

**REQUEST FOR PLANNED AREA DEVELOPMENT**

FOR

**VILLA LEGRANDE**

**STANDARDS AND GUIDELINES REPORT**

**LOCATION**

16.4± ACRES GENERALLY LOCATED ON THE EAST SIDE OF 87<sup>TH</sup> AVENUE,  
ONE BLOCK SOUTH OF GRAND AVENUE,  
PEORIA, ARIZONA

**OWNER**

VIRGINIA WAGONER LANHAM  
5903 LINDENSHIRE LANE  
DALLAS, TEXAS 75230-2724

**DEVELOPER**

CLARK WAYLAND, INC./  
P. A. SPILLER & CO., L.L.C.  
4117 NORTH 44<sup>TH</sup> STREET  
PHOENIX, ARIZONA 85018

**PREPARED BY**

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Case Z01-01  
JANUARY 25, 2001  
MAY 8, 2001  
MAY 31, 2001



**LEGAL DESCRIPTION**  
**VILLA LEGRANDE**

PART OF THE WEST HALF OF THE SOUTHEAST ¼ OF SECTION 22, TOWNSHIP 3 NORTH, RANGE 1 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA DESCRIBED AS FOLLOWS:

COMMENCING AT A POINT ON THE SOUTH LINE OF SECTION 22, THAT LIES EAST (ASSUMED BEARING) 28.00 FEET FROM THE SOUTH ¼ CORNER;  
THENCE NORTH 00°34'08" EAST 405.27 FEET;  
THENCE CONTINUING NORTH 00°34'08" EAST 366.87 FEET TO THE POINT OF BEGINNING;  
THENCE CONTINUING NORTH 00°34'08" EAST 973.23 FEET TO A PIPE ON A FENCE LINE 1745.37 FEET FROM THE POINT OF COMMENCEMENT THAT IS A POINT 41.30 FEET EAST OF THE NORTH-SOUTH MIDSECTION LINE OF SECTION 22;  
THENCE CONTINUING NORTH 00°34'08" EAST 420.00 FEET TO A POINT THAT IS THE MOST SOUTHERLY CORNER OF SUNFLOWER RETAIL CENTER AMENDED RECORDED IN BOOK 248 OF MAPS, PAGE 21, RECORDS OF MARICOPA COUNTY, ARIZONA;  
THENCE NORTHEASTERLY ALONG THE EASTERLY LINE OF 87<sup>TH</sup> AVENUE AS SHOWN ON SAID MAP ALONG A CURVE CONCAVE SOUTHEAST WITH A RADIUS OF 364.67 FEET AND A CENTRAL ANGLE OF 37°25'13" A DISTANCE OF 238.16 FEET TO A POINT THAT IS THE MOST WESTERLY CORNER OF PARCEL DEEDED IN DOCUMENT NO. 96-870077, RECORDS OF MARICOPA COUNTY;  
THENCE SOUTH 44°17'18" EAST ALONG THE SOUTHWESTERLY LINE OF SAID PARCEL 357.72 FEET TO THE MOST SOUTHERLY POINT OF SAID PARCEL BEING A POINT ON THE WESTERLY LINE OF PARCEL DEEDED IN DOCKET 11859, PAGE 18, RECORDS OF MARICOPA COUNTY;  
THENCE SOUTH ALONG THE SAID WEST LINE SOUTH 00°10'17" WEST 243.41 FEET TO AN ANGLE POINT IN SAID WESTERLY LINE;  
THENCE CONTINUING ALONG SAID WESTERLY LINE SOUTH 44°17'18" EAST 365.00 FEET TO A POINT IN THE WEST LINE OF THE EAST 692.91 FEET OF THE WEST HALF OF THE SOUTHEAST ¼ OF SECTION 22;  
THENCE SOUTH 00°10'17" WEST ALONG SAID WEST LINE 853.07 FEET MORE OR LESS TO THE NORTHEAST CORNER OF PARCEL DESCRIBED IN DOCKET 14041, PAGE 516, RECORDS OF MARICOPA COUNTY;  
THENCE WEST 592.45 FEET ALONG THE NORTH LINE OF SAID PARCEL TO THE POINT OF BEGINNING.

**ASSESSOR'S INFORMATION**

Tax Parcel Number: 145-45-137F

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- A. Vicinity Map
- B. Traffic Study
- C. Developer Assistance Agreement
- D. Preliminary Grading and Drainage Plan
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- H. Preliminary Development Plan
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## **OVERVIEW**

### **Purpose**

This rezone request proposes the development of a multifamily residential, apartment complex, to be called *Villa LeGrande*, on 16.4± acres. *Villa LeGrande* will comprise 256 one, two and three bedroom apartments arranged in a campus-like setting. Open space is also provided in this development as the only other use. Currently the property is vacant. All development within the *Villa LeGrande* P.A.D. will conform to the City of Peoria Design Review Ordinance. A preliminary plat for apartment development has been submitted to the City of Peoria and is in the review process. The requested rezoning much more accurately reflects the character of surrounding uses and the development that is contemplated for this property under the Central Peoria Revitalization Plan. The proposed PAD will permit the applicant to achieve design flexibility required by the irregular shape of the subject property as well as greater flexibility in designing the project as a whole. Development under the proposed PAD will be not only consistent with the objectives of the Central Peoria Revitalization Plan for the site, but also will spur further redevelopment of the downtown core as a whole. The project further will serve as an appropriate buffer between the commercial zoning to the east and the north, and the residential uses to the west. The proposed PAD will, of course, be completely consistent with the multi-family uses to the south.

### **Location**

*Villa LeGrande* is located on the east side of 87<sup>th</sup> Avenue, approximately one block south of Grand Avenue. (See Exhibit A)

### **Zoning History**

The property is currently zoned AG. This use is wholly inconsistent with surrounding neighborhoods and the Peoria Comprehensive Plan. Single family residential neighborhoods are located to the west of the property. Commercial uses fronting on Grand Avenue are located to the north and east of the property. Multi-family uses are located to the south of the property.

### **Consistency with General Plan**

The Peoria General Plan designates this area for residential uses at a density of 15+ units/acre, with a target density of 18 units/acre. The Central Peoria Revitalization Plan designates this property for high density residential development at a density of 10.0 to 15 units/acre.

## **GENERAL SITE INFORMATION AND EXISTING SITE CONDITIONS**

### **Surrounding Land Uses and Conditions**

The site is an irregularly shaped parcel of 16.4± acres generally located on the east side of 87<sup>th</sup> Avenue one block south of Grand Avenue. The site is bounded by retail business uses and

vacant land to the north and east, multi-family development to the south, and single family residential uses and vacant land to the west.

The site has been previously graded and is substantially flat, with a very slight slope from northeast to southwest. The total gradient is approximately seven feet, per ALTA Survey.

|        | <u>Land Use</u>                           | <u>Zoning</u> |
|--------|---|---------------|
| Site   | Vacant                                    | AG            |
| South: | Multi-family residential                  | RM-2          |
| East:  | Retail commercial                         | C-2           |
| North: | Retail commercial                         | C-2           |
| West:  | Single family residential and vacant land | R1-6 and RM-1 |

Existing and Proposed Area Circulation

A traffic study has been furnished to the City of Peoria demonstrating that *Villa LeGrande* will not cause disproportionate traffic congestion at the intersection of Peoria Avenue and 87<sup>th</sup> Avenue, Grand Avenue and 87<sup>th</sup> Avenue, or 91<sup>st</sup> Avenue and Grand Avenue. (See Exhibit B) Arizona Department of Transportation has also reviewed the traffic study and concluded that it has no objection to *Villa LeGrande* as it may impact Grand Avenue. Finally, children residing at *Villa LeGrande* will attend Cheyenne Elementary School and Peoria High School, which will entail crossing Grand Avenue and the Santa Fe railroad right-of-way. Peoria Unified School District has confirmed that bus service will be provided, alleviating the risk of injury to children on their way to and from school.

Full right-of-way dedications will be made for the east half-street on 87<sup>th</sup> Avenue from the north boundary of the property to the north edge of the Country Meadows apartment complex, which boundary is approximately 300 feet to the south of the south edge of the property. No traffic generated by *Villa LeGrande* will be routed through the residential neighborhoods to the west of the property.

Community Services

*Villa LeGrande* is served by the Peoria Unified School District. The school District has been contacted and a Developer Assistance Agreement has been negotiated to pay an impact fee by the developer. (See Exhibit C) This agreement will be finalized prior to the rezoning of the property. Fire and police protection will be provided by the City of Peoria.

Drainage

*Villa LeGrande* drains to the southwest. All drainage will be retained on-site, as will drainage from the vacant property to the north and east of the property. The applicant has submitted a Preliminary Grading and Drainage Plan that shows all surface water being retained in basins located throughout the property. (See Exhibit D)

## UTILITIES

### INFRASTRUCTURE/UTILITIES

#### Sewer

There is an existing sewer line under 87<sup>th</sup> Avenue. *Villa LeGrande* will connect with this line. The applicant has submitted a Water and Sewer Plan showing the site of all water and sewer lines. (See Exhibit E) All sewer lines within *Villa LeGrande* will be 8". The applicant has also completed and submitted a Wastewater System Analysis Report. (See Exhibit F)

#### Water

There is an existing water line under 87<sup>th</sup> Avenue. *Villa LeGrande* will connect with this line. (See Exhibit E) All sewer lines within *Villa LeGrande* will be 8". The applicant has also completed and submitted a Water System Analysis Report. (See Exhibit G)

#### Telephone

Qwest will provide telephone service to *Villa LeGrande*.

#### Electric Power

Salt River Project will provide electric power to *Villa LeGrande*. Power lines run along 87<sup>th</sup> Avenue and will be buried.

## LAND USE PLAN

### Preliminary Development Plan

The applicant has submitted a Preliminary Development Plan to the City of Peoria. A copy is attached a Exhibit H.

### Allocation of Land Use Table/Density

The proposed PAD encompasses 714,384 square feet, or 16.4 gross acres, and will be developed as follows:

| <u>Use</u>                                    | <u>Acres</u> | <u>Portion of Gross Acres</u> |
|---|--------------|-------------------------------|
| Streets (87 <sup>th</sup> Avenue dedication): | 0.69         | 4.27%                         |
| Land Uses (Two story apartment buildings):    | 3.10         | 18.90%                        |
| (Detached garages):                           | 0.10         | 0.61%                         |
| (Clubhouse):                                  | 0.06         | 0.37%                         |
| (Cabanas):                                    | 0.02         | 0.12%                         |
| Active Open Space (per 44-33-2K(2)):          | 1.96         | 11.95%                        |

## Density

The density for *Villa LeGrande* will not exceed 15.48 units per gross acre, or 16.16 units per net acre.

## Project Planning and Development Schedule

*Villa LeGrande* will be built in a single phase of construction. A copy of the *Villa LeGrande* Site plan is attached as Exhibit I.

## Development Standards

### Permitted Uses:

The applicant is seeking to construct a multi-family/apartment complex, typical accessory buildings, structures and uses customarily incidental to residential purposes.

### Architectural Style:

Quality: *Villa LeGrande* will provide apartment dwellings which are commensurate with the current state of similar high quality residential development in Peoria, metropolitan East Phoenix and North Scottsdale area. Conceptual Exterior Elevations are attached hereto as Exhibit J.

Materials: The structures will reflect the southwest in roof tile, colors and trim. Buildings will have tan stucco exteriors. Each building shall reflect materials and construction techniques expressed in a simple, contemporary manner, using materials, colors and other architectural treatments to create visual unity, continuity and identifiable character within the PAD. (See Exhibit J)

Building materials within the PAD will be consistent with and drawn from regional vernacular.

Walls/Fences: Cement/Plaster/Stucco or One-coat stucco system  
Concrete block with stucco finish  
Decorative concrete masonry  
Glass

Roofs: Contemporary slate concrete tile, and built-up flat roofing.

Colors: Color will create visual harmony within the PAD. Appropriate colors may include, but not limited to: Desert Hues and other earth tones including light tan and cream plus off-white and light grey. The following materials will not be used with in the project: Colonial siding, Bermuda shake, Victorian shingles or any other metal panel

system which is embossed to imitate wood, tile or any other material. In addition, corrugated metal panels or metal buildings will not be incorporated.

Dwellings: See preliminary elevations attached hereto as Exhibit I and illustrative floor plans attached hereto as Exhibit K.

Resident support structures: A club house will be constructed in similar architectural style. Development is designed to provide a significant amount of on-site amenities for the residents, lounges, large open areas with adjacent kitchen.

Site: Resident controlled gated entry. Each dwelling will have dedicated parking. Exteriors amenities will include two swimming a pools and spas, with three cabanas and a significant amount of on-site open space.

#### Lot Coverage:

Not to exceed 25.0%. This coverage includes all buildings including their overhangs and carport canopies. Actual coverage is 21.72%.

#### Setbacks (Internal, External, Building, etc.):

All setbacks meet the requirements of Article 14-6 of the Peoria Ordinances; provided, however, the northwest property line setback shall be 15 feet due to the 40 feet of right-of-way taken from the west boundary of the Property. The Property shall have a 20 foot landscape buffer along the west boundary to buffer the site from the single family residential neighborhood across 87<sup>th</sup> Avenue. All buildings shall be 50 feet from the west boundary line.

#### Building Heights:

The buildings will not exceed two stories in height, or a total height of 28 feet.

#### Open Space Requirements:

*Villa LeGrande* shall have 11.95% usable open space; i.e., open space developed in accordance with City of Peoria Ordinance 44-33-2K(2). This will be in the form of a Club House, 2 Swimming Pools, 3 Spas, 3 Cabanas, an Exercise Path, and Recreational Areas.

#### Lighting:

Electric service shall be provided by Salt River Project. Decorative theme lighting will be utilized throughout the site. Pole heights shall not exceed 25 feet. And shall comply with the City of Peoria's dark sky ordinance.

**Parking:**

Parking recommendations are based on city requirements. Standard parking will be provided in spaces 9' 6" wide by 20' deep, with a 2' landscape overhang. Onsite parking shall be provided as follows:

| <u>Type</u>                   | <u>Spaces</u> |
|-------------------------------|---------------|
| Garages:                      | 22            |
| Carports:                     | <u>256</u>    |
| Total Covered Parking:        | 278           |
| Surface:                      | 152           |
| Compact:                      | 84            |
| Handicapped Accessible (Van): | <u>13</u>     |
| Total Uncovered Parking:      | 249           |
| <b>Total Parking Spaces:</b>  | <b>527</b>    |

Quantity and size of handicap parking shall conform to ANSI and 1997 UBC requirements.

Peoria Ordinance requires 563 parking spaces (2.2 spaces per unit). The parking described above is adequate for the anticipated needs of *Villa LeGrande* due to the fact that the large preponderance of units to be built will only contain a single bedroom.

Minimal parking will be placed along the westerly perimeter of *Villa LeGrande*. Spaces will be oriented toward the east; i.e., to the interior of the complex. There will be minimal covered parking visible to the neighbors to the west, creating a far more residential and aesthetically pleasing streetscape from 87<sup>th</sup> Avenue. All parking shall be screened from view by a 3 foot screen wall.

## **PROJECT SIGNAGE STANDARDS**

Street signage will be mounted on low masonry/stucco walls with integrated flower planters. This signage will be connected with the project screen wall along 87<sup>th</sup> Avenue. Along with "VILLA LEGRANDE" lettering the address number will appear. The area of sign copy shall not exceed 36 square feet (12' wide by 3' high). Building and unit numbers will appear on the buildings' stucco walls and be visible from the curb. All signage will conform to ordinances and policies of the City of Peoria. All signage shall be reviewed and subject to separate permitting.

## **PROJECT LANDSCAPING STANDARDS**

The landscaping for the proposed residential community will have an integrated design theme. This design will be carried through the site by the incorporation of olive trees along 87<sup>th</sup> Avenue as theme trees. Along the interior roadways, sissou trees will be the theme trees. Resort style

palm trees will be a focal point at the pool area. All of the foregoing trees will be installed along street frontages and will be low water use xeriscape trees. All landscaping will be maintained by the *Villa LeGrande's* owner/manager.

*Villa LeGrande* will contain a children's active play area; i.e., a tot lot; as well as passive recreational areas; i.e., turf green belts.

*Villa LeGrande* will conform with the Landscape Ordinance, Article 14-35, of the City of Peoria.

All ground mounted mechanical equipment in a location visible from streets or properties shall be screened by landscaping or a wall that is compatible with the finish, textures and colors of buildings. There will be no roof mounted mechanical equipment.

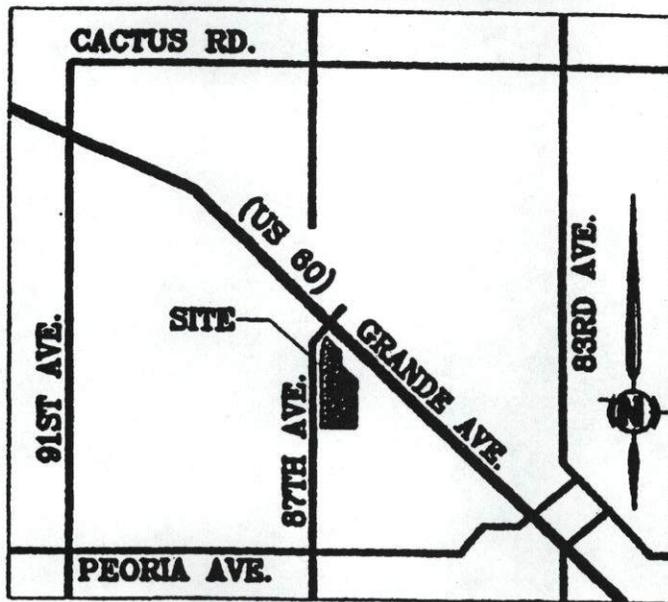
A copy of the *Villa LeGrande* Preliminary Landscape Plan is attached as Exhibit L.

## **SLOPE ANALYSIS**

The site has been previously graded. The ALTA Survey of the Property shows a uniform declination of seven feet from the north to the south of the Property; accordingly, a slope analysis is not necessary.



# VICINITY MAP



NOT TO SCALE



TRAFFIC IMPACT STUDY  
for

VILLA LEGRANDE

87<sup>TH</sup> AVENUE & GRAND AVENUE  
PEORIA, ARIZONA

Prepared for

Clark-Wayland Builders, L.C.

Prepared by

C. Todd Heglund, P.E.  
Consulting Transportation Engineer

March 6, 2001  
Revised May 10, 2001

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## **I. INTRODUCTION**

Clark-Wayland Builders is proposing to construct Villa LeGrande, a 256 unit apartment complex on the east side of 87th Avenue south of Grand Avenue in Peoria, Arizona. Figure 1 shows a vicinity map of the site. The City of Peoria has requested a traffic study to show the amount of traffic that will be generated by this development, and an analysis of the impact of this generated traffic on the surrounding street system. This report is in response to that request.

## **II. EXISTING CONDITIONS**

### **Land Use**

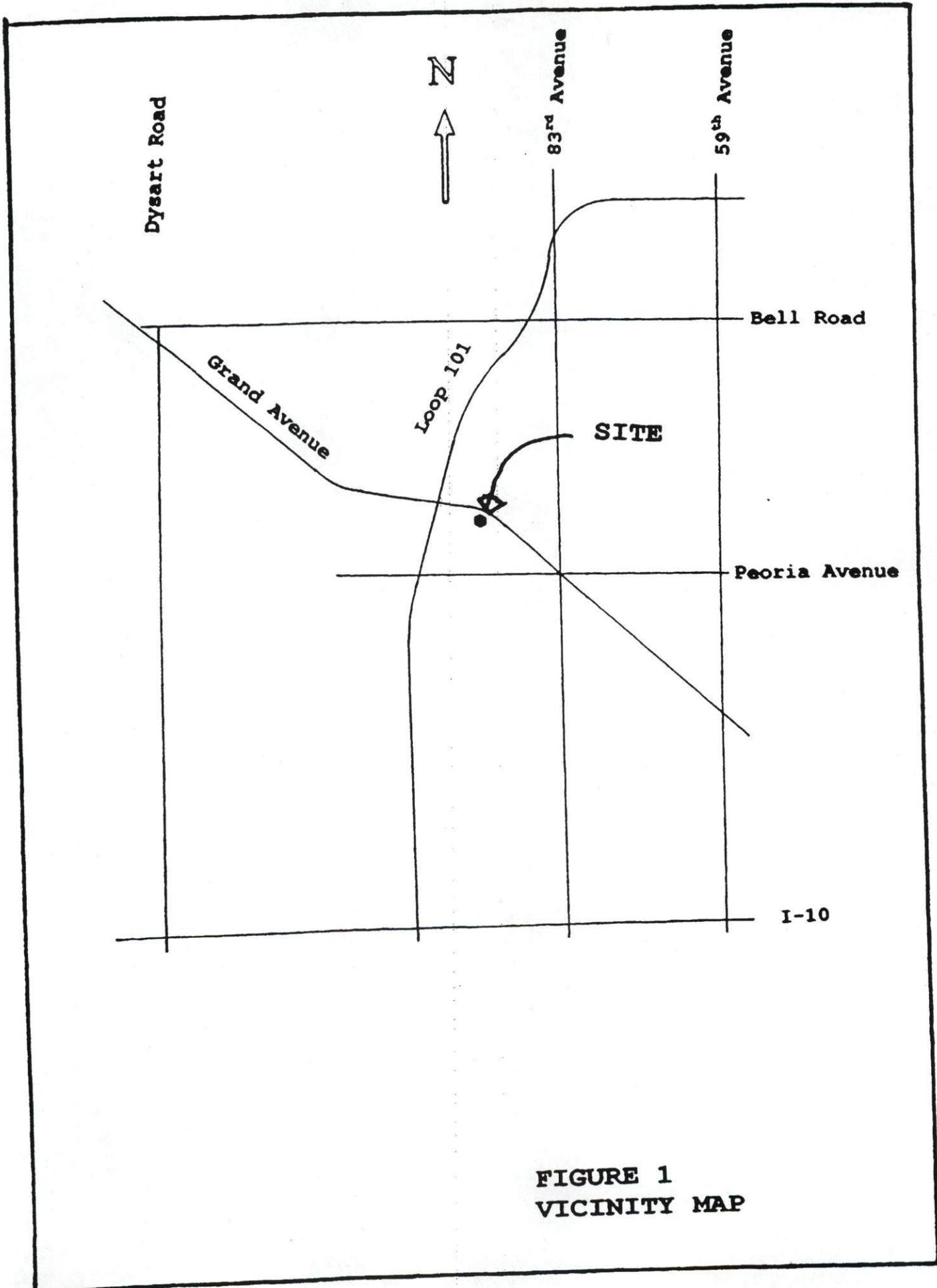
The site proposed for this development is currently undeveloped. The land north of the site and south of Grand Avenue, and the land west of the site and south of Grand Avenue, is occupied by retail-commercial establishments. South of the site on the east side of 87th Avenue is an apartment complex, and single family residential units exist on the west side of 87th Avenue.

### **Roadways**

Grand Avenue adjacent to the site is U.S. 60. It is a four lane, divided roadway, with separate turn lanes. The intersection of 87th Avenue and Grand Avenue is a tee intersection with no roadway on the north side. 87th Avenue has one left turn and one right turn lane for northbound traffic at Grand Avenue.

Adjacent to the site, the east side of the 87th Avenue roadway is undeveloped. South of the site, 87th Avenue is a full width roadway with one lane in each direction.

At the intersection with Peoria Avenue, 87th Avenue has one left turn lane and one lane for straight and right turning vehicles on both approaches. Both approaches of Peoria Avenue have one left turn lane, one lane for straight and right turning vehicles, and one lane for straight through vehicles.



**FIGURE 1  
VICINITY MAP**

## Traffic Volumes

On Tuesday, February 20, 2001, traffic was counted at the intersections of 87th Avenue with both Grand Avenue and Peoria Avenue. Traffic was counted between 7:00 and 9:00 am, and 4:00 and 6:00 pm. The results are shown in the Appendix, and on Figure 2.

## III. FUTURE CONDITIONS

### Direction of Approaching Traffic

The peak hour traffic generated by residential units occurs during the morning and evening peak traffic hours as residents travel to and from work. To determine where the site generated traffic will go during these peak travel times, the employment by traffic analysis zones as provided by the Maricopa Association of Governments, was used. Data for 1998 was used, and the results are shown on Figure 3.

### Site Generated Traffic

The amount of traffic generated by the site was estimated using data from Trip Generation, 6<sup>th</sup> Edition, published by the Institute of Transportation Engineers. The category used was 221--Low-Rise Apartments. Table I shows the data used and the resulting trip ends for the site.

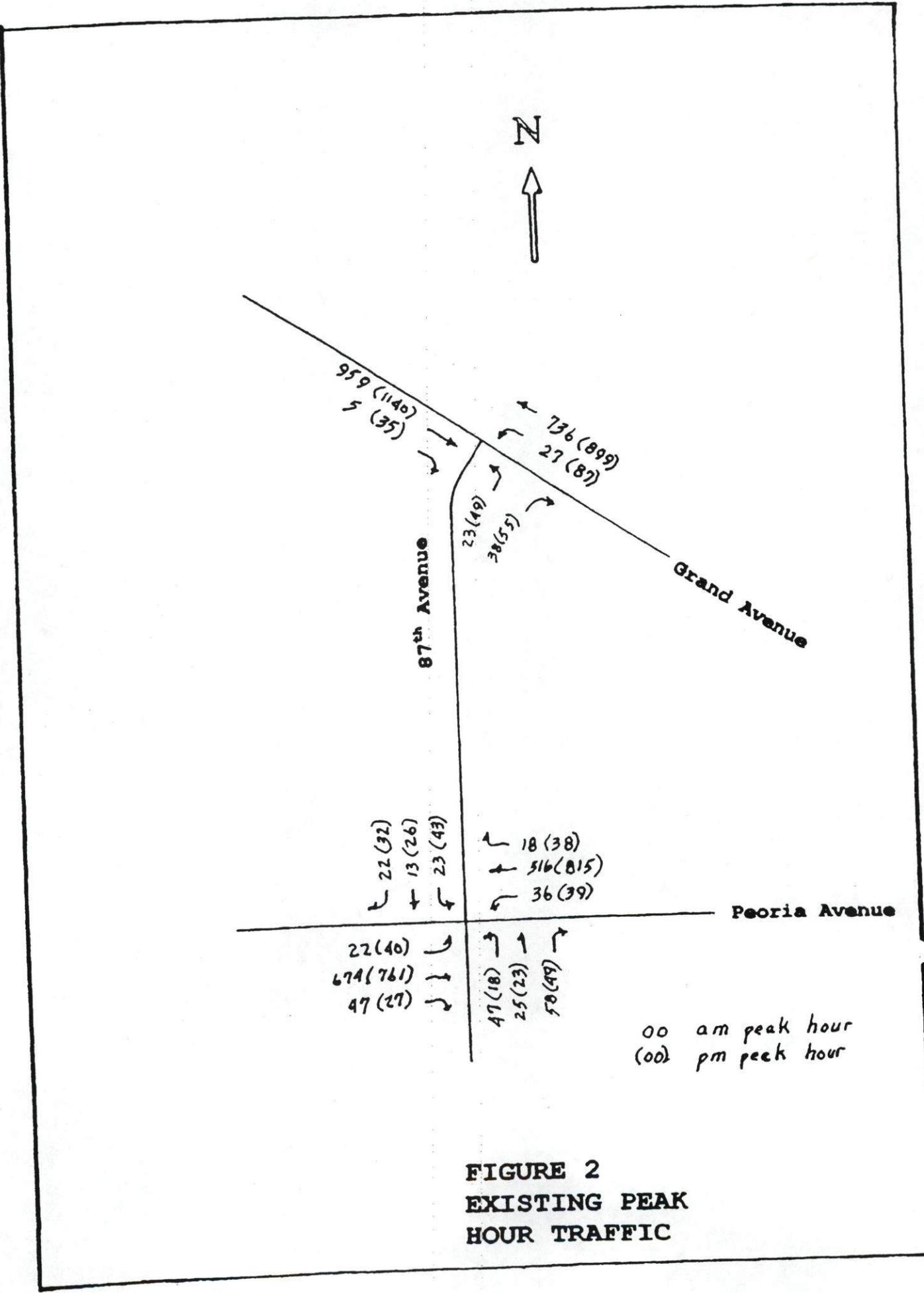
TABLE I  
TRIP ENDS PER OCCUPIED DWELLING UNIT

| Time Period    | Equation                                 | In  | Out |
|----------------|--|-----|-----|
| Daily          | $T = 5.124(x) + 387.526$                 | 850 | 850 |
| A.M. Peak Hour | $\text{Ln}T = 0.829\text{Ln}(x) + 0.187$ | 24  | 96  |
| P.M. Peak Hour | $\text{Ln}T = 0.876\text{Ln}(x) + 0.165$ | 100 | 52  |

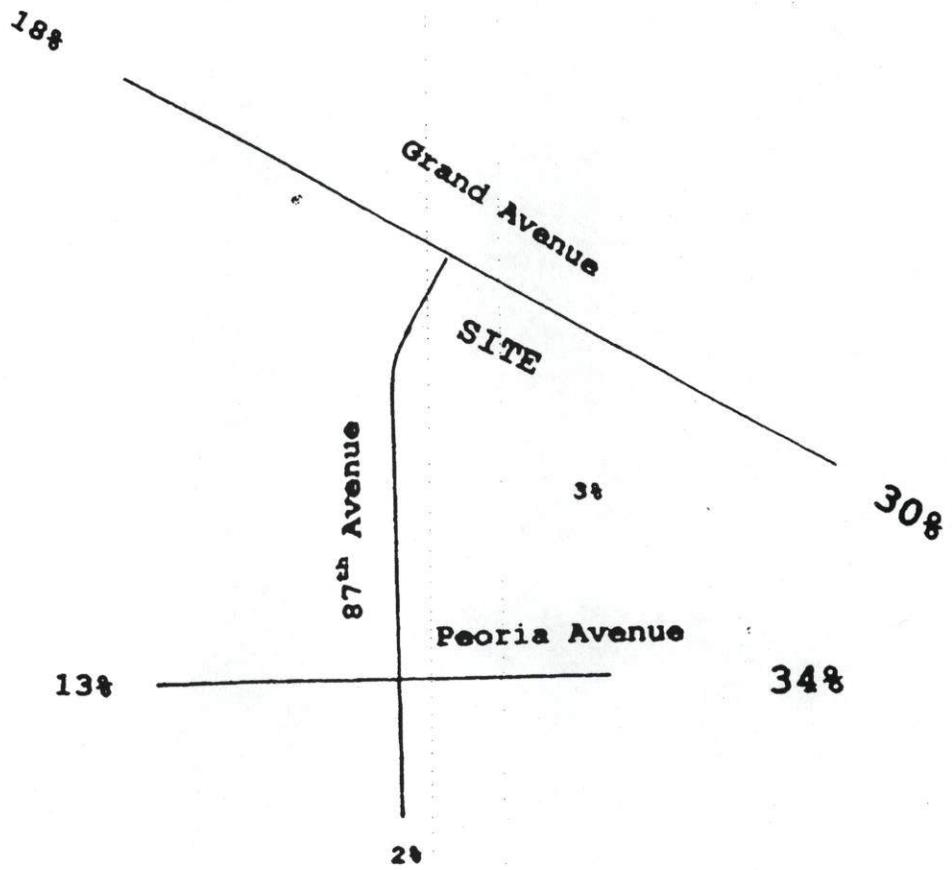
Using the data in Figure 3 and Table I, the site generated trips were assigned to the area roadways. Figure 4 shows the am and pm peak hour trips at the intersections of 87th Avenue with Grand Avenue and Peoria Avenue.

### Total Traffic

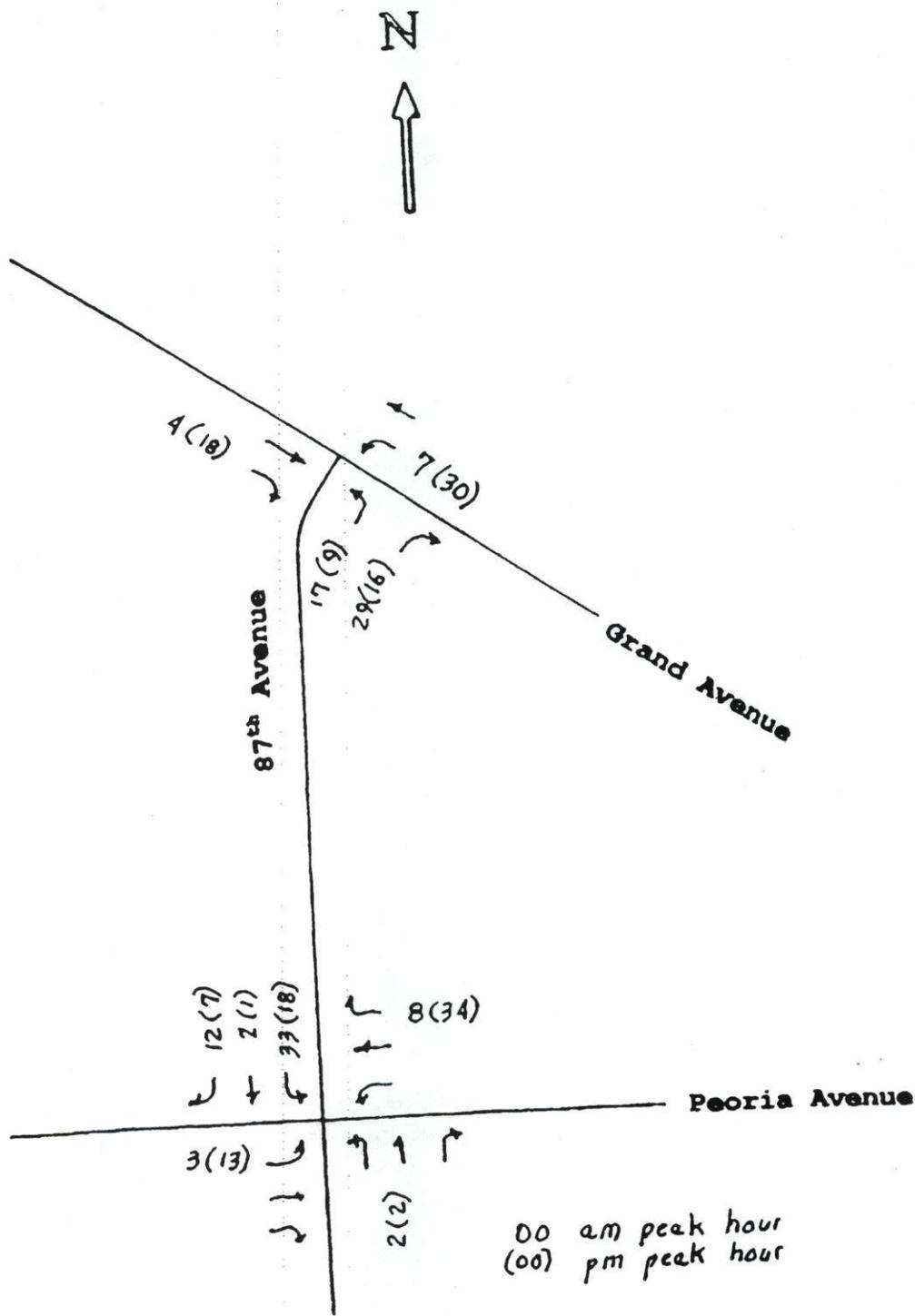
Clark-Wayland Builders anticipates completing Villa LeGrande within two years after receiving approval from the City of Peoria. Therefore, the existing traffic shown in



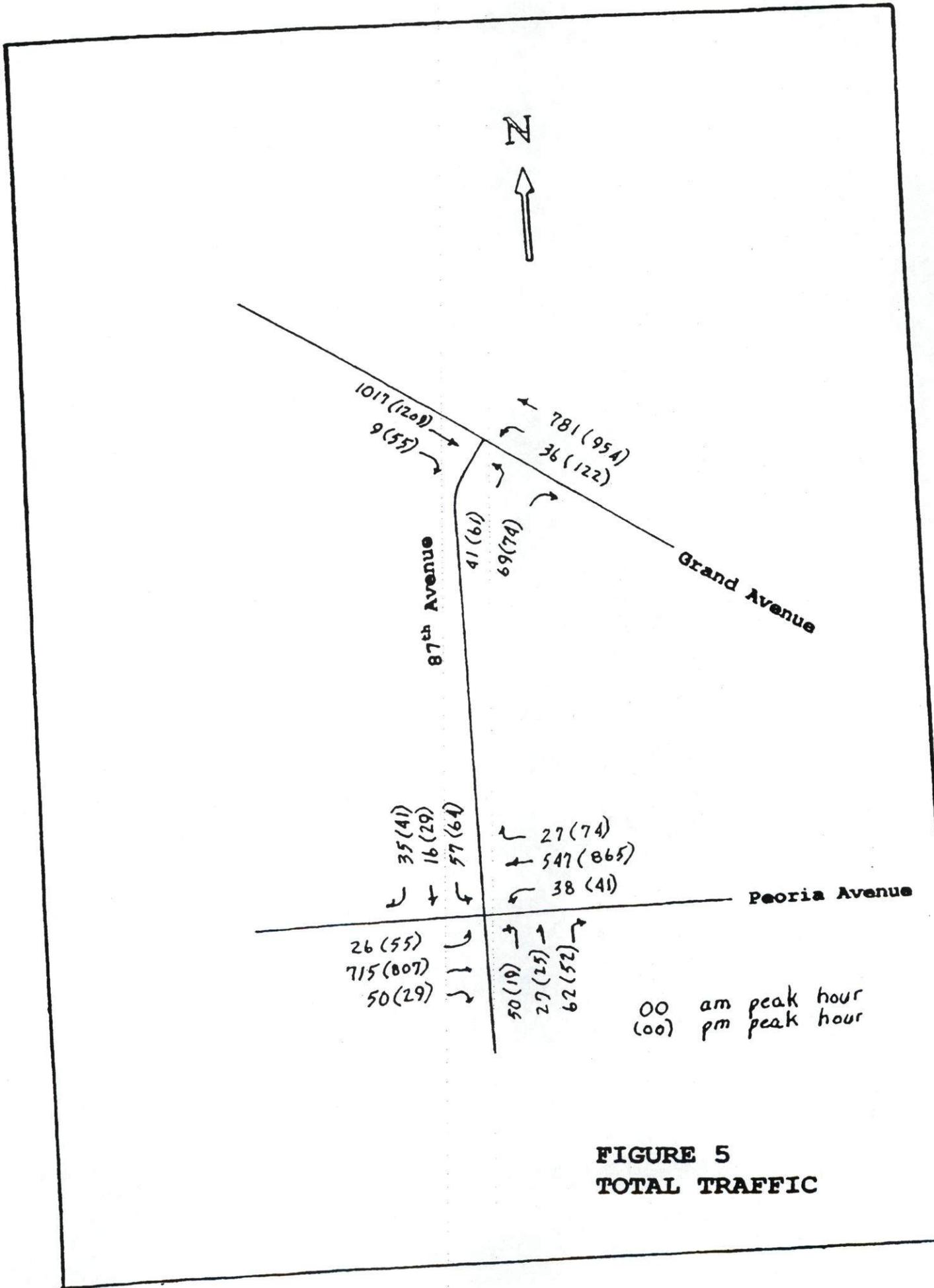
**FIGURE 2  
 EXISTING PEAK  
 HOUR TRAFFIC**



**FIGURE 3  
DIRECTION OF  
APPROACHING TRAFFIC**



**FIGURE 4**  
**SITE GENERATED TRAFFIC**



**FIGURE 5**  
**TOTAL TRAFFIC**

Figure 2 was increased three percent per year for two years and combined with the site generated traffic to represent the total traffic when the development opens. The results are shown in Figure 5.

#### IV. ANALYSIS

##### Level of Service

The capacity of a roadway is the maximum number of vehicles that can reasonably pass a point in a given amount of time, generally stated in vehicles per hour. The volume of traffic on a roadway is the number of vehicles passing a point in a given amount of time, which is also generally expressed in vehicles per hour. The volume/capacity relationship provides a number that can be used to designate a "Level of Service", which is a qualitative measure describing operational conditions within a traffic stream, or at an intersection. There are six levels of service designated from A to F, with A being the best and F being nearly stopped conditions. In urban areas, Levels of Service D or better are acceptable.

The Highway Capacity Manual, Special Report 209, revised in 1994, published by the Transportation Research Board, was used to analyze the traffic operations at the intersections of 87<sup>th</sup> Avenue with Grand Avenue and Peoria Avenue. Existing conditions were analyzed for the peak hour between 7:00 am and 9:00 am, and the peak hour between 4:00 pm and 6:00 pm. Site generated traffic was then added to the existing traffic, and the peak am and pm hours were analyzed and compared to existing conditions. The results are shown in Table II. Worksheets are included in the Appendix.

TABLE II  
LEVEL OF SERVICE ANALYSIS

| Time Period | Grand Ave. & 87 <sup>th</sup> Av |    | Peoria Ave. & 87 <sup>th</sup> Av |       |
|-------------|----------------------------------|----|-----------------------------------|-------|
|             | am                               | pm | am                                | pm    |
| Existing    | A                                | A  | Under                             | Under |
| Future      | A                                | A  | Under                             | Under |

## Site Access

Three driveways on 87<sup>th</sup> Avenue are shown on the site plan. The access closest to Grand Avenue is opposite Cholla Street, providing a four legged intersection. The main access drive is approximately 400' south of C M Lane. A third access drive is located near the south property line. These drives will provide adequate capacity for the site, and their locations will allow through traffic to move with little interference.

## V. CONCLUSIONS

The results of the analysis indicate the proposed development will not have a significant adverse impact on the traffic operations on 87<sup>th</sup> Avenue or at either of the major intersections near the site.

## VI. REVISION

After reviewing the original report, dated March 6, 2001, personnel at the City of Peoria requested that the intersections on Grand Avenue at 91<sup>st</sup> Avenue, Peoria Avenue, and 83<sup>rd</sup> Avenue be included in the report. Therefore, on May 8, 2001, traffic at these intersections was counted from 7:00 am to 9:00 am, and 4:00 pm to 6:00 pm. The counts are shown in the Appendix.

The capacity of each of the intersections was computed for the am and pm peak hour as outlined previously. The analyses were done for existing traffic conditions, and after Villa Grande is constructed. The existing traffic counts were increased three percent per year for two years to account for the increase anticipated when the project is completed. The results of the analyses are shown in Table III, and the capacity worksheets are included in the Appendix.

TABLE III  
LEVEL OF SERVICE ANALYSIS

| Intersection               | Existing |       | Existing + Site |       |
|----------------------------|----------|-------|-----------------|-------|
|                            | am       | pm    | am              | pm    |
| Grand/91 <sup>st</sup> Ave | Under    | Under | Under           | Near  |
| Grand/Peoria               | Under    | Under | Under           | Under |
| Grand/83 <sup>rd</sup> Ave | Under    | Under | Under           | Under |

The results of the analysis indicate the proposed development will not have a significant adverse impact on traffic operations on Grand Avenue at its intersections with 91<sup>st</sup> Avenue, Peoria Avenue, or 83<sup>rd</sup> Avenue.

**APPENDIX**

**EXISTING TRAFFIC**  
**87<sup>th</sup> Avenue & Grand Avenue**  
**02/20/01**

| Time Period  | Northbound |          | Westbound |            | Eastbound  |          | Total      |
|--------------|------------|----------|-----------|------------|------------|----------|------------|
|              | L          | R        | L         | S          | S          | R        |            |
| 7:00-7:15 am | 2          | 8        | 6         | 186        | 130        | 0        | 332        |
| 7:15-7:30 am | 4          | 8        | 5         | 199        | 244        | 1        | 461        |
| 7:30-7:45 am | 8          | 9        | 6         | 206        | 251        | 1        | 481        |
| 7:45-8:00 am | 6          | 10       | 7         | 181        | 239        | 2        | 445        |
| 8:00-8:15 am | 5          | 11       | 9         | 150        | 225        | 1        | 401        |
| 8:15-8:30 am | 7          | 12       | 10        | 162        | 187        | 1        | 379        |
| 8:30-8:45 am | 6          | 14       | 8         | 157        | 114        | 2        | 301        |
| 8:45-9:00 am | <u>3</u>   | <u>9</u> | <u>6</u>  | <u>149</u> | <u>128</u> | <u>1</u> | <u>296</u> |
| TOTAL        | 41         | 81       | 57        | 1390       | 1518       | 9        | 3096       |
| 4:00-4:15 pm | 8          | 8        | 18        | 236        | 248        | 5        | 523        |
| 4:15-4:30 pm | 10         | 7        | 19        | 228        | 229        | 6        | 499        |
| 4:30-4:45 pm | 9          | 9        | 17        | 202        | 213        | 9        | 459        |
| 4:45-5:00 pm | 7          | 9        | 20        | 216        | 257        | 10       | 519        |
| 5:00-5:15 pm | 9          | 11       | 24        | 222        | 290        | 9        | 565        |
| 5:15-5:30 pm | 13         | 14       | 25        | 228        | 301        | 7        | 588        |
| 5:30-5:45 pm | 20         | 21       | 18        | 233        | 292        | 9        | 593        |
| 5:45-6:00 pm | <u>7</u>   | <u>8</u> | <u>12</u> | <u>199</u> | <u>237</u> | <u>4</u> | <u>467</u> |
| TOTAL        | 83         | 87       | 153       | 1764       | 2067       | 59       | 4213       |

**EXISTING TRAFFIC**  
**87<sup>th</sup> Avenue & Peoria Avenue**

02/20/01

| Direction<br>Time | NB |    |    | SB |    |    | EB |      |    | WB |     |    | TOTAL |
|-------------------|----|----|----|----|----|----|----|------|----|----|-----|----|-------|
|                   | L  | S  | R  | L  | S  | R  | L  | S    | R  | L  | S   | R  |       |
| 7:00-7:15a        | 5  | 4  | 6  | 4  | 1  | 3  | 4  | 114  | 5  | 5  | 108 | 4  | 263   |
| 7:15-7:30a        | 6  | 3  | 8  | 5  | 2  | 4  | 3  | 120  | 6  | 9  | 129 | 5  | 300   |
| 7:30-7:45a        | 12 | 6  | 14 | 5  | 3  | 6  | 5  | 168  | 12 | 11 | 133 | 6  | 381   |
| 7:45-8:00a        | 18 | 9  | 20 | 6  | 5  | 5  | 8  | 213  | 18 | 9  | 135 | 5  | 451   |
| 8:00-8:15a        | 11 | 7  | 16 | 7  | 3  | 7  | 6  | 173  | 11 | 7  | 119 | 2  | 369   |
| 8:15-8:30a        | 7  | 6  | 12 | 5  | 2  | 4  | 4  | 104  | 3  | 5  | 95  | 3  | 250   |
| 8:30-8:45a        | 6  | 2  | 9  | 2  | 2  | 3  | 3  | 99   | 7  | 6  | 81  | 4  | 224   |
| 8:45-9:00a        | 5  | 3  | 7  | 3  | 1  | 2  | 2  | 95   | 6  | 3  | 63  | 2  | 192   |
| TOTAL             | 70 | 40 | 92 | 37 | 19 | 34 | 35 | 1086 | 68 | 55 | 863 | 31 | 2430  |

|            |    |    |    |    |    |    |    |      |    |    |      |    |      |
|------------|----|----|----|----|----|----|----|------|----|----|------|----|------|
| 4:00-4:15p | 9  | 2  | 11 | 13 | 5  | 5  | 9  | 189  | 1  | 6  | 182  | 4  | 436  |
| 4:15-4:30p | 7  | 3  | 8  | 10 | 6  | 4  | 11 | 195  | 3  | 7  | 164  | 5  | 423  |
| 4:30-4:45p | 3  | 5  | 7  | 9  | 7  | 6  | 7  | 174  | 4  | 9  | 196  | 6  | 433  |
| 4:45-5:00p | 4  | 5  | 9  | 12 | 9  | 5  | 10 | 62   | 3  | 9  | 215  | 8  | 451  |
| 5:00-5:15p | 4  | 5  | 9  | 12 | 9  | 5  | 10 | 187  | 7  | 8  | 203  | 9  | 475  |
| 5:15-5:30p | 5  | 7  | 12 | 11 | 8  | 8  | 10 | 187  | 7  | 8  | 203  | 9  | 475  |
| 5:30-5:45p | 5  | 7  | 12 | 11 | 8  | 8  | 10 | 219  | 11 | 12 | 215  | 14 | 545  |
| 5:45-6:00p | 6  | 6  | 20 | 12 | 6  | 12 | 12 | 219  | 11 | 12 | 215  | 14 | 545  |
|            | 6  | 6  | 20 | 12 | 6  | 12 | 12 | 193  | 6  | 10 | 182  | 7  | 440  |
|            | 3  | 5  | 8  | 8  | 3  | 7  | 8  | 179  | 4  | 12 | 170  | 4  | 409  |
|            | 2  | 4  | 6  | 6  | 4  | 6  | 12 | 179  | 4  | 12 | 170  | 4  | 409  |
| TOTAL      | 39 | 37 | 81 | 81 | 48 | 53 | 79 | 1498 | 39 | 73 | 1527 | 57 | 3612 |

**EXISTING TRAFFIC**  
**91<sup>st</sup> Avenue & Grand Avenue**

05/08/01

| Direction<br>Time | SB         |            |           | NB        |            |            | EB         |             |            | WB        |             |            | TOTAL       |
|-------------------|------------|------------|-----------|-----------|------------|------------|------------|-------------|------------|-----------|-------------|------------|-------------|
|                   | R          | S          | L         | R         | S          | L          | R          | S           | L          | R         | S           | L          |             |
| 7:00-7:15a        | 67         | 31         | 6         | 9         | 50         | 19         | 14         | 119         | 12         | 8         | 133         | 55         | 523         |
| 7:15-7:30a        | 93         | 43         | 8         | 12        | 88         | 26         | 19         | 166         | 13         | 11        | 186         | 77         | 742         |
| 7:30-7:45a        | 97         | 45         | 12        | 13        | 92         | 27         | 20         | 173         | 14         | 12        | 193         | 80         | 778         |
| 7:45-8:00a        | 108        | 60         | 8         | 10        | 58         | 28         | 8          | 153         | 12         | 20        | 173         | 95         | 733         |
| 8:00-8:15a        | 90         | 93         | 24        | 9         | 75         | 33         | 6          | 111         | 18         | 21        | 264         | 90         | 834         |
| 8:15-8:30a        | 90         | 38         | 11        | 11        | 64         | 22         | 19         | 136         | 15         | 8         | 137         | 57         | 608         |
| 8:30-8:45a        | 90         | 38         | 11        | 11        | 64         | 22         | 19         | 136         | 15         | 8         | 137         | 57         | 608         |
| 8:30-8:45a        | 78         | 34         | 10        | 8         | 52         | 16         | 18         | 123         | 14         | 8         | 122         | 49         | 532         |
| 8:45-9:00a        | 71         | 30         | 9         | 9         | 50         | 12         | 15         | 107         | 15         | 6         | 108         | 45         | 477         |
| <b>TOTAL</b>      | <b>694</b> | <b>374</b> | <b>88</b> | <b>81</b> | <b>529</b> | <b>183</b> | <b>119</b> | <b>1088</b> | <b>113</b> | <b>94</b> | <b>1316</b> | <b>548</b> | <b>5227</b> |

|              |            |            |            |           |            |            |            |             |            |            |             |            |             |
|--------------|------------|------------|------------|-----------|------------|------------|------------|-------------|------------|------------|-------------|------------|-------------|
| 4:00-4:15p   | 51         | 39         | 6          | 17        | 59         | 14         | 9          | 150         | 99         | 12         | 126         | 6          | 588         |
| 4:15-4:30p   | 64         | 50         | 11         | 7         | 53         | 15         | 26         | 155         | 118        | 18         | 175         | 22         | 714         |
| 4:30-4:45p   | 88         | 68         | 15         | 9         | 72         | 21         | 36         | 213         | 162        | 24         | 240         | 30         | 978         |
| 4:45-5:00p   | 72         | 63         | 11         | 6         | 99         | 18         | 14         | 218         | 105        | 14         | 182         | 11         | 813         |
| 5:00-5:15p   | 78         | 69         | 12         | 5         | 108        | 20         | 15         | 237         | 114        | 15         | 198         | 12         | 883         |
| 5:15-5:30p   | 81         | 72         | 13         | 5         | 113        | 21         | 16         | 248         | 119        | 14         | 207         | 11         | 920         |
| 5:30-5:45p   | 67         | 52         | 16         | 6         | 76         | 21         | 14         | 144         | 117        | 11         | 148         | 13         | 685         |
| 5:45-6:00p   | 63         | 41         | 18         | 6         | 60         | 17         | 11         | 114         | 93         | 9          | 117         | 9          | 548         |
| <b>TOTAL</b> | <b>554</b> | <b>454</b> | <b>102</b> | <b>61</b> | <b>640</b> | <b>147</b> | <b>141</b> | <b>1479</b> | <b>927</b> | <b>117</b> | <b>1393</b> | <b>114</b> | <b>6129</b> |

**EXISTING TRAFFIC**  
**Peoria Avenue & Grand Avenue**

05/08/01

| Direction<br>Time | SB        |             |            | NB        |             |            | WB         |             |            | EB         |             |           | TOTAL       |
|-------------------|-----------|-------------|------------|-----------|-------------|------------|------------|-------------|------------|------------|-------------|-----------|-------------|
|                   | R         | S           | L          | R         | S           | L          | R          | S           | L          | R          | S           | L         |             |
| 7:00-7:15a        | 6         | 197         | 36         | 4         | 139         | 6          | 32         | 99          | 17         | 24         | 88          | 6         | 654         |
| 7:15-7:30a        | 12        | 157         | 42         | 6         | 129         | 12         | 36         | 165         | 51         | 54         | 159         | 6         | 829         |
| 7:30-7:45a        | 12        | 162         | 44         | 7         | 132         | 13         | 37         | 172         | 53         | 56         | 165         | 7         | 860         |
| 7:45-8:00a        | 11        | 153         | 40         | 6         | 130         | 12         | 35         | 159         | 49         | 52         | 154         | 6         | 807         |
| 8:00-8:15a        | 7         | 140         | 37         | 5         | 116         | 11         | 32         | 144         | 42         | 47         | 119         | 4         | 704         |
| 8:15-8:30a        | 3         | 141         | 26         | 6         | 108         | 14         | 33         | 66          | 23         | 17         | 86          | 5         | 528         |
| 8:30-8:45a        | 2         | 112         | 21         | 5         | 93          | 11         | 26         | 52          | 18         | 14         | 68          | 3         | 425         |
| 8:45-9:00a        | 4         | 111         | 20         | 5         | 91          | 11         | 27         | 52          | 17         | 14         | 67          | 2         | 421         |
| <b>TOTAL</b>      | <b>57</b> | <b>1173</b> | <b>266</b> | <b>44</b> | <b>938</b>  | <b>90</b>  | <b>258</b> | <b>909</b>  | <b>270</b> | <b>278</b> | <b>906</b>  | <b>39</b> | <b>5228</b> |
| 4:00-4:15p        | 6         | 156         | 36         | 8         | 167         | 27         | 6          | 188         | 3          | 41         | 181         | 12        | 831         |
| 4:15-4:30p        | 7         | 172         | 28         | 11        | 192         | 20         | 5          | 126         | 2          | 17         | 130         | 7         | 717         |
| 4:30-4:45p        | 4         | 160         | 26         | 10        | 180         | 19         | 4          | 147         | 4          | 29         | 141         | 6         | 730         |
| 4:45-5:00p        | 5         | 177         | 29         | 9         | 197         | 21         | 6          | 128         | 3          | 18         | 131         | 3         | 727         |
| 5:00-5:15p        | 6         | 191         | 32         | 10        | 210         | 23         | 7          | 133         | 5          | 20         | 136         | 4         | 777         |
| 5:15-5:30p        | 7         | 198         | 33         | 10        | 217         | 24         | 9          | 136         | 3          | 21         | 137         | 6         | 801         |
| 5:30-5:45p        | 4         | 146         | 30         | 6         | 171         | 26         | 8          | 124         | 2          | 23         | 152         | 8         | 700         |
| 5:45-6:00p        | 3         | 121         | 24         | 3         | 146         | 21         | 12         | 114         | 4          | 18         | 138         | 9         | 613         |
| <b>TOTAL</b>      | <b>42</b> | <b>1321</b> | <b>238</b> | <b>67</b> | <b>1480</b> | <b>181</b> | <b>57</b>  | <b>1096</b> | <b>26</b>  | <b>187</b> | <b>1146</b> | <b>55</b> | <b>5896</b> |

**EXISTING TRAFFIC**  
**83<sup>rd</sup> Avenue & Grand Avenue**

05/08/01

| Direction<br>Time | SB        |             |            | NB        |            |           | EB        |            |           | WB        |            |           | TOTAL       |
|-------------------|-----------|-------------|------------|-----------|------------|-----------|-----------|------------|-----------|-----------|------------|-----------|-------------|
|                   | R         | S           | L          | R         | S          | L         | R         | S          | L         | R         | S          | L         |             |
| 7:00-7:15a        | 3         | 172         | 27         | 3         | 72         | 6         | 12        | 75         | 6         | 6         | 42         | 6         | 430         |
| 7:15-7:30a        | 6         | 179         | 43         | 5         | 95         | 3         | 3         | 28         | 13        | 5         | 40         | 5         | 425         |
| 7:30-7:45a        | 4         | 192         | 39         | 4         | 104        | 9         | 17        | 109        | 9         | 8         | 61         | 7         | 563         |
| 7:45-8:00a        | 4         | 177         | 36         | 5         | 97         | 8         | 16        | 101        | 7         | 4         | 57         | 6         | 518         |
| 8:00-8:15a        | 5         | 100         | 13         | 6         | 168        | 5         | 13        | 35         | 12        | 2         | 40         | 9         | 408         |
| 8:15-8:30a        | 5         | 142         | 12         | 5         | 158        | 5         | 12        | 33         | 11        | 2         | 38         | 8         | 431         |
| 8:30-8:45a        | 4         | 116         | 10         | 5         | 126        | 2         | 9         | 26         | 9         | 1         | 30         | 6         | 344         |
| 8:45-9:00a        | 2         | 114         | 9          | 6         | 122        | 1         | 6         | 24         | 10        | 2         | 26         | 5         | 327         |
| <b>TOTAL</b>      | <b>33</b> | <b>1192</b> | <b>189</b> | <b>39</b> | <b>942</b> | <b>39</b> | <b>88</b> | <b>431</b> | <b>77</b> | <b>30</b> | <b>334</b> | <b>52</b> | <b>3446</b> |

|              |           |             |            |            |             |            |           |            |           |            |            |           |             |
|--------------|-----------|-------------|------------|------------|-------------|------------|-----------|------------|-----------|------------|------------|-----------|-------------|
| 4:00-4:15p   | 13        | 153         | 30         | 21         | 197         | 8          | 4         | 46         | 7         | 15         | 44         | 7         | 545         |
| 4:15-4:30p   | 12        | 147         | 29         | 20         | 189         | 8          | 3         | 44         | 6         | 14         | 42         | 6         | 520         |
| 4:30-4:45p   | 11        | 135         | 27         | 18         | 173         | 7          | 4         | 40         | 5         | 13         | 38         | 5         | 476         |
| 4:45-5:00p   | 12        | 152         | 30         | 21         | 195         | 6          | 7         | 45         | 8         | 11         | 43         | 9         | 539         |
| 5:00-5:15p   | 12        | 152         | 30         | 21         | 195         | 6          | 7         | 45         | 8         | 11         | 43         | 9         | 539         |
| 5:00-5:15p   | 14        | 166         | 33         | 23         | 213         | 13         | 11        | 52         | 9         | 16         | 47         | 7         | 604         |
| 5:15-5:30p   | 14        | 166         | 33         | 23         | 213         | 13         | 11        | 52         | 9         | 16         | 47         | 7         | 604         |
| 5:15-5:30p   | 8         | 132         | 45         | 11         | 180         | 16         | 17        | 110        | 13        | 13         | 54         | 11        | 610         |
| 5:30-5:45p   | 8         | 132         | 45         | 11         | 180         | 16         | 17        | 110        | 13        | 13         | 54         | 11        | 610         |
| 5:30-5:45p   | 5         | 105         | 44         | 8          | 143         | 24         | 26        | 87         | 11        | 18         | 51         | 9         | 531         |
| 5:45-6:00p   | 5         | 105         | 44         | 8          | 143         | 24         | 26        | 87         | 11        | 14         | 40         | 7         | 420         |
| 5:45-6:00p   | 4         | 83          | 35         | 6          | 113         | 19         | 21        | 69         | 9         | 14         | 40         | 7         | 420         |
| <b>TOTAL</b> | <b>79</b> | <b>1073</b> | <b>273</b> | <b>128</b> | <b>1403</b> | <b>101</b> | <b>93</b> | <b>493</b> | <b>68</b> | <b>114</b> | <b>359</b> | <b>61</b> | <b>4245</b> |

# WORKSHEET FOR ANALYSIS OF TWSC T-INTERSECTIONS

Location: 87th Av & Grand Av

Major Street Name: Grand Av

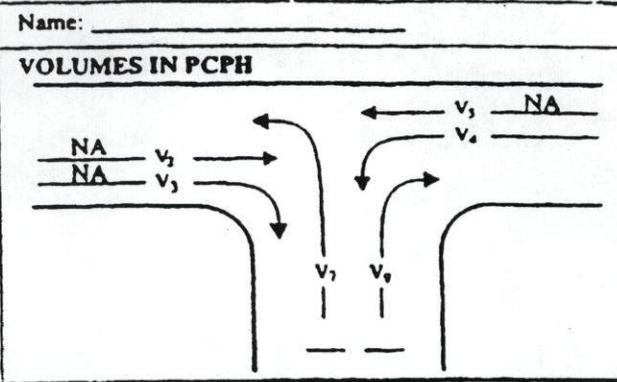
Minor Street Name: 87th Av

Date of Counts: 02-20-01

Time Period: am peak hour

Average Running Speed: \_\_\_\_\_

PHF: \_\_\_\_\_



**VOLUME ADJUSTMENTS**

|                                  |     |   |    |     |    |    |
|----------------------------------|-----|---|----|-----|----|----|
| Movement No.                     | 2   | 3 | 4  | 5   | 7  | 9  |
| Volume, V (vph)                  | 959 | 5 | 27 | 736 | 23 | 38 |
| Volume, v (pcph), see Table 10-1 |     |   | 27 |     | 23 | 38 |

**STEP 1: RT from Minor Street** ↗ V<sub>9</sub>

Conflicting Flows:  $V_c$  (Figure 10-3)  $V_{c,9} = 1/2 V_3^\oplus + V_2$   
 $3 + 959 = 962$  vph

Potential Capacity:  $c_{p,i}$  (Fig. 10-4, 5)  $c_{p,9} = 450$  pcph

Movement Capacity:  $c_{m,i}$   $c_{m,9} = c_{p,9} = 450$  pcph

**STEP 2: LT From Major Street** ↖ V<sub>4</sub>

Conflicting Flows:  $V_c$  (Figure 10-3)  $V_{c,4} = V_3^\oplus + V_2$   
 $5 + 959 = 964$  vph

Potential Capacity:  $c_{p,i}$  (Fig. 10-4, 5)  $c_{p,4} = 450$  pcph

Movement Capacity:  $c_{m,i}$   $c_{m,4} = c_{p,4} = 450$  pcph

Prob. of Queue-free State:  $p_{0,i}$  (Equation 10-3)  $p_{0,4} = 1 - v_i/c_{m,i} = 1 - 27/450 = 0.94$

Major Left Shared Lane  
Prob. of Queue-free State:  $p^*_{0,i}$  (Equation 10-10)  $p^*_{0,4} = 1 - \frac{1 - p_{0,4}}{1 - (V_3/S_3)} =$  \_\_\_\_\_

**STEP 3: LT From Minor Street** ↙ V<sub>7</sub>

Conflicting Flows:  $V_c$  (Figure 10-3)  $V_{c,7} = 1/2 V_3^\oplus + V_2 + V_5 + V_4$   
 $3 + 959 + 736 + 27 = 1725$  vph

Potential Capacity:  $c_{p,i}$  (Fig. 10-4, 5)  $c_{p,7} = 100$  pcph

Capacity Adjustment Factor due to Impeding Movements:  $f_i$   $f_7 = p_{0,4}$  (shared lane use  $p^*$ )

Movement Capacity:  $c_{m,i}$   $c_{m,7} = f_7 \times c_{p,7} =$  \_\_\_\_\_ pcph

**SHARED-LANE CAPACITY**

$$CSH = \frac{v_7 + v_9}{(v_7/c_{m,7}) + (v_9/c_{m,9})} \text{ if lane is shared}$$

| Movement No. | v (pcph) | $c_{m,i}$ (pcph) | CSH (pcph) | Avg Total Delay (Fig 10-7) | LOS | $D_A$ |
|--------------|----------|------------------|------------|----------------------------|-----|-------|
| 7            | 23       | 100              |            | 14                         | C   |       |
| 9            | 38       | 450              |            | 9                          | B   |       |
| 4            | 27       | 450              |            | 9                          | B   |       |

Average total delay for the intersection (Eq. 10-14)  $\frac{D_7 V_7 + D_9 V_9 + D_4 V_4}{V_2 + V_3 + V_4 + V_5 + V_7 + V_9} = \frac{23(14) + 38(9) + 27(9)}{959 + 5 + 27 + 736 + 23 + 38} = 0.51 = L.O.S. A$

⊕ - if a right turn lane exists on major road  $V_3$  is excluded  
 ⊖ - if right turn from major street is channelized and yields to major street left turning traffic,  $V_4$  is excluded

# WORKSHEET FOR ANALYSIS OF TWSC T-INTERSECTIONS

Location: 87th Av & Grand Av

Major Street Name: Grand Av

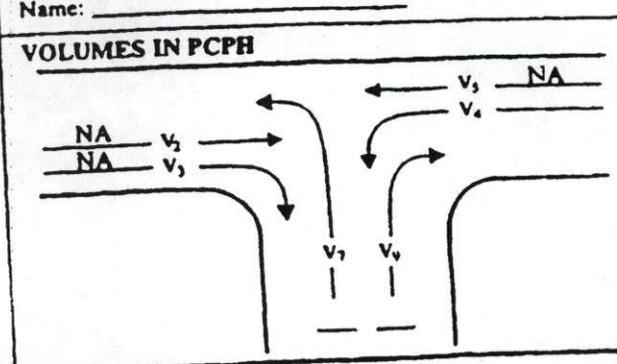
Minor Street Name: 87th Av

Date of Counts: 02-20-01

Time Period: pm peak hour

Average Running Speed: \_\_\_\_\_

PHF: \_\_\_\_\_



| VOLUME ADJUSTMENTS               | 2    | 3  | 4  | 5   | 7  | 9  |
|----------------------------------|------|----|----|-----|----|----|
| Movement No.                     |      |    |    |     |    |    |
| Volume, V (vph)                  | 1140 | 35 | 87 | 899 | 49 | 55 |
| Volume, v (pcph), see Table 10-1 |      |    |    |     |    |    |

**STEP 1: RT from Minor Street**

Conflicting Flows:  $V_c$  (Figure 10-3)

Potential Capacity:  $C_{p,i}$  (Fig. 10-4, 5)

Movement Capacity:  $C_{m,i}$

$V_9$

$$V_{c,9} = 1/2 V_3^{\oplus} + V_2$$

$$1/2 + 1140 = 1158 \text{ vph}$$

$$C_{p,9} = 350 \text{ pcph}$$

$$C_{m,9} = C_{p,9} = 350 \text{ pcph}$$

**STEP 2: LT From Major Street**

Conflicting Flows:  $V_c$  (Figure 10-3)

Potential Capacity:  $C_{p,j}$  (Fig. 10-4, 5)

Movement Capacity:  $C_{m,j}$

Prob. of Queue-free State:  $po_i$  (Equation 10-3)

Major Left Shared Lane

Prob. of Queue-free State:  $p^{*o}_j$  (Equation 10-10)

$V_4$

$$V_{c,4} = V_3^{\oplus} + V_2$$

$$35 + 1140 = 1175 \text{ vph}$$

$$C_{p,4} = 400 \text{ pcph}$$

$$C_{m,4} = C_{p,4} = 400 \text{ pcph}$$

$$po_{0,4} = 1 - v_4 / C_{m,4} = 1 - 87 / 400 = 0.78$$

$$p^{*o}_{0,4} = 1 - \frac{1 - po_{0,4}}{1 - \left(\frac{V_3}{S_3}\right)}$$

**STEP 3: LT From Minor Street**

Conflicting Flows:  $V_c$  (Figure 10-3)

Potential Capacity:  $C_{p,j}$  (Fig. 10-4, 5)

Capacity Adjustment Factor due to Impeding Movements:  $f_i$

Movement Capacity:  $C_{m,j}$

$V_7$

$$V_{c,7} = 1/2 V_3^{\oplus} + V_2 + V_5 + V_4$$

$$1/2 + 1140 + 899 + 87 = 2144 \text{ vph}$$

$$C_{p,7} = 50 \text{ pcph}$$

$$f_7 = po_{0,4} = 0.78 \text{ (shared lane use } p^*)$$

$$C_{m,7} = f_7 \times C_{p,7} = 39 \text{ pcph}$$

**SHARED-LANE CAPACITY**

$CSH = \frac{v_7 + v_9}{(v_7 / C_{m,7}) + (v_9 / C_{m,9})}$  if lane is shared

| Movement No. | v (pcph) | $C_m$ (pcph) | CSH (pcph) | Avg Total Delay (Fig 10-7) | LOS | $D_A$ |
|--------------|----------|--------------|------------|----------------------------|-----|-------|
| 7            | 49       | 39           |            | 22                         | D   |       |
| 9            | 55       | 350          |            | 12                         | C   |       |
| 4            | 87       | 400          |            | 12                         | C   |       |

Average total delay for the intersection (Eq. 10-14)

$$\frac{D_7 V_7 + D_9 V_9 + D_4 V_4}{V_2 + V_3 + V_4 + V_5 + V_7 + V_9} = \frac{22(49) + 12(55) + 12(87)}{1140 + 35 + 899 + 899 + 49 + 55} = 1.23 = L.O.S. A$$

$\oplus$  - if a right turn lane exists on major road  $V_3$  is excluded

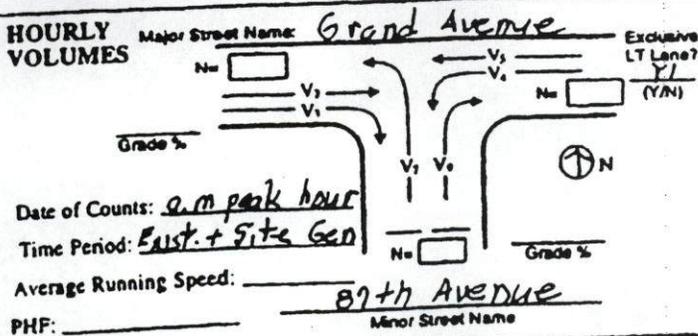
$\ominus$  - if a right turn lane exists on major road and yields to minor street left turning traffic,  $V_3$  is excluded.

# WORKSHEET FOR ANALYSIS OF TWSC T-INTERSECTIONS

Location: 87th Av. & Grand Ave.

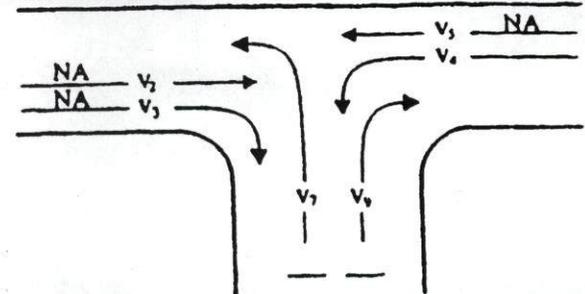
Name: \_\_\_\_\_

**HOURLY VOLUMES**



Date of Counts: a.m. peak hour  
 Time Period: East + Side Gen  
 Average Running Speed: \_\_\_\_\_  
 PHF: \_\_\_\_\_

**VOLUMES IN PCPH**



**VOLUME ADJUSTMENTS**

|                                  |      |   |    |     |    |    |
|----------------------------------|------|---|----|-----|----|----|
| Movement No.                     | 2    | 3 | 4  | 5   | 7  | 9  |
| Volume, V (vph)                  | 1017 | 9 | 36 | 781 | 41 | 69 |
| Volume, v (pcph), see Table 10-1 |      |   |    |     |    |    |

**STEP 1: RT from Minor Street**

Conflicting Flows:  $V_c$  (Figure 10-3)  

$$V_{c,9} = 1/2 V_3^{\text{O}} + V_2 = \frac{5}{2} + 1017 = 1022 \text{ vph}$$
  
 Potential Capacity:  $c_{p,i}$  (Fig. 10-4, 5)  
 $c_{p,9} = 400 \text{ pcph}$   
 Movement Capacity:  $c_{m,i}$   
 $c_{m,9} = c_{p,9} = 400 \text{ pcph}$

**STEP 2: LT From Major Street**

Conflicting Flows:  $V_c$  (Figure 10-3)  

$$V_{c,4} = V_3^{\text{O}} + V_2 = 9 + 1017 = 1026 \text{ vph}$$
  
 Potential Capacity:  $c_{p,i}$  (Fig. 10-4, 5)  
 $c_{p,4} = 500 \text{ pcph}$   
 Movement Capacity:  $c_{m,i}$   
 $c_{m,4} = c_{p,4} = 500 \text{ pcph}$   
 Prob. of Queue-free State:  $p_{0,i}$  (Equation 10-3)  

$$p_{0,4} = 1 - v_4 / c_{m,4} = 1 - 36 / 500 = 0.928$$
  
 Major Left Shared Lane  
 Prob. of Queue-free State:  $p^*_{0,i}$  (Equation 10-10)  

$$p^*_{0,4} = 1 - \frac{1 - p_{0,4}}{1 - \left(\frac{V_3}{S_3}\right)} = \dots$$

**STEP 3: LT From Minor Street**

Conflicting Flows:  $V_c$  (Figure 10-3)  

$$V_{c,7} = 1/2 V_3^{\text{O}} + V_2 + V_5 + V_4 = \frac{5}{2} + 1017 + 781 + 36 = 1839 \text{ vph}$$
  
 Potential Capacity:  $c_{p,i}$  (Fig. 10-4, 5)  
 $c_{p,7} = 75 \text{ pcph}$   
 Capacity Adjustment Factor due to Impeding Movements:  $f_i$   
 $f_7 = p_{0,4} = 0.928$  (shared lane use  $p^*$ )  
 Movement Capacity:  $c_{m,i}$   
 $c_{m,7} = f_7 \times c_{p,7} = 70 \text{ pcph}$

**SHARED-LANE CAPACITY**

$$CSH = \frac{v_7 + v_9}{(v_7 / c_{m,7}) + (v_9 / c_{m,9})} \text{ if lane is shared}$$

| Movement No. | v (pcph) | $c_m$ (pcph) | CSH (pcph) | Avg. Total Delay (Fig. 10-7) | LOS | DA |
|--------------|----------|--------------|------------|------------------------------|-----|----|
| 7            | 41       | 70           |            | 20                           | C   |    |
| 9            | 69       | 400          |            | 10                           | B   |    |
| 4            | 36       | 500          |            | 8                            | B   |    |

Average total delay for the intersection (Eq. 10-14)

$$\frac{D_7 V_7 + D_9 V_9 + D_4 V_4}{V_2 + V_3 + V_4 + V_5 + V_7 + V_9} = \frac{41(20) + 69(10) + 36(8)}{1017 + 9 + 36 + 781 + 41 + 69} = 0.92 = \text{LOS A}$$

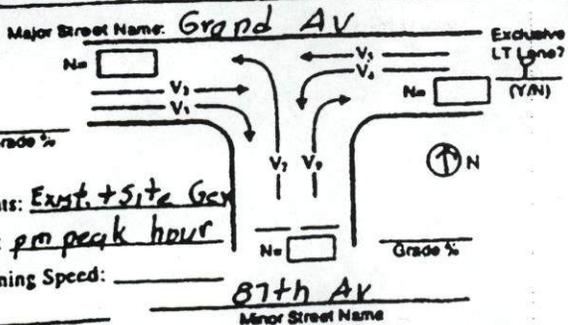
⊙ - if a right turn lane exists on major road  $V_3$  is excluded  
 ⊙ - if right turn from major street is channelized and yields to major street left turning traffic,  $V_3$  is excluded.

# WORKSHEET FOR ANALYSIS OF TWSC T-INTERSECTIONS

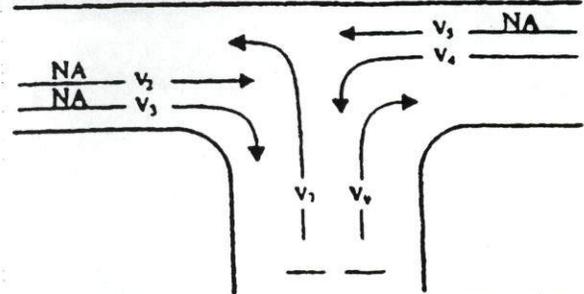
Location: 87th Av & Grand Av

Name: \_\_\_\_\_

**HOURLY VOLUMES**



**VOLUMES IN PCPH**



**VOLUME ADJUSTMENTS**

|                                  |      |    |     |     |    |    |
|----------------------------------|------|----|-----|-----|----|----|
| Movement No.                     | 2    | 3  | 4   | 5   | 7  | 9  |
| Volume, V (vph)                  | 1209 | 55 | 122 | 954 | 61 | 74 |
| Volume, v (pcph), see Table 10-1 |      |    |     |     |    |    |

**STEP 1: RT from Minor Street**

Conflicting Flows:  $V_c$  (Figure 10-3)

$$V_{c,9} = 1/2 V_3^{\oplus} + V_2 = \frac{2.8}{2} + 1209 = 1237 \text{ vph}$$

Potential Capacity:  $c_{p,i}$  (Fig. 10-4, 5)

$$c_{p,9} = 325 \text{ pcph}$$

Movement Capacity:  $c_{m,i}$

$$c_{m,9} = c_{p,9} = 325 \text{ pcph}$$

**STEP 2: LT From Major Street**

Conflicting Flows:  $V_c$  (Figure 10-3)

$$V_{c,4} = V_3^{\oplus} + V_2 = 55 + 1209 = 1264 \text{ vph}$$

Potential Capacity:  $c_{p,j}$  (Fig. 10-4, 5)

$$c_{p,4} = 350 \text{ pcph}$$

Movement Capacity:  $c_{m,i}$

$$c_{m,4} = c_{p,4} = 350 \text{ pcph}$$

Prob. of Queue-free State:  $p_{0,i}$  (Equation 10-3)

$$p_{0,4} = 1 - v/c_{m,4} = 1 - \frac{122}{350} = 0.65$$

Major Left Shared Lane  
 Prob. of Queue-free State:  $p^{*0,i}$  (Equation 10-10)

$$p^{*0,4} = 1 - \frac{1 - p_{0,4}}{1 - \left(\frac{V_3}{S_3}\right)} = \text{_____}$$

**STEP 3: LT From Minor Street**

Conflicting Flows:  $V_c$  (Figure 10-3)

$$V_{c,7} = 1/2 V_3^{\oplus} + V_2 + V_5 + V_4 = \frac{2.8}{2} + 1209 + 954 + 122 = 2313 \text{ vph}$$

Potential Capacity:  $c_{p,j}$  (Fig. 10-4, 5)

$$c_{p,7} = 50 \text{ pcph}$$

Capacity Adjustment Factor due to Impeding Movements:  $f_i$

$$f_7 = p_{0,4} = 0.65 \text{ (shared lane use } p^*)$$

Movement Capacity:  $c_{m,i}$

$$c_{m,7} = f_7 \times c_{p,7} = 33 \text{ pcph}$$

**SHARED-LANE CAPACITY**

$$CSH = \frac{v_7 + v_9}{(v_7/c_{m,7}) + (v_9/c_{m,9})} \text{ if lane is shared}$$

| Movement No. | v (pcph) | $c_m$ (pcph) | CSH (pcph) | Avg Total Delay (Fig 10-7) | LOS | $D_A$ |
|--------------|----------|--------------|------------|----------------------------|-----|-------|
| 7            | 61       | 33           |            | 22                         | D   |       |
| 9            | 74       | 325          |            | 14                         | C   |       |
| 4            | 122      | 350          |            | 16                         | C   |       |

Average total delay for the intersection (Eq. 10-14)

$$\frac{D_7 V_7 + D_9 V_9 + D_4 V_4}{V_2 + V_3 + V_4 + V_5 + V_7 + V_9} = \frac{6(22) + 74(14) + 122(16)}{1209 + 55 + 122 + 954 + 61 + 74} = 1.75 = L.O.S. A$$

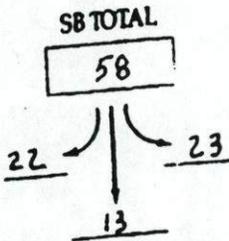
⊕ - if a right turn lane exists on major road  $V_3$  is excluded  
 ⊖ - if right turn from major street is channelized and yields to major street left turning traffic,  $V_4$  is excluded

# PLANNING APPLICATION WORKSHEET

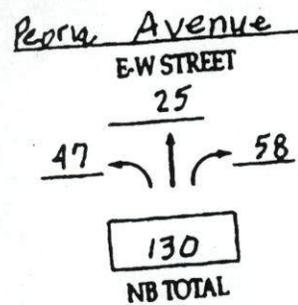
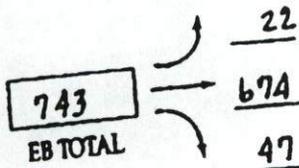
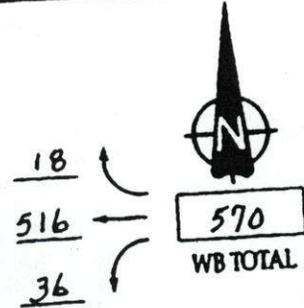
Intersection: Peoria Av. & 87th Av Date: 02-20-01

Analyst: \_\_\_\_\_ Time Period Analyzed: 9m peak hour

Project No. \_\_\_\_\_ City/State: Peoria, AZ



87th Avenue  
N-S STREET



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>22</u>  | } OR |
| WB TH | = | <u>284</u> |      |
|       |   | <u>306</u> |      |
| WB LT | = | <u>36</u>  |      |
| EB TH | = | <u>370</u> |      |
|       |   | <u>406</u> |      |

|       |   |           |      |
|-------|---|-----------|------|
| NB LT | = | <u>47</u> | } OR |
| SB TH | = | <u>13</u> |      |
|       |   | <u>50</u> |      |
| SB LT | = | <u>23</u> |      |
| NB TH | = | <u>25</u> |      |
|       |   | <u>48</u> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

406 + 50 = 456 STATUS? Under

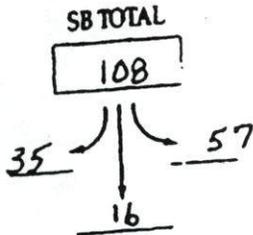
E-W CRITICAL + N-S CRITICAL

PLANNING APPLICATION WORKSHEET

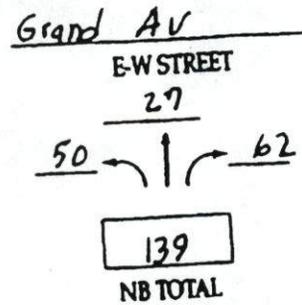
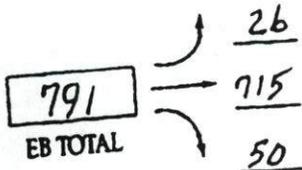
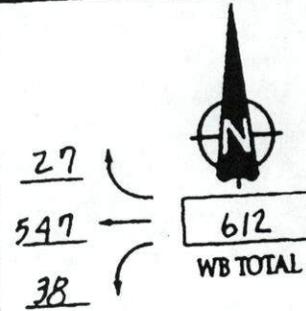
Intersection: Peoria Av. & 87th Av. Date: Existing + Site Gen.

Analyst: \_\_\_\_\_ Time Period Analyzed: 9 m peak hour

Project No. \_\_\_\_\_ City/State: Peoria, AZ



87th Av  
N-S STREET



EB LT = 26

WB TH = 547

WB LT = 38

EB TH = 715

753 } OR

NB LT = 50

SB TH = 16

SB LT = 66

57

NB TH = 27

84 } OR

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 TO 1,400                  | NEAR           |
| > 1,400                         | OVER           |

753 + 84 = 837 STATUS? Under

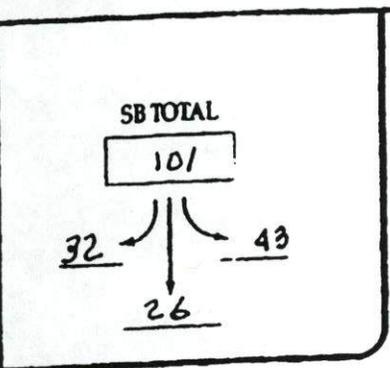
E-W CRITICAL + N-S CRITICAL

PLANNING APPLICATION WORKSHEET

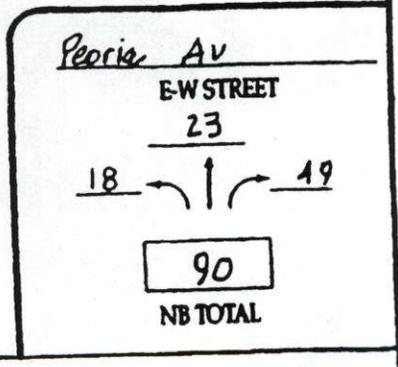
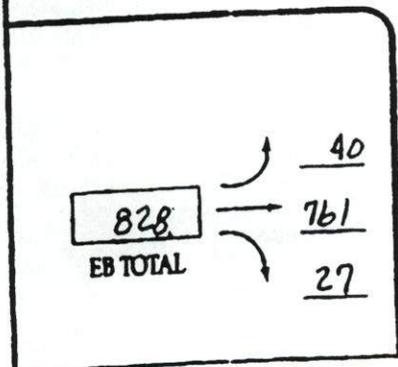
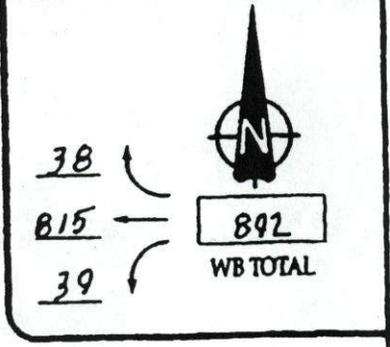
Intersection: Peoria Av. & 87th Av. Date: 02-20-01

Analyst: \_\_\_\_\_ Time Period Analyzed: pm peak hour

Project No. \_\_\_\_\_ City/State: Peoria, AZ



87th Av  
N-S STREET



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>40</u>  |      |
| WB TH | = | <u>448</u> |      |
| WB LT | = | <u>39</u>  | } OR |
| EB TH | = | <u>419</u> |      |
|       |   | <u>488</u> |      |
|       |   | <u>458</u> |      |

|       |   |           |      |
|-------|---|-----------|------|
| NB LT | = | <u>18</u> |      |
| SB TH | = | <u>26</u> |      |
| SB LT | = | <u>43</u> | } OR |
| NB TH | = | <u>23</u> |      |
|       |   | <u>44</u> |      |
|       |   | <u>66</u> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

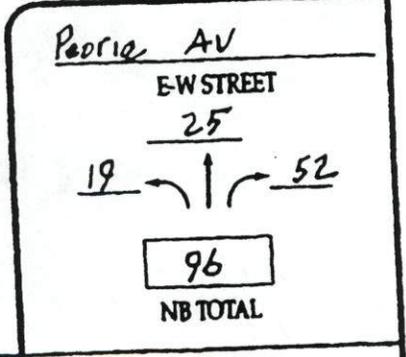
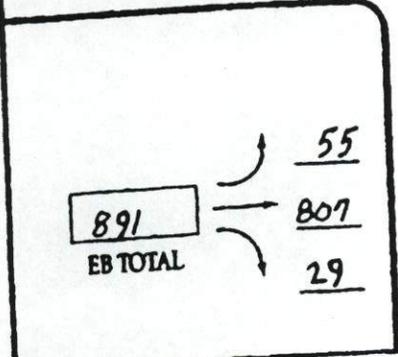
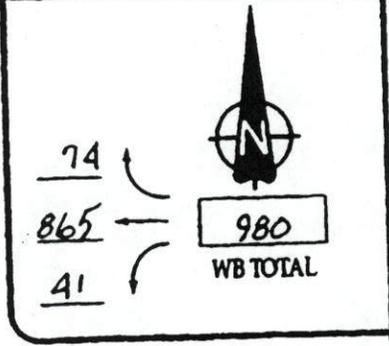
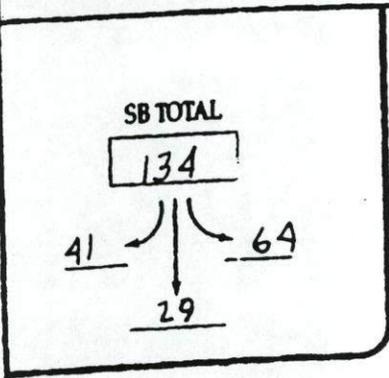
$\frac{488}{\text{E-W CRITICAL}} + \frac{66}{\text{N-S CRITICAL}} = 554$  STATUS? Under

PLANNING APPLICATION WORKSHEET

Intersection: Peoria Av. & 87<sup>th</sup> Av Date: Existing + Site Gen.

Analyst: \_\_\_\_\_ Time Period Analyzed: pm peak hour

Project No. \_\_\_\_\_ City/State: Peoria, AZ



|       |   |                          |   |    |
|-------|---|--------------------------|---|----|
| EB LT | = | <u>55</u>                | } | OR |
| WB TH | = | <u>865</u>               |   |    |
| WB LT | = | <u>920</u><br><u>74</u>  |   |    |
| EB TH | = | <u>807</u><br><u>881</u> |   |    |

|       |   |                        |   |    |
|-------|---|------------------------|---|----|
| NB LT | = | <u>19</u>              | } | OR |
| SB TH | = | <u>29</u>              |   |    |
| SB LT | = | <u>48</u><br><u>64</u> |   |    |
| NB TH | = | <u>25</u><br><u>89</u> |   |    |

| MAXIMUM<br>SUM OF CRITICAL<br>VOLUMES | CAPACITY<br>LEVEL |
|---------------------------------------|-------------------|
| 0 TO 1,200                            | UNDER             |
| 1,201 to 1,400                        | NEAR              |
| > 1,400                               | OVER              |

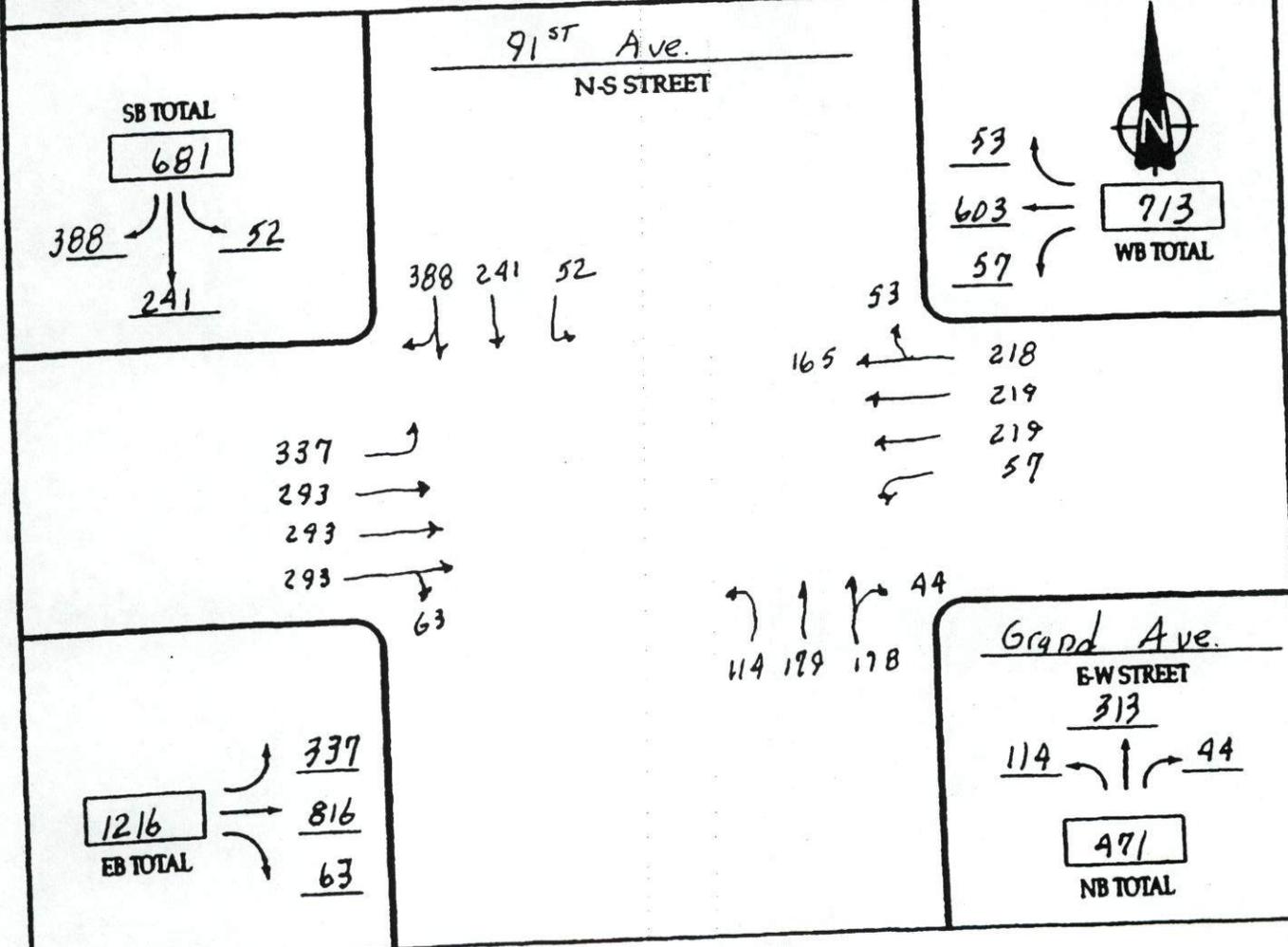
$$\frac{920}{\text{E-W CRITICAL}} + \frac{89}{\text{N-S CRITICAL}} = 1009 \quad \text{STATUS? } \underline{\text{Under}}$$

PLANNING APPLICATION WORKSHEET

Intersection: 91<sup>st</sup> Ave. & Grand Ave. Date: 05-08-01

Analyst: \_\_\_\_\_ Time Period Analyzed: A.M. Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |
|-------|---|------------|
| EB LT | = | <u>337</u> |
| WB TH | = | <u>219</u> |
| WB LT | = | <u>556</u> |
| EB TH | = | <u>293</u> |
|       |   | <u>380</u> |

|       |   |            |
|-------|---|------------|
| NB LT | = | <u>114</u> |
| SB TH | = | <u>241</u> |
| SB LT | = | <u>353</u> |
| NB TH | = | <u>179</u> |
|       |   | <u>231</u> |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

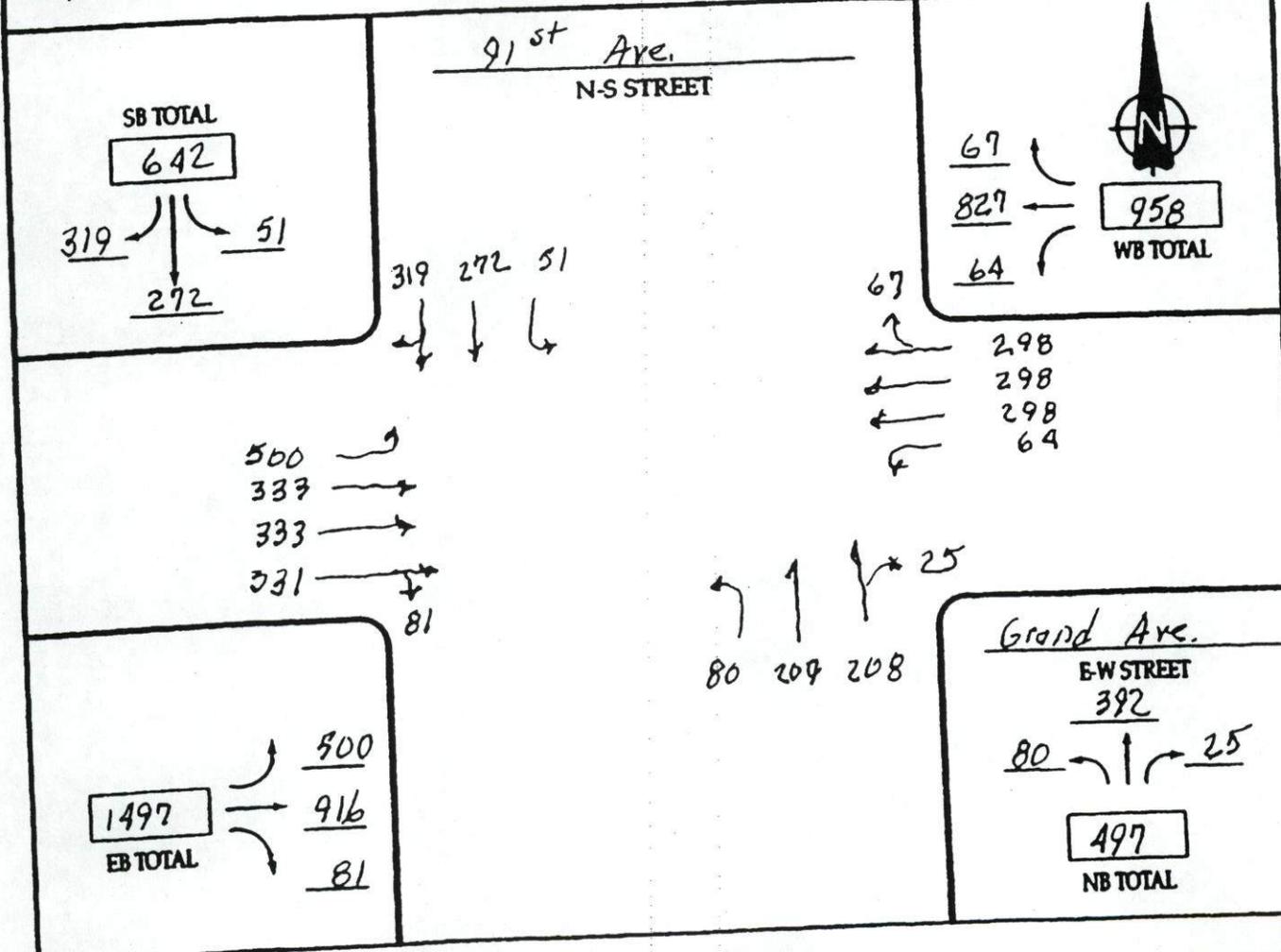
556 E-W CRITICAL + 355 N-S CRITICAL = 911 STATUS? Under

PLANNING APPLICATION WORKSHEET

Intersection: 91<sup>st</sup> Ave. & Grand Ave. Date: 05-08-01

Analyst: \_\_\_\_\_ Time Period Analyzed: P.M. Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>500</u> |      |
| WB TH | = | <u>298</u> |      |
| WB LT | = | <u>798</u> | } OR |
| EB TH | = | <u>397</u> |      |

|       |   |            |      |
|-------|---|------------|------|
| NB LT | = | <u>80</u>  |      |
| SB TH | = | <u>272</u> |      |
| SB LT | = | <u>352</u> | } OR |
| NB TH | = | <u>260</u> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

798 + 352 = 1150 STATUS? Under

E-W CRITICAL + N-S CRITICAL

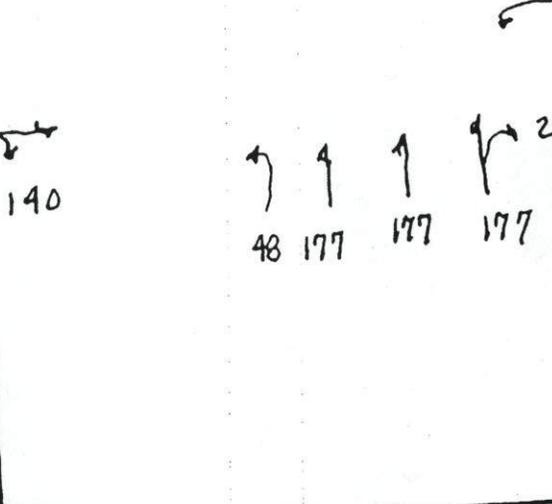
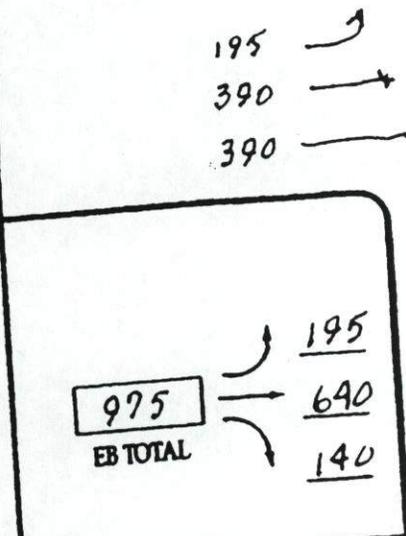
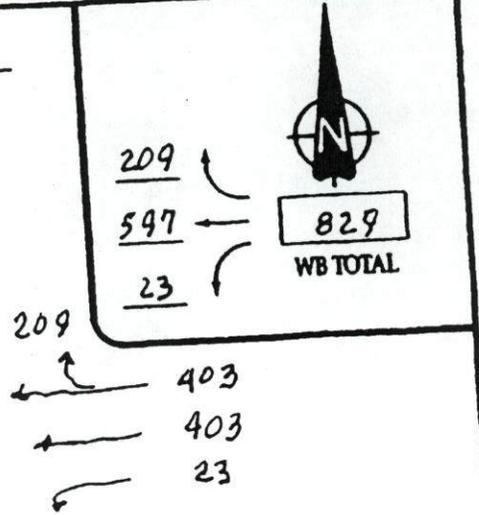
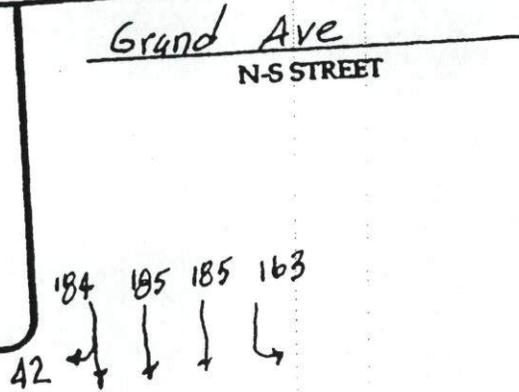
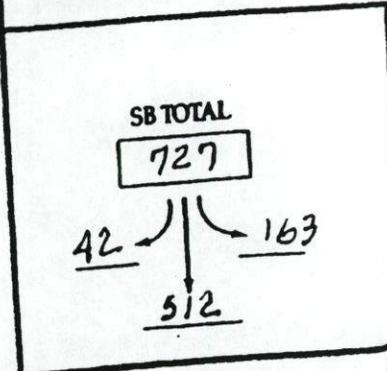
SIGNALIZED INTERSECTIONS

PLANNING APPLICATION WORKSHEET

Intersection: Peoria Ave. & Grand Ave. Date: 05-08-01

Analyst: \_\_\_\_\_ Time Period Analyzed: AM Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>195</u> | } OR |
| WB TH | = | <u>403</u> |      |
| WB LT | = | <u>23</u>  |      |
| EB TH | = | <u>390</u> |      |
|       |   | <b>598</b> |      |
|       |   | <b>413</b> |      |

|       |   |            |      |
|-------|---|------------|------|
| NB LT | = | <u>48</u>  | } OR |
| SB TH | = | <u>185</u> |      |
| SB LT | = | <u>163</u> |      |
| NB TH | = | <u>127</u> |      |
|       |   | <b>233</b> |      |
|       |   | <b>340</b> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

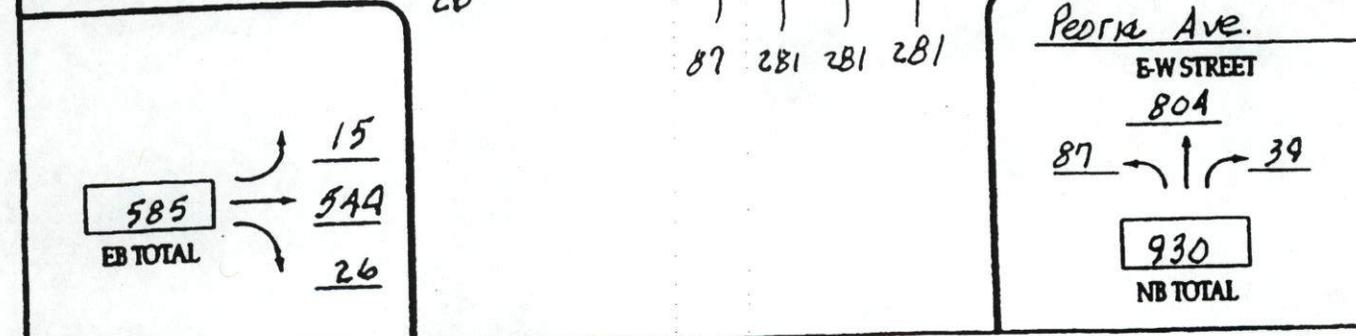
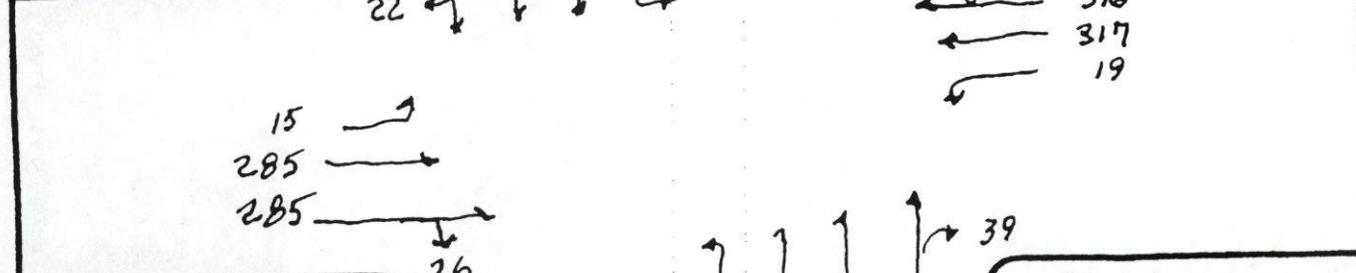
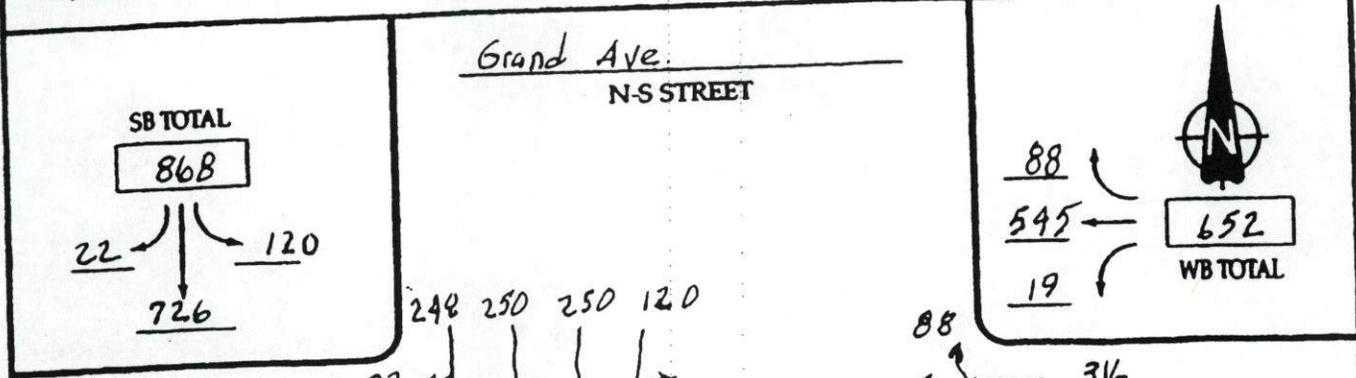
598 EW CRITICAL + 340 N-S CRITICAL = 938 STATUS? Under

# PLANNING APPLICATION WORKSHEET

Intersection: Peoria Ave. & Grand Ave. Date: 05-08-01

Analyst: \_\_\_\_\_ Time Period Analyzed: PM Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>15</u>  | } OR |
| WB TH | = | <u>317</u> |      |
| WB LT | = | <u>19</u>  |      |
| EB TH | = | <u>285</u> |      |
|       |   | <u>332</u> |      |
|       |   | <u>304</u> |      |

|       |   |            |      |
|-------|---|------------|------|
| NB LT | = | <u>87</u>  | } OR |
| SB TH | = | <u>250</u> |      |
| SB LT | = | <u>120</u> |      |
| NB TH | = | <u>281</u> |      |
|       |   | <u>337</u> |      |
|       |   | <u>401</u> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

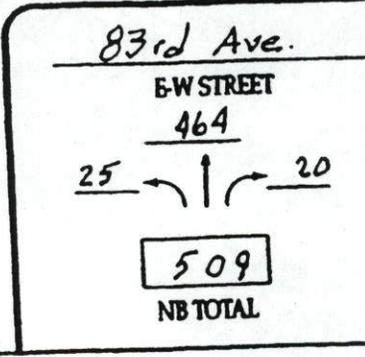
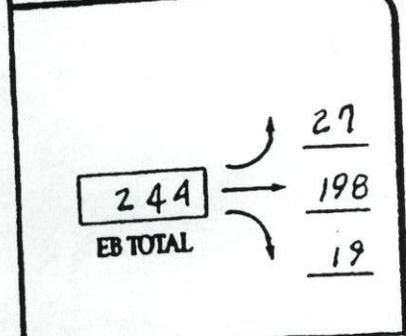
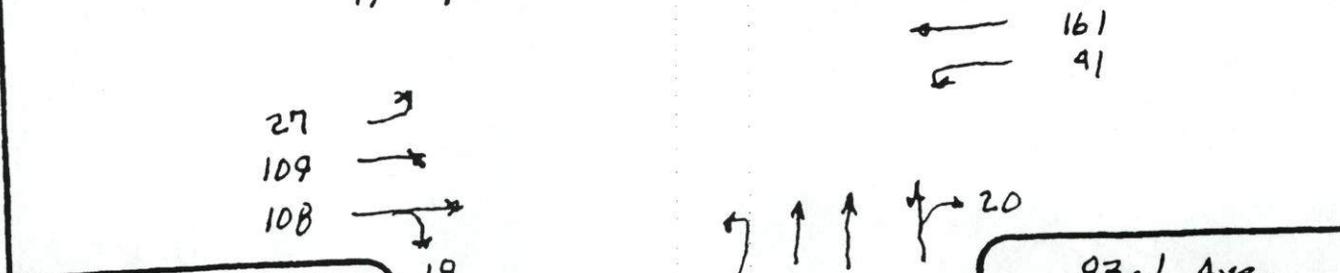
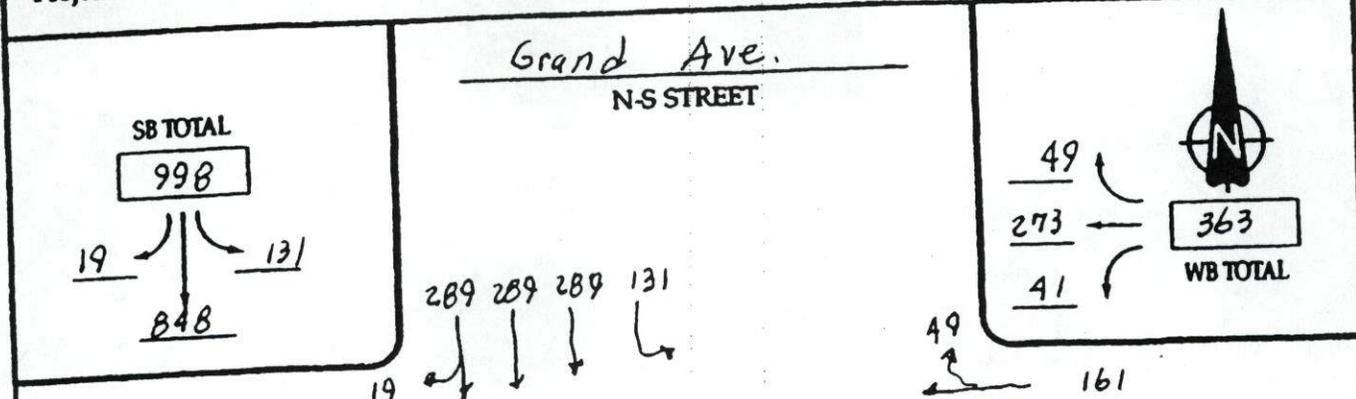
332 E-W CRITICAL + 401 N-S CRITICAL = 733 STATUS? Under

PLANNING APPLICATION WORKSHEET

Intersection: 83rd Ave. & Grand Ave. Date: 05-08-01

Analyst: \_\_\_\_\_ Time Period Analyzed: AM Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>27</u>  |      |
| WB TH | = | <u>161</u> |      |
| WB LT | = | <u>188</u> | } OR |
| EB TH | = | <u>109</u> |      |
|       |   | <u>150</u> |      |

|       |   |            |      |
|-------|---|------------|------|
| NB LT | = | <u>25</u>  |      |
| SB TH | = | <u>289</u> |      |
| SB LT | = | <u>314</u> | } OR |
| NB TH | = | <u>162</u> |      |
|       |   | <u>293</u> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

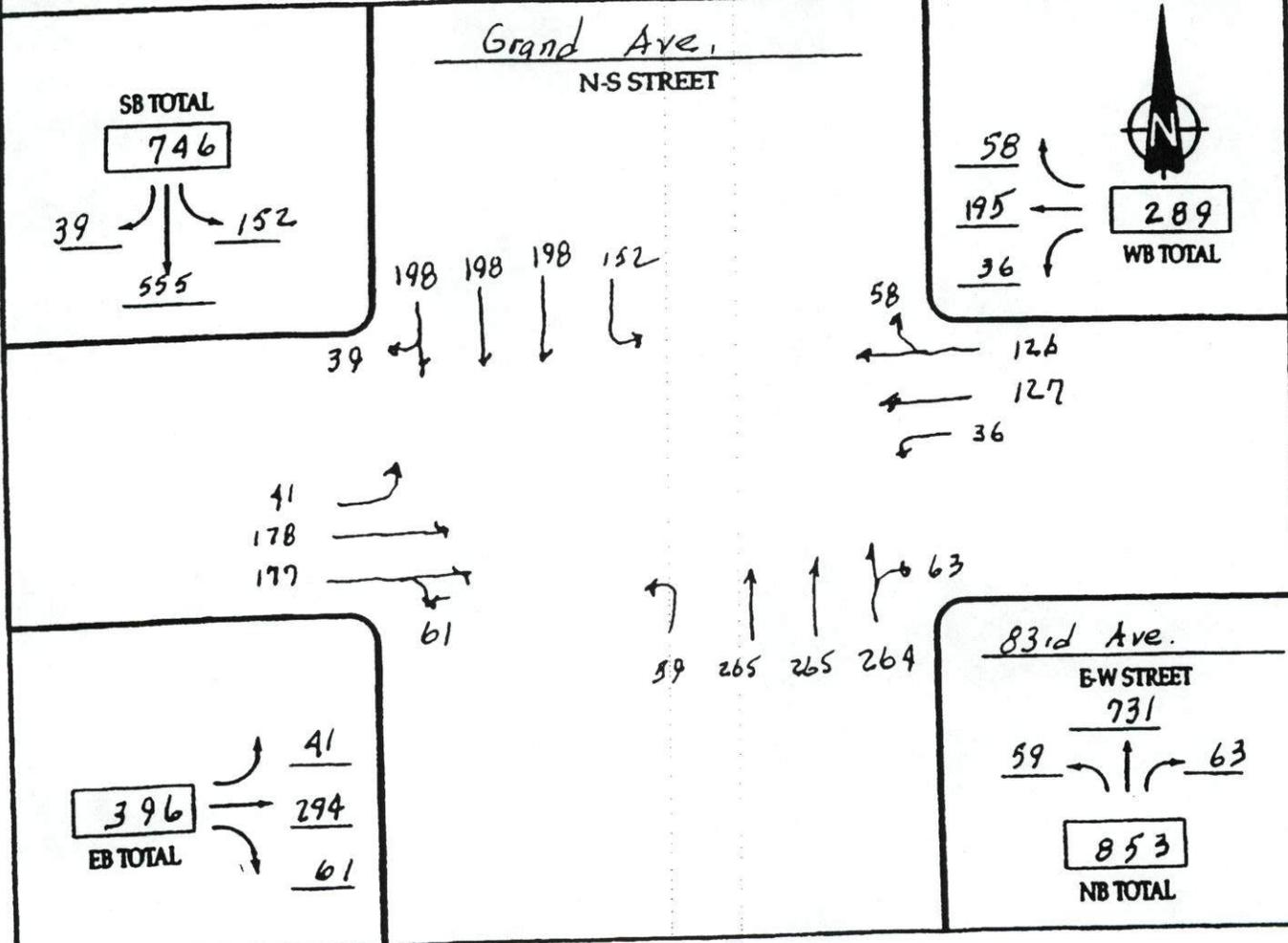
188 E-W CRITICAL + 314 N-S CRITICAL = 502 STATUS? Under

PLANNING APPLICATION WORKSHEET

Intersection: 83rd Ave. & Grand Ave. Date: 05-08-01

Analyst: \_\_\_\_\_ Time Period Analyzed: PM Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |
|-------|---|------------|
| EB LT | = | <u>41</u>  |
| WB TH | = | <u>127</u> |
| WB LT | = | <u>160</u> |
| EB TH | = | <u>178</u> |
|       |   | <u>214</u> |

OR

|       |   |            |
|-------|---|------------|
| NB LT | = | <u>59</u>  |
| SB TH | = | <u>198</u> |
| SB LT | = | <u>257</u> |
| NB TH | = | <u>265</u> |
|       |   | <u>417</u> |

OR

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 TO 1,400                  | NEAR           |
| > 1,400                         | OVER           |

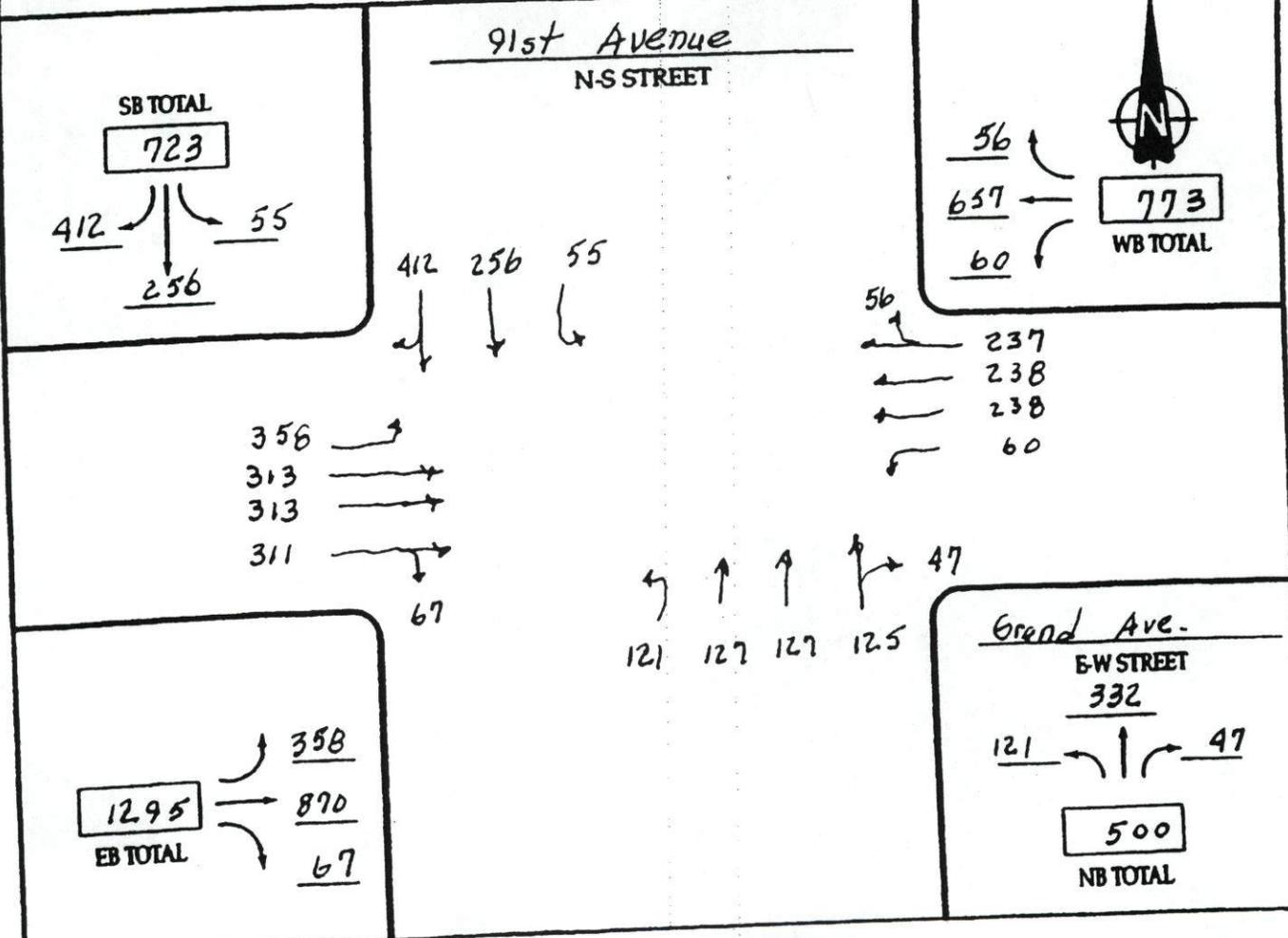
214 E-W CRITICAL + 417 N-S CRITICAL = 631 STATUS? Under

PLANNING APPLICATION WORKSHEET

Intersection: 91st Ave. & Grand Ave. Date: Through + Site Generated

Analyst: \_\_\_\_\_ Time Period Analyzed: AM Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>358</u> | } OR |
| WB TH | = | <u>238</u> |      |
| WB LT | = | <u>60</u>  |      |
| EB TH | = | <u>313</u> |      |
|       |   | <b>596</b> |      |
|       |   | <b>373</b> |      |

|       |   |            |      |
|-------|---|------------|------|
| NB LT | = | <u>121</u> | } OR |
| SB TH | = | <u>256</u> |      |
| SB LT | = | <u>55</u>  |      |
| NB TH | = | <u>127</u> |      |
|       |   | <b>377</b> |      |
|       |   | <b>182</b> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

596 + 377 = 973 STATUS? Under

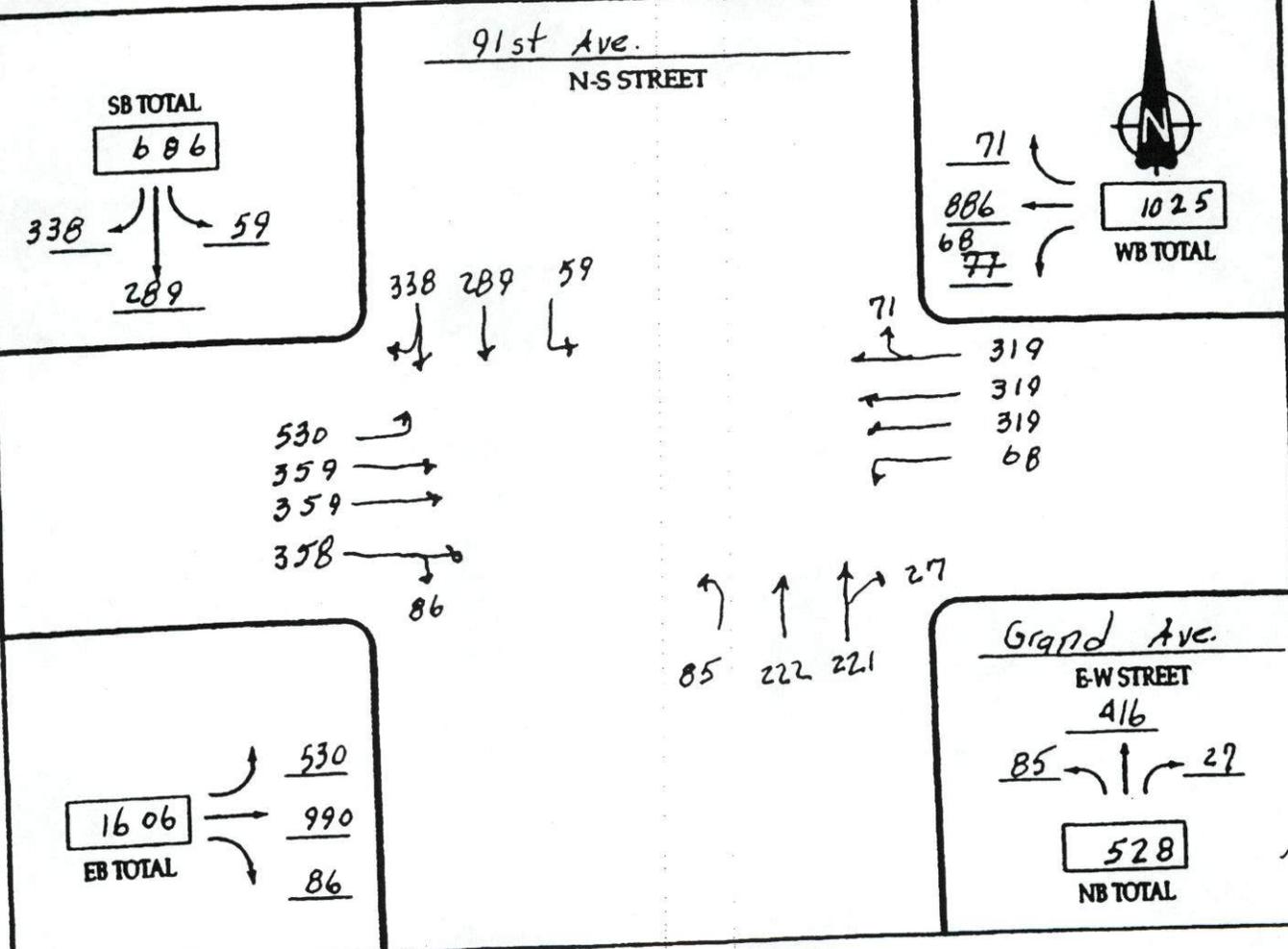
E-W CRITICAL + N-S CRITICAL

PLANNING APPLICATION WORKSHEET

Intersection: 91st Ave. & Grand Ave. Date: Thru + Site Generated

Analyst: \_\_\_\_\_ Time Period Analyzed: PM Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>530</u> | } OR |
| WB TH | = | <u>319</u> |      |
| WB LT | = | <u>849</u> |      |
| EB TH | = | <u>68</u>  |      |
|       |   | <u>427</u> |      |

|       |   |            |      |
|-------|---|------------|------|
| NB LT | = | <u>85</u>  | } OR |
| SB TH | = | <u>289</u> |      |
| SB LT | = | <u>374</u> |      |
| NB TH | = | <u>59</u>  |      |
|       |   | <u>222</u> |      |
|       |   | <u>281</u> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

849 + 374 = 1223 STATUS? Near

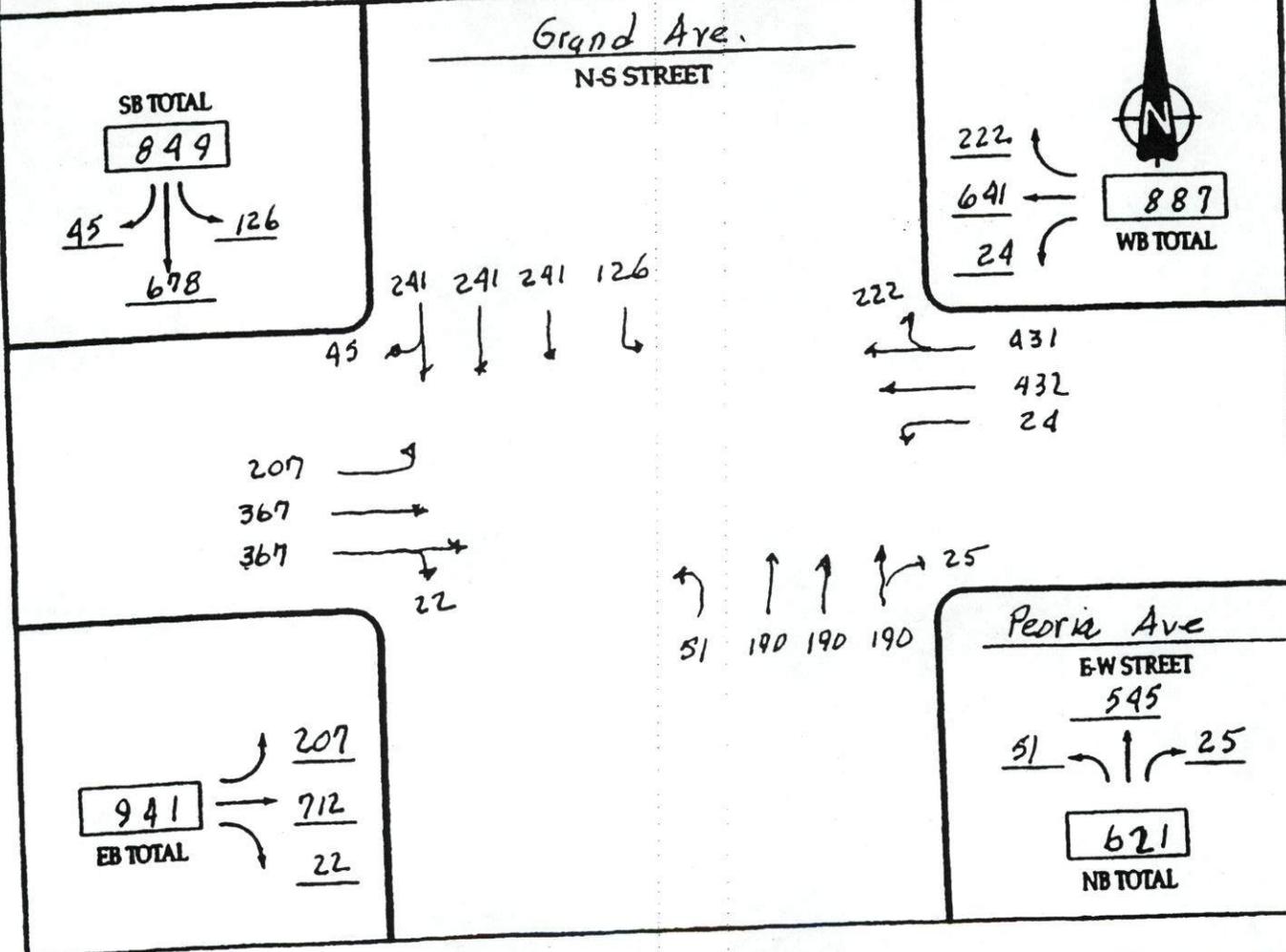
EW CRITICAL + N-S CRITICAL

PLANNING APPLICATION WORKSHEET

Intersection: Peoria Ave. & Grand Ave. Date: Thru + Site Generated

Analyst: \_\_\_\_\_ Time Period Analyzed: PM Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>207</u> |      |
| WB TH | = | <u>432</u> |      |
| WB LT | = | <u>24</u>  | } OR |
| EB TH | = | <u>367</u> |      |
|       |   | <u>639</u> |      |
|       |   | <u>391</u> |      |

|       |   |            |      |
|-------|---|------------|------|
| NB LT | = | <u>51</u>  |      |
| SB TH | = | <u>241</u> |      |
| SB LT | = | <u>126</u> | } OR |
| NB TH | = | <u>190</u> |      |
|       |   | <u>292</u> |      |
|       |   | <u>316</u> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

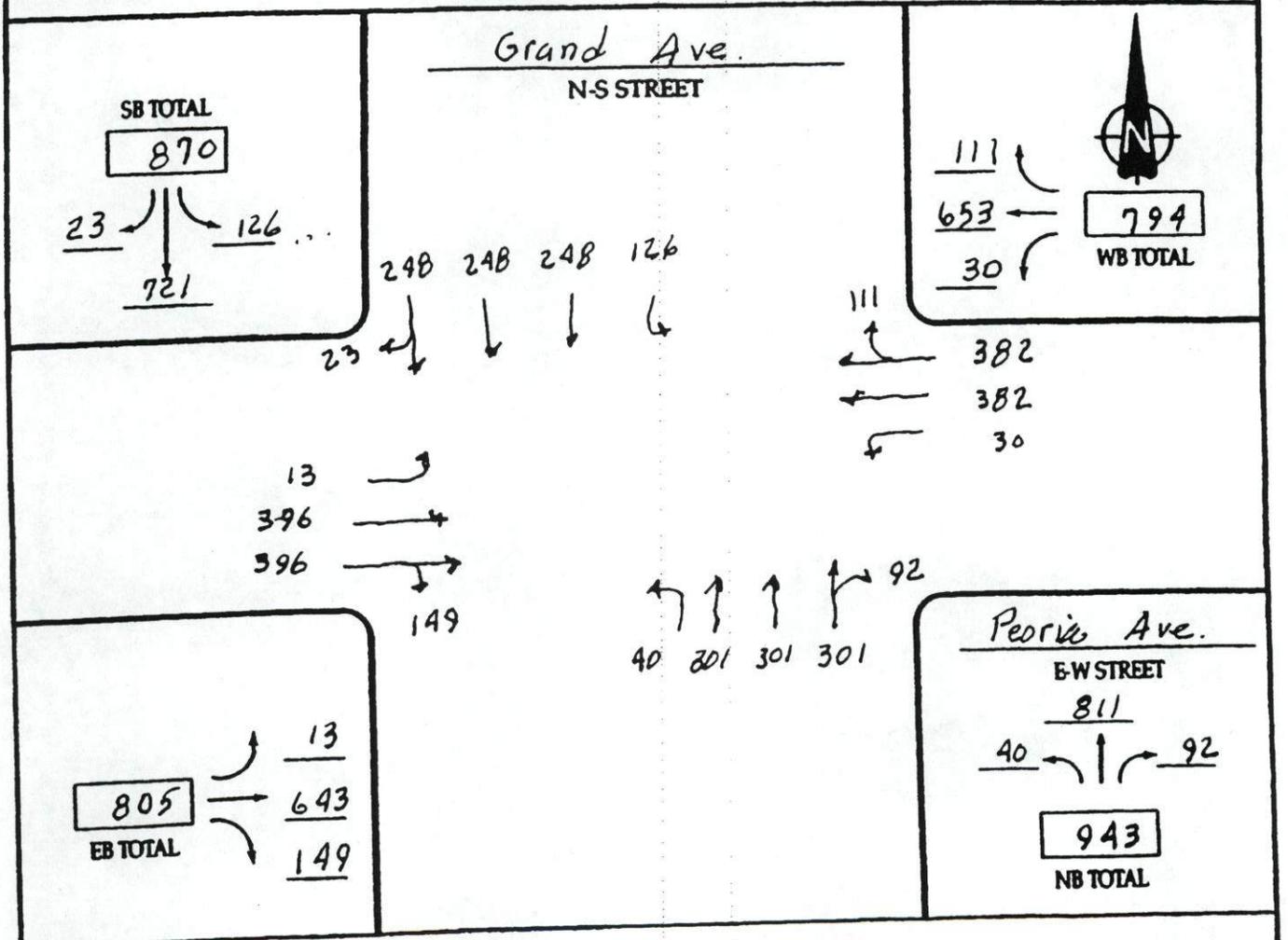
639 E-W CRITICAL + 316 N-S CRITICAL = 955 STATUS? Under

PLANNING APPLICATION WORKSHEET

Intersection: Peoria Ave. & Grand Ave. Date: Thru + Site Generated

Analyst: \_\_\_\_\_ Time Period Analyzed: PM Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>13</u>  |      |
| WB TH | = | <u>382</u> |      |
| WB LT | = | <u>395</u> | } OR |
| EB TH | = | <u>396</u> |      |
|       |   | <u>426</u> |      |

|       |   |            |      |
|-------|---|------------|------|
| NB LT | = | <u>40</u>  |      |
| SB TH | = | <u>248</u> |      |
| SB LT | = | <u>288</u> | } OR |
| NB TH | = | <u>301</u> |      |
|       |   | <u>427</u> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

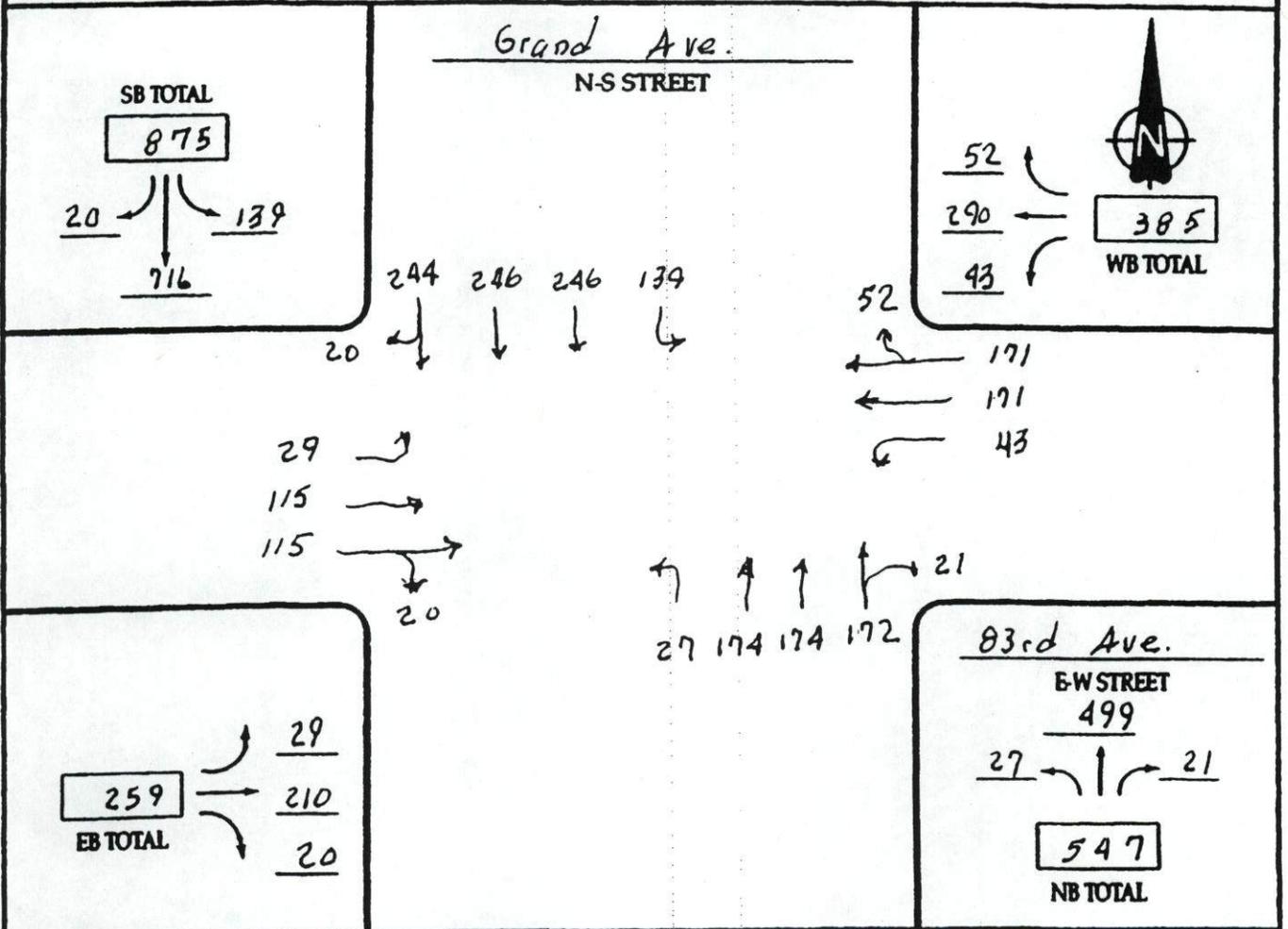
426 E-W CRITICAL + 427 N-S CRITICAL = 853 STATUS? Under

PLANNING APPLICATION WORKSHEET

Intersection: 83rd Ave. & Grand Ave. Date: Thru + Site Generated

Analyst: \_\_\_\_\_ Time Period Analyzed: AM Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



EB LT =  $\frac{29}{200}$

WB TH =  $\frac{171}{200}$

WB LT =  $\frac{43}{158}$

EB TH =  $\frac{115}{158}$

OR

NB LT =  $\frac{27}{313}$

SB TH =  $\frac{246}{313}$

SB LT =  $\frac{139}{313}$

NB TH =  $\frac{174}{313}$

OR

MAXIMUM SUM OF CRITICAL VOLUMES

- 0 TO 1,200
- 1,201 to 1,400
- > 1,400

CAPACITY LEVEL

- UNDER
- NEAR
- OVER

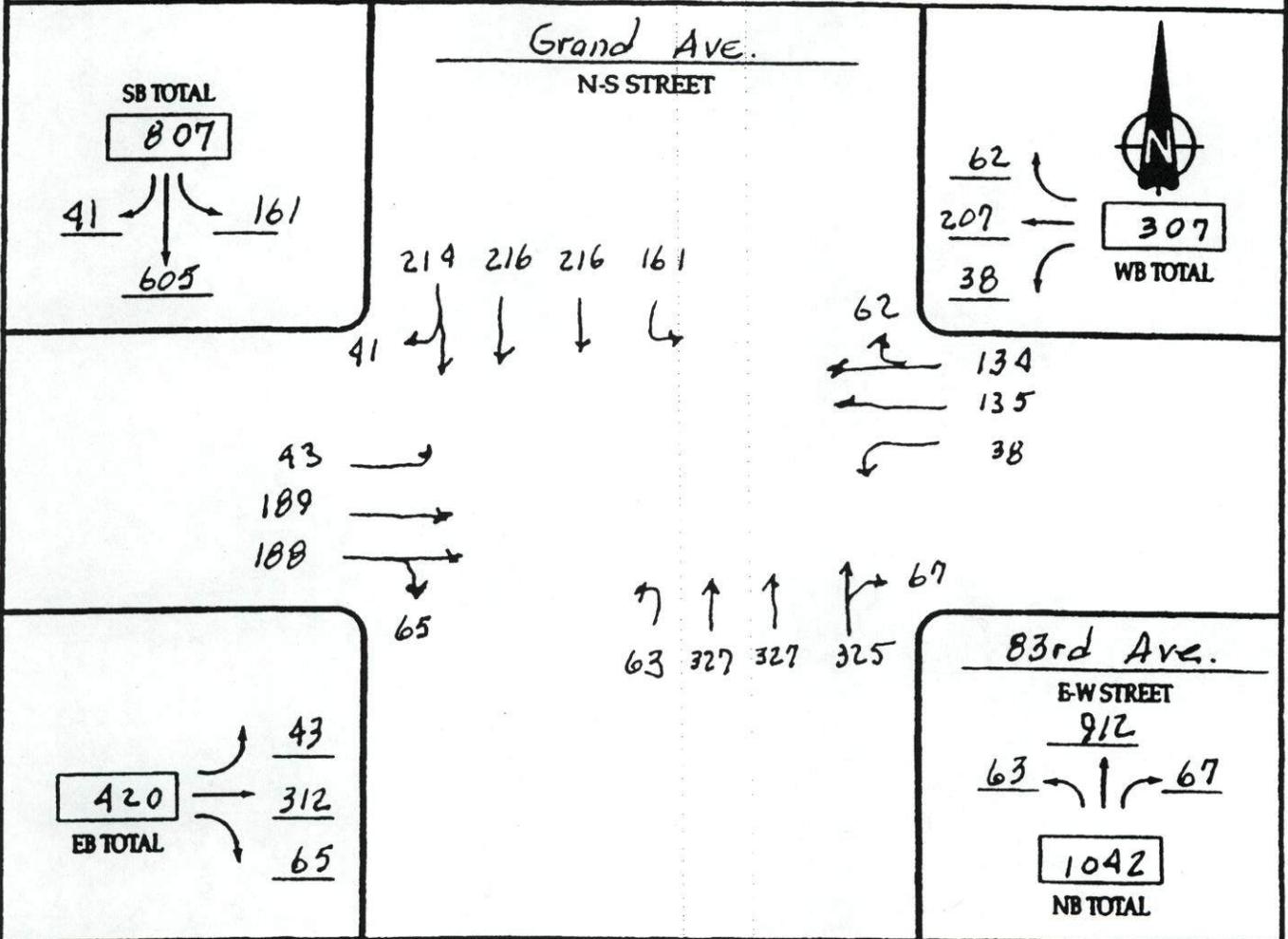
$\frac{200}{\text{E-W CRITICAL}} + \frac{313}{\text{N-S CRITICAL}} = 513$  STATUS? Under

PLANNING APPLICATION WORKSHEET

Intersection: 83rd Ave. & Grand Ave. Date: Thru + Site Generated

Analyst: \_\_\_\_\_ Time Period Analyzed: PM Peak Hour

Project No. \_\_\_\_\_ City/State: \_\_\_\_\_



|       |   |            |      |
|-------|---|------------|------|
| EB LT | = | <u>43</u>  |      |
| WB TH | = | <u>135</u> |      |
| WB LT | = | <u>38</u>  | } OR |
| EB TH | = | <u>189</u> |      |
|       |   | <u>227</u> |      |

|       |   |            |      |
|-------|---|------------|------|
| NB LT | = | <u>63</u>  |      |
| SB TH | = | <u>216</u> |      |
| SB LT | = | <u>161</u> | } OR |
| NB TH | = | <u>327</u> |      |
|       |   | <u>488</u> |      |

| MAXIMUM SUM OF CRITICAL VOLUMES | CAPACITY LEVEL |
|---------------------------------|----------------|
| 0 TO 1,200                      | UNDER          |
| 1,201 to 1,400                  | NEAR           |
| > 1,400                         | OVER           |

227 E-W CRITICAL + 488 N-S CRITICAL = 715 STATUS? Under



# Arizona Department of Transportation

Phoenix Maintenance District  
2140 W. Hilton Ave. Phoenix, Arizona 85009  
Phone 602.712.6664 Fax 602.712.6983

May 21, 2001

Dick Wright  
State Engineer

John B. Hauskins  
District Engineer

Mr. Mark J.A. Hughes, P.C.  
A Professional Corporation  
8253 West Thunderbird Road, Suite 103  
Peoria, Arizona 85381

Re: Villa LeGrande, 87<sup>th</sup> Avenue and Grand Avenue, Traffic Impact Analysis

Dear Mr. Hughes:

We have reviewed your Traffic Impact Analysis for the proposed Villa LeGrande apartment complex on 87<sup>th</sup> Avenue south of Grand Avenue. The projected trip generation appears to be reasonable for this type of development. We have no other comments concerning to the traffic impact analysis.

If you have any question please feel free to call me at 602.712.7193

Sincerely,

*George Chin by Brent Neptune*

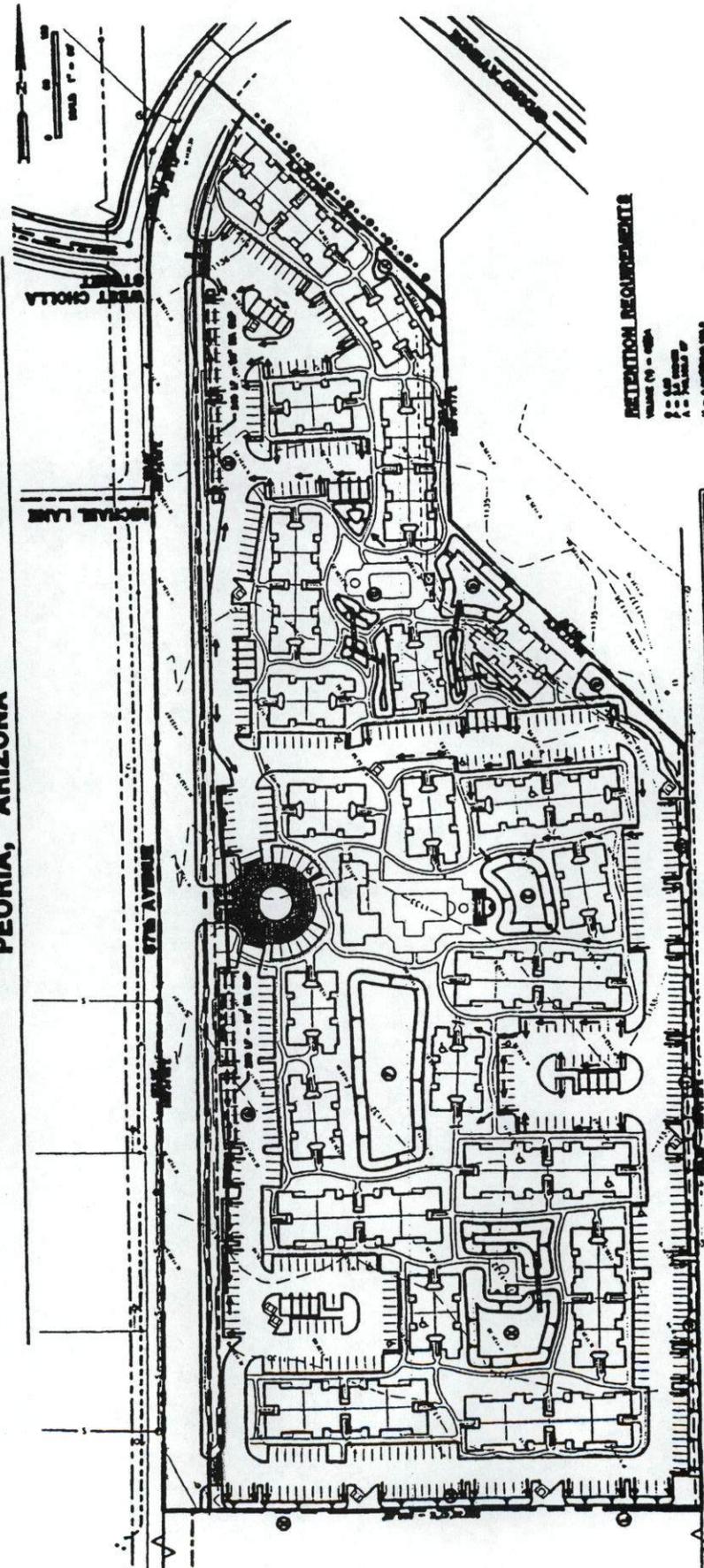
George K. Chin, P.E.  
Phoenix Regional Traffic Engineer

|                   |                  |      |         |               |
|-------------------|------------------|------|---------|---------------|
| Post-It® Fax Note |                  | 7671 | Date    | # of pages    |
| To                | Mark J.A. Hughes |      | From    | Brent Neptune |
| Co./Dept.         |                  |      | Co.     |               |
| Phone #           | 623-412-4073     |      | Phone # | 602-712-6552  |
| Fax #             | 623-412-9087     |      | Fax #   | 602-712-6983  |

**EXHIBIT "C"**

**EXHIBIT "D"**

# PRELIMINARY GRADING AND DRAINAGE for VILLA LEGRANDE - 87TH AVE AND GRAND SECTION 22, TOWNSHIP 3 NORTH, RANGE 1 EAST PEORIA, ARIZONA



**KNUDSEN-SMITH  
ENGINEERING, INC.**  
1000 North Grand Avenue, Peoria, Arizona 85601  
PH (505) 837-7000 FAX (505) 837-1810

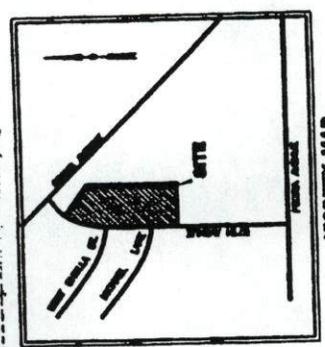
**PRELIMINARY GRADING AND DRAINAGE PLAN**  
VILLA LEGRANDE  
87TH AVENUE AND GRAND  
PEORIA, ARIZONA

**C-1**  
1:2



**RETENTION REQUIREMENTS**  
Volume (cu ft) - 1000  
1 - 1000  
2 - 1000  
3 - 1000  
4 - 1000  
5 - 1000  
6 - 1000  
7 - 1000  
8 - 1000  
9 - 1000  
10 - 1000

**RETENTION BASIN VOLUME**  
Volume (cu ft) - 1000  
1 - 1000  
2 - 1000  
3 - 1000  
4 - 1000  
5 - 1000  
6 - 1000  
7 - 1000  
8 - 1000  
9 - 1000  
10 - 1000



- BENCHMARKS**  
BENCHMARKS SHOWN ARE APPROXIMATE  
ELEVATIONS BASED ON THE PEORIA  
MERCATOR PROJECTION - 1983
- DEVELOPMENT DATA**  
ALL ELEVATIONS ARE IN FEET  
UNLESS OTHERWISE NOTED  
PEORIA, ARIZONA  
DATE: 10/15/00
- MASTER LEGEND**
- PROPOSED DRIVE
  - EXISTING DRIVE
  - PROPOSED SIDEWALK
  - EXISTING SIDEWALK
  - PROPOSED CURB
  - EXISTING CURB
  - PROPOSED PAVEMENT
  - EXISTING PAVEMENT
  - PROPOSED GRADE
  - EXISTING GRADE
  - PROPOSED DRAINAGE
  - EXISTING DRAINAGE
  - PROPOSED RETENTION BASIN
  - EXISTING RETENTION BASIN
  - PROPOSED LOT
  - EXISTING LOT
  - PROPOSED BUILDING
  - EXISTING BUILDING
  - PROPOSED PARKING
  - EXISTING PARKING
  - PROPOSED TREE
  - EXISTING TREE
  - PROPOSED FENCE
  - EXISTING FENCE
  - PROPOSED SIGN
  - EXISTING SIGN
  - PROPOSED UTILITY
  - EXISTING UTILITY
  - PROPOSED EROSION CONTROL
  - EXISTING EROSION CONTROL
  - PROPOSED LIGHTING
  - EXISTING LIGHTING
  - PROPOSED LANDSCAPE
  - EXISTING LANDSCAPE
  - PROPOSED SITE
  - EXISTING SITE

**EXHIBIT "E"**



**EXHIBIT "F"**

WASTEWATER SYSTEM ANALYSIS REPORT  
FOR THE DEVELOPMENT KNOWN AS VILLA LEGRANDE

The proposed Villa LeGrande Development contains 256 dwelling units (apartment complex)

LOCATION: PART OF THE WEST ½, SE ¼, SECTION 22, T3N, R1E, GILA AND SALT RIVER BASE AND MERIDIAN, SOUTHEASTERLY CORNER OF 87<sup>TH</sup> AVENUE AND GRAND AVENUE, PEORIA, ARIZONA

Wastewater Flow Calculations

- The average daily flow is 100 gallons per day per capita (100 gpcd)
- The peaking factor to be used is 4.
- The population per dwelling units follows:

$$3 \text{ bedroom} = 24 \text{ units} = (4 \text{ persons/unit}) (24) = 96$$

$$2 \text{ bedroom} = 192 \text{ units} = (3 \text{ persons/unit}) (192) = 576$$

$$1 \text{ bedroom} = 40 \text{ units} = (2 \text{ persons/unit}) (40) = \underline{80}$$

$$\text{Total population} = 752$$

- The average daily flow per person is:

$$(100 \text{ gal/capita/day}) (752 \text{ persons}) = 75,200 \text{ gal/day}^*$$

- The maximum day is equal to 4.0 times the average day flow.

- The maximum daily flow is:

$$(75,200 \text{ gal/day}) (4.0) = 300,800 \text{ gal/day}^*$$

\*INDICATES TOTAL FOR ENTIRE VILLA LEGRANDE DEVELOPMENT

Average per unit:

$$\text{Average daily flow} = (75,200) \div (256 \text{ units}) = 294 \text{ gal/day/unit}$$

$$\text{Maximum daily flow} = (300,800) \div (256 \text{ units}) = 1,175 \text{ gal/day/unit}$$



EXHIBIT "G"

## WATER SYSTEM ANALYSIS REPORT

### FOR THE DEVELOPMENT KNOWN AS VILLA LEGRANDE

The proposed Villa LeGrande Development contains 256 dwelling units (apartment complex)

**LOCATION:** PART OF THE WEST ½, SE ¼, SECTION 22, T3N, R1E, GILA AND SALT RIVER BASE AND MERIDIAN, SOUTHEASTERLY CORNER OF 87<sup>TH</sup> AVENUE AND GRAND AVENUE, PEORIA, ARIZONA

#### Domestic Water Demand Calculation

- The average daily demand is 240 gallons per day per capita (240 gpcd)
- The lost and unaccounted water factor is 0.88.
- The population per dwelling unit follows:

|  |           |
|--|-----------|
| 3 bedroom = 24 units = (4 persons/unit) (24) =   | 96        |
| 2 bedroom = 192 units = (3 persons/unit) (192) = | 576       |
| 1 bedroom = 40 units = (2 persons/unit) (40) =   | <u>80</u> |
| Total population = 752                           |           |

- The average daily demand is:

$$(240 \text{ gal/capita/day}) (752 \text{ persons}) \div (0.88) = 205,091 \text{ gal/day}^*$$

- The maximum day is equal to 1.8 times the average day demand.
- The maximum daily demand is:

$$(205,091 \text{ gal/day}) (1.8) = 369,164 \text{ gal/day}^*$$

- The peak hour demand is equal to 1.7 times the maximum day demand.

The peak hour demand is:

$$(369,164 \text{ gal/day}) (1.7) (\text{day}/24\text{hr.}) (\text{hr}/60 \text{ min}) = 436 \text{ gal/min}^*$$

\*INDICATES TOTAL FOR ENTIRE VILLA LEGRANDE DEVELOPMENT

Average per unit:

$$\text{Average daily} = (205,091) \div (256 \text{ units}) = 801 \text{ gal/day/unit}$$

$$\text{Maximum daily} = (369,164) \div (256 \text{ units}) = 1,442 \text{ gal/day/unit}$$

$$\text{Peak hour demand} = (436) \div (256 \text{ units}) = 1.4 \text{ gal/min/unit}$$



EXHIBIT "H"

**PRELIMINARY DEVELOPMENT PLAN**

**VILLA LEGRANDE**

Date: January 25, 2001  
Applicant: Clark Wayland, Inc./P.A. Spiller & Co., L.L.C.

a. Legal Description: see Exhibit A attached hereto.

b. Nature of Applicant's Interest:

The Applicant has entered into a contract to purchase the property, which contract is in escrow pending satisfaction of conditions precedent to the acquisition.

c. Persons with an Interest in the Property:

Virginia Wagoner Lanham owns the property and has agreed to sell it to Applicant.

There is an easement for electric lines burdening the Property recorded at Book 54 of Miscellaneous, page 580.

d. Generalized location map is attached as Exhibit A.

e. Site Conditions:

1. Topographic contours: an ALTA Survey of the Property is being submitted that shows the Property to be essentially flat and graded, with a uniform declination in elevation of seven feet from the north to the south of the Property
2. Major Vegetative Cover: none.
3. Location of Streams/Ponding Areas: none.
4. Existing drainage and irrigation patterns: there is no irrigation on the Property and the drainage follows the topography of the Property.
5. Applicant notes that the undeveloped parcel to the north of the Property drains across the Property; the retainage area provided by applicant on the Property is sufficient to accept surface water run-off from that undeveloped parcel, as well.

f. Land Use Allocation:

| <u>Use</u>                                      | <u>Acres</u> | <u>Portion of Gross Acres</u> |
|---|--------------|-------------------------------|
| 1. Arterial Streets                             | 0.69         | 4.27%                         |
| 2. Open Space (public)                          | 0.00         | 0.00%                         |
| 3. Open Space (private)                         | 6.71         | 40.92%                        |
| 4. Residential (two story apartment buildings): | 3.10         | 18.90%                        |

- g. Land Use Plan: refer to the Site Plan that has been submitted.
- h. Sewer and Water Lines, Drainage: refer to the Site Plan that has been submitted.
- i. Conceptual Architectural Renderings: see Elevations attached as Exhibit B.
- j. Conceptual Landscaping Plans: not yet prepared.
- k. Traffic Study: see attached.
- l. Phasing Plan: the Property will be developed in a single phase.

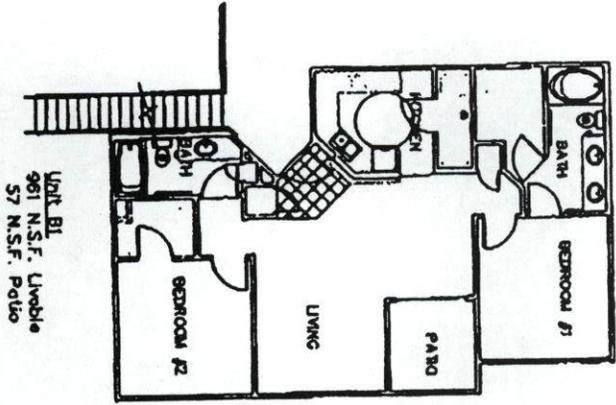
**EXHIBIT "I"**



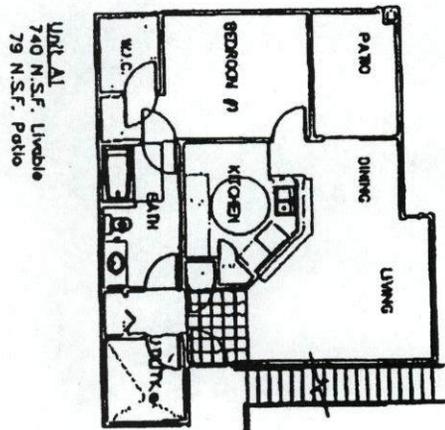
**EXHIBIT "J"**



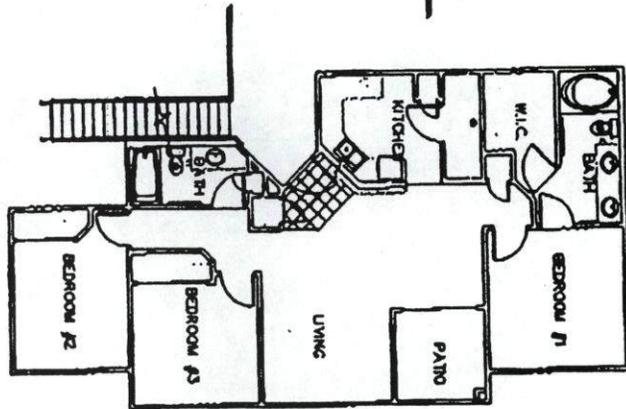
**EXHIBIT "K"**



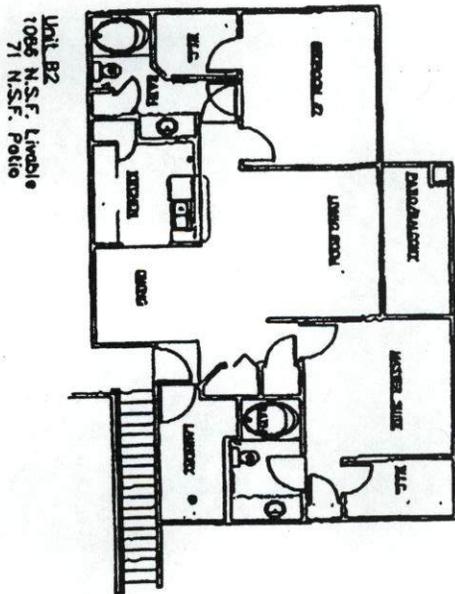
Unit B1  
961 N.S.F. Livable  
57 N.S.F. Patio



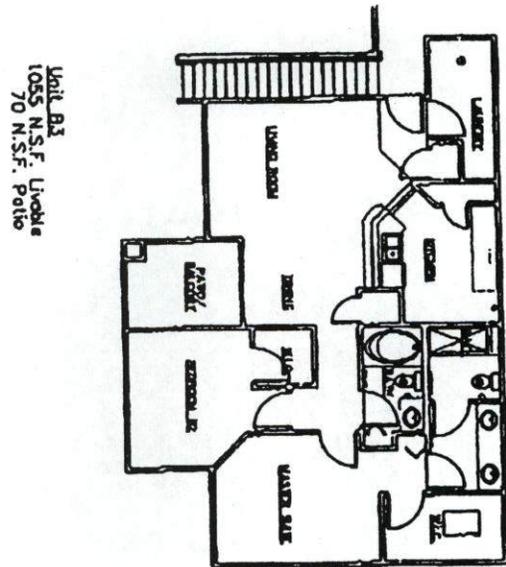
Unit A1  
740 N.S.F. Livable  
79 N.S.F. Patio



Unit C1  
1102 N.S.F. Livable  
57 N.S.F. Patio



Unit B2  
1086 N.S.F. Livable  
71 N.S.F. Patio



Unit B3  
1055 N.S.F. Livable  
70 N.S.F. Patio

Floor Plans  
1/4" = 1'-0"

Villa LeGrande  
Peoria, Arizona

These floor plans are prepared for the purpose of illustrating the general character and design of the building. They are not to be used for construction purposes without the approval of the architect. The architect is not responsible for the accuracy of the information shown on these plans. The architect is not responsible for the accuracy of the information shown on these plans. The architect is not responsible for the accuracy of the information shown on these plans.

G.M. Zimmerman - Architect

**Main Identity**

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**From:** Chad Daines <ChadD@PeoriaAz.Com>  
**To:** Tim Loughrin <TimL.CityHallPO.Peoria\_Az@PeoriaAz.Com>; <gzimmerman@worldnet.att.net>  
**Cc:** <markhughes@integrity.com>  
**Sent:** Friday, May 18, 2001 11:24 AM  
**Subject:** Re: 87th ave & Grand

After consideration of the intent of the Design Review Requirement and review of the specific elevations for the project, I hereby grant a design review waiver from Section 20-70-22.A.1.o and allow the proposed exterior stair design. Should you have any further questions in this regard, please contact me at 623-773-7203. Thanks.

>>> "GZimmerman" <gzimmerman@worldnet.att.net> 05/14/01 09:52PM >>>  
Chad,

I am Greg Zimmerman and I am the architect for the proposed apartment project located at the southeast corner of 87th avenue and Grand. (Villa LeGrande Apartments)

I met with Tim Loughrin today and he suggest I send you a written request for consideration of the angled exterior stair requirement. My designs are specific to pull the stairs into the building, thereby screening them from view by approximately 90%.

With the standard requirement for an angled stair, I would have to pull them out into view in order to angle them. It seems the angle is to not allow straight run stairs to be seen and to add some interest to what you must see.

I feel with stairs "tucked" into the building, the same is achieved without the use of an angle.

Please consider this request as it is difficult if not impossible to angle stairs within a 10' wide entry. It would cut off light and access to the first level entries.

There is a site plan on file with the city as well as elevations for your review.

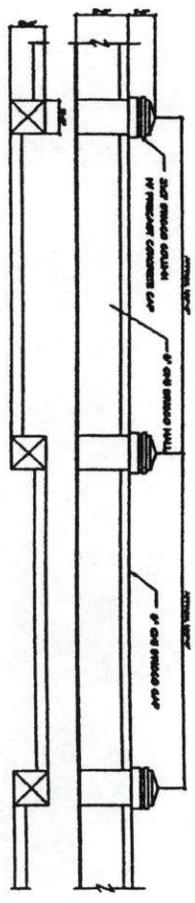
If you need any additional information I would be happy to provide it. Thank you in advance for your consideration.

respectfully submitted,

Greg Zimmerman-Architect  
14646 North Kierland Boulevard  
Suite 155  
Scottsdale, Az. 85254

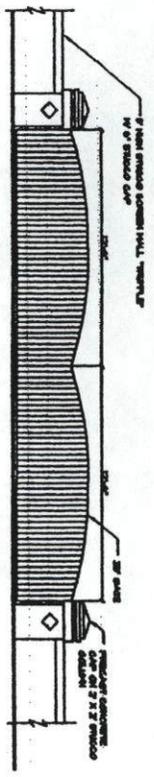
**EXHIBIT "L"**





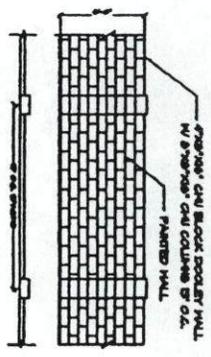
PROJECT SCREEN WALL

NOT TO SCALE



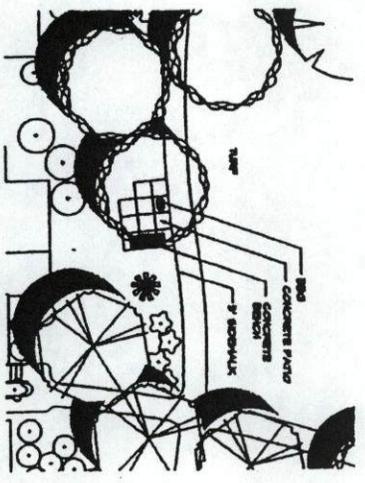
ENTRY GATE

NOT TO SCALE



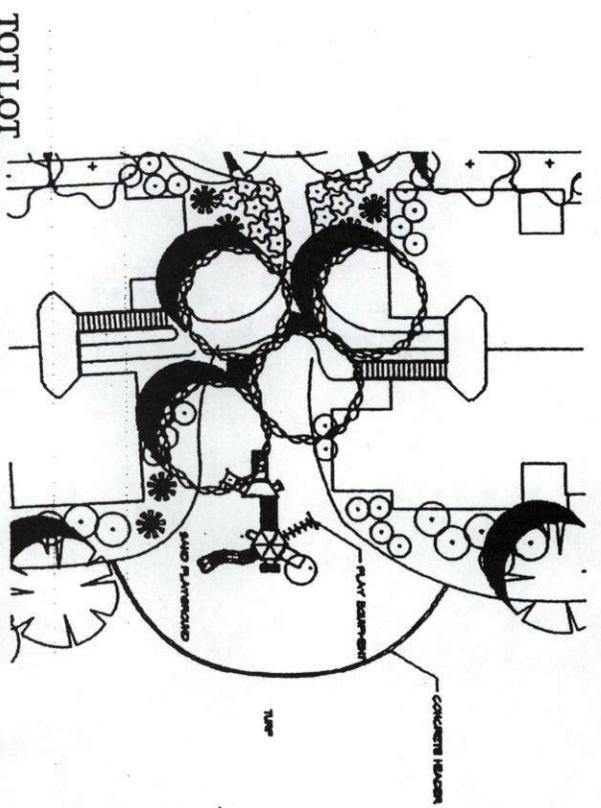
PERIMETER SCREEN WALL

NOT TO SCALE



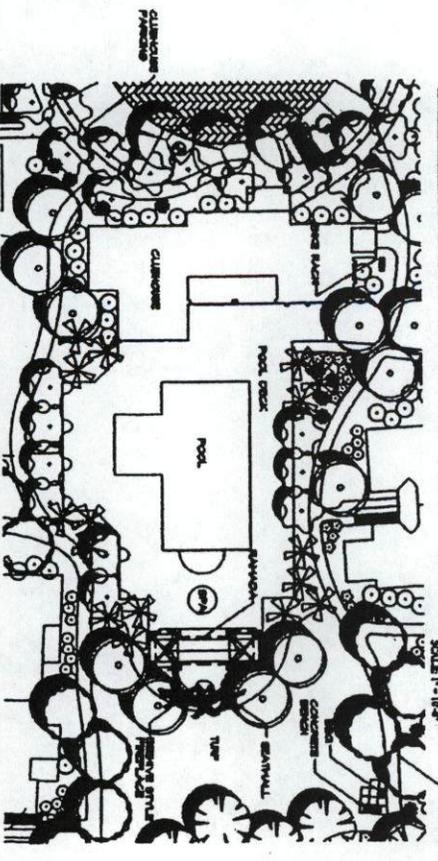
BBQ AND SEATING AREA

SCALE 1" = 10'-0"



TOTAL LOT

SCALE 1" = 10'-0"



POOL AND CABANA LAYOUT

SCALE 1" = 20'-0"

PINNACLE DESIGN, INC

4824 S. Comstock Rd  
 Suite 100, Phoenix, AZ 85042  
 Phone: 602-998-1111  
 Fax: 602-998-1112  
 Website: www.pinnacle-design.com

# Villa LeGrande

PRELIMINARY LANSCAPE PLAN