of 1995 the southern extension of Independent Avenue will be modified to only allow right-turns to and from the Independent Avenue accesses to US 6 & 50.

Total Traffic

The combined project-generated and future background traffic volumes for morning and evening, and Saturday peak-hours for 1995 are shown in Figures 10 and 11, respectively. The combined project-generated and future background traffic volumes for morning and evening, and Saturday peak-hours for 2015 are shown in Figures 12 and 13, respectively. It was assumed that there will be twenty percent "Pass-by" trips entering the proposed

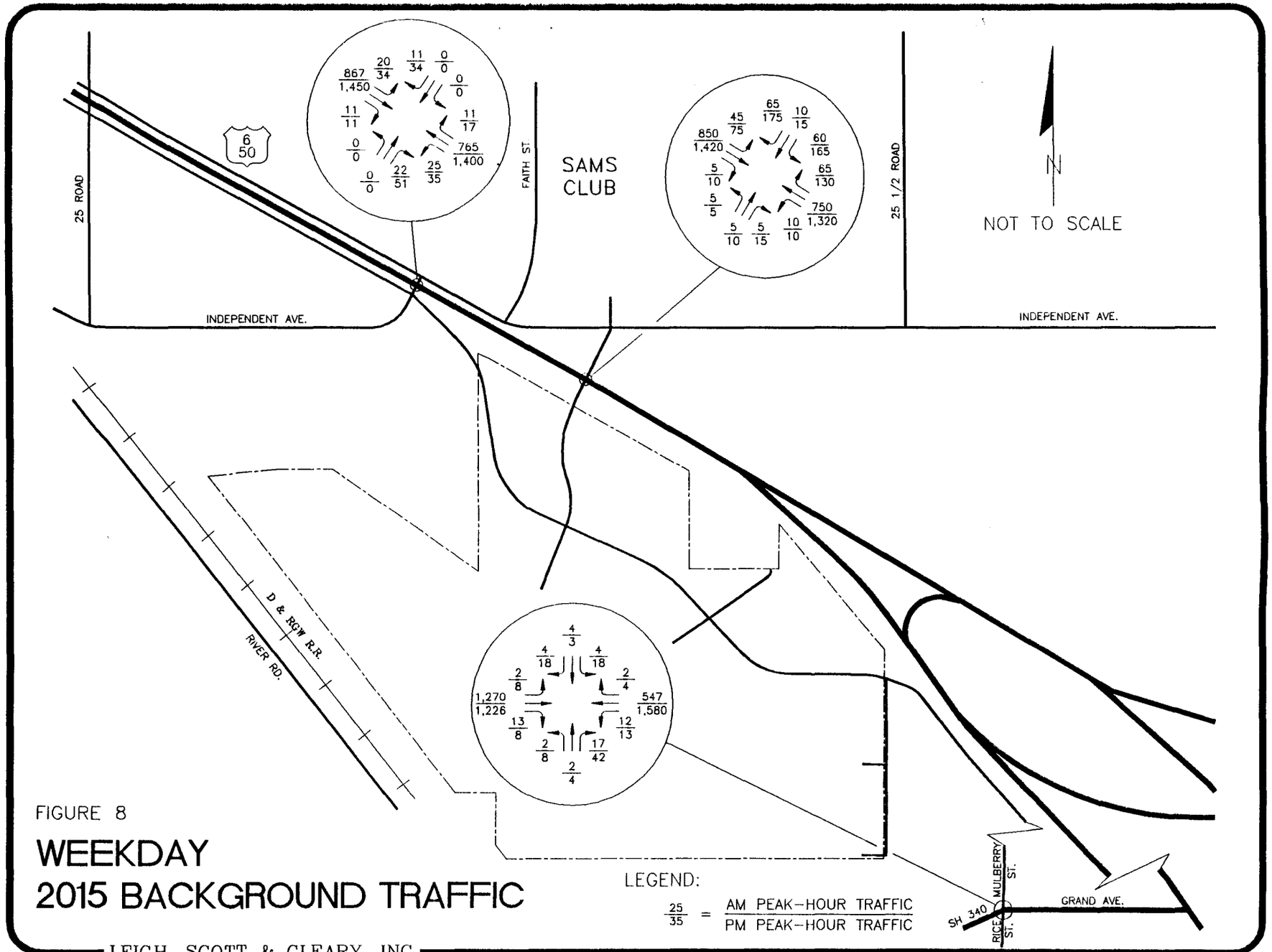


FIGURE 8

WEEKDAY
2015 BACKGROUND TRAFFIC

LEGEND:

$\frac{25}{35}$ = $\frac{\text{AM PEAK-HOUR TRAFFIC}}{\text{PM PEAK-HOUR TRAFFIC}}$

LEIGH, SCOTT & CLEARY, INC.

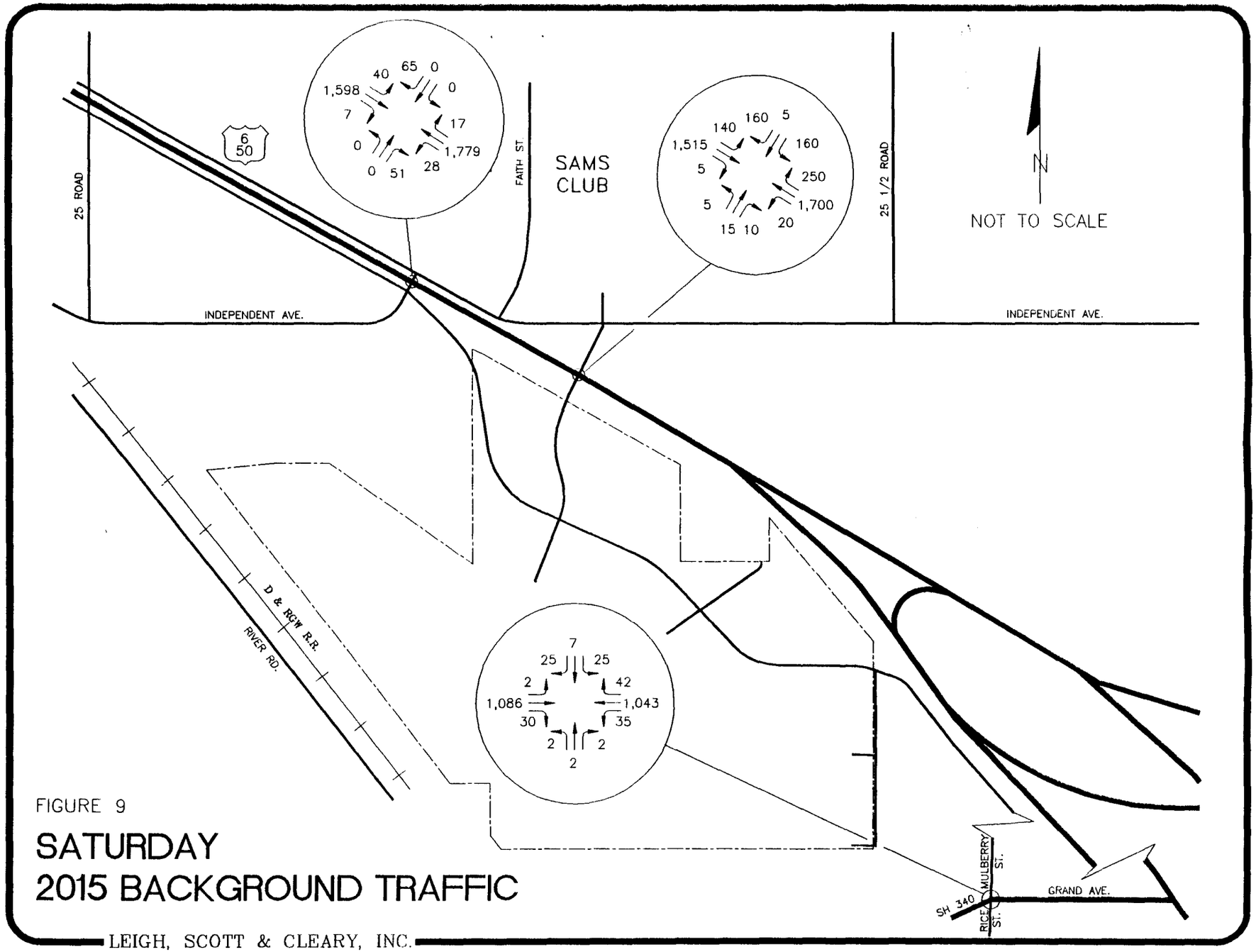


FIGURE 9

SATURDAY
2015 BACKGROUND TRAFFIC

LEIGH, SCOTT & CLEARY, INC.

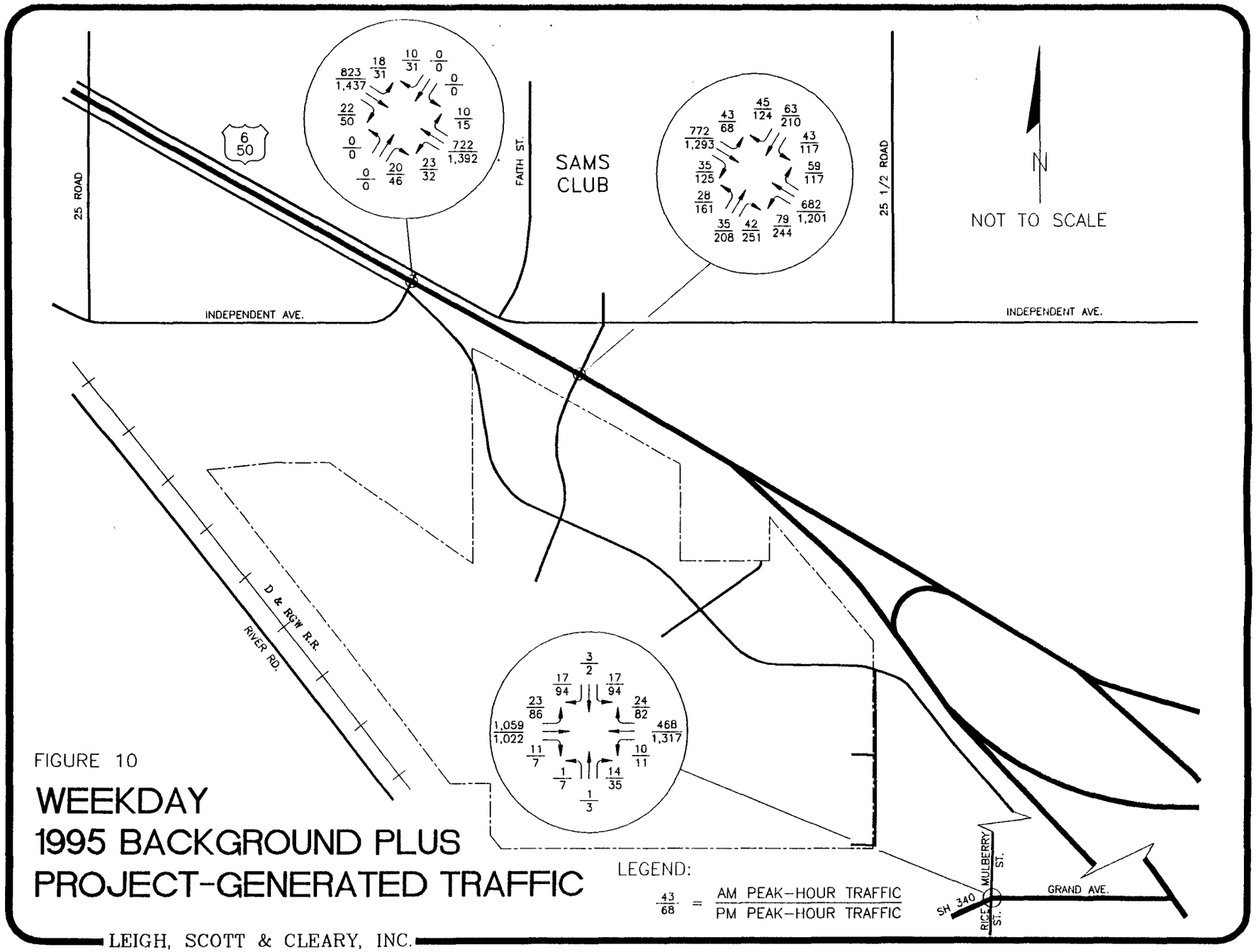


FIGURE 10

WEEKDAY 1995 BACKGROUND PLUS PROJECT-GENERATED TRAFFIC

LEIGH, SCOTT & CLEARY, INC.

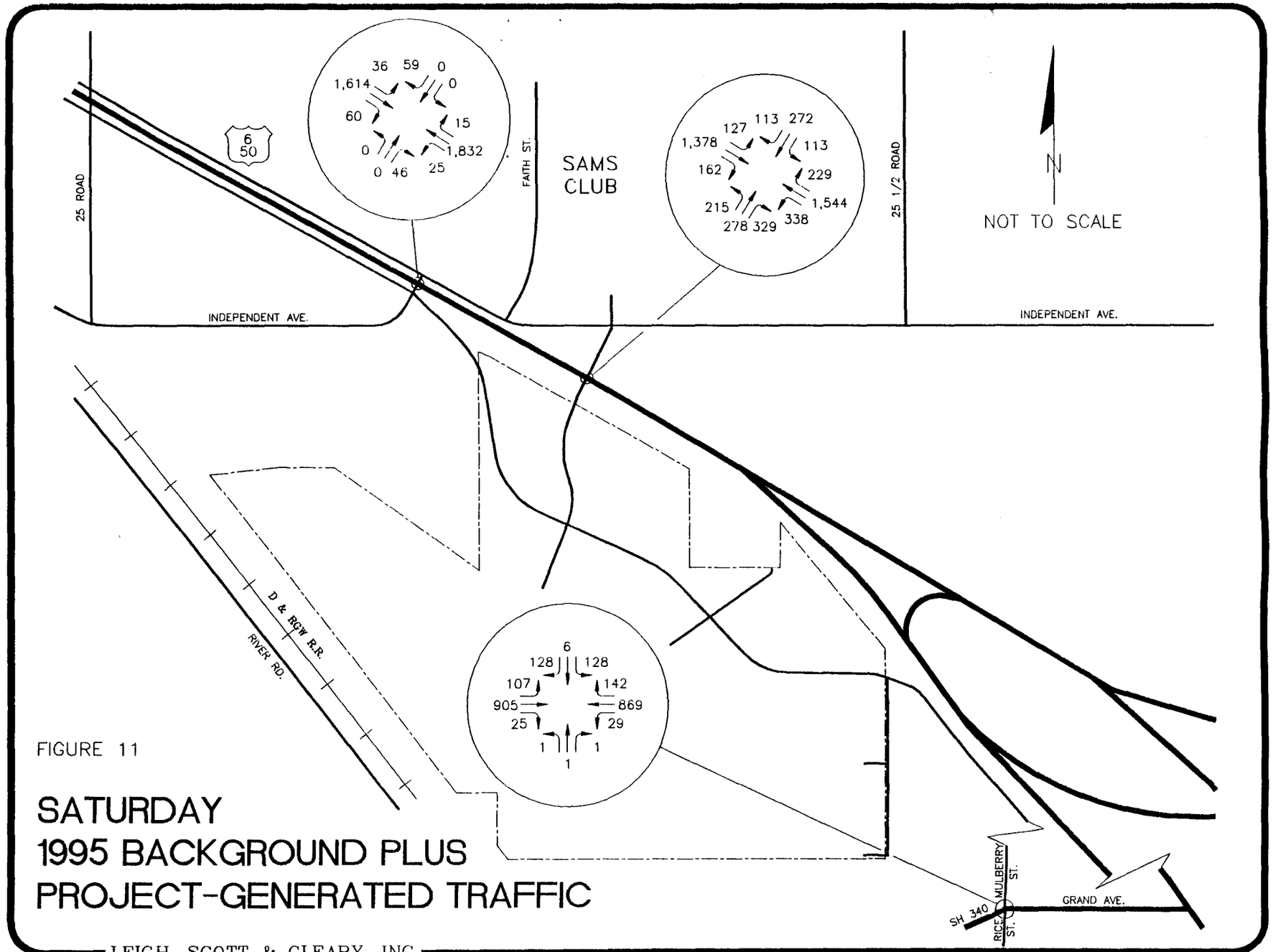


FIGURE 11

SATURDAY
1995 BACKGROUND PLUS PROJECT-GENERATED TRAFFIC

LEIGH, SCOTT & CLEARY, INC.

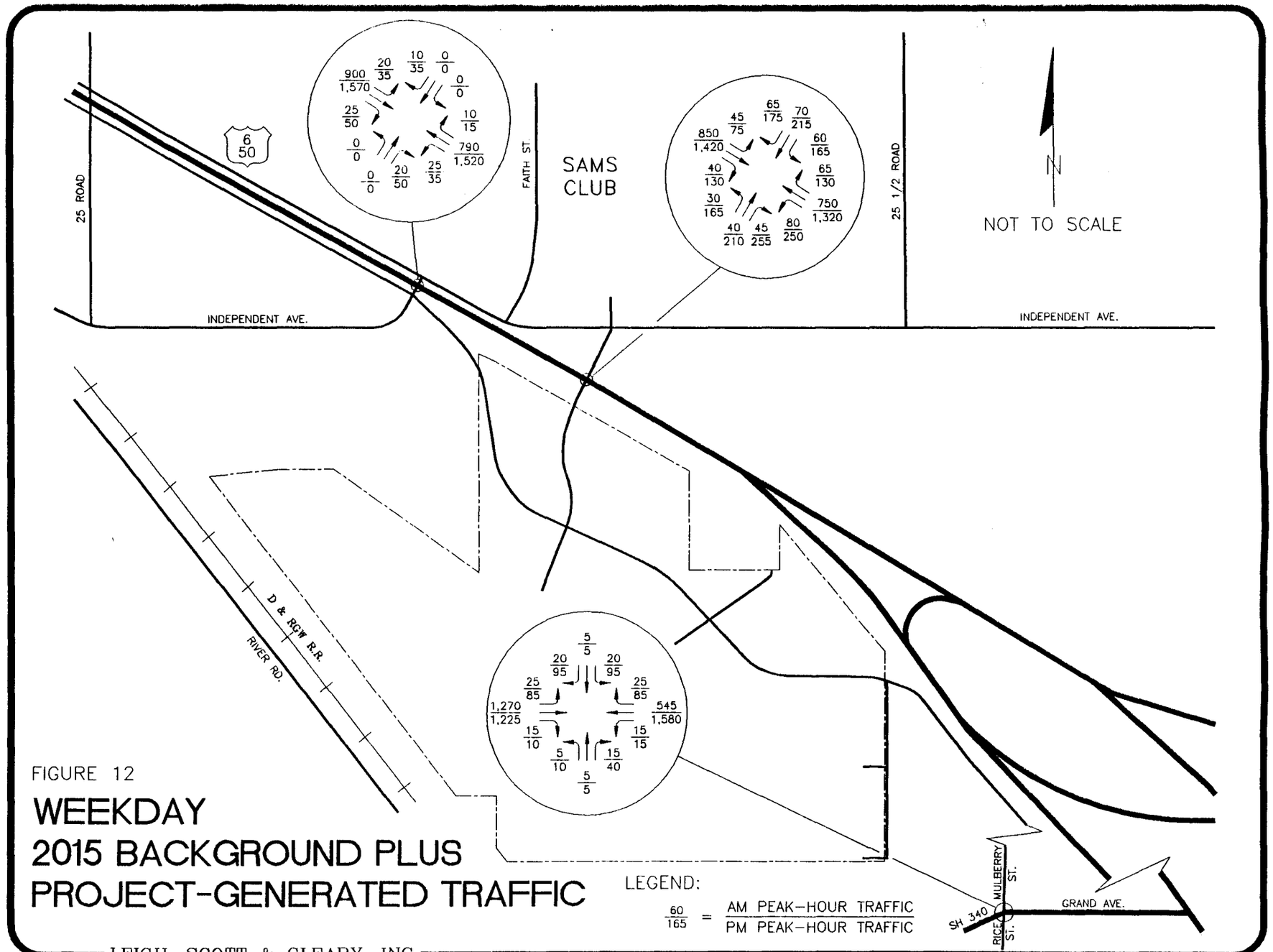


FIGURE 12

WEEKDAY 2015 BACKGROUND PLUS PROJECT-GENERATED TRAFFIC

LEIGH, SCOTT & CLEARY, INC.

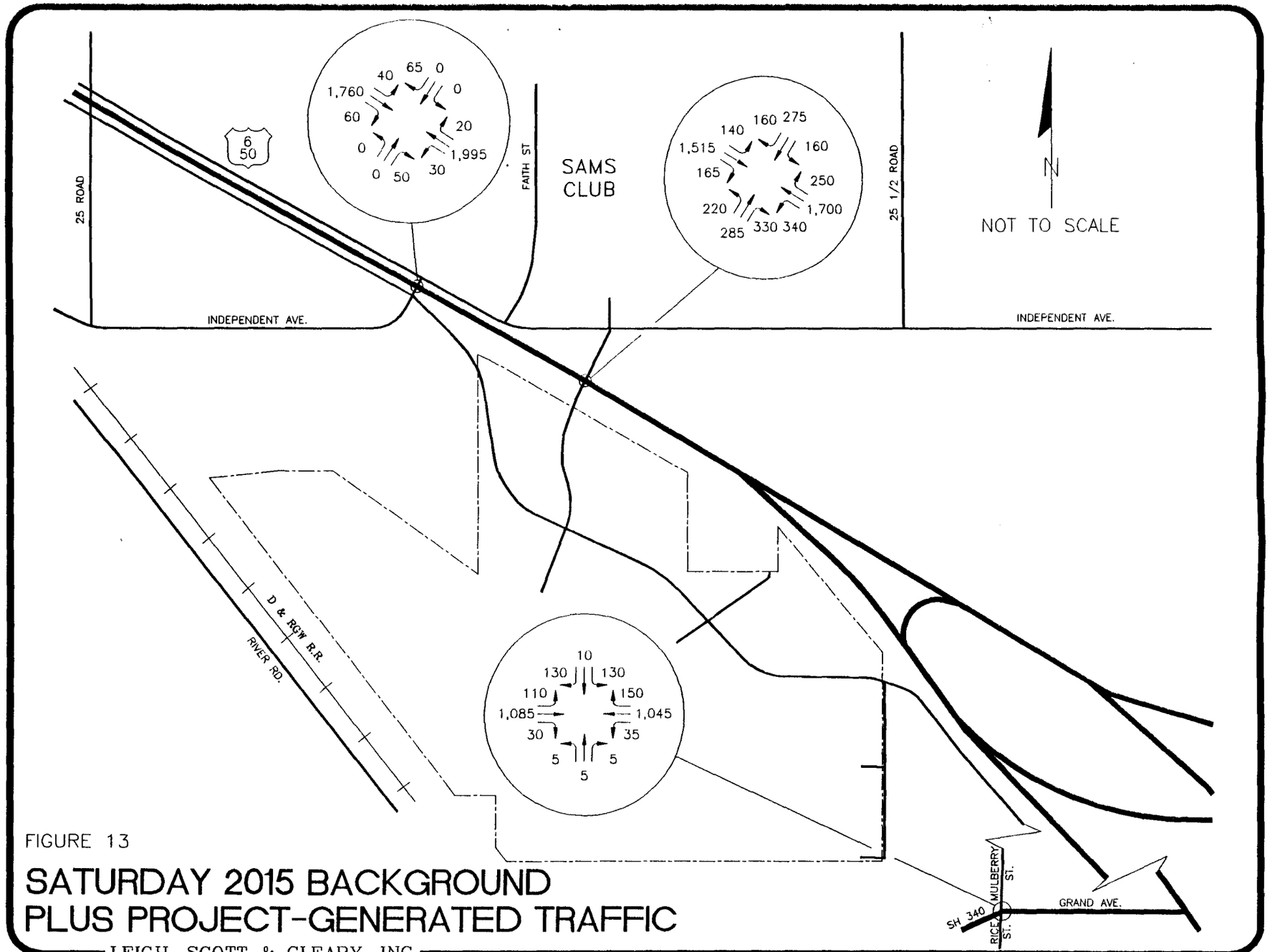


FIGURE 13

SATURDAY 2015 BACKGROUND PLUS PROJECT-GENERATED TRAFFIC

LEIGH, SCOTT & CLEARY, INC.

development. These are vehicle trips that will already be on the local roadway system and will be diverted into a specific development. This phenomenon will only reduce the vehicles coming to the local roads but not total driveway traffic. These volumes have been used as input into intersection capacity calculations discussed in the following section.

Intersection Capacity Analysis

The traffic impacts of the Rimrock Shopping Center can be described by evaluating the resulting levels of traffic service (LOS) at the intersections and access points that will be directly impacted by the development. The major impacted intersections are the intersections of US 6 & 50 with both extensions of Independent Avenue.

Intersection capacities have been analyzed in accordance with the requirements of the 1985 Highway Capacity Manual (HCM), using the "operations" methodology. Traffic volumes used in the analyses include those from Figures 10 through 12. The complete analysis reports are located in Appendix B of this report.

The results of the capacity analyses are shown in Tables 2 and 3. These tables show Level of Service (LOS) conditions for the Years 1995 and 2015 "peak-hour background plus project-generated traffic" volumes at the intersections described above. The analyses were conducted for the probable intersection geometry and traffic controls. These analyses were conducted assuming that geometric modifications, described in the "Recommended Improvements" section of this report, are made prior to the buildout of the proposed shopping center.

The signalized intersection of US 6 & 50 with the northern extension of Independent Avenue will have deeply varying levels of service depending on the peak hour analyzed. In both 1995 and 2015, the intersection will experience modest delays with a LOS B and C during the morning peak hour. During the evening peak hour, the Level of Service will remain a LOS C in both 1995 and 2015. The Saturday peak hour traffic volumes are substantially higher than other two peak hours. This means that drivers will generally experience longer delays during the Saturday peak hour. For 1995, the intersection will experience an overall LOS C and in 2015 the intersection will experience a LOS D.

Table 2
INTERSECTION LEVELS OF SERVICE
AM/PM/SATURDAY PEAK-HOURS
YEAR 1995
Rimrock Shopping Center
Grand Junction, Colorado

		1995 Background Traffic Plus Project Generated Traffic		
Intersection Location	Intersection Control	Level of Service AM	Level of Service PM	Level of Service Saturday
US 6/50 & Independent (North)	Signalized	B	C	C
US 6/50 & Independent (South)	Unsignalized	B (1)	D (1)	E (2)
Mulberry St. & Grand Ave.	Signalized	B	B	B

Notes:
(1) Westbound left-turns
(2) Eastbound left-turns

Table 3
INTERSECTION LEVELS OF SERVICE
AM/PM/SATURDAY PEAK-HOURS
YEAR 2015
Rimrock Shopping Center
Grand Junction, Colorado

		2015 Background Traffic Plus Project Generated Traffic		
Intersection Location	Intersection Control	Level of Service AM	Level of Service PM	Level of Service Saturday
US 6/50 & Independent (North)	Signalized	C	C	D
US 6/50 & Independent (South)	Unsignalized	B (1)	E (2)	E (1)
Mulberry St. & Grant Ave.	Signalized	B	B	B
Internal 4-way Intersection	Unsignalized	A	E (2)	E (3)

Notes: (1) Westbound Left Turns.
(2) Eastbound and Westbound Left Turns.
(3) Eastbound and Westbound Left Turns and Through Vehicles.

The intersection of US 6 & 50 with the southern extension of Independent Avenue is presently a four-way unsignalized configuration. During the morning peak hour in the analysis years 1995 and 2015, the westbound left-turning vehicles will experience minor delays with Levels of Service B. During the evening and Saturday peak hours in the analysis years 1995 and 2015, the westbound left-turning vehicles will experience significant delays with Levels of Service E in virtually all cases. The eastbound left-turning vehicles will also experience a LOS E during the evening and Saturday peak hours of the 2015 analysis year.

The construction of this project will also create a new four-way intersection where the relocated southerly frontage road intersects the "main" access to the shopping center. This intersection is planned to be a four-way stop configuration. The analyses indicate that this intersection will operate at substantially different levels of service based on the peak hour. The intersection will operate at LOS A during the morning peak hour, and at LOS E during the evening peak hour and during the Saturday peak hour. The other intersections of the frontage road with site accesses are anticipated to operate in a satisfactory manner.

Signal Progression Analysis

A signal progression analysis was performed for US 6 & 50 using Passer II-90, Version 2.0. The intersections included in this analysis were "McDonald's", 24 1/2 Road, 25 Road, and Independent Avenue (proposed site access). Since turning movement counts were not available for the three westerly intersections, the volumes were determined by using the Mesa County's MINUTP traffic volume projections for 2015 with the shopping center scenario. Traffic distribution patterns were determined and the raw traffic volumes were distributed accordingly to represent the 2015 Saturday peak hour.

The results of the analysis show that the arterial will have a progression efficiency of "Great" (0.). The attainability rating for this segment of US 6 & 50 is calculated to be 1.00. A copy of the actual progression analysis is available for review in Appendix C.

Queuing Analysis

A queuing analysis was performed in areas where it is thought that waiting traffic might "stack up" into other areas of travel. The highest expected traffic volumes, Saturday 2015 background plus project generated traffic, were used for these analyses.

The first area of concern was the northbound through traffic at the intersection of US 6 & 50 with the "main" access road. The analysis of the movement showed that a lane length of 200 feet would be required. This is far less than the 350 feet available between US 6 & 50 and the southerly frontage road. The second area of concern was the westbound double left-turn lane from US 6 & 50. It was assumed that 60 percent of the westbound left-turners or 204 vehicles would determine the length of the longest lane. The analysis shows that the limiting lane length would have to be 160 feet. The third and final area of concern was the southbound through traffic on Independent Avenue approaching US 6 & 50. The analysis shows that this lane is expected to queue (stack up) 180 feet from the US 6 & 50 intersection. This may cause some congestion at the northern frontage road and SAM'S Club accesses. The queuing analysis calculations can be seen in Appendix D.

SECTION F

Traffic Safety Analysis

Traffic accident records were obtained from the Grand Junction Police Department for a three year period beginning in 1991. The study area included a mile segment of US 6 & 50, one half mile east and west of the proposed shopping center access. There were a total of twenty-six accidents that occurred within the study area and time period. There were six accidents located at the proposed site access intersection (Independent northern extension), four accidents located at the southern Independent Avenue intersection, five accidents located at the 25 Road intersection, five accidents located at the US 6 & 50 interchange, and six accidents located at non-intersection locations along the study segment. 77 percent (or 20) of the accidents were of the rear-end type. This type of accident is quite common at busy intersection locations and are generally caused by driver inattention. There were only six injuries included within these twenty rear-end accidents and only one other injury attributed to a off-road accident. The other accidents included two broadside accidents and four off-road accidents. Most of the injuries were minor in nature. This proves that most of the accidents occurred at relatively slow speeds. In conclusion, the frequency and severity of the accidents observed for this study area are of a number to be expected along a busy principal arterial such as this one. Accident diagrams have been prepared and can be found in Appendix D.

SECTION G

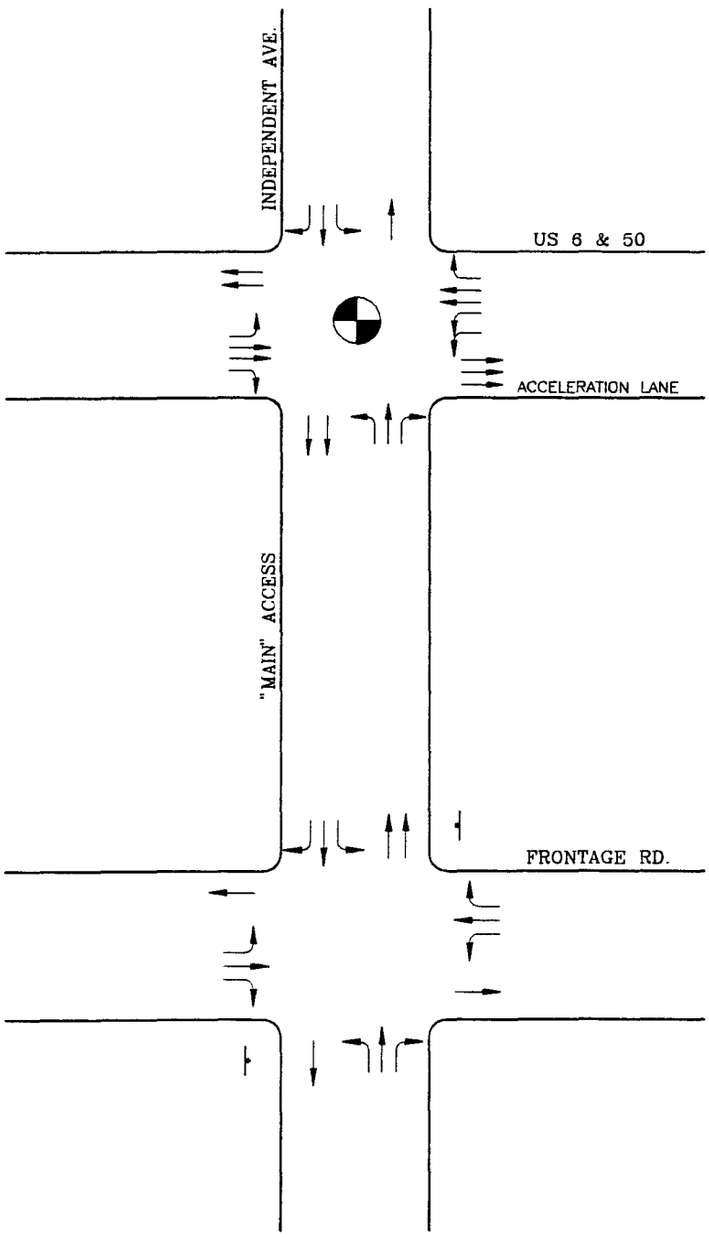
Recommended Improvements

This proposed development will require some modification to the existing intersections and roadway system. These improvements will be needed to assure safe and efficient traffic operations and to mitigate traffic impacts. It is important to note that the existing traffic counts were conducted during the peak travel time of the year for this segment of US 6 & 50. This is generally because of the nearby Mesa Mall and the busy Christmas shopping period.

The US 6 & 50/Independent Avenue (northern) intersection will need to be modified by the end of the first phase of construction. The north and south approaches to the intersection should each be modified to include one left-turn lane, one through lane, and one right-turn lane. The eastbound approach to the intersection should add an exclusive right-turn lane and the westbound approach to the intersection should be modified to include two left-turn lanes, two through lanes, and one right-turn lane. Both US 6 & 50 departures should be modified to include acceleration lanes to accommodate right-turns from the side streets. The existing traffic signal installation will have to be modified accordingly and the existing three-phase signal operation will have to be expanded to eight phases. Figure 14 illustrates the proposed lane configurations and traffic controls for this intersection as well as the frontage road/"main" access intersection.

The US 6 & 50/Independent Avenue (southern) intersection will also need to be modified by the end of the first construction phase. The north and south approaches to this intersection should be modified to only allow right-turns out and left or right-turns in from US 6 & 50.

The project's current site plan indicates a direct access connection to the eastbound US 6 & 50 lanes at the east end of the site. This access should be eliminated from further consideration due to potential conflicts with merging and diverging traffic within this important reach of US 6 & 50.



NOT TO SCALE

LEGEND:

= TRAFFIC SIGNAL

= STOP SIGN

FIGURE 14

PROPOSED LANE CONFIGURATION AND INTERSECTION CONTROLS

LEIGH, SCOTT & CLEARY, INC.

As discussed earlier in the report, it is anticipated that the existing southerly frontage road, between the two Independent Avenue extensions, will be re-aligned to the south as part of this project. The frontage road itself should be constructed to a two lane cross-section with left-turn bays as required over its proposed length. The intersection of the frontage road with the "main" access is planned to be a two-way stop controlled intersection with the stop signs being located at the east and west approaches. The east and west approaches are planned to have three lanes each which will include separate left-, through, and right-turn lanes. Similarly, the north and south approaches are planned to have three lanes each which will include separate left-, through, and right-turn lanes. Southeast of the project site, the frontage road is planned to parallel US 6 & 50 and eventually tie into Mulberry Street.

SECTION H
Summary

Based upon the foregoing analysis, the following conclusions may be made concerning the impact of the proposed Rimrock shopping center development:

1. The 42-acre development with 400,000 SF commercial retail development can be expected to generate a total of about 17,000 vehicle-trips to the surrounding roadway system during the 24 hours of a typical weekday and about 22,000 vehicle-trips on a average Saturday. Based on project-generated traffic, during the morning peak-hour about 232 vehicles will enter the site and about 136 vehicles will exit the site; during the evening peak-hour, about 793 vehicles will enter and exit the site. During the Saturday peak hour, about 1,073 vehicles will enter and exit the site.

2. The project-generated traffic is expected to be oriented to and from the site by the following percentages: 25% along the northern extension of Independent Avenue, 30% along easterly US 6 & 50, 20% along the proposed southerly frontage road, 5% along the southern extension of Independent Avenue, and 20% along westerly US 6 & 50.

3. There are a total of three accesses planned for this development. All three will access the proposed frontage road directly with one at the southern extension of Independent Avenue, and the other two somewhat equally spaced at the center and easterly end of the site.

4. It is proposed that the existing traffic signal and geometry located at the intersection of US 6 & 50 with the northern extension of Independent Avenue be modified to accommodate one left-turn lane, one through lane, and one right-turn lane at the northbound and southbound approaches; dual left-turn lanes, dual through lanes, and one right-turn lane at the westbound approach; and one left-turn lane, two through lanes, and one right-turn lane at the eastbound approach.

5. It is proposed that the existing unsignalized intersection of US 6 & 50 with the southern extension of Independent Avenue be modified to only permit right-turns from the northbound and southbound approaches as well left and right-turns from mainline US 6 & 50 into these approaches.

6. It is anticipated that the proposed intersection between the southerly frontage and the "main" access will be unsignalized with the eastbound and westbound approaches stop controlled.

7. Based upon the analyses presented herein, the study intersections will operate at Levels of Service which vary from little or no delays to more significant delays. It should be noted that these analyses were conducted with traffic volumes that represent the worst traffic volumes expected in this area for the year. Most hours of the year, these intersections will operate at very acceptable Levels of Service.

APPENDIX A

Existing Traffic

Counter Measures

*** Weekly Summary for week of December 11, 1994 *** Page

Data File : M1294001.PRN
Station : 000000000012 Lane(s) : 1
Identification : 000000000012 Direction : East/West Combined
City/Town : GRAND JUNCTION County : MESA
Location : US-6/US-50 E/O INDEPENDENT

Time	11 Sun	12 Mon	13 Tue	14 Wed	15 Thu	16 Fri	17 Sat	Wkday Avg.	Dail Avg
01:00					105		209	105	10
02:00					91		134	91	8
03:00					80		99	80	7
04:00					99		77	99	8
05:00					98		86	98	8
06:00					233		168	233	19
07:00					616		271	616	47
08:00					1461		591	1461	112
09:00					1488		1015	1488	120
10:00					1815		1672	1815	153
11:00					2316		2394	2316	199
12:00					2655		2906	2655	231
13:00					3104		3198	3104	267
14:00					2954		3074	2954	254
15:00					2957		2927	2957	253
16:00					2626		2843	2626	228
17:00					2713		2541	2713	230
18:00					2548		2199	2548	213
19:00					1669		1855	1669	145
20:00					1180		1266	1180	102
21:00					1025		1006	1025	87
22:00					700		890	700	62
23:00					482		628	482	43
24:00					245		336	245	22
Totals					33260		32384	33260	28380

% Avg Wkday	100.0	97.4
% Avg Day	117.2	114.1
AM Peak Hr	12:00	12:00
AM Count	2655	2906
PM Peak Hr	13:00	13:00
PM Count	3104	3198

Counter Measures

*** Weekly Summary for week of December 11, 1994 *** Page

Data File : M1294025.PRN
Station : 000000000010 Lane(s) : 1
Identification : 000000000010 Direction : Eastbound
City/Town : GRAND JUNCTION County : MESA
Location : US-6/US-50 E/O INDEPENDENT

Time	11 Sun	12 Mon	13 Tue	14 Wed	15 Thu	16 Fri	17 Sat	Wkday Avg.	Dail Avg
01:00					58		92	58	5
02:00					36		60	36	3
03:00					44		48	44	3
04:00					47		37	47	3
05:00					42		28	42	3
06:00					97		57	97	7
07:00					292		124	292	22
08:00					706		231	706	53
09:00					702		466	702	56
10:00					831		731	831	69
11:00					1025		1055	1025	88
12:00					1296		1320	1296	111
13:00					1466		1443	1466	125
14:00					1418		1514	1418	122
15:00					1519		1508	1519	130
16:00					1325		1500	1325	116
17:00					1290		1433	1290	112
18:00					1198		1220	1198	103
19:00					809		1014	809	72
20:00					574		669	574	50
21:00					548		558	548	47
22:00					419		514	419	37
23:00					308		405	308	27
24:00					123		205	123	11
Totals					16173		16232	16173	13871
% Avg Wkday					100.0		100.4		
% Avg Day					116.6		117.0		
AM Peak Hr					12:00		12:00		
AM Count					1296		1320		
PM Peak Hr					15:00		14:00		
PM Count					1519		1514		

*** Weekly Summary for week of December 11, 1994 *** Page 1

Data File : M1294024.PRN
Station : 000000000011 Lane(s) : 1
Identification : 000000000011 Direction : Westbound
City/Town : GRAND JUNCTION County : MESA
Location : US-6/US-50 E/O INDEPENDENT

Time	11 Sun	12 Mon	13 Tue	14 Wed	15 Thu	16 Fri	17 Sat	Wkday Avg.	Daily Avg.
01:00					47		117	47	50
02:00					55		74	55	50
03:00					36		51	36	30
04:00					52		40	52	43
05:00					53		58	53	46
06:00					136		111	136	110
07:00					324		147	324	252
08:00					755		360	755	591
09:00					786		549	786	640
10:00					984		941	984	837
11:00					1291		1339	1291	1110
12:00					1359		1586	1359	1197
13:00					1638		1755	1638	1421
14:00					1536		1560	1536	1320
15:00					1438		1419	1438	1230
16:00					1301		1343	1301	1121
17:00					1423		1108	1423	1175
18:00					1350		979	1350	1104
19:00					860		841	860	704
20:00					606		596	606	518
21:00					477		448	477	405
22:00					281		376	281	254
23:00					174		223	174	156
24:00					122		131	122	106
Totals					17084		16152	17084	14510
% Avg Wkday					100.0		94.5		
% Avg Day					117.7		111.3		
AM Peak Hr					12:00		12:00		
AM Count					1359		1586		
PM Peak Hr					13:00		13:00		
PM Count					1638		1755		

Counter Measures

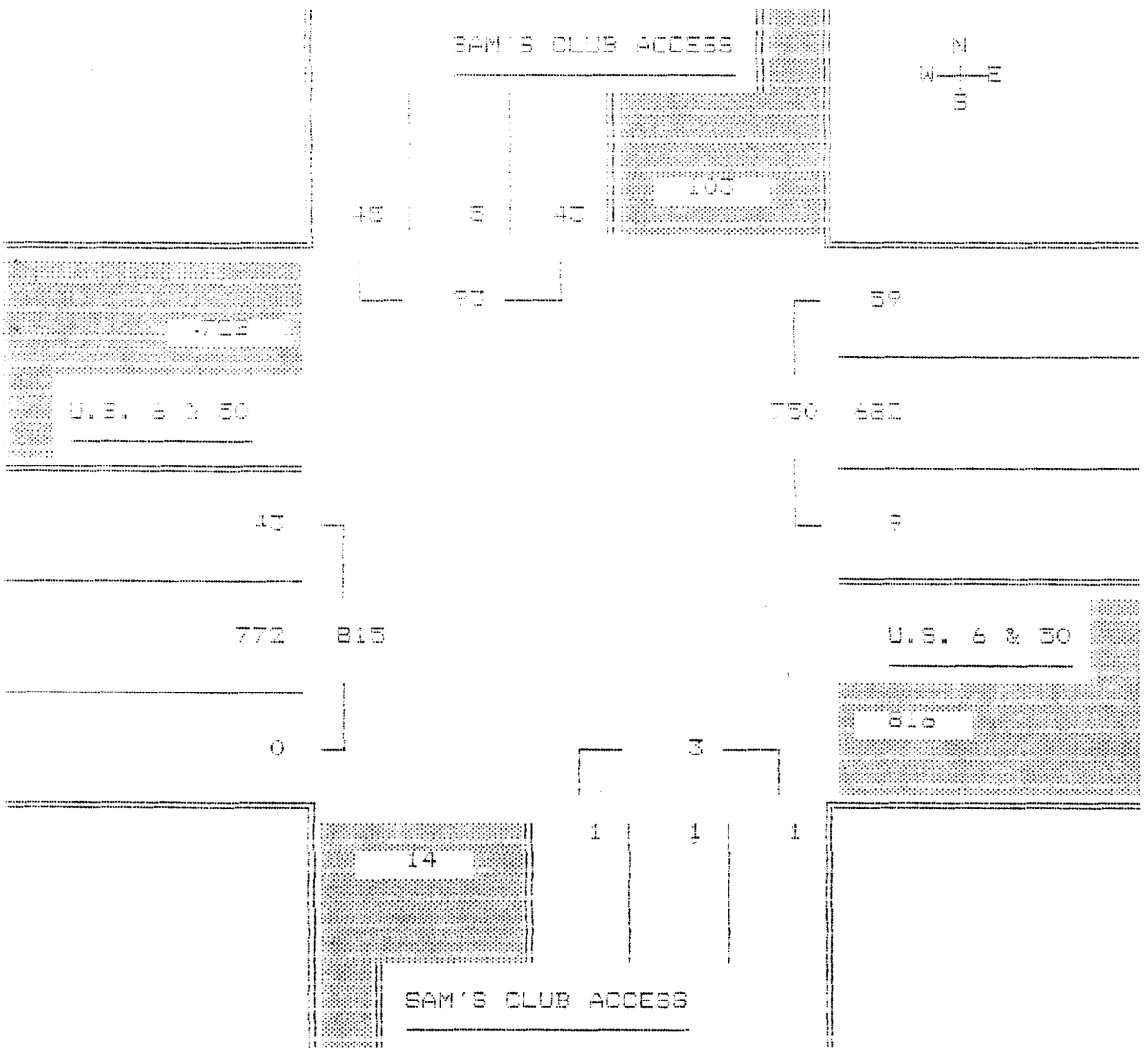
Site Code :
N-S Street: SAM'S CLUB ACCESS
E-W Street: U.S. 6 & 50
:

PAGE: 1
FILE: SAM'SU36
Movements by: Primary
DATE: 12/15/94

Time Begin	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
7:00 AM	2	0	5	10	100	1	1	0	0	0	99	4	220
7:15	5	0	4	5	147	2	1	0	0	0	127	11	312
7:30	9	2	12	10	158	2	0	0	0	0	158	9	361
7:45	4	0	18	11	222	0	0	1	0	0	172	16	347
HR TOTAL	20	2	38	36	627	5	2	1	0	0	666	40	1440
8:00 AM	11	2	5	22	153	4	0	0	1	0	172	10	380
8:15	21	1	7	16	149	0	1	0	0	0	170	8	373
8:30	9	2	12	11	154	1	2	0	0	0	149	6	346
8:45	20	0	17	23	186	1	7	1	1	0	171	10	437
HR TOTAL	61	5	41	72	642	6	10	1	2	0	662	34	1536
Break													
4:00 PM	21	0	22	52	296	3	0	2	0	0	325	9	751
4:15	28	1	28	32	308	0	2	1	0	0	289	21	717
4:30	18	2	23	41	272	1	2	0	1	1	300	21	703
4:45	33	4	23	41	309	1	6	6	0	2	319	12	756
HR TOTAL	117	7	107	166	1186	5	10	9	1	3	1233	63	2907
5:00 PM	41	1	26	42	311	1	4	4	0	2	336	24	802
5:15	22	5	25	47	308	3	1	0	1	1	338	11	762
5:30	29	0	21	33	251	2	0	2	0	0	270	12	620
5:45	40	0	30	36	232	2	3	4	0	0	266	8	621
HR TOTAL	132	6	122	158	1102	8	8	10	1	3	1213	55	2818
DAY TOTAL	330	20	308	432	3557	27	30	21	4	6	3774	192	8701

PEAK PERIOD ANALYSIS FOR THE PERIOD: 7:00 AM - 9:00 AM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
North	8:00 AM	0.72	61	5	41	107	57	5	38
East	7:30 AM	0.79	59	682	9	750	8	91	1
South	8:00 AM	0.26	10	1	2	13	77	8	15
West	7:30 AM	0.71	0	772	43	815	0	95	5
Entire Intersection									
North	7:30 AM	0.80	45	5	43	93	48	5	46
East		0.79	59	682	9	750	8	91	1
South		0.75	1	1	1	3	33	33	33
West		0.71	0	772	43	815	0	95	5



Counter Measures

Site Code :
N-S Street: SAM'S CLUB ACCESS
E-W Street: U.S. 6 & 50
:

PAGE: 1
FILE: SAM'SUS6
DATE: 12/15/94

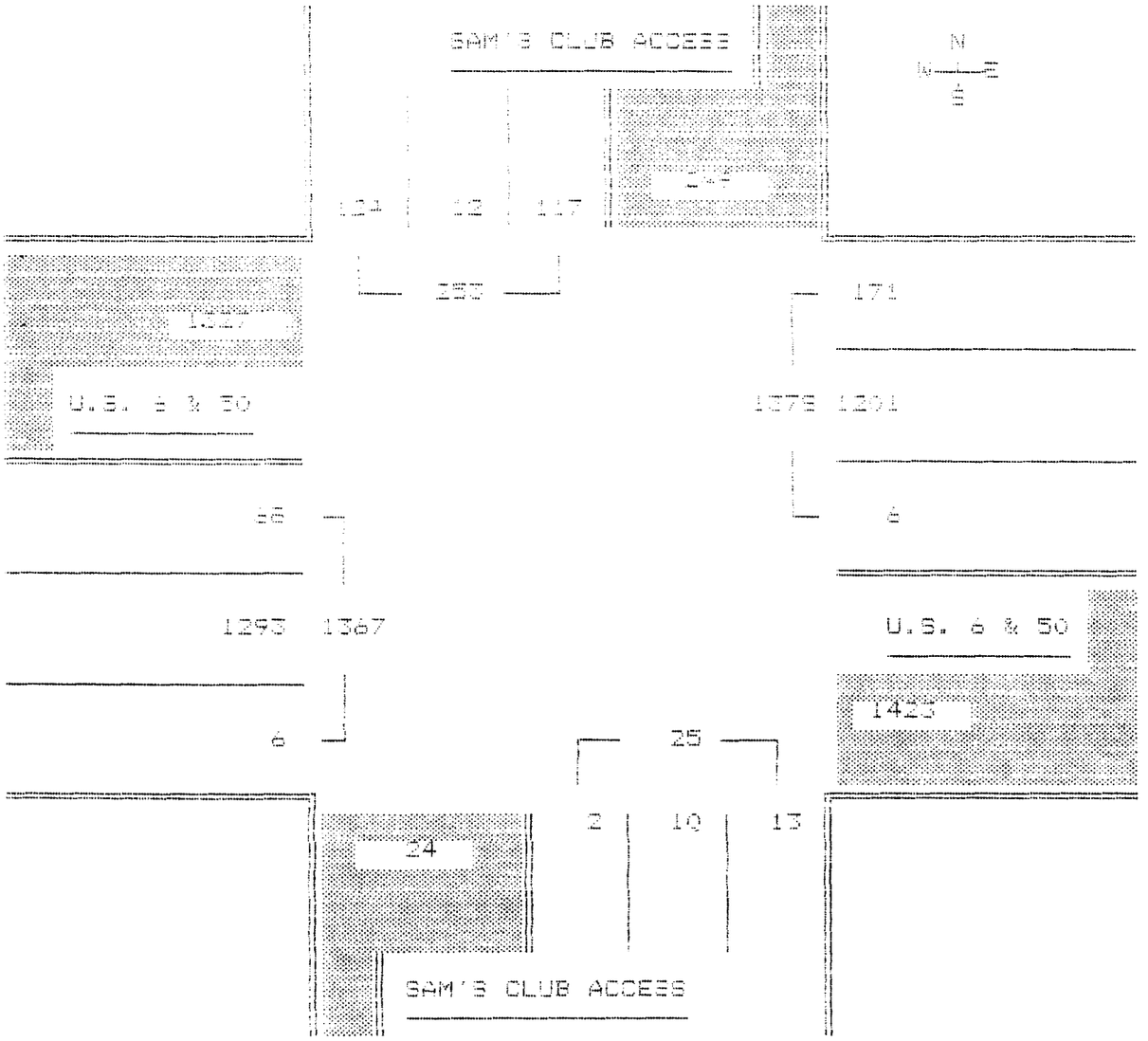
Movements by: Primary

PEAK PERIOD ANALYSIS FOR THE PERIOD: 4:00 PM - 5:00 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
North	4:15 PM	0.85	107	8	120	263	82	3	45
East	4:00 PM	0.96	171	1201	6	1378	12	87	0
South	4:15 PM	0.54	14	11	1	26	54	42	4
West	4:30 PM	0.94	6	1293	68	1367	0	95	5

Entire Intersection

North	4:30 PM	0.81	124	12	117	253	49	5	46
East		0.96	171	1201	6	1378	12	87	0
South		0.82	13	10	2	25	52	40	8
West		0.94	6	1293	68	1367	0	95	5



Counter Measures

Site Code :
N-S Street: SAM'S CLUB ACCESS
E-W Street: INDEPENDENT
:

PAGE: 1
FILE: SAM'SIND
DATE: 12/15/94

Movements by: Primary

Time Begin	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
7:00 AM	0	0	1	0	1	7	6	3	1	1	1	0	22
7:15	1	2	0	0	1	7	13	1	0	0	0	0	27
7:30	0	0	0	0	1	22	15	3	1	2	3	1	49
7:45	0	1	1	0	0	16	22	0	0	5	3	0	54
HR TOTAL	1	3	1	0	3	48	61	10	3	8	7	1	152
8:00 AM	1	0	0	2	4	17	29	3	0	1	3	0	60
8:15	1	2	0	0	2	25	21	3	0	2	2	0	58
8:30	1	0	1	2	2	23	13	3	1	0	2	0	48
8:45	0	1	0	0	3	34	22	10	2	2	2	0	76
HR TOTAL	3	3	1	4	11	99	85	19	3	5	9	0	242

Break

4:00 PM	9	13	5	1	7	26	26	37	0	5	3	4	136
4:15	0	33	1	0	7	27	24	38	2	4	5	2	133
4:30	2	29	1	1	6	31	32	38	2	3	5	0	141
4:45	6	33	0	1	4	32	28	31	0	3	4	1	135
HR TOTAL	18	98	7	3	24	116	100	134	4	17	17	7	545
5:00 PM	1	36	1	2	1	33	27	43	0	9	4	1	159
5:15	2	30	0	0	3	17	18	39	1	5	2	0	117
5:30	3	30	2	0	1	29	24	32	0	1	4	0	126
5:45	4	36	0	3	4	31	21	25	2	2	2	1	132
HR TOTAL	10	132	3	5	10	110	90	139	3	18	12	2	534
DAY TOTAL	32	236	12	12	50	373	336	305	13	49	45	10	1473

Counter Measures

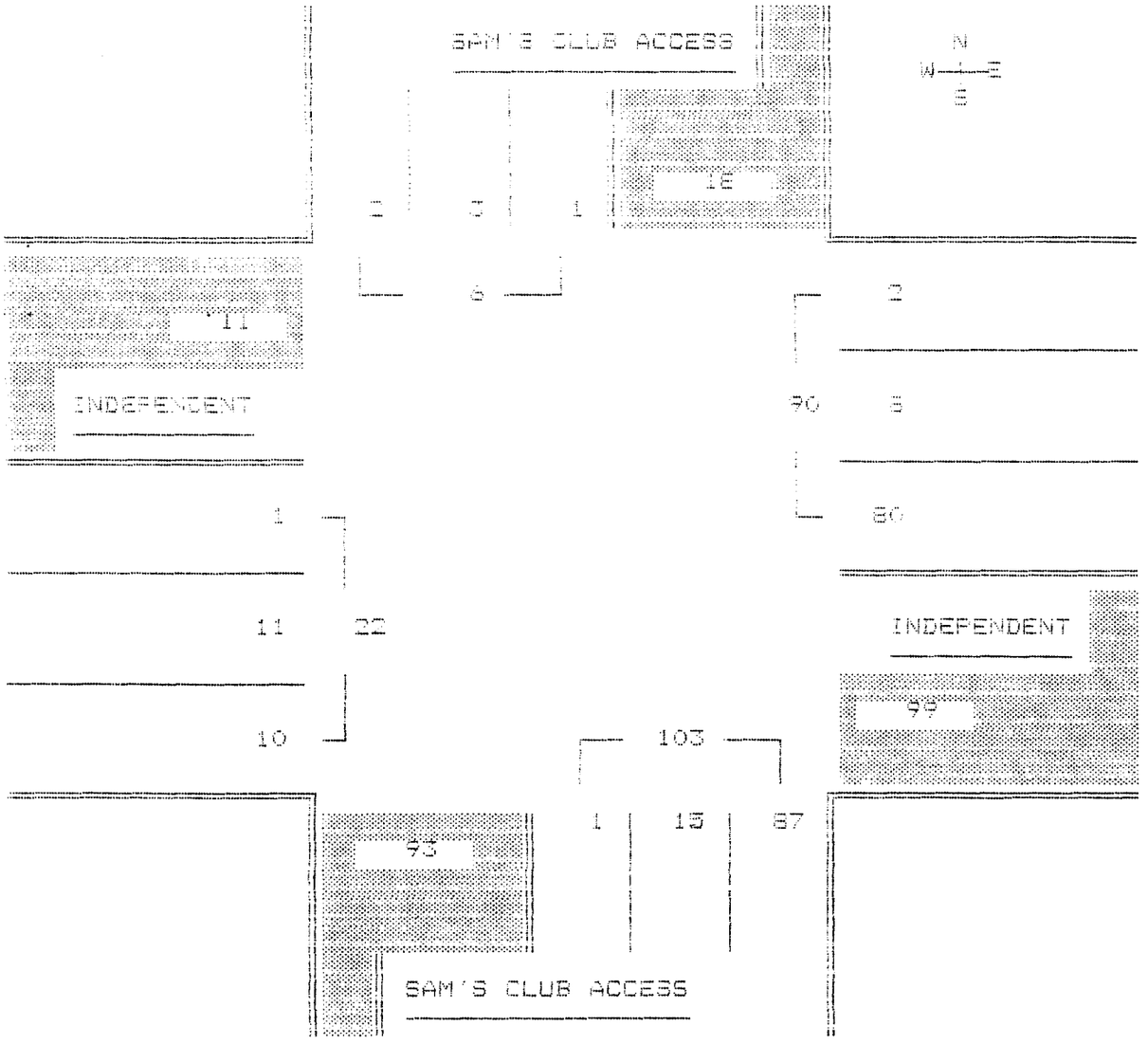
Site Code :
E-W Street: SAM'S CLUB ACCESS
N-S Street: INDEPENDENT
:

Movements by: Primary

PAGE: 1
FILE: SAM'SIND
DATE: 12/15/94

PEAK PERIOD ANALYSIS FOR THE PERIOD: 7:00 AM - 9:00 AM

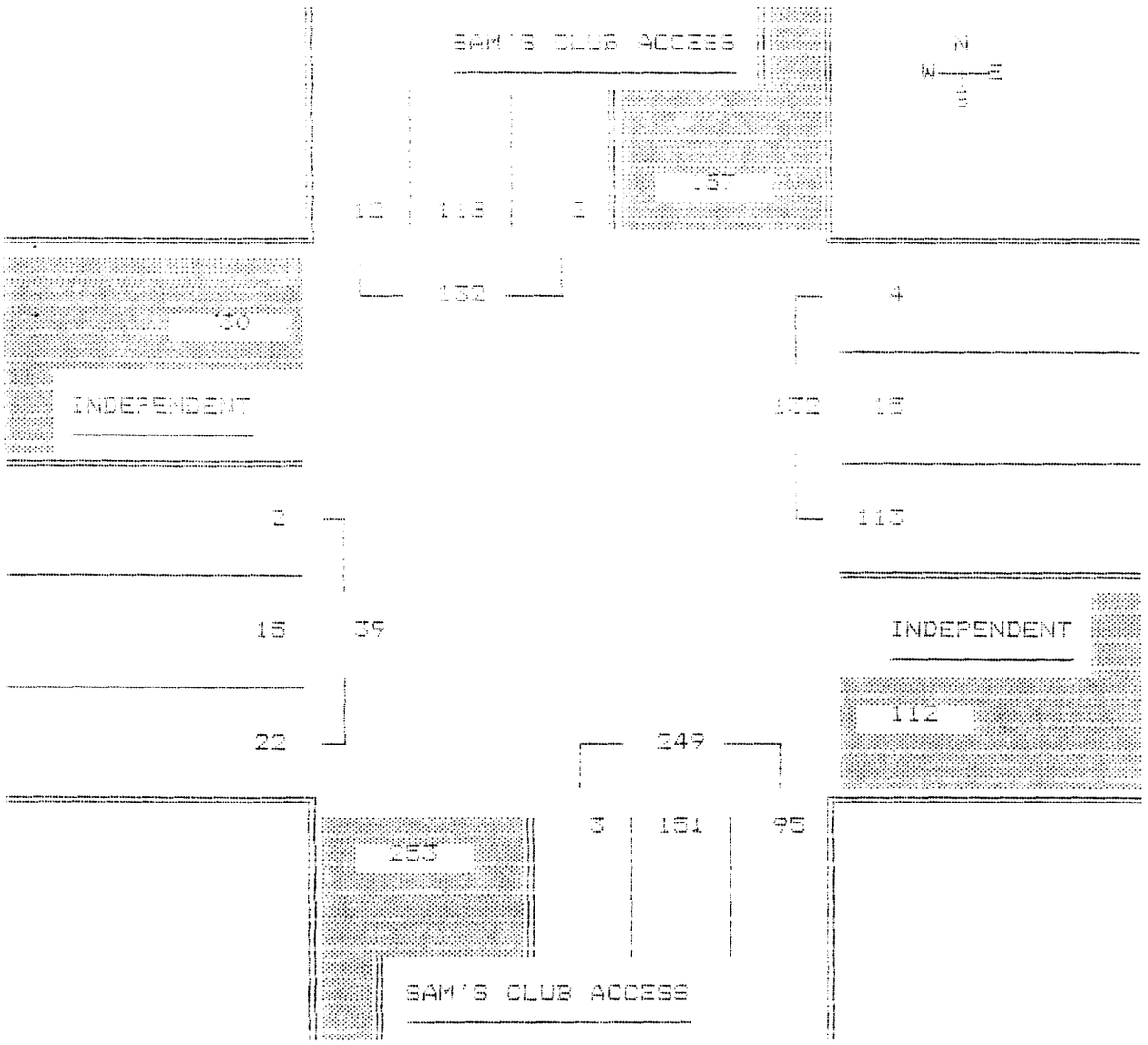
	DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
	North	7:30 AM	0.50	2	3	1	6	33	50	17
	East	7:30 AM	0.83	2	8	80	90	2	9	89
	South	7:30 AM	0.80	87	15	1	103	84	15	1
	West	7:30 AM	0.69	10	11	1	22	45	50	5
	Entire Intersection									
	North	7:30 AM	0.50	2	3	1	6	33	50	17
	East		0.83	2	8	80	90	2	9	89
	South		0.80	87	15	1	103	84	15	1
	West		0.69	10	11	1	22	45	50	5



Movements by: Primary

PEAK PERIOD ANALYSIS FOR THE PERIOD: 4:00 PM - 5:00 PM

	DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	VOLUMES Right	Thru	Left	Total	PERCENTS Right	Thru	Left
	North	4:00 PM	0.87	12	118	2	132	9	89	2
	East	4:00 PM	0.87	4	15	113	132	3	11	86
	South	4:00 PM	0.89	95	151	3	249	38	61	1
	West	4:00 PM	0.70	22	15	2	39	56	38	5
	Entire Intersection									
	North	4:00 PM	0.87	12	118	2	132	9	89	2
	East		0.87	4	15	113	132	3	11	86
	South		0.89	95	151	3	249	38	61	1
	West		0.70	22	15	2	39	56	38	5



Counter Measures

Site Code :
E-W Street: BAM'S CLUB ACCESS
N-S Street: SOUTH FRONTAGE RD.

PAGE: 1
FILE: BAM'SFRN

Movements by: Primary

DATE: 12/15/94

Time Period	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
7:00 AM	1	0	0	1	0	0	0	0	0	0	0	0	2
7:15	2	0	0	1	0	0	0	0	0	0	1	0	4
7:30	4	0	0	0	0	0	0	0	0	0	1	0	5
7:45	3	0	0	1	1	0	0	0	0	0	0	0	5
HR TOTAL	10	0	0	3	1	0	0	0	0	0	2	0	16
8:00 AM	3	0	3	1	0	0	0	0	0	0	1	0	8
8:15	1	0	0	0	0	0	0	0	0	0	0	1	2
8:30	0	0	0	0	0	0	0	0	0	0	0	2	5
8:45	1	0	0	2	1	0	0	0	0	0	0	7	11
HR TOTAL	5	0	3	3	1	0	0	0	0	0	1	10	26

Break

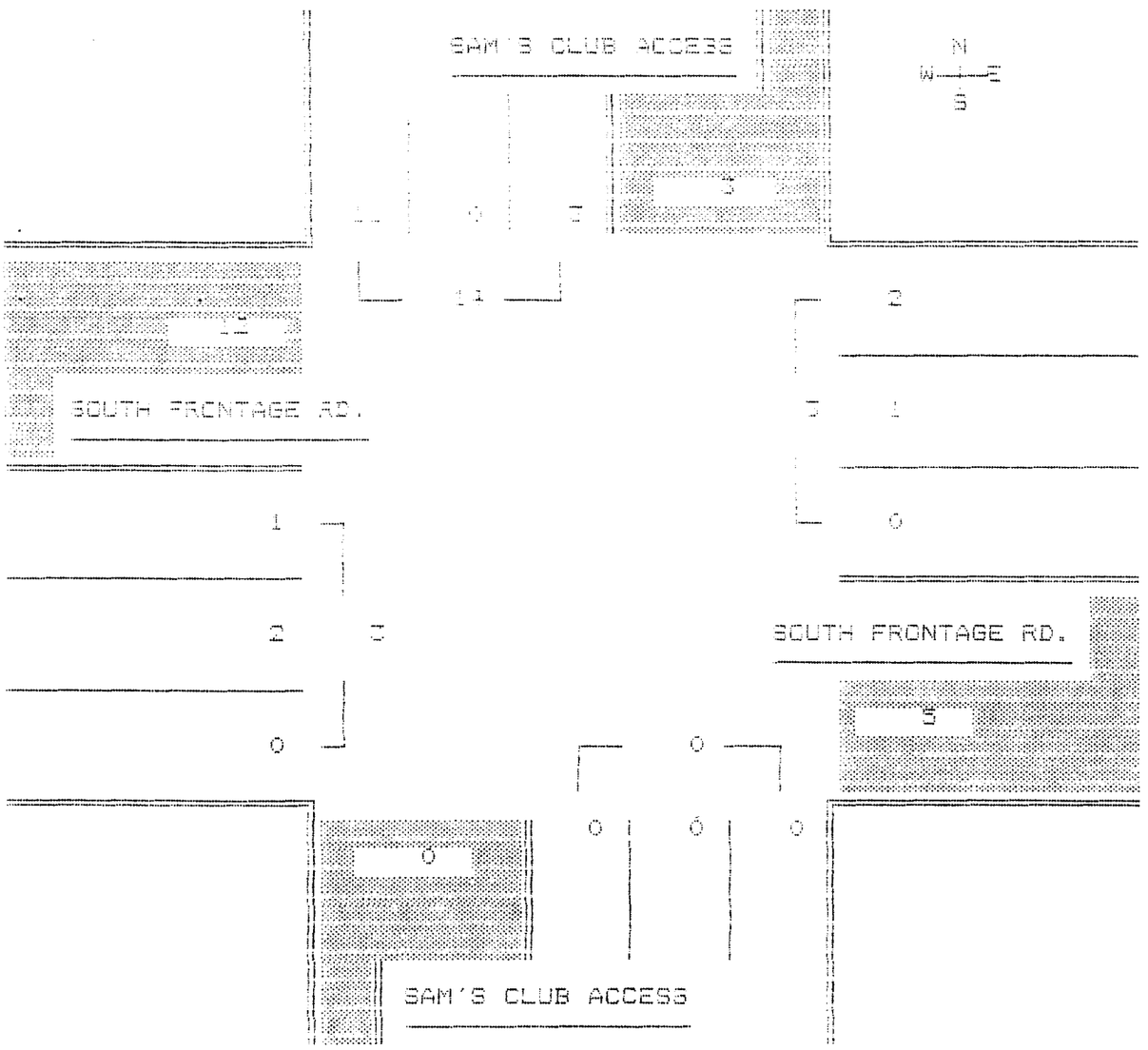
4:00 PM	2	0	0	1	2	0	0	0	0	0	1	1	10
4:15	1	0	1	0	0	0	0	0	0	0	0	3	9
4:30	1	0	2	1	1	0	0	0	0	0	0	2	8
4:45	5	0	1	6	0	0	0	0	0	0	0	6	18
HR TOTAL	10	0	4	8	3	0	0	0	0	0	1	12	46
5:00 PM	0	0	1	2	0	0	0	0	0	0	0	6	12
5:15	6	0	2	1	0	0	0	0	0	0	0	1	11
5:30	1	0	0	0	0	0	0	0	0	0	0	2	3
5:45	0	0	0	0	0	0	0	0	0	0	1	7	8
HR TOTAL	10	0	4	3	0	0	0	0	0	0	1	16	34
AM TOTAL	28	0	16	17	5	0	0	0	0	0	5	28	122

PEAK PERIOD ANALYSIS FOR THE PERIOD: 7:30 AM - 8:30 AM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	VOLUMES Right	Thru	Left	Total	PERCENTS Right	Thru	Left
North	7:30 AM	0.58	11	0	3	14	79	0	21
East	7:30 AM	0.38	2	1	0	3	67	33	0
South	7:30 AM	0.00	0	0	0	0	0	0	0
West	7:30 AM	0.75	0	2	1	3	0	67	33

Entire Intersection

North	7:30 AM	0.58	11	0	3	14	79	0	21
East		0.38	2	1	0	3	67	33	0
South		0.00	0	0	0	0	0	0	0
West		0.75	0	2	1	3	0	67	33



Counter Measures

Site Code :
N-S Street: SAM'S CLUB ACCESS
E-W Street: SOUTH FRONTAGE RD.
:

PAGE: 1
FILE: SAM'SFRN
DATE: 12/15/94

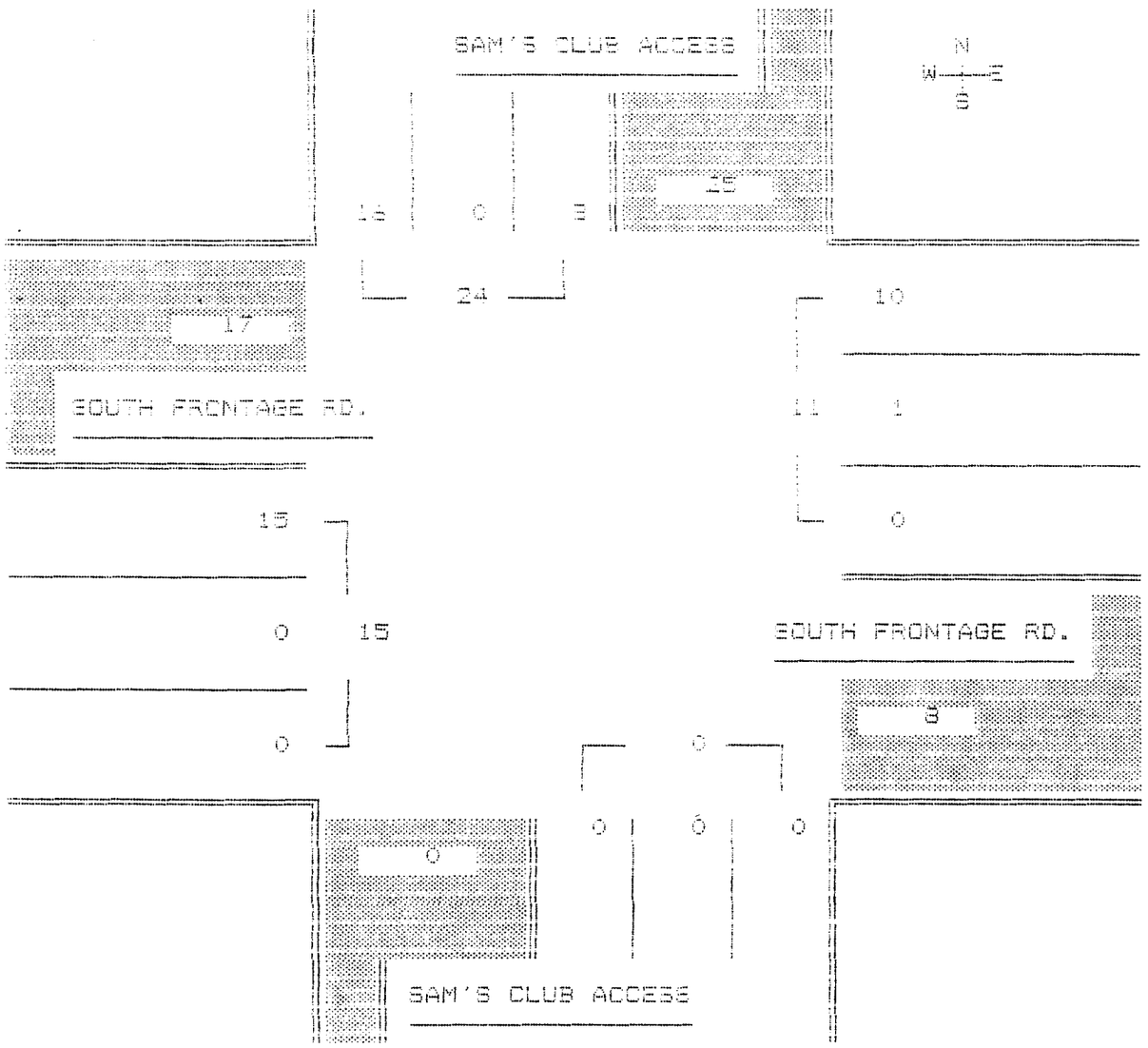
Movements by: Primary

PEAK PERIOD ANALYSIS FOR THE PERIOD: 4:30 PM - 5:30 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
North	4:30 PM	0.67	16	0	8	24	67	0	33
East	4:30 PM	0.46	10	1	0	11	91	9	0
South	4:30 PM	0.00	0	0	0	0	0	0	0
West	4:30 PM	0.63	0	0	15	15	0	0	%100

Entire Intersection

North	4:30 PM	0.67	16	0	8	24	67	0	33
East		0.46	10	1	0	11	91	9	0
South		0.00	0	0	0	0	0	0	0
West		0.63	0	0	15	15	0	0	%100



Counter Measures

Site Code :
N-S Street: INDEPENDENT
E-W Street: U.S. 6 & 30
:

PAGE: 1
FILE: IND0606
DATE: 12/15/94

Movements by: Primary

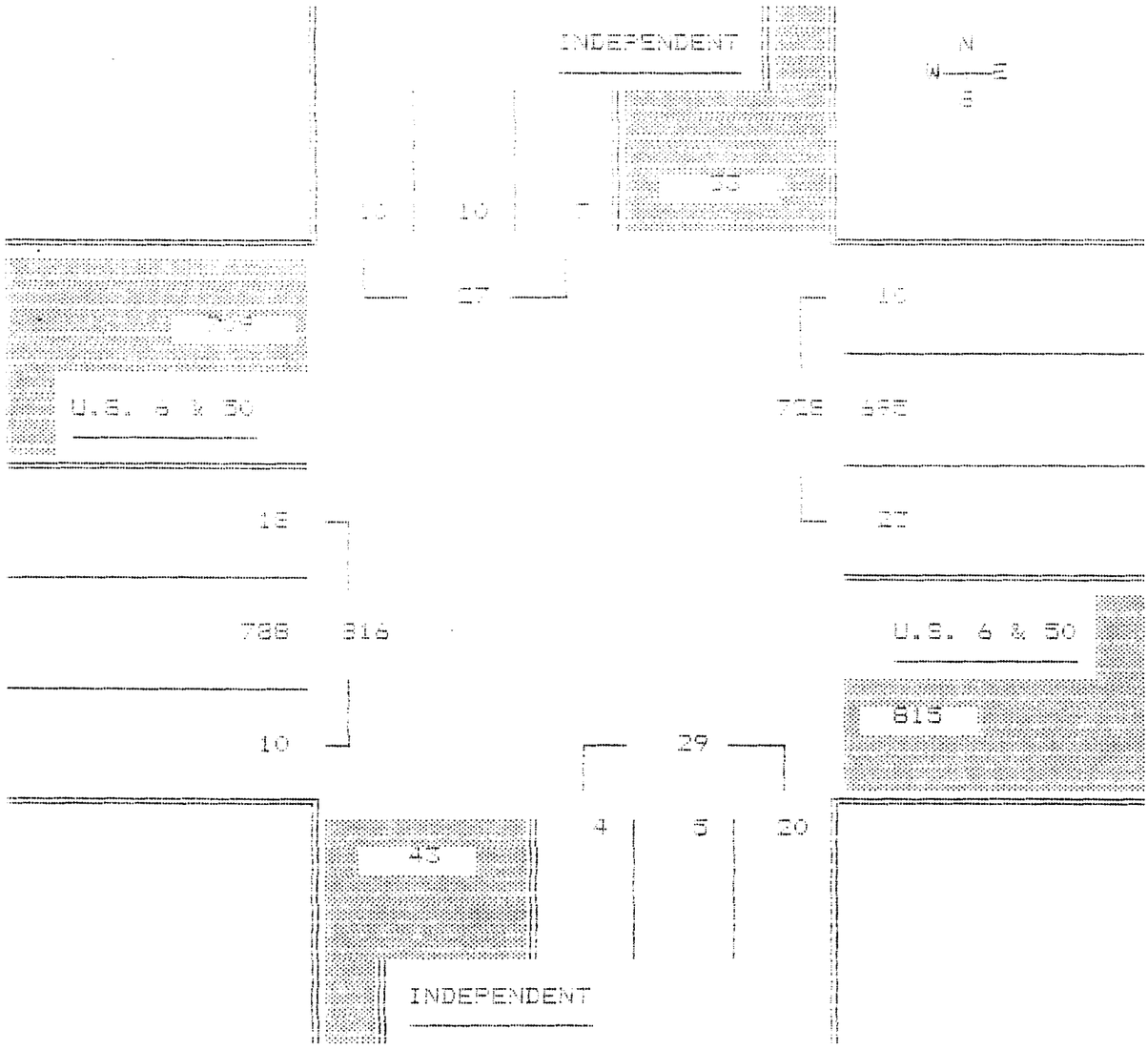
Time Begin	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
7:00 AM	1	0	1	4	84	4	1	2	0	0	98	2	200
7:15	0	3	0	7	146	7	1	1	0	3	147	1	308
7:30	0	2	2	2	160	8	4	1	1	2	160	6	346
7:45	1	1	0	3	218	6	8	2	0	2	280	7	527
HR TOTAL	2	6	4	11	608	18	17	6	1	7	685	16	1381
8:00 AM	2	1	3	3	159	3	5	0	2	1	174	5	358
8:15	7	6	1	3	158	9	3	2	1	5	174	0	369
8:30	6	0	0	1	155	7	9	0	3	2	146	3	332
8:45	4	0	2	1	201	5	8	0	2	5	171	2	401
HR TOTAL	19	7	6	8	673	24	25	2	8	13	665	10	1460
Break													
4:00 PM	2	0	0	1	313	1	8	1	0	7	326	11	672
4:15	4	0	0	5	330	8	15	1	0	2	295	9	669
4:30	8	1	1	3	291	8	15	0	0	4	306	8	645
4:45	9	1	0	4	335	3	9	1	0	3	324	10	699
HR TOTAL	23	2	1	13	1271	20	47	3	0	16	1251	38	2685
5:00 PM	6	1	1	4	330	10	8	0	1	1	350	9	724
5:15	8	1	1	4	317	11	14	0	0	2	308	4	697
5:30	8	2	1	1	268	10	13	1	0	1	281	6	592
5:45	6	1	1	3	259	10	15	0	0	2	259	7	562
HR TOTAL	28	5	4	12	1174	41	50	1	1	6	1227	26	2575
DAY TOTAL	72	20	15	44	3726	103	139	12	10	42	3828	90	8101

PEAK PERIOD ANALYSIS FOR THE PERIOD: 7:00 AM - 8:00 AM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
North	7:00 AM	0.48	10	10	7	27	37	37	26
East	7:00 AM	0.81	10	695	23	728	1	95	3
South	7:00 AM	0.72	20	5	4	29	69	17	14
West	7:00 AM	0.71	10	788	18	816	1	97	2

Entire Intersection

North	7:00 AM	0.48	10	10	7	27	37	37	26
East		0.81	10	695	23	728	1	95	3
South		0.72	20	5	4	29	69	17	14
West		0.71	10	788	18	816	1	97	2

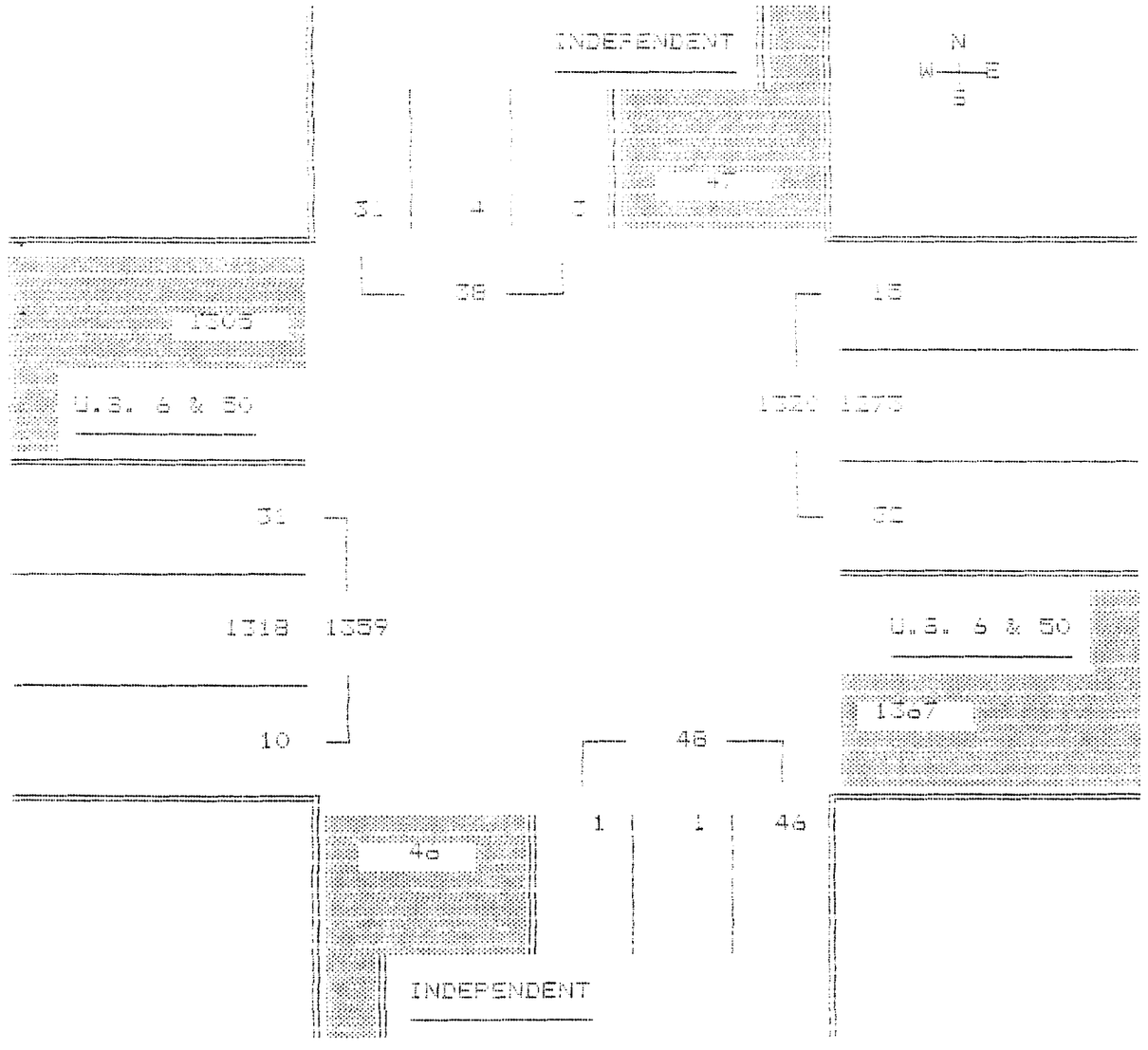


PEAK PERIOD ANALYSIS FOR THE PERIOD: 4:00 PM - 5:00 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
North	4:00 PM	0.95	31	4	3	38	82	11	8
East	4:30 PM	0.96	15	1273	32	1320	1	96	2
South	4:30 PM	0.80	46	1	1	48	96	2	2
West	4:30 PM	0.94	10	1318	31	1359	1	97	2

Entire Intersection

North	4:00 PM	0.95	31	4	3	38	82	11	8
East		0.96	15	1273	32	1320	1	96	2
South		0.80	46	1	1	48	96	2	2
West		0.94	10	1318	31	1359	1	97	2



Counter Measures

Site Code:
N-S Street: INDEPENDENCE
E-W Street: NORTH FRONTAGE RD

PAGE: 1
FILE: NFRONT

Movements and Totals

DATE: 12/15/94

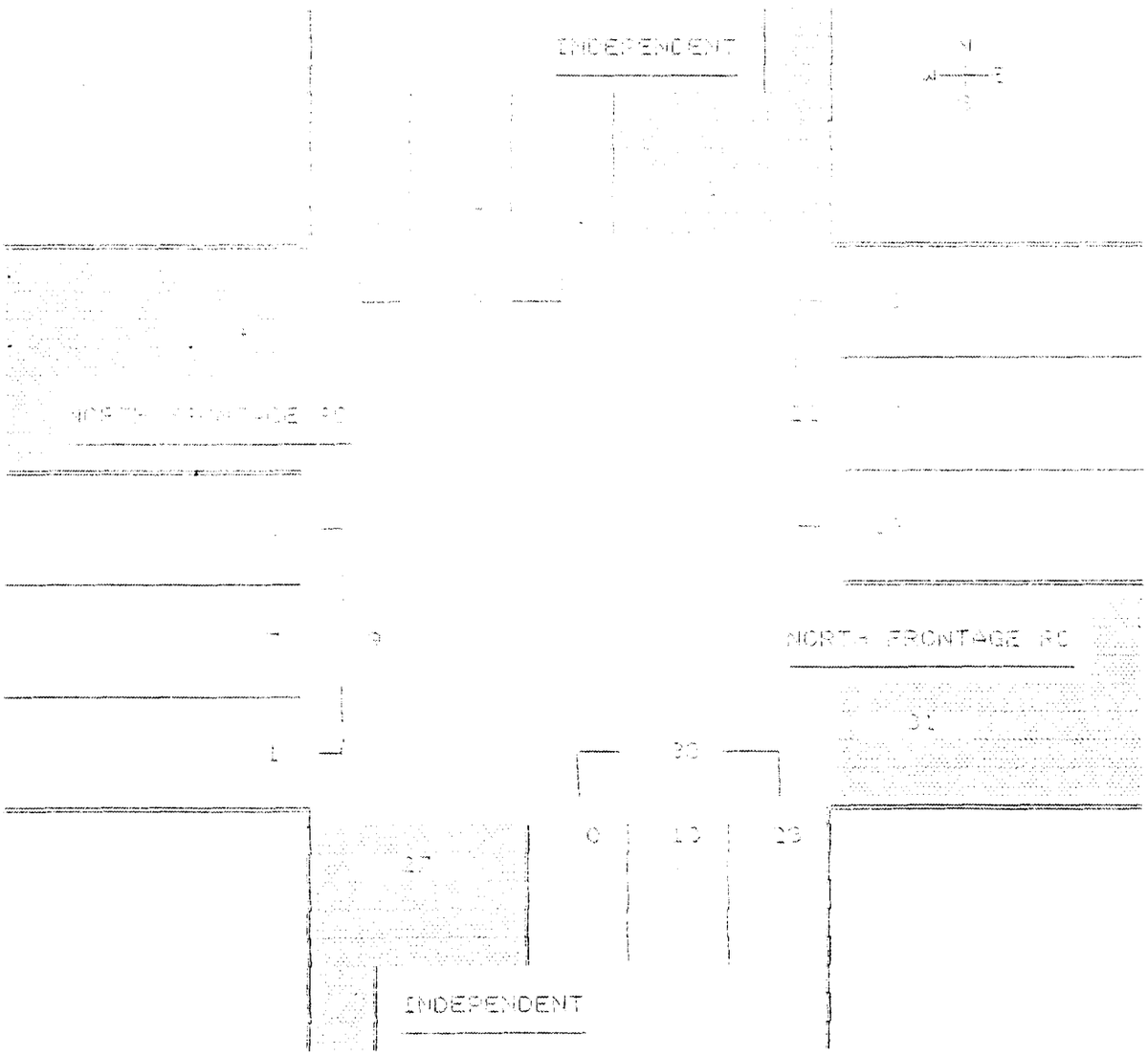
Time Begin	From North			From East			From South			From West			Hourly Total
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	
7:00 AM	1	1	1	1	2	1	1	1	1	1	1	1	11
7:15	1	3	1	1	1	1	1	1	1	2	1	1	14
7:30	1	1	1	1	1	2	2	1	1	1	1	2	15
7:45	1	1	1	2	2	1	2	1	2	1	2	1	18
AM TOTAL	4	6	4	5	6	5	6	4	5	5	5	5	58
8:00 AM	1	1	1	2	1	2	2	1	2	2	2	1	20
8:15	2	1	2	2	1	2	2	1	2	1	1	2	20
8:30	2	1	1	1	1	1	1	1	2	1	2	2	16
8:45	2	1	1	1	1	1	2	1	1	2	1	1	15
AM TOTAL	7	4	5	6	4	6	7	4	7	6	6	6	71
11:00 AM	2	2	1	1	2	1	4	2	2	2	2	1	23
11:15	2	1	2	1	2	1	3	1	1	2	1	1	18
11:30	1	2	1	2	1	2	3	2	2	2	2	2	24
11:45	2	1	2	1	2	1	4	2	1	2	1	1	20
PM TOTAL	7	6	6	5	7	5	14	7	6	8	6	5	85
5:00 PM	2	1	1	2	1	1	3	2	2	1	1	1	18
5:15	1	2	1	2	1	1	2	1	1	1	1	2	16
5:30	2	1	1	1	1	2	2	2	1	1	1	2	17
5:45	1	1	2	1	1	1	3	1	1	2	1	2	17
PM TOTAL	6	5	5	6	4	5	10	6	5	5	4	7	68
DAY TOTAL	24	21	20	22	21	21	37	21	23	24	21	23	300

TEAM PEDDIS ANAL DIS FOR THE PERIOD: 7:00 AM - 8:00 AM

Direction From	Start Peak Hour	Peak Hr Factor	Volumes Thru	Left	Right	Total	Pedestrians Thru	Left	Right
North	7:00 AM	0.56	1	7	1	9	11	79	11
East	7:00 AM	0.55	7	8	14	22	7	14	86
South	7:00 AM	0.75	10	10	0	20	79	20	0
West	7:00 AM	0.56	1	7	1	9	11	79	11

Entire Intersection

North	7:00 AM	0.56	1	7	1	9	11	79	11
East		0.55	7	8	14	22	7	14	86
South		0.75	10	10	0	20	79	20	0
West		0.56	1	7	1	9	11	79	11

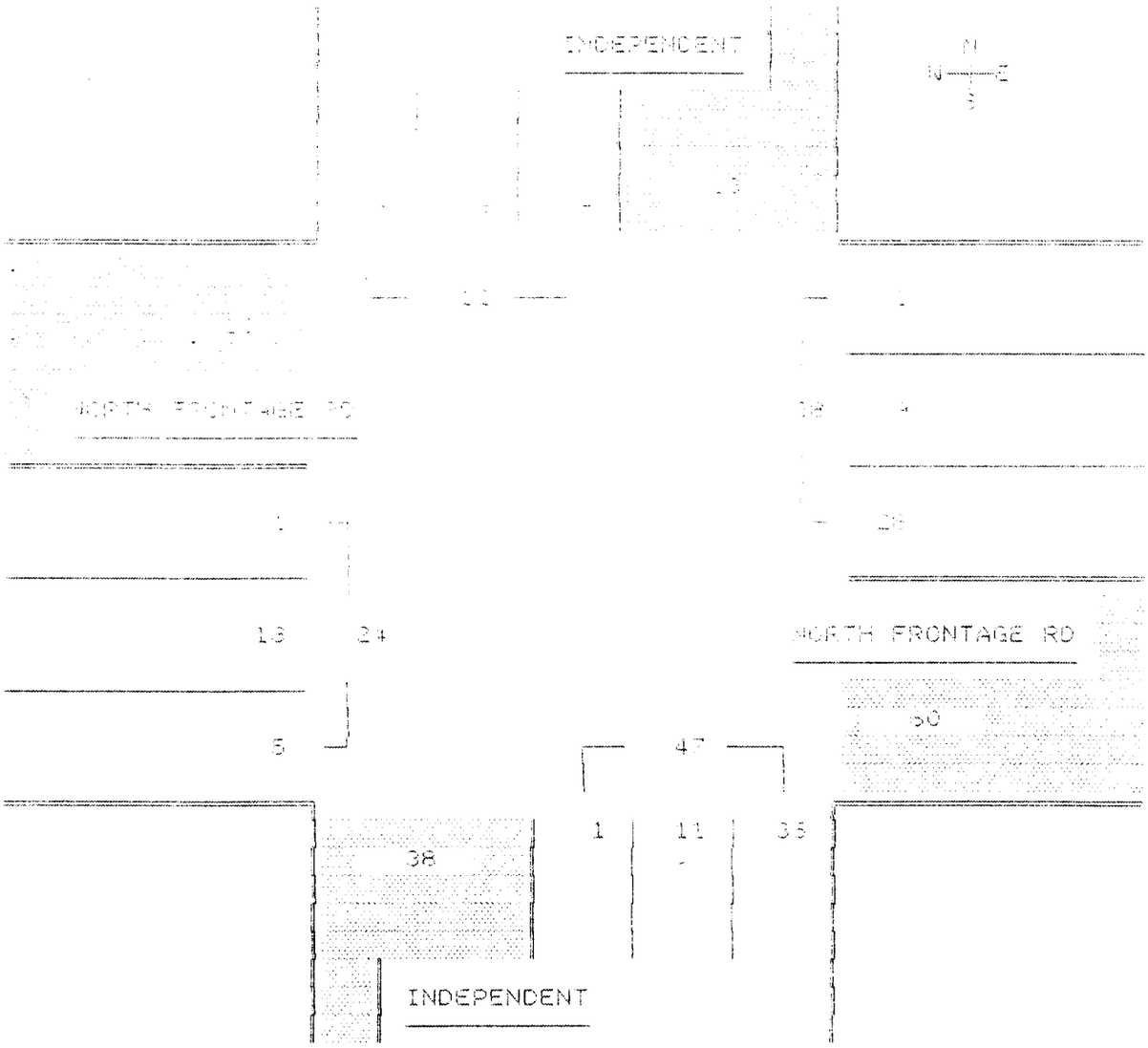


PEAK PERIOD ANALYSIS FOR THE PERIOD: 4:00 PM - 5:00 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	VOLUMES Right	Thru	Left	U-Turn	PERCENT Right	Thru	Left
North	4:00 PM	0.50	0	5	7	12	0	42	58
East	4:00 PM	0.68	1	9	28	38	3	24	74
South	4:00 PM	0.79	35	11	1	47	74	23	2
West	4:00 PM	0.57	8	13	1	24	33	54	4

Entire Intersection

North	4:00 PM	0.50	0	5	7	12	0	42	58
East		0.68	1	9	28	38	3	24	74
South		0.79	35	11	1	47	74	23	2
West		0.57	8	13	1	24	33	54	4



Counter Measures

Site Code :
N-S Street: INDEPENDENT
E-W Street: SOUTH FRONTAGE RD
:

PAGE: 1
FILE: INDEPS

Movements by: Primary

DATE: 12/15/94

Time	From North			From East			From South			From West			Venicle
Begin	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	Total
7:00 AM	3	1	0	0	0	0	0	1	0	0	0	5	10
7:15	4	3	2	0	0	0	0	0	0	0	0	2	11
7:30	4	5	0	0	0	0	0	2	0	0	1	4	16
7:45	3	4	2	0	0	0	0	3	0	0	0	7	19
HR TOTAL	14	13	4	0	0	0	0	6	0	0	1	18	56
8:00 AM	3	2	0	0	0	0	0	0	0	0	0	7	12
8:15	11	7	2	0	0	0	0	3	1	0	1	3	28
8:30	4	5	0	0	0	3	0	7	1	1	3	5	29
8:45	5	4	1	0	2	1	0	9	0	4	1	1	28
HR TOTAL	23	18	3	0	2	4	0	19	2	5	5	16	97
Break													
4:00 PM	4	4	0	1	0	3	1	7	0	0	4	1	25
4:15	6	4	0	2	4	0	0	5	0	0	3	9	33
4:30	8	4	1	4	4	0	0	5	0	1	0	6	33
4:45	5	2	0	2	7	1	0	1	0	2	6	7	33
HR TOTAL	23	14	1	9	15	4	1	18	0	3	13	23	124
5:00 PM	8	3	1	2	1	1	1	2	1	0	3	5	28
5:15	8	5	1	3	3	1	0	3	0	2	3	8	37
5:30	6	6	1	3	6	0	0	2	0	1	2	9	36
5:45	6	6	1	2	4	0	1	3	0	0	1	10	34
HR TOTAL	28	20	4	10	14	2	2	10	1	3	9	32	135
DAY TOTAL	88	65	12	19	31	10	3	53	3	11	28	89	412

Counter Measures

Site Code :
N-S Street: INDEPENDENT
E-W Street: SOUTH FRONTAGE RD
:

PAGE: 1
FILE: INDEPS
DATE: 12/15/94

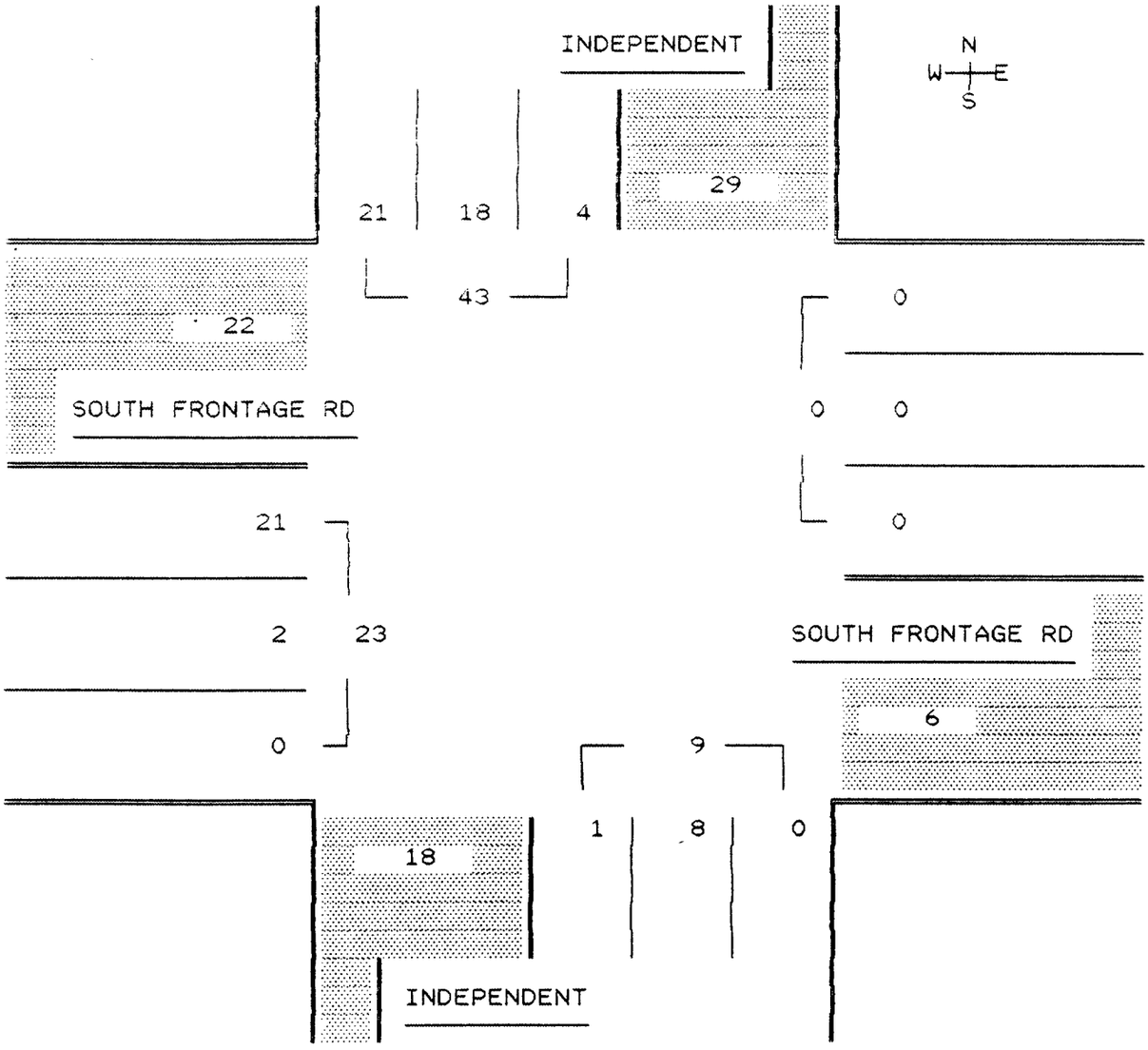
Movements by: Primary

PEAK PERIOD ANALYSIS FOR THE PERIOD: 7:30 AM - 8:30 AM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	VOLUMES Right	Thru	Left	Total	PERCENTS Right	Thru	Left
North	7:30 AM	0.54	21	18	4	43	49	42	9
East	7:30 AM	0.00	0	0	0	0	0	0	0
South	7:30 AM	0.56	0	8	1	9	0	89	11
West	7:30 AM	0.82	0	2	21	23	0	9	91

Entire Intersection

North	7:30 AM	0.54	21	18	4	43	49	42	9
East		0.00	0	0	0	0	0	0	0
South		0.56	0	8	1	9	0	89	11
West		0.82	0	2	21	23	0	9	91



Counter Measures

Site Code :
N-S Street: INDEPENDENT
E-W Street: SOUTH FRONTAGE RD
:

PAGE: 1
FILE: INDEPS
DATE: 12/15/94

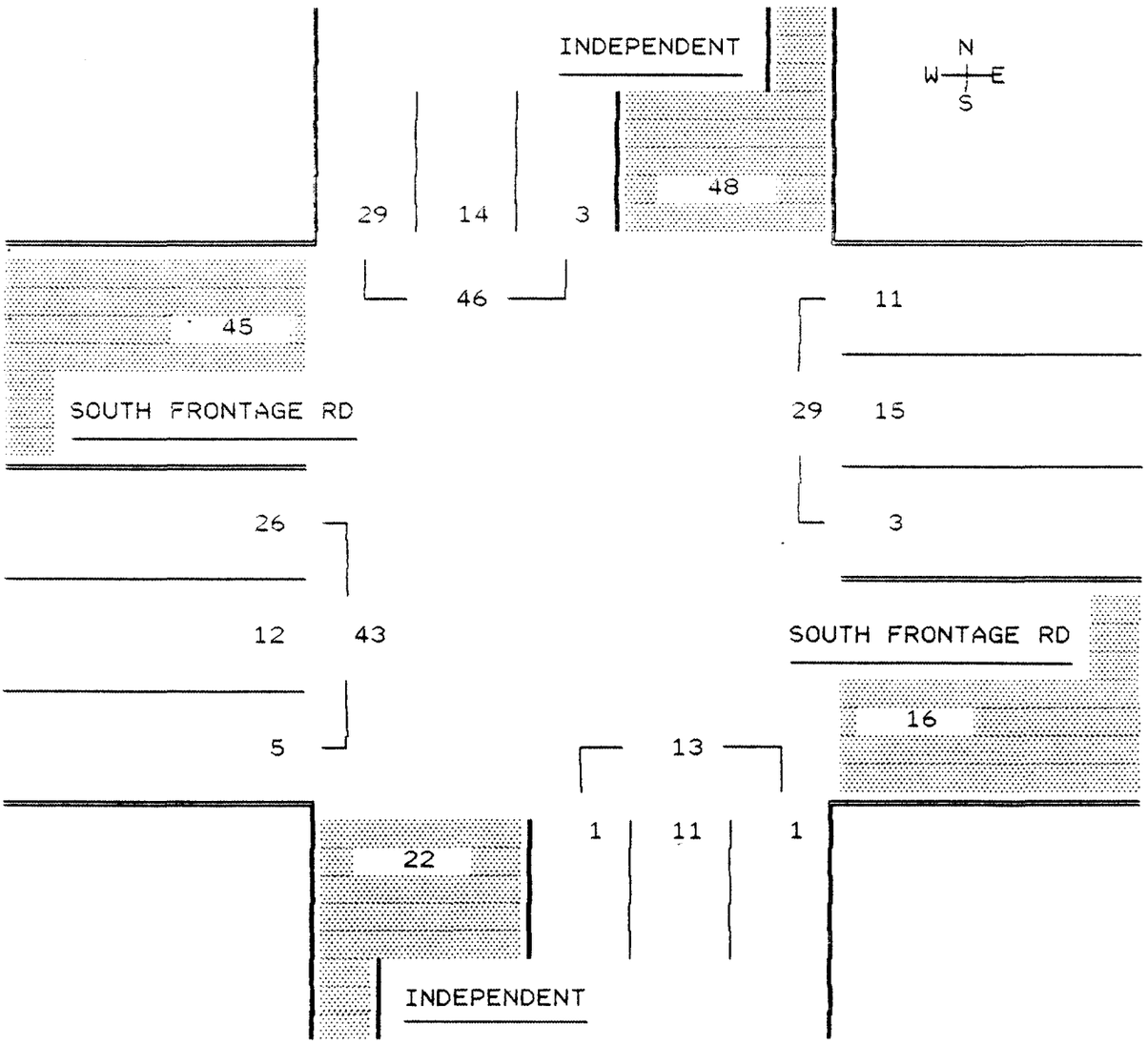
Movements by: Primary

PEAK PERIOD ANALYSIS FOR THE PERIOD: 4:30 PM - 5:30 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	VOLUMES Right	Thru	Left	Total	PERCENTS Right	Thru	Left
North	4:30 PM	0.32	29	14	3	46	63	30	7
East	4:30 PM	0.73	11	15	3	29	38	52	10
South	4:30 PM	0.65	1	11	1	13	8	85	8
West	4:30 PM	0.72	5	12	26	43	12	28	60

Entire Intersection

North	4:30 PM	0.32	29	14	3	46	63	30	7
East		0.73	11	15	3	29	38	52	10
South		0.65	1	11	1	13	8	85	8
West		0.72	5	12	26	43	12	28	60



Counter Measures

Site Code :
N-S Street: MULBERRY
E-W Street: SR240/GRAND AVE.

PAGE: 1
FILE: SR24GRA

Movements by: Primary

DATE: 10/15/98

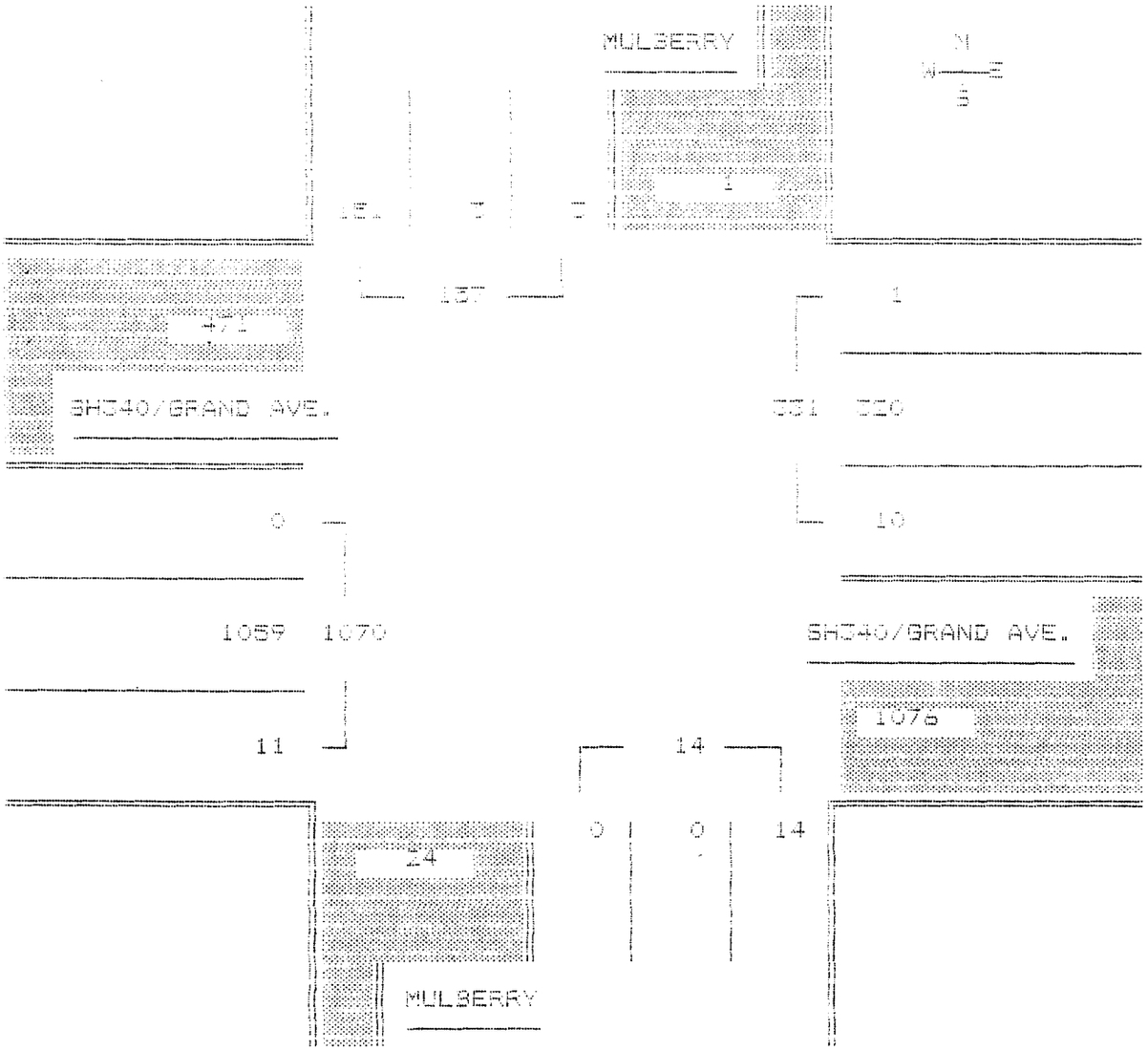
Time Period	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
7:00 AM	21	4	0	1	81	1	1	0	0	2	170	0	281
7:15	27	0	0	0	76	1	1	0	0	7	222	0	330
7:30	43	0	0	0	81	2	4	0	0	4	251	0	385
7:45	44	1	1	1	85	2	2	0	0	1	291	0	428
HR TOTAL	135	5	1	2	283	6	8	0	0	10	934	0	1384
8:00 AM	21	0	2	0	87	3	4	0	0	4	272	0	393
8:15	43	2	0	0	87	3	4	0	0	2	245	0	386
8:30	37	3	0	1	79	5	1	0	0	2	175	0	323
8:45	78	2	0	3	107	3	1	0	0	3	243	0	400
HR TOTAL	159	7	2	4	360	14	10	0	0	11	935	0	1502
4:00 PM	125	5	3	4	183	5	0	0	0	2	283	0	567
4:15	120	1	3	4	153	2	6	5	6	3	272	6	591
4:30	117	0	10	2	125	1	9	2	4	4	279	7	664
4:45	119	1	0	0	200	0	5	0	2	1	299	0	630
HR TOTAL	481	7	16	10	766	11	20	7	12	10	1103	13	2472
5:00 PM	97	1	1	1	261	3	10	1	0	3	229	0	605
5:15	106	0	3	0	203	4	11	0	1	2	215	0	545
5:30	105	3	0	0	191	8	5	0	0	1	198	2	514
5:45	103	1	1	0	211	6	7	0	0	2	210	22	563
HR TOTAL	411	5	5	0	866	21	33	1	1	8	852	24	2229
DAY TOTAL	1186	24	25	22	2277	52	73	8	13	36	3824	37	7587

PEAK PERIOD ANALYSIS FOR THE PERIOD: 7:00 AM - 9:00 AM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
North	7:30 AM	0.85	151	3	3	157	96	2	2
East	7:30 AM	0.92	1	320	10	331	0	97	3
South	7:30 AM	0.88	14	0	0	14	%100	0	0
West	7:30 AM	0.92	11	1059	0	1070	1	99	0

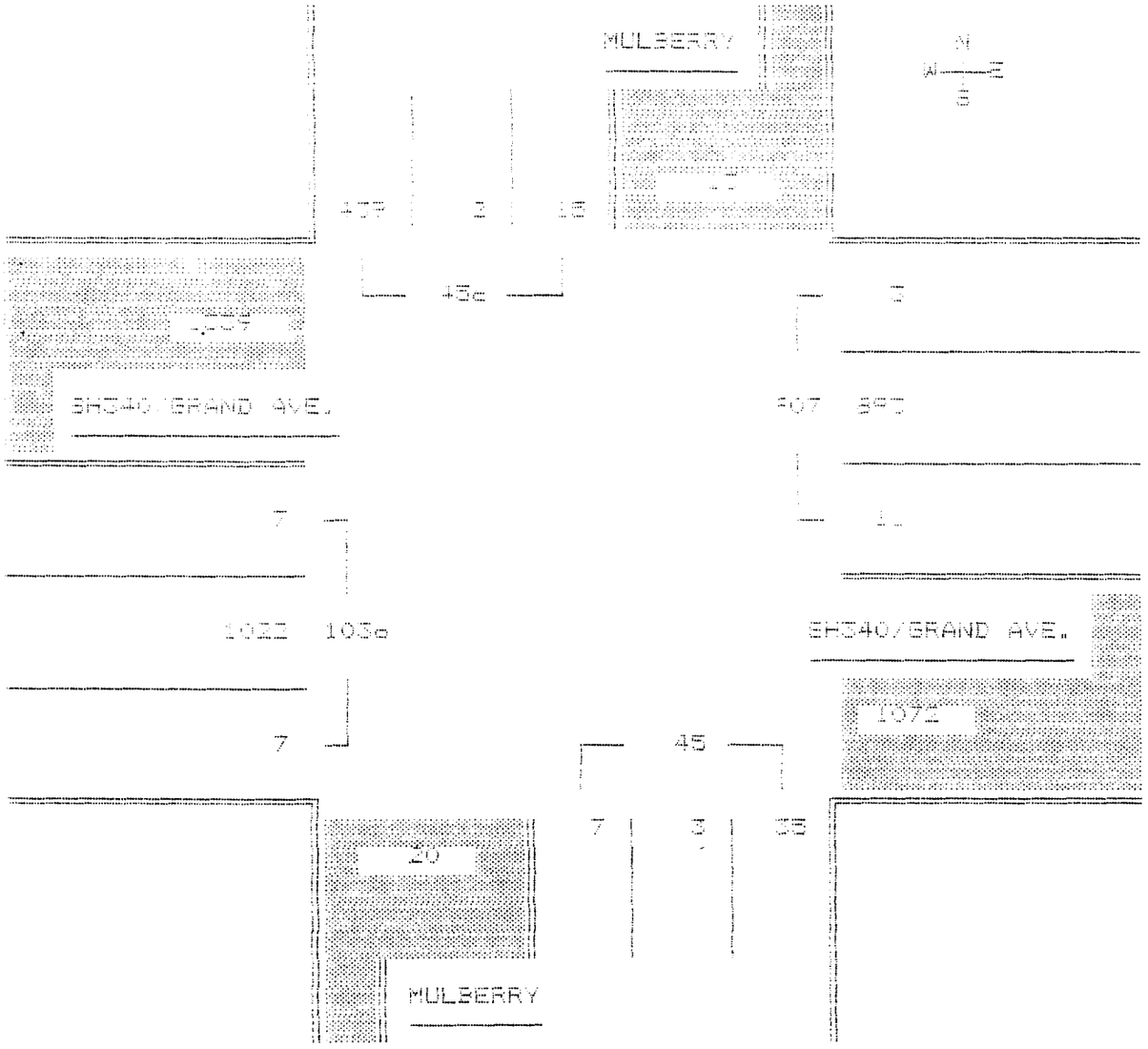
Entire Intersection

North	7:30 AM	0.85	151	3	3	157	96	2	2
East		0.92	1	320	10	331	0	97	3
South		0.88	14	0	0	14	%100	0	0
West		0.92	11	1059	0	1070	1	99	0



PEAK PERIOD ANALYSIS FOR THE PERIOD: 4:00 PM - 5:30 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	VOLUMES Right	Thru	Left	Total	PERCENTS Right	Thru	Left
North	4:00 PM	0.90	439	2	15	456	96	0	3
East	4:00 PM	0.86	3	893	11	907	0	98	1
South	4:30 PM	0.75	35	3	7	45	78	7	16
West	4:30 PM	0.86	7	1022	7	1036	1	99	1
Entire Intersection									
North	4:00 PM	0.90	439	2	15	456	96	0	3
East		0.86	3	893	11	907	0	98	1
South		0.75	35	3	7	45	78	7	16
West		0.86	7	1022	7	1036	1	99	1



Counter Measures

Site Code :
N-S Street: SAM'S CLUB ACCESS
E-W Street: U.S. 6 & 50
:

PAGE: 1
FILE: ACSAM'S
DATE: 12/17/94

Movements by: Primary

Time Begin	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
11:00 AM	16	1	27	72	359	2	0	1	0	0	386	28	503
11:15	28	2	25	61	319	5	2	1	1	0	299	28	794
11:30	19	1	27	46	382	7	1	0	1	1	398	43	837
11:45	17	1	24	57	340	6	0	0	1	3	327	24	901
HR TOTAL	100	5	123	236	1400	20	4	4	3	4	1210	123	3235
12:00 PM	22	2	28	50	386	1	2	1	0	0	342	28	863
12:15	30	1	31	55	420	5	3	2	0	0	311	31	889
12:30	30	0	25	72	394	5	2	6	0	1	402	19	956
12:45	31	0	29	52	344	5	0	1	0	0	323	49	834
HR TOTAL	113	4	113	229	1544	16	7	10	0	1	1378	127	3542
DAY TOTAL	213	12	236	465	2944	36	11	14	3	5	2588	250	6777

Counter Measures

Site Code :
E-W Street: SAM'S CLUB ACCESS
N-S Street: U.S. 6 & 50
:

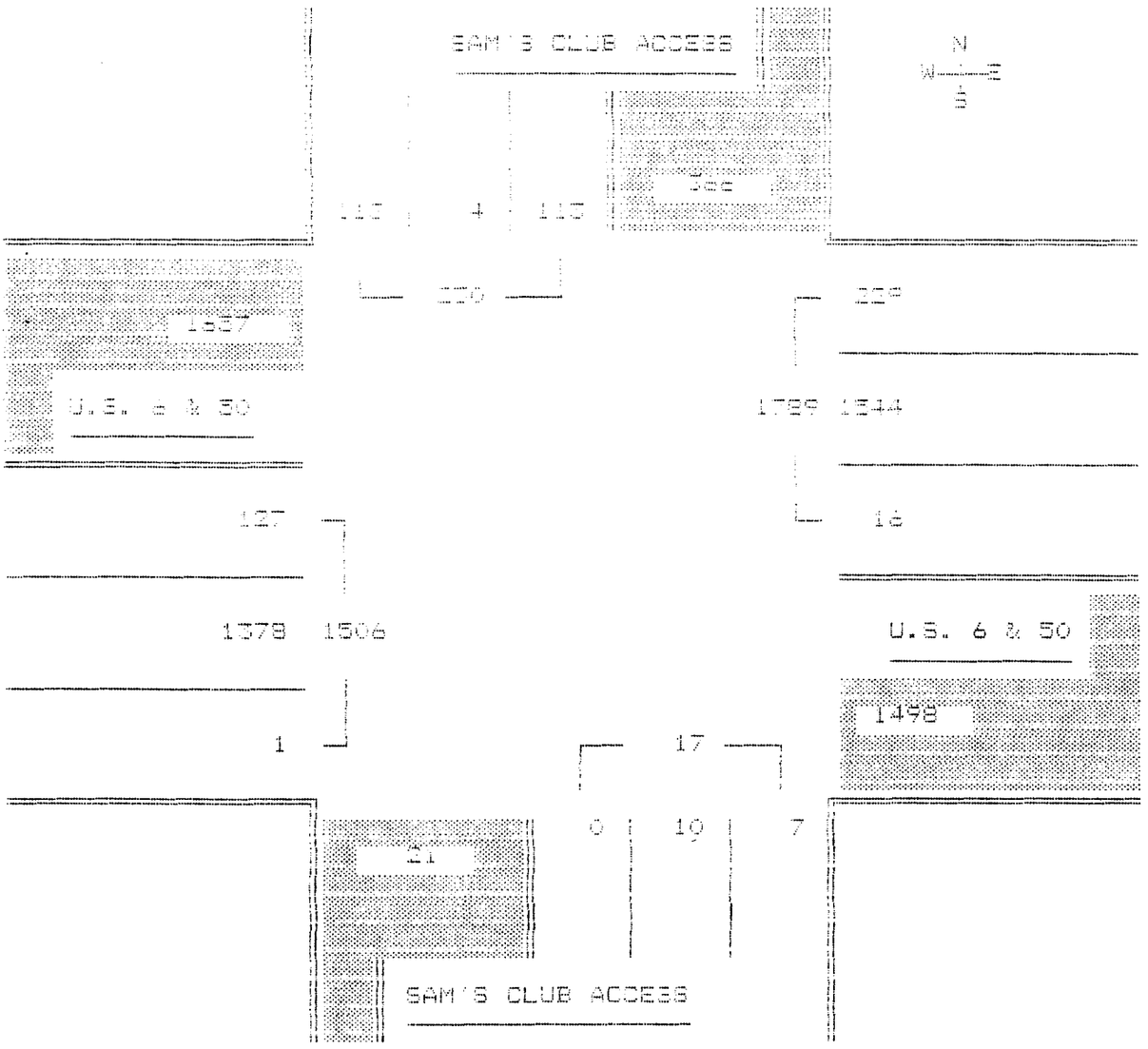
PAGE: 1
FILE: MDSAM'S
Movements by: Primary
DATE: 12/17/94

PEAK PERIOD ANALYSIS FOR THE PERIOD: 11:00 AM - 1:00 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	VOLUMES Right	Thru	Left	Total	PERCENTS Right	Thru	Left
North	11:00 AM	0.76	100	8	123	231	43	3	53
East	11:45 AM	0.93	234	1540	17	1791	13	86	1
South	11:45 AM	0.83	7	9	1	17	41	53	6
West	12:00 PM	0.89	1	1378	127	1506	0	92	8

Entire Intersection

North	12:00 PM	0.93	113	4	113	230	49	2	49
East		0.93	229	1544	16	1789	13	86	1
South		0.83	7	10	0	17	41	59	0
West		0.89	1	1378	127	1506	0	92	8



Counter Measures

Site Code :
E-W Street: BAM'S CLUB ACCESS
N-S Street: INDEPENDENT
:

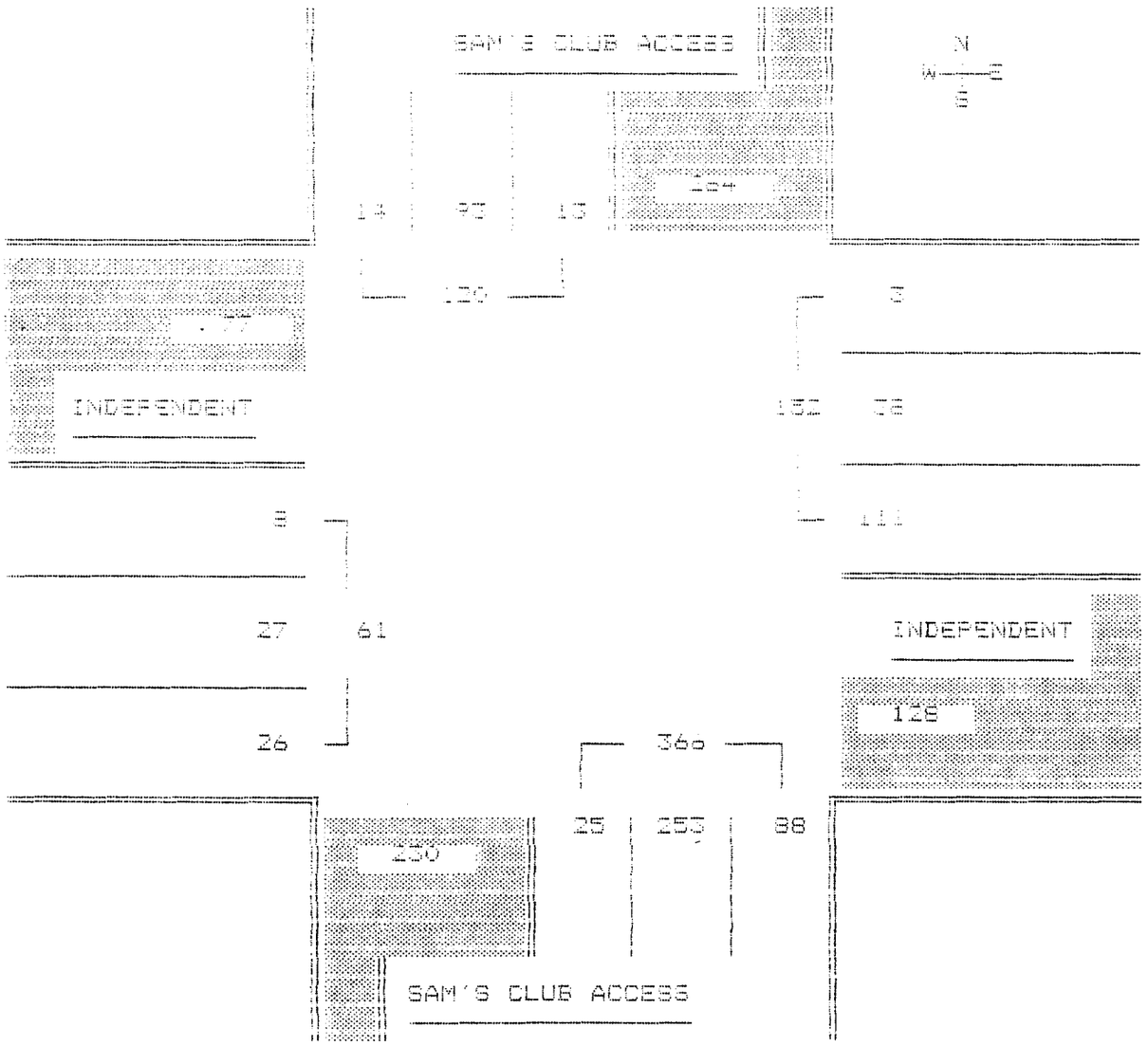
PAGE: 1
FILE: MDBAM'EN
DATE: 12/17/94

Movements by: Primary

Time Begin	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
11:00 AM	1	26	2	0	8	25	22	71	9	3	2	0	169
11:15	5	28	0	6	8	25	19	69	4	6	1	7	189
11:30	2	23	1	2	7	32	22	60	7	2	4	2	164
11:45	3	20	3	2	12	26	17	37	7	3	8	2	140
HR TOTAL	11	97	6	10	35	108	79	257	27	16	15	11	682
12:00 PM	2	26	4	1	14	30	20	51	8	7	4	3	170
12:15	0	27	5	0	4	27	16	66	6	5	6	3	165
12:30	5	25	2	1	12	25	20	72	5	1	5	2	175
12:45	7	15	2	1	9	29	32	64	6	13	12	0	189
HR TOTAL	14	93	13	3	38	111	88	253	25	26	27	8	699
DAY TOTAL	25	190	19	13	73	229	167	510	52	42	42	19	1381

PEAK PERIOD ANALYSIS FOR THE PERIOD: 12:00 PM - 1:00 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	VOLUMES Right	Thru	Left	Total	PERCENTS Right	Thru	Left
North	12:00 PM	0.94	14	93	13	120	12	78	11
East	12:00 PM	0.84	3	38	111	152	2	25	73
South	12:00 PM	0.90	88	253	25	366	24	69	7
West	12:00 PM	0.61	26	27	8	61	43	44	13
Entire Intersection									
North	12:00 PM	0.94	14	93	13	120	12	78	11
East		0.84	3	38	111	152	2	25	73
South		0.90	88	253	25	366	24	69	7
West		0.61	26	27	8	61	43	44	13



Counter Measures

Site Code :
E-W Street: SAM'S CLUB ACCESS
N-S Street: SOUTH FRONTAGE RD.
:

PAGE: 1
FILE: MDSFRONT

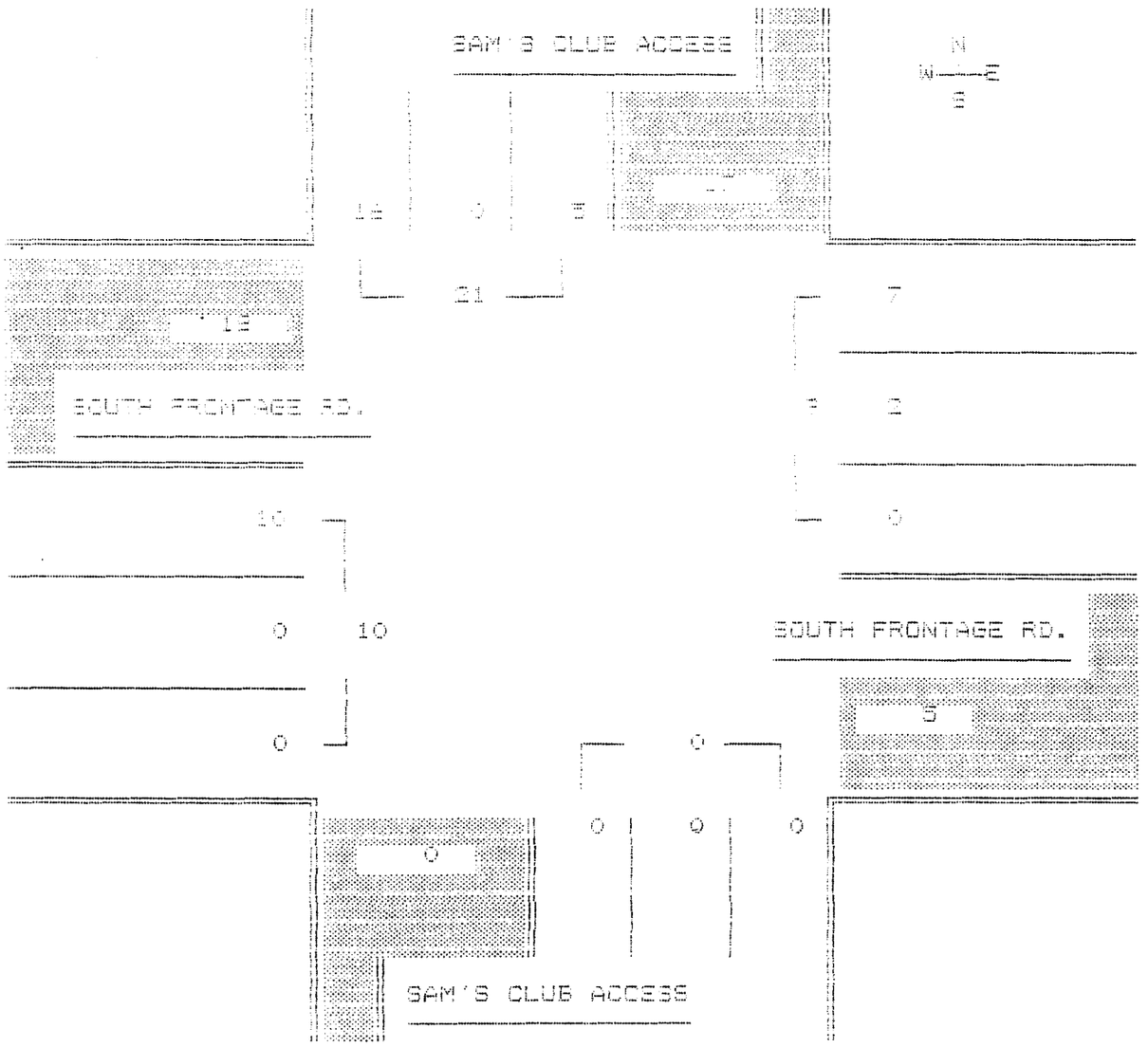
Movements by: Primary

DATE: 12/17/94

Time Begin	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
11:00 AM	2	0	1	0	0	0	0	0	0	0	0	2	5
11:15	4	0	4	4	0	0	0	0	0	0	1	2	15
11:30	6	0	4	0	0	0	0	0	0	0	1	2	13
11:45	8	0	3	1	0	0	0	0	0	0	1	0	13
HR TOTAL	20	0	12	5	0	0	0	0	0	0	3	6	46
12:00 PM	1	0	3	1	2	0	0	0	0	0	0	2	9
12:15	4	0	2	0	0	0	0	0	0	0	0	5	11
12:30	6	0	0	6	0	0	0	0	0	0	0	2	14
12:45	5	0	0	0	0	0	0	0	0	0	0	1	6
HR TOTAL	16	0	5	7	2	0	0	0	0	0	0	10	40
DAY TOTAL	36	0	17	12	2	0	0	0	0	0	3	16	86

PEAK PERIOD ANALYSIS FOR THE PERIOD: 12:00 PM - 1:00 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	VOLUMES Right	Thru	Left	Total	PERCENTS Right	Thru	Left
North	12:00 PM	0.38	16	0	5	21	76	0	24
East	12:00 PM	0.38	7	2	0	9	78	22	0
South	12:00 PM	0.00	0	0	0	0	0	0	0
West	12:00 PM	0.50	0	0	10	10	0	0	%100
Entire Intersection									
North	12:00 PM	0.38	16	0	5	21	76	0	24
East		0.38	7	2	0	9	78	22	0
South		0.00	0	0	0	0	0	0	0
West		0.50	0	0	10	10	0	0	%100



Counter Measures

Site Code :
E-W Street: INDEPENDENT
N-S Street: U.S. 6 & 50
:

PAGE: 1
FILE: MDIND&6

Movements by: Primary

DATE: 12/17/94

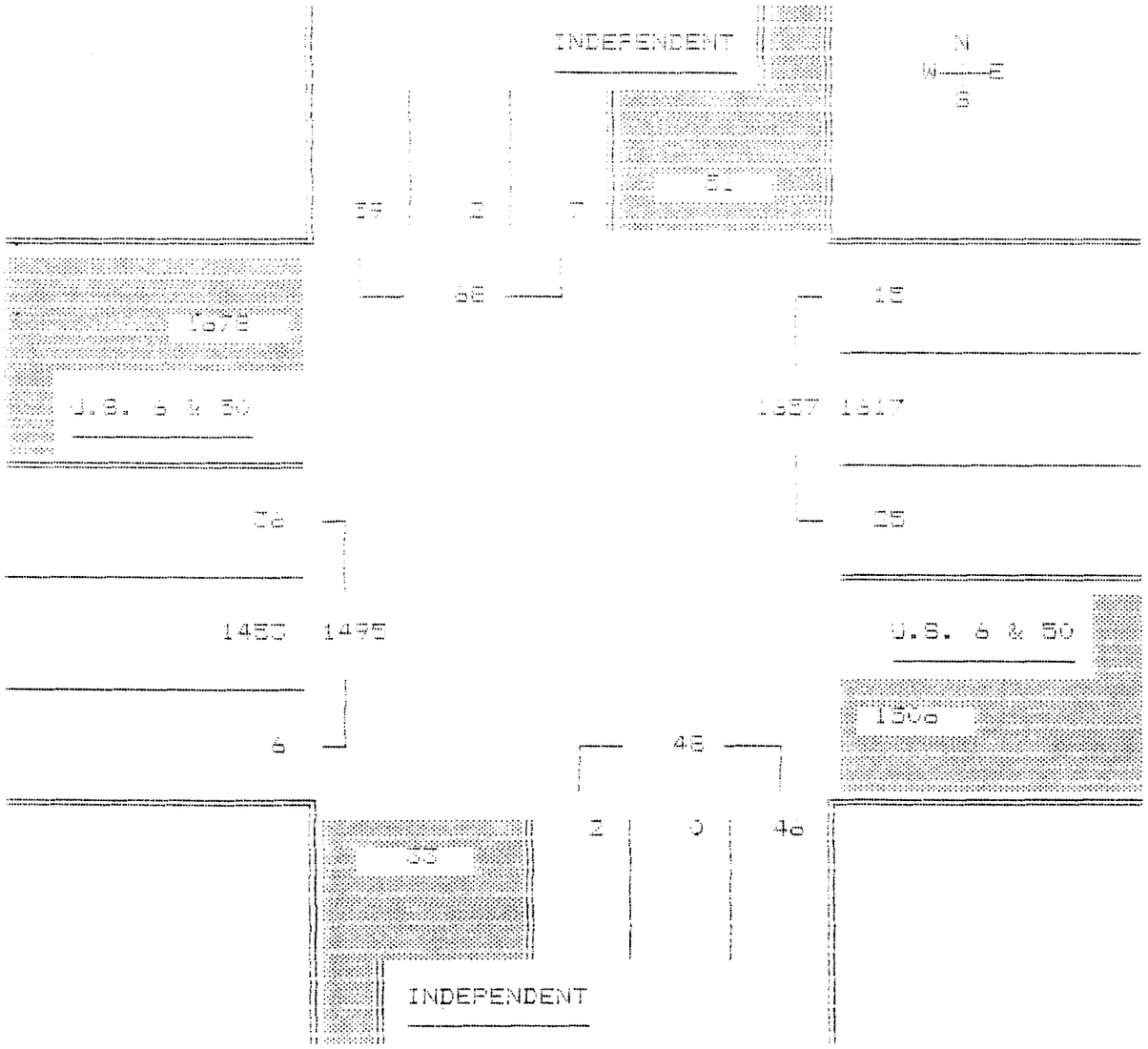
Time Begin	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
11:00 AM	14	1	3	8	371	9	6	0	1	2	305	17	734
11:15	18	0	0	4	349	5	11	0	0	2	316	15	720
11:30	16	0	0	6	370	6	13	0	0	1	329	9	770
11:45 PM	17	0	3	11	346	1	7	0	1	2	344	17	749
HR TOTAL	65	1	6	26	1456	21	37	0	2	7	1294	58	2973
12:00 PM	16	0	3	4	396	8	11	0	1	1	356	4	800
12:15	11	0	1	4	438	8	12	0	1	0	329	18	822
12:30	15	0	3	5	417	2	10	0	0	3	409	9	873
12:45	17	2	0	2	366	7	13	0	0	2	359	5	773
HR TOTAL	59	2	7	15	1617	25	46	0	2	6	1453	36	3268
DAY TOTAL	124	3	13	41	3073	46	83	0	4	13	2747	94	6241

PEAK PERIOD ANALYSIS FOR THE PERIOD: 12:00 PM - 1:00 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
North	12:00 PM	0.89	59	2	7	68	87	3	10
East	12:00 PM	0.92	15	1617	25	1657	1	98	2
South	12:00 PM	0.92	46	0	2	48	96	0	4
West	12:00 PM	0.89	6	1453	36	1495	0	97	2

Entire Intersection

North	12:00 PM	0.89	59	2	7	68	87	3	10
East		0.92	15	1617	25	1657	1	98	2
South		0.92	46	0	2	48	96	0	4
West		0.89	6	1453	36	1495	0	97	2



Counter Measures

Site Code :
N-S Street: INDEPENDENT
E-W Street: NORTH FRONTAGE RD.
:

PAGE: 1
FILE: NFRONTIN

Movements by: Primary

DATE: 12/17/94

Time Begin	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
11:00 AM	1	9	0	1	21	9	12	10	0	0	4	1	68
11:15	3	11	3	3	26	7	13	3	0	0	3	1	74
11:30	0	6	4	1	27	10	8	7	0	0	3	1	72
11:45	1	3	2	7	24	12	17	10	1	0	12	0	95
HR TOTAL	5	34	9	14	98	38	50	30	1	0	31	3	319
12:00 PM	2	10	4	4	28	9	5	2	1	0	15	4	84
12:15	1	12	3	3	22	0	16	6	0	0	8	1	72
12:30	0	16	0	2	32	2	9	5	0	0	7	1	74
12:45	0	18	0	4	28	1	4	2	1	0	7	0	65
HR TOTAL	3	56	7	13	110	12	34	15	2	0	37	6	295
DAY TOTAL	11	90	16	27	208	50	84	48	3	0	68	9	614

Counter Measures

Site Code :
E-W Street: INDEPENDENT
N-S Street: NORTH FRONTAGE RD.
:

Movements by: Primary

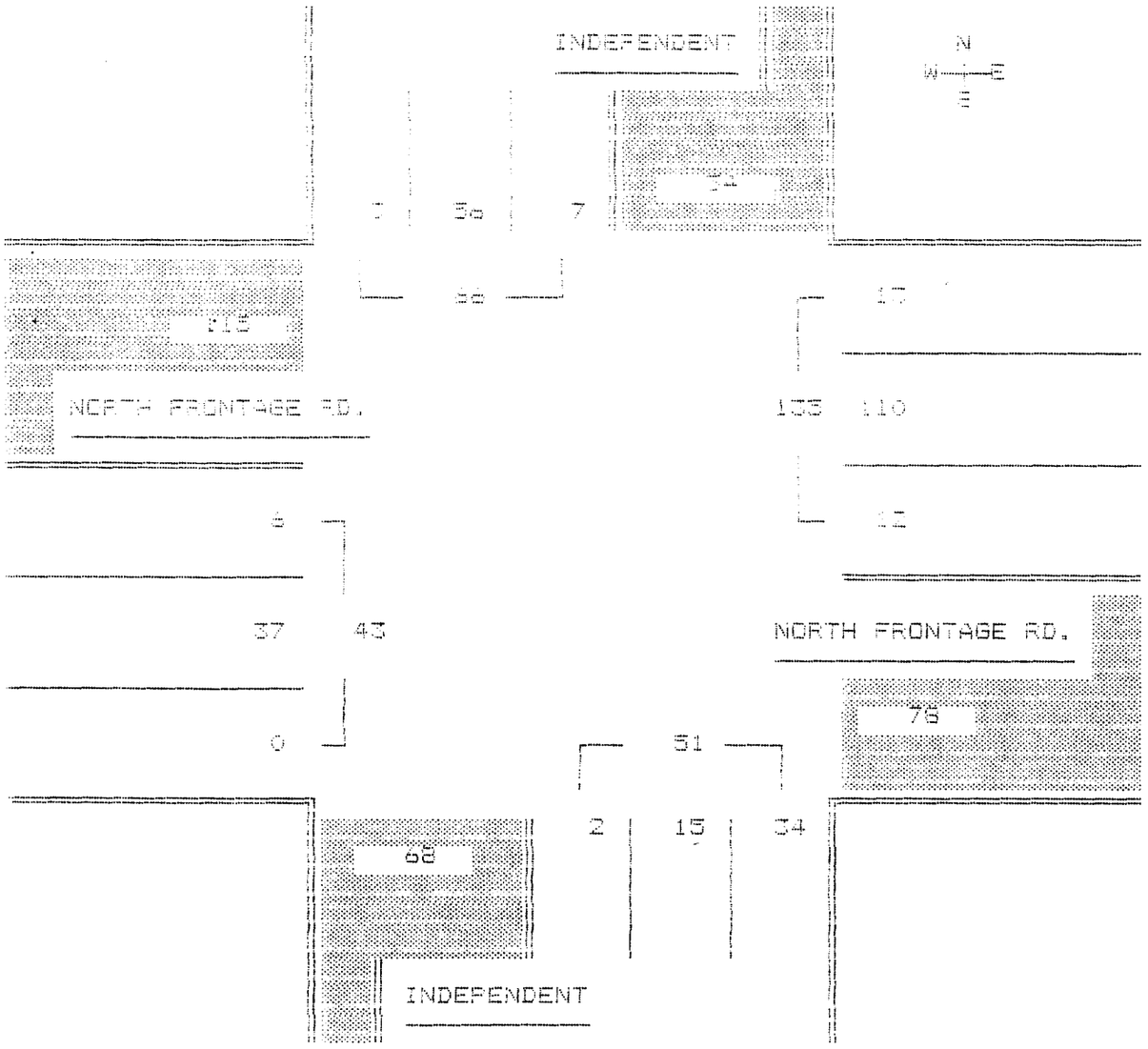
PAGE: 1
FILE: NFRONTIN
DATE: 12/17/94

PEAK PERIOD ANALYSIS FOR THE PERIOD: 12:00 PM - 1:00 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
North	12:00 PM	0.92	3	56	7	66	5	85	11
East	12:00 PM	0.82	10	110	12	135	10	81	9
South	12:00 PM	0.68	34	15	2	51	67	29	4
West	12:00 PM	0.57	0	37	6	43	0	86	14

Entire Intersection

North	12:00 PM	0.92	3	56	7	66	5	85	11
East		0.82	10	110	12	135	10	81	9
South		0.68	34	15	2	51	67	29	4
West		0.57	0	37	6	43	0	86	14



Counter Measures

Site Code :
E-W Street: INDEPENDENT
S-N Street: SOUTH FRONTAGE RD.

PAGE: 1
FILE: MDINDFRN

Movements by: Primary

DATE: 12/17/94

Time Begin	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
11:00 AM	9	2	1	0	1	1	1	1	1	1	0	6	24
11:15	6	1	0	0	1	1	0	1	2	1	3	10	26
11:30	4	3	0	0	2	1	2	1	1	1	5	12	32
11:45	1	2	0	0	4	1	2	1	0	0	1	7	19
HR TOTAL	20	8	1	0	8	4	5	4	4	3	9	35	101
12:00 PM	8	1	0	0	5	1	0	0	0	0	7	12	34
12:15	3	5	0	0	0	1	1	2	0	0	5	11	28
12:30	2	3	0	0	4	1	0	2	0	0	3	8	23
12:45	9	2	0	0	4	0	0	3	0	1	3	10	32
HR TOTAL	22	11	0	0	13	3	1	7	0	1	18	41	117
24H TOTAL	42	19	1	0	21	7	6	11	4	4	27	76	218

Counter Measures

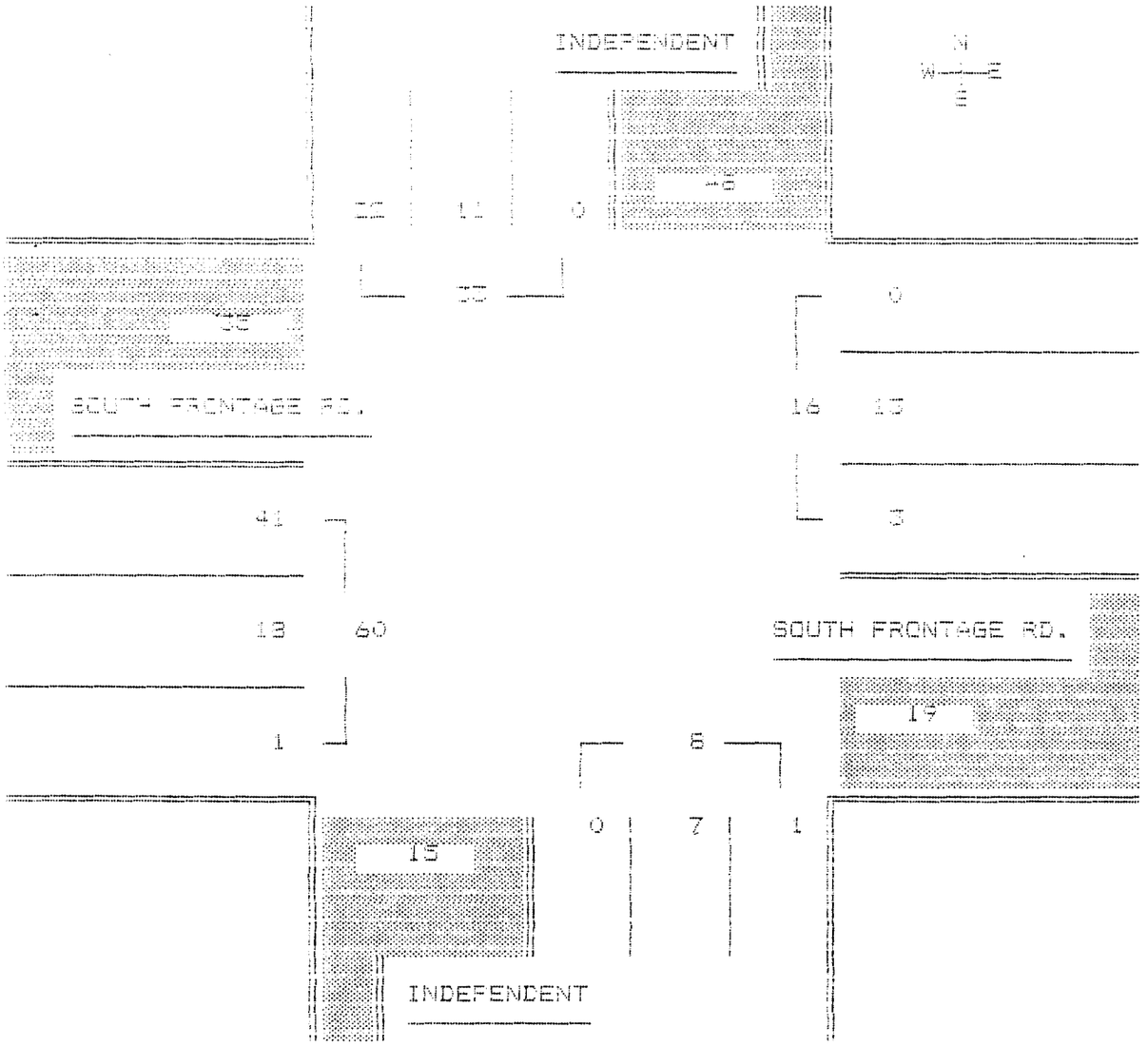
Site Code :
N-S Street: INDEPENDENT
E-W Street: SOUTH FRONTAGE RD.

Movements by: Primary

PAGE: 1
FILE: MDINDFRN
DATE: 12/17/94

PEAK PERIOD ANALYSIS FOR THE PERIOD: 12:00 PM - 1:00 PM

	DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
	North	12:00 PM	0.75	22	11	0	33	67	33	0
	East	12:00 PM	0.67	0	13	3	16	0	81	19
	South	12:00 PM	0.67	1	7	0	8	12	88	0
	West	12:00 PM	0.79	1	18	41	60	2	30	68
	Entire Intersection									
	North	12:00 PM	0.75	22	11	0	33	67	33	0
	East		0.67	0	13	3	16	0	81	19
	South		0.67	1	7	0	8	12	88	0
	West		0.79	1	18	41	60	2	30	68



Counter Measures

Site Code :
E-W Street: MULBERRY
N-S Street: SR240/GRAND AVE.

PAGE: 1
FILE: MDC40GRA

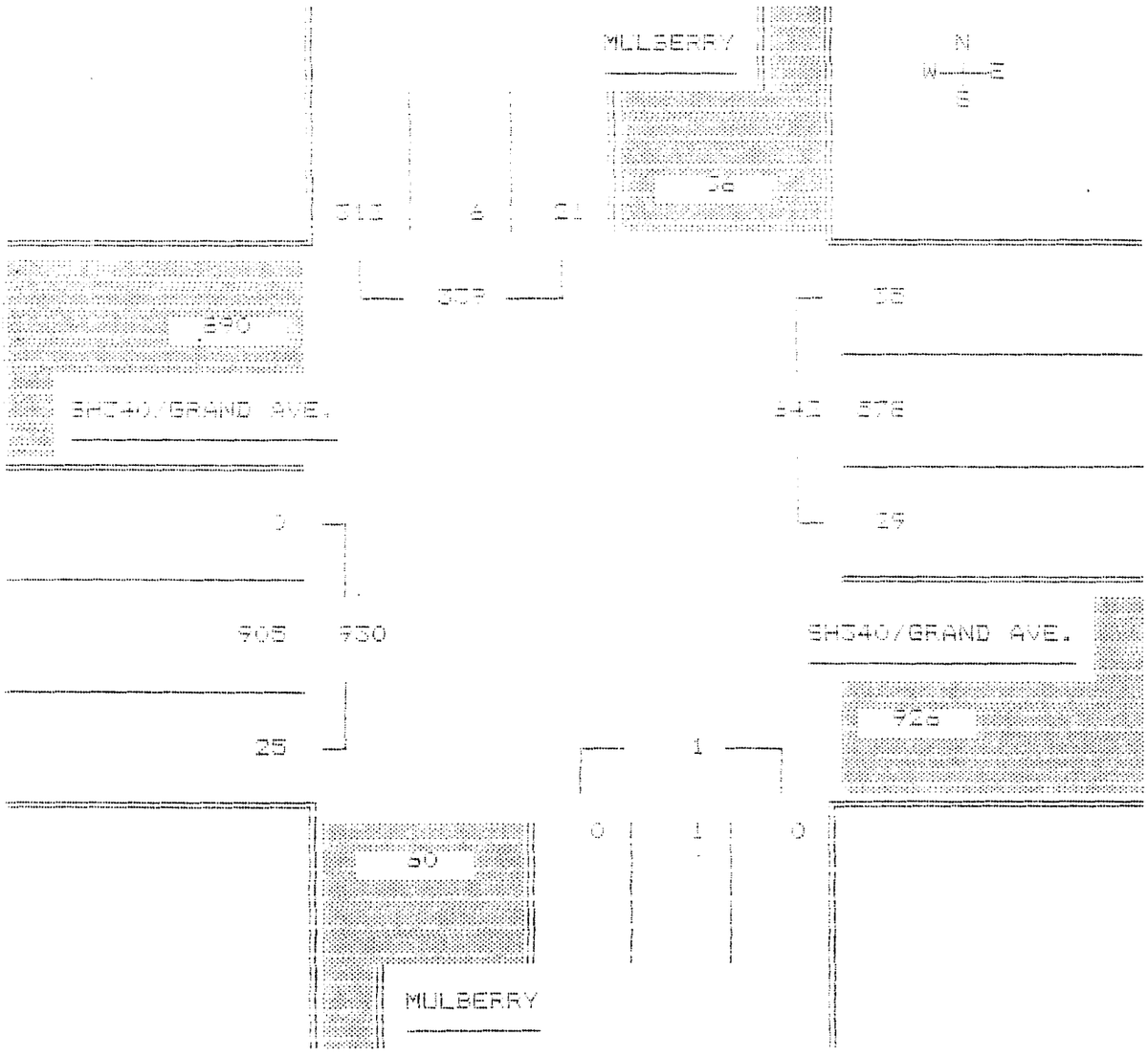
Movements by: Primary

DATE: 12/17/94

Time Begin	From North RT	THRU	LT	From East RT	THRU	LT	From South RT	THRU	LT	From West RT	THRU	LT	Vehicle Total
11:00 AM	79	1	4	12	118	6	0	0	0	1	227	0	450
11:15	71	1	10	4	121	4	2	0	0	1	113	0	420
11:30	85	2	6	8	151	7	0	0	0	1	148	0	490
11:45	81	0	5	9	120	10	0	0	0	2	151	0	475
AM TOTAL	266	4	26	32	515	29	2	0	0	5	956	0	1835
12:00 PM	69	1	3	7	154	7	0	0	0	0	217	0	461
12:15	85	2	6	12	150	6	0	0	0	3	243	0	507
12:30	77	0	3	11	147	6	0	0	0	6	225	0	475
12:45	81	3	9	5	127	10	0	1	0	13	220	0	469
PM TOTAL	312	6	21	35	578	29	0	1	0	25	905	0	1912
DAY TOTAL	578	10	47	67	1093	58	2	1	0	30	1861	0	3747

PEAK PERIOD ANALYSIS FOR THE PERIOD: 12:00 PM - 1:00 PM

DIRECTION FROM	START PEAK HOUR	PEAK HR FACTOR	..... VOLUMES ..... Right	Thru	Left	Total	.... PERCENTS ... Right	Thru	Left
North	12:00 PM	0.91	312	6	21	339	92	2	6
East	12:00 PM	0.96	35	578	29	642	5	90	5
South	12:00 PM	0.25	0	1	0	1	0	%100	0
West	12:00 PM	0.95	25	905	0	930	3	97	0
Entire Intersection									
North	12:00 PM	0.91	312	6	21	339	92	2	6
East		0.96	35	578	29	642	5	90	5
South		0.25	0	1	0	1	0	%100	0
West		0.95	25	905	0	930	3	97	0



APPENDIX B

Level of Service Analyses

HCM: SIGNALIZED INTERSECTION SUMMARY 09-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) US 6 & 50 (N-S) SAM'S CLUB

Analyst: MRM File Name: GJSAMP95.HC9

Area Type: Other 8-10-95 AM PEAK

Comment: 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	1	2	1	1	1	1	1	1	1
Volumes	43	772	35	79	682	59	28	35	42	43	63	45
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols			7			11			8			9

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
WB Left	*	*			SB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
NB Right	*				EB Right	*			
SB Right	*				WB Right	*			
Green	7.0A	43.0P			Green	12.0A	22.0A		
Yellow/A-R	3.0	6.0			Yellow/A-	3.0	4.0		
Lost Time	3.0	3.0			Lost Time	3.0	3.0		

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	125	1787	0.14	0.56	8.0	B	13.9	B
	T	1731	3762	0.49	0.46	14.5	B		
	R	975	1599	0.03	0.61	5.9	B		
WB	L	125	1787	0.29	0.56	9.1	B	13.1	B
	T	1731	3762	0.44	0.46	14.0	B		
	R	975	1599	0.05	0.61	6.0	B		
NB	L	214	1787	0.07	0.38	15.0	B	18.8	C
	T	433	1881	0.09	0.23	23.0	C		
	R	528	1599	0.07	0.33	17.5	C		
SB	L	214	1787	0.09	0.38	15.1	C	19.4	C
	T	433	1881	0.15	0.23	23.4	C		
	R	528	1599	0.07	0.33	17.5	C		

Intersection Delay = 14.2 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.312

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) US 6 & 50 (N-S) SAM'S CLUB

Analyst: MRM File Name: GJSPMP95.HC9

Area Type: Other 8-10-95 PM PEAK

Comment: 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	2	2	1	1	1	1	1	1	1
Volumes	68	1293	125	244	1201	117	161	208	251	117	210	124
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols			25			23			50			25

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
WB Left	*	*			SB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
NB Right	*				EB Right	*			
SB Right	*				WB Right	*			
Green	8.0A	41.0P			Green	11.0A	24.0A		
Yellow/A-R	3.0	6.0			Yellow/A-	3.0	4.0		
Lost Time	3.0	3.0			Lost Time	3.0	3.0		

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	143	1787	0.34	0.55	10.0	B	21.2	C
	T	1655	3762	0.86	0.44	22.8	C		
	R	927	1599	0.11	0.58	7.2	B		
WB	L	277	3461	0.74	0.55	19.6	C	19.6	C
	T	1655	3762	0.80	0.44	20.5	C		
	R	927	1599	0.11	0.58	7.1	B		
NB	L	197	1787	0.59	0.39	21.7	C	21.5	C
	T	470	1881	0.47	0.25	24.7	C		
	R	576	1599	0.37	0.36	18.1	C		
SB	L	197	1787	0.46	0.39	18.4	C	21.1	C
	T	470	1881	0.47	0.25	24.8	C		
	R	576	1599	0.18	0.36	16.7	C		

Intersection Delay = 20.6 sec/veh Intersection LOS = C

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.661

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) US 6 & 50 (N-S) SAM'S CLUB

Analyst: MRM File Name: GJSSAP95.HC9

Area Type: Other 8-10-95 SA PEAK

Comment: 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	2	2	1	1	1	1	1	1	1
Volumes	127	1378	162	338	1544	229	215	278	329	113	272	113
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols			32			45			65			23

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
WB Left	*	*			SB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
NB Right	*				EB Right	*			
SB Right	*				WB Right	*			
Green	9.5A	43.0A			Green	12.5A	19.0A		
Yellow/A-R	3.0	6.0			Yellow/A-	3.0	4.0		
Lost Time	3.0	3.0			Lost Time	3.0	3.0		

Cycle Length: 100.0 secs Phase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	170	1787	0.55	0.58	12.6	B	17.7	C
	T	1731	3762	0.88	0.46	19.3	C		
	R	983	1599	0.14	0.62	5.2	B		
WB	L	329	3461	0.89	0.58	30.6	D	27.2	D
	T	1731	3762	0.99	0.46	29.0	D		
	R	983	1599	0.20	0.62	5.5	B		
NB	L	223	1787	0.77	0.35	31.5	D	26.6	D
	T	376	1881	0.78	0.20	30.3	D		
	R	520	1599	0.53	0.32	18.5	C		
SB	L	223	1787	0.40	0.35	19.1	C	24.4	C
	T	376	1881	0.76	0.20	29.5	D		
	R	520	1599	0.18	0.32	15.7	C		

Intersection Delay = 23.7 sec/veh Intersection LOS = C

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.840

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET.. 40

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... US 6/50

NAME OF THE NORTH/SOUTH STREET..... INDEPENDENT (SOUTH)

NAME OF THE ANALYST..... MRM

DATE OF THE ANALYSIS (mm/dd/yy)..... 08-10-95

TIME PERIOD ANALYZED..... AM PEAK

OTHER INFORMATION... 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	18	23	0	0
THRU	823	722	0	0
RIGHT	22	10	30	10

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	3	1	1
LANE USAGE			LTR	LTR

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	2	2	0
WESTBOUND	2	2	0
NORTHBOUND	2	2	0
SOUTHBOUND	2	2	0

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	6.10	6.10	0.00	6.10
SB	6.10	6.10	0.00	6.10
MAJOR LEFTS				
EB	5.80	5.80	0.00	5.80
WB	5.80	5.80	0.00	5.80
MINOR THROUGHS				
NB	7.40	7.40	0.00	7.40
SB	7.40	7.40	0.00	7.40
MINOR LEFTS				
NB	7.90	7.90	0.00	7.90
SB	7.90	7.90	0.00	7.90

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 08-10-95 : AM PEAK
OTHER INFORMATION.... 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c_p (pcph)	ACTUAL MOVEMENT CAPACITY c_M (pcph)		SHARED CAPACITY c_{SH} (pcph)		RESERVE CAPACITY $c_R = c_{SH} - v$		LOS
MINOR STREET									
NB LEFT	0	48	45	>	45	>	45	>	E
THROUGH	0	63	59	> 707	59	> 677	59	>A	E
RIGHT	31	707	707	>	707	>	677	>	A
MINOR STREET									
SB LEFT	0	48	44	>	44	>	44	>	E
THROUGH	0	63	59	> 741	59	> 731	59	>A	E
RIGHT	10	741	741	>	741	>	731	>	A
MAJOR STREET									
EB LEFT	19	430	430		430		412		A
WB LEFT	24	368	368		368		344		B

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 08-10-95 : AM PEAK
OTHER INFORMATION.... 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

****

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED. MAJOR STREET.. 45

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... US 6/50

NAME OF THE NORTH/SOUTH STREET..... INDEPENDENT (SOUTH)

NAME OF THE ANALYST..... MRM

DATE OF THE ANALYSIS (mm/dd/yy)..... 8-10-95

TIME PERIOD ANALYZED..... PM PEAK

OTHER INFORMATION.... 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	31	32	0	0
THRU	1437	1392	0	0
RIGHT	50	15	46	31

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	3	1	1
LANE USAGE			LTR	LTR

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	2	2	0
WESTBOUND	2	2	0
NORTHBOUND	2	2	0
SOUTHBOUND	2	2	0

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS					
	NB	6.10	6.10	0.00	6.10
	SB	6.10	6.10	0.00	6.10
MAJOR LEFTS					
	EB	5.80	5.80	0.00	5.80
	WB	5.80	5.80	0.00	5.80
MINOR THROUGHS					
	NB	7.40	7.40	0.00	7.40
	SB	7.40	7.40	0.00	7.40
MINOR LEFTS					
	NB	7.90	7.90	0.00	7.90
	SB	7.90	7.90	0.00	7.90

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 8-10-95 : PM PEAK
OTHER INFORMATION.... 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) p	ACTUAL MOVEMENT CAPACITY c (pcph) M		SHARED CAPACITY c (pcph) SH		RESERVE CAPACITY c = c - v R SH		LOS
MINOR STREET									
NB LEFT	0	48	34	>	34	>	34	>	E
THROUGH	0	63	46	> 536	46	> 488	46	>A	E
RIGHT	47	536	536	>	536	>	488	>	A
MINOR STREET									
SB LEFT	0	48	33	>	33	>	33	>	E
THROUGH	0	63	46	> 558	46	> 526	46	>A	E
RIGHT	32	558	558	>	558	>	526	>	A
MAJOR STREET									
EB LEFT	32	168	168		168		136		D
WB LEFT	33	151	151		151		118		D

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 8-10-95 : PM PEAK
OTHER INFORMATION.... 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

****

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED. MAJOR STREET.. 45

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... US 6/50

NAME OF THE NORTH/SOUTH STREET..... INDEPENDENT (SOUTH)

NAME OF THE ANALYST..... MRM

DATE OF THE ANALYSIS (mm/dd/yy)..... 08-10-95

TIME PERIOD ANALYZED..... SAT PEAK

OTHER INFORMATION.... 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	36	25	0	0
THRU	1614	1832	0	0
RIGHT	60	15	46	59

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	3	1	1
LANE USAGE			LTR	LTR

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	2	2	0
WESTBOUND	2	2	0
NORTHBOUND	2	2	0
SOUTHBOUND	2	2	0

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	6.10	6.10	0.00	6.10
SB	6.10	6.10	0.00	6.10
MAJOR LEFTS				
EB	5.80	5.80	0.00	5.80
WB	5.80	5.80	0.00	5.80
MINOR THROUGHS				
NB	7.40	7.40	0.00	7.40
SB	7.40	7.40	0.00	7.40
MINOR LEFTS				
NB	7.90	7.90	0.00	7.90
SB	7.90	7.90	0.00	7.90

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 08-10-95 : SAT PEAK
OTHER INFORMATION.... 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

MOVEMENT	FLOW-RATE v(pcph)	POTEN-TIAL CAPACITY c (pcph) p	ACTUAL MOVEMENT CAPACITY c (pcph) M		SHARED CAPACITY c (pcph) SH		RESERVE CAPACITY c = c - v R SH		LOS
MINOR STREET									
NB LEFT	0	48	29	>	29	>	29	>	E
THROUGH	0	63	42	> 491	42	>	444	42 >A	E
RIGHT	47	491	491	>	491	>	444	>	A
MINOR STREET									
SB LEFT	0	48	30	>	30	>	30	>	E
THROUGH	0	63	42	> 459	42	>	398	42 >B	E
RIGHT	61	459	459	>	459	>	398	>	B
MAJOR STREET									
EB LEFT	37	127	127		127		90		E
WB LEFT	26	127	127		127		101		D

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 08-10-95 : SAT PEAK
OTHER INFORMATION.... 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) GRAND AVE(RTE 340) (N-S) MULBERRY ST/RICE ST

Analyst: MRM File Name: GJMGAM95.HC9

Area Type: Other 8-10-95 AM PEAK

Comment: 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	<	1	2	1	1	1	<	1	1	<
Volumes	23	1059	11	10	468	24	1	1	14	17	3	17
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
RTOR Vols			2			5			3			3

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds					Peds				
WB Left	*	*			SB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	5.0A	48.0P			Green	33.0A			
Yellow/A-R	4.0	5.0			Yellow/A-	5.0			
Lost Time	3.0	3.0			Lost Time	3.0			

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Aproach: Delay	LOS
EB	L	107	1787	0.05	0.59	6.6	B	14.2	B
	TR	1878	3756	0.63	0.50	14.3	B		
WB	L	107	1787	0.06	0.59	6.6	B	10.9	B
	T	1881	3762	0.28	0.50	11.0	B		
	R	800	1599	0.03	0.50	9.6	B		
NB	L	571	1632	0.00	0.35	16.1	C	16.2	C
	TR	567	1621	0.02	0.35	16.2	C		
SB	L	576	1645	0.03	0.35	16.2	C	16.2	C
	TR	576	1647	0.03	0.35	16.2	C		

Intersection Delay = 13.2 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.350

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) GRAND AVE(RTE 340) (N-S) MULBERRY ST/RICE ST

Analyst: MRM File Name: GJMGPM95.HC9

Area Type: Other 8-10-95 PM PEAK

Comment: 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	<	1	2	1	1	1	<	1	1	<
Volumes	86	1022	7	11	1317	82	7	3	35	94	2	94
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
RTOR Vols			1			16			7			19

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds					Peds				
WB Left	*	*			SB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	5.0A	51.0P			Green	30.0A			
Yellow/A-R	4.0	5.0			Yellow/A-	5.0			
Lost Time	3.0	3.0			Lost Time	3.0			

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	107	1787	0.50	0.62	11.1	B	12.2	B
	TR	1991	3756	0.57	0.53	12.3	B		
WB	L	107	1787	0.06	0.62	5.7	B	14.3	B
	T	1994	3762	0.73	0.53	14.7	B		
	R	847	1599	0.08	0.53	8.8	B		
NB	L	472	1475	0.01	0.32	17.7	C	17.9	C
	TR	520	1624	0.06	0.32	17.9	C		
SB	L	514	1607	0.19	0.32	18.7	C	18.6	C
	TR	513	1604	0.16	0.32	18.5	C		

Intersection Delay = 13.8 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.509

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) GRAND AVE(RTE 340) (N-S) MULBERRY ST/RICE ST

Analyst: MRM File Name: GJMGSA95.HC9

Area Type: Other 8-10-95 SA PEAK

Comment: 1995 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	<	1	2	1	1	1	<	1	1	<
Volumes	107	905	25	29	869	142	1	1	1	128	6	128
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
RTOR Vols			5			28			0			25

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds					Peds				
WB Left	*	*			SB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	5.0A	47.0P			Green	34.0A			
Yellow/A-R	4.0	5.0			Yellow/A-	5.0			
Lost Time	3.0	3.0			Lost Time	3.0			

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	107	1787	0.53	0.58	13.5	B	13.8	B
	TR	1838	3751	0.56	0.49	13.9	B		
WB	L	107	1787	0.13	0.58	7.3	B	13.0	B
	T	1843	3762	0.52	0.49	13.5	B		
	R	784	1599	0.15	0.49	10.7	B		
NB	L	500	1389	0.00	0.36	15.6	C	15.6	C
	TR	626	1740	0.00	0.36	15.6	C		
SB	L	600	1667	0.22	0.36	17.0	C	16.9	C
	TR	581	1613	0.20	0.36	16.8	C		

Intersection Delay = 13.8 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.410

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) US 6 & 50 (N-S) SAM'S CLUB

Analyst: MRM File Name: GJSAMP15.HC9

Area Type: Other 8-10-95 AM PEAK

Comment: 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	2	2	1	1	1	1	1	1	1
Volumes	45	850	40	80	750	65	30	40	45	60	70	65
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols			8			13			9			13

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
WB Left	*	*			SB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
NB Right	*				EB Right	*			
SB Right	*				WB Right	*			
Green	14.0A	37.0P			Green	13.0A	20.0A		
Yellow/A-R	3.0	6.0			Yellow/A-	3.0	4.0		
Lost Time	3.0	3.0			Lost Time	3.0	3.0		

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	250	1787	0.13	0.57	7.6	B	17.9	C
	T	1505	3762	0.62	0.40	18.8	C		
	R	895	1599	0.04	0.56	7.5	B		
WB	L	485	3461	0.15	0.57	7.7	B	16.4	C
	T	1505	3762	0.55	0.40	17.9	C		
	R	895	1599	0.06	0.56	7.6	B		
NB	L	232	1787	0.08	0.37	15.5	C	18.6	C
	T	395	1881	0.11	0.21	24.3	C		
	R	608	1599	0.06	0.38	15.0	B		
SB	L	232	1787	0.14	0.37	15.9	C	19.1	C
	T	395	1881	0.19	0.21	24.7	C		
	R	608	1599	0.09	0.38	15.1	C		

Intersection Delay = 17.4 sec/veh Intersection LOS = C

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.349

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) US 6 & 50 (N-S) SAM'S CLUB

Analyst: MRM File Name: GJSPMP15.HC9

Area Type: Other 8-10-95 PM PEAK

Comment: 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	2	2	1	1	1	1	1	1	1
Volumes	75	1420	130	250	1320	130	165	210	255	165	215	175
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols			26			26			51			25

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
WB Left	*	*			SB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
NB Right	*				EB Right	*			
SB Right	*				WB Right	*			
Green	8.0A	43.0P			Green	9.0A	24.0A		
Yellow/A-R	3.0	6.0			Yellow/A-	3.0	4.0		
Lost Time	3.0	3.0			Lost Time	3.0	3.0		

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	143	1787	0.37	0.57	9.7	B	22.6	C
	T	1731	3762	0.91	0.46	24.4	C		
	R	927	1599	0.12	0.58	7.2	B		
WB	L	277	3461	0.75	0.57	19.9	C	20.0	C
	T	1731	3762	0.84	0.46	20.9	C		
	R	927	1599	0.12	0.58	7.2	B		
NB	L	161	1787	0.75	0.37	32.2	D	24.6	C
	T	470	1881	0.47	0.25	24.8	C		
	R	576	1599	0.37	0.36	18.2	C		
SB	L	161	1787	0.75	0.37	32.2	D	25.1	D
	T	470	1881	0.48	0.25	24.9	C		
	R	576	1599	0.27	0.36	17.3	C		

Intersection Delay = 22.1 sec/veh Intersection LOS = C

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.707

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) US 6 & 50 (N-S) SAM'S CLUB

Analyst: MRM File Name: GJSSAP15.HC9

Area Type: Other 8-10-95 SA PEAK

Comment: 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	2	2	1	1	1	1	1	1	1
Volumes	140	1515	165	340	1700	250	220	285	330	160	275	160
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols			33			50			66			32

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
WB Left	*	*			SB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
NB Right	*				EB Right	*			
SB Right	*				WB Right	*			
Green	9.5A	45.5A			Green	12.0A	17.0A		
Yellow/A-R	3.0	6.0			Yellow/A-	3.0	4.0		
Lost Time	3.0	3.0			Lost Time	3.0	3.0		

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	170	1787	0.61	0.61	13.4	B	18.7	C
	T	1825	3762	0.92	0.49	20.3	C		
	R	1015	1599	0.14	0.63	4.7	A		
WB	L	329	3461	0.89	0.61	30.4	D	33.4	D
	T	1825	3762	1.03	0.49	37.2	D		
	R	1015	1599	0.21	0.63	5.0	A		
NB	L	214	1787	0.81	0.33	37.1	D	32.2	D
	T	339	1881	0.89	0.18	39.7	D		
	R	488	1599	0.57	0.31	19.9	C		
SB	L	214	1787	0.59	0.33	24.2	C	28.6	D
	T	339	1881	0.85	0.18	36.6	D		
	R	488	1599	0.27	0.31	17.1	C		

Intersection Delay = 27.8 sec/veh Intersection LOS = D

Lost Time/Cycle. L = 6.0 sec Critical v/c(x) = 0.895

****

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED. MAJOR STREET.. 45

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... US 6/50

NAME OF THE NORTH/SOUTH STREET..... INDEPENDENT (SOUTH)

NAME OF THE ANALYST..... MRM

DATE OF THE ANALYSIS (mm/dd/yy)..... 08-10-95

TIME PERIOD ANALYZED..... AM PEAK

OTHER INFORMATION.... 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	20	25	0	0
THRU	900	790	0	0
RIGHT	25	10	20	10

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	3	1	1
LANE USAGE			LTR	LTR

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	2	2	0
WESTBOUND	2	2	0
NORTHBOUND	2	2	0
SOUTHBOUND	2	2	0

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS					
	NB	6.10	6.10	0.00	6.10
	SB	6.10	6.10	0.00	6.10
MAJOR LEFTS					
	EB	5.80	5.80	0.00	5.80
	WB	5.80	5.80	0.00	5.80
MINOR THROUGHS					
	NB	7.40	7.40	0.00	7.40
	SB	7.40	7.40	0.00	7.40
MINOR LEFTS					
	NB	7.90	7.90	0.00	7.90
	SB	7.90	7.90	0.00	7.90

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 08-10-95 : AM PEAK
OTHER INFORMATION.... 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) p	ACTUAL MOVEMENT CAPACITY c (pcph) M		SHARED CAPACITY c (pcph) SH		RESERVE CAPACITY c = c - v R SH		LOS
MINOR STREET									
NB LEFT	0	48	44	>	44	>	44	>	E
THROUGH	0	63	58	> 684	58	> 664	58	>A	E
RIGHT	21	684	684	>	684	>	664	>	A
MINOR STREET									
SB LEFT	0	48	43	>	43	>	43	>	E
THROUGH	0	63	58	> 722	58	> 712	58	>A	E
RIGHT	10	722	722	>	722	>	712	>	A
MAJOR STREET									
EB LEFT	21	389	389		389		368		B
WB LEFT	26	330	330		330		304		B

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 08-10-95 : AM PEAK
OTHER INFORMATION.... 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

****

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED. MAJOR STREET.. 45

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... US 6/50

NAME OF THE NORTH/SOUTH STREET..... INDEPENDENT (SOUTH)

NAME OF THE ANALYST..... MRM

DATE OF THE ANALYSIS (mm/dd/yy)..... 08-10-95

TIME PERIOD ANALYZED..... PM PEAK

OTHER INFORMATION.... 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	35	35	0	0
THRU	1570	1520	0	0
RIGHT	50	15	50	35

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	3	1	1
LANE USAGE			LTR	LTR

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	2	2	0
WESTBOUND	2	2	0
NORTHBOUND	2	2	0
SOUTHBOUND	2	2	0

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	6.10	6.10	0.00	6.10
SB	6.10	6.10	0.00	6.10
MAJOR LEFTS				
EB	5.80	5.80	0.00	5.80
WB	5.80	5.80	0.00	5.80
MINOR THROUGHS				
NB	7.40	7.40	0.00	7.40
SB	7.40	7.40	0.00	7.40
MINOR LEFTS				
NB	7.90	7.90	0.00	7.90
SB	7.90	7.90	0.00	7.90

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 08-10-95 : PM PEAK
OTHER INFORMATION.... 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

MOVEMENT	FLOW-RATE v(pcph)	POTENTIAL CAPACITY c_p (pcph)	ACTUAL MOVEMENT CAPACITY c_M (pcph)		SHARED CAPACITY c_{SH} (pcph)		RESERVE CAPACITY $c_R = c_{SH} - v$		LOS
MINOR STREET									
NB LEFT	0	48	29	>	29	>	29	>	E
THROUGH	0	63	40	> 505	40	> 453	40	>A	E
RIGHT	52	505	505	>	505	>	453	>	A
MINOR STREET									
SB LEFT	0	48	29	>	29	>	29	>	E
THROUGH	0	63	40	> 529	40	> 493	40	>A	E
RIGHT	36	529	529	>	529	>	493	>	A
MAJOR STREET									
EB LEFT	36	141	141		141		105		D
WB LEFT	36	127	127		127		91		E

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 08-10-95 : PM PEAK
OTHER INFORMATION.... 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

****

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED. MAJOR STREET.. 45

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... US 6/50

NAME OF THE NORTH/SOUTH STREET..... INDEPENDENT (SOUTH)

NAME OF THE ANALYST..... MRM

DATE OF THE ANALYSIS (mm/dd/yy)..... 08-10-95

TIME PERIOD ANALYZED..... SAT PEAK

OTHER INFORMATION.... 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	40	30	0	0
THRU	1760	1995	0	0
RIGHT	60	20	50	65

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	3	1	1
LANE USAGE			LTR	LTR

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	2	2	0
WESTBOUND	2	2	0
NORTHBOUND	2	2	0
SOUTHBOUND	2	2	0

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	6.10	6.10	0.00	6.10
SB	6.10	6.10	0.00	6.10
MAJOR LEFTS				
EB	5.80	5.80	0.00	5.80
WB	5.80	5.80	0.00	5.80
MINOR THROUGHS				
NB	7.40	7.40	0.00	7.40
SB	7.40	7.40	0.00	7.40
MINOR LEFTS				
NB	7.90	7.90	0.00	7.90
SB	7.90	7.90	0.00	7.90

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 08-10-95 ; SAT PEAK
OTHER INFORMATION.... 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) p	ACTUAL MOVEMENT CAPACITY c (pcph) M		SHARED CAPACITY c (pcph) SH		RESERVE CAPACITY c = c - v R SH		LOS
MINOR STREET									
NB LEFT	0	48	26	>	26	>	26	>	E
THROUGH	0	63	39	> 459	39	> 408	39	>A	E
RIGHT	52	459	459	>	459	>	408	>	A
MINOR STREET									
SB LEFT	0	48	27	>	27	>	27	>	E
THROUGH	0	63	39	> 426	39	> 359	39	>B	E
RIGHT	67	426	426	>	426	>	359	>	B
MAJOR STREET									
EB LEFT	41	127	127		127		86		E
WB LEFT	31	127	127		127		96		E

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... US 6/50
NAME OF THE NORTH/SOUTH STREET.... INDEPENDENT (SOUTH)
DATE AND TIME OF THE ANALYSIS..... 08-10-95 : SAT PEAK
OTHER INFORMATION.... 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) GRAND AVE(RTE 340) (N-S) MULBERRY ST/RICE ST

Analyst: MRM File Name: GJMGAM5.HC9

Area Type: Other 9-10-95 AM PEAK

Comment: 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	<	1	2	1	1	1	<	1	1	<
Volumes	25	1270	15	15	545	25	5	5	15	20	5	20
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
RTOR Vols			3			5			3			4

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds					Peds				
WB Left	*	*			SB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	5.0A	50.0P			Green	31.0A			
Yellow/A-R	4.0	5.0			Yellow/A-	5.0			
Lost Time	3.0	3.0			Lost Time	3.0			

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	107	1787	0.06	0.61	6.0	B	14.9	B
	TR	1953	3756	0.73	0.52	15.0	B		
WB	L	107	1787	0.09	0.61	6.1	B	10.3	B
	T	1956	3762	0.31	0.52	10.5	B		
	R	831	1599	0.03	0.52	8.9	B		
NB	L	539	1632	0.01	0.33	17.1	C	17.2	C
	TR	554	1678	0.03	0.33	17.2	C		
SB	L	542	1643	0.04	0.33	17.3	C	17.3	C
	TR	549	1664	0.04	0.33	17.3	C		

Intersection Delay = 13.6 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.421

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) GRAND AVE(RTE 340) (N-S) MULBERRY ST/RICE ST

Analyst: MRM File Name: GJMGPM5.HC9

Area Type: Other 8-10-95 PM PEAK

Comment: 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	<	1	2	1	1	1	<	1	1	<
Volumes	85	1225	10	15	1580	85	10	5	40	95	5	95
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
RTOR Vols			2			17			8			19

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds					Peds				
WB Left	*	*			SB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	5.0A	54.0P			Green	27.0A			
Yellow/A-R	4.0	5.0			Yellow/A-	5.0			
Lost Time	3.0	3.0			Lost Time	3.0			

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	107	1787	0.49	0.65	9.7	B	11.9	B
	TR	2103	3756	0.65	0.56	12.1	B		
WB	L	107	1787	0.09	0.65	5.0	A	15.4	C
	T	2107	3762	0.83	0.56	15.8	C		
	R	895	1599	0.08	0.56	7.7	B		
NB	L	425	1467	0.03	0.29	19.3	C	19.6	C
	TR	474	1636	0.08	0.29	19.6	C		
SB	L	465	1605	0.21	0.29	20.5	C	20.4	C
	TR	469	1616	0.18	0.29	20.2	C		

Intersection Delay = 14.3 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.592

HCM: SIGNALIZED INTERSECTION SUMMARY 08-10-1995

Leigh, Scott & Cleary, Inc.

Streets: (E-W) GRAND AVE(RTE 340) (N-S) MULBERRY ST/RICE ST

Analyst: MRM File Name: GJMGSA5.HC9

Area Type: Other 8-10-95 SA PEAK

Comment: 2015 BACKGROUND PLUS PROJECT GENERATED TRAFFIC

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	<	1	2	1	1	1	<	1	1	<
Volumes	110	1085	30	35	1045	150	5	5	5	130	10	130
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
RTOR Vols			6			36			1			33

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	*	*			NB	Left	*			
	Thru		*				Thru	*			
	Right		*				Right	*			
	Peds						Peds				
WB	Left	*	*			SB	Left	*			
	Thru		*				Thru	*			
	Right		*				Right	*			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		6.0A	48.0P			Green		32.0A			
Yellow/A-R		4.0	5.0			Yellow/A-		5.0			
Lost Time		3.0	3.0			Lost Time		3.0			

Cycle Length: 100.0 secsPhase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	125	1787	0.59	0.60	14.5	B	14.7	B
	TR	1876	3751	0.65	0.50	14.7	B		
WB	L	125	1787	0.18	0.60	6.9	B	13.6	B
	T	1881	3762	0.61	0.50	14.1	B		
	R	800	1599	0.15	0.50	10.3	B		
NB	L	473	1391	0.01	0.34	16.6	C	16.6	C
	TR	597	1757	0.02	0.34	16.6	C		
SB	L	565	1661	0.24	0.34	18.1	C	18.0	C
	TR	553	1627	0.20	0.34	17.8	C		

Intersection Delay = 14.5 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.480

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IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED. MAJOR STREET.. 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 100000

NAME OF THE EAST/WEST STREET..... FRONTAGE RD

NAME OF THE NORTH/SOUTH STREET..... MAIN INT. ACCESS

NAME OF THE ANALYST..... PDM

DATE OF THE ANALYSIS (mm/dd/yy)..... 08-10-1995

TIME PERIOD ANALYZED..... AM PEAK

OTHER INFORMATION.... 2015 TOTAL TRAFFIC - INTERNAL INT.

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: NORTH/SOUTH

CONTROL TYPE EASTBOUND: STOP SIGN

CONTROL TYPE WESTBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	10	1	5	82
THRU	14	10	48	82
RIGHT	9	48	1	1

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	3	3	3
LANE USAGE	L + TR	L + TR		

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	0	0	0

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
EB	5.50	5.50	0.00	5.50
WB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
SB	5.50	5.50	0.00	5.50
NB	5.50	5.50	0.00	5.50
MINOR THROUGHS				
EB	6.50	6.50	0.00	6.50
WB	6.50	6.50	0.00	6.50
MINOR LEFTS				
EB	7.00	7.00	0.00	7.00
WB	7.00	7.00	0.00	7.00

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... FRONTAGE RD
NAME OF THE NORTH/SOUTH STREET.... MAIN INT. ACCESS
DATE AND TIME OF THE ANALYSIS..... 08-10-1995 ; AM PEAK
OTHER INFORMATION.... 2015 TOTAL TRAFFIC - INTERNAL INT.

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c_p (pcph)	ACTUAL MOVEMENT CAPACITY c_M (pcph)	SHARED CAPACITY c_{SH} (pcph)	RESERVE CAPACITY $c_R = c_{SH} - v$	LOS
MINOR STREET						
EB LEFT	11	599	541	541	530	A
THROUGH	15	704	664	664	648	A
RIGHT	10	999	999	999	989	A
MINOR STREET						
WB LEFT	1	627	580	580	579	A
THROUGH	11	704	664	664	653	A
RIGHT	53	999	999	999	946	A
MAJOR STREET						
SB LEFT	90	998	998	998	907	A
NB LEFT	6	996	996	996	990	A

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... FRONTAGE RD
NAME OF THE NORTH/SOUTH STREET.... MAIN INT. ACCESS
DATE AND TIME OF THE ANALYSIS..... 08-10-1995 : AM PEAK
OTHER INFORMATION.... 2015 TOTAL TRAFFIC - INTERNAL INT.

****

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET.. 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 100000

NAME OF THE EAST/WEST STREET..... FRONTAGE RD

NAME OF THE NORTH/SOUTH STREET..... MAIN INT. ACCESS

NAME OF THE ANALYST..... PDM

DATE OF THE ANALYSIS (mm/dd/yy)..... 08-10-1995

TIME PERIOD ANALYZED..... PM PEAK

OTHER INFORMATION.... 2015 TOTAL TRAFFIC - INTERNAL INT.

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: NORTH/SOUTH

CONTROL TYPE EASTBOUND: STOP SIGN

CONTROL TYPE WESTBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	10	1	32	278
THRU	42	42	278	278
RIGHT	32	278	1	1

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	3	3	3
LANE USAGE	L + TR	L + TR		

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	0	0	0

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
EB	5.50	5.50	0.00	5.50
WB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
SB	5.50	5.50	0.00	5.50
NB	5.50	5.50	0.00	5.50
MINOR THROUGHS				
EB	6.50	6.50	0.00	6.50
WB	6.50	6.50	0.00	6.50
MINOR LEFTS				
EB	7.00	7.00	0.00	7.00
WB	7.00	7.00	0.00	7.00

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... FRONTAGE RD
NAME OF THE NORTH/SOUTH STREET.... MAIN INT. ACCESS
DATE AND TIME OF THE ANALYSIS..... 08-10-1995 ; PM PEAK
OTHER INFORMATION.... 2015 TOTAL TRAFFIC - INTERNAL INT.

MOVEMENT	FLOW-RATE v(pcph)	POTEN-TIAL CAPACITY c_p (pcph)	ACTUAL MOVEMENT CAPACITY c_M (pcph)	SHARED CAPACITY c_{SH} (pcph)	RESERVE CAPACITY $c_R = c_{SH} - v$	LOS
MINOR STREET						
EB LEFT	11	143	66	66	55	E
THROUGH	46	283	191	191	145	D
RIGHT	35	995	995	995	960	A
MINOR STREET						
WB LEFT	1	212	125	125	123	D
THROUGH	46	283	191	191	145	D
RIGHT	306	995	995	995	690	A
MAJOR STREET						
SB LEFT	306	811	811	811	505	A
NB LEFT	35	811	811	811	776	A

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... FRONTAGE RD
NAME OF THE NORTH/SOUTH STREET.... MAIN INT. ACCESS
DATE AND TIME OF THE ANALYSIS..... 08-10-1995 : PM PEAK
OTHER INFORMATION.... 2015 TOTAL TRAFFIC - INTERNAL INT.

****

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED. MAJOR STREET.. 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 100000

NAME OF THE EAST/WEST STREET..... FRONTAGE RD

NAME OF THE NORTH/SOUTH STREET..... MAIN INT. ACCESS

NAME OF THE ANALYST..... PDM

DATE OF THE ANALYSIS (mm/dd/yy)..... 08-10-1995

TIME PERIOD ANALYZED..... SAT PEAK

OTHER INFORMATION.... 2015 TOTAL TRAFFIC - INTERNAL INT.

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: NORTH/SOUTH

CONTROL TYPE EASTBOUND: STOP SIGN

CONTROL TYPE WESTBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	10	1	43	376
THRU	53	53	376	376
RIGHT	43	376	1	1

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	3	3	3
LANE USAGE	L + TR	L + TR		

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	0	0	0

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
EB	5.50	5.50	0.00	5.50
WB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
SB	5.50	5.50	0.00	5.50
NB	5.50	5.50	0.00	5.50
MINOR THROUGHS				
EB	6.50	6.50	0.00	6.50
WB	6.50	6.50	0.00	6.50
MINOR LEFTS				
EB	7.00	7.00	0.00	7.00
WB	7.00	7.00	0.00	7.00

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... FRONTAGE RD
NAME OF THE NORTH/SOUTH STREET.... MAIN INT. ACCESS
DATE AND TIME OF THE ANALYSIS..... 08-10-1995 ; SAT PEAK
OTHER INFORMATION.... 2015 TOTAL TRAFFIC - INTERNAL INT.

MOVEMENT	FLOW-RATE v(pcph)	POTENTIAL CAPACITY c_p (pcph)	ACTUAL MOVEMENT CAPACITY c_M (pcph)	SHARED CAPACITY c_{SH} (pcph)	RESERVE CAPACITY $c_R = c_{SH} - v$	LOS
MINOR STREET						
EB LEFT	11	75	18	18	7	E
THROUGH	58	178	87	87	28	E
RIGHT	47	968	968	968	921	A
MINOR STREET						
WB LEFT	1	128	45	45	44	E
THROUGH	58	178	87	87	28	E
RIGHT	414	968	968	968	554	A
MAJOR STREET						
SB LEFT	414	721	721	721	307	B
NB LEFT	47	721	721	721	673	A

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... FRONTAGE RD
NAME OF THE NORTH/SOUTH STREET.... MAIN INT. ACCESS
DATE AND TIME OF THE ANALYSIS..... 08-10-1995 : SAT PEAK
OTHER INFORMATION.... 2015 TOTAL TRAFFIC - INTERNAL INT.

APPENDIX C

Progression Analysis

(INPUT.DATA

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** INPUT DATA CONTINUED ****

****

**** INTERSECTION 1 McDONALDS

DISTANCE 0 TO 1	SPEED	DISTANCE 1 TO 0	SPEED
0. FT	0. MPH	0. FT	0. MPH

A SIDE QUEUE CLEARANCE	B SIDE QUEUE CLEARANCE
0 SECS	2 SECS

ARTERIAL PERMISSIBLE PHASE SEQUENCE

DUAL THRUS (2+6) WITH OVERLAP
LT 5 LEADS (2+5) WITH OVERLAP

CROSS ST PHASE SEQUENCE
LT 7 LEADS (4+7)
NO OVERLAP

		ARTERIAL STREET				CROSS STREET			
PHASE	(NEMA)	5[6]	6	1[4]	2	3[4]	4	7[4]	8
VOLUMES	(VPH)	201	1371	0	1109	0	201	237	0
SAT FLOW RATE	(VPHG)	1805	3620	0	3620	0	1900	1805	0
MINIMUM PHASE	(SEC)	10	25	0	25	0	15	15	0

(INPUT.DATA)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** INPUT DATA CONTINUED ****

****

**** INTERSECTION 2 24.5 RD.

DISTANCE 1 TO 2	SPEED	DISTANCE 2 TO 1	SPEED
1400. FT	45. MPH	1400. FT	45. MPH

A SIDE QUEUE CLEARANCE	B SIDE QUEUE CLEARANCE
2 SECS	2 SECS

ARTERIAL PERMISSIBLE PHASE SEQUENCE

DUAL THRUS (2+6) WITH OVERLAP
LT 5 LEADS (2+5) WITH OVERLAP

CROSS ST PHASE SEQUENCE
LT 7 LEADS (4+7)
NO OVERLAP

		ARTERIAL STREET				CROSS STREET			
PHASE	(NEMA)	5[4]	6	1[4]	2	3[4]	4	7[4]	8
VOLUMES	(VPH)	91	1374	0	1519	0	91	90	0
SAT FLOW RATE	(VPHG)	1805	3620	0	3620	0	1900	3330	0
MINIMUM PHASE	(SEC)	0	25	0	25	0	15	15	0

(INPUT.DATA)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** INPUT DATA CONTINUED ****

****

**** INTERSECTION 3 25 RD.

DISTANCE 2 TO 3	SPEED	DISTANCE 3 TO 2	SPEED
6240. FT	45. MPH	6240. FT	45. MPH

A SIDE QUEUE CLEARANCE	B SIDE QUEUE CLEARANCE
2 SECS	2 SECS

ARTERIAL PERMISSIBLE PHASE SEQUENCE

DUAL THRUS	(2+6)	WITH OVERLAP
LT 5 LEADS	(2+5)	WITH OVERLAP

CROSS ST PHASE SEQUENCE

LT 7 LEADS (4+7) NO OVERLAP

		ARTERIAL STREET				CROSS STREET			
PHASE	(NEMA)	5[4]	6	1[4]	2	3[4]	4	7[4]	8
VOLUMES	(VPH)	141	1481	0	1328	0	141	141	0
SAT FLOW RATE	(VPHG)	1805	3620	0	3620	0	1900	1805	0
MINIMUM PHASE	(SEC)	0	25	0	25	0	15	15	0

(INPUT.DATA)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** INPUT DATA CONTINUED ****

****

**** INTERSECTION 4 INDEPENDENT

DISTANCE 3 TO 4	SPEED	DISTANCE 4 TO 3	SPEED
3840. FT	45. MPH	3840. FT	45. MPH

A SIDE QUEUE CLEARANCE	B SIDE QUEUE CLEARANCE
2 SECS	0 SECS

ARTERIAL PERMISSIBLE PHASE SEQUENCE

DUAL LEFTS	(1+5)	WITH OVERLAP
DUAL THRUS	(2+6)	WITH OVERLAP
LT 5 LEADS	(2+5)	WITH OVERLAP
LT 1 LEADS	(1+6)	WITH OVERLAP

CROSS ST PHASE SEQUENCE

DUAL LEFTS (3+7) WITH OVERLAP

		ARTERIAL STREET				CROSS STREET			
PHASE	(NEMA)	5[6]	6	1[5]	2	3[6]	4	7[5]	8
VOLUMES	(VPH)	127	1544	338	1378	215	272	113	278
SAT FLOW RATE	(VPHG)	1805	3620	3330	3620	1805	1900	1805	1900
MINIMUM PHASE	(SEC)	10	25	10	25	10	15	10	15

(ART.SUMY)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** BEST PROGRESSION SOLUTION SUMMARY ****

GRAND JUNCT. US 6 & 50 DISTRICT 01/17/95 RUN NO. 1

CYCLE LENGTH =100 SECS (MAXIMIN CYCLE > 120 SECS)
EFFICIENCY = .51 (GREAT PROGRESSION)
ATTAINABILITY = .98 (FINE-TUNING NEEDED)

BAND A = 48 SECS AVERAGE SPEED = 45 MPH
BAND B = 52 SECS AVERAGE SPEED = 45 MPH

NOTE: ARTERIAL PROGRESSION EVALUATION CRITERIA

EFFICIENCY	0.00 - 0.12	"POOR PROGRESSION"
	0.13 - 0.24	"FAIR PROGRESSION"
	0.25 - 0.36	"GOOD PROGRESSION"
	0.37 - 1.00	"GREAT PROGRESSION"
ATTAINABILITY	1.00 - 0.99	"INCREASE MIN THRU PHASE"
	0.99 - 0.70	"FINE-TUNING NEEDED"
	0.69 - 0.00	"MAJOR CHANGES NEEDED"

(INT.SUMY)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** INTERSECTION PERFORMANCE SUMMARY ****

CYCLE LENGTH = 100 SECS SYSTEM MAXIMIN CYCLE = 272 SECS

INT NO	CROSS STREET INTERSECTION	PHASE ART	PHASE CRS	MIN. DELAY CYCLE	DELAY (SECS)	INTERSECTION V/C RATIO	AVERAGE DELAY (SECS/VEH)	INT NO
1	McDONALDS	3	4	63		.83	12.6	1
2	24.5 RD.	2	4	185		1.06	4.3	2
3	25 RD.	2	4	272		1.06	5.0	3
4	INDEPENDENT	4	1	80		.89	26.5	4

NOTE: PHASE SEQUENCE CODE FOR ARTERIAL (ART) CROSS STREET (CRS)

1 - LEFT TURN FIRST	OR DUAL LEFTS LEADING	OR DUAL LEFTS (1+5)
2 - THROUGH FIRST	OR DUAL THRUS LEADING	OR DUAL THRUS (2+6)
3 - LEADING GREEN	OR NO. 5 LEADING	OR LT 5 LEADS (2+5)
4 - LAGGING GREEN	OR NO. 1 LEADING	OR LT 1 LEADS (1+6)

(BEST.SOLN)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** BEST SOLUTION.... NEMA PHASE DESIGNATION ****

*** INT. 1 .0 SEC OFFSET ART ST PHASE SEQ IS LT 5 LEADS (2+5)
McDONALDS .0 % OFFSET CROSS ST PHASE SEQ IS LT 7 LEADS (4+7)

	ARTERIAL STREET				CROSS STREET			
CONCURRENT PHASES	2+5	2+6	1+6	TOTAL	4+7	4+8	3+8	TOTAL
PHASE TIME (SECS)	19.6	62.8	.0	82.4	17.6	.0	.0	17.6
PHASE TIME (%)	19.6	62.8	.0	82.4	17.6	.0	.0	17.6
MEASURES OF EFFECTIVENESS								
PHASE (NEMA)	5[6]	6	1[4]	2	3[4]	4	7[4]	8
PHASE DIRECTION	EBLTPP	WBTHRU	WBLTPM	EBTHRU	NBLTPM	SBTHRU	SBLTPM	NBTHRU
PHASE TIME (SEC)	19.6	62.8	.0	82.4	.0	17.6	17.6	.0
V/C-RATIO	.44	.63	.00	.39	.00	.73	.82	.00
LEVEL OF SERVICE	A	B		A		C	D	
DELAY (SECS/VEH)	8.0	10.6	.0	2.7	.0	42.1	49.0	.0
LEVEL OF SERVICE	B	B		A		D	D	
QUEUE (VEH/LANE)	1.3	6.5	.0	3.2	.0	5.3	7.3	.0
STOPS (STOPS/HR)	153.	707.	0.	999.	0.	199.	244.	0.

TOTAL INTERSECTION DELAY 12.58 SECS/VEH FUEL CONSUMPTION 47.21 GAL/HR MINIMUM DELAY CYCLE 63 SECS

(BEST.SOLN)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** BEST SOLUTION CONTINUED.... NEMA PHASE DESIGNATION ****

*** INT. 2 90.9 SEC OFFSET ART ST PHASE SEQ IS DUAL THRUS (2+6)
24.5 RD. 90.9 % OFFSET CROSS ST PHASE SEQ IS LT 7 LEADS (4+7)

	ARTERIAL STREET				CROSS STREET			
CONCURRENT PHASES	2+6	1+6	1+5	TOTAL	4+7	4+8	3+8	TOTAL
PHASE TIME (SECS)	85.0	.0	.0	85.0	15.0	.0	.0	15.0
PHASE TIME (%)	85.0	.0	.0	85.0	15.0	.0	.0	15.0
MEASURES OF EFFECTIVENESS								
PHASE (NEMA)	5[4]	6	1[4]	2	3[4]	4	7[4]	8
PHASE DIRECTION	EBLTPM	WBTHRU	WBLTPM	EBTHRU	NBLTPM	SBTHRU	SBLTPM	NBTHRU
PHASE TIME (SEC)	.0	85.0	.0	85.0	.0	15.0	15.0	.0
V/C-RATIO	.26	.46	.00	.51	.00	.40	.20	.00
LEVEL OF SERVICE	A	A		A		A	A	
DELAY (SECS/VEH)	4.3	2.3	.0	2.5	.0	35.3	32.7	.0
LEVEL OF SERVICE	A	A		A		D	D	
QUEUE (VEH/LANE)	.7	3.5	.0	3.8	.0	2.1	1.2	.0
STOPS (STOPS/HR)	31.	1238.	0.	1370.	0.	83.	73.	0.

TOTAL INTERSECTION DELAY 4.28 SECS/VEH FUEL CONSUMPTION 106.87 GAL/HR MINIMUM DELAY CYCLE > 120 SECS

(BEST.SOLN)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** BEST SOLUTION CONTINUED.... NEMA PHASE DESIGNATION ****

*** INT. 3 .8 SEC OFFSET ART ST PHASE SEQ IS DUAL THRUS (2+6)
25 RD. .8 % OFFSET CROSS ST PHASE SEQ IS LT 7 LEADS (4+7)

	ARTERIAL STREET				CROSS STREET			
CONCURRENT PHASES	2+6	1+6	1+5	TOTAL	4+7	4+8	3+8	TOTAL
PHASE TIME (SECS)	85.0	.0	.0	85.0	15.0	.0	.0	15.0
PHASE TIME (%)	85.0	.0	.0	85.0	15.0	.0	.0	15.0
MEASURES OF EFFECTIVENESS								
PHASE (NEMA)	5[4]	6	1[4]	2	3[4]	4	7[4]	8
PHASE DIRECTION	EBLTPM	WBTHRU	WBLTPM	EBTHRU	NBLTPM	SBTHRU	SBLTPM	NBTHRU
PHASE TIME (SEC)	.0	85.0	.0	85.0	.0	15.0	15.0	.0
V/C-RATIO	.46	.50	.00	.45	.00	.62	.58	.00
LEVEL OF SERVICE	A	A		A		B	A	
DELAY (SECS/VEH)	5.4	1.0	.0	2.3	.0	39.6	37.4	.0
LEVEL OF SERVICE	A	A		A		D	D	
QUEUE (VEH/LANE)	1.0	2.0	.0	3.3	.0	3.6	3.6	.0
STOPS (STOPS/HR)	60.	1328.	0.	1197.	0.	135.	126.	0.

TOTAL INTERSECTION DELAY FUEL CONSUMPTION MINIMUM DELAY CYCLE
5.00 SECS/VEH 133.52 GAL/HR > 120 SECS

(BEST.SOLN)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** BEST SOLUTION CONTINUED.... NEMA PHASE DESIGNATION ****

*** INT. 4 55.6 SEC OFFSET ART ST PHASE SEQ IS LT 1 LEADS (1+6)
INDEPENDENT 55.6 % OFFSET CROSS ST PHASE SEQ IS DUAL LEFTS (3+7)

	ARTERIAL STREET				CROSS STREET			
CONCURRENT PHASES	1+6	2+6	2+5	TOTAL	3+7	3+8	4+8	TOTAL
PHASE TIME (SECS)	17.0	39.1	11.7	67.8	11.3	.0	20.9	32.2
PHASE TIME (%)	17.0	39.1	11.7	67.8	11.3	.0	20.9	32.2
MEASURES OF EFFECTIVENESS								
PHASE (NEMA)	5[6]	6	1[5]	2	3[6]	4	7[5]	8
PHASE DIRECTION	EBLTPP	WBTHRU	WBLTPR	EBTHRU	NBLTPP	SBTHRU	SBLTPR	NBTHRU
PHASE TIME (SEC)	11.7	56.1	17.0	50.8	12.1	20.9	11.3	21.7
V/C-RATIO	.52	.82	.77	.80	.70	.80	.76	.78
LEVEL OF SERVICE	A	D	C	C	B	C	C	C
DELAY (SECS/VEH)	32.7	19.2	42.3	20.8	29.2	44.3	55.3	42.0
LEVEL OF SERVICE	D	B	D	C	C	D	E	D
QUEUE (VEH/LANE)	2.6	11.2	5.1	10.7	4.7	7.4	3.9	7.2
STOPS (STOPS/HR)	110.	1429.	321.	1273.	205.	278.	123.	279.

TOTAL INTERSECTION DELAY FUEL CONSUMPTION MINIMUM DELAY CYCLE
26.52 SECS/VEH 106.28 GAL/HR 80 SECS

(ART.MOE)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

**** TOTAL ARTERIAL SYSTEM PERFORMANCE ****

GRAND JUNCT. US 6 & 50 DISTRICT 01/17/95 RUN NO. 1

CYCLE LENGTH = 100 SECS BAND A = 48 SECS BAND B = 52 SECS
AVERAGE PROGRESSION SPEED - BAND A = 45 MPH BAND B = 45 MPH

.51 EFFICIENCY .98 ATTAINABILITY

AVERAGE INTERSECTION DELAY	TOTAL SYSTEM DELAY	TOTAL NUMBER VEHICLES
13.2 SECS/VEH	50.6 VEH-HR/HR	13781.

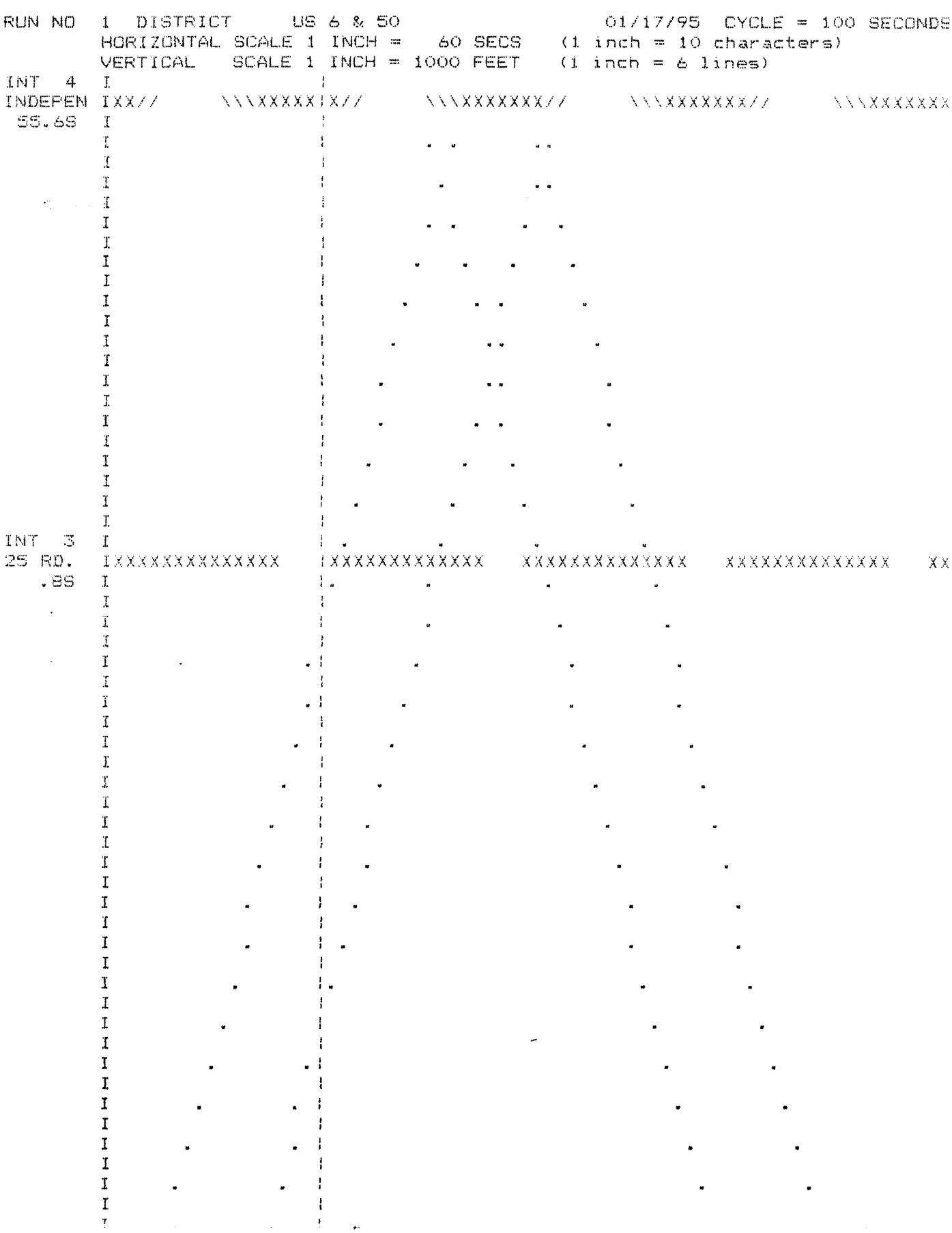
TOTAL SYSTEM FUEL CONSUMPTION	TOTAL SYSTEM STOPS	MAXIMIN CYCLE
393.89 GAL/HR	11963. STOPS	> 120 SECS

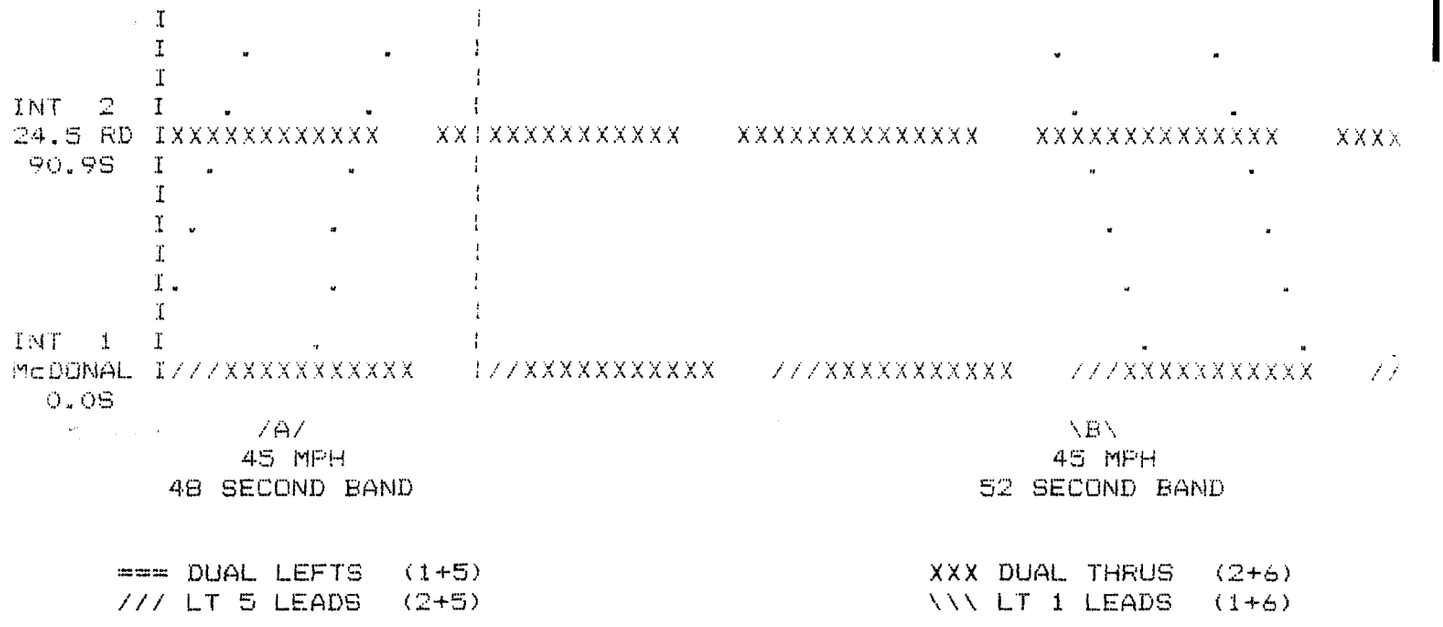
(TS.DIAGM)

PASSER II-90

DECEMBER 93 MULTIPHASE ARTERIAL PROGRESSION PROGRAM VERSION 2.0

RUN NO 1 DISTRICT US 6 & 50 01/17/95 CYCLE = 100 SECONDS
HORIZONTAL SCALE 1 INCH = 60 SECS (1 inch = 10 characters)
VERTICAL SCALE 1 INCH = 1000 FEET (1 inch = 6 lines)




INT 2
24.5 RD
90.9S
INT 1
McDONAL
0.0S
/A/
45 MPH
48 SECOND BAND
\B\
45 MPH
52 SECOND BAND
=== DUAL LEFTS (1+5)
/// LT 5 LEADS (2+5)
XXX DUAL THRUS (2+6)
\\\ LT 1 LEADS (1+6)

APPENDIX D

Queuing Analysis

Queue Calculations

Rimrock Shopping Center
Peak-hour, Saturday

Movement: Southbound thrus on Independent Ave. at US 6 & 50

c	=	Cycle length (sec)	=	100
Ge	=	Effective Green, (sec)	=	21
Q	=	Approach Flow, (veh/hour)	=	275
q	=	Approach Flow, (veh/sec)	=	0.0764
n	=	Average Queue Length, (# of veh)		
Tr	=	Effective Red, (sec)	=	79
X	=	Number of vehicles		
Z	=	Average number of vehicles passing a point at during time t.		

Assuming vehicles are unblocked and arrive during green and can complete turn.

Z = q*c = 8 Vehicles/cycle

P(x) = ((exp^(-q*Tr))*(q*Tr)^x)/(x!) =

			Cumulative P(X)	
X = 0	P(x) =	0.002	0.002	Storage needed
X = 1	P(x) =	0.014	0.017	Storage needed
X = 2	P(x) =	0.044	0.060	Storage needed
X = 3	P(x) =	0.088	0.148	Storage needed
X = 4	P(x) =	0.132	0.280	Storage needed
X = 5	P(x) =	0.160	0.440	Storage needed
X = 6	P(x) =	0.161	0.601	Storage needed
X = 7	P(x) =	0.138	0.739	Storage needed
X = 8	P(x) =	0.104	0.844	Storage needed
X = 9	P(x) =	0.070	0.914	Storage needed
X = 10	P(x) =	0.042	0.956	
X = 11	P(x) =	0.023	0.979	
X = 12	P(x) =	0.012	0.991	
X = 13	P(x) =	0.005	0.996	
X = 14	P(x) =	0.002	0.999	
X = 15	P(x) =	0.001	0.999	
X = 16	P(x) =	0.000	1.000	

Assume vehicle length = 20 ft.

Number of vehicles = 9 Vehicles

Queue Length = 20 * # of veh = 180 Feet

Formulae Source: Poisson and Other Distribution in Traffic, ENO Foundation for Transportation, Saugatuck, 1971, Connecticut, pg. 31.

Queue Calculations

Rimrock Shopping Center
Peak-hour, Saturday

Movement: Northbound thrus on "main" access at US 6 & 50

c	=	Cycle length (sec)	=	100
Ge	=	Effective Green, (sec)	=	21
Q	=	Approach Flow, (veh/hour)		285
q	=	Approach Flow, (veh/sec)	=	0.0792
n	=	Average Queue Length, (# of veh)		
Tr	=	Effective Red, (sec)	=	79
X	=	Number of vehicles		
Z	=	Average number of vehicles passing a point at during time t.		

Assuming vehicles are unblocked and arrive during green and can complete turn.

Z = q*c = 8 Vehicles/cycle

P(x) = ((exp^(-q*Tr))*(q*Tr)^x)/(x!) =

			Cumulative P(X)	
X =	0	P(x) = 0.002	0.002	Storage needed
X =	1	P(x) = 0.012	0.014	Storage needed
X =	2	P(x) = 0.038	0.052	Storage needed
X =	3	P(x) = 0.078	0.130	Storage needed
X =	4	P(x) = 0.123	0.252	Storage needed
X =	5	P(x) = 0.153	0.406	Storage needed
X =	6	P(x) = 0.160	0.566	Storage needed
X =	7	P(x) = 0.143	0.708	Storage needed
X =	8	P(x) = 0.112	0.820	Storage needed
X =	9	P(x) = 0.078	0.897	Storage needed
X =	10	P(x) = 0.049	0.946	Storage needed
X =	11	P(x) = 0.028	0.974	
X =	12	P(x) = 0.014	0.988	
X =	13	P(x) = 0.007	0.995	
X =	14	P(x) = 0.003	0.998	
X =	15	P(x) = 0.001	0.999	
X =	16	P(x) = 0.001	1.000	

Assume vehicle length = 20 ft.

Number of vehicles = 10 Vehicles

Queue Length = 20 * # of veh = 200 Feet

Formulae Source: Poisson and Other Distribution in Traffic, ENO Foundation for Transportation, Saugatuck, 1971, Connecticut, pg. 31.

Queue Calculations

Rimrock Shopping Center
Peak-hour, Saturday

Movement: Westbound left-turns on US 6 & 50

c	=	Cycle length (sec)	=	100
Ge	=	Effective Green, (sec)	=	12.5
Q	=	Approach Flow, (veh/hour)		204
q	=	Approach Flow, (veh/sec)	=	0.0567
n	=	Average Queue Length, (# of veh)		
Tr	=	Effective Red, (sec)	=	87.5
X	=	Number of vehicles		
Z	=	Average number of vehicles passing a point at during time t.		

Assuming vehicles are unblocked and arrive during green and can complete turn.

Z = q*c = 6 Vehicles/cycle

P(x) = ((exp^(-q*Tr))*(q*Tr)^x)/(x!) =

			Cumulative P(X)	
X =	0	P(x) = 0.007	0.007	Storage needed
X =	1	P(x) = 0.035	0.042	Storage needed
X =	2	P(x) = 0.086	0.128	Storage needed
X =	3	P(x) = 0.143	0.271	Storage needed
X =	4	P(x) = 0.177	0.448	Storage needed
X =	5	P(x) = 0.175	0.623	Storage needed
X =	6	P(x) = 0.145	0.768	Storage needed
X =	7	P(x) = 0.103	0.871	Storage needed
X =	8	P(x) = 0.064	0.935	Storage needed
X =	9	P(x) = 0.035	0.970	
X =	10	P(x) = 0.017	0.987	
X =	11	P(x) = 0.008	0.995	
X =	12	P(x) = 0.003	0.998	
X =	13	P(x) = 0.001	0.999	
X =	14	P(x) = 0.000	1.000	

Assume vehicle length = 20 ft.

Number of vehicles = 8 Vehicles

Queue Length = 20 * # of veh = 160 Feet

Formulae Source: Poisson and Other Distribution in Traffic, ENO Foundation for Transportation, Saugatuck, 1971, Connecticut, pg. 31.

APPENDIX E

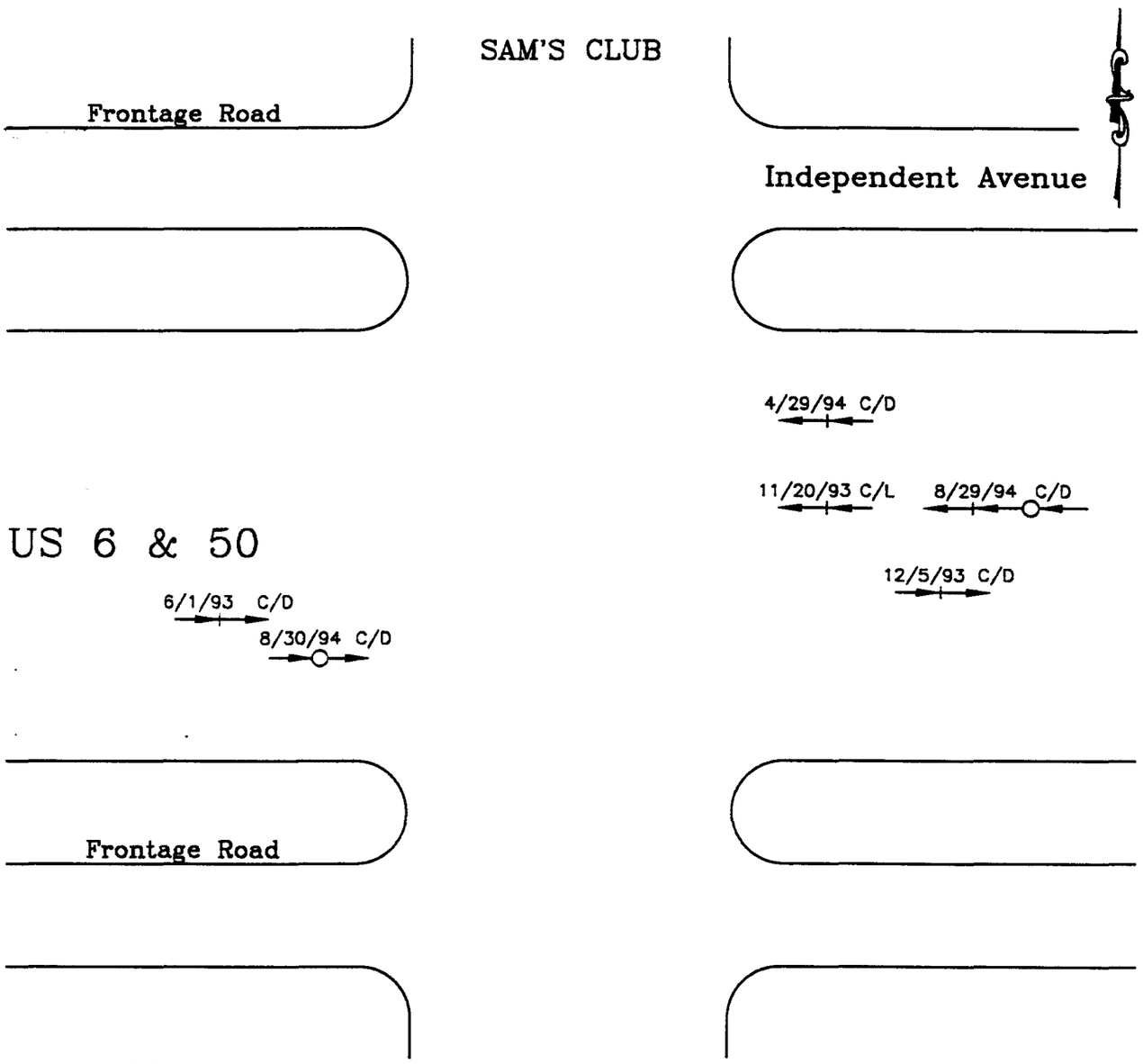
Accident Diagrams

COLLISION DIAGRAM

INTERSECTION OF Route 6 & 50 AND SAM'S CLUB

PERIOD 3 Years FROM 1991 TO 1994

CITY Grand Junction PREPARED BY PDM



NOT TO SCALE

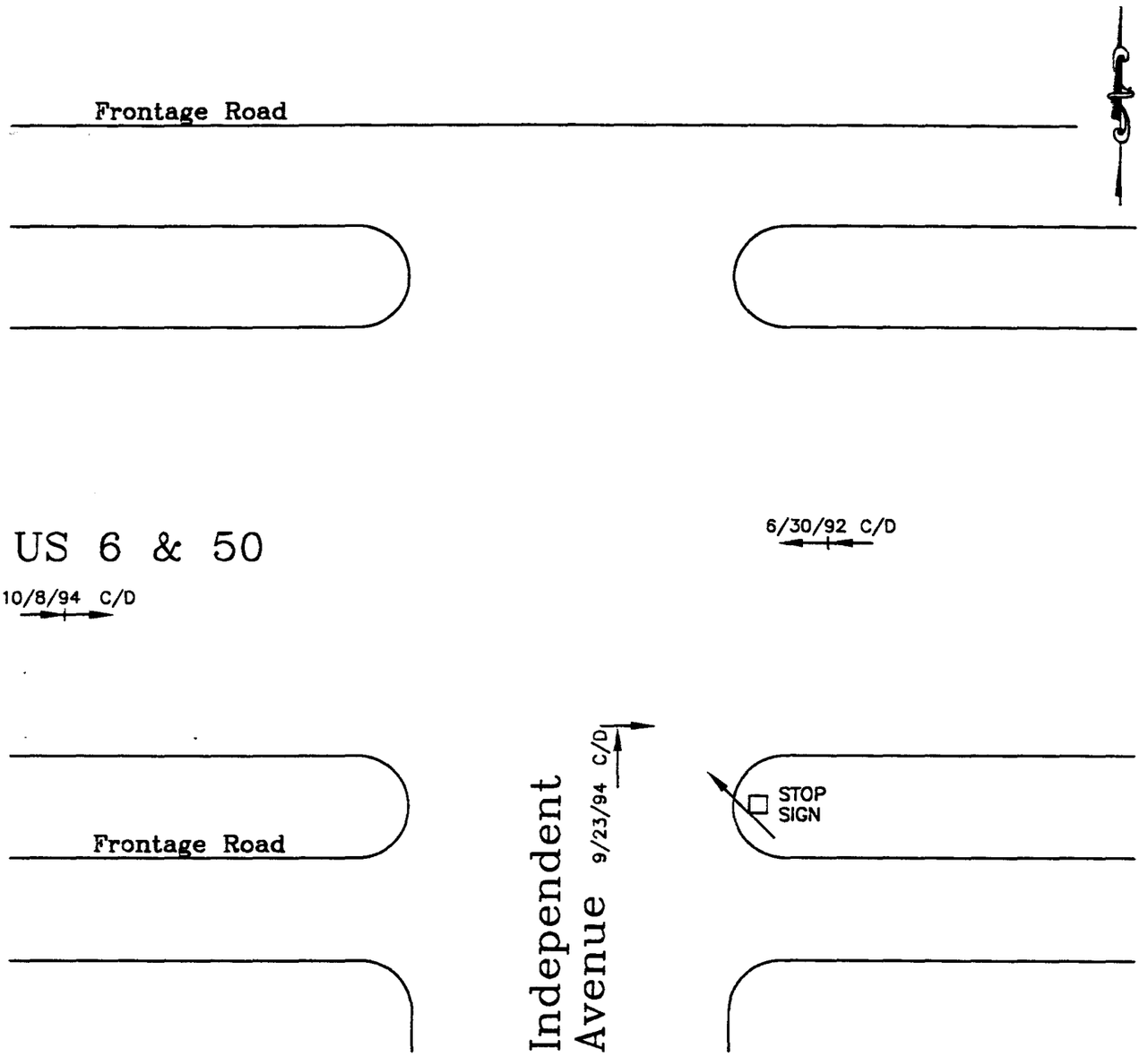
SYMBOLS		TYPES OF COLLISIONS		ROAD SURFACE/LIGHTING	
←	MOVING VEHICLE	→ ←	HEAD ON	C	DRY, CLEAR
←»»»	BACKING VEHICLE	↙ ←	ANGLE	W	WET
– – –	PEDESTRIAN	↓ ←	BROADSIDE	S	SNOWY, ICY
▨	PARKED VEHICLE			O	OTHER
○	INJURY	→ ←	REAR–END	D	DAYLIGHT
●	FATALITY	↘ ←	SIDESWIPE–SAME	N	DARK/NO LIGHTS
□	FIXED OBJECT			L	DARK/LIGHTED
←ee	OUT OF CONTROL	↗ ←	SIDESWIPE–OPP.		Leigh, Scott & Cleary

COLLISION DIAGRAM

INTERSECTION OF Route 6 & 50 AND Independent Avenue

PERIOD 3 Years FROM 1991 TO 1994

CITY Grand Junction PREPARED BY PDM



NOT TO SCALE

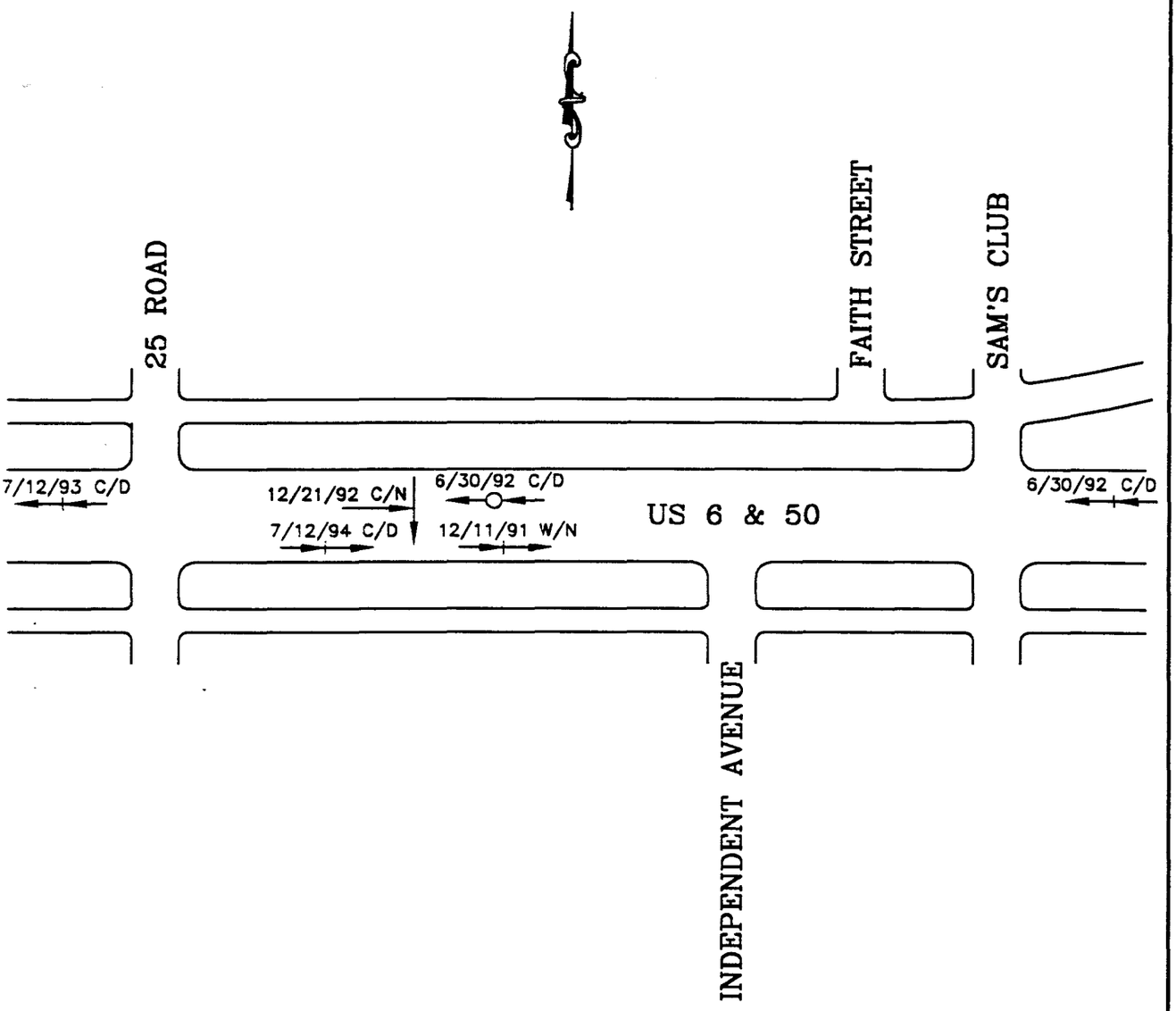
SYMBOLS		TYPES OF COLLISIONS		ROAD SURFACE/LIGHTING	
	MOVING VEHICLE		HEAD ON	C	DRY, CLEAR
	BACKING VEHICLE		ANGLE	W	WET
	PEDESTRIAN		BROADSIDE	S	SNOWY, ICY
	PARKED VEHICLE			O	OTHER
	INJURY		REAR–END	D	DAYLIGHT
	FATALITY		SIDESWIPE–SAME	N	DARK/NO LIGHTS
	FIXED OBJECT			L	DARK/LIGHTED
	OUT OF CONTROL		SIDESWIPE–OPP.		Leigh, Scott & Cleary

COLLISION DIAGRAM

INTERSECTION OF Non Intersection AND

PERIOD 3 Years FROM 1991 TO 1994

CITY Grand Junction PREPARED BY PDM



NOT TO SCALE

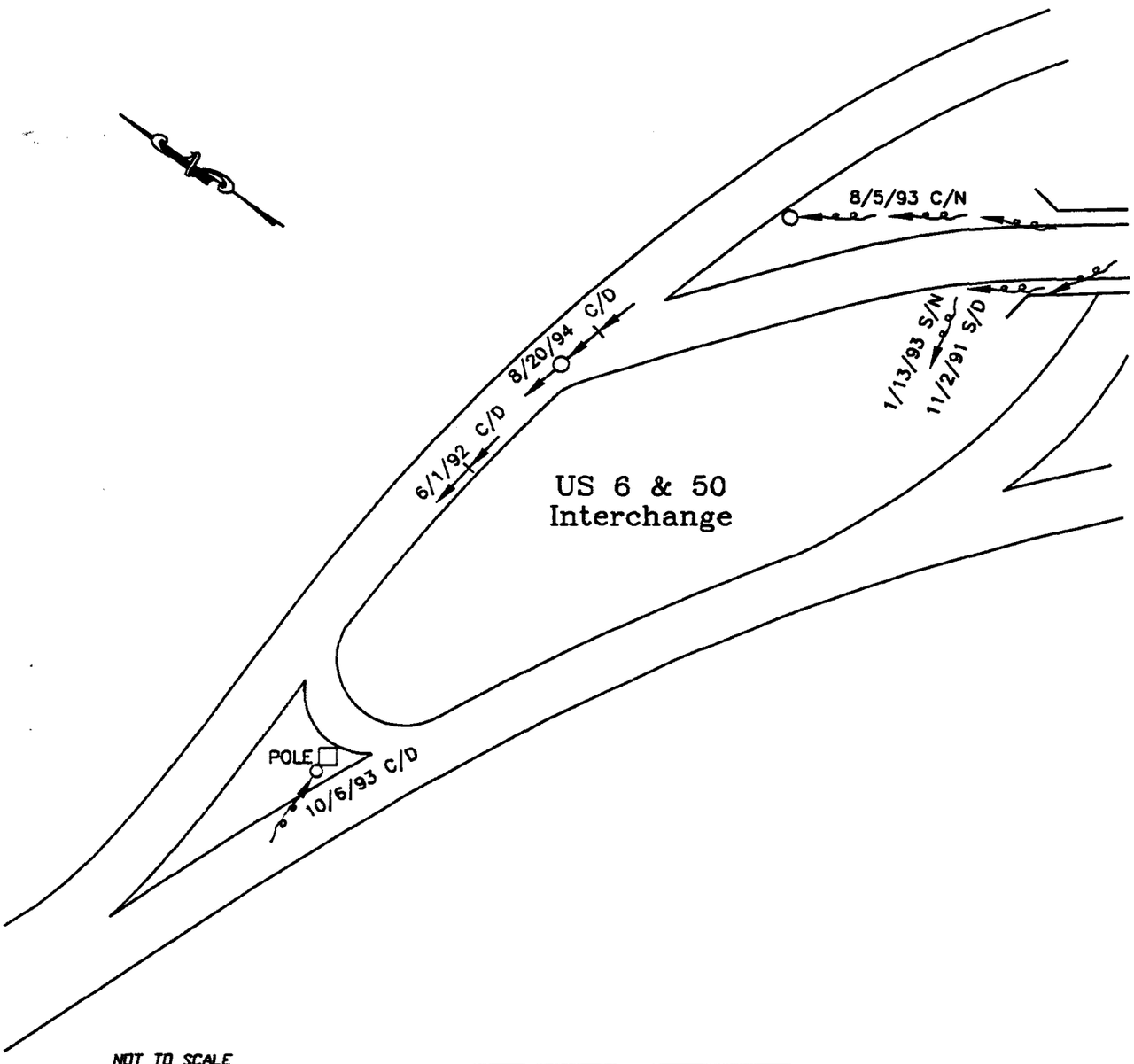
SYMBOLS	TYPES OF COLLISIONS	ROAD SURFACE/LIGHTING
MOVING VEHICLE	HEAD ON	C DRY, CLEAR
BACKING VEHICLE	ANGLE	W WET
PEDESTRIAN	BROADSIDE	S SNOWY, ICY
PARKED VEHICLE		O OTHER
INJURY	REAR–END	D DAYLIGHT
FATALITY	SIDESWIPE–SAME	N DARK/NO LIGHTS
FIXED OBJECT		L DARK/LIGHTED
OUT OF CONTROL	SIDESWIPE–OPP.	Leigh, Scott & Cleary

COLLISION DIAGRAM

INTERSECTION OF US 6 AND US 50

PERIOD 3 Years FROM 1991 TO 1994

CITY Grand Junction PREPARED BY PDM



NOT TO SCALE

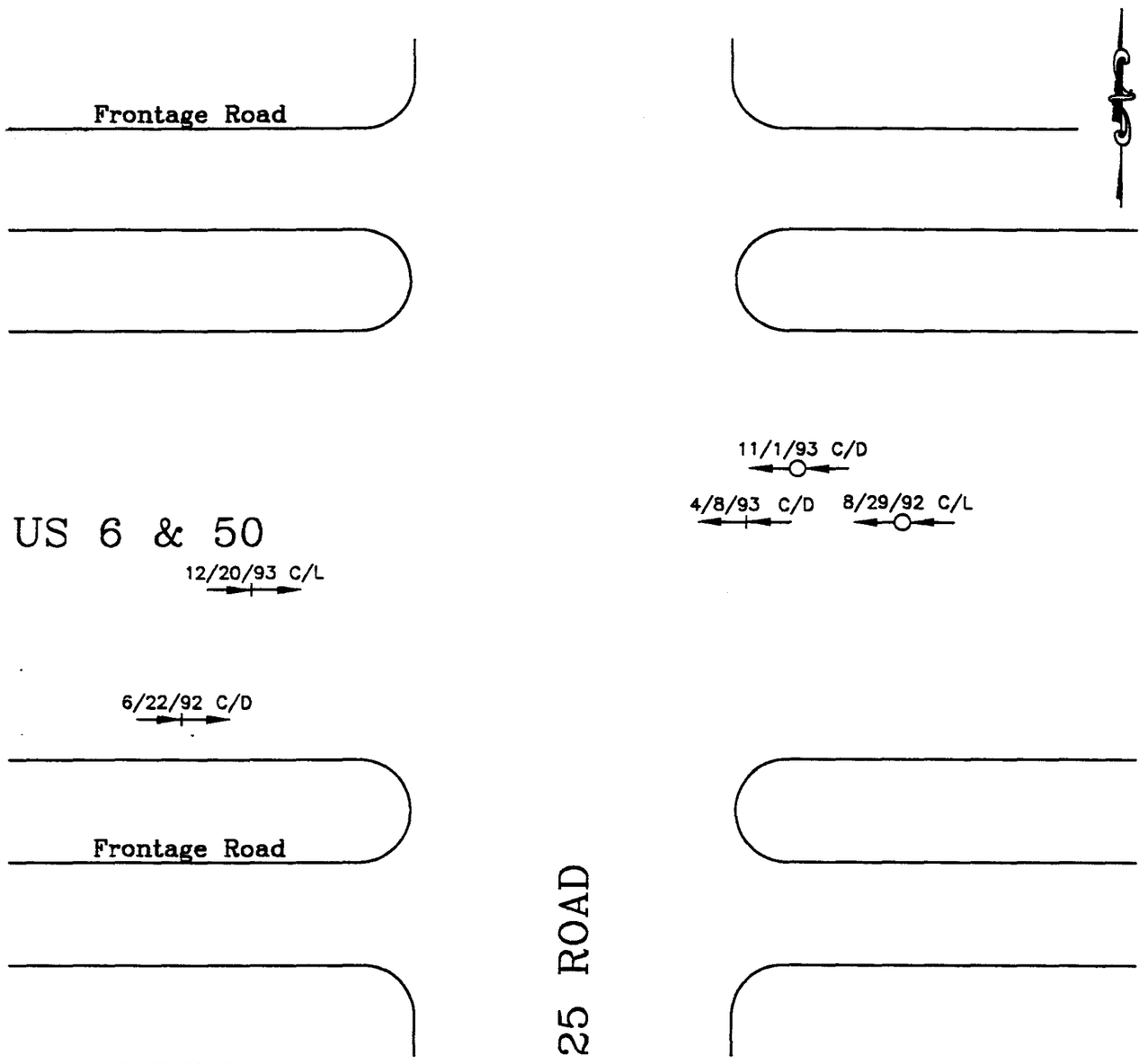
SYMBOLS		TYPES OF COLLISIONS		ROAD SURFACE/LIGHTING	
	MOVING VEHICLE		HEAD ON	C	DRY, CLEAR
	BACKING VEHICLE		ANGLE	W	WET
	PEDESTRIAN		BROADSIDE	S	SNOWY, ICY
	PARKED VEHICLE			O	OTHER
	INJURY		REAR-END	D	DAYLIGHT
	FATALITY		SIDESWIPE-SAME	N	DARK/NO LIGHTS
	FIXED OBJECT			L	DARK/LIGHTED
	OUT OF CONTROL		SIDESWIPE-OPP.		Leigh, Scott & Cleary

COLLISION DIAGRAM

INTERSECTION OF Route 6 & 50 AND 25 ROAD

PERIOD 3 Years FROM 1991 TO 1994

CITY Grand Junction PREPARED BY PDM



NOT TO SCALE

SYMBOLS	TYPES OF COLLISIONS	ROAD SURFACE/LIGHTING
MOVING VEHICLE	HEAD ON	C DRY, CLEAR
BACKING VEHICLE	ANGLE	W WET
PEDESTRIAN	BROADSIDE	S SNOWY, ICY
PARKED VEHICLE		O OTHER
INJURY	REAR-END	D DAYLIGHT
FATALITY	SIDESWIPE-SAME	N DARK/NO LIGHTS
FIXED OBJECT		L DARK/LIGHTED
OUT OF CONTROL	SIDESWIPE-OPP.	Leigh, Scott & Cleary

REVIEW COMMENTS

FILE #CUP-95-137 **TITLE HEADING:** Conditional Use Permit - Rimrock Market Place (REVISED)

LOCATION: 2523 Highway 6 & 50

PETITIONER: High Plains Land Co. (Jim Cook)

PETITIONER'S ADDRESS/TELEPHONE: 10955 Lowell, Ste. #930
Overland Park, KS 66210
913-345-2354

PETITIONER'S REPRESENTATIVE: Landesign (Phil Hart)

STAFF REPRESENTATIVE: Michael Drollinger

NOTE: THE PETITIONER IS REQUIRED TO SUBMIT FOUR (4) COPIES OF WRITTEN RESPONSE AND REVISED DRAWINGS ADDRESSING ALL REVIEW COMMENTS ON OR BEFORE 5:00 P.M., AUGUST 25, 1995.

MESA COUNTY BUILDING DEPT. **8/3/95**
Bob Lee **244-1656**

No Comments.

CITY FIRE DEPARTMENT **8/4/95**
Hank Masterson **244-1414**

1. The 8" water line serving this complex must be a looped system. The water line proposed is a dead end line from where it connects to the existing 8" line on Independent Avenue. To create a true looped line the system must be fed from two directions.
2. A looped line can be created using the proposed plan by either extending the line where it ends at the intersection of the new frontage road/main entrance - north to the 8" line in the existing frontage road or extending it northwest along the new frontage road to the line on Independent Avenue.
3. The proposed fire hydrant locations and fire department access are both acceptable.

CITY ATTORNEY **8/11/95**
John Shaver **244-1501**

Evidence of title in or conveyance to High Plains Land Co. needs to be provided.

CITY DEVELOPMENT ENGINEER **8/16/95**
Jody Kliska **244-1591**

See attached comments.

August 18, 1995

REVIEW COMMENTS FOR: **Rimrock Marketplace CUP-95-137**

TYPE OF REVIEW: **Conditional Use Permit**

REVIEWED BY: **Jody Kliska**

Traffic Study

1. On page E-1 the study states the assumption that by the end of 1995 the southern extension of Independent Avenue will be modified to only allow right turns to and from Independent Avenue accesses to US 6 & 50. No detail is shown on the submitted plans which shows how that is accomplished.

2. Page E-11 states the intersection of the frontage road and main access is planned to be a four-way stop configuration, but further in the report on page G-3 states it will be two-way stop controlled. The plans do not show any control.

3. The summary did not address the frontage road extension or the number of proposed lanes for the frontage road.

Site Plan

4. What is the cross-hatched area on the northwest portion of the site supposed to represent?

5. The plan shows a portion of parking on property other than this site, as well as street improvements on a portion of other property. Nothing on the plans or in the narrative addresses this.

6. What does "deed line description overlaps" mean on the site plan?

7. The frontage road as shown does not match the lane configuration used in the traffic study for analysis. The site plan should be representative of the proposed construction.

8. The site plan needs to identify access points for the proposed pad sites. No access will be allowed to the pads from the main access.

9. The site plan does not indicate the extent of improvements to the frontage road. Cross-sections A-A and C-C are called out on the plan but are not shown anywhere.

10. The on-site circulation is not efficient. The main access dumps cars directly into the parking lot. The original proposal of a boulevard like entry to the front of the anchor store functioned much better. The service drive around the back of the stores appears to just terminate into the parking lot, leaving trucks to find there way through the parking lot to exit. The entry to the strip of stores does not lead patrons directly to the stores but off to one side with poor intersection geometry into the parking lot. A reconfiguration of the intersection with the frontage road leading to the center of the stores would work more efficiently and cause less frustration to customers.

11. No parking summary was provided on the plans to verify the required parking is met.

Drainage

12. An analysis of the existing culverts under the railroad and river Road will be required, as well as an analysis of the ditch conveying water to the river. Is there a drainage easement for the ditch which runs to the river?

GRAND VALLEY RURAL POWER **8/7/95**
Perry Rupp **242-0040**

None at this time.

GRAND JUNCTION DRAINAGE DISTRICT **8/14/95**
John Ballagh **242-4343**

1. The preliminary drainage plan is adequate for preliminary approval. The proposed 30' drainage easement will only suffice if the open drain is piped. Otherwise the open drain easement with road on both sides will be required.
2. Piping will be to GJDD specs or higher. Intersecting pipes will only be allowed at manholes.
3. Grant of easement along the final alignment should be to GJDD.
4. Definite responsibility for all drainage structures and facilities should be made clear on one or more permanent documents.
5. GJDD expects a final drainage study, to be reviewed, prior to final plan(s) approval.

UTE WATER **8/10/95**
Gary Mathews **242-7491**

Water mains shall be C-900, Class 150. Installation of pipe fittings, valves and services including testing and disinfection shall be in accordance with Ute Water standard specifications and drawings. Developer will maintain the water system installed on property and in the easement located to the West. A looped system is required to supply sufficient fire flow requirements. Water meters will be installed inside buildings with a outside touch pad reader.

POLICIES AND FEES IN EFFECT AT THE TIME OF APPLICATION WILL APPLY...

COLORADO DEPARTMENT OF TRANSPORTATION **8/15/95**
Rich Perske/Jim Nall **248-7212/248-7213**

The Colorado Department of Transportation's comments are as follows:

Our original comments are still in effect. Both CDOT and the City of Grand Junction must agree on a transportation system for this development. Then the approved transportation system must be constructed before any development is authorized. The current plan would require the acquisition of right-of-way from land owners who are not a part to this development. Therefore, their land must be acquired before the development is allowed to proceed, or we will not have a transportation system to meet the needs of the traveling public due to the developers' impacts.

COMMUNITY DEVELOPMENT ENGINEER **8/16/95**
Michael Drollinger **244-1439**

See attached comments.

CITY POLICE DEPARTMENT **8/16/95**
Dave Stassen **244-3587**

The traffic flow at both the main entrance and the second entrance is confusing.

What are the plans for the northwest corner of the property? (where the frontage road enters the property).

What are the fencing and lighting plans for the rear of the project? I would suggest at least .5 candlepower for the whole rear of the buildings.

Is there enough room at the southeast corner for trucks to make the corner.

CITY UTILITY ENGINEER **8/16/95**
Trent Prall **244-1590**

WATER - Ute Water
SEWER - City of Grand Junction

1. 15" Venegas sewer appears to be available, if grade permits, rather than extending sewer up to West Independent.
2. Site plan fails to depict easements for proposed sewer on west side of proposed development.
3. Site plan very unclear; please include legend.
4. Sewer and water plan unclear; please include legend and labels.
5. The most south-westerly unit (22,499 s.f.) appears to be over easement running parallel to west property.

LATE COMMENTS

CITY PARKS & RECREATION DEPARTMENT **8/16/95**
Shawn Cooper **244-3869**

1. It appears that adjacent trails will be on the roads and across River Road. No additional trail easements seem necessary.
2. Parks & Open Space fees will apply.

PUBLIC SERVICE **8/23/95**
Jon Price **244-2693**

Additional easements will be required for electric lines when job is designed.

TO DATE, NO COMMENTS RECEIVED FROM:

City Property Agent	Mesa County Planning Department
Mesa County Building Department	U.S. West
Corps of Engineers	Persigo Wastewater Treatment Facility

revised 8/23/95

MESA COUNTY PLANNING DEPARTMENT **8/30/95**
Matt Osborn **244-1724**

Site appears to have too much parking and not enough landscaping. The site should be modified to move the buildings to the front with parking in the rear. In doing so, there will be easier access for customers visiting the building pads along the highway and the remaining stores without having to drive.

TO DATE, NO COMMENTS RECEIVED FROM:

City Property Agent		
Mesa County Building Department	U.S. West	
Corps of Engineers	Persigo Wastewater Treatment Facility	revised 9/5/95

RESPONSE TO REVIEW COMMENTS

August 23, 1995

Title: RIMROCK MARKET PLACE, Revised Conditional Use Permit

File No: CUP-95-137

Location: 2523 Highway 6 and 50

The following agency comments were informational in nature, or do not require a response:

BUILDING DEPARTMENT
GRAND VALLEY RURAL POWER
UTE WATER
COLORADO DEPT. OF TRANSPORTATION

RESPONSE TO FIRE DEPARTMENT:
The final construction plans will include looping as suggested by the department.

RESPONSE TO GRAND JUNCTION DRAINAGE DIST.:
The final construction plans will incorporate the district's construction specification for the piping of the existing open drain. A final plat will be prepared which will dedicate a permanent drainage easement to the district. The final drainage study will be provided for the district's review in conjunction with the submission of the final construction plans.

RESPONSE TO POLICE DEPT.:
The site plan has been modified to avoid confusion with the traffic flows at the main entrance and at the northwest corner of the property. A six foot chain link fence will be constructed along the site's southerly boundary. A minimum of 0.5 candlepower lighting will be located along the entire length at the rear of the buildings.

RESPONSE TO UTILITY ENGINEER:
The Utility Plan has been revised to clarify the intent of the routing of the sewer and water mains. Tentative easements have also been added to the plan. A final plat will be prepared and submitted for review showing the exact location of all easements and rights-of-way.

RESPONSE TO DEVELOPMENT ENGINEER:

Traffic Study

1. The site plan has been modified to eliminate the extension of Independent Avenue to the proposed relocated frontage road.

2. Based on the modified site plan, the intersection of the frontage and main access will be a controlled three way stop intersection

3. The proposal calls for the extension of the frontage easterly to Mulberry Avenue. The frontage road will be constructed to a three lane width across the Rimrock Market Place property tapering to a two lane section between the site and Mulberry Avenue.

Site Plan

The eight comments by the department have been incorporated into the modified site plan.

Drainage

The preliminary drainage analysis indicates that the culverts under the railroad and River Road have sufficient capacity to convey the increased storm water run off. There is not a recorded drainage easement for any of the existing drainage channel which crosses the site or between River Road and the Colorado River. However, the Grand Junction Drainage District does have access to the drain since they historically have maintained the channel for it entire length.

RESPONSE TO COMMUNITY DEVELOPMENT:

1. Guidelines for signage at Rimrock Marketplace are attached.

2. A updated appraisal will be transmitted to the department under separate cover.

3. A Land Use Summary has been added to the site plan.

4. The site plan has been modified to reflect the revisions requested by the department for site circulation.

5. Access points to the pad sites are shown on the modified site plan.

STAFF REVIEW

FILE: #CUP 95-137

DATE: August 30, 1995

REQUEST: Conditional Use Permit - Rimrock Marketplace Retail Center

LOCATION: SW corner 25 1/2 Road & Hwy. 6 & 50

APPLICANT: High Plains Land Company
10955 Lowell
Overland Park, KS 66210

EXISTING LAND USE: Vacant/retail

PROPOSED LAND USE: Retail center

SURROUNDING LAND USE:

NORTH:	Commercial (Sam's Club)
SOUTH:	Railroad
EAST:	Vacant
WEST:	Commercial (Various)

EXISTING ZONING: C-1 & C-2

PROPOSED ZONING: No Change

SURROUNDING ZONING:

NORTH:	C-2
SOUTH:	I-1 (County Zoning)
EAST:	C-1
WEST:	C-2

RELATIONSHIP TO COMPREHENSIVE PLAN:

No comprehensive plan exists for the area.

STAFF ANALYSIS:

The staff analysis is divided into three sections: (1) an overview of the proposal; (2) planning analysis of conditional use permit criteria and (3) staff findings and recommendations:

The Development Proposal

High Plains Land Company is requesting Conditional Use approval of an approximately 370,000 square foot retail center plus additional "pad site" development on an approximately 44.6 acre parcel on Highway 6&50 just west of 25/1/2 and directly south of Sam's Club.

The staff has been working with the petitioner from the early stages of the proposal to develop the site development and circulation layouts which are illustrated on the attached preliminary site development plan. The site development and access plans will be further refined to meet applicable code and review agency requirements and requires Site Plan Review prior to issuance of a Planning Clearance.

The development proposal is detailed in the petitioner's General Project Report. Briefly, access to the proposed site will be from three points, two along Hwy 6&50 and one from a proposed extension to the frontage road to be constructed from the vicinity of Gene Taylor's to the subject site. The major retail users will be located to the rear of the parcel. Smaller "pad" users will be located on sites which are generally to the north of the proposed relocated frontage road and will have their own parking. Service access to the retail center is available to the rear of the buildings. Buildings will cover approximately 19% of the site whereas almost 53% of the site will be covered by parking and drives. Landscaping as prescribed by the Code will be provided along the frontage and in the parking lot. The relocated frontage road will be dedicated as public right-of-way.

Planning Analysis of Conditional Use Permit Criteria

Section 4-8 of the Zoning and Development Code specifies the criteria used to evaluate all uses requiring a special and conditional use permit. The proposed project falls in the use category of "major shopping center" which requires a conditional use permit in the C-1 and C-2 zoning districts. This section contains staff's evaluation of the conditional use criteria based on the proposed project.

It is important to note that a conditional use is not a use by right. In general terms, the Planning Commission must evaluate whether the use proposed can function satisfactorily at the subject site without creating significant adverse impacts on surrounding properties or public services. Staff analysis of the specific Code criteria are as follows:

1. The proposed use must be compatible with adjacent uses.

The uses proposed are compatible with those existing in the Hwy. 6&50 corridor.

2. The use shall be approved only if the design features of the site, such as service areas, pedestrian and vehicular circulation, safety provisions, accessory uses, accessways to and from the site, buffering, etc. are sufficient to protect adjacent uses.

Based on staff's review of the preliminary design, no determination can be made regarding the adequacy of the vehicular circulation design based on the revised site plan. Further traffic analysis is required to address this issue and is detailed later in the staff report. Other site design features appear to be adequate. Specific design details are required in the final site plan design and are subject to staff approval.

3. Proposed accessory uses must demonstrate that they are necessary and desirable.

No accessory uses are proposed at this time.

4. Adequate public services (e.g. sewage and waste disposal, domestic and irrigation water, gas, electricity, police and fire protection) must be available without the reduction of services to other existing uses.

The petitioner is required to accommodate the concerns of City agencies regarding sewage, waste disposal, and police and fire protection. The petitioner proposes to upgrade and provide sufficient public services and based on review agency comments on the preliminary design, City agency concerns are being met with the exception of the Utility Engineer's concerns detailed later in the staff report.

5. Other uses complimentary to, and supportive of, the proposed project shall be available including schools, parks, hospitals, business and commercial facilities, transportation facilities, etc.

Availability of support facilities is good. Transportation facilities will require upgrading as detailed in the petitioner's traffic study and are subject to City and CDOT approval.

6. The use shall conform to adopted plans, policies and requirements for parking and loading, signs and all other applicable regulations of this Code.

It is staff's recommendation that the issuance of the conditional use permit be contingent upon all applicable Zoning and Development Code requirements being met in the final site plan design. The use and preliminary design as proposed appears to conform with the intent of the I-70B (Hwy. 6&50) Corridor Guidelines with regard to landscaping, circulation and drainage. The signage plan and guidelines is acceptable to staff with the conditions as noted in the next section.

Staff Recommendation

Based on staff's review of the preliminary design and supporting reports and based on the analysis of the conditional use criteria contained in the Zoning and Development Code, staff recommends

denial of the conditional use permit for Rimrock Marketplace retail center unless the following issues/items are satisfactorily addresed:

1. The traffic study provided has not been updated to reflect the change in the Site Plan which calls for the elimination of the frontage road west of the main site driveway. The petitioner must at a minimum supply an addendum to the traffic study prepared by the traffic consultant which verifies that adequate capacity is being proposed at the main site driveway to accommodate expected traffic flows based on the revised design.

2. The petitioner must supply information which is satisfactory to the Utility Engineer to demonstrate that adequate flow velocities for sanitary sewer can be obtained with the proposed sanitary sewer design.

Should the Planning Commission choose to favorably consider the subject application, staff recommends that the permit contains the following provisions:

1. The project is approved for a maximum of 370,000 square feet of retail space (not including the pad sites which will be limited in number by the ability to meet City Zoning Code requirements) to be constructed within the building envelopes identified on the attached site plan. If the proposal should exceed the size limit or the building envelopes proposed, the conditional use permit will subject to reevaluation by the Planning Commission at the discretion of City staff.

2. The project signage will be subject to the attached signage guidelines which are based on those proposed by the petitioner and modified by staff.

3. The conditional use permit approval is subject to subsequent acceptance of a site plan and subdivision which meets all Zoning and Development Code requirements and are subject to staff approval, review agency approval, and Planning Commission approval as required by Code.

4. Staff finds that the circulation improvements identified by the petitioner in the "General Project Report" and the "Traffic Impact Analysis for DHI Shopping Center" are necessary for the safe and efficient movement of vehicles to and from the site at acceptable levels of service (LOS). A condition of this approval is that the funding and construction of the identified improvements are the responsibility of the developer and that all circulation improvements are subject to review and approval by the City and CDOT and must meet all applicable requirements. Significant changes to the design and operation of the circulation network as proposed may require reevaluation of the conditional use permit by the Planning Commission at the discretion of City staff.

5. All pad site development is subject to the requirements of the Zoning and Development Code and the adopted signage guidelines for Rimrock Marketplace. Development proposals for

the pad sites require Site Plan Review.

STAFF RECOMMENDATION:

Staff recommends denail of the conditional use permit if the concerns identified in the staff report have not been addressed to Staff's satisfaction. Should approval be considered, staff recommends that conditions #1-#5 above and the signage plan be made part of the Conditional Use Permit.

RECOMMENDED PLANNING COMMISSION MOTION

Mr. Chairman, on item #CUP-95-137 I recommend that we approve the Conditional Use Permit with the conditions #1-5 and the signage plan in the staff report (STAFF RECOMMENDS DENIAL).

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STAFF REVIEW **(City Council)**

FILE: #CUP 95-137

DATE: September 28, 1995

REQUEST: Conditional Use Permit - Rimrock Marketplace Retail Center

LOCATION: SW corner 25 1/2 Road & Hwy. 6 & 50

STAFF: Michael T. Drollinger

APPLICANT: High Plains Land Company
10955 Lowell
Overland Park, KS 66210

This is an appeal of a Conditional Use Permit decision by Planning Commission. Harold Woolard, an adjoining property owner, had appealed the Planning Commission approval of the Rimrock Marketplace to the City Council based on access concerns. High Plains Land Company is requesting Conditional Use approval of an approximately 370,000 square foot retail center plus additional "pad site" development on an approximately 44.6 acre parcel on Highway 6&50 just west of 25/1/2 and directly south of Sam's Club.

EXISTING LAND USE: Vacant/retail

PROPOSED LAND USE: Retail center

SURROUNDING LAND USE:
NORTH: Commercial (Sam's Club)
SOUTH: Railroad
EAST: Vacant
WEST: Commercial (Various)

EXISTING ZONING: C-1 & C-2

PROPOSED ZONING: No Change

SURROUNDING ZONING:
NORTH: C-2
SOUTH: I-1 (County Zoning)
EAST: C-1

WEST: C-2

RELATIONSHIP TO COMPREHENSIVE PLAN:

No comprehensive plan exists for the area.

STAFF ANALYSIS:

The staff analysis is divided into three sections: (1) an overview of the proposal; (2) planning analysis of conditional use permit criteria and (3) staff findings and recommendations:

The Development Proposal

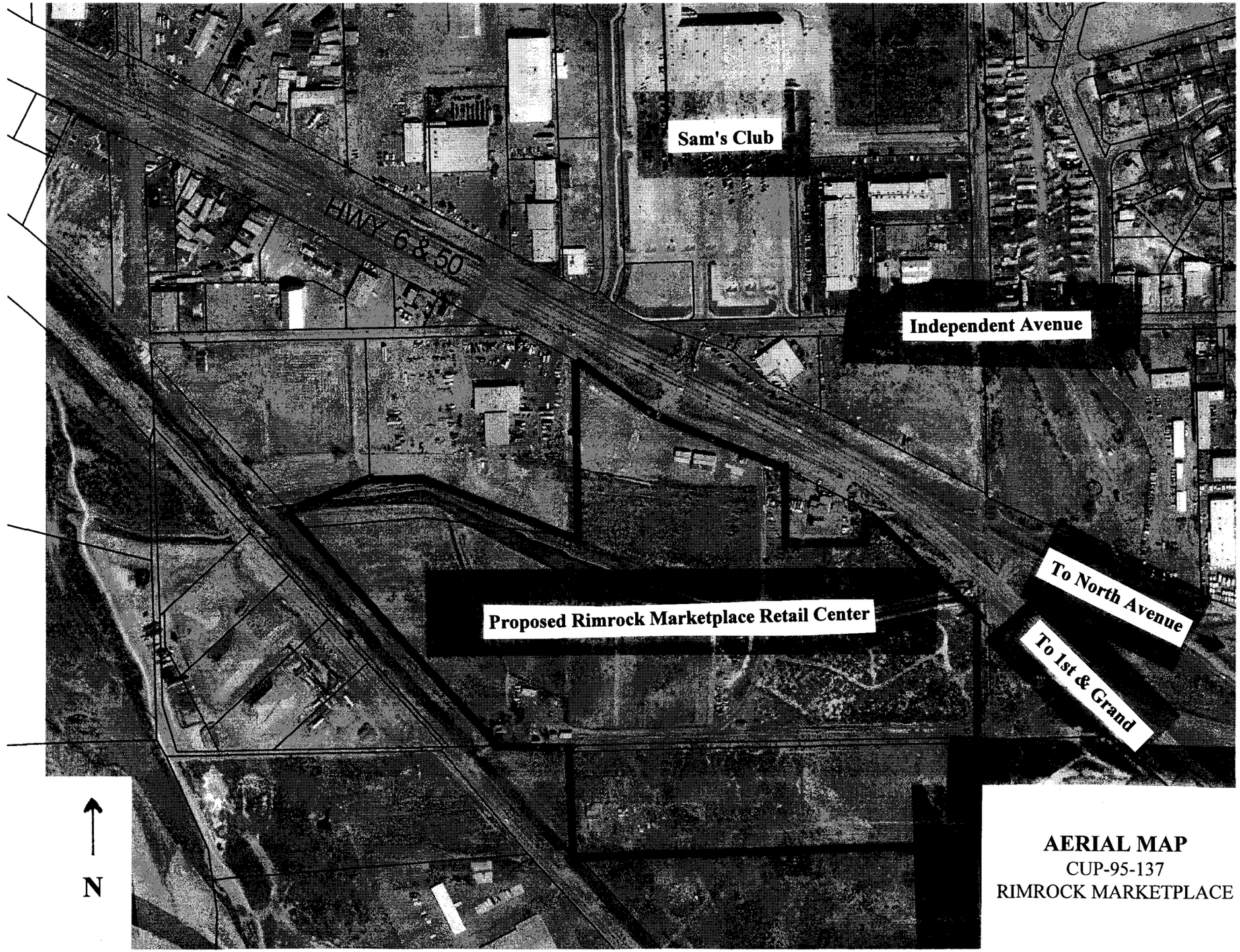
High Plains Land Company is requesting Conditional Use approval of an approximately 370,000 square foot retail center plus additional "pad site" development on an approximately 44.6 acre parcel on Highway 6&50 just west of 25/1/2 and directly south of Sam's Club.

The staff has been working with the petitioner from the early stages of the proposal to develop the site development and circulation layouts which are illustrated on the attached preliminary site development plan. The site development and access plans will be further refined to meet applicable code and review agency requirements and requires Site Plan Review prior to issuance of a Planning Clearance.

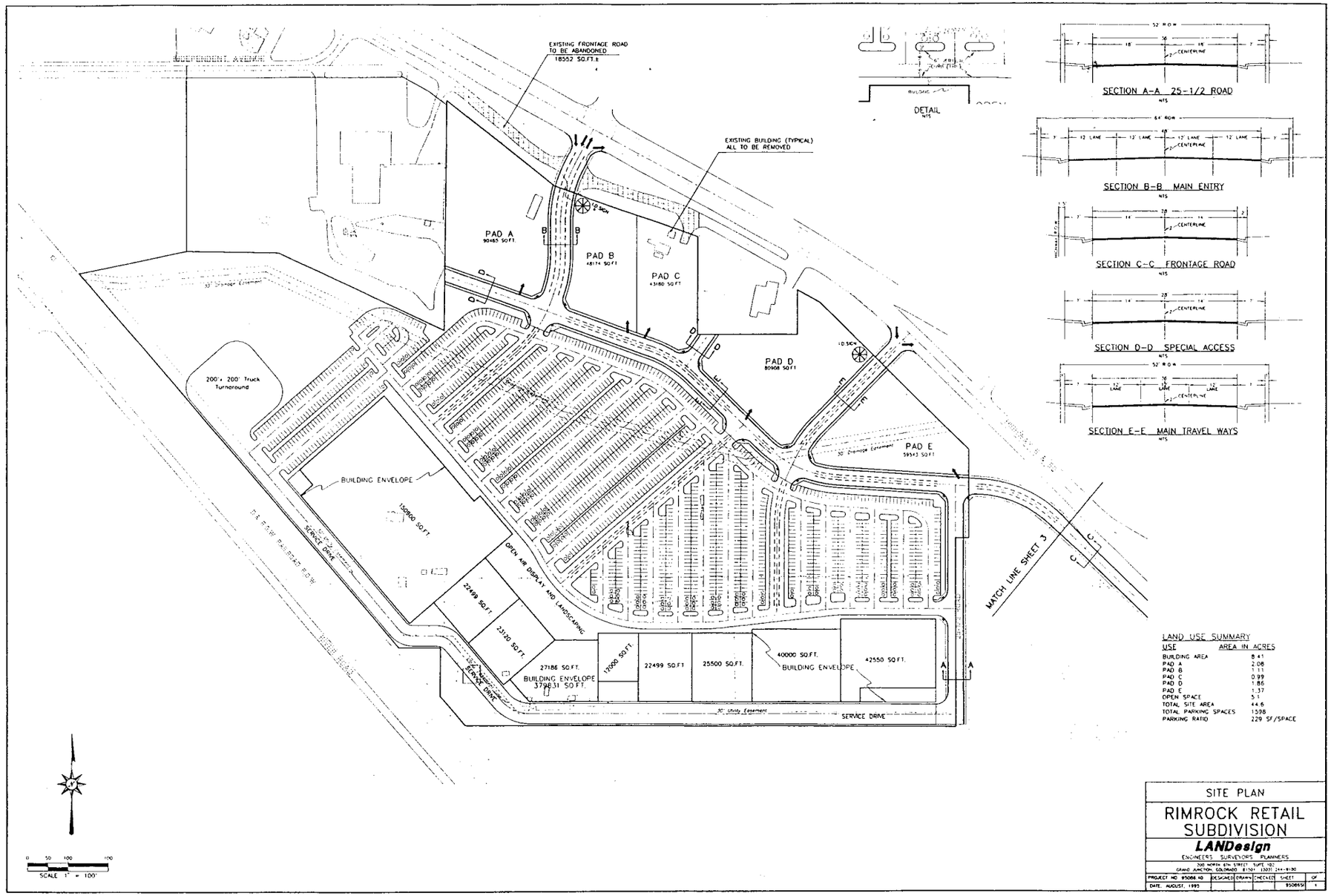
The development proposal is detailed in the petitioner's General Project Report. Briefly, access to the proposed site will be from three points, two along Hwy 6&50 and one from a proposed extension to the frontage road to be constructed from the vicinity of Gene Taylor's to the subject site. The major retail users will be located to the rear of the parcel. Smaller "pad" users will be located on sites which are generally to the north of the proposed relocated frontage road and will have their own parking. Service access to the retail center is available to the rear of the buildings. Buildings will cover approximately 19% of the site whereas almost 53% of the site will be covered by parking and drives. Landscaping as prescribed by the Code will be provided along the frontage and in the parking lot. The relocated frontage road will be dedicated as public right-of-way.

Planning Analysis of Conditional Use Permit Criteria

Section 4-8 of the Zoning and Development Code specifies the criteria used to evaluate all uses requiring a special and conditional use permit. The proposed project falls in the use category of "major shopping center" which requires a conditional use permit in the C-1 and C-2 zoning districts. This section contains staff's evaluation of the conditional use criteria based on the proposed project.



AERIAL MAP
CUP-95-137
RIMROCK MARKETPLACE



LAND USE SUMMARY

USE	AREA IN ACRES
BUILDING AREA	8.41
PAD A	2.08
PAD B	1.11
PAD C	0.99
PAD D	1.86
PAD E	1.37
OPEN SPACE	5.1
TOTAL SITE AREA	44.6
TOTAL PARKING SPACES	1598
PARKING RATIO	229 SF/SPACE

SITE PLAN

RIMROCK RETAIL SUBDIVISION

LANDesign
ENGINEERS SURVEYORS PLANNERS
200 NORTH 6TH STREET, SUITE 102
GRAND JUNCTION, COLORADO 81501 (303) 244-8130

PROJECT NO 95086.10	DESIGNED	DRAWN	CHECKED	SHEET	OF
DATE AUGUST, 1995				950865	1

It is important to note that a conditional use is not a use by right. In general terms, the Planning Commission must evaluate whether the use proposed can function satisfactorily at the subject site without creating significant adverse impacts on surrounding properties or public services. Staff analysis of the specific Code criteria are as follows:

1. The proposed use must be compatible with adjacent uses.

The uses proposed are compatible with those existing in the Hwy. 6&50 corridor.

2. The use shall be approved only if the design features of the site, such as service areas, pedestrian and vehicular circulation, safety provisions, accessory uses, accessways to and from the site, buffering, etc. are sufficient to protect adjacent uses.

Based on staff's review of the preliminary design, no determination can be made regarding the adequacy of the vehicular circulation design based on the revised site plan. Further traffic analysis is required to address this issue and is detailed later in the staff report. Other site design features appear to be adequate. Specific design details are required in the final site plan design and are subject to staff approval.

3. Proposed accessory uses must demonstrate that they are necessary and desirable.

No accessory uses are proposed at this time.

4. Adequate public services (e.g. sewage and waste disposal, domestic and irrigation water, gas, electricity, police and fire protection) must be available without the reduction of services to other existing uses.

The petitioner is required to accommodate the concerns of City agencies regarding sewage, waste disposal, and police and fire protection. The petitioner proposes to upgrade and provide sufficient public services and based on review agency comments on the preliminary design, City agency concerns are being met with the exception of the Utility Engineer's concerns detailed later in the staff report.

5. Other uses complimentary to, and supportive of, the proposed project shall be available including schools, parks, hospitals, business and commercial facilities, transportation facilities, etc.

Availability of support facilities is good. Transportation facilities will require upgrading as detailed in the petitioner's traffic study and are subject to City and CDOT approval.

6. The use shall conform to adopted plans, policies and requirements for parking and loading, signs and all other applicable regulations of this Code.

It is staff's recommendation that the issuance of the conditional use permit be contingent upon all

applicable Zoning and Development Code requirements being met in the final site plan design. The use and preliminary design as proposed appears to conform with the intent of the I-70B (Hwy. 6&50) Corridor Guidelines with regard to landscaping, circulation and drainage. The signage plan and guidelines is acceptable to staff with the conditions as noted in the next section.

Staff Recommendation

Should the City Council choose to favorably consider the subject application, staff recommends that the permit contains the following provisions:

1. The project is approved for a maximum of 370,000 square feet of retail space (not including the pad sites which will be limited in number by the ability to meet City Zoning Code requirements) to be constructed within the building envelopes identified on the attached site plan. If the proposal should exceed the size limit or the building envelopes proposed, the conditional use permit will subject to reevaluation by the Planning Commission at the discretion of City staff.

2. The project signage will be subject to the attached signage guidelines which are based on those proposed by the petitioner and modified by staff.

3. The conditional use permit approval is subject to subsequent acceptance of a site plan and subdivision which meets all Zoning and Development Code requirements and are subject to staff approval, review agency approval, and Planning Commission approval as required by Code.

4. Staff finds that the circulation improvements identified by the petitioner in the "General Project Report" and the "Traffic Impact Analysis for DHI Shopping Center" are necessary for the safe and efficient movement of vehicles to and from the site at acceptable levels of service (LOS). A condition of this approval is that the funding and construction of the identified improvements are the responsibility of the developer and that all circulation improvements are subject to review and approval by the City and CDOT and must meet all applicable requirements. Significant changes to the design and operation of the circulation network as proposed may require reevaluation of the conditional use permit by the Planning Commission at the discretion of City staff.

5. All pad site development is subject to the requirements of the Zoning and Development Code and the adopted signage guidelines for Rimrock Marketplace. Development proposals for the pad sites require Site Plan Review.

STAFF RECOMMENDATION:

Staff recommends approval of the Conditional Use Permit with conditions #1-#5 above and the signage plan.

PLANNING COMMISSION RECOMMENDATION

At their September 3, 1995 meeting the Planning Commission approved the Conditional Use Permit with the conditions #1-#5 in the staff report 4-2.

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Grand Junction Community Development Department
Planning • Zoning • Code Enforcement
250 North Fifth Street
Grand Junction, Colorado 81501-2668
(970) 244-1430 FAX (970) 244-1599

January 24, 1996

John Rubenstein
Rubenstein Real Estate Company, LC
4350 Shawnee Mission Parkway
Suite 159
Shawnee Mission, KS 66205

Dear Mr. Rubenstein:

This letter is a follow-up to our recent conversation regarding the Rimrock Marketplace development. As you know, the Conditional Use permit for the project is valid until October 4, 1996. The next step in the development of the project is to submit a preliminary major subdivision application to create the pad sites and dedicate the required street right-of-way. The phasing and timing of improvements will also be determined at the preliminary subdivision stage. The actual platting of the phases or filings will take place at final subdivision. The development of improvements (buildings, parking, etc.) on the site will require site plan review. Development of some types of pad site uses may require a special or conditional use permit.

You had also indicated to me that you may want to remove some structures, clean up some contamination, and possibly do some preliminary site grading prior to submitting for the subdivision review. Depending on the extent of proposed site work, City review may be required and you are advised to contact our office prior to commencement of any work.

I hope that this summary is of use to you. If you have any questions or require further explanation of any items please do not hesitate to contact me.

Sincerely yours,

Michael T. Drollinger
Senior Planner

cc: File #CUP-95-137

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PRELIMINARY MASTER DRAINAGE STUDY

FOR

RIMROCK MARKETPLACE SHOPPING CENTER

February, 1994

Prepared For:

High Plains Land Company
10955 Lowell
Overland Park, KS 66210

Prepared By:

LANDesign LTD.
200 North 6th. Street, Suite 102
Grand Junction, Colorado 81501
(303) 245-4099

Prepared By: _____
Monty D. Stroup

"I hereby certify that this Preliminary Master Drainage Study for Country Crossing Subdivision was prepared under my direct supervision."

Reviewed By: _____
Philip M. Hart, P.E.
State of Colorado, #19346

I. General Location and Description

A. Site and Major Basin Location:

The Rimrock Marketplace Shopping Center property contains approximately 52 acres. The project is located in the City of Grand Junction, State of Colorado, more particularly in sections 10 and 15 Township 1 South, Range 1 West of the Ute Meridian. Streets in the vicinity include 6 and 50 Road running northwest and southeast and Independent Avenue which runs east and west.

Development in the vicinity and surrounding the site is commercial in nature. To the south and land included in this site has been agricultural. To the west and east is commercial properties. Across 6 and 50 Road is a Sams Club and a used car dealership. See Exhibit 1

The major drainage offsite is the Ligrani Drainage from the east. This site contains the outfall of the drainage basin.

B. Site and Major Basin Description:

The proposed project site contains approximately 52 acres and is planned for a single developed commercial site. The site contains some existing structures which will be removed during construction of this project. The major drainage basin from offsite, the Ligrani Drainage, enters the site from the east and is conveyed across the site in a ditch. This drainage will be placed in conduit along with the developed drainage.

Based on the "Soil Survey, Grand Junction Area" (Exhibit 2.0) on and off-site soils are defined as (Gm), Green River very fine sandy loam, 0 to 2 percent slopes, hydrological soil group "B" (90% of the site) and (Gl), Green River silty clay loam deep over gravel, 0 to 2 percent slopes, hydrological soils group "B" (10% of the site).

II. Existing Drainage Conditions

A. Major Basin:

The major off site contributory basin is the ligrani drainage. This site is concentrated in a conduit which crosses 6 and 50 Road near the east side of the site. Other off site flows are from the southeast and enter the site on the south boundary.

A site inspection reveals various types of plant life indigenous to agricultural and fallow land.

The subject site is within the Effective Floodplain and is classified as Zone "X" as determined by the FIRM Flood Insurance Rate Map (Reference 6, Exhibit 4.0).

B. Site:

Historically the property drains in a sheet flow fashion from the east to the west at slopes of 0.7 to 1.2 percent towards 25 Road. At the west side of the site it is conveyed via a 84 inch culvert under the Denver and Rio Grand Western Rail Road and River Road. It then is directed to the Colorado River via a ditch

III. Proposed Drainage Conditions

A. Changes in Drainage Patterns:

Ligrani Drainage:

The Ligrani Drainage will be conveyed across the site in conduit as opposed to the current ditch. The conduit will be sized to convey the 100 year storm.

Offsite Drainage from the SE:

Offsite Drainage from the SE will be conveyed by ditch along the railroad to the current site drainage at the west side of the site.

Site Drainage:

Site drainage will be directed to the conduit containing the ligrani Drainage and conveyed off site by the current conduit configuration under the DRGW Railroad.

Maintenance Issues:

Access to and through the site shall be by dedicated easement.

Ownership and responsibility for maintenance of proposed drainage areas shall be that of the Rimrock Marketplace ownership.

IV. Design Criteria & Approach

A. Hydrology:

The "Stormwater Management Manual, (SWMM), Public Works Department, City of Grand Junction, Co., June 1994" (Reference 1) and the "Mesa County Storm Drainage Criteria Manual" (Reference 2) shall be used as the basis for analysis and facility design.

B. Study Methodology:

Precipitation Method

The Rational method will be used to determine runoff. The 100 Year Synthetic Storm will be simulated based on rainfall (DDF) Depth-Duration-Frequency data for the Grand Junction Urbanized, Area (Table 403a, Reference 2). All site drainage facilities shall be designed to convey the 100 year storm, therefor the 2 year storm event will not be analyzed.

Loss Rate Method:

The effects of interception and infiltration will be analyzed using the Rational Method.

Runoff Transformation Method:

Based on watershed geometry the Rational method is to be used.

Element Application:

Each sub-basin is to be analyzed using 3 elements, overland flow, shallow concentrated flow and channel flow. Travel times (Tt) for each of these elements were calculated individually and combined to define the Time of Concentration (Tc) for each sub-basin. The Lag Time (TLAG) for each basin will be calculated based on the relationship of TLAG = 0.6 * Tc as defined in Reference 9.

C. Hydraulics:

All site facilities and conveyance elements shall be designed in accordance with the City of Grand Junction guidelines as provided in Reference 1.

This Preliminary Master Drainage Study has been prepared to address site specific drainage concerns in accordance with the requirements of the City of Grand Junction, Colorado. The Appendix of this report includes criteria, exhibits, tables and design nomographs to be used in the Final Drainage Study.

D. Stormwater Permit:

The issue of a stormwater permit has been discussed with the Colorado Department of Health. See Exhibit 3.

NOTHING
ON
PAGE 6

V. References:

1. Stormwater Management Manual, (SWMM), Public Works Department, City of Grand Junction, Co., June 1994.

2. Mesa County Storm Drainage Criteria Manual, Final Draft, Mesa County, Colorado, March, 1992.

3. Flood Hazard Information, Colorado River and Tributaries, Grand Junction, Colorado, prepared for the City of Grand Junction and Mesa County, by The Department Of The Army, Sacramento District, Corps Of Engineers, Sacramento, California, November, 1976.

4. Flood Insurance Study, City of Grand Junction, Colorado, Mesa County, Community Number 080117, Federal Emergency Management Agency, Revised July 15th, 1992.

5. Flood Insurance Study, Mesa County, Colorado (Unincorporated Areas), Community Number 080115, Federal Emergency Management Agency, Revised July 15th, 1992.

6. Flood Insurance Rate Map, City of Grand Junction, Colorado, Mesa County, Community-Panel Number 080117 0006 E, Federal Emergency Management Agency, Map Revised July 15th, 1992.

7. Flood Insurance Rate Map, Mesa County, Colorado, (Unincorporated Areas), Community Panel Number 080115 0460 B, Federal Emergency Management Agency, Map Revised July 15th, 1992.

8. Soil Survey, Grand Junction Area, Colorado, Series 1940, No. 19, U.S. Department of Agriculture, issued November, 1955.

APPENDIX

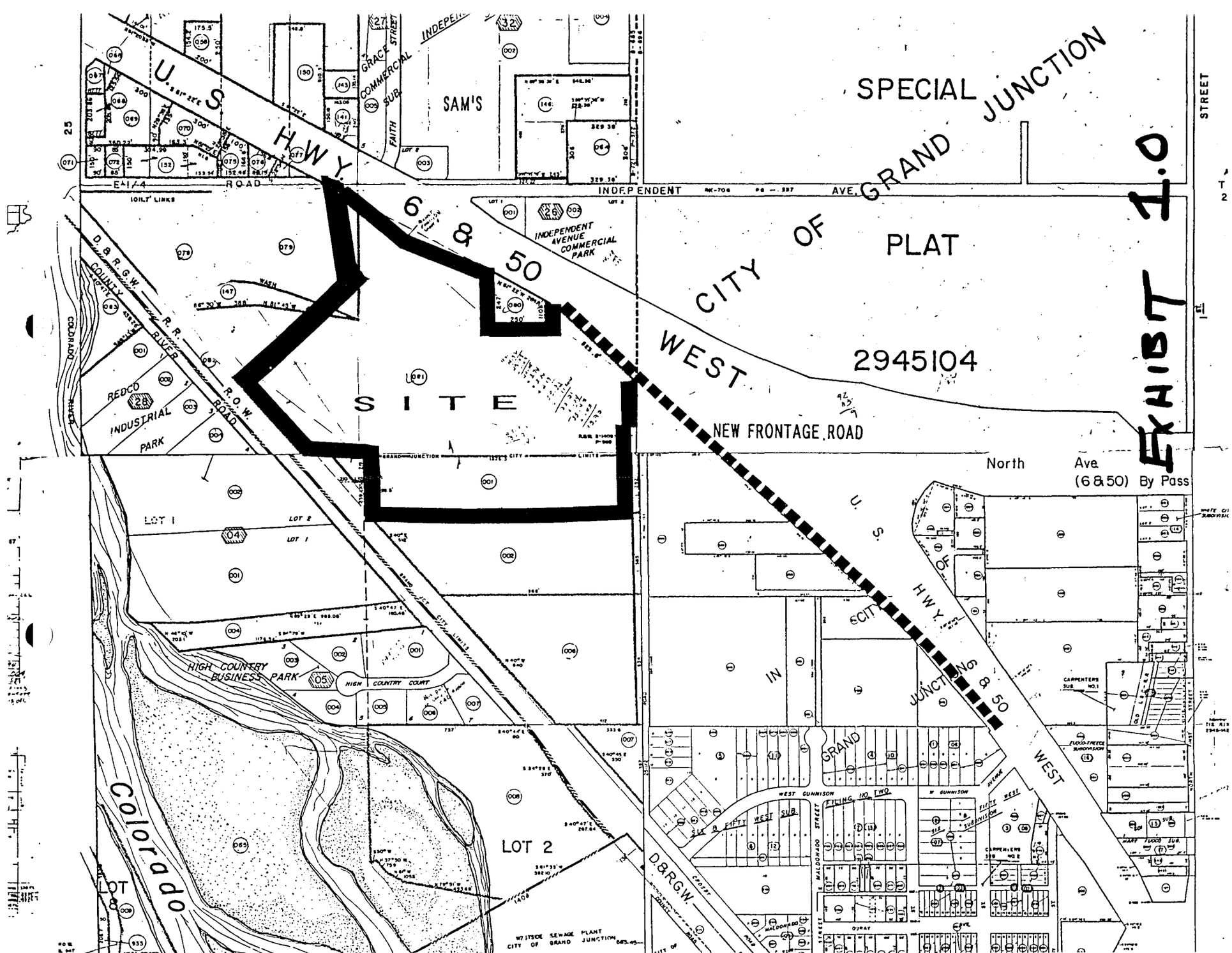
EXHIBIT 1.0
SPECIAL JUNCTION
CITY OF GRAND JUNCTION
PLAT
2945104
SITE
6 & 50
U.S. HWY.
INDEPENDENT AVE.
NEW FRONTAGE ROAD
North Ave (6 & 50) By Pass
WEST
D&RGW
COLORADO RIVER
REDCO INDUSTRIAL PARK
HIGH COUNTRY BUSINESS PARK
INDEPENDENT AVENUE COMMERCIAL PARK
SAM'S
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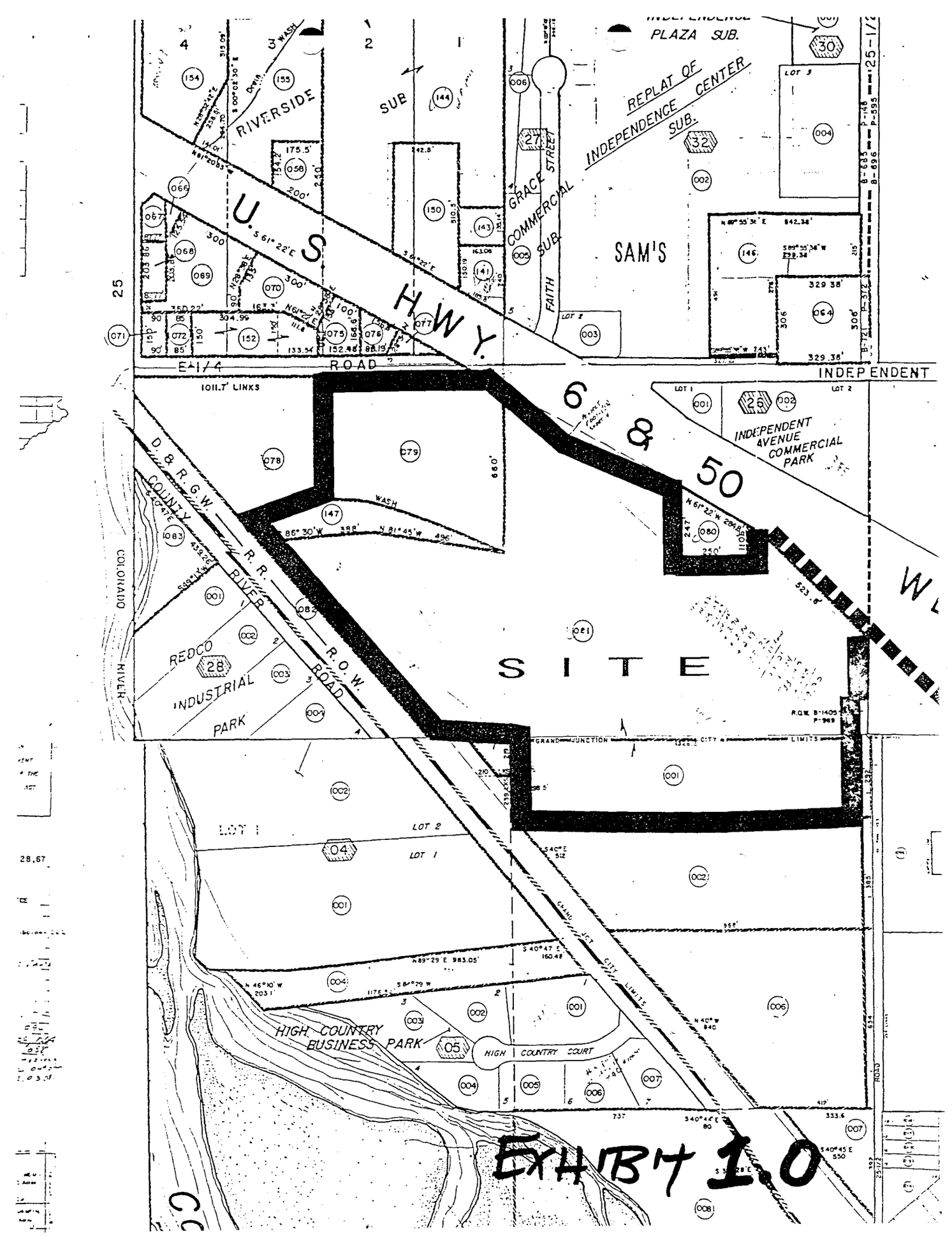
PLAZA SUB.
REPLAT OF INDEPENDENCE CENTER SUB.
RIVERSIDE SUB
GRACE STREET
COMMERCIAL SUB
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SAM'S
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INDEPENDENT
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COUNTY ROAD
RIVER
R.O.W.
WASH
COLORADO RIVER
REDCO INDUSTRIAL PARK
SITE
GRAND JUNCTION CITY LIMITS
HIGH COUNTRY BUSINESS PARK
HIGH COUNTRY COURT
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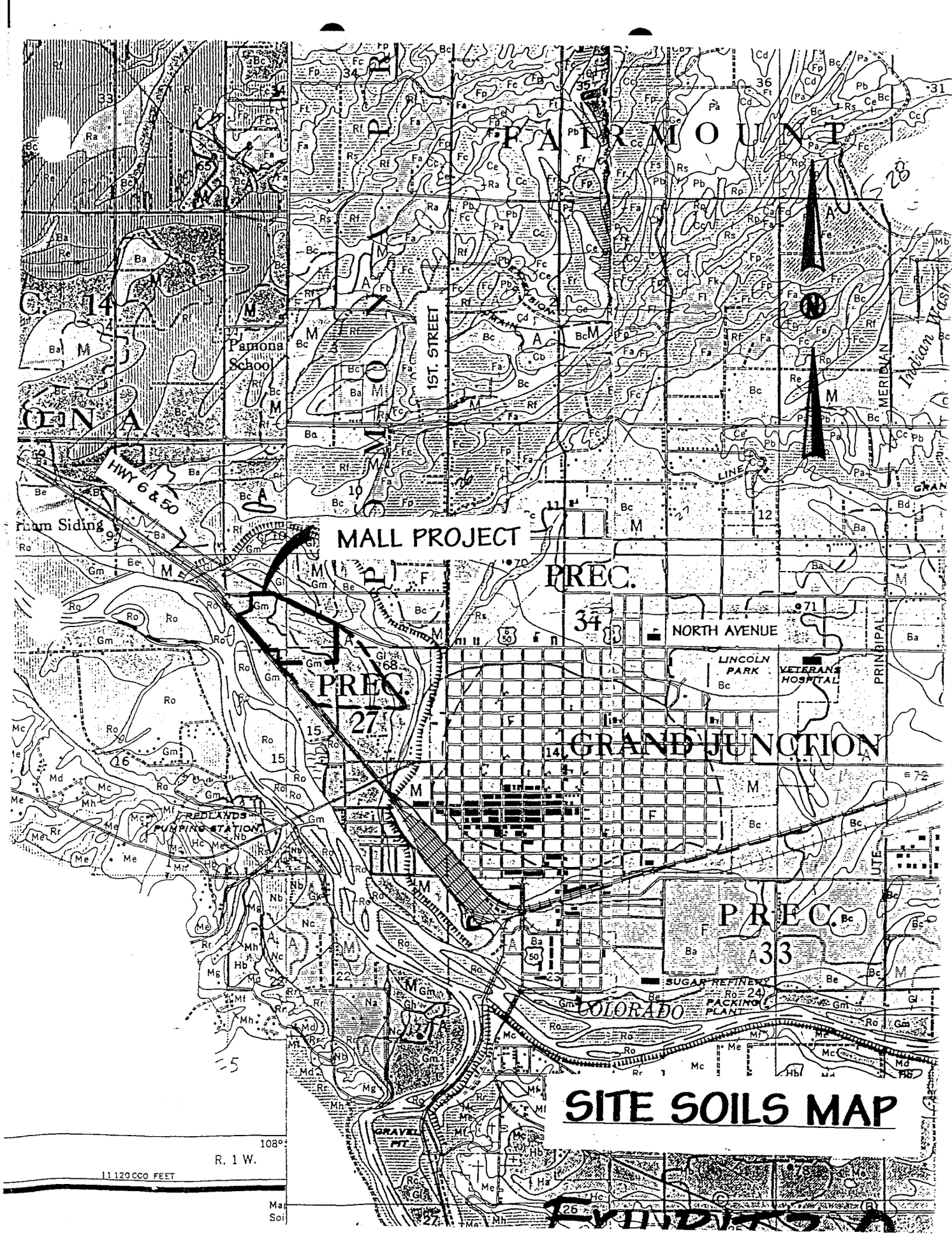
LOT 2
EXHIBIT 1.0


MALL PROJECT
SITE SOILS MAP
GRAND JUNCTION
PATTERSON
1ST. STREET
HWY 6 & 50
NORTH AVENUE
LINCOLN PARK
VETERANS HOSPITAL
PRINCIPAL
REDLANDS PUMPING STATION
SUGAR REFINERY
PACKING PLANT
COLORADO
Pamona School
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PREC. 34
PREC. 33
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LANDesign, LLC.

200 North 6th Street · Suite102 · Grand Junction · Colorado 81501 · 303-245-4099

February 2, 1995

Colorado Department of Health
Water Quality Control Division
WQCD-PE-B2
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530

Attention: Permits and Enforcement Section, Ms. Kathy Dolan.

Re: New Shopping Center, Grand Junction, Colorado

Dear Ms. Dolan:

This letter is to follow up on our telephone conversation of today regarding the appropriate Stormwater Discharge Permits which will be required for a proposed 50 Acre Shopping Center located west of Grand Junction.

As shown on the enclosed map, the subject property is located southeast of US Hwy 6 & 50 at the lower end of a large urban watershed which is tributary to the Colorado River via the "Ligrani Drain". The Ligrani Drain bisects the project site flowing from the northeast to the southwest and discharges directly to the Colorado River. This drain is currently an open channel which is proposed to be piped under ground to facilitate the construction of the parking lots.

This project contains approximately 50 Acres and is planned for a variety of high volume retail sales outlets. Plans call for the construction of three separate building structures, associated asphalt parking area, access roads and a utility infrastructure to include water, sanitary sewer and dry utilities (see enclosure).

Stormwater runoff from the site including roofs and the asphalt parking lot will be routed unabated to the "Ligrani Drain" and subsequently southwest directly to the Colorado River.

Based on our review of the "Colorado Stormwater Program - Fact Sheet" and points of clarification by yourself we understand that following:

Item 1. Since the project site is in excess of 5.0 acres a permit for "Stormwater Discharges Associated With Construction Activity" will be required.

Item 2. Since the proposed land use is "Retail Sales" the project is exempt from the current permit requirements and will not be required to obtain a "Colorado Stormwater General Permit".

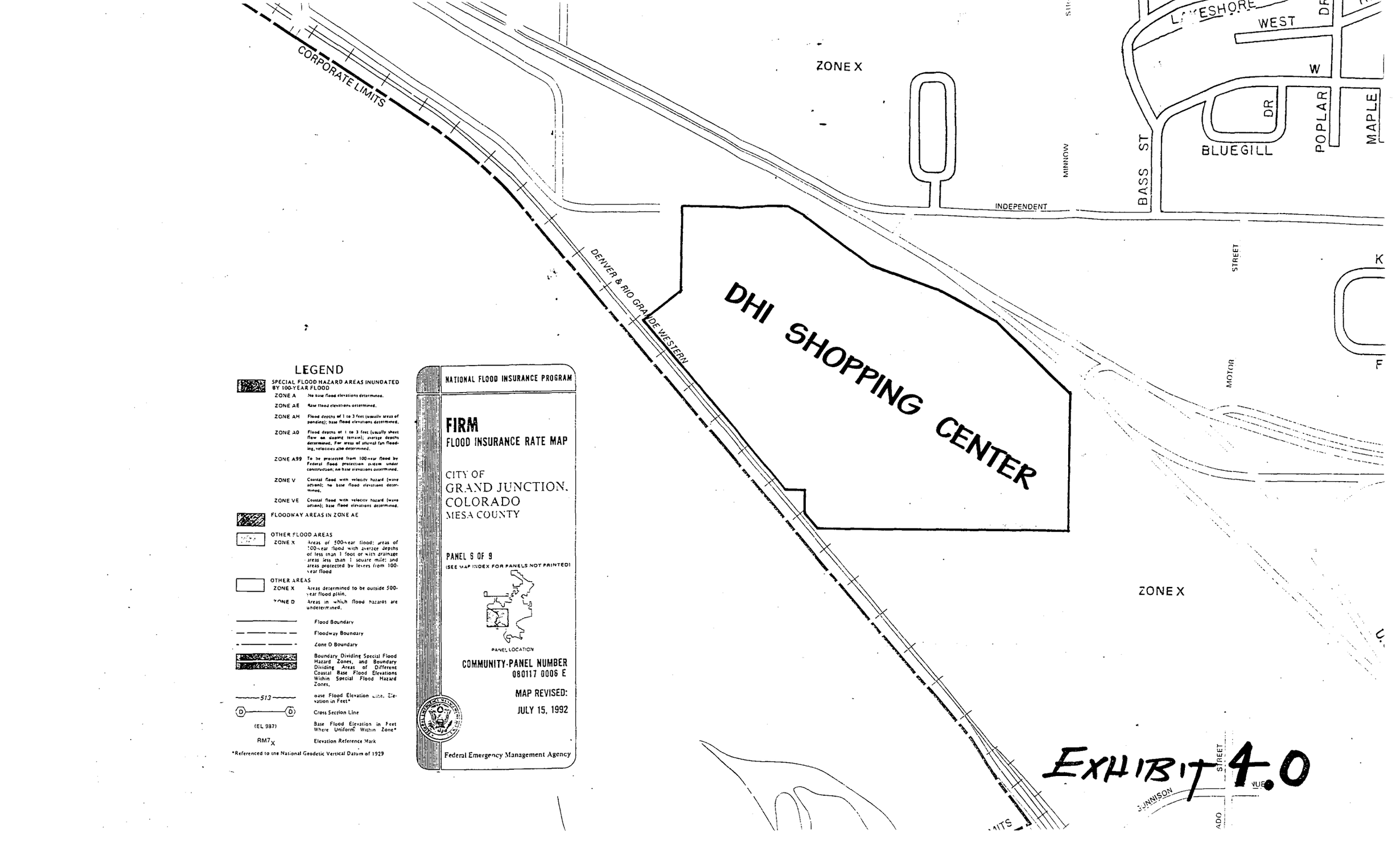
At this time we are requesting a letter from your agency to verifying that these assumptions are correct..

Sincerely

Monty D. Stroup

Monty D. Stroup

EXHIBIT 3.0


CORPORATE LIMITS
ZONE X
INDEPENDENT
DENVER & RIO GRANDE WESTERN
DHI SHOPPING CENTER
ZONE X
LAKESHORE
WEST
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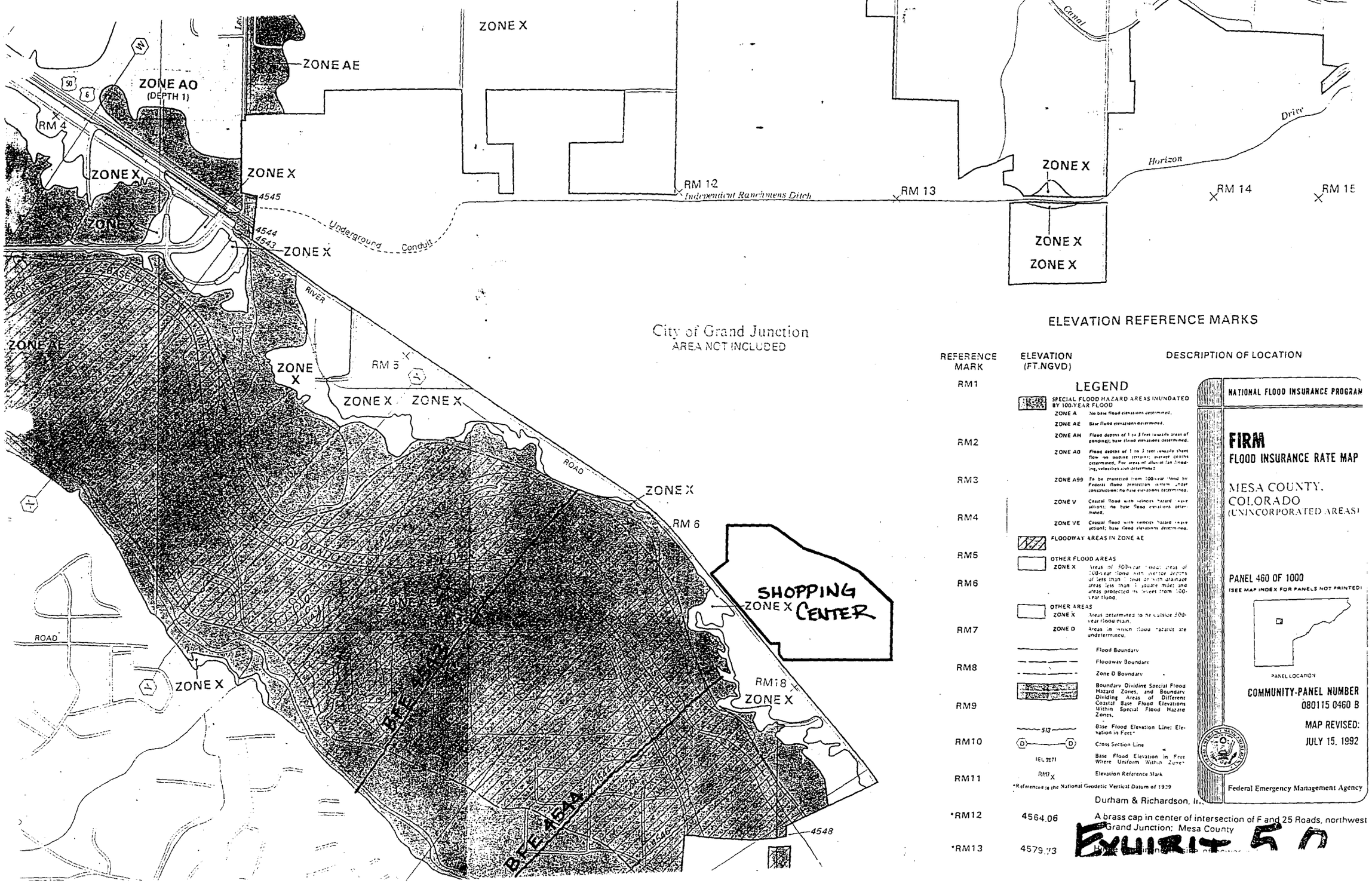
DR
POPLAR
MAPLE
BLUEGILL
BASS ST
MINNOW
STREET
MOTOR
K
F
GUNNISON
STREET
LEGEND
SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD
ZONE A No base flood elevations determined.
ZONE AE Base flood elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.
ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.
FLOODWAY AREAS IN ZONE AE
OTHER FLOOD AREAS
ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood
OTHER AREAS
ZONE X Areas determined to be outside 500-year flood plain.
ZONE D Areas in which flood hazards are undetermined.
Flood Boundary
Floodway Boundary
Zone D Boundary
Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
513 Base Flood Elevation Line; Elevation in Feet*
Cross Section Line
(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone*
RM7X Elevation Reference Mark
*Referenced to the National Geodetic Vertical Datum of 1929
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CITY OF
GRAND JUNCTION,
COLORADO
MESA COUNTY
PANEL 6 OF 9
(SEE MAP INDEX FOR PANELS NOT PRINTED)
PANEL LOCATION
COMMUNITY-PANEL NUMBER
080117 0006 E
MAP REVISED:
JULY 15, 1992
Federal Emergency Management Agency

EXHIBIT 4.0



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT.NGVD)	DESCRIPTION OF LOCATION
RM1		
RM2		
RM3		
RM4		
RM5		
RM6		
RM7		
RM8		
RM9		
RM10		
RM11		
*RM12	4564.06	A brass cap in center of intersection of F and 25 Roads, northwest
*RM13	4579.73	

*Referenced to the National Geodetic Vertical Datum of 1929

Durham & Richardson, In

Grand Junction; Mesa County

House

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD
- ZONE A — No base flood elevations determined.
- ZONE AE — Base flood elevations determined.
- ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE A99 — To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
- ZONE V — Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- ZONE VE — Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS
- ZONE X — Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS
- ZONE X — Areas determined to be outside 500-year flood plain.
- ZONE D — Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet*

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone*

RM7 X — Elevation Reference Mark

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MESA COUNTY, COLORADO (UNINCORPORATED AREAS)

PANEL 460 OF 1000
(SEE MAP INDEX FOR PANELS NOT PRINTED)

PANEL LOCATION

COMMUNITY-PANEL NUMBER
080115 0460 B

MAP REVISED:
JULY 15, 1992

Federal Emergency Management Agency

EXHIBIT 5 D

MESA COUNTY
STORM DRAINAGE CRITERIAL MANUAL | FIGURE 401c

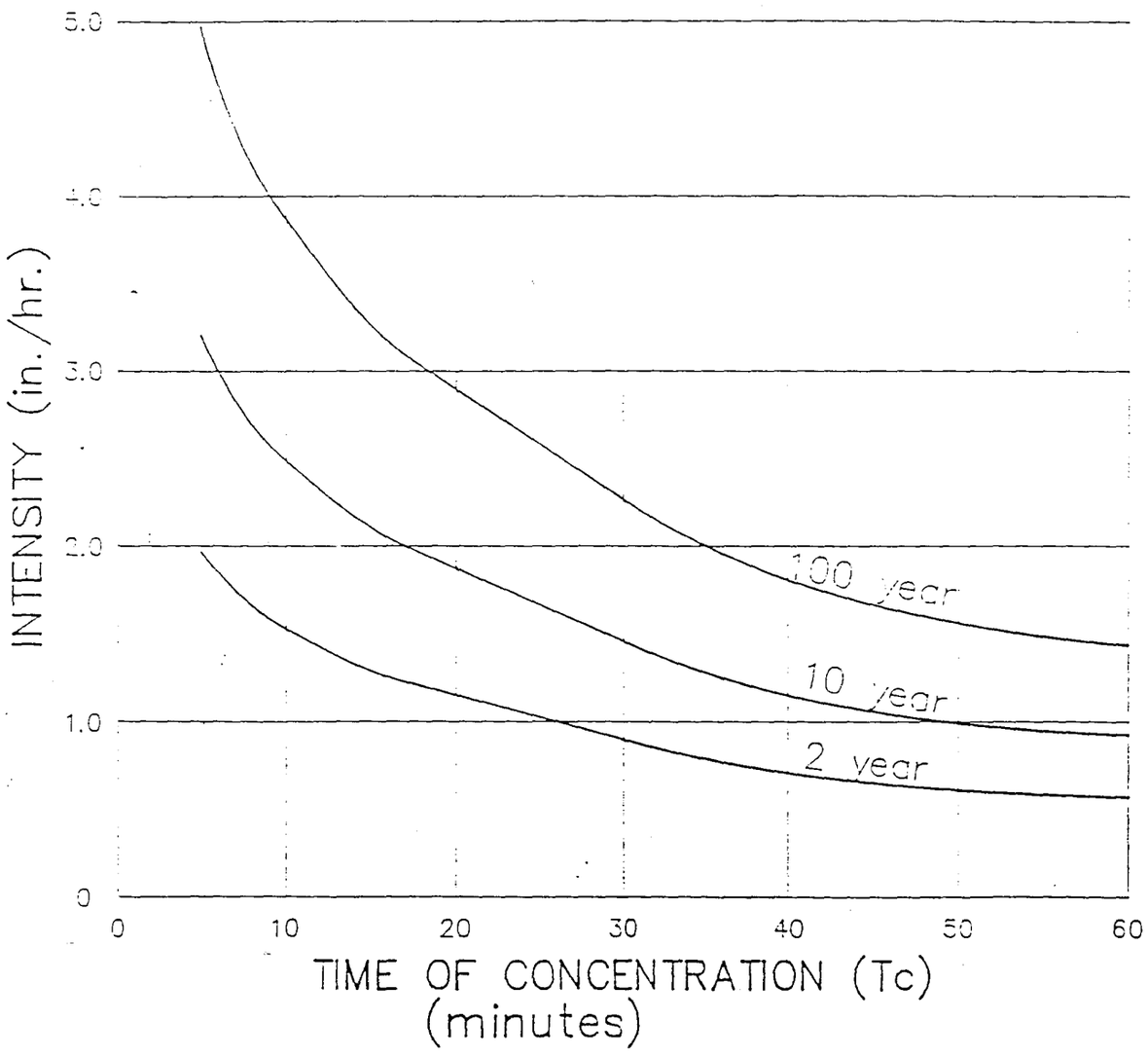


EXHIBIT 6.0

TABLE "A-1"
INTENSITY-DURATION-FREQUENCY (IDF) TABLE

Time (min)	2-Year Intensity (in/hr)	100-Year Intensity (in/hr)	Time (min)	2-Year Intensity (in/hr)	100-Year Intensity (in/hr)
5	1.95	4.95	33	0.83	2.15
6	1.83	4.65	34	0.82	2.12
7	1.74	4.40	35	0.81	2.09
8	1.66	4.19	36	0.80	2.06
9	1.59	3.99	37	0.79	2.03
10	1.52	3.80	38	0.78	2.00
11	1.46	3.66	39	0.77	1.97
12	1.41	3.54	40	0.76	1.94
13	1.36	3.43	41	0.75	1.91
14	1.32	3.33	42	0.74	1.88
15	1.28	3.24	43	0.73	1.85
16	1.24	3.15	44	0.72	1.82
17	1.21	3.07	45	0.71	1.79
18	1.17	2.99	46	0.70	1.76
19	1.14	2.91	47	0.69	1.73
20	1.11	2.84	48	0.68	1.70
21	1.08	2.77	49	0.67	1.67
22	1.05	2.70	50	0.66	1.64
23	1.02	2.63	51	0.65	1.61
24	1.00	2.57	52	0.64	1.59
25	0.98	2.51	53	0.63	1.57
26	0.96	2.46	54	0.62	1.55
27	0.94	2.41	55	0.61	1.53
28	0.92	2.36	56	0.60	1.51
29	0.90	2.31	57	0.59	1.49
30	0.88	2.27	58	0.58	1.47
31	0.86	2.23	59	0.57	1.45
32	0.84	2.19	60	0.56	1.43

Source: Mesa County 1991

Exhibit 7A

JUNE 1994

LAND USE OR SURFACE CHARACTERISTICS	SCS HYDROLOGIC SOIL GROUP (SEE APPENDIX "C" FOR DESCRIPTIONS)											
	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
UNDEVELOPED AREAS Bare ground	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .40 - .48	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Cultivated/Agricultural	.08 - .18 .14 - .24	.13 - .23 .18 - .28	.16 - .26 .22 - .32	.11 - .19 .16 - .24	.15 - .23 .21 - .29	.21 - .29 .28 - .36	.14 - .22 .20 - .28	.19 - .27 .25 - .33	.26 - .34 .34 - .42	.18 - .26 .24 - .32	.23 - .31 .29 - .37	.31 - .39 .41 - .49
Pasture	.12 - .22 .15 - .25	.20 - .30 .25 - .35	.30 - .40 .37 - .47	.18 - .26 .23 - .31	.28 - .36 .34 - .42	.37 - .45 .45 - .53	.24 - .32 .30 - .38	.34 - .42 .42 - .50	.44 - .52 .52 - .60	.30 - .38 .37 - .45	.40 - .48 .50 - .58	.50 - .58 .62 - .70
Meadow	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .44 - .52	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Forest	.05 - .15 .08 - .18	.08 - .18 .11 - .21	.11 - .21 .14 - .24	.08 - .16 .10 - .18	.11 - .19 .14 - .22	.14 - .22 .18 - .26	.10 - .18 .12 - .20	.13 - .21 .16 - .24	.16 - .24 .20 - .28	.12 - .20 .15 - .23	.16 - .24 .20 - .28	.20 - .28 .25 - .33
RESIDENTIAL AREAS 1/8 acre per unit	.40 - .50 .48 - .58	.43 - .53 .52 - .62	.46 - .56 .55 - .65	.42 - .50 .50 - .58	.45 - .53 .54 - .62	.50 - .58 .59 - .67	.45 - .53 .53 - .61	.48 - .56 .57 - .65	.53 - .61 .64 - .72	.48 - .56 .56 - .64	.51 - .59 .60 - .68	.57 - .65 .69 - .77
1/4 acre per unit	.27 - .37 .35 - .45	.31 - .41 .39 - .49	.34 - .44 .42 - .52	.29 - .37 .38 - .46	.34 - .42 .42 - .50	.38 - .46 .47 - .55	.32 - .40 .41 - .49	.36 - .44 .45 - .53	.41 - .49 .52 - .60	.35 - .43 .43 - .51	.39 - .47 .47 - .55	.45 - .53 .57 - .65
1/3 acre per unit	.22 - .32 .31 - .41	.26 - .36 .35 - .45	.29 - .39 .38 - .48	.25 - .33 .33 - .41	.29 - .37 .38 - .46	.33 - .41 .42 - .50	.28 - .36 .36 - .44	.32 - .40 .41 - .49	.37 - .45 .48 - .56	.31 - .39 .39 - .47	.35 - .43 .43 - .51	.42 - .50 .53 - .61
1/2 acre per unit	.16 - .26 .25 - .35	.20 - .30 .29 - .39	.24 - .34 .32 - .42	.19 - .27 .28 - .36	.23 - .31 .32 - .40	.28 - .36 .36 - .44	.22 - .30 .31 - .39	.27 - .35 .35 - .43	.32 - .40 .42 - .50	.26 - .34 .34 - .42	.30 - .38 .38 - .46	.37 - .45 .48 - .56
1 acre per unit	.14 - .24 .22 - .32	.19 - .29 .26 - .36	.22 - .32 .29 - .39	.17 - .25 .24 - .32	.21 - .29 .28 - .36	.26 - .34 .34 - .42	.20 - .28 .28 - .36	.25 - .33 .32 - .40	.31 - .39 .40 - .48	.24 - .32 .31 - .39	.29 - .37 .35 - .43	.35 - .43 .46 - .54
MISC. SURFACES Pavement and roofs	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97
Traffic areas (soil and gravel)	.55 - .65 .65 - .70	.60 - .70 .70 - .75	.64 - .74 .74 - .79	.60 - .68 .68 - .76	.64 - .72 .72 - .80	.67 - .75 .75 - .83	.64 - .72 .72 - .80	.67 - .75 .75 - .83	.69 - .77 .77 - .85	.72 - .80 .79 - .87	.75 - .83 .82 - .90	.77 - .85 .84 - .92
Green landscaping (lawns, parks)	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .42 - .52	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Non-green and gravel landscaping	.30 - .40 .34 - .44	.36 - .46 .42 - .52	.45 - .55 .50 - .60	.45 - .55 .50 - .60	.42 - .50 .48 - .56	.50 - .58 .57 - .65	.40 - .48 .46 - .54	.48 - .56 .55 - .63	.56 - .64 .64 - .72	.44 - .52 .50 - .58	.50 - .58 .60 - .68	.60 - .68 .70 - .78
Cemeteries, playgrounds	.20 - .30 .24 - .34	.26 - .36 .32 - .42	.35 - .45 .40 - .50	.35 - .45 .40 - .50	.32 - .40 .38 - .46	.40 - .48 .47 - .55	.30 - .38 .36 - .44	.38 - .44 .45 - .53	.46 - .54 .54 - .62	.34 - .42 .40 - .48	.40 - .48 .50 - .58	.50 - .58 .60 - .68

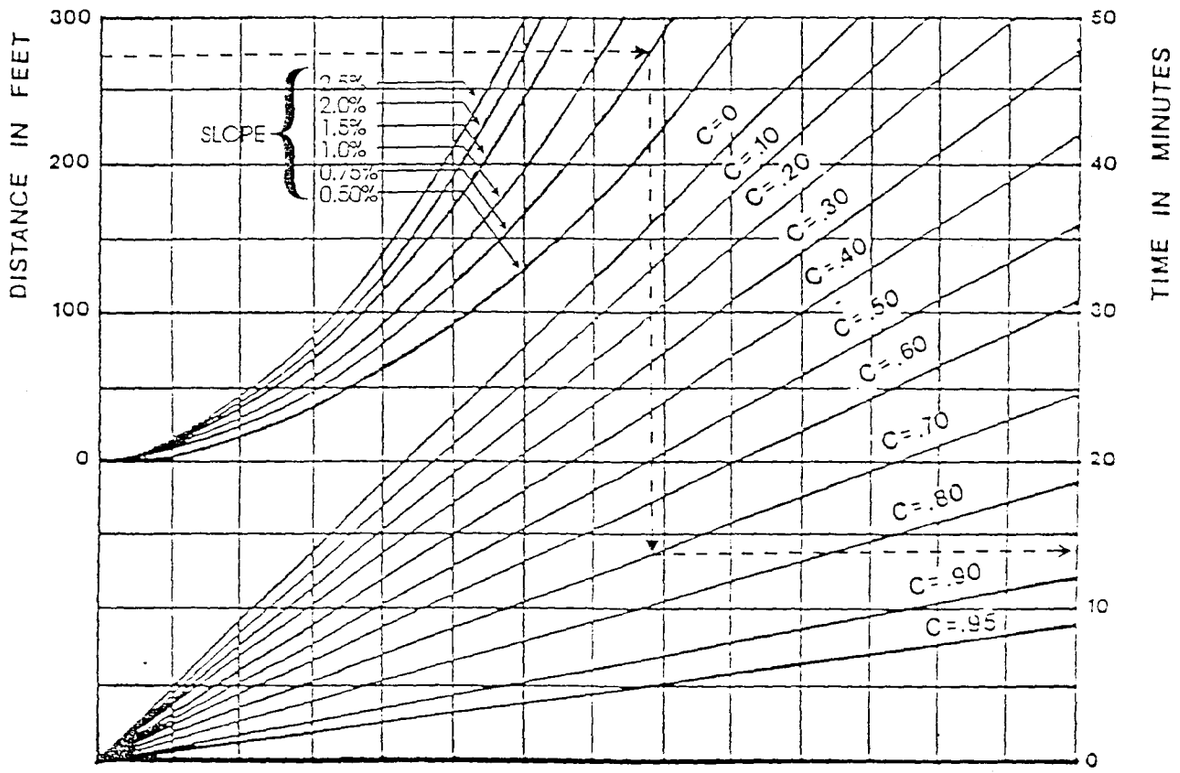
NOTES:
1. Values above and below pertain to the 2-year and 100-year storms, respectively.
2. The range of values provided allows for engineering judgement of site conditions such as basic shape, homogeneity of surface type, surface depression storage, and storm duration. In general, during shorter duration storms (Tc ≤ 10 minutes), infiltration capacity is higher, allowing use of a "C" value in the low range. Conversely, for longer duration storms (Tc) 30 minutes), use a ""C value in the higher range.
3. For residential development at less than 1/8 acre per unit or greater than 1 acre per unit, and also for commercial and industrial areas, use values under MISC SURFACES to estimate "C" value ranges for use.

RATIONAL METHOD RUNOFF COEFFICIENTS
(Modified from Table 4, UC-Davis, which appears to be a modification of work done by Rawls)

TABLE "B-1"

EXHIBIT 8.0

MODIFIED FROM FIGURE 403, MESA COUNTY



THE ABOVE CURVES ARE A SOLUTION OF THE FOLLOWING EQUATION:

$$To = \frac{1.8\,(1.1 - C)\sqrt{L}}{\sqrt[3]{S}}$$

WHERE: To = OVERLAND FLOW TIME (MIN.)
S = SLOPE OF BASIN (%)
C = RUNOFF COEFFICIENT (SEE TABLE "B-1" IN APPENDIX "B")
L = LENGTH OF BASIN (ft)

EXHIBIT 9.0

GRAPHICAL DETERMINATION OF "To:" FAA METHOD	FIGURE "E-2"

REPRODUCED FROM FIGURE 15.2, SCS 1972

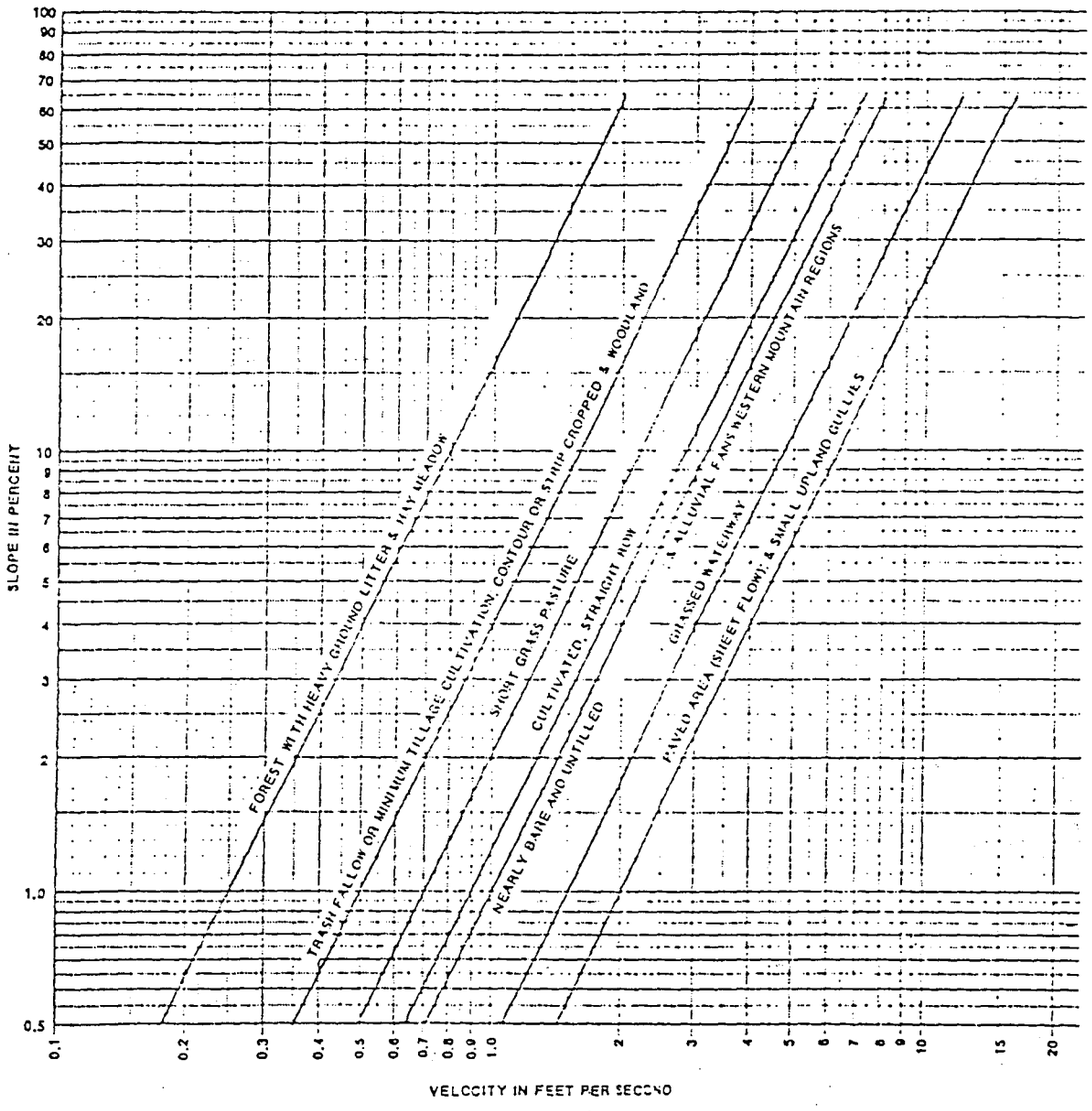


EXHIBIT 10.0

DETERMINATION OF "Ts"	FIGURE "E-3"