



**City of Phoenix**

# **Street Planning And Design Guidelines**

**December 1, 2009**

**Maintained by:  
Design Section  
Planning, Design, and Programming Division  
Street Transportation Department**

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## **CHAPTER 1 – GENERAL PROVISIONS**

### **1.1 Authority of This Document**

These design guidelines, along with all future amendments, shall be known as the City of Phoenix Street Planning and Design Practices (hereinafter called “this manual”). This manual has been adopted as of *October 1, 2009* by the City of Phoenix Street Transportation Department. All projects not receiving preliminary approval by the above adopted date shall fall under the requirements as outlined within this manual.

### **1.2 Purpose**

The purpose of this manual is to standardize roadway design elements where necessary for consistency and to ensure, as far as it is practical, that minimum requirements are met for efficiency, safety, welfare, convenience, pleasant appearance, environmental sensitivity and economical maintenance.

The guidelines outlined in this manual cannot apply to all situations. They are intended to assist the professional engineer’s judgment but not serve as a substitute. Professional engineers are expected to bring the best of their skills and abilities to each project so that it is designed in an optimal manner.

Further, these guidelines are not intended to unreasonably limit any innovative or creative effort that might result in a higher quality or increased savings. Any proposed departure from these guidelines will be evaluated on the basis of whether such a variance will yield a compensating or comparable result that is fully adequate for the road users and City residents.

It is also the intent of these guidelines to promote the adoption and implementation of policies, strategies, and technologies to achieve sustainability within the City of Phoenix. The City of Phoenix is committed to use of sustainable design and construction through the use of green materials, systems and methods to maximize longevity and efficiency of all public improvements.

Within this manual, there are several City Council approved policies and procedures that are italicized for clarification.

While every effort has been made to ensure the accuracy and completeness of this manual, the City of Phoenix shall not be held responsible for any errors or omissions. It shall be the sole responsibility of the design engineer to ensure a proper design and the accuracy and completeness of construction documents sealed and signed by a registered professional engineer.

For items not covered by this manual, the City of Phoenix may require the use of the resource standards in Section 1.3 below.

### 1.2.1 Objectives

It is the objective of this manual to address the following:

1. Efficiency, Public Safety and Convenience. To protect the public health, safety, and welfare to the greatest extent possible and minimize inconvenience resulting from construction and maintenance activities within the public right-of-way.
2. Maintaining Public Use. To assure that bicycle, pedestrian and vehicular uses of rights-of-way are the primary uses thereof and that the rights-of-way are properly maintained during construction and repair work in these areas.
3. Standardizing Criteria. To protect the City's infrastructure investment by establishing standardized design, materials, construction, and repair criteria for all public improvements.
4. Optimizing Use. To optimize the use of the limited physical capacity of public rights-of-way held by the City of Phoenix.
5. Protecting Private Property. To protect private property from damages that could occur because of faulty design during the construction of public improvements within public rights-of-way.

### 1.3 Resources

The following National, Regional and Local Resources (the latest editions unless otherwise stated) are referenced in the design of streets within the City of Phoenix.

#### 1.3.1 National Resource Standards and References

*A Policy on Geometric Design for Highways and Streets*, The American Association of State Highway and Transportation Officials (AASHTO)

*Manual on Uniform Traffic Control Devices (MUTCD)*, U.S. Department of Transportation, with Arizona revisions

*Roundabouts: An Informational Guide*, U.S. Department of Transportation, Federal Highway Administration

*Guide for the Development of Bicycle Facilities*, The American Association of State Highway and Transportation Officials (AASHTO)  
*Highway Capacity Manual*, Transportation Research Board

*Designing Sidewalks and Trails for Access – Part 1 and 2*, U.S. Department of Transportation

*Guidelines For Driveway Location & Design*, Institute Of Transportation Engineers

*Trip Generation Volumes 1 through 3*, Institute Of Transportation Engineers

American Public Works Association  
Guide for the Planning, Design, and Operation of Pedestrian Facilities

American Society for Testing and Materials

Federal Americans with Disabilities Act, ADA

1.3.2 Maricopa Association of Governments (MAG) Standards

Uniform Standard Specifications

Regional Bicycle Plan

1.3.3 City of Phoenix Standards and References

Supplements to Maricopa Association of Governments (MAG) Uniform Standard Specifications

Street Classification Map and Street Classification System-General Policy Document and Technical Supplement

Design Procedure Manual (Maintained by Street Transportation, PDP Division, Design Section)

Traffic Operations Handbook (Maintained by Street Transportation, Operations Division)

City of Phoenix Zoning Ordinance

Zoning Ordinance (TOD) Sec. 662 - 663

Subdivision Ordinance

Planned Community District (PCD) Master Plan Manual

## Traffic Impact Study Guidelines

### Parks and Recreation Department 2006 Street Landscape Standards

#### 1.4 Defined Terms

**AASHTO** – *American Association of State Highway and Transportation Officials*

**ABC** – *Aggregate Base Course*

**Accessible Route** – *A continuous unobstructed path accessible by all pedestrians including those in wheelchairs, connecting all accessible elements and spaces of a building or facility. Interior accessible routes may include corridors, floors, ramps, elevators, lifts, and clear floor space at fixtures. Exterior accessible routes may include parking access aisles, curb ramps, crosswalks, sidewalks, ramps, and lifts.*

**ADA** – *Americans with Disabilities Act*

**ADOT** – *Arizona Department of Transportation*

**ADT** – *Average Daily Trips*

**Alley** – *Minor public thoroughways that abut the side or rear of residential, industrial or commercial property and are used for limited vehicular access.*

**Americans with Disabilities Act of 1990 (ADA)** – *Federal legislation guaranteeing equal access to all Americans.*

**ANSI** – *American National Standards Institute*

**Applicant** – *The person or designated agent providing pertinent information for preparation of permits, MSP, TIS, etc. This is often the developer.*

**Approach Taper** – *A taper from the point where all approaching traffic must shift laterally, to the point of the beginning bay taper.*

**APS** – *Arizona Public Service Company*

**APWA** – *American Public Works Association*

**Arterial Street** – *That part of the roadway system serving as the principal network for through traffic flow. Arterials connect areas of principal traffic generation and important rural highways entering urban areas. Arterials may contain 2, 4, 5, or 6 through lanes, as designated on the Street Classification Map.*

**ASTM** - *American Society for Testing and Materials*

**Attached Sidewalk** – *Sidewalk that is adjoining the curb.*

**Bay Taper** – *A taper from the edge of the adjacent through traffic lane to the beginning of the full width of the turn lane storage.*

**Bicycle Facilities** – *A general term denoting improvements and provisions made to accommodate or encourage bicycling, including parking facilities, off road trails, on-street designated lanes, mapping of all bikeways, and shared roadways not specifically designated for bicycle use.*

**Bicycle Lane (Bike Lane)** – *The portion of the shoulder or roadway designated by pavement markings and signing (optional) for the preferential or exclusive use of bicyclists.*

**Bicycle Path (Bike Path)** – *A bikeway physically separated from motorized vehicular traffic by open space or barriers and either within the public right-of-way or within an easement.*

**Bicycle Route (Bike Route)** – *A segment of a bicycle system, designated by the City. Bicycle routes have appropriate directional or informational markers, with or without specific bicycle route number.*

**Bikeway** – *Any road or path that is designed for bicycle or pedestrian traffic, but necessarily for their exclusive use.*

**Bridge** – *Any structure conveying a roadway or path over a body of water or other feature. Bridges shall be designed to carry a varying combination of loading, including vehicular, bicycle, and/or pedestrian traffic.*

**Chicanes** – *Offset curb extensions which change the path of vehicular travel from straight to curvilinear.*

**City** - *City of Phoenix (C.O.P.)*

**CIP** – *Capital Improvement Program*

**Code** – *The latest official adopted ordinances, policies, codes, and or regulations of the City of Phoenix.*

**Collector Street** – *A street that provides both land access service and traffic circulation within residential neighborhoods and commercial and industrial areas. The primary purpose is to collect traffic from local streets and properties and channel it into the arterial street system.*

**Commercial District** – *A business area of a village where ordinarily there are many pedestrians during the day or night hours. This definition applies to densely developed business areas outside, as well as within, the central section of a village.*

**Construction Costs** – *Generally, the cost of earthwork, paving, drainage, structures, signing and striping, traffic control, lighting, landscaping, curb and gutter, sidewalk, and utility relocation work necessary to complete the required improvements.*

**Consultant Engineer** – *An Arizona licensed professional engineer working on behalf of the Developer.*

**Cross Slope** – *Slope of the pavement surface, excluding gutter, measured perpendicular to the street centerline.*

**Curb Ramp** – *A short ramp cutting through a curb or built up to it.*

**Deceleration Lane** – *A right-turn lane or left turn lane lengthened to provide for reduction of travel speed out of the through lanes.*

**Departure Taper** – *A left-turn bay from the point where through traffic beyond the intersection begins a lateral shift to the left to the point where the through lane is adjacent and parallel to the centerline.*

**Design Speed** – *The speed determined for design which takes into account the physical features of a street influencing vehicle operation. Design speed is usually 5 to 10 mph higher than the posted speed limit and allows for other conditions or uses of the street that may affect vehicle operation. The design speed at a point does not and should not control the overall design speed of the facility.*

**Designer** – *The person or persons responsible for the creation and submission of contract documents or construction plans for the purpose of one-time construction of a facility. This person shall be an Arizona licensed professional engineer.*

**Detached Sidewalk** – *Sidewalk that is off-set from the curb.*



**Developer** – *The private party or parties constructing public or private improvements within the City's right-of-way or easements, securing all required approvals and permits from the City, and assuming full and complete responsibility for the project.*

**Development** – *Construction of improvements on land that is essentially vacant.*

**Development Agreement** – *The contract between the City and the Developer that defines public improvement requirements, costs, and other related public improvement issues.*

**Driveway** – *A private access from a public facility to a private roadway.*

**Driveway Approach** – *The portion of the driveway lying in the public right-of-way or public access easement between the street gutter or roadway of a public street and the right-of-way or public access easement line, for the full width of the access, including both apron and side slopes.*

**Easement** – *The property right of the City or its licensee to use lands owned in fee by a private party for the purposes of maintenance, access, or other use, as specified on a plat or deed of dedication.*

**Expressway** – *A divided major roadway for through traffic with partial control of access and usually with interchanges at major crossroads.*

**Eyebrow** – *A bulb or semi-circular extension of a curb on the outside of a street or at an "L" turn to provide more street frontage for adjacent lots.*

**FEMA** – *Federal Emergency Management Agency*

**Fence** – *An artificially constructed barrier of wood, masonry, stone, wire, metal, or other manufactured material, or combination of materials, erected to enclose, partition, beautify, mark, or screen areas of real property.*

**FHWA** – *Federal Highway Administration, U.S. Department of Transportation.*

**Freeway** – *A divided major roadway with full control of access and with no at grade crossings.*

**Frontage** – *The distance along the street right-of-way line of a single property or development within the property lines. Corner property at an intersection would have a separate frontage along each street.*

**Improvements** – *All public or private improvements within the rights-of-way or easements controlled by the City of Phoenix.*

**ITE** – *Institute of Transportation Engineers*

**Landscaping** – *Materials including, but not limited to, grass, ground cover, shrubs, vines, trees and non-living materials, commonly used in landscape development, as well as irrigation systems.*

**Lip** – *Defines the outermost edge of the gutter pan.*

**Local Streets** – *All street facilities that are not in one of the higher use systems. Their primary purpose is to provide direct access to abutting lands and connections to the higher classification streets.*

**MAG** – *Maricopa Association of Governments*

**May** – *A permissive condition.*

**MCDOT** – *Maricopa County Department of Transportation*

**Median Island** – *A raised landscaped area down the middle of a roadway that adds a pleasant appearance and prevents left-turns at unauthorized locations.*

**MSP** – *Master Street Plan*

**MUTCD** – *Manual on Uniform Traffic Control Devices*

**Neighborhood** – *A residential or commercial area defined by ordinance, resolution or common understanding.*

**Ordinance** – *A law established by the City of Phoenix.*

**OSHA** – *Occupational Safety and Health Administration*

**P.C.** – *Point of curvature.*

**Pedestrian Walkway** – *A public facility for pedestrian traffic either within the right-of-way of the vehicular traffic roadway or within a public easement.*

**Phasing Schedule** – *A plan that defines improvements to be completed in specified parts over a defined sequence.*

**P.I.** – *Point of intersection*

**Planned Community District (PCD)** - *A zoning district that may have several types of zoning within a larger master planned area.*

**Professional Engineer (P.E.)** – *An Arizona licensed professional engineer.*

**Project** – *The public or private improvement(s) designated in the approved plans, which are to be constructed in conformance with these Standards. The term “Project” includes any and all public or private improvement projects for or within the City of Phoenix, whether development projects, private utility projects, or capital improvement projects.*

**P.T.** – *Point of tangency*

**Public Improvements** – *Those public-type facilities to include: pavement, curb and gutter, sidewalk, pedestrian/bike/equestrian paths, storm drain facilities with related appurtenances, culverts, channels, bridges, water distribution or transmission facilities with related appurtenances, sanitary sewer collection facilities with related appurtenances, water and waste water treatment facilities, pavement markings, signage and striping, traffic signals and related appurtenances, erosion control and right-of-way grading, or earth excavation processes integral to construction of other public improvements listed herein.*

**Ramp** – *A walking surface which has a running slope greater than 1:20.*

**Redevelopment** – *Removal or modification of existing improvements and construction of new improvements or substantial remodeling.*

**Right-of-way (Also “public right-of-way.”)** – *A public street, way, alley, sidewalk, or easement.*

**Roadway** – *The portion of the highway, arterial, collector, or local street, including shoulders, intended for vehicle and/or bicycle use.*

**Roundabout** – *A circular street intersection used as a traffic control device in lieu of a multi-way stop or a traffic signal.*

**Running Slope** – *The slope that is parallel to the direction of travel (see cross slope).*

**Setback** – *The lateral distance measured perpendicular to the street and extending from the right-of-way line, or other specific feature, to the closest point of a structure.*

**Shall** – *A mandatory condition.*

**Should** – *An advisory condition, recommended, but not required.*

**Sidewalk** – *Paved or otherwise improved area for pedestrian use, located within the public street right-of-way, or within an exclusive easement.*

**Speed Humps** – *Paved humps placed on local streets with the intent to slow vehicular traffic. The geometrics **of the speed hump determine how fast it can be navigated.***

**SRP** – *Salt River Project*

**Stopping Sight Distance** – *The distance required of a vehicle traveling at the design speed to bring the vehicle to a stop after an object on the road becomes visible under worst case (wet pavement, slow driver reaction, etc.) conditions. This distance is measured from the driver's eye, 3.5 feet above the pavement to the top of an object 6 inches high on the pavement anywhere on the roadway.*

**Storage Length** – *The distance from the end of the bay taper to the nearest flow line extension of the intersecting street.*

**Street** – *A public way for vehicular, pedestrian, and bicycle travel, including the entire area within the right-of-way. This includes alleyways.*

**Street Classification Map** – *Map, approved and adopted by City Council, of the City of Phoenix showing all arterial streets (existing and future) and their ultimate design width. Existing collector streets are also shown on the map with their ultimate design width.*

**Streetscape** – *Pedestrian and landscape improvements in the right-of-way, generally occurring between the curb and the right-of-way line. Streetscape generally includes sidewalks, street trees, pedestrian lighting, fencing, furnishings, and landscaped areas, including medians and irrigation.*

**Structure** – *Anything constructed or erected with a fixed location below, upon or above grade, including without limitation foundations, traffic signals, fences, retaining walls, buildings, inlets, vaults, poles, bridges, and major drainage facilities.*

**TIS** – *Traffic Impact Study*

**Trail** – *Any designated path intended for use by pedestrians or bicyclists within public right-of-way or easement. **This would include concrete, gravel, or natural surfaces.***

**USGS** – *United States Geological Survey*

**Variance** – *A deviation from those Standards that have been duly approved by the City of Phoenix.*

**Work** – *All construction activity, including materials, labor, supervision, and use of tools and equipment necessary to complete a project in full compliance with this manual, approved Plans, or Development Agreements.*

## **1.5 Acknowledgements**

The City of Phoenix staff, who prepared this document, wishes to thank all of the following organizations and people for their help and guidance in the creation of this manual:

Arizona Department of Transportation

Maricopa County Department of Transportation

City of Scottsdale, Arizona

Larimer County, Colorado

Iowa Department of Transportation

Federal Highway Administration

Wood, Patel and Associates

CMX

Don Herp P.E.

John Siefert P.E.

Chaun Hill P.E.

Walt Cicioni P.E.

Rick Coles P.E.

Frank Barrey

Shane Silsby P.E.

Mike Cynecki P.E.

James Sparks P.E.

Ralph Goodall P.E.

Sara Elco P.E.

Equbalali Charania, P.E.

Manuel Esquaval

Dan Brown

## Chapter 2 - STREET CLASSIFICATION

### 2.1 Street Classification

The *City of Phoenix Street Classification System General Policy Document and Technical Supplement* approved by City Council on July 8, 1992 defines the following street types: freeway/expressway, major arterial, arterial, collector, minor/residential collector, and local. The *Street Classification Map* maintained by the Street Transportation Department and Planning Department represents the roadway plan for the arterial and collector streets within the City of Phoenix.

#### 2.1.1 Freeway/Expressway

*Trip Distances:* Provides for long-distance traffic movement within Phoenix and between Phoenix and other cities.

*Access Controls:* No service to abutting land. Access points are limited to other freeways, expressways, and selected arterial streets, with typical minimal spacing of one (1) mile.

*Traffic Separation:* Opposing traffic flows are physically separated and cross streets are grade-separated except that expressways may have at-grade signalized intersections, spaced at least one (1) mile apart.

*Traffic Volumes:* Over 50,000 ADT (Average Daily Trips)

*Other:* Travel by pedestrians, bicycles, and low-powered vehicles is prohibited. Design, construction, and operations shall be provided by the Arizona Department of Transportation.

#### 2.1.2 Major Arterial

*Trip Distances:* Provides for long-distance traffic movement within Phoenix and between Phoenix and other cities.

*Access Controls:* Very limited service to abutting land. Access control through frontage roads, raised medians, and the spacing and location of driveways and intersections.

*Traffic Separation:* Opposing traffic flows are physically separated by a raised median.

*Signalization:* Traffic signals are coordinated for progressive movement.

*Traffic Volumes:* 30,000 to 60,000 ADT (Typical)

**Number of Lanes:** *Three (3) through lanes in each direction (there may be four (4) lanes in the peak direction of movement or four (4) lanes in each direction when the street serves as an extension of a freeway or expressway)*

**Other:** *Travel by pedestrians, bicycles, and low-powered vehicles will be considered.*

### **2.1.3 Arterial**

**Trip Distances:** *Provides for moderately long-distance traffic movement within Phoenix and between Phoenix and adjacent cities.*

**Access Controls:** *Moderate service to abutting land. Access control through frontage roads, raised medians, and the spacing and location of driveways and intersections.*

**Traffic Separation:** *Opposing traffic flows are separated by a raised median or a continuous left-turn lane.*

**Signalization:** *Traffic signals are coordinated for progressive movement.*

**Traffic Volumes:** *15,000 to 50,000 ADT (Typical)*

**Number of Lanes:** *Two (2) or three (3) through lanes in each direction when fully improved*

**Other:** *Travel by pedestrians, bicycles, and low-powered vehicles will be considered.*

### **2.1.4 Collector**

**Trip Distances:** *Provides for short-distance (less than three (3) miles) traffic movement; primarily functions to collect and distribute traffic between local streets or high volume traffic generators and arterial streets. (A small group of existing streets operating under unique conditions are included in this classification. These streets differ from other collectors in that they accommodate medium distance trips (less than six (6) miles) and relieve arterial streets in congested areas.*

**Access Controls:** *Provides direct access to abutting land and some access control through raised medians and the spacing and location of driveways and intersections.*

**Traffic Separation:** *Generally unseparated but may have a continuous left-turn lane or median.*



<i>Signalization:</i>	<i>Some traffic signals are coordinated.</i>
<i>Traffic Volumes:</i>	<i>5,000 to 30,000 ADT (Typical)</i>
<i>Number of Lanes:</i>	<i>One (1) or two (2) through lanes in each direction.</i>
<i>Other:</i>	<i>Travel by pedestrians, bicycles, and low-powered vehicles will be considered.</i>

### **2.1.5 Minor/Residential Collector**

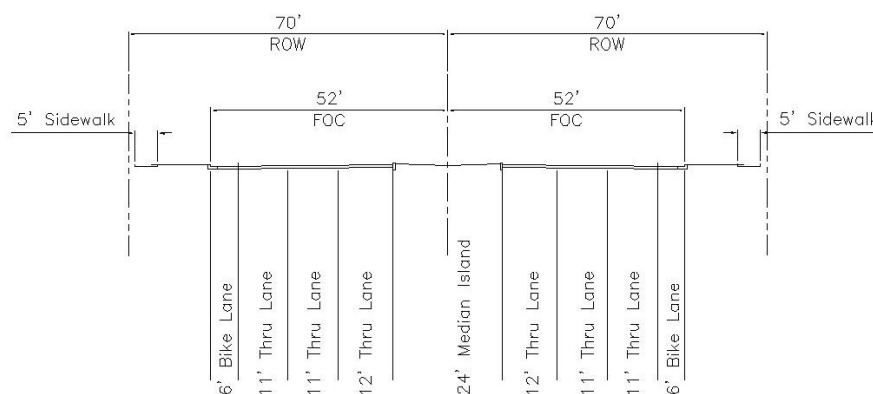
<i>Trip Distances:</i>	<i>Provides for short-distance (less than three (3) miles) traffic movement; primarily functions to collect and distribute traffic between local streets and arterial streets.</i>
<i>Access Controls:</i>	<i>Provides direct access to abutting land and some access control through the spacing and location of driveways and intersections.</i>
<i>Traffic Separation:</i>	<i>Generally unseparated but may have a continuous left-turn lane.</i>
<i>Signalization:</i>	<i>Traffic signalization should discourage through traffic from using the collector street.</i>
<i>Traffic Volumes:</i>	<i>1,000 to 8,000 ADT (Typical)</i>
<i>Number of Lanes:</i>	<i>One (1) through lane in each direction.</i>
<i>Other:</i>	<i>Travel by pedestrians, bicycles, and low-powered vehicles will be considered.</i>

### **2.1.6 Local**

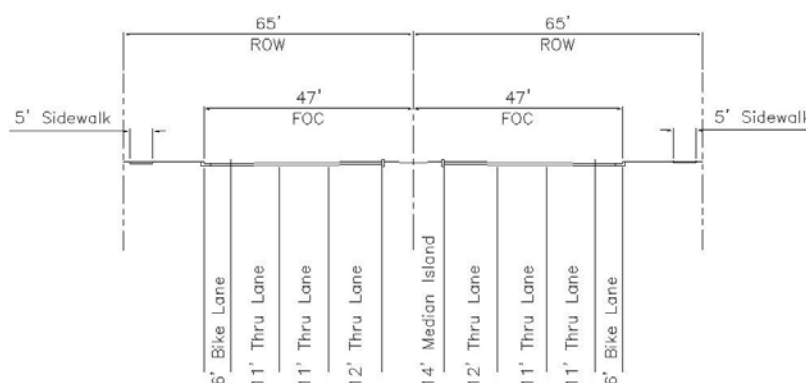
<i>Trip Distances:</i>	<i>Provides for short-distance (less than ½ mile) traffic movement; not intended for through traffic; connects to collector, minor collector and arterial streets.</i>
<i>Access Controls:</i>	<i>Primarily functions to provide direct access to abutting land and for traffic movements within neighborhoods.</i>
<i>Traffic Volumes:</i>	<i>Under 1,000 ADT with single family homes, 2,000 with more dense development</i>
<i>Number of Lanes:</i>	<i>One (1) through lane in each direction.</i>
<i>Other:</i>	<i>Travel by pedestrians, bicycles, and low-powered vehicles will be considered.</i>

## 2.2 Street Cross-Sections

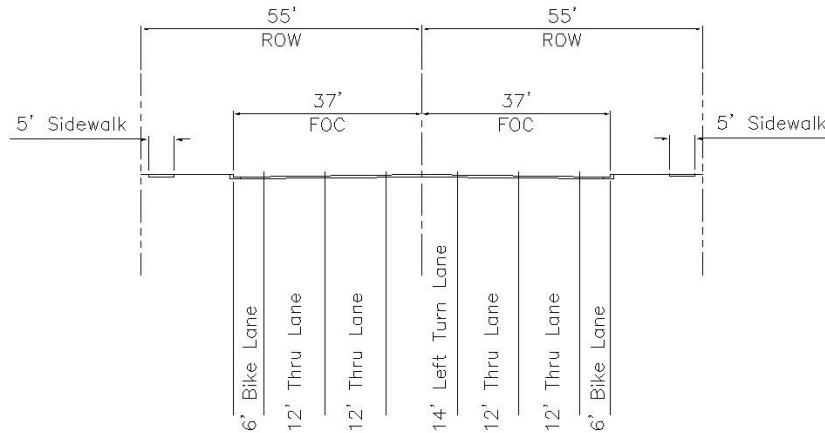
There are eleven (11) street cross-sections based upon the type and level of use for which the streets are intended. The adopted street cross-sections are shown on the *Street Classification Map* for each arterial and collector in the City of Phoenix. The corresponding figures show the details of each of the cross-sections.



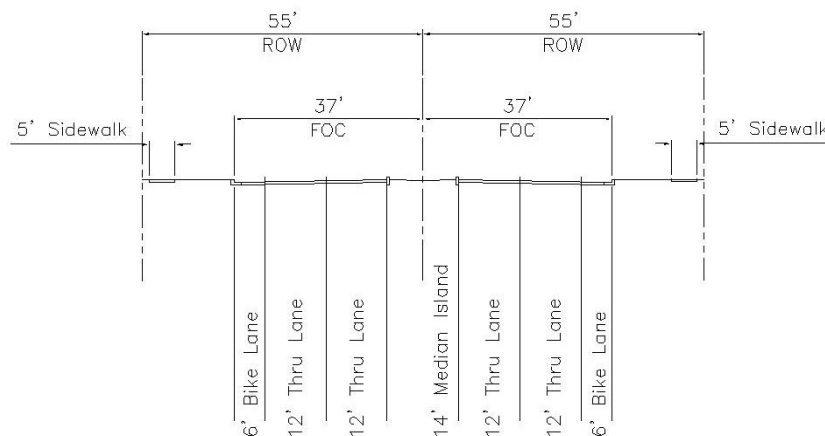
**Figure 2.1**  
**Cross-section "A" – Major Arterial**



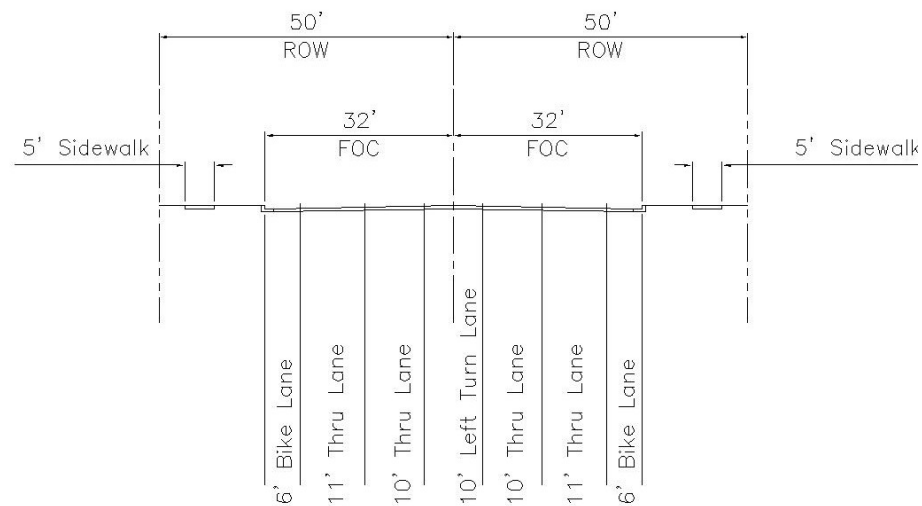
**Figure 2.2**  
**Cross-section "B" – Major Arterial and Arterial**



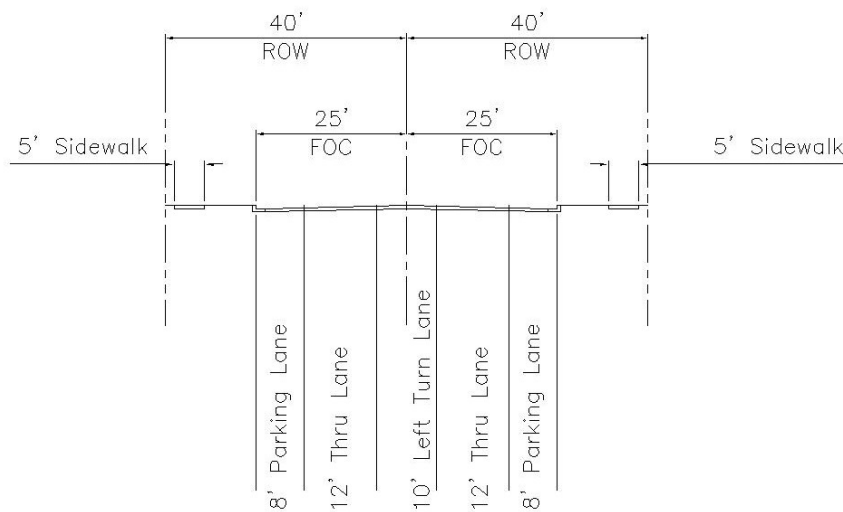
**Figure 2.3**  
**Cross-section "C" – Major Arterial and Arterial**



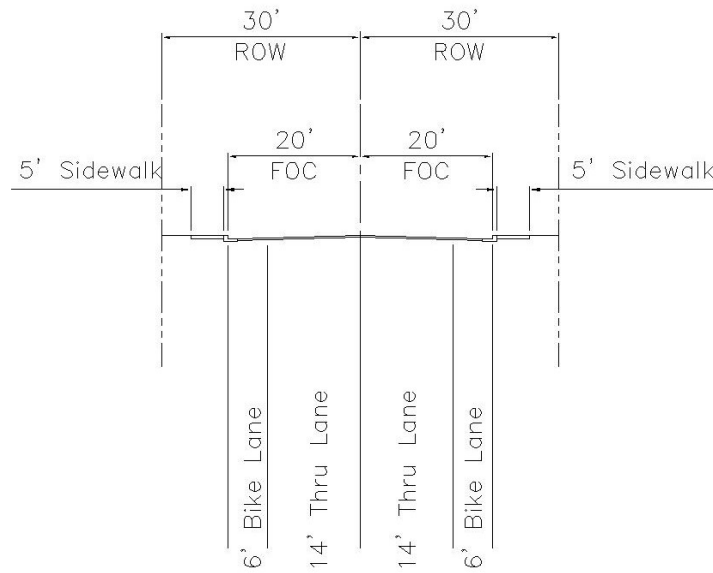
**Figure 2.4**  
**Cross-section "CM" (C with Raised Median) – Major Arterial and Arterial**



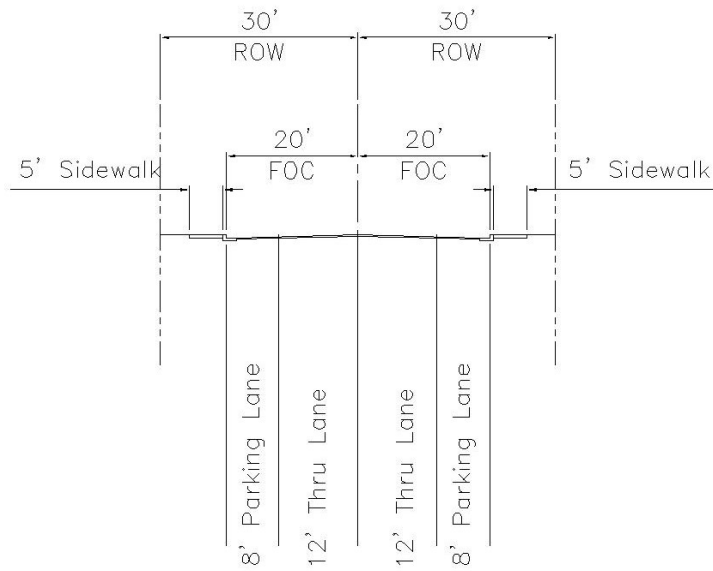
**Figure 2.5**  
**Cross-section "D" – Arterial, and Major Collector**



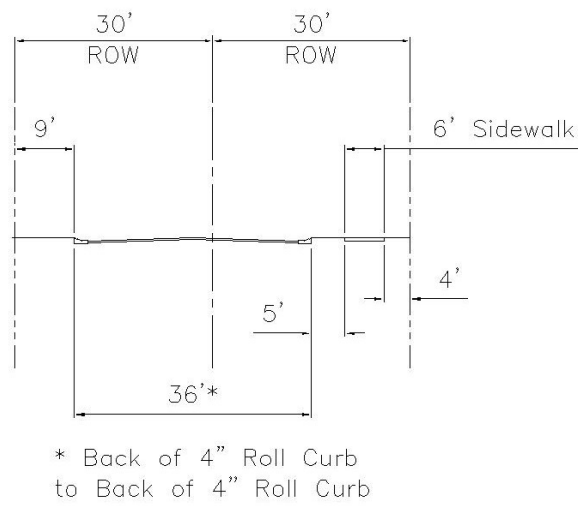
**Figure 2.6**  
**Cross-section "E" – Collector**



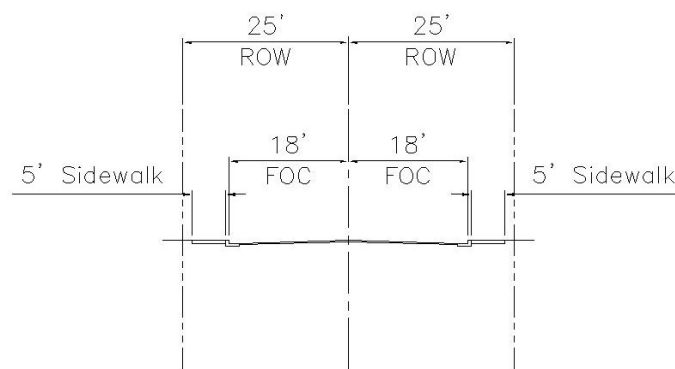
**Figure 2.7**  
**Cross-section “F” – Minor (Residential) Collector**



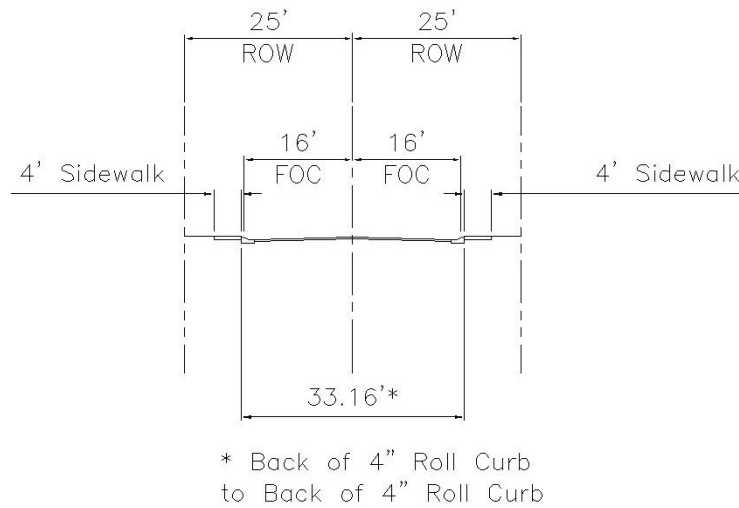
**Figure 2.8**  
**Cross-section “F” – Minor (Industrial) Collector**



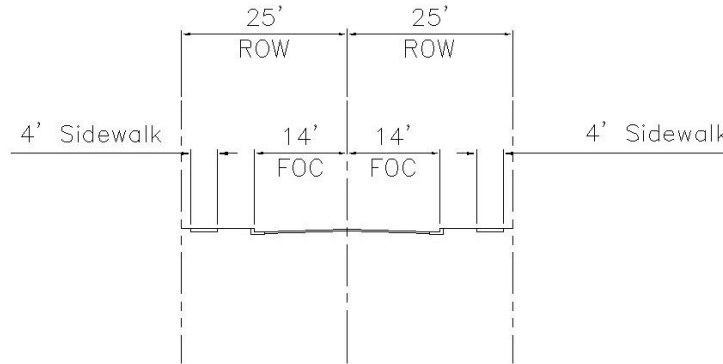
**Figure 2.9**  
**Cross-section "FN" (F Narrower) – Minor & Residential Collector with No Houses Facing the Street**



**Figure 2.10**  
**Cross-section "G" – Local (Commercial and Multi-Family)**



**Figure 2.11**  
**Cross-section "H" – Local (Single Family Residential)**



**Figure 2.12**  
**Cross-section "I" – Local (Single Family Residential)**

## Chapter 3 - GEOMETRIC DESIGN STANDARDS

### 3.1 – Geometric Design

The alignment of a street produces a great impact on the environment, the fabric of the community, and the roadway user. The alignment is comprised of a variety of elements joined together to create a facility that serves the traffic in a safe and efficient manner, consistent with the facility's intended function. Each alignment element should complement others to produce a consistent, safe, and efficient design.

A well-designed roadway system can provide shorter travel times, increased safety and convenient access. Roadway design can also control vehicle speed and influence roadway noise levels.

All Arterial and Collector streets within the City of Phoenix shall be located and designed in accordance with the most recently approved Street Classification Map. The layout of Local streets and Collector streets (not included on the Street Classification Map) shall meet the needs of the specific development and satisfy the design requirements as approved by the Development Services Department.

**Table 3.1** (see below) lists most of the design standards data for the public streets within Phoenix. Subsequent paragraphs in this manual discuss this data and provide additional guidelines that are not included in the table.

Street Design Element	Cross-Section "A"	Cross-Section "B"	Cross-Section "C"	Cross-Section "CM"	Cross-Section "D"	Cross-Section "E"	Cross-Section "F"	Cross-Section "FN"	Cross-Section "G"	Cross-Section "H"	Cross-Section "I"
Street Class Type	Major Arterial	Major Arterial & Arterial	Major Arterial & Arterial	Major Arterial & Arterial	Arterial & Major Collector	Collector	Minor (Residential) Collector & Industrial Local	Minor (Residential) Collector w/ no Houses facing street	Local Commercial & Multi-Family	Local Single Family Residential	Local Single Family Residential
Full right-of-way width, ft	140	130	110	110	100	80	60	60	50	50	50
Pavement width, face of curb to face of curb, ft	104	94	74	74	64	50	40	36	36	32	28
Median width, R-raised, P-painted	24R	14R	14P	14R	10P	10P	None	None	None	None	None
Type of Curb V-Vertical R-Rolled	V	V	V	V	V	V	V	V	V	R or V	V
Design Speed, miles per hour	60	60	55	55	50	45	45	45	30	30	30
Min. tangent length approaching intersection from curb return, ft	250	250	250	250	150	100	100*	100*	50*	50*	50*

**Table 3.1**  
**Basic Design Data for Streets**



\* See section 3.8.5

Design Speed (mph)	Stopping Sight Distance (ft)	Passing Sight Distance (ft)
25	155	900
30	200	1090
35	250	1280
40	305	1470
45	360	1625
50	425	1835
55	495	1985

**Table 3.2**  
**Stopping and Passing Sight Distance**  
(From AASHTO Exhibit 3-1 & 3-7, 2004)

	Cross-Section A & B (ft)	Cross-Section C, CM, & D (ft)	Cross-Section E, F, FN, G, H, & I (ft)
Passenger Vehicles	315	295	280
Single-unit Trucks, School Buses	400	375	350
Measured from driver's eye, 8 ' from face of curb, center of lane			
<p>For 2 lane streets (Cross Section E, F, FN, G, H, I):</p> $ISD = 1.47(V)(t)$ <p>V = posted speed limit or 25 mph minimum  t = 7.5 seconds for passenger vehicles, 9.5 seconds for single-unit trucks</p> <p>Minimum Intersection Sight Distance (25 mph):</p> <p>Passenger Vehicles: 280'</p> <p>Single-unit Trucks, School Buses: 350'</p>			
<p>For 5 lane streets (Cross Section C, CM, D):</p> $ISD = 1.47(V)(t)$ <p>V = posted speed for existing streets, design speed for proposed streets  t = 8.0 seconds for passenger vehicles, 10.2 seconds for single-unit trucks</p> <p>Minimum Intersection Sight Distance (25 mph):</p> <p>Passenger Vehicles: 295'</p> <p>Single-unit Trucks, School Buses: 375'</p>			
<p>For 6 lane streets (Cross Section A, B):</p> $ISD = 1.47(V)(t)$ <p>V = posted speed for existing streets, design speed for proposed streets  t = 8.5 seconds for passenger vehicles, 10.9 seconds for single-unit trucks</p> <p>Minimum Intersection Sight Distance (25 mph):</p> <p>Passenger Vehicles: 315'</p> <p>Single-unit Trucks, School Buses: 400'</p>			

**Table 3.3**  
**Intersection Sight Distance**

## 3.2 Street Right-of-Way and Easement Requirements

The right-of-way requirements shown in **Figures 2.1 – 2.12** are based on the space needed for the street when it is constructed to the ultimate design. The right-of-way must also provide space for utilities, cut or fill slopes, sidewalks, street lights, bicycle paths, traffic control devices and information signs, fire hydrants, landscaping, transit facilities, and other public facilities that must be located adjacent to street pavements.

Right-of-way and easement widths in excess of the standard widths may be required in special circumstances when:

- Cut or fill slopes cannot be confined within the standard width;
- Minimum sight distance lines on horizontal curves are not within the standards;
- Minimum sight distances at intersections are not within the standards;
- Auxiliary lanes are to be provided;
- Transit Facilities are required;
- Trails are required.

### 3.2.1 SRP/USA Fee Title Property

The City of Phoenix is in the process of creating an official policy dealing with SRP/USA Fee Title Property. A copy of the temporary policy may be found in **Section 12.1.7**.

## 3.3 Pavement Cross-Section Slopes

### 3.3.1 Typical Street Cross-Sections

Undivided streets should have a normal crown that has a two-way cross-slope with the cross-section high point on the street centerline. Divided streets should have cross-slope on each pavement section. The high point of each slope on each pavement section shall occur on the edge of the pavement nearest to the median, except where superelevated.

Unusual conditions may cause cross-slope requirements to vary, but normally, the desirable cross-slope is two (2) percent, with a maximum cross-slope of three (3) percent and a minimum cross-slope of one (1) percent. Any deviation from the desirable cross-slope is subject to review by the Street Transportation Department.

### 3.3.2 Cross-Sections in Street Dip Sections (Wet Crossings)

Street Dip crossings shall be avoided. All lots within new subdivisions shall be provided with a “dry” access from at least one direction. “Dry” means no more than 6” of water at no greater than 5 feet per second flow across the road in a 50 year storm event. This will allow emergency vehicle access. The pavements through the dip section should have a one-way slope (no crown), curbing and medians must not be raised, and cut-off walls shall be installed in accordance with designs approved by the City of Phoenix Development Services Department. Transitions back to normal street cross-slopes will be needed at both ends of the dip section.

\*See March 2004 *City of Phoenix Storm Water Policies and Standards*, for public street design and drainage requirements.

## 3.4 Medians

Medians shall be provided on all Arterial streets and may be permitted on collector and local streets. Medians shall either be raised or flush depending upon the classification of the street. Raised median islands are intended to separate opposing traffic flows, restrict indiscriminate crossing maneuvers, control turns, provide pedestrian refuge and, if of sufficient width, protect vehicles waiting to turn left. The basic purpose of a median island is to expedite traffic and increase vehicle and pedestrian safety. Too frequent openings may void these benefits.

### 3.4.1 Median Widths

The width of a raised median is measured from the *face* of median curb to the *face* of median curb. The nominal width of a raised median island should be fourteen (14) feet wide with twenty four (24) feet being approved for streets built to Cross-section “A” standards, see **Figure 2.1**. When a raised median island is narrowed for a left-turn pocket, the minimum width should be four (4) feet. The Street Transportation Department may approve raised median islands widths other than 14 or 24 feet, but only in extremely special circumstances will a raised median be approved to a width of less than four (4) feet. For a flush median, the width is measured between the centers of the continuous, painted median stripes. The ideal minimum width for a flush or painted median is ten (10) feet, but any separation between opposing flows of traffic is desirable.

### 3.4.2 Raised Medians

Raised medians that are more than four (4) feet in width are normally landscaped. Landscaping and other median features shall not restrict the sight distance for vehicles turning left on the through street. Decorative rocks shall not be used in raised medians. Median landscaping shall not restrict sight distance in the vicinity of intersections for side street traffic. Raised medians on Collector and Local public streets should be placed in a “tract” and shall be maintained by the Development’s Home Owners Association.

\*See City of Phoenix, Parks and Recreation *2006 Street Landscape Standards* for additional information.

### **3.4.3 Flush Medians**

Flush medians should be striped to provide a continuous left turn lane. The median shall be paved with asphalt, concrete or brick pavers, matching the grade of the adjacent street paving.

### **3.4.4 Median Nose Islands**

A median island nose from four (4) feet to five (5) feet in width should be paved. The paved surface should have the same cross-slope as the street pavement. Acceptable paving materials are Portland concrete cement or brick pavers.

### **3.4.5 Spacing and Location of Median Openings**

Median island openings will be allowed at 660 foot intervals as required in the City of Phoenix Street Classification System General Policy Document and Technical Supplement. Openings other than at the 660 foot locations may be permitted if approved by the Street Transportation Department.

## **3.5 Curbs**

Typical curb and gutters shall be constructed using the Maricopa Association of Governments (MAG) Standard Detail 220 - Type A and Type C

### **3.5.1 Vertical Curbs**

Vertical curbs (6" typical) are required for all streets except local single family residential streets (see **Figures 2.1- 2.12**) where traffic calming is not being implemented. Local single family residential streets with special narrower cross-sections will be constructed with vertical curbs and offset (separated) sidewalks. Vertical curbs should also be used where drainage considerations make such use desirable. Vertical curbs with gutter are to be constructed in accordance with the current City of Phoenix supplements to the MAG (Maricopa Association of Governments) standard details. Vertical curb and gutter type shall match the adjacent pavement slope to the gutter cross slope direction. The curb height shown on the standard detail is 6 inches, but the following variations may be used where appropriate:

- Where fire lane or public maintenance vehicle access to abutting property must be provided over the curb, use mountable curb and gutter.
- If special drainage requirements make a higher curb necessary, the height may be increased to eight (8) inches maximum and the width of the gutter may be increased to 24 inches.
- Historical areas with variable curb dimensions.

### 3.5.2 Roll Curb and Ribbon Curb

Roll curb is permitted on local single family residential streets except where vertical curb is required for drainage, and is to be constructed in accordance with the current City of Phoenix supplements to the MAG standard details. Ribbon curb is discouraged but may be used in lieu of roll curb for local residential streets, where attached sidewalks are not provided. When ribbon curb is used, drainage runoff from the road shall not drain with the road but shall be directed to roadside drainage ditches. Where a paved sidewalk is provided with ribbon curb, a 5 foot setback from the curb is required.

### 3.5.3 Cut-Off Walls

In locations where dip sections are permitted to allow drainage flows to cross roadways, cut-off walls conforming to MAG Detail 222, modified to 3 feet deep and topped with 24 inch ribbon curb, must be installed. Cut-off walls must have a top that is flush with the pavement surface. The exposed portion of the cut-off wall will have the appearance of a ribbon curb, with the same width as the street's regular curb and gutter. The cut-off walls must extend across the flow path in the dip section to protect the pavement structure during runoff flows from a 2 hour duration 100-year storm. Transitions will be needed between the regular curbs and the cut-off walls at each end of the dip section.

### 3.5.4 Curb Returns

Vertical curb shall be used through the curb return from PC to PT regardless of whether the tangent curb sections are vertical, ribbon or roll curb. All curb returns shall be provided with curb ramps with sidewalk from PC to PT per the applicable City of Phoenix sidewalk ramp detail as required by the ADA. Four (4) inch vertical curb is allowed on local streets with ribbon and roll curb. Six (6) inch vertical curb is required on all collector and arterial streets.

1) *Curb Return Radii* – **Table 3.4** was developed to accommodate turning movements of vehicles, including large trucks, in commercial and industrial areas, and vehicle traffic in residential areas.

<b>Curb Return Radii</b>		
Classification of Intersecting Streets	Residential Commercial	Industrial
Arterial and Arterial	35 ft	35 ft
Arterial and Collector	35 ft	35 ft
Arterial and Local	20 ft	35 ft
Collector and Collector	35 ft	35 ft
Collector and Local	20 ft	35 ft
Local and Local	20 ft	35 ft
Local and Private	20 ft	35 ft

**Table 3.4**

## Curb Radii at Intersections

2) *Sidewalk Ramp at Curb Return* - Sidewalk ramps shall be constructed at all curb returns in accordance with City of Phoenix Standard Details. If a traffic signal exists or is planned, the ramp and apron must provide access to the pedestrian push button. See **Section 8.6** of this document for further information regarding the design of sidewalk ramps.

## 3.6 Selection of a Design Speed

Design speed is a selected speed used to determine the various geometric design features of the roadway. The assumed design speed should be a logical one with respect to the topography, anticipated operating speed, the adjacent land use, and the functional classification of the roadway. Except for local streets where speed controls are frequently included intentionally, every effort should be made to use as high a design speed as practical to attain a desired degree of safety, mobility, and efficiency within the constraints of environmental quality, economics, aesthetics, and social or political impacts. Once the design speed is selected, all of the pertinent roadway features should be related to it to obtain a balanced design. Design speeds for the various classifications of roadways in Phoenix may be found in **Table 3.1**. The use of design speeds other than those shown in **Table 3.1** must be approved by the Street Transportation Department.

## 3.7 Superelevation in Curves

The purpose of superelevating a roadway is to maintain the riding comfort on roads with less than standard curve radii. Superelevation may only be used when other means of design will not work. The following criteria shall be followed:

### 3.7.1 Superelevation 0.02 ft/ft (2%)

Superelevation of 0.02 ft/ft may be used when the standard radius cannot be provided due to circumstances beyond the control of the engineer and the general alignment cannot be changed.

### 3.7.2 Superelevation Greater than 0.02 ft/ft (2%)

Superelevation greater than 0.02 ft/ft may not be used except when approved by the Street Transportation Department. In no case shall a superelevation exceed 0.06 ft/ft.

### 3.7.3 Transition for Superelevation

- The length of superelevation transition shall be based on the superelevation rate and the width of rotation. The axis of rotation shall generally be about the pavement centerline. For more information on superelevations, refer to the AASHTO publication, *A Policy on Geometric Design of Highways and Streets*.

- With respect to the beginning or ending of a horizontal curve, one-third (1/3) of the transition should be on the curve and two-thirds (2/3) of the transition should be on the tangent pavement section.

#### **3.7.4 Drainage on Superelevated Curves**

Whenever superelevation is allowed on a divided street, a storm drainage system to collect the runoff along the median curb will be provided. In no case shall nuisance water from the higher traveled way be allowed to cross the lower traveled way.

### **3.8 Horizontal Curves**

Horizontal alignments should provide for efficient and comfortable operation of motor vehicles at a uniform design speed for substantial lengths of street. A horizontal curve is required when the angle of change in horizontal alignment is equal to or greater than one degree on arterial and collector streets. The nature of the surrounding development, topography, and the street classification will establish the factors that determine the radius of a curve.

#### **3.8.1 Minimum Radii of Curvature**

The minimum radius of curvature will be determined by the design speed or by the stopping sight distance.

**1) *Minimum Radii Based on Design Speed***

On arterials, wherever possible, the radii used in design should be as large as possible. For the minimum radii allowed, refer to the AASHTO publication, *A Policy on Geometric Design of Highways and Streets*.

**2) *Consideration of Stopping Sight Distance***

When walls, buildings, bridge piers, cut slopes, vegetation, or other obstructions are near the roadway on the inside of a curve, they can block a driver's view of the road ahead. If they are too close, the driver will not have sufficient distance along the curved roadway to stop when an approaching vehicle or other object on the roadway comes into view. For design, the driver's eye is 3.5 feet above the center of the inside lane (the driving lane closest to the inside of the curve) and that the object in the roadway is 0.5 feet high in the center of the inside lane. The clear distance, "M," is measured from the center of the inside lane to the view obstruction. For a quick check use 13 times the design speed, for exact distance, refer to the AASHTO publication, *A Policy on Geometric Design of Highways and Streets*.



### 3.8.2 Reduced Design Speeds on Curves

The reduction of a street design speed on a curve should be avoided. However, where physical restrictions prohibit increasing the radius of the curve or the clear distance, "M," the design speed for the curved section may be reduced. In such circumstances, signing in accordance with MUTCD (*Manual on Uniform Traffic Control Devices*) is highly recommended. The difference between the design speed for the roadway approaching the curve and the design speed for the curve should not be greater than 10 miles per hour. The design speed for a curved roadway section is normally not to be reduced if the reduction would occur at the end of a long tangent or at any location where high approach speeds may be expected.

### 3.8.3 Compound Curves

Compound curves should normally be avoided. However, if site conditions make the use of a compound curve unavoidable, refer to the AASHTO publication, *A Policy on Geometric Design of Highways and Streets*, for the minimum lengths for tangents between two curves curving in the same direction. The shorter radius should be at least 2/3 the length of the long radius when the shorter radius is 1,000 feet or less. Compound curves are not permitted when design speeds require the shorter radius to be greater than 1,000 feet.

### 3.8.4 Tangent Sections between Curves in the Same Direction

On two-lane roads, tangent sections are needed between two curves in the same direction if the pavement cross-sections through the curves do not have superelevation. If superelevation is provided in the curved portions of the roadway, then the tangent lengths will be determined by the superelevation transition lengths indicated in AASHTO.

### 3.8.5 Tangent Sections between Reverse Curves and Approaching Intersections

On arterial and collector streets a tangent section must be provided between two curves that curve in the opposite direction. Local streets must provide a minimum of a 100' tangent or have a 400' minimum radius where they intersect an arterial street. Tangent sections must also be provided between an intersection and a curve on collector and arterial streets. For minimum lengths for tangent sections between reverse curves without superelevation, refer to the AASHTO publication, *A Policy on Geometric Design of Highways and Streets*. If the curve radii are at least 50% greater than the radii required by the design speed, the tangent sections may not be required depending on grades, topography, and vegetation. If superelevation is provided for the curves, then the superelevation transition lengths indicated in AASHTO will determine the minimum length of tangent sections between reverse curves.

### 3.9 Vertical Alignment

A vertical curve is normally required when grade changes are equal to or greater than 1.5%. All sections of a street's vertical alignment should meet passing and stopping sight distance requirements for the design speed established for the street. For further details, see the AASHTO publication, *A Policy on Geometric Design of Highways and Streets*.

#### 3.9.1 Longitudinal Street Grades

For parkways, expressways, and arterial streets the maximum grade is 7%-- for collector and local streets the maximum grade is 9%. The minimum longitudinal street grade for all streets is 0.4%. Wherever possible, longitudinal street grades greater than or equal to the minimum grade shall be provided. Where necessary, grades less than 0.4% to 0.15% may be used with written approval from the City of Phoenix, Development Services Departments Grading and Drainage Section.

#### 3.9.2 Vertical Curves

Properly designed vertical curves should provide adequate sight distance, safety, and effective drainage.

##### 1) *Type of Curve*

A parabolic vertical curve is to be used. AASHTO provides all necessary mathematical relations for computing a vertical curve, for both crests and sags.

##### 2) *Sight Distance Requirements*

Sight distance is the continuous length of street ahead that is visible to the driver. For vertical alignment design, two sight distances are considered: passing sight distance and stopping sight distance. Stopping sight distance is the minimum sight distance to be provided at all points on multi-lane streets and on two-lane streets when passing sight distance is not economically obtainable. Stopping sight distance shall also be provided in the vicinity of intersections. **Table 3.2** lists the minimum passing and stopping sight distances for the various street classifications at various design speeds.

##### a) *Stopping Sight Distance*

The minimum stopping sight distance is the distance required by the driver of a vehicle, traveling at a given speed, to bring the vehicle to a stop after an object on the road becomes visible. Stopping sight distance is measured from the driver's eyes, 3.5 feet above the pavement surface, to an object 0.5 feet high on the roadway, or currently accepted AASHTO standards.

##### b) *Passing Sight Distance*

Passing sight distance is the minimum sight distance that must be available to enable the driver of one vehicle to pass another vehicle safely, without interfering with the speed of an oncoming

vehicle traveling at the design speed should it come into view after the overtaking maneuver is started. The sight distance available for passing at any one place is the distance at which a driver whose eyes are 3.5 feet above the roadway surface can see the top of an object 4.25 feet high on the road, or currently accepted AASHTO standards.

### 3) *Minimum Vertical Curve Lengths*

Minimum vertical curve lengths are determined by sight distance requirements for a given design speed. City Ordinance requires a minimum of 100' on all collector and local streets.

#### a) *Crest Vertical Curve Lengths*

Minimum crest curve lengths are determined by either the stopping sight distance or the passing sight distance, whichever provides the greatest curve length, unless the street is striped for no passing.

- i) The minimum crest vertical curve lengths on streets with two or more through travel lanes per direction must only meet stopping sight distance requirements.
- ii) *Two-Lane Streets* - Passing sight distance requirements should be met on streets with one through travel lane per direction. When crest curve construction in accordance with passing sight distance requirements would result in the creation of drainage problems or excessive cuts or fills, the curve length may be reduced with the installation of appropriate traffic control measures.
- iii) *Minimum Crest Vertical Curve Length Determined by Stopping Sight Distance* - The following equations are to be used to determine the minimum crest vertical curve lengths based upon stopping distance requirements (assuming AASHTO minimum requirements of 3.5 ft driver height and a 0.5 ft object height):

$$\text{When } S_s < L, L = \frac{A \times S_s^2}{2158}$$

$$\text{When } S_s > L, L = 2 \times S_s - \frac{2158}{A}$$

Where:

$S_s$  = Stopping sight distance in feet for a given design speed.

$L$  = Length of curve in feet.

$A$  = Algebraic grade difference in percent.

- iv) *Minimum Crest Vertical Curve Length Determined by Passing Sight Distance.* - The following equations are to be used to determine the minimum crest vertical curve lengths based upon sight distance requirements (assuming AASHTO minimum requirements of 3.5 ft driver height and a 4.25 ft object height):

$$\text{When } Sp < L, L = \frac{A \times Sp^2}{2800}$$

$$\text{When } Sp > L, L = 2 \times Sp - \frac{2800}{A}$$

Where:

Sp = Passing sight distance in feet for a given design speed.

L = Length of curve in feet.

A = Algebraic grade difference in percent.

b) *Sag Vertical Curve Lengths*

Minimum sag vertical curve lengths are determined by either the stopping sight distance or comfort factors. The longer of the two possible minimum curve lengths will be used.

- i) *Minimum Sag Vertical Curve Length Determined by Stopping Sight Distance* - The following equations are to be used to determine the minimum sag vertical curve length based upon stopping sight distance requirements (assuming AASHTO minimum requirements of 2 ft headlight height and a 1° divergence):

$$\text{When } Ss < L, L = \frac{A \times Ss^2}{400 + 3.5 \times Ss}$$

$$\text{When } Ss > L, L = 2 \times Ss - \frac{400 + 3.5 \times Ss}{A}$$

Where:

Ss = Stopping sight distance in feet for a given design speed.

L = Length of curve in feet.

A = Algebraic grade difference in percent.

- ii) *Minimum Sag Vertical Curve Length Determined by Comfort Factors* - The following equation is to be used to determine the minimum sag vertical curve length based upon comfort factors (assuming AASHTO minimum requirements  $\leq 1 \text{ ft/s}^2$  centripetal acceleration):

$$L = \frac{A \times V^2}{46.5}$$

Where:

L = Curve length in feet.

A = Algebraic grade difference in percent.

V = Design speed in miles per hour.

### 3.10 Combined Horizontal and Vertical Curves

When horizontal and vertical curves are combined, the horizontal curve shall lead and follow the vertical curve. For additional information on this topic, refer to the AASHTO publication, *A Policy on Geometric Design of Highways and Streets*.

### 3.11 Intersections

Although all intersections share certain common elements, they are not subject to generalized treatment. To minimize conflicts and provide for anticipated traffic movements each intersection must be evaluated with regard to its individual characteristics and designed based on the following factors:

- Traffic factors such as capacities, turning movements, vehicle size and operating characteristics, vehicle speed, pedestrian and bicycle movements, transit operations, and accident history.
- Physical factors such as topography, existing conditions, channelization requirements; and available sight distance.
- Human factors such as driving habits, reaction to surprises, decision and reaction time, and natural paths of movement.

#### 3.11.1 Angle of Intersection

A right-angle intersection provides the shortest crossing distance for intersecting traffic streams and pedestrians. It also provides the most favorable condition for drivers to judge the relative position and speed of intersecting vehicles. Where special conditions exist, intersection angles may diverge from a right-angle with approval of the Street Transportation Department on arterial and collector streets; a 15 degree divergence is the maximum allowed on local streets.

### 3.11.2 Alignment and Profile

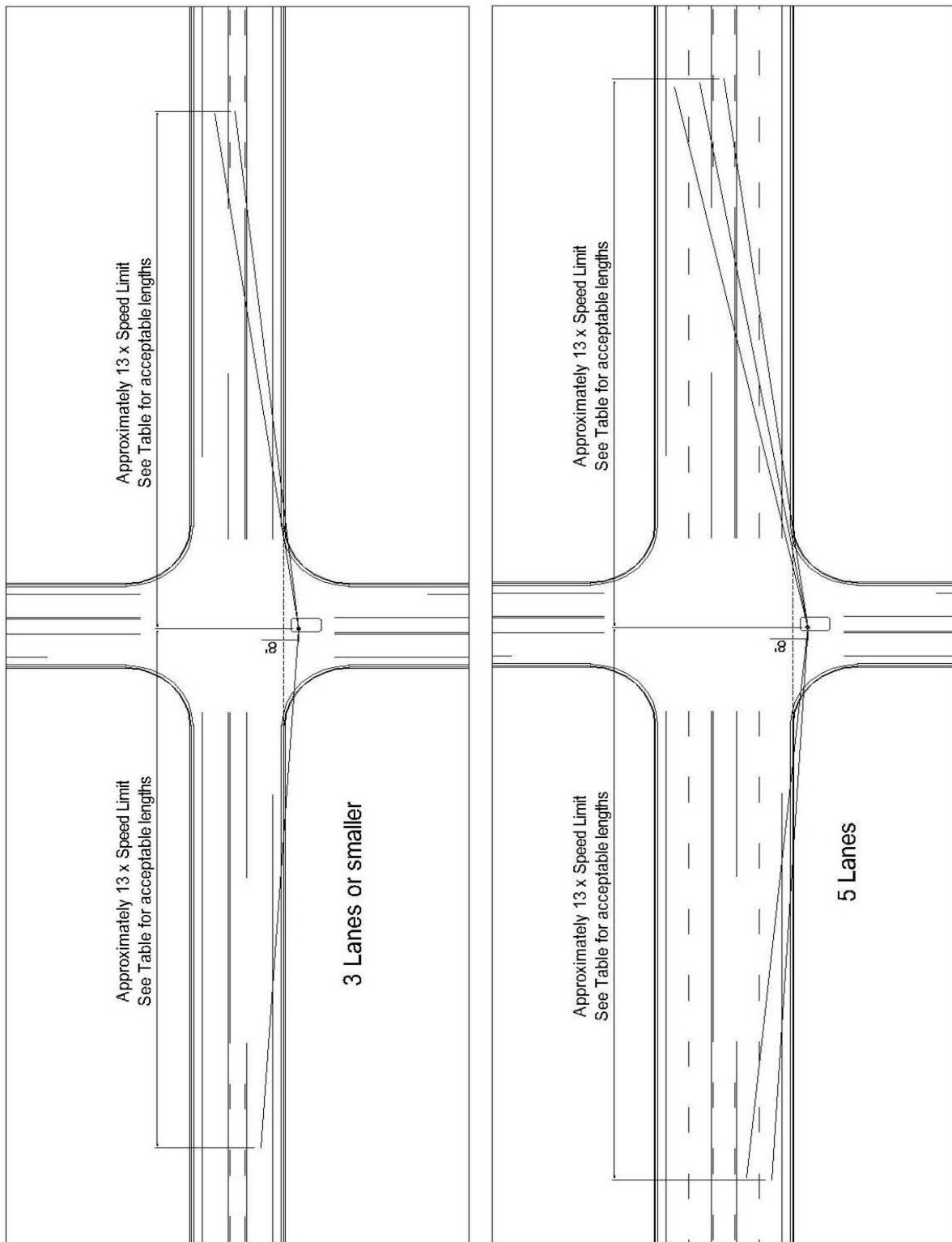
Intersections occurring on horizontal or crest vertical curves are undesirable. When there is latitude in the selection of intersection locations, vertical or horizontal curvature should be avoided. An alignment or grade change is frequently warranted when major intersections are involved. If a curve is unavoidable, it should be as flat as site conditions permit. Where the grade of the through roadway is steep, flattening through the intersection is desirable as a safety and efficiency measure. Grade breaks through major-major, major-collector, and any other signalized or potentially-signalized intersections shall not exceed 2.5% desirable or 3.0% absolute maximum.

### 3.11.3 Intersection Sight Distance

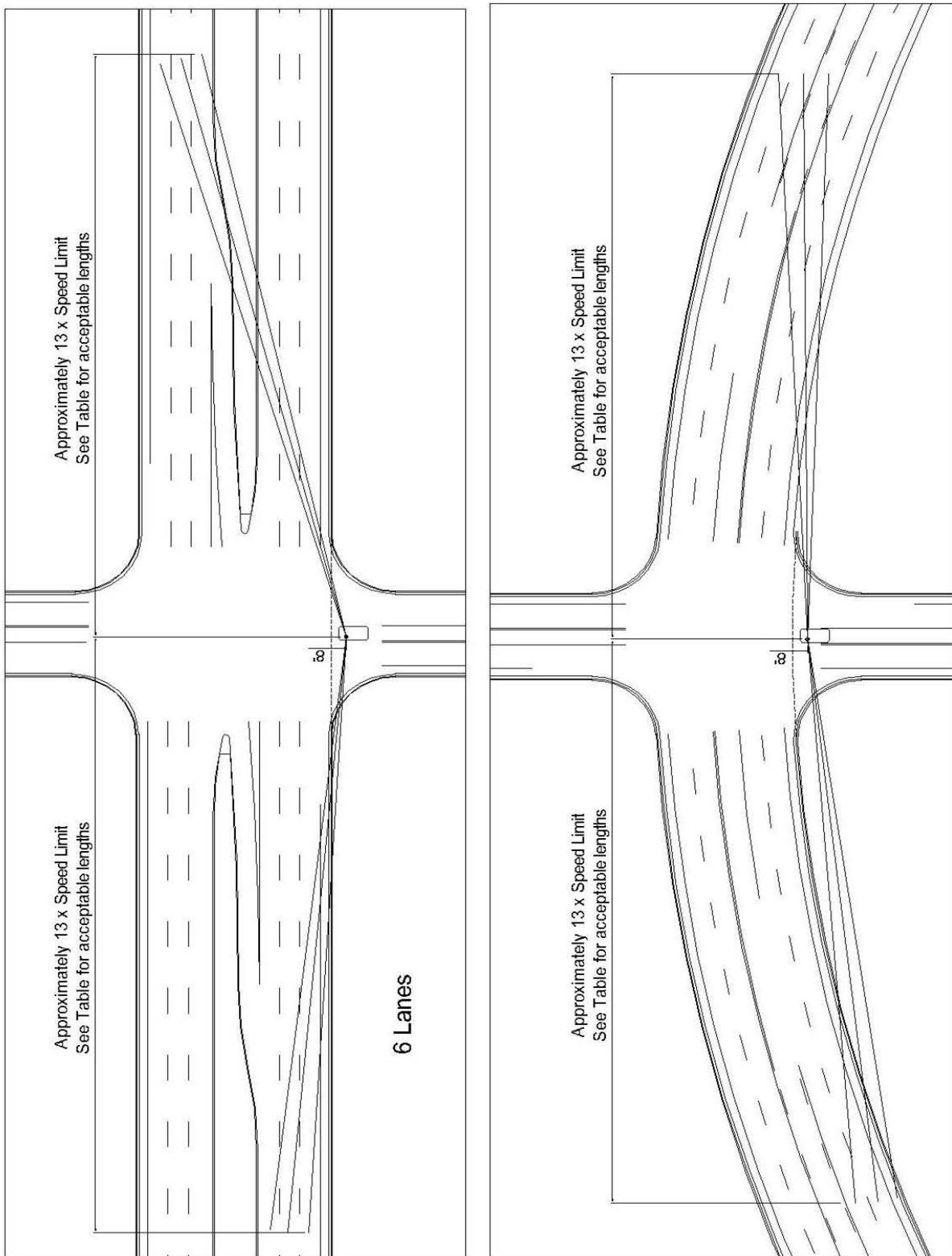
In order to provide the opportunity for vehicles at an intersection to safely cross or make left or right turns onto a through street, adequate sight distance must be provided. Sight lines are to be drawn on roadway and landscaping plans to represent the areas that must be free of all objects greater than 6" in width and topography in excess of 36 inches above the roadway surface. Continuous unobstructed line of sight must be provided along this line and throughout the approach to the intersection, providing an unobstructed sight triangle to the side street driver. Vegetation placed within the sight triangle shall be of a low variety that remains below 24 inches when mature. Trees can be considered within the triangle as long as the canopy is above ten (10) feet, and if it is a single trunk variety and less than 12 inches in diameter.

#### 1) *Right-Angle Intersections*

If the street intersection legs meet at an angle of 88 to 90 degrees, the sight distances shown in **Table 3.1** are to be used with **Figure 3.2** to calculate the sight triangle. The intersection sight distance shown on **Figure 3.2** for all street classifications except local industrial was determined assuming passenger car traffic. If high volumes of truck traffic are anticipated on other than local industrial street, the procedures in the AASHTO publication, *A Policy on Geometric Design of Highways and Streets* should be consulted to determine the necessary sight distances.



**Figure 3.2.A**  
**Intersection Sight Distance**



**Figure 3.2.B**  
**Intersection Sight Distance**



<b>INTERSECTION SIGHT DISTANCE</b>			
3 LANE STREETS (BL, THRU, LEFT, THRU, BL) OR SMALLER			
SPEED	LENGTH PASSENGER VEHICLE	LENGTH SINGLE UNIT TRUCK	ACCEPTABLE AVERAGE
25 MPH	280 ft	350 ft	315 ft
30 MPH	335 ft	420 ft	380 ft
35 MPH	390 ft	490 ft	440 ft
5 LANE STREETS (BL, 2 THRU, LEFT, 2 THRU, BL)			
SPEED	LENGTH PASSENGER VEHICLE	LENGTH SINGLE UNIT TRUCK	ACCEPTABLE AVERAGE
25 MPH	295 ft	375 ft	335 ft
30 MPH	353 ft	450 ft	402 ft
35 MPH	412 ft	525 ft	469 ft
40 MPH	471 ft	600 ft	536 ft
45 MPH	530 ft	675 ft	603 ft
50 MPH	588 ft	750 ft	670 ft
6 LANE STREETS (BL, 3 THRU, LEFT, 3 THRU, BL)			
SPEED	LENGTH PASSENGER VEHICLE	LENGTH SINGLE UNIT TRUCK	ACCEPTABLE AVERAGE
25 MPH	315 ft	400 ft	358 ft
30 MPH	380 ft	481 ft	431 ft
35 MPH	438 ft	561 ft	500 ft
40 MPH	500 ft	641 ft	571 ft
45 MPH	563 ft	721 ft	642 ft
50 MPH	625 ft	801 ft	713 ft

**Figure 3.2.C**  
**Intersection Sight Distance**

## 2) *Skewed Intersections*

For skewed intersections where the intersection angles are less than 88 degrees, sight distances should be calculated in accordance with the procedures described in Chapter 9 of the AASHTO publication, *A Policy on Geometric Design of Highways and Streets*.

## 3) *Intersections within or near a curve*

Sight Distances shown in **Figure 3.2** shall follow the street alignment when the intersection is within or near a horizontal curve. Desirable sight distance is typically approximated at 13 x the posted speed limit.

## 4) *Sight Visibility Triangles*

Sight Visibility Triangles shall be used as a means to limit the height of structures, vegetation, and other improvements on corner properties immediately adjacent to intersections. Sight visibility triangles are required by City of Phoenix Ordinance Section 31-13. **Visibility triangles are not to be used as a substitute for intersection sight distance!** Visibility triangles provide additional visibility around corners for all intersection approaches, and should be applied to the design of perimeter walls and landscape features. Items within the safety triangle shall be no higher than 36 inches measured from the roadway surface. City Of Phoenix Ordinance Section 31-13 depicts the method used to determine the sight triangle as measured along the property line.

### **3.11.4 Intersections with an Unpaved Leg**

If an intersection has a leg that is unpaved, the paving to be placed in the intersection shall extend to the end of the normal curb return location on the unpaved leg at a minimum.

### **3.11.5 Valley Gutters at Street Intersections**

#### 1) *Locations of Valley Gutters*

Valley gutters may only be used across minor collector streets and local residential streets. Exceptions must be approved by the Street Transportation Department.

#### 2) *Valley Gutter Widths*

Valley gutters should be constructed in accordance with City of Phoenix standard details.

### **3.11.6 Modern Roundabout Intersections**

Modern roundabouts are circular intersections at grade. They can be an effective intersection type with fewer conflict points, lower speeds, and easier decision points than conventional intersections.

The Street Transportation Department recommends that roundabouts be considered for all intersection design, where appropriate. The majority of roundabouts within the City are at local/local, local/collector or collector/collector intersections. The use of a roundabout within a development can assist in calming traffic and can provide an alternative to stop controlled intersections. They can be more economical to build and to maintain than intersections with traffic signals. All roundabouts on arterial and collector streets must be approved by the Street Transportation Department.

Locations recommended for roundabout design should be evaluated based on many factors including:

- Where stop signs result in unacceptable delays for crossroad traffic
- With a high left-turn percentage on one or more legs
- Where a disproportionately high number of accidents involve crossing or turning traffic
- Where it is not desirable to give priority to either roadway
- Intersections with unusual geometry

Locations are not typically recommended for the following intersections but with City approval may be considered:

- On a collector/arterial where any leg is posted 45 mph or higher
- Where the grade for any leg exceeds 4%
- Where traffic volumes are unbalanced with higher flows on one or more approaches
- Where a collector/arterial intersects a local and a roundabout would result in unacceptable delays to the collector/arterial
- High pedestrian activity including special needs pedestrians
- Where there is inadequate sight distance
- Where there is a large volume of bicycle traffic
- Where a downstream traffic control device such as a traffic signal would result in a queue that extends into the roundabout

Locations where roundabouts are not recommended include intersections:

- Where a satisfactory design cannot be provided
- Where reversible lanes are required
- At a single intersection in a network of linked traffic signals
- Where a signal interconnect system provides a better level of service
- Where it is desirable to adjust traffic movements via signal timing

See [current City of Phoenix Std Dtls for supplement to MAG for Section 12.3.3](#) for the current Street Transportation Department roundabout guidelines and examples.

Currently the City recommends following the Federal Highways Administration's guide, "Roundabouts: An Informational Guide". For a link to the site, please see <http://www.tfhrc.gov////////safety/00-0671.pdf>

### 3.12 Right-Turn and Left-Turn Lanes

Right-turn and left-turn lanes were developed to provide a deceleration lane for vehicles turning right or left into large traffic generators, or at street intersections with a high right or left-turn demand. This reduces delay for the following through vehicles and minimizes rear-end crash potential.

Where a right turn lane at a traffic signal is warranted, an island separated right turn lane is recommended on arterial streets with a roadway width larger than 74'. See COP Supplement to MAG for the current guideline.

Right turn deceleration lanes at local streets or driveways are considered on a case by case basis. Typically when a commercial development is 100,000 sq feet or larger or has a minimum 20 truck bays, a decal lane would be requested. At non-signalized intersections or driveways, the width of a right turn lane is 12' measured from face of curb to face of curb. Typical storage length is 100' from curb return or driveway wing, with a 150' curb taper. The maximum allowable storage length is 250' and must be supported by a traffic study. Continuous right turn lanes between driveways will not be allowed, there will be a minimum of 20' from curb return/wing of driveway to the start of the approach taper for the next right turn lane.

Current left turn storage lengths on arterial streets:

Arterial intersections – 250' – includes dual lefts

Collector intersections – 150'

Local streets – 100'

Driveways – 100'

Any left turn storage lengths that differ from the current guidelines must be reviewed and approved by the Traffic Operations Division of the Street Transportation Division.

## CHAPTER 4 - STREET CONSTRUCTION

### 4.1 Bridges, Retaining Walls, and Structural Clearances

#### 4.1.1 Bridges

##### Bridge Roadbed Width

The clear width of all bridges, including grade separation structures, shall equal the full width of the physical improvements of the approaching roadway, consisting of sidewalk, street, median, and curb and gutter.

##### Approach Guardrail

If a vehicular railing or safety-shaped barrier is provided, which is within 10 feet of a traveled way with or without a sidewalk, approach guardrails should be installed on all approach ends in accordance with AASHTO guidelines and paragraph 4.D below.

##### Cross Slope

The crown is normally centered on the bridge except for one-way bridges, where a straight cross slope in one direction shall be used. The cross slope shall be the same as for the approach pavement.

##### Median

On multi-lane divided highways, a bridge median that is 26 feet wide or less shall be decked. The decking of all medians greater than 6 feet wide should be grated to allow natural light into the structure. Exceptions must be submitted to the Street Transportation Department for approval.

##### Railings

The railings to be used are the State of Arizona or State of California Department of Transportation standard design railings. There are four types of railings, which are described below:

1. Vehicular Barrier Railings

The primary function of these railings is to retain and redirect errant vehicles.

2. Combination Vehicular, Bicyclist and Pedestrian Railings

These railings perform the dual function of retaining vehicles, bicyclist and pedestrians on the bridge. They consist of two parts: 1) a concrete barrier railing with a sidewalk, and 2) a metal hand railing or fence-type railing.

### 3. Pedestrian and Bicyclist Railings

These railings prevent pedestrians and bicyclists from accidentally falling from the structure and, in the case of the fence-type railing, prevent objects from being thrown to the roadway below the bridge.

### 4. Bridge Approach Railings

- A. Approach railings are required at the ends of bridge railings exposed to approach traffic. On divided highways, with separate one-way traffic structures, they shall be placed to the left and right of approach traffic.
- B. On two-way roadbeds with a clear width less than 60 feet across the structure, approach railings will be placed on both sides of each end of the structure.
- C. When the clear width is 60 feet or more, approach railings will be placed only to the right of approach traffic.
- D. Several types of approach railings are available, including Metal Beam Guardrail, Bridge Approach Guardrail (Types I and II), and Safety-Shape Barriers. The type of approach railing selected should match the rail to be used on the bridge. When long runs of guardrail (such as embankment guardrail) precede the bridge, the guardrail should connect to the bridge railing and thus serve the approach railing function.
- E. Approach railings shall be flared at their exposed end. The greatest flare offset possible should be used commensurate with the approach roadway. For detailed information, refer to the AASHTO publication, *Roadside Design Guide*.

#### 4.1.2 Retaining Walls

All retaining walls shall conform to Section 703 of Zoning Ordinance of Phoenix Arizona.

##### Types and Uses

Recommend types of retaining walls include reinforced concrete and structural masonry. Heavy timber construction is not encouraged except when approved by the Street Transportation Department. The walls shall also include integral attachments for railings and weep drainage where applicable.

### Aesthetic Considerations

In general, the materials and design of retaining walls should match or blend with the adjacent natural features, landscaping, and/or buildings. The surface of the retaining wall should have a low light reflectance. Suggested surface treatments include exposed aggregate, stucco or mortar wash, and native stone, or other surfaces as approved by the Development Review Board.

The height of retaining walls should not exceed 6 feet except when approved by the Street Transportation Department. If approved to retain above six (6) feet, terracing is encouraged and the length of the alignment of the retaining walls should be foreshortened by vertical grooves, periodic offsets, and height changes, or other configurations as approved by the Development Review Board.

### Safety Railings

A safety railing is required on or adjacent to vertical faces such as retaining walls, wing-walls, abutments, etc., and where the vertical fall is two (2) feet or more. The safety railing shall be constructed per City of Phoenix standard details and should be placed on top of the vertical face structure of the vertical drop.

## **4.1.3 Structural Clearances**

### Horizontal Clearance

The term “clear zone” is used to designate the unobstructed, relatively flat area provided beyond the edge of the traveled way for the recovery of errant vehicles. The clear zone includes any shoulders or auxiliary lanes.

The *AASHTO Roadside Design Guide* discusses clear zone widths as related to speed, volume, and embankment slope. The Guide may be used as a reference for determination of clear-zone widths for freeways, rural arterials, and high-speed rural collectors. For low-speed rural collectors and rural local roads, a minimum clear-zone width of 10 feet should be provided.

For urban arterials, collectors, and local streets where curbs are utilized, space for clear zones is generally restricted. A minimum offset distance of 18 inches should be provided beyond the face of the curb, with wider offsets provided where practical. This “operational” offset will generally permit curbside parking and will not have a negative impact on traffic flow. However, since most curbs do not have a significant capability to redirect vehicles, a minimum clear zone distance commensurate with prevailing traffic volumes and vehicle speeds should be provided where practical.

### Vertical Clearance

The minimum vertical clearance should be 16.5 feet over the entire width of the traveled way of an arterial street or major collector street. On other streets, the minimum should be 14.5 feet. Exceptions must be submitted to, and approved by, the Street Transportation Department.

## **4.2 Side Slopes**

### **4.2.1 Side Slope Standards**

Side slopes should be designed for functional effectiveness, ease of maintenance, and pleasing appearance. For areas greater than ten (10) feet back of curb, slopes of 4:1 or flatter should be provided. Steeper slopes may be approved in areas more than 30 feet back of curb when soils are not highly susceptible to erosion, or when a cut is not more than four (4) feet. Consult the AASHTO publication, *Roadside Design Guide* for further details. The Development Review Board must review cuts or fills greater than four (4) feet.

### **4.2.2 Slope Rounding**

The top of all cut slopes shall be rounded where the material is other than solid rock. A layer of earth overlaying a rock cut also shall be rounded. The top and bottoms of all fill slopes for, or adjacent to a traveled way, sidewalk, or bicycle path shall also be rounded.

## **4.3 Pavement Design**

### **4.3.1 General Information**

The purpose of this section is to describe the procedures to be used in the design of the structural section of flexible pavements which are to be constructed in Phoenix's public rights-of-way. This method will also apply to developers of private property in fulfillment of the requirements for development stipulated by the City as a condition for authorization of the development.

### **4.3.2 Definitions**

1. "Structural section" means the combination of an asphalt concrete surface course and a base course of either rock aggregate materials or asphalt concrete.
2. "Subgrade" means native soil or fill material over which the structural section is to be placed.



3. “Asphalt concrete course” means the total depth of asphalt concrete which may be placed in one or more layers. The upper layer is called asphalt concrete surface course (ACSC) and the lower layer is called asphalt concrete base course (ACBC). The maximum thickness of any individual lift of pavement will not be greater than 3-inches, unless approved by the City Engineer.
4. “Rock aggregate base material” means the total depth of rock aggregate material which may be placed in one or two layers. If one layer is placed, it will be “Aggregate Base Course” (ABC) in accordance with Table 702 of the MAG Specifications. If two layers are placed, the top four inches must be ABC and the bottom layer may be ABC or “Select material” in accordance with Table 702 of the MAG Specifications. For the sake of brevity, the rock aggregate base material is called the “base course” in this manual.
5. “MAG Specifications” are the Uniform Standard Specifications for Public Works Construction distributed by the Maricopa Association of Governments.

#### **4.3.3 Soil Testing Requirements**

##### **1. Subgrade Sampling Locations**

Subgrade samples should be taken to a depth of at least five feet for each type of soil found on the project site. There should also be at least one sample for each type of soil used as fill material on which a roadway is to be built. Samples should be taken in locations which the engineer responsible for the pavement design believes will provide an accurate representation of the subgrade that will lie beneath the pavement.

##### **2. Types of Tests**

The following tests are required for design procedures indicated and must be performed in accordance with ASTM procedures.

- A. Sieve analysis of each sample is needed to determine the percent passing a #200 sieve.

Atterberg - Limits tests are needed for each sample. (The liquid limit and plastic limit to establish the plasticity index.)

- B. R-value determination shall be made for exudation pressure of 300 psi. Each pavement thickness design must be based on the R-values determined by the tests, and for each length of pavement to be constructed with a constant thickness design; engineering judgment will be exercised in selecting the R-value for design. If the engineer elects to not run R-value tests on every subgrade sample, his design report must indicate the basis on which he selected the samples for the R-value tests.
- C. Swelling tests are needed if the soil type indicates the presence of soils tending to swell significantly with added moisture.

#### **4.3.4 Minor Streets**

1. Design Charts:

There are two design charts for the base courses of minor streets.

- A. Design of base courses for local Residential Streets is based on the City of Phoenix Standard Detail P-1102.
- B. Design of base courses for Local Collector Streets, Minor Collector Streets, Local Commercial Streets and Local Industrial Streets is based on the City of Phoenix Standard Detail P-1103.

2. Substitution of Asphalt Concrete for Aggregate Base Material

If the total structural section depth determined is undesirable, a deeper asphalt concrete section can be used in lieu of some or all of the aggregate base material at a rate of 1 inch of asphalt concrete for 3 inches of aggregate base material.

3. Recycled Asphalt Concrete and Asphalt Millings:

If these materials meet the MAG specifications for aggregate base course, then these materials will be allowed in sub-base and as backfill. However, these materials are not allowed as part of the pavement structure.

### **4.3.5 Modified AASHTO Design Procedures for Arterial Streets**

#### **1. Historical Background**

The American Association of State Highway and Transportation Officials (AASHTO) published a guide for the design of pavement structures in 1961 and revised guides in 1986 and 1992. The City of Phoenix uses modified procedures and has selected certain design coefficients appropriate to the Phoenix metropolitan area.

#### **2. Assumptions**

The 1986 AASHTO design was implemented by the City of Phoenix in September 1988. Following simplifying assumptions were made:

- A. No freeze or thaw.
- B. No swelling conditions.
- C. Resilient modulus of the sub-grade is fairly constant throughout the year, unless some external factor affects the site. The value of resilient modulus (MR) can be determined by one of the methods shown below:

### **4.3.6. Design Parameters**

#### **1. Resilient modulus (MR)**

MR can be determined by any of the following methods,

- A. from relationships proposed by AASHTO,  
 $MR = 1000 + 555 \cdot R\text{-value}$  (for  $R\text{-value} < 20$ ) or  
 $MR = CBR \cdot 1500$  (for  $CBR \leq 10$ )
- B. from back-calculation of surface deflections measured using non-destructive devices such as dynaflect
- C. from laboratory test on representative sample using AASHTO T-274 procedure
- D. from Arizona Department of Transportation procedure using actual and correlated R-values.

However, some engineering judgment is required in choosing the most appropriate value of resilient modulus for the design.

## 2. Reliability

Arterials	Reliability=95%
Collectors	Reliability=90-95%
Local Streets	Reliability=80%

## 3. Overall Standard Deviation(s)

Arterials	s=0.4
Collectors and local streets	s=0.45

## 4. Serviceability

Initial serviceability	Po=5.0
Terminal serviceability	Pt=2.5
Change in serviceability index	PSI=2.5

## 5. Regional Factor

This factor is used to adjust the Structural Number for climatic and environmental conditions different from those of the AASHTO road test site. The Regional Factor to be used for Phoenix is 1.0.

## 6. Projected Traffic Loading

The Projected Traffic Loading is based on the cumulative expected 18 kip single axle load (ESAL) during the analysis period, which is usually 20-years. The information is obtained from the Traffic Operation Division of the Street Transportation Department.

### 4.3.7. Design Procedure

Design structural number (SN) is obtained from the AASHTO (Guide for Design of Pavement Structures) flexible pavement design equation or nomograph.

## 1. Structural Coefficients

Design structural number (SN) can be converted to thickness of various flexible pavement layers by using structural layer coefficients. In the absence of specific values, the following structural coefficients are recommended:

<u>Material</u>	<u>Structural Coefficient</u>
Asphaltic concrete	0.39
Aggregate base	0.12
Select material	0.11
Cement treated base	0.27
Bituminous Treated Base	0.31

## 2. Minimum Pavement Thickness

For the City's streets, the following are provided as minimum thicknesses for asphaltic concrete and base materials:

<u>Street Type</u>	<u>Minimum Thickness of Asphaltic Concrete</u>
Arterial Street	6-inch
Major Collector Street	4.5-inch
Residential Collector Street	3-inch
Local Street	2-inch

Base materials may not be required for full depth asphaltic concrete design. However, if base materials are required, then the minimum thickness will be:

<u>Base Material</u>	<u>Minimum Thickness</u>
Aggregate base	6-inch
Cement treated base	6-inch
Select material	6-inch

### 3. Asphaltic Concrete Mixes

The following mixes and oil contents are general guides for streets with High Traffic Volumes or Low Traffic Volumes and may vary for different projects:

#### Arterial Streets:

A-1 1/2" Base Course, Oil Content:	4.3 $\pm$ 0.4% (High Volume)
C- 3/4" Base and Surface Course, Oil Content:	5.0 $\pm$ 0.4% (High Volume)
D- 1/2" Surface Course, Oil Content:	5.1 $\pm$ 0.4% (High Volume)
D-1/2" Asphalt Rubber Concrete Surface, Binder:	8.0 $\pm$ 0.4% (High Volume)

#### Local Streets:

C- 3/4" Base and Surface Course, Oil Content:	5.5 $\pm$ 0.4% (Low Volume)
D- 1/2" Surface Course, Oil Content:	5.6 $\pm$ 0.4% (Low Volume)
D-1/2" Asphalt Rubber Concrete Surface, Binder	8.5 $\pm$ 0.4% (Low Volume)

## 4.4 Construction of Half-Streets

Half-streets along subdivision boundaries should not exceed one-fourth mile in length, and should have a minimum paving width of 24 feet if homes are fronting on the half-street, reducible to not less than 18 feet (two 9 foot traffic lanes) if "No Parking" signs are posted; such signs would not be required with the minimum width if houses side or back onto the half-street. Half-streets will not be permitted if serving as primary access to the development. The foregoing bases of acceptance assume that construction of the remaining half-street improvements would be "imminent" – within two years. As per City Of Phoenix Ordinance, Section 32-26.

### 4.4.1 Design of Cross-Section for Half-Streets

#### 1. Local and Collector Streets

Local half street construction is to be avoided as per City Ordinance, Section 32 – 26 (k). If a half street must be constructed, 24 feet of pavement should be provided for local and collector streets. In the event that right-of-way is not available and the developer is unable to obtain the additional right-of-way necessary to construct 24 feet of pavement, a minimum of 18 feet of paving for local streets or 20 feet for collector streets, shall be provided. Half street construction should provide adequate transitions and tapers to the adjoining roadways.

## 2. Arterial Streets

Arterial half street construction should provide a minimum of  $\frac{1}{2}$  of the approved cross-section of the street, as per the Street Classification Map. A minimum of 32 feet of paving is required at all arterial half street intersections, see 4.4.3 below.

### 4.4.2 Design of Half-Street to Join Existing Street Pavement

The half-street should be designed to match existing construction as much as possible unless doing so is likely to create an unsatisfactory condition. If changes are needed to correct conditions on an existing half-street in order to properly construct the other half of the street, the solutions must be developed with the Development Services Department and/or Street Transportation Department staff on a case-by-case basis. The plans for the new half-street must contain sufficient information on the profile and cross-sections of the existing street to demonstrate that the new construction will match the old construction, and result in a full street with a proper cross-section.

### 4.4.3 Design of Half-Street at Intersections

Collector and arterial half-streets must be flared at all arterial street intersections to provide one lane in each direction and a left-turn lane. The in-bound lane on a half-street, at an arterial or collector street intersections should be a minimum of 18 feet in width. The out-bound lane should be a minimum of 12 feet wide. Additional consideration must be given to the lane alignment if a street exists on the opposite side of the arterial street.

### 4.4.4 Culverts Under Half-Streets

A culvert provided in conjunction with half-street construction must extend beyond the edge of the traveled way a minimum of ten (10) feet into the area where the other half of the street will be constructed in the future. The 10-foot distance is measured perpendicular to the street alignment. The culvert capacity, flow line slope and alignment must be based upon the ultimate design requirements for the culvert if it were to be built under the full cross-section where it could be considerably longer.

## **4.5 Pavement Transitions**

When development causes the widening of a portion of the pavement of an existing road, pavement transitions are required at each end of the widened portion. Design of the various features of the transition between pavements of different widths should be consistent with the design standards of the superior facility. The transitions should be made on a tangent section whenever possible. Locations with horizontal and vertical sight distance restrictions should be avoided. Whenever feasible, the entire transition should be visible to the driver of a vehicle approaching the narrower section. Intersections at grade within the transition area should be avoided.

### **4.5.1 Transition to a Wider Pavement Section**

If right-of-way is available, a transition from a narrower cross-section to a wider cross-section should have a length that is five (5) times the street design speed in miles per hour. Additional taper length may be required based on the location of cross streets and driveways downstream from the new improvements.

### **4.5.2 Transition to a Narrower Pavement Section**

A transition from a wider cross-section to a narrower cross-section should have a length equal to the difference of the two (2) widths in feet, times the street design speed in miles per hour or 50 to 1, whichever is greater.

## **4.6 Scenic Easements**

Certain arterial roadways in the City Of Phoenix fall under a dedication to the Scenic Corridor. Consult the City Of Phoenix Streets Classification Map to find exact locations of dedication, this can be found at:

<http://phoenix.gov/PLANNING/gpmaps.html>

or call (602) 262-6364.

## **4.7 Street Segments over ½ mile in length**

When a development is going to construct over a ½ mile of arterial street, the developer must fill out a MAG Transportation Improvement Program (TIP) form, see **Section 12.1.1**. Additionally, the developer should contact the Street Transportation Department to coordinate the project with any City projects that may be under design for the same area.



## **CHAPTER 5 - STREETLIGHTING**

This guideline has been prepared to inform and assist private Developers in their responsibility of their submittal for requirements on new development. Installation of streetlights is required as part of required off-site improvements by Development Services Department. Developers should also be aware of the Street Light Policy, adopted by the City Council, which sets the broad policy framework and guidance for street lighting in the city. All developers of residential, commercial, and industrial properties are responsible for the design, materials and installation of streetlights and their associated cost on all public streets adjacent and within their projects. The method of installation will vary according to the electric utility service area where the project is located.

### **5.1 STREETLIGHTING POLICY**

The City of Phoenix has a Streetlighting Policy originally adopted by City Council July 1961 with subsequent amendments. The most recent amendment was June 18, 1996. The following is the Streetlighting Policy:

#### **5.1.1 General**

Arterial and collector streets open to traffic in the City of Phoenix are to be lighted when practical. Exceptions to the general concepts of arterial and collector streetlighting are stated in this Policy.

In developed areas of Phoenix, intersection streetlighting will generally be provided. In new subdivisions all streetlighting shall be installed concurrently with other off-site improvements.

Low density residential subdivisions of two or less units per acre may request reduced level of streetlighting on local and collector streets, as provided in this Policy under the section Low Density Residential Areas.

Streetlights, traffic signals and power distribution lines should be mounted on the same pole where practical.

In new construction, streetlight poles should be located in back of the sidewalk or four (4) feet behind the curb if the sidewalk is located away from the curb.

Underground streetlight circuits: responsibility for underground streetlight circuits is fixed in relation to the following conditions:

In existing subdivisions where all utilities are presently placed underground, the City of Phoenix will install streetlight circuits underground when streetlights are installed.

In new subdivisions under development within the City of Phoenix where all utilities are required to be underground, underground streetlight circuits are to be provided by the developer.

In existing subdivisions where utilities exist overhead, and the property owners initiate the placing of the overhead utilities underground, the property owners would be responsible for placing the streetlight circuits within that subdivision underground.

Along arterial streets, underground streetlight circuits should be installed when it is economically feasible and/or when all other overhead utility lines are installed underground. If utility poles exist but cannot be used for new lighting, and the majority of subdivisions adjacent to the arterial street segment have underground utilities, new streetlight circuits should be placed underground.

Streetlighting designs, including the location of poles are to be approved by the Street Transportation Director.

In all new developments or subdivisions, the developer shall be responsible for the installation of new streetlights at no cost to the City. Streetlight design and pole locations are to be reviewed and approved by the City Street Transportation Department. Streetlights shall normally be installed by the developer concurrently with other required off-site improvements. After the installation of streetlights have been inspected and approved by the City, the City will pay for all operating costs.

Ornamental type streetlights may be installed with the approval of the Street Transportation Director.

In new subdivisions or developments, the developer electing ornamental lights shall provide the streetlight system at no cost to the City. After the installation has been inspected and approved by the City, the City will pay the monthly streetlight maintenance and energy charge equivalent to the charges for typical streetlighting. Costs for maintenance and energy over the above and standard will be paid by the developer or residents.

In established subdivisions, ornamental type streetlights may be installed at the property owners' expense. After the installation has been inspected and approved by the City, the City will pay the monthly streetlight maintenance and energy charge equivalent to the charges for typical streetlighting. Costs for maintenance and energy over and above the typical streetlight will be paid by the property owners.

### **5.1.2 Freeways**

The City of Phoenix is responsible for lighting arterial streets going over or under a freeway if this lighting has been approved by the City of Phoenix and the Arizona Department of Transportation. The City of Phoenix shall pay the monthly energy costs for these lights. The City is not responsible for lighting the structures, such as soffit lighting.

The City of Phoenix may install streetlights at freeway frontage road intersections with local and collector streets. Streetlighting, streetlight maintenance, and energy costs at signalized freeway intersections will be the responsibility of the entity which retains maintenance responsibilities for the traffic signal at that location.

### **5.1.3 Arterial Streets**

Continuous streetlighting should be installed on one side of streets where traffic volumes, nighttime collisions and crime statistics show that this lighting may be helpful. Average spacing of streetlights should be about 200 to 250 feet. However, spacing may deviate from the average if power poles exist and are used for streetlighting.

On seven or more lane streets (including left-turns lanes), or streets of this width having raised landscaped medians, streetlighting may be installed on both sides of the street using approximately 200 to 250-foot spacing and staggering the lights where appropriate. Single-pole dual mast-type lighting may be installed in the median island as an alternate.

All separate streetlight installations will be on metal poles except on unimproved arterial streets, or where otherwise approved by the Street Transportation Director.

### **5.1.4 Collector Streets**

Where there is justification because of neighborhood security, traffic volume, or nighttime accidents, which show that continuous lighting may be helpful, and funds are available. One side continuous lighting with approximate spacing of 200 feet may be provided. (Also see Section 5.2.6 Low Density Residential Areas.)

### **5.1.5 Local Streets**

Mid-block lighting is encouraged along streets bordering schools, parks, large community centers, churches, and housing projects where an engineering study demonstrates the need, as approved by the Street Transportation Director.

Residential mid-block lighting may be installed in existing subdivisions by the City of Phoenix, if funds are available, upon the petition of a majority of property owners within a distance of approximately 100 feet on each side of the proposed light.

In new subdivisions and developments, developers are responsible for providing all streetlights which are installed concurrently with other off-site improvements. Industrial and commercial zoned developments will have mid-block streetlights spaced at an approximate distance of 250 feet.

New subdivisions with four (4) lots per acre or more (zoning classifications R2, R3, R3A, R4, R5, R1-6, and R1-8) will have mid-block streetlights spaced at an approximate distance of 250 feet.

New subdivisions with less than four (4) lots per acre (zoning classifications R1-10, R1-14, R1-18, RE-24, RE-35, RE-43, S-1, and S-2) will have mid-block streetlights spaced at an approximate distance of 450 feet. If desired, developers and/or property owners in these zoning classifications may install additional streetlights with the approval of the Street Transportation Director, at no cost to the City. After the installation has been approved and inspected by the City, the City will pay monthly streetlight energy and maintenance costs.

The typical residential mid-block lighting spacing policy of 250 feet is illustrated in Figure 5.1.

In areas where there are crime, security and/or traffic concerns, streetlights may be spaced at less than 250 feet or existing streetlights may be upgraded to a higher intensity than the typical residential streetlight, as determined by the Street Transportation Director. (Also see Section 5.1.6 Low Density Residential Areas.)

## **5.2 Low Density Residential Areas**

A reduced level of streetlighting may be installed on collector and local streets in residential areas of two or less residences per acre as approved in the City of Phoenix General Plan.

### **5.2.1 Collector Streets**

A single streetlight will be installed at all collector/collector and collector/local street intersections. No mid-block streetlights will be installed. Where commercial zoning is vested, one-side continuous streetlighting will be provided along the commercial frontage. The streetlights will be 16,000 lumen ornamental fixtures (“shoe box”) mounted at 26 feet.

### **5.2.2 Local Streets**

A single streetlight will be installed at local/local intersections only. No mid-block streetlights will be installed. The streetlights will be 9,500 lumen ornamental fixtures (“shoe box”) mounted at 20 feet.

### **5.2.3 New Development**

A developer desiring a reduced level of streetlighting for a proposed low density residential development must file a letter of request through the Development Services Department at time of subdivision review.

Streetlights shall be installed at developer expense at the time off-site improvements are installed. Conduits and junction boxes shall also be installed at developer expense for any future additional non-intersection streetlights.

As a condition of development, the developer is required to state in all advertising material that a “reduced level of streetlighting” will be provided in the development, and a Streetlighting Disclosure Letter stating same shall be given to each buyer. A note on the recorded subdivision plat is required stating that the subdivision has reduced streetlighting. The note shall state:

*This subdivision has a reduced level of streetlighting. Any future additional streetlighting will be at the expense of the abutting property owners, not at City expense.*

Under covenants or deed restrictions of the development, a statement shall be required that a “reduced level of streetlighting” is in effect in the development and that intersection-only streetlighting is provided. This statement is included to inform succeeding buyers of residences of the reduced levels of streetlighting.

#### **5.2.4 Annexed Areas**

Developed residential areas meeting the low-density criterion, which are annexed to the City of Phoenix, will have streetlights installed by the City at all intersections in accordance with this section of the Policy upon annexation. Residents in an annexed residential development may petition the City to delete future, residential, non-intersection streetlighting if 70 percent of the residents agree. A letter requesting the exception and the petition must be filed with the Street Transportation Department within 90 days of annexation.

#### **5.2.5 Mid-block Streetlighting**

Both annexed and new residential developments meeting the low-density criterion of this section of the Policy, and having streetlighting installed under this section of the Policy, may petition for mid-block lighting upon 70 percent agreement of the residents. The City of Phoenix has no responsibility for any construction costs. All costs to install underground circuits and streetlights shall be at the expense of the residents of the development. The City will assume maintenance of mid-block streetlights once installed to City standards.

#### **5.2.6 Additional Streetlighting**

From time to time, it may become necessary to install lighting in low-density areas in addition to that expressly provided for in this section. Such additional lighting shall be installed when, in the judgement of the Street Transportation Director, such additional streetlighting is necessary for the safety of vehicular and pedestrian traffic or for the general public.

### **5.2.7 Residential & Commercial Development Projects**

Developers of residential subdivisions, apartments, condominiums, commercial, industrial projects and all permittees are responsible for the design, materials, and installation costs of all streetlighting on public streets within and adjacent to their projects. The unique status of 'shared ownership' of the streetlight system requires a unique approach to streetlight design. The City of Phoenix owns the poles and fixtures and the utility companies own the electrical service. The streetlight Design Guidelines have been created to aid developers and their design professionals to create a layout that will meet City of Phoenix streetlight guidelines and provide the utility company a standard design format from which to start their streetlight electrical service design. The submittal process for streetlight layout review is explained step by step with a graphic representation to simplify this process. Computer Aided Drafting (CAD) details and notes are provided to ensure a consistent and up to date design. Specifications and an approved materials list will assist the contractor in constructing a system that meets City of Phoenix requirements. The intent of this manual is to help the developer understand City of Phoenix streetlight layout procedure and installation requirements allowing for a straightforward design and construction process.

## **5.3 ARTERIAL STREETS**

- 5.3.1** Spacing will be approximately 200 to 250 feet using 30,000 lumen High Pressure Sodium lighting. Arterial streets will be lighted on two sides using staggered spacing. Ideal spacing is 200 to 250 feet along the same side of the street; 100 to 150 feet between opposite sides of the street. In an effort to achieve reasonable uniformity, deviations away from the point of radius are permitted up to 25 feet. Any further deviation must be approved by Street Transportation Department, Streetlight Section.
- 5.3.2** Once the right-of-way permit is issued, adherence to pole locations is expected. Exceptions are hereby granted for shifts up to 10± feet parallel to the roadway with approval of Development Services Department (DSD) Inspector. Where underground obstructions are encountered, any shift in pole placement must not interfere with a driveway. Shifts perpendicular to the roadway from permit locations will not be allowed without permission of the Street Transportation Department, Streetlight Section.
- 5.3.3** All poles are to be located approximately 1-foot back of sidewalk where the sidewalk abuts the curb. Where the sidewalk is detached to create a landscaped area, poles are to be located approximately 4-feet back of the curb. The goal is to keep obstructions including streetlights out of the sidewalk.

Deviations must be approved by Street Transportation Department, Streetlight Section. Contact the Street Transportation Department, Streetlight Section, for any developments in Downtown Phoenix.

## **5.4 COLLECTOR STREETS**

5.3.1 Spacing on collector streets will be approximately 200 feet and require one-sided lighting using 16,000 lumen High Pressure Sodium streetlights. Lighting on both sides of the street may be utilized when there are four (4) or more through lanes of traffic or when there is a raised, landscaped median. Streetlights are to be set back approximately 4-feet back of curb or approximately 1-foot back of sidewalk where the sidewalk abuts the curb.

## **5.5 LOCAL STREETS**

5.5.1 Poles are to be placed at least 3-feet from back of curb to face of pole. Where sidewalks abut the curb, the pole should be placed approximately 1-foot back of sidewalk.

5.5.2 Streetlight poles should be placed within approximately one-foot laterally from the divisional property line. Residential mid-block streetlight spacing should be approximately 250 feet using 9500 lumen High Pressure Sodium Streetlights, as per the City Council Approved Streetlighting Policy amended July 18, 1996.

## **5.6 LOW DENSITY RESIDENTIAL LIGHTING**

5.6.1 Low Density Residential Lighting (residential areas of two or less residences per acre) may qualify for a reduced level of lighting per City of Phoenix Policy adopted July 18, 1996. Requests must be submitted to the City of Phoenix Development Services Department, Team Leader.

## **5.7 DEVELOPER RESPONSIBILITY:**

5.7.1 Developers of residential subdivisions, apartments, condominiums, commercial, industrial projects, and all permittees are responsible for the design, materials, and installation costs of all streetlighting on public streets within and adjacent to their project.

5.7.1.1 Streetlighting plans expiration parallels Civil plans expiration and requires re-submittal if Civil plans are updated.

5.7.1.2 **Salt River Project (SRP) – Specific Requirements**  
(Applicable only in SRP service areas) ([www.srpnet.com](http://www.srpnet.com))

**5.7.1.3** All costs for streetlight installation including construction and energization are to be addressed in 8 streetlight construction contract between developer and SRP.

**5.7.1.4 Arizona Public Service (APS) – Specific Requirements**  
**(Applicable only in APS service areas) ([www.aps.com](http://www.aps.com))**

**5.7.1.4.1** All costs for streetlight installation including construction and energization are to be addressed in streetlight construction contract between developer and APS.

## **5.8 DESIGN GUIDELINES**

**5.8.1** Streetlight layout and design shall include existing and known future streetlight location information for all streets adjacent to and across from the proposed development.

**5.8.2** Streetlights must be shown on all roadway right-of-way adjacent to private developments. The developer shall pay all City inspection permit fees. Design conflicts shall be resolved by the developer to the satisfaction of the electrical utility company and City of Phoenix. It shall be the developer's responsibility to coordinate conflict resolution with electric utility company facilities, including vertical clearances without compromise to the uniformity in the lighting design.

**5.8.3** Future streetlight locations may be identified by researching adjacent developments through the City's KIVA System. Efforts shall be made during the design stage to assure that two (2) streetlights are located at each arterial street intersection and one streetlight at all other intersections. (When neighborhood traffic calming devices are installed additional lights may be required, see detailed drawings).

Label specific locations, sizes, and dimension from the center line and/or monument line along with the following:

- a. Existing and proposed underground utilities
- b. Existing and proposed overhead utilities
- c. Face of curb
- d. Width of sidewalk
- e. Width of any Public Utility Easement (PUE)
- f. Edge of right-of-way
- g. Edge of pavement



**5.8.4** There should be a minimum six (6) feet of clearance between streetlight poles, fire hydrants, and City water services facilities. Three (3) feet clearance required for service taps (water/sewer) and two (2) feet clearance required from storm drains and city sewer facilities.

**5.8.5** The public streetlight system shall be installed in the right-of-way. Where right of way is not available and where an easement allows for streetlight equipment, the engineer may design equipment within the easement with approval from the City of Phoenix Streetlighting section.

**5.8.6** Any public street cul-de-sac having a depth of one hundred fifty (150) feet or greater from face of nearest curb of intersecting street to cul-de-sac radius point will have a streetlight or lights located in the cul-de-sac.

**5.8.7** Public streetlighting plans will show luminaire and pole type.

**5.8.8** The streetlight design shall be submitted on E size sheets (24 inches by 36 inches). Plans shall be prepared so that north is to the top or right side of the sheet. The scale for the streetlight plan shall be 1- inch equals 20 feet or 1-inch equals 40 feet.

**5.8.9 Design line characterists are as follows:**

- a. Solid medium for proposed streetim provments.
- b. Light and/or dashed for existing street improvements.
- c. Bold for streetlight system design.

**5.8.9.1** On local and/or proposed driveways and Americans With Disability Act (ADA) ramps shall be shown on the streetlight plans.

**5.8.9.2** In areas where standard vertical curb, roll curb or sidewalk do not exist, all poles shall be centered at least ten (10) feet from edge of asphalt pavement.

**5.8.9.3 Information needed on each set of plans:**

- a. Vicinity Map
- b. Legend
- c. Construction Notes
- d. Streetlight Notes
- e. General Notes as Required

- f. Project Number/KivaNumber, SDEVNumber, CSPR Number, Project Title and Address, if applicable
- g. Blue Stake Caution Label
- h. Quantities List
- i. City Project Number, if applicable
- j. Utility provider

## **5.9 SUPPLEMENTAL DEVELOPMENT GUIDELINES**

### **5.9.1 SPACING SUMMARY**

- 5.9.1.1** Streetlight spacing for new development should be in accordance with Table 1 which summarizes City of Phoenix Streetlight Policy adopted by City of Phoenix City Council July 18, 1996.

**Table 1: Spacing and Mounting Height Criteria**

Classification Arterial (7lanes or more / median island wider than 64')	Utility Company  SRP	Watts 250W	Lumens 30,000	Mounting Height  35'	*Standard Spacing 200-250'	*Spacing Type Double- Sided Staggered
Arterial (Narrower than 64')	SRP	250W	30,000	35'	200-250'	Single Sided
Collector (Median island or wider than 64')	SRP	150W	16,000	32'	200-250'	Double- Sided Staggered
Collector (Narrower than 64')	SRP	150W	16,000	32'	200'	Single Sided
Local	SRP	100W	9,500	26'	250'	Single Sided
Arterial (7lanes or more / median island wider than 64')	APS	250W	30,000	34'-3"	200-250'	Double- Sided Staggered
Arterial (Narrower than 64')	APS	250W	30,000	34'-3"	200-250'	Single Sided
Collector (Median island or wider than 64')	APS	150W	16,000	32'-11"	200-250'	Double- Sided Staggered
Collector	APS	150W	16,000	32'-11"	200'	Single Sided
Local (Narrower than 64')	APS	100W	9,500	25'-11"	250'	Single Sided

**\* Existing power poles, safety considerations and traffic volumes may impact spacing and single/double sided streetlight installation**

**requirements and will be determined by Street Transportation Department. Double sided spacing shown above is the distance between poles on the same side.**

- 5.9.1.2** In order to achieve reasonable uniformity, deviations in this spacing may be permitted up to 25 feet. Any further deviation must be approved by Street Transportation Department, Streetlight Section
- 5.9.1.3** Private streetlights should be labeled as such. Streetlighting on private streets is approved by Planning Department and Development Services Department per their requirements at review.
- 5.9.1.4** Streetlight poles should be set approximately 4 feet back of curb. Where the sidewalk abuts the back of curb, poles should be located approximately 1 foot back of sidewalk. In cases where the streetlights facilities are in conflict with underground or overhead utilities streetlights may be set a minimum of two feet back of curb. However any setback deviation must be approved by Street transportation department, Streetlighting section.
- 5.9.1.5** Contact the Street Transportation Department, Streetlight Section, for developments in Downtown Phoenix.
- 5.9.1.6** All streetlight poles and equipment should be shown with station and offset dimension.
- 5.9.1.7** Streetlight equipment shall conform to approved manufacturers per current utility company standards.
- 5.9.1.8** When proposed streetlighting is in near vicinity of an airport runway, the developer shall provide all necessary pole height clearance calculations for review by COP Streetlighting.
- 5.9.1.9** Provide additional details of any items not covered by COP standard details.
- 5.9.1.10** Streetlight general notes as provided by COP. See General notes.
- 5.9.1.11** Construction plan sheet format to follow COP standards. CAD details and standards will be provided by COP Streetlight Department. The standard sheet format is shown in Figure 1.
- 5.9.1.12** All items as described on streetlight design checklist.

CITY OF PHOENIX STREET LIGHTING  
PROJECT NAME

## STREET LIGHTING GENERAL NOTES




THE FOLLOWING INFORMATION IS PROVIDED TO EMPOWER CRITICAL WORK AND IS INTENDED TO SUPPLEMENT THE SPECIFICATIONS.

- [illegible]

### STREETLIGHT NOTES

- [illegible]

**LEGEND**

-  HPS OVERHEAD LUMINAIRE STREET LIGHT POLE  
 (SEE NOTE FOR DESCRIPTION)  
 EXISTING STREET LIGHT MOUNTED ON POWER POLE  
 EXISTING STREET LIGHT POLE

[illegible]

**SHEET INDEX**

- |              |      |
|--------------|------|
| COVER SHEET  | SL-1 |
| SITE PLAN    | SL-2 |
| DETAIL, SHED | SL-3 |



**CALL FOR MORE INFO**  
**(602) 263-1100**  
Open House 10/25/07  
Call 602-263-1100

DATE: _____	STREET LIGHTING	CITY OF PHOENIX, ARIZONA STREET ILLUMINATION DEPT.
PROJECT NO. _____	PROJECT NAME _____	
DATE: _____	LOCATION _____	
PROJECT NO. _____	COVER SHEET _____	
DATE: _____	FILE NO. _____	

PROJECT NAME

FIGURE 1, SHEET 1

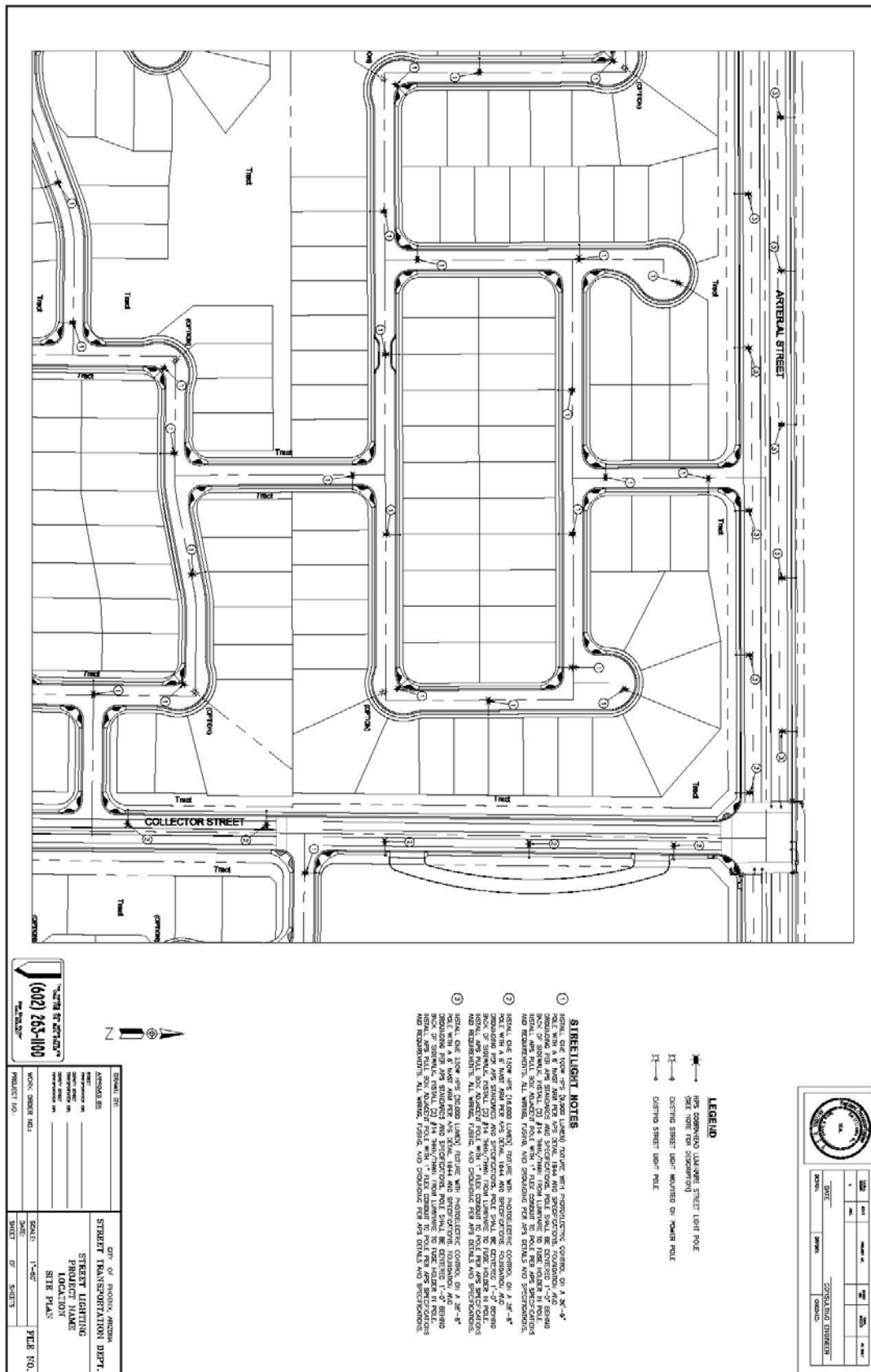
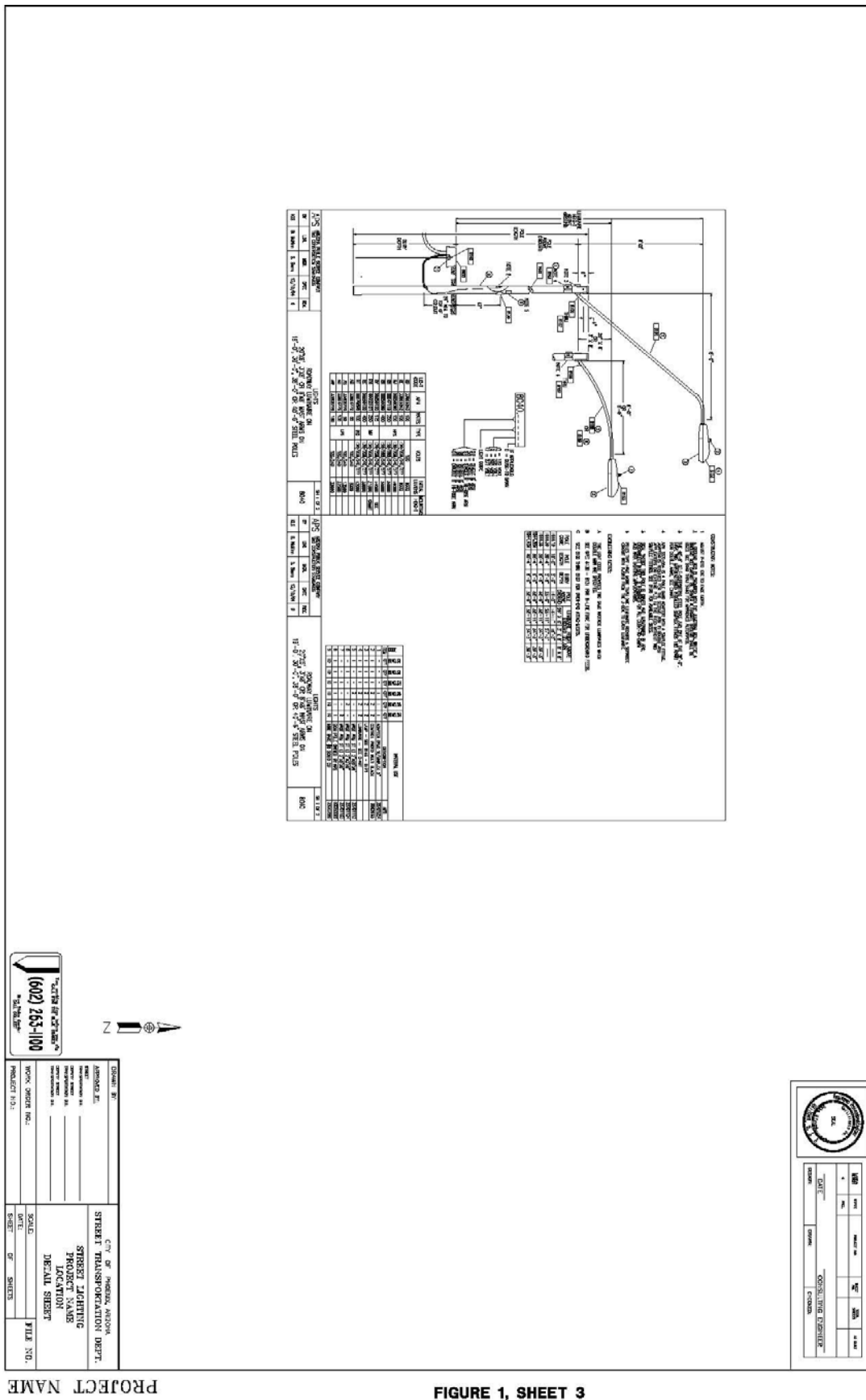
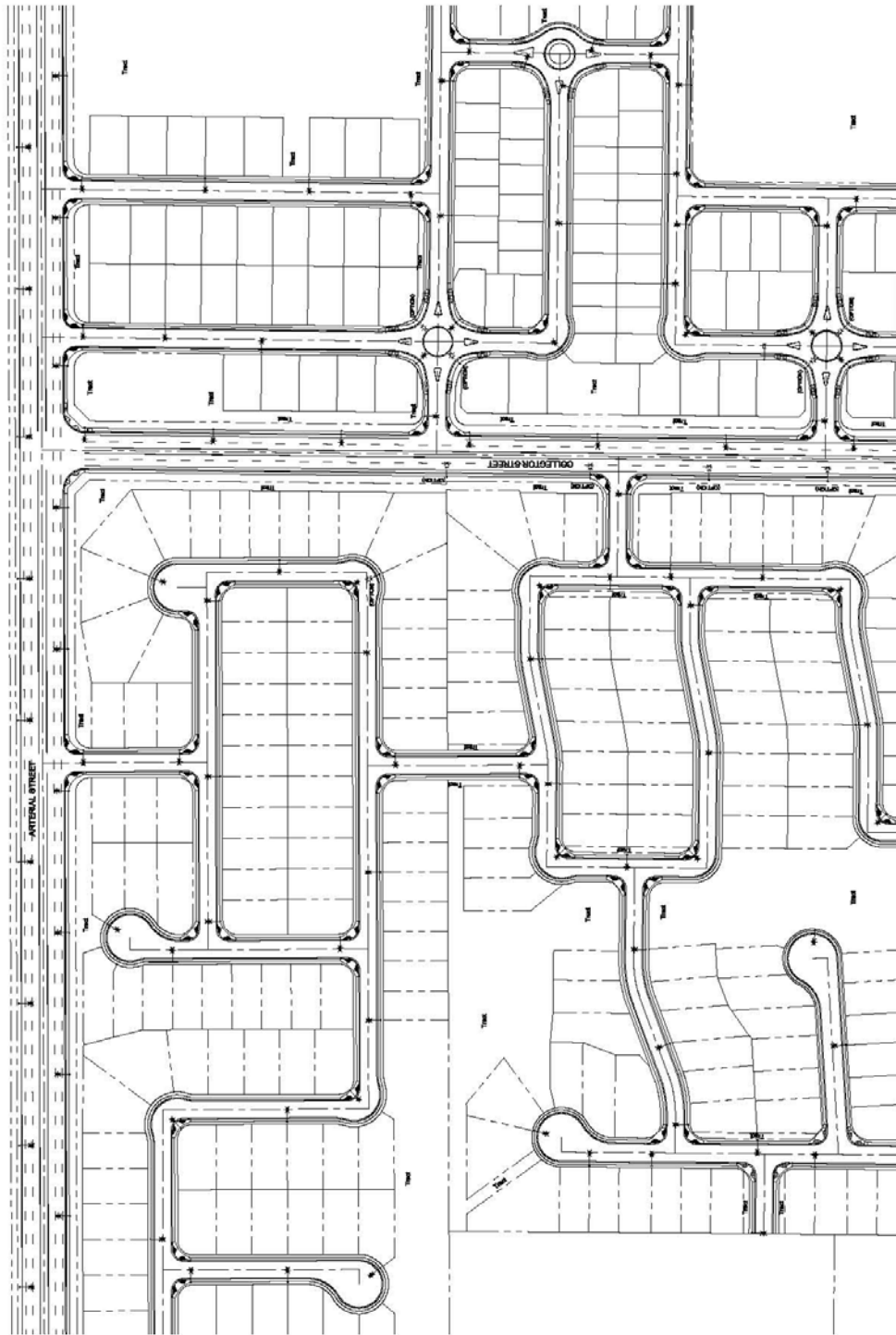


FIGURE 1, SHEET 2



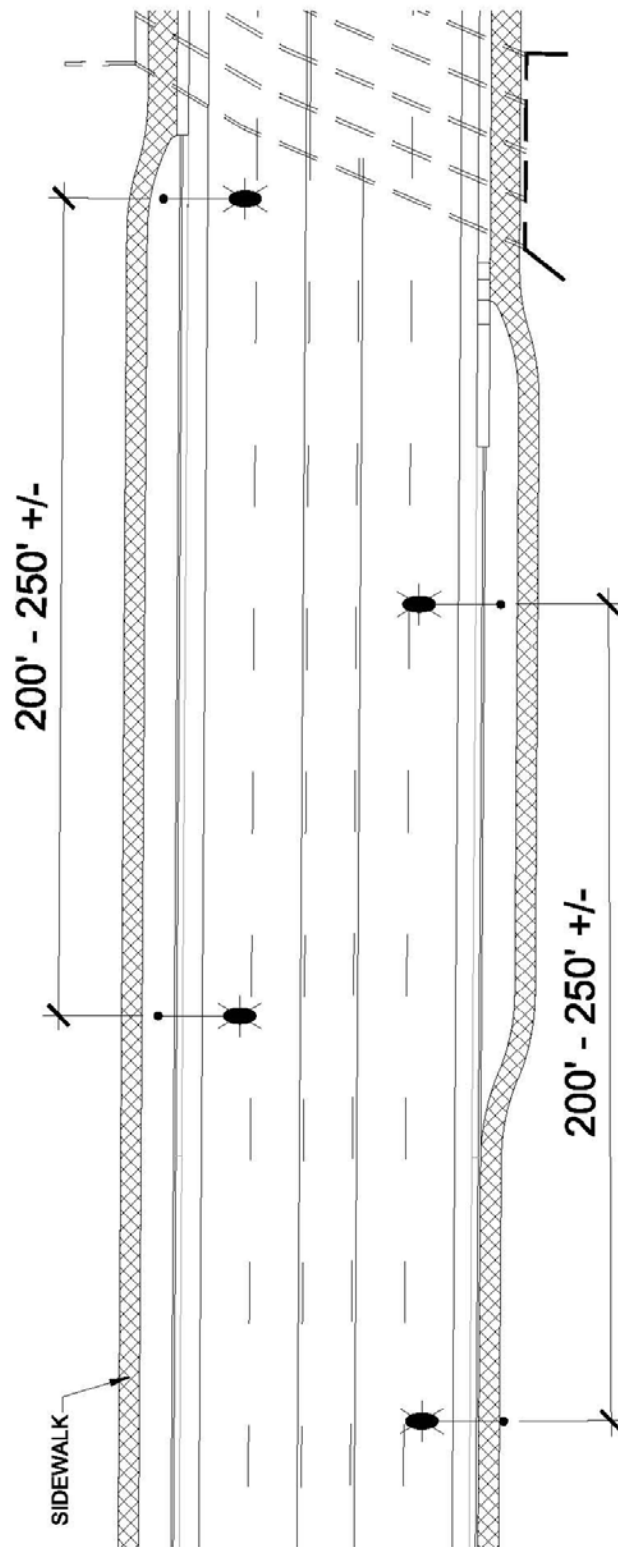


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**STREETLIGHT DESIGN GUIDELINES**  
**FIGURE 4: TYPICAL RESIDENTIAL STREET SPACING**

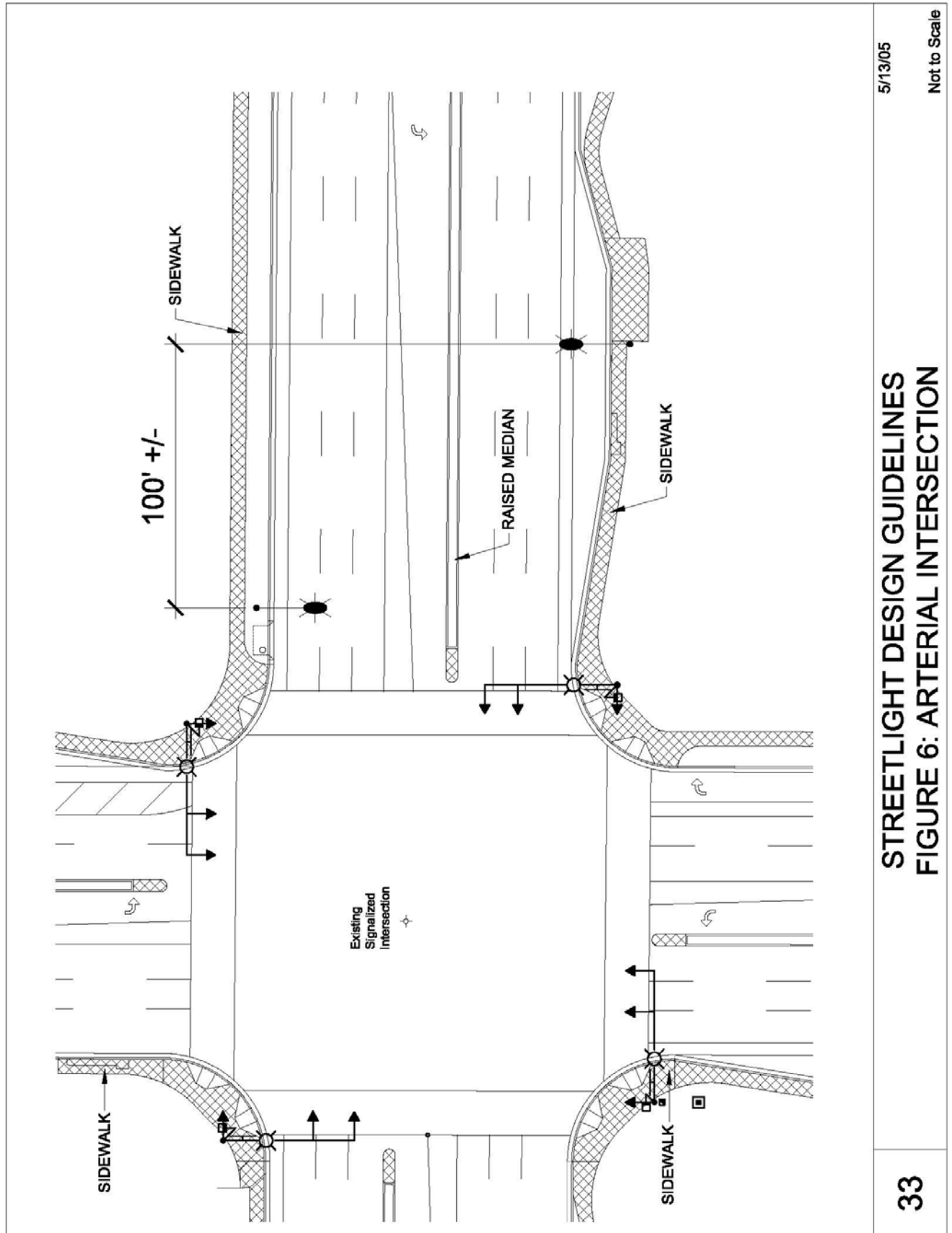


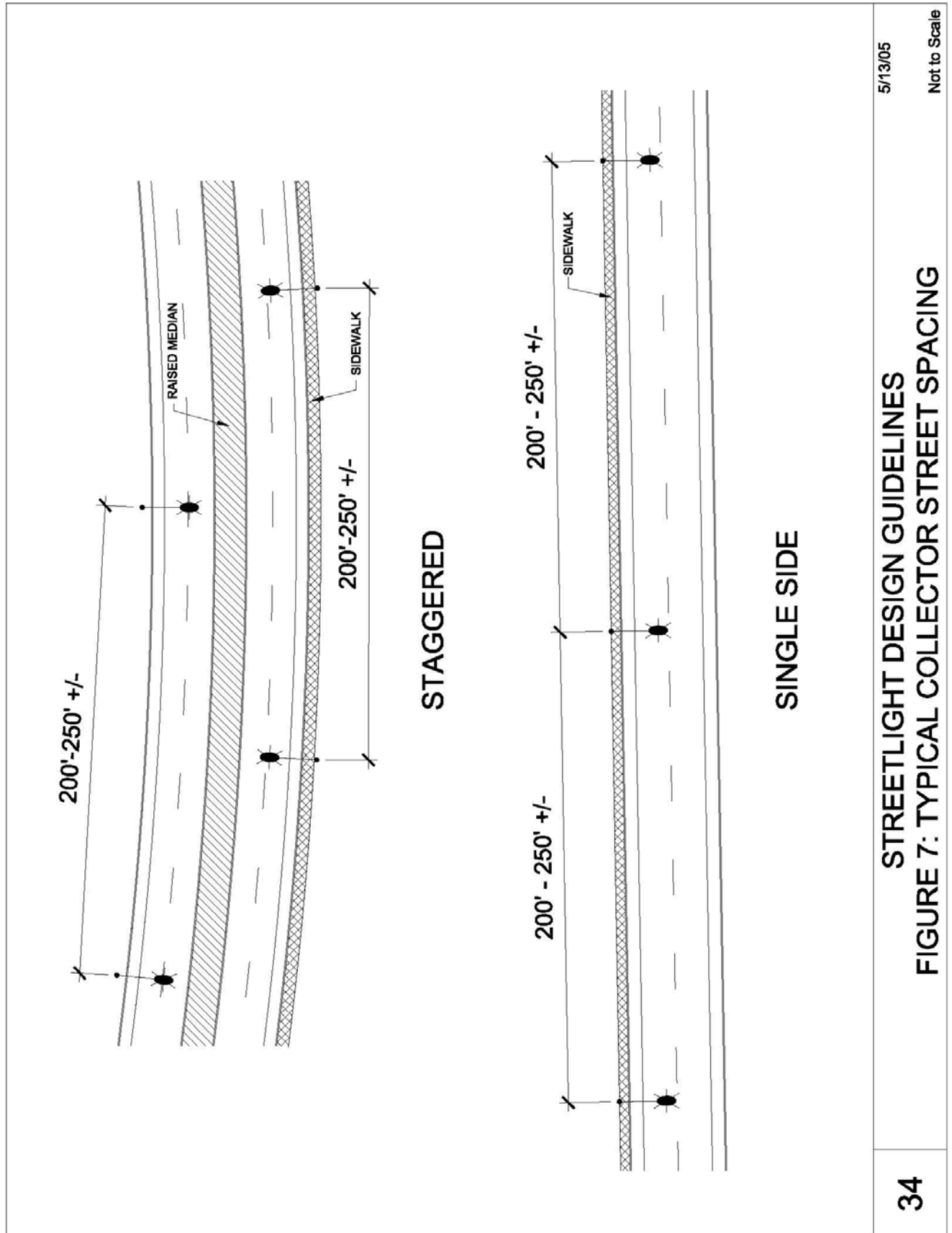


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**STREETLIGHT DESIGN GUIDELINES**  
**FIGURE 5: ARTERIAL STREET STAGGERED - NO MEDIAN ISLAND**

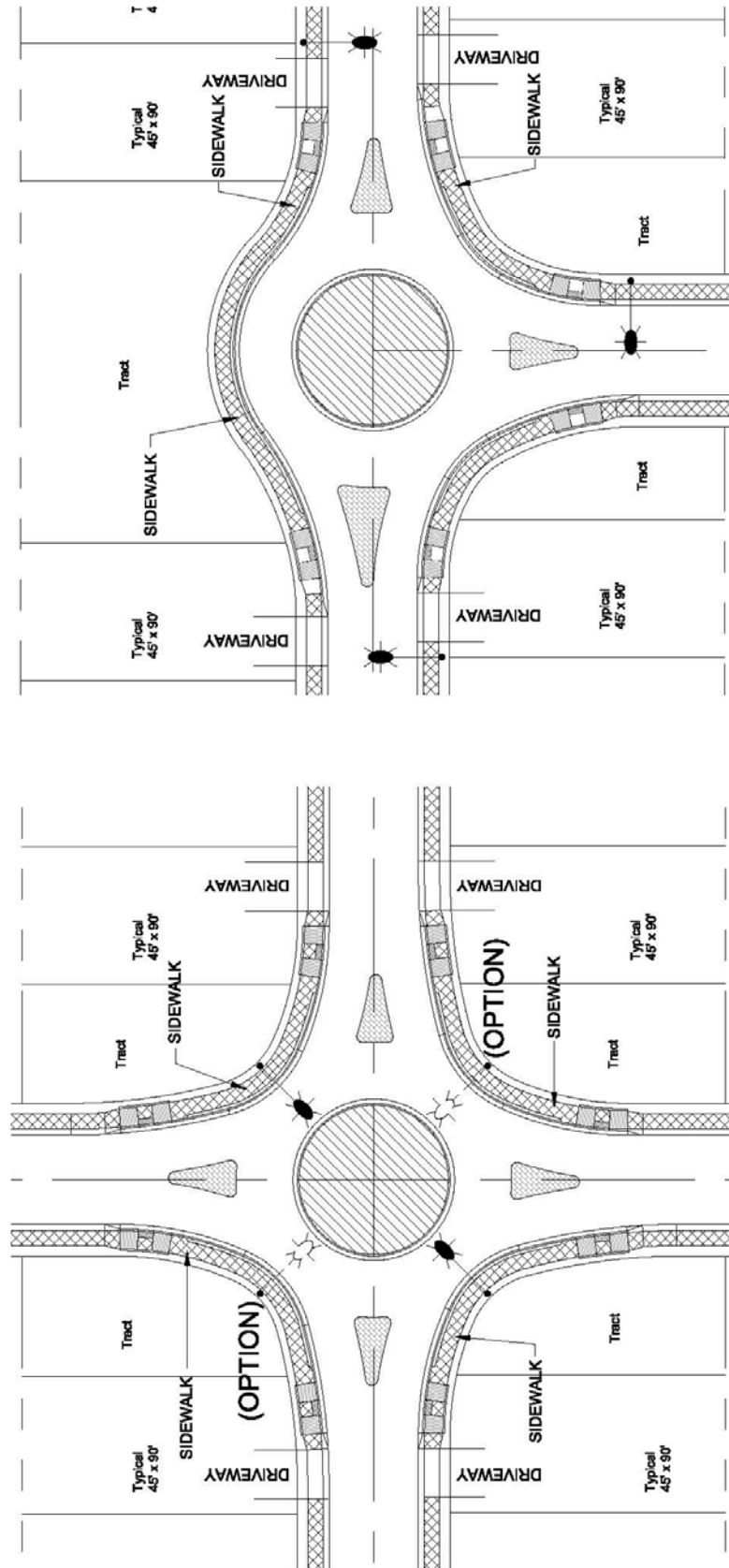




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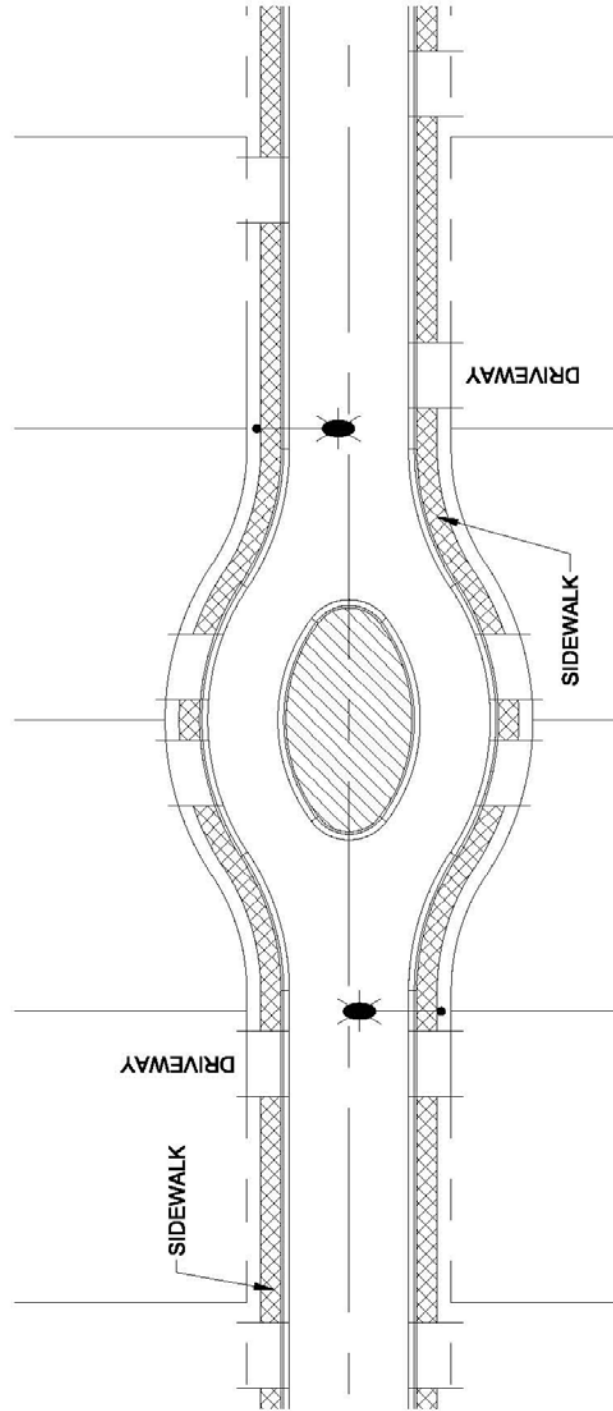
STREETLIGHT DESIGN GUIDELINES  
FIGURE 7: TYPICAL COLLECTOR STREET SPACING



**STREETLIGHT DESIGN GUIDELINES**  
**FIGURE 8: LOCAL/LOCAL ROUNDABOUT**

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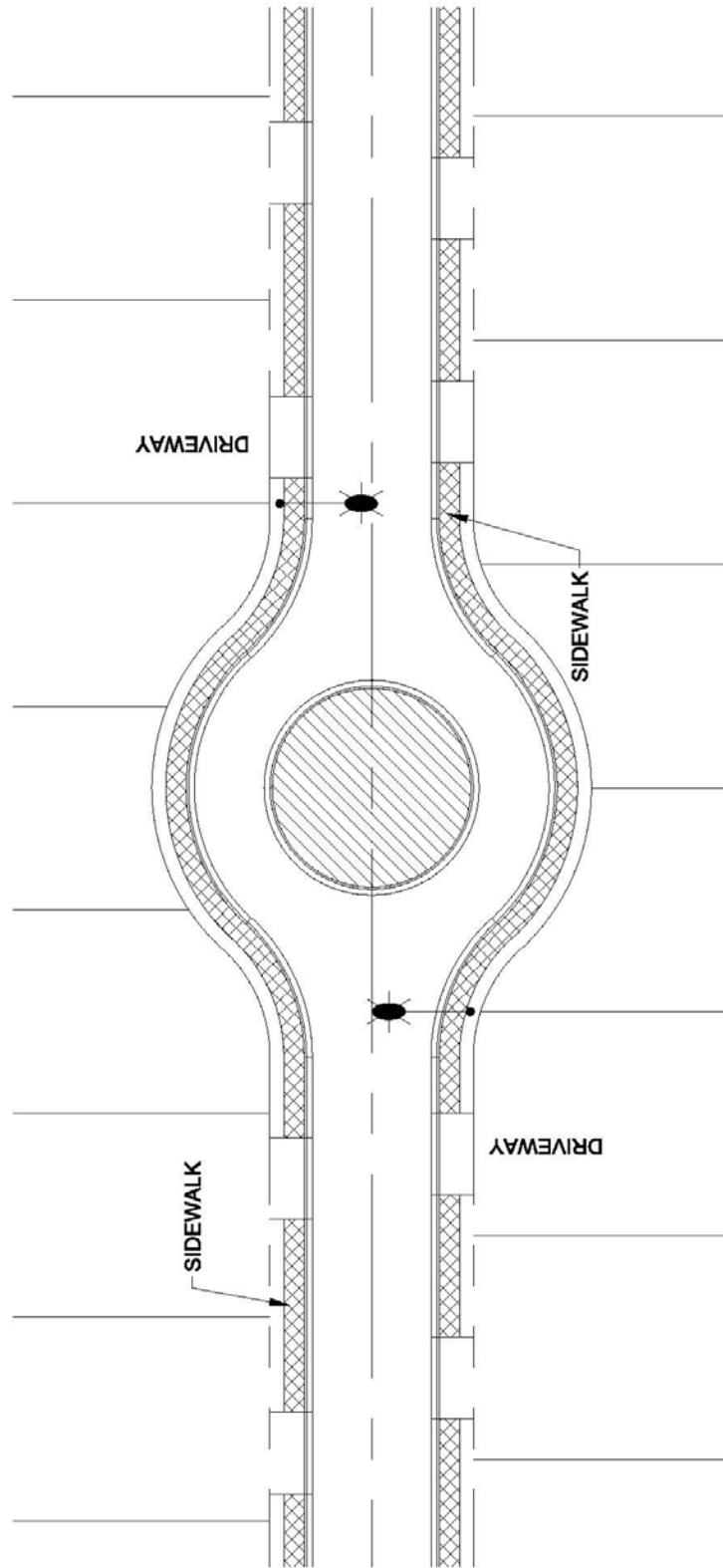
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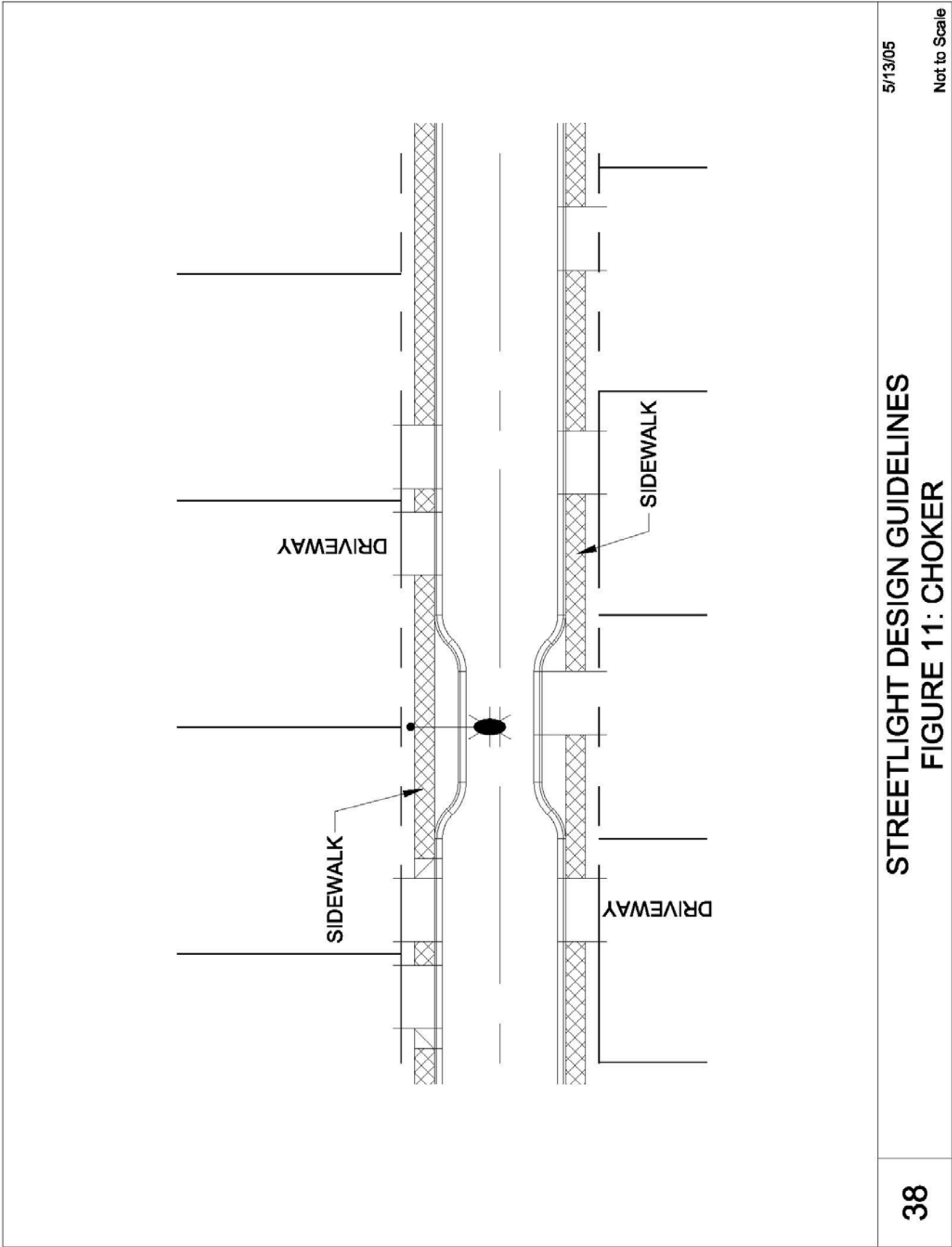
**STREETLIGHT DESIGN GUIDELINES**  
**FIGURE 9: FOOTBALL ISLAND**

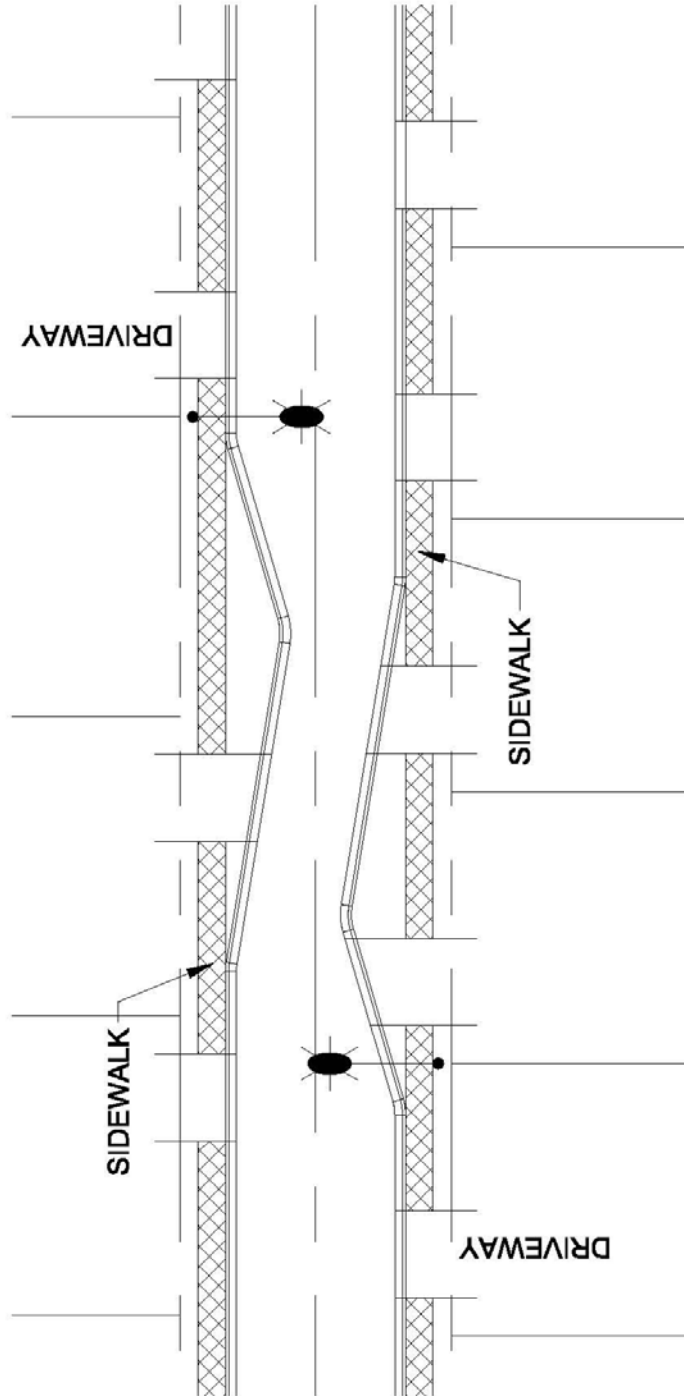


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**STREETLIGHT DESIGN GUIDELINES**  
**FIGURE 10: BASEBALL ISLAND**



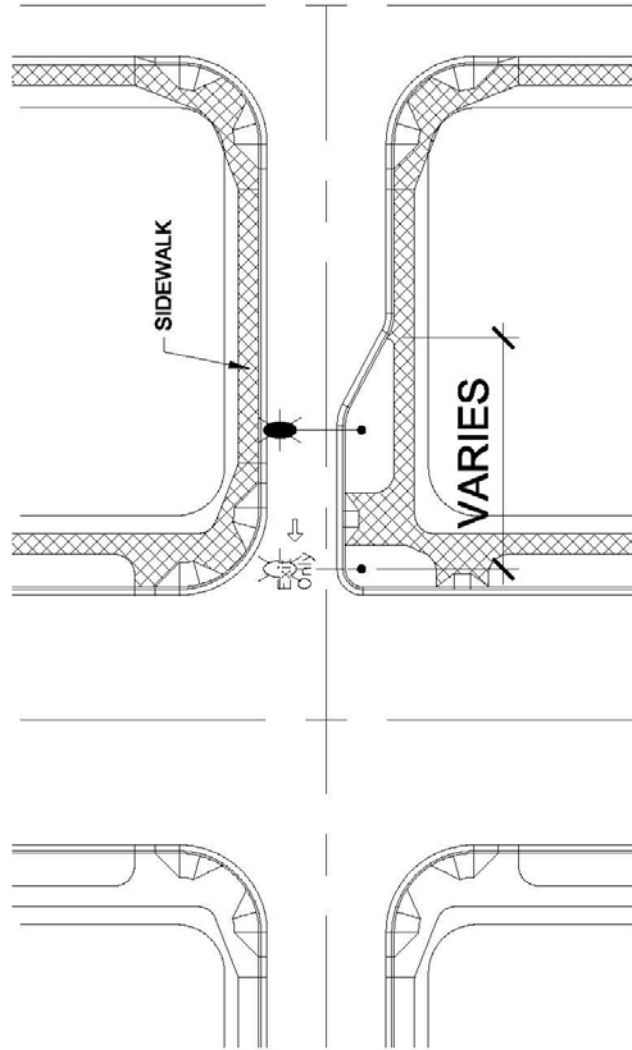


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**STREETLIGHT DESIGN GUIDELINES**  
**FIGURE 12: CHICANE**

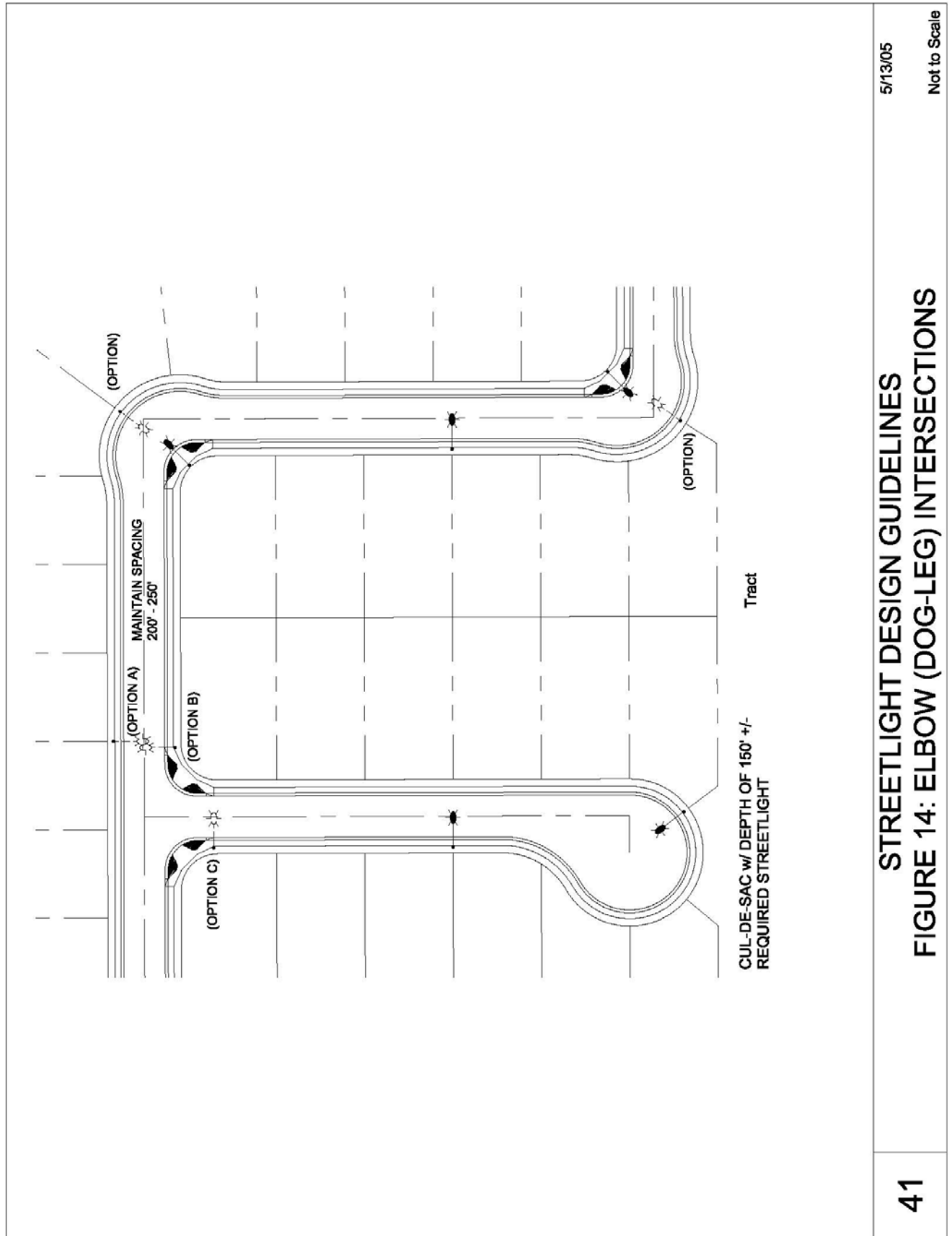




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**STREETLIGHT DESIGN GUIDELINES**  
**FIGURE 13: SEMI-DIVERTER**



## **CHAPTER 6.0 - TRAFFIC SIGNALS, SIGNS, AND STRIPING**

All traffic signal plans and striping and signing plans must satisfy current City of Phoenix, Street transportation Department guidelines and the Manual on Uniform Traffic Control Devices (MUTCD).

### **6.1 Traffic Signals**

The City of Phoenix anticipates the possibility of traffic signals at all arterial - arterial intersections and at half mile collector - arterial intersections. All proposed traffic signal locations must be approved by the Traffic Signal Section of the City of Phoenix Streets Transportation Department, Traffic Operations Division. It is imperative that this approval be obtained before any installation or submittal of plans. Typical time for review and approval of traffic signal plans is three (3) months from date of submittal.

It is important to note that a developer is responsible for any impacts on an existing traffic signal when performing construction within the vicinity of the signal. For example, the moving of a curb could cause the need for poles and /or boxes to be relocated, at the developer's cost.

Prior to preparing traffic signal plans, contact the Design Section of the Planning, Design, and Programming Division within the Street Transportation Department. Obtain the 'Design Procedure Manual' most recent guidelines. The Design Section is the point of contact for traffic signal plans and is responsible for the plan review and approval.

Typically the developer/contractor will construct the underground related items per approved plans and City of Phoenix Signals Section will construct the above ground signal items and provide traffic signal inspection.

Separate from the City of Phoenix Development Services typical inspection, all construction and inspections must be coordinated with the Street Transportation Department, Traffic Operations Division Signal Section (602) 262-4693 and the Street Transportation Department, Traffic Operations Division Signal Shop (602) 262-6733.

## 6.2 Signing and Striping

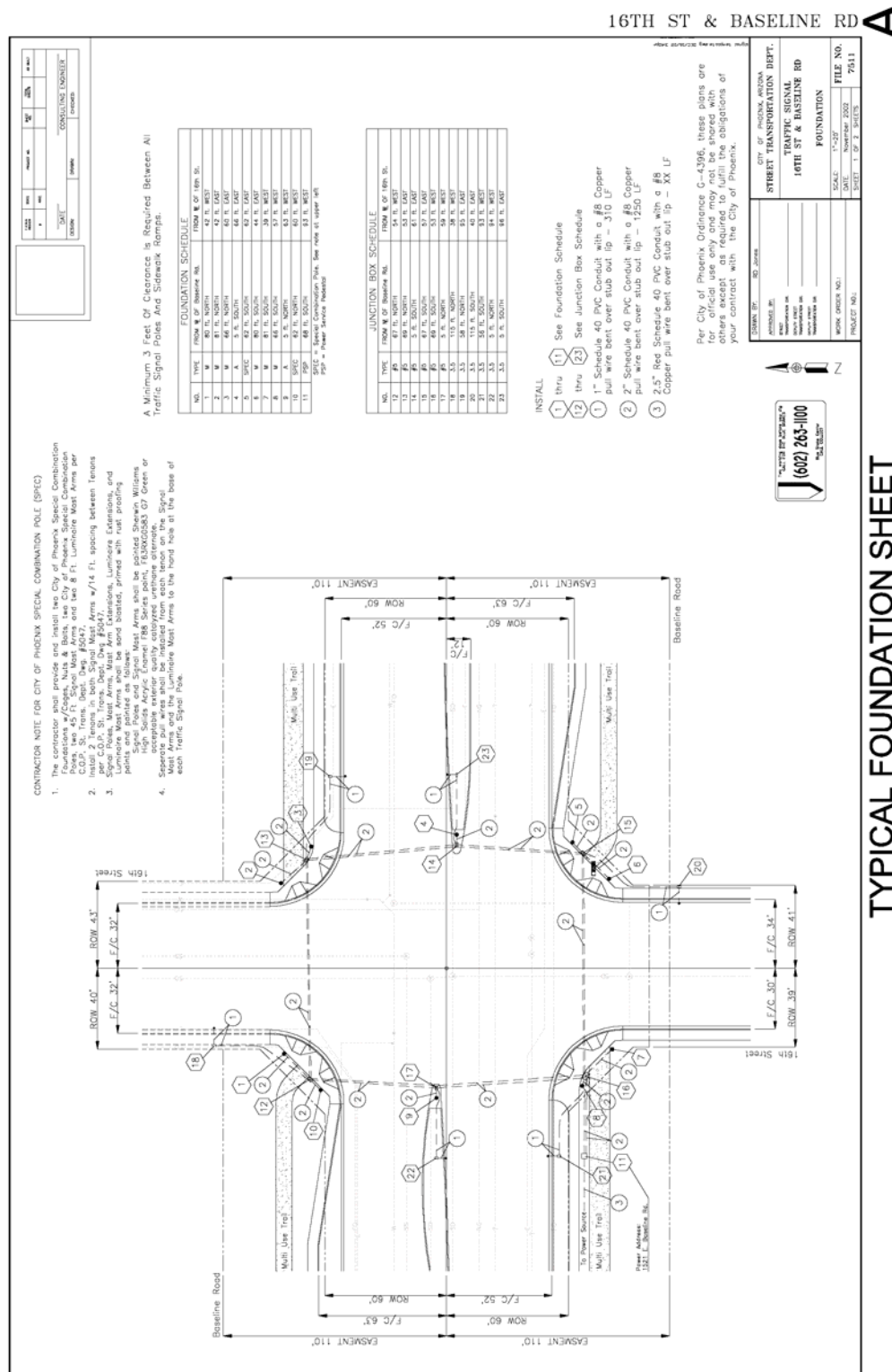
The City of Phoenix typically provides signing and striping on all arterials and a majority of the collectors. Street Transportation Department Traffic Operations Division will determine which collectors will be striped.

City of Phoenix typically installs all signs and striping on public roadways, as a result, it is pertinent that the plans meet the standards and guidelines of the City of Phoenix.

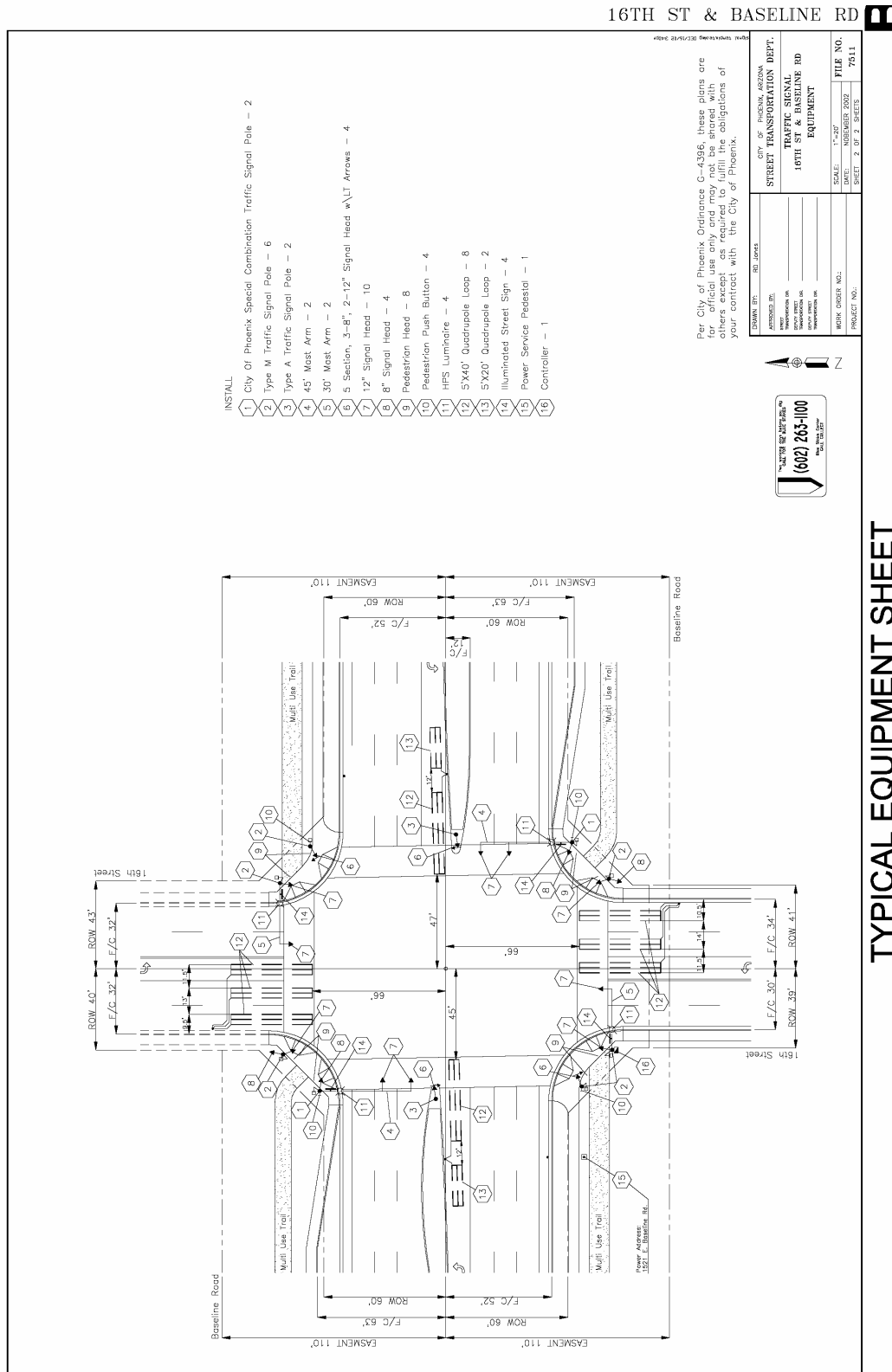
Prior to preparing signing and striping plans, contact the Design Section of the Planning, Design, and Programming Division within the Street Transportation Department. Obtain the 'Design Procedure Manual' most recent guidelines. The Design Section is the point of contact for signing and striping plans and is responsible for the plan review and approval.

The developer/contractor will be responsible for the removal of existing signing and striping as shown on the approved plans, or as directed by the inspector. Typical time for the review and approval of signing and striping plans is three (3) months from date of submittal. The developer/contractor needs to coordinate with the Street Transportation Department, Traffic Operations Division and provide approved plans approximately one (1) month before installation.

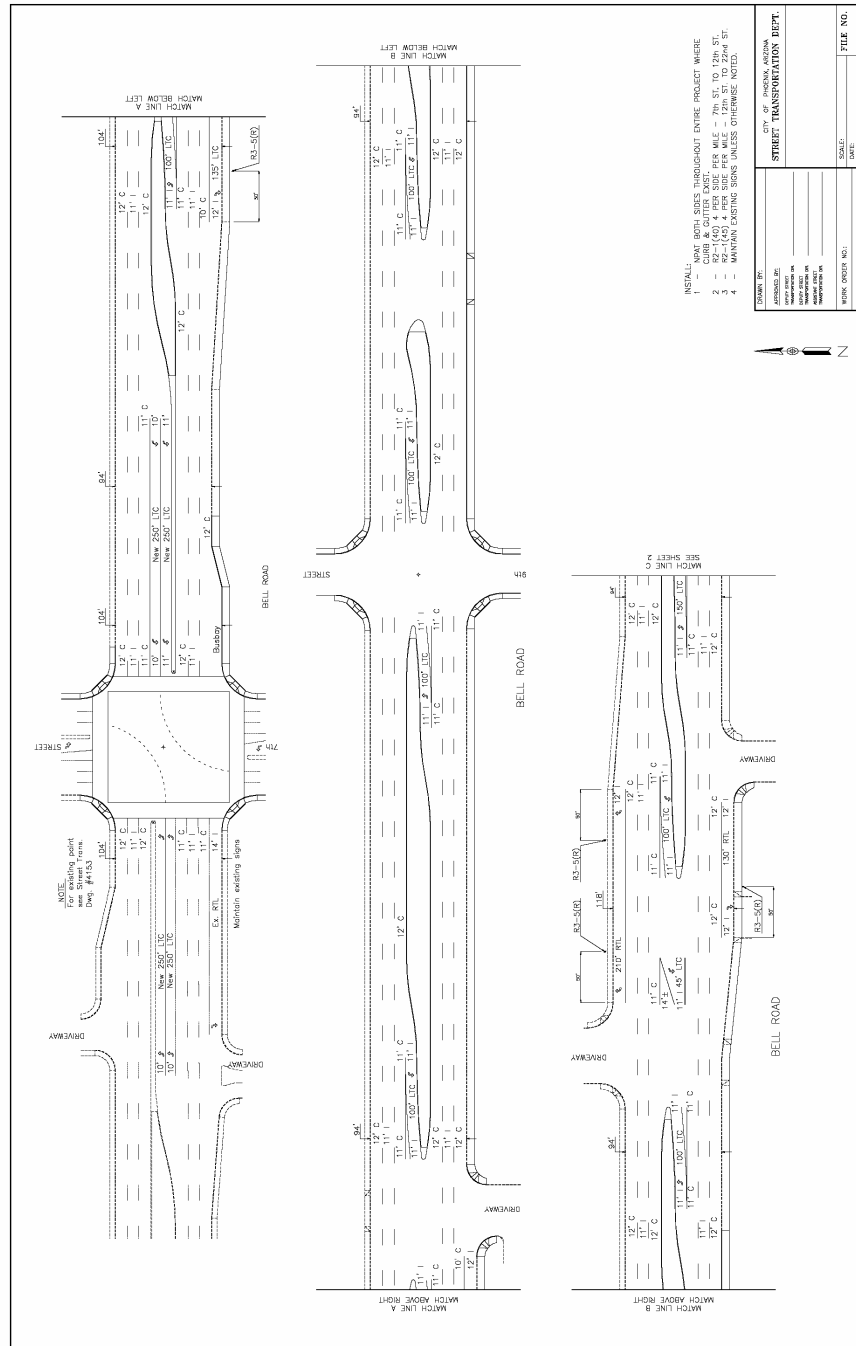
**Figure 6.1** and **Figure 6.2** are examples of a typical traffic signal plan, and **Figure 6.3** through **Figure 6.5** are typical signing and striping plans.



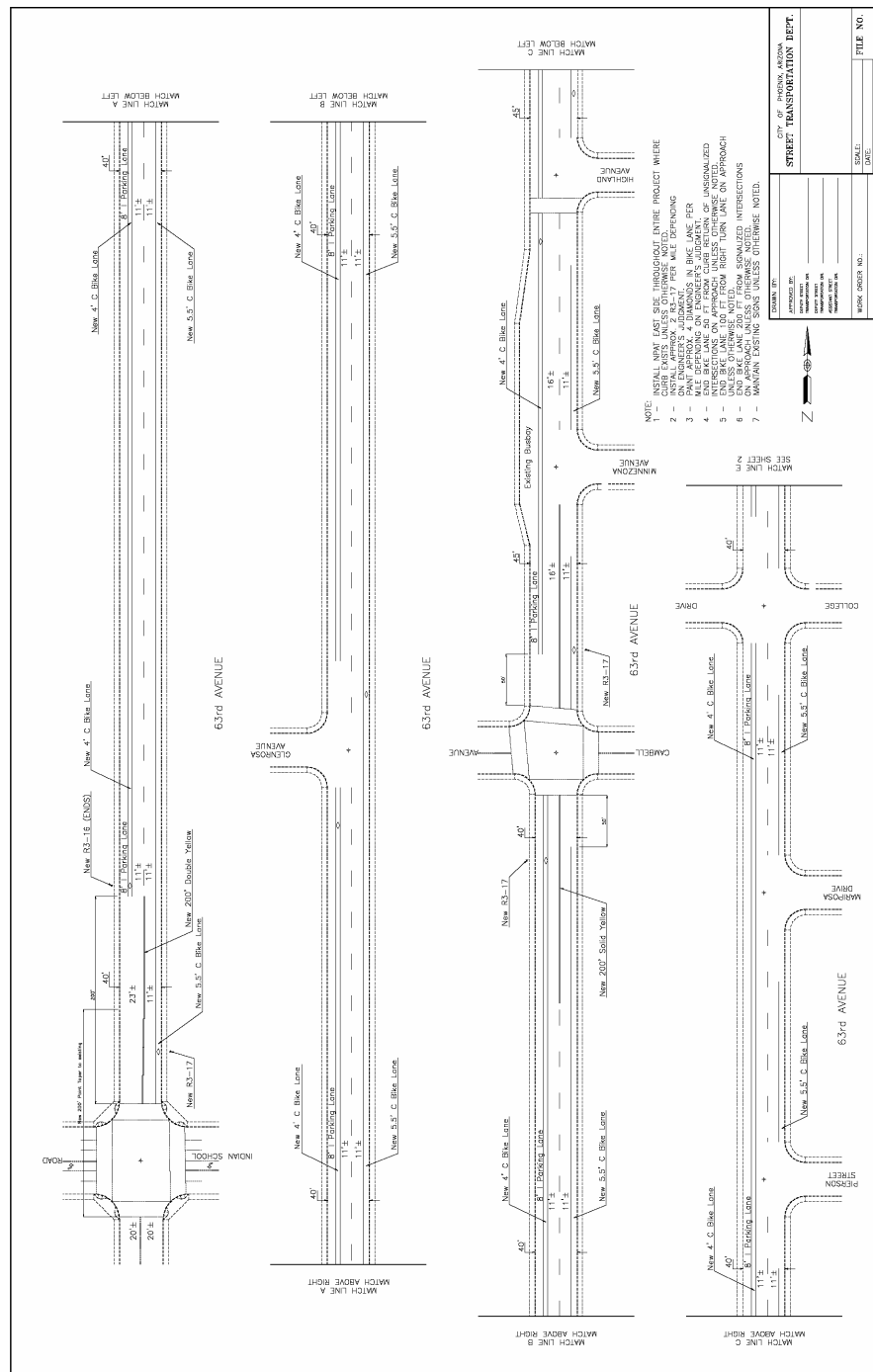
**Figure 6.1  
Signal Plan**



**Figure 6.2**  
**Signal Plan**



**Figure 6.3**  
**Signing and Striping Plans**

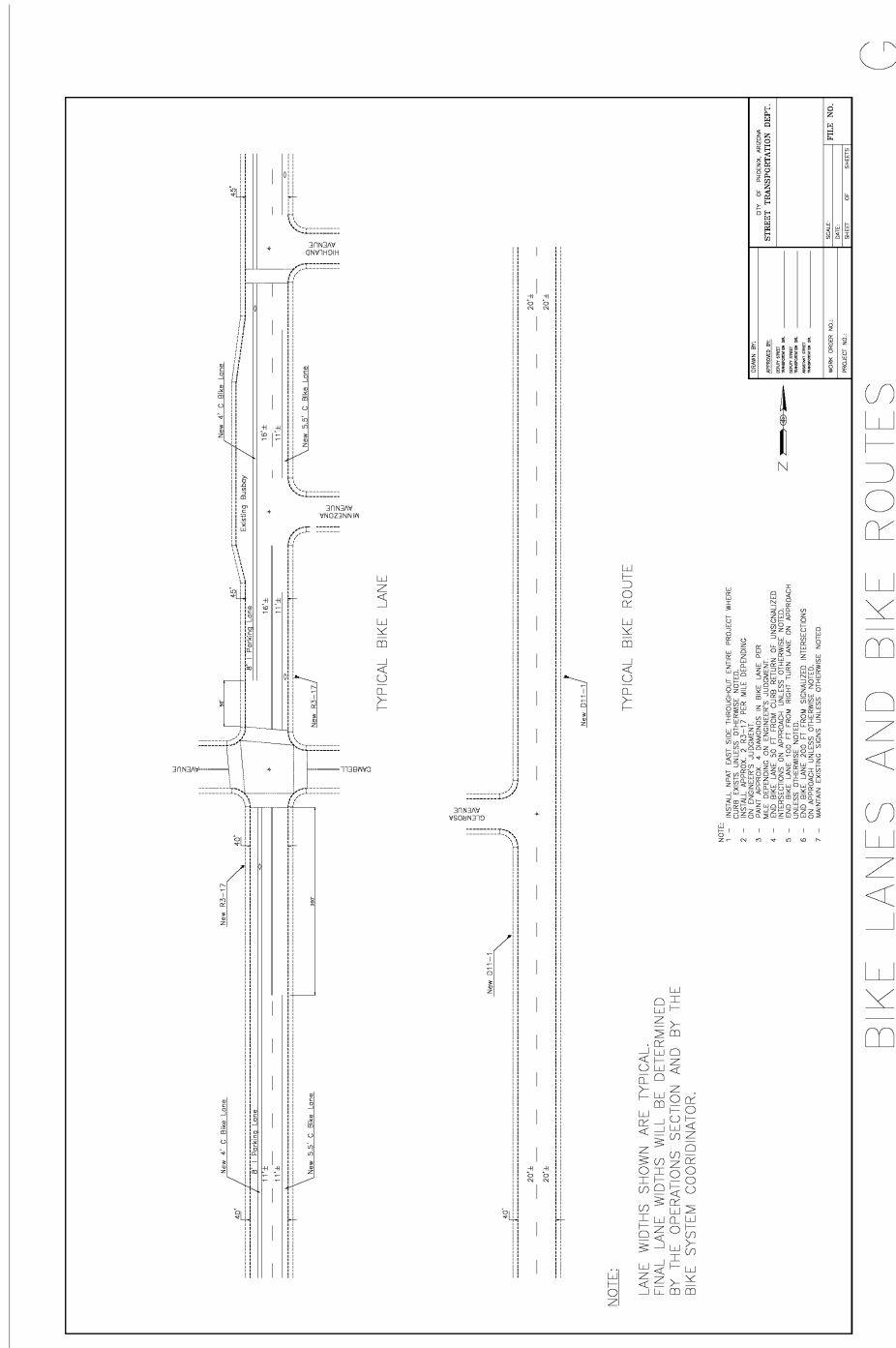


### Figure 6.4 Signing and Striping Plans



4 SEGMENT - 74' OR SMALLER ROADWAY





**Figure 6.5**  
**Signing and Striping Plans**

## CHAPTER 7 - TRAFFIC MANAGEMENT

With the continued growth of Phoenix, concern continues to mount that traffic which tries to avoid congestion on Freeways and Arterial streets intrudes into neighborhoods. That intrusion seriously impacts the quality of life of neighborhoods, with the negative impacts of increased accidents, noise and pollution.

### 7.1 Procedure

The following set of Goals, Policies and Guidelines were established to take a more comprehensive approach to the problem. They have been endorsed by the Surface Transportation Advisory Committee and adopted by City Council on September 26, 1989.

#### 7.1.1 Goals

1. The welfare of the city requires that residential neighborhoods be protected from blighting influences. The use of residential local and collector streets by “unwanted” traffic can be such an influence.

“Unwanted” traffic is defined as either: (a) traffic using a residential local or collector street as a shortcut or detour or; (b) an excessive volume of traffic on a residential local or collector street or; (c) traffic operating at excessive speeds or; (d) vehicles with an origin and destination outside the neighborhood.

2. The welfare of the city requires the safe, efficient and economical movement of persons and goods. To accomplish this, it is essential to develop and maintain a complete transportation system (freeways, major streets and public transit) adequate to accommodate travel demands. Doing so is the most effective way to discourage unnecessary use of residential local and collector streets.
3. The intensity of land development and the travel demand produced by it must be in balance with the planned capacity of the transportation system. If this balance is not maintained, the inevitable result is traffic intrusion into residential local and collector streets.

In order to accomplish these goals, the City Council reaffirms the following:

### **7.1.2 Policies**

1. The establishment of a hierarchy of streets consisting of arterial, collector and local streets, each with a distinct traffic service function. The functional classification of each street will be shown on the Street Classification Map, adopted by Resolution.
2. The adoption of right-of-way width standards adequate to construct or reconstruct arterial streets with sufficient capacity to accommodate existing and projected traffic volumes safely and efficiently. Such widths will be shown on the Street Classification Map, adopted by Resolution.
3. The continued use of street design standards appropriate to the functional classification and anticipated traffic demand, particularly on major streets.
4. The continuation, at adequate funding levels, of the Five Year Arterial Street Program, other arterial street improvement programs, and the street maintenance program.
5. Application of traffic control devices in such a way that traffic is further encouraged to use arterial streets, including the expansion of the computerized synchronization of traffic signals, proper spacing of new signals, control of access to arterial streets through driveway regulations, and posting of realistic speed limits on arterial streets.
6. Strong support for the expansion of the public transit system, to provide an attractive alternative to those who cannot, or choose not to drive, and to support overall transportation needs in corridors of highest travel demand.
7. Strong support for the expeditious implementation of the adopted MAG freeway plan. Priorities should be set so that early construction is programmed in corridors of greatest need, while continued capacity and traffic management improvements are made to existing freeways.

8. Thoughtful planning of land use patterns and intensities so that a balance is maintained between traffic generation and the capacity of the transportation system to accommodate the traffic. Integration of the Street Environment Policy would enhance use of the system as well.
9. Continued efforts to design new residential local and collector street networks to discourage unnecessary non-local traffic through the use of loop streets, cul-de-sacs, T-type intersections and discontinuous alignments, while providing adequate access for residents, visitors, emergency and service vehicles.
10. Expanded technical assistance to neighborhoods through the Safety and Neighborhood Traffic Section to define the nature of perceived traffic problems, and develop solutions which can be implemented technically and financially. Solutions may include placement of physical devices such as traffic circles, chokers, diverters, street narrowing or street closure; or install regulatory devices such as parking, turn restrictions or one-way operation.

### 7.1.3 Guidelines

1. A residential local or collector street is defined as one whose abutting land use is at least 85% residential when considered in segments of one-quarter mile.
2. Traffic on residential local or collector streets (total both directions) should not exceed:

#### Local Street

Low Density	1000 vehicles per day; 100 vehicles per hour
High Density	2000 vehicles per day; 200 vehicles per hour

Collector Street 8000 vehicles per day; 800 vehicles per hour

Neighborhoods with traffic near or in excess of these guidelines may benefit from a study to determine possible remedial measures. Neighborhoods with less traffic on their street may also request help and staff will, as always, work with them in solving problems.

3. Average vehicle speeds (established by radar or equivalent method) on residential local or collector streets should not exceed:

Local Street	25 miles per hour
Collector Street	35 miles per hour

Traffic speeds in excess of these guidelines would normally indicate the need for increased Police enforcement and may require a traffic study to determine other possible remedial measures.

4. Level of Service “D” should be provided at signalized intersection approaches. Level D occurs when all vehicles waiting at the start of the green portion of the signal cycle are able to clear the intersection by the end of that green portion, for at least 90% of the signal cycles during peak traffic hours. Peak hours normally occur between 7 a.m. and 9 a.m., and 4 p.m. and 6 p.m.
5. Residents along a residential local or collector street(s) experiencing “unwanted” traffic may ask the City’s help in preparing a traffic study to recommend a traffic mitigation plan. Involvement of each neighborhood in their study to the maximum extent feasible will be encouraged and petitions indicating neighborhood consensus may be required. Requests for studies shall be made to the Safety and Neighborhood Traffic Section. Requests will be prioritized based on relative need, neighborhood requests may be refused or placed on a waiting list until studies can be completed.
6. The Village Planning Committees may review proposed traffic mitigation plans for residential local or collector streets within the village, and may recommend approval as presented or with modifications. This recommendation, along with the recommendation of the Street Transportation Department, will be presented to the City Council Transportation Subcommittee committee. The Subcommittee shall make a recommendation to the City Council who shall have final approval of such plans.
7. All proposed land use developments expected to generate at least 5000 vehicle trips per day, or 500 during either the morning or afternoon peak times, may be required to submit a Traffic Impact Study as determined by the Street Transportation Director. This study will include both streets and transit improvements necessary to accommodate total traffic at adjacent major intersections at a tolerable degree of congestion (defined as Level of Service “D”), a draft Travel Reduction Plan, and such other elements as may be required by the Street Transportation Director.

8. The Village Planning Committee shall review all proposed land developments for which a Traffic Study is required. The Committee shall make a recommendation on the development plan to the Planning Commission. The Street Transportation Department will also review these land use developments and make a recommendation to the Planning Commission. The Street Transportation Department may also make a recommendation to the City Council Transportation Subcommittee.
9. Applications for local street closures will be processed through the existing abandonment procedure. The term “closures” is defined to include any physical restriction to traffic flow on a residential local or collector street such as a diverter or cul-de-sac.

## **7.2 New Development**

All new developments within the City of Phoenix are required to use approved traffic management techniques. All streets should be designed to minimize cut-through traffic in residential areas. Local streets should be discontinuous and generally should be interrupted with jogs and offsets. Four-way intersections should be minimized.

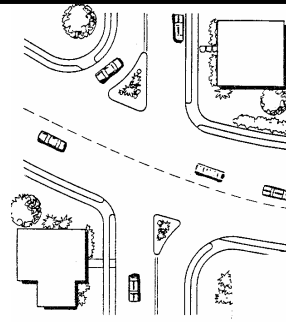
## **7.3 Existing Development**

In 1989, the City of Phoenix formed the Neighborhood Traffic Management Program to work with neighborhoods to help alleviate cut-through traffic and speeding. Once a neighborhood group submits a petition to the Safety and Neighborhood Traffic Section, a traffic study is conducted. If the study shows that a cut-through or speeding problem exists, the Section will work with the neighborhood group to find the best solution to fix the problems. No traffic plan will be implemented without a neighborhood consensus or notification to do so.

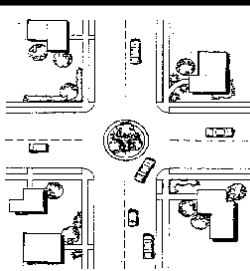
## **7.4 Traffic Management Techniques**

There are a number of traffic management techniques used by the City to help alleviate cut-through or speeding traffic problems in neighborhoods. The following are several examples used by the City.

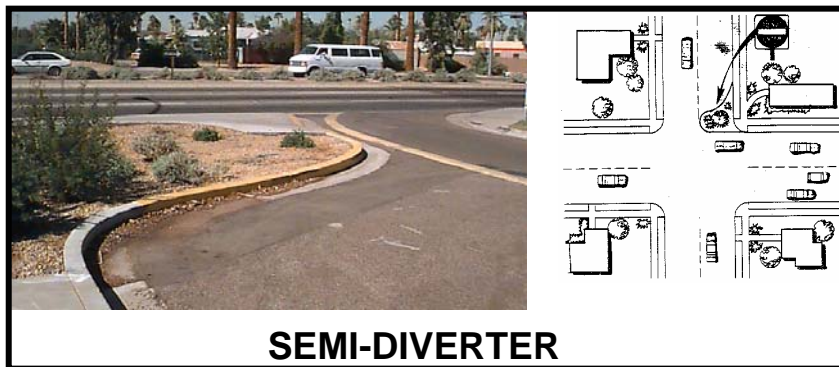
### 7.4.1 Intersection Mitigation



**RIGHT-TURN DIVERTER**

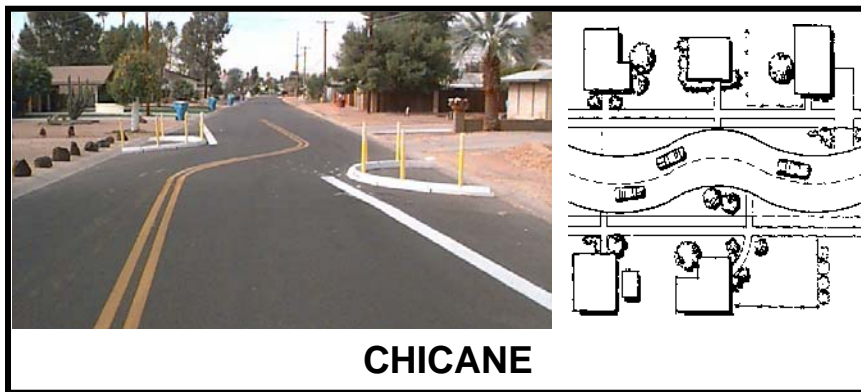


**TRAFFIC CIRCLE**



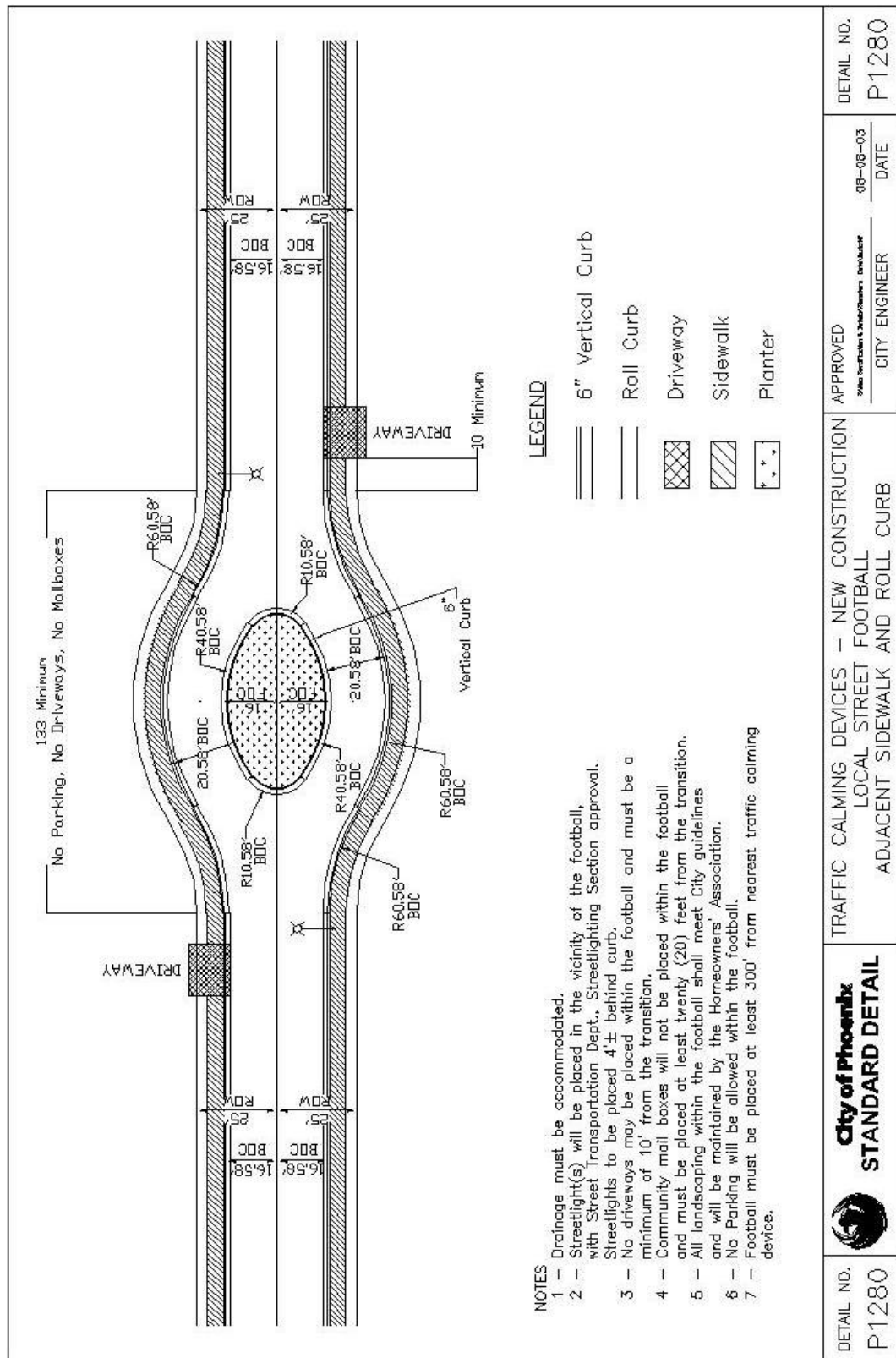


### 7.4.2 Mid-block Mitigation

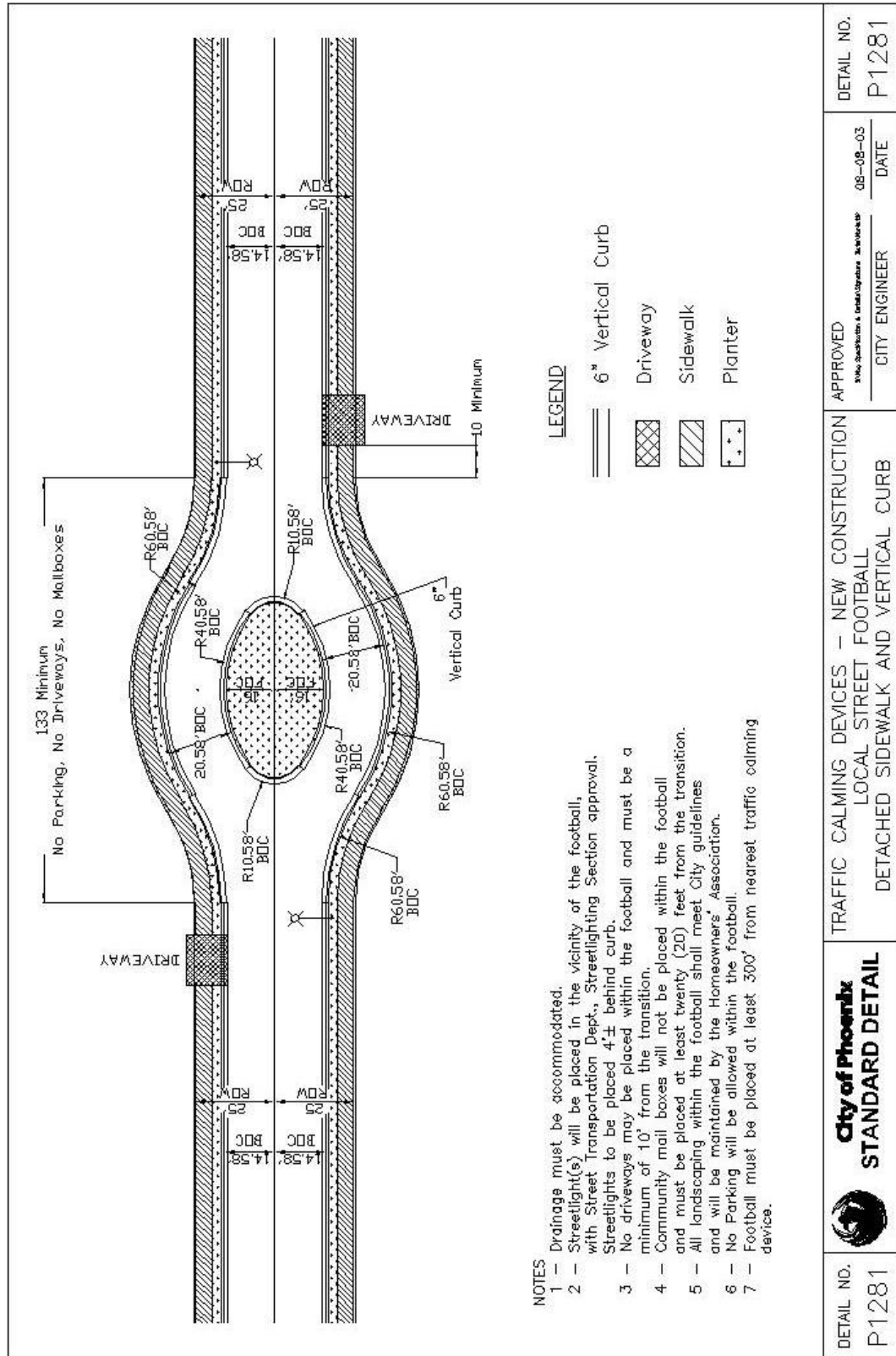


### 7.4.3 Traffic Calming Device Details

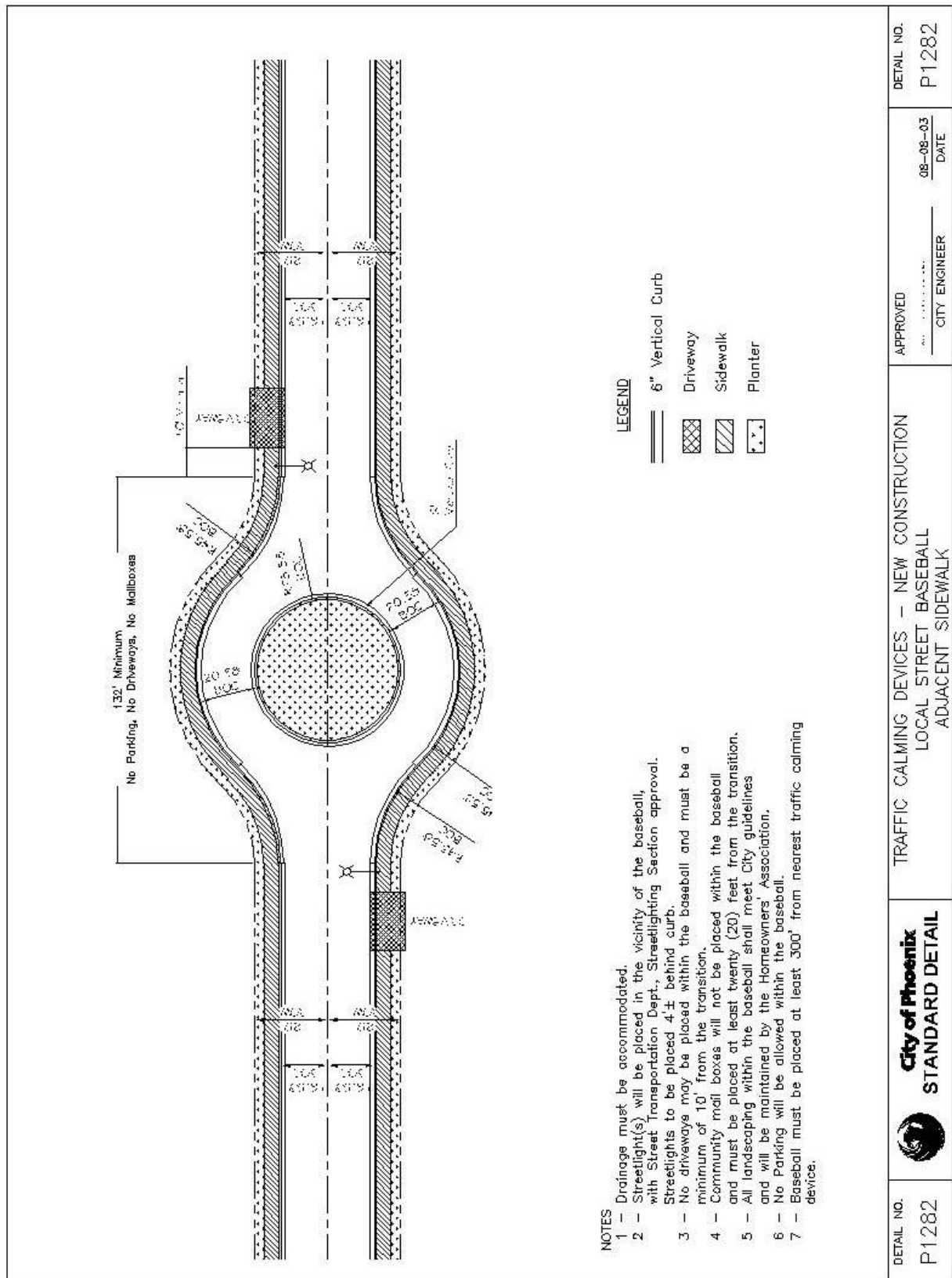
The following are approved City of Phoenix standard details for Traffic Calming Devices:



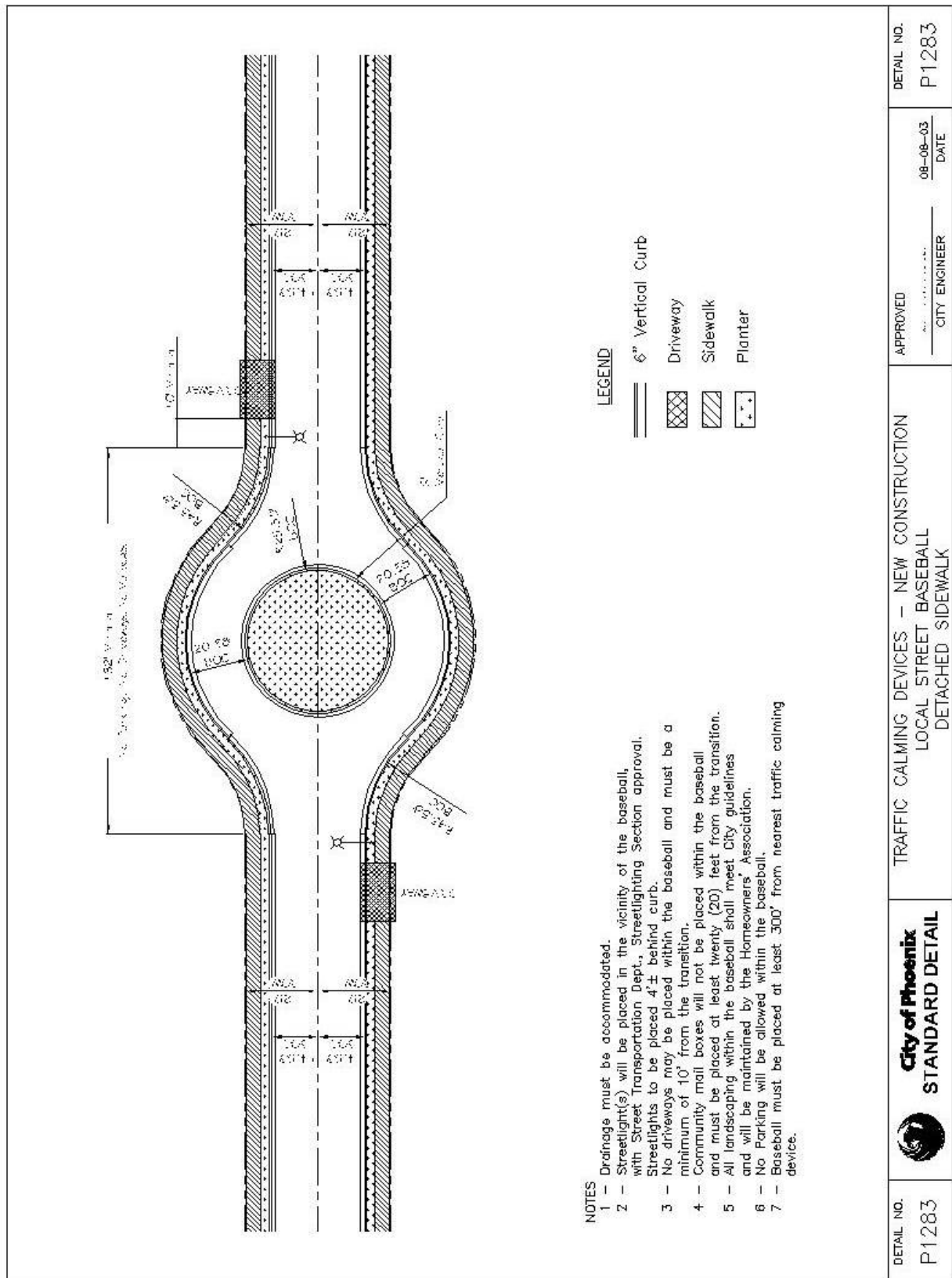
**Figure 7.1**  
**Standard Detail P-1280**



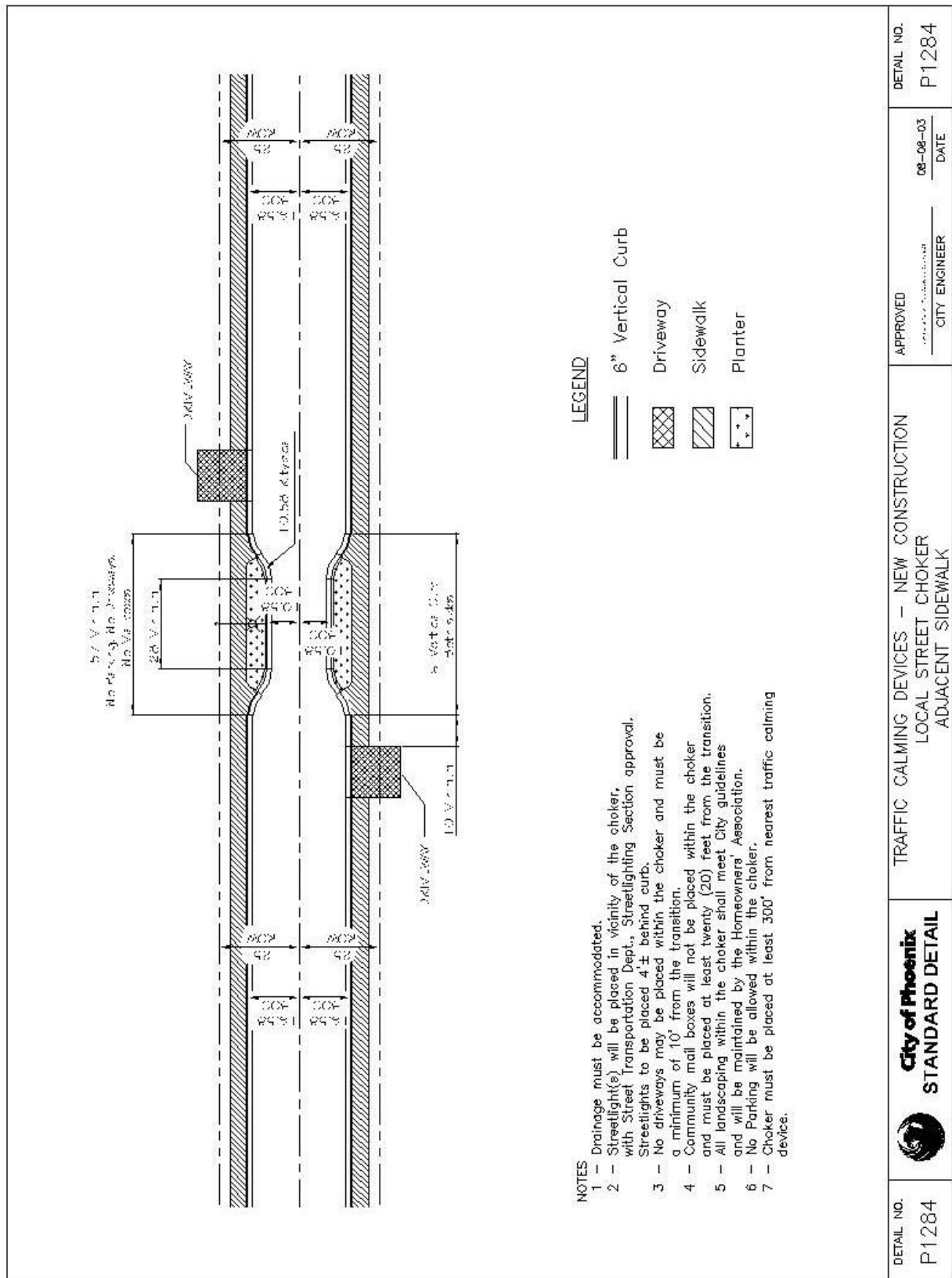
**Figure 7.2**  
**Standard Detail P-1281**



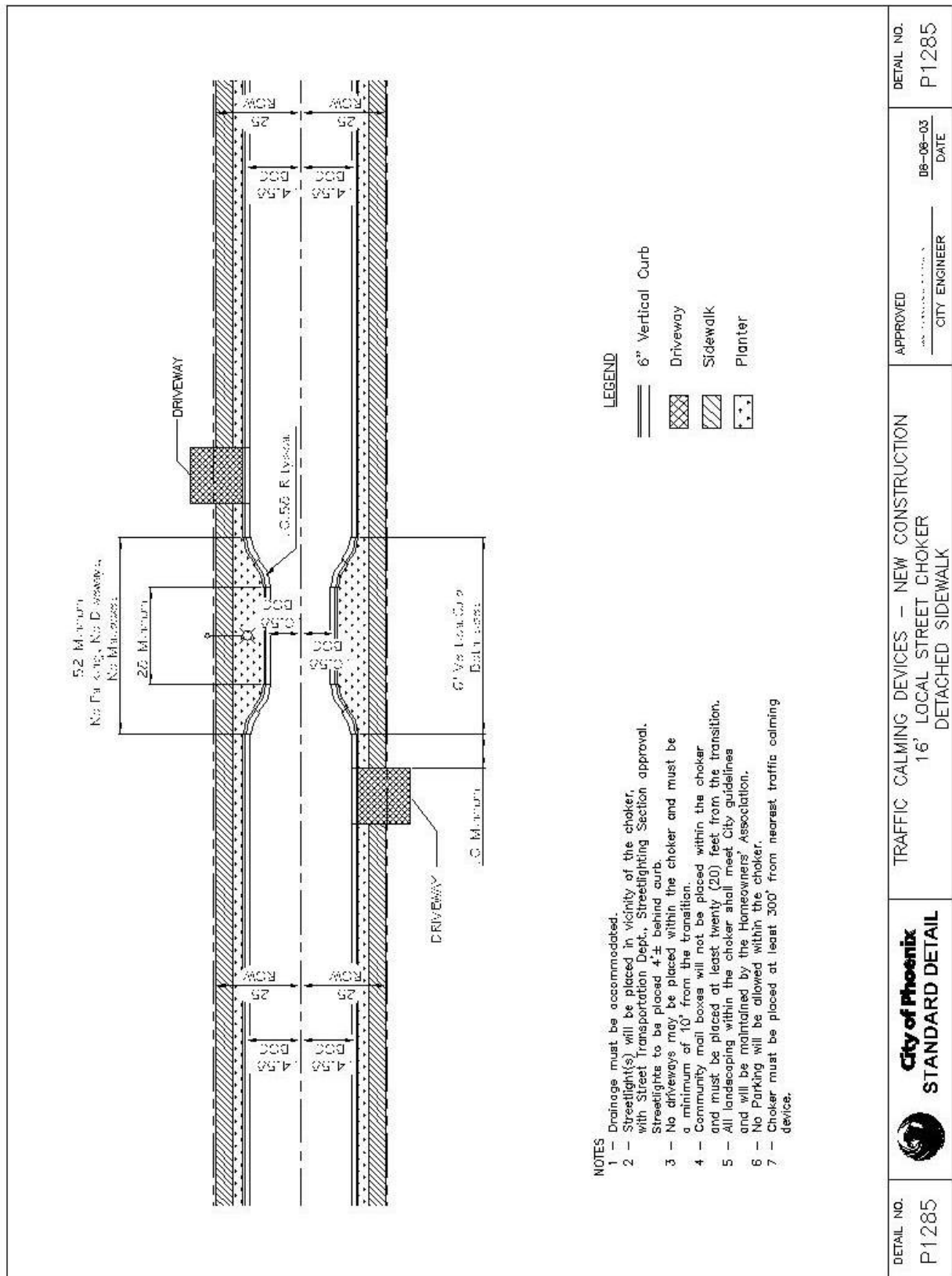
**Figure 7.3**  
**Standard Detail P-1282**



**Figure 7.4**  
**Standard Detail P-1283**

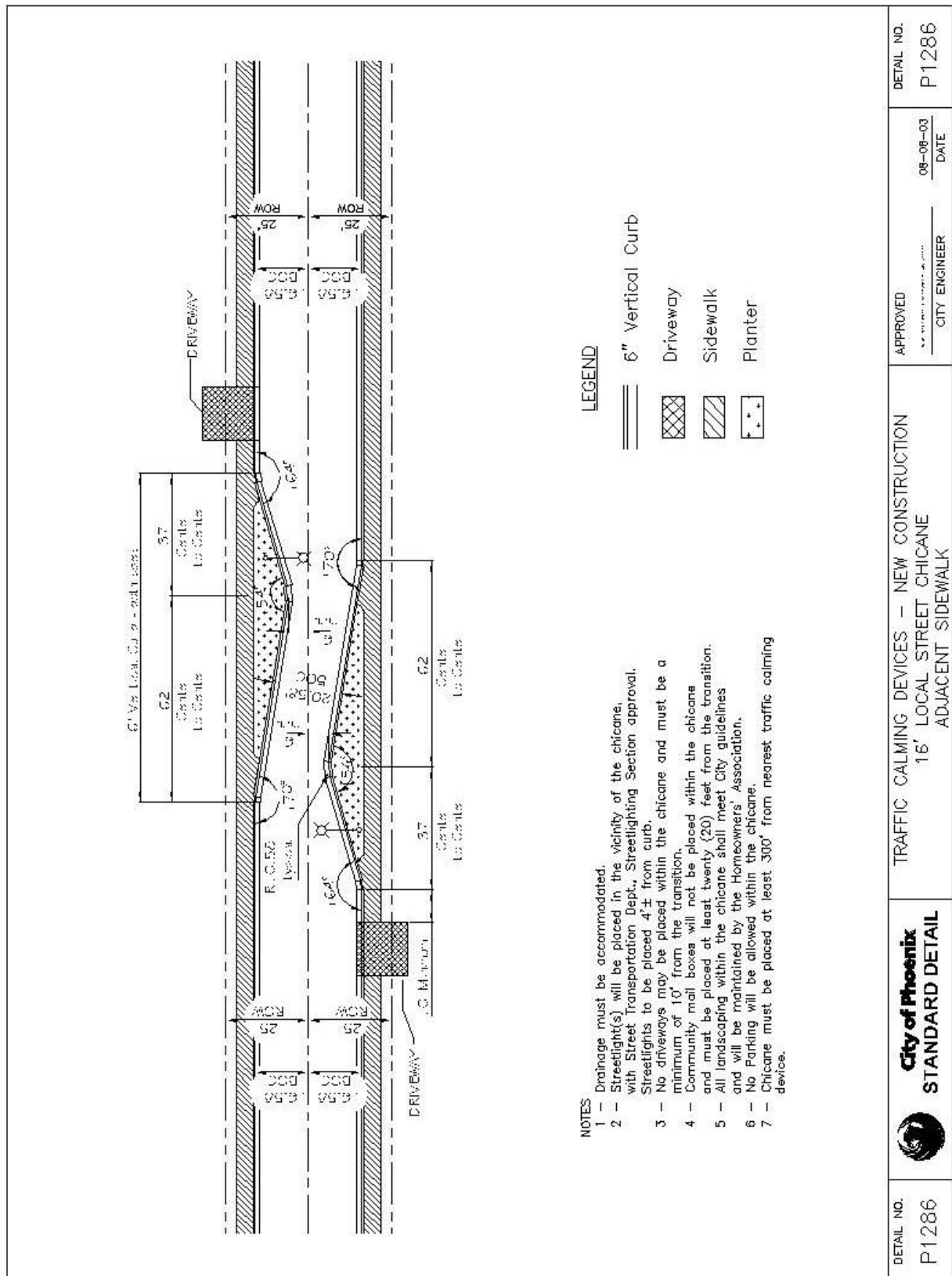


**Figure 7.5**  
**Standard Detail P-1284**

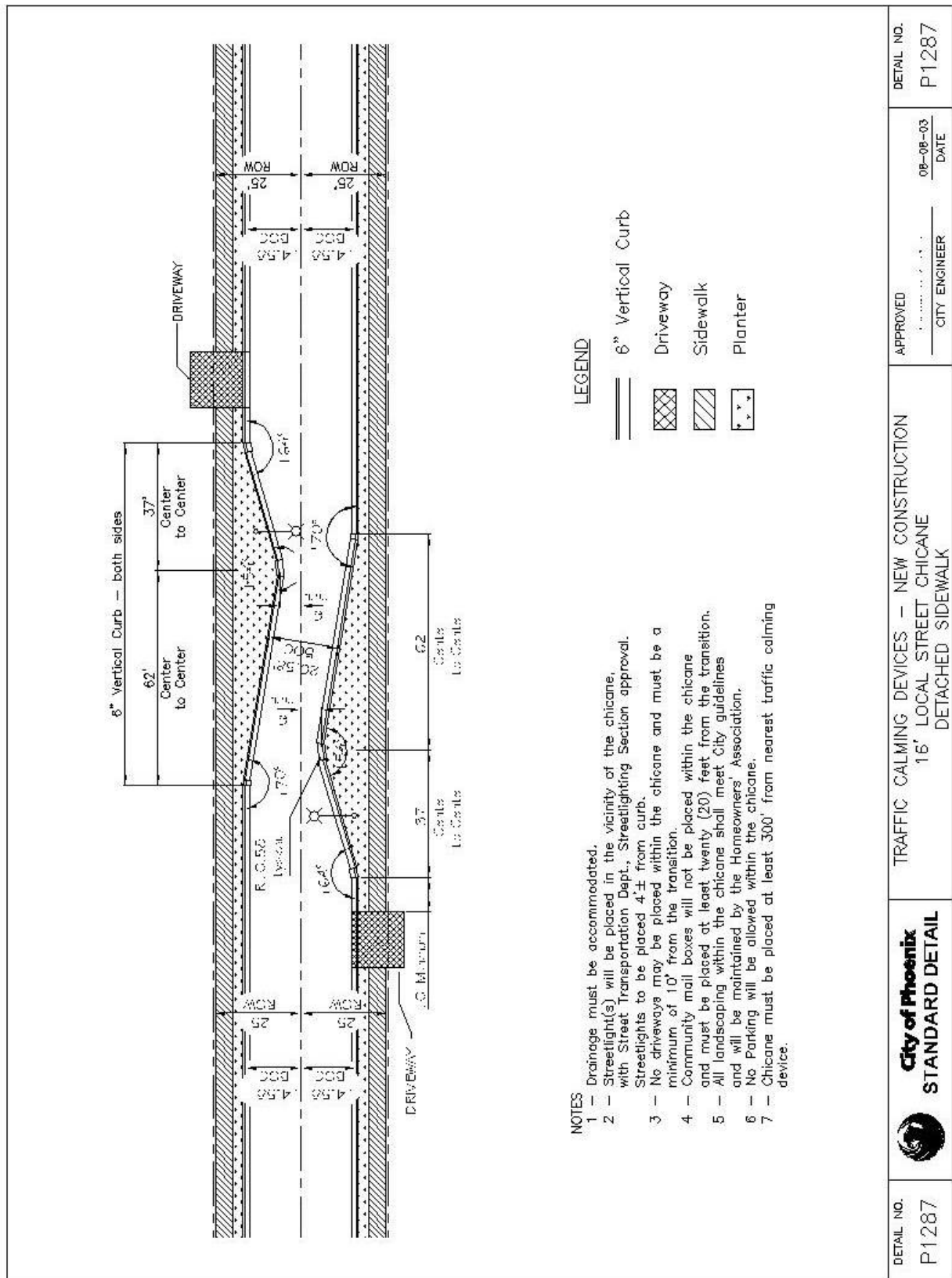


**Figure 7.6**  
**Standard Detail P-1285**

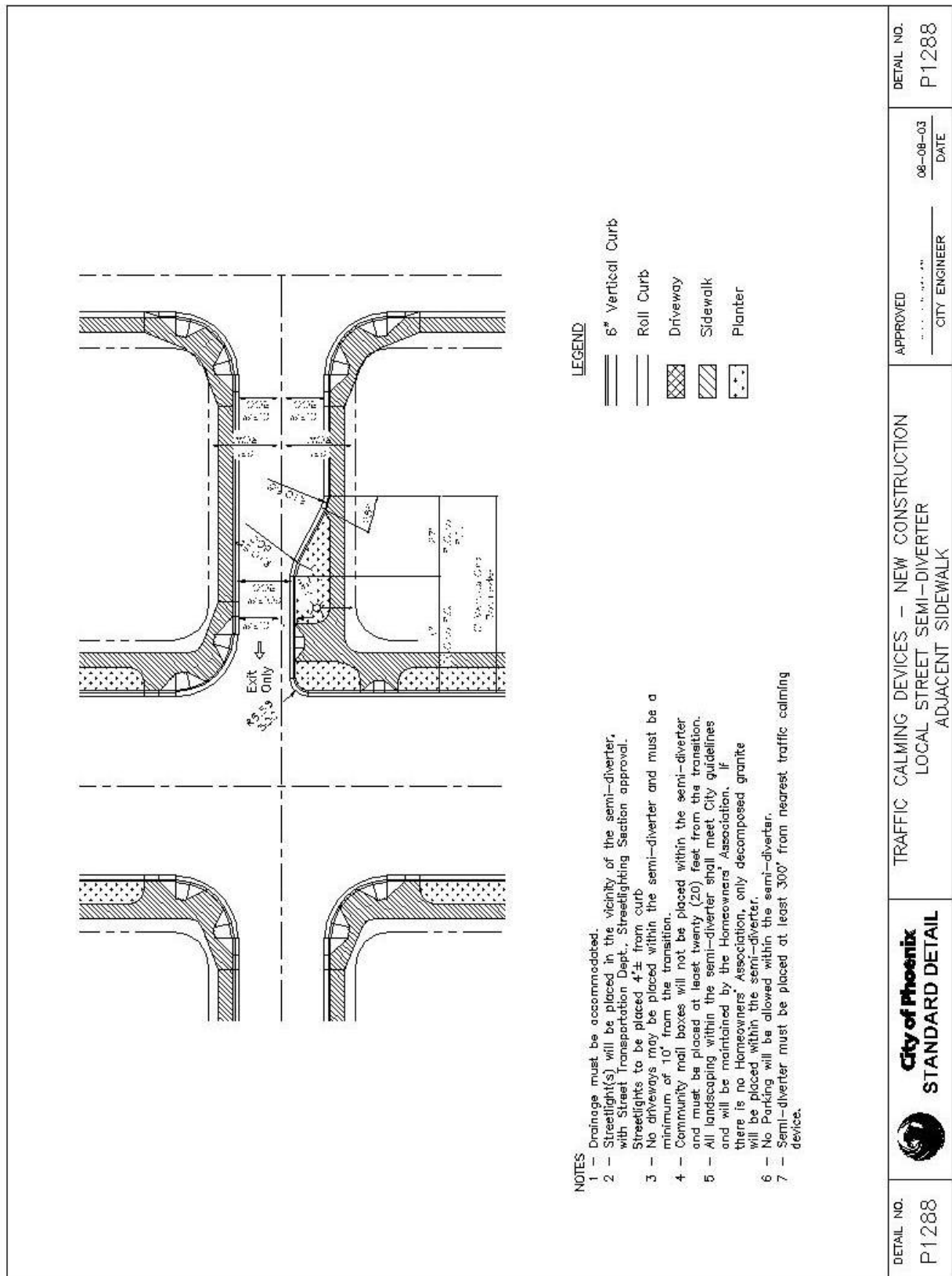




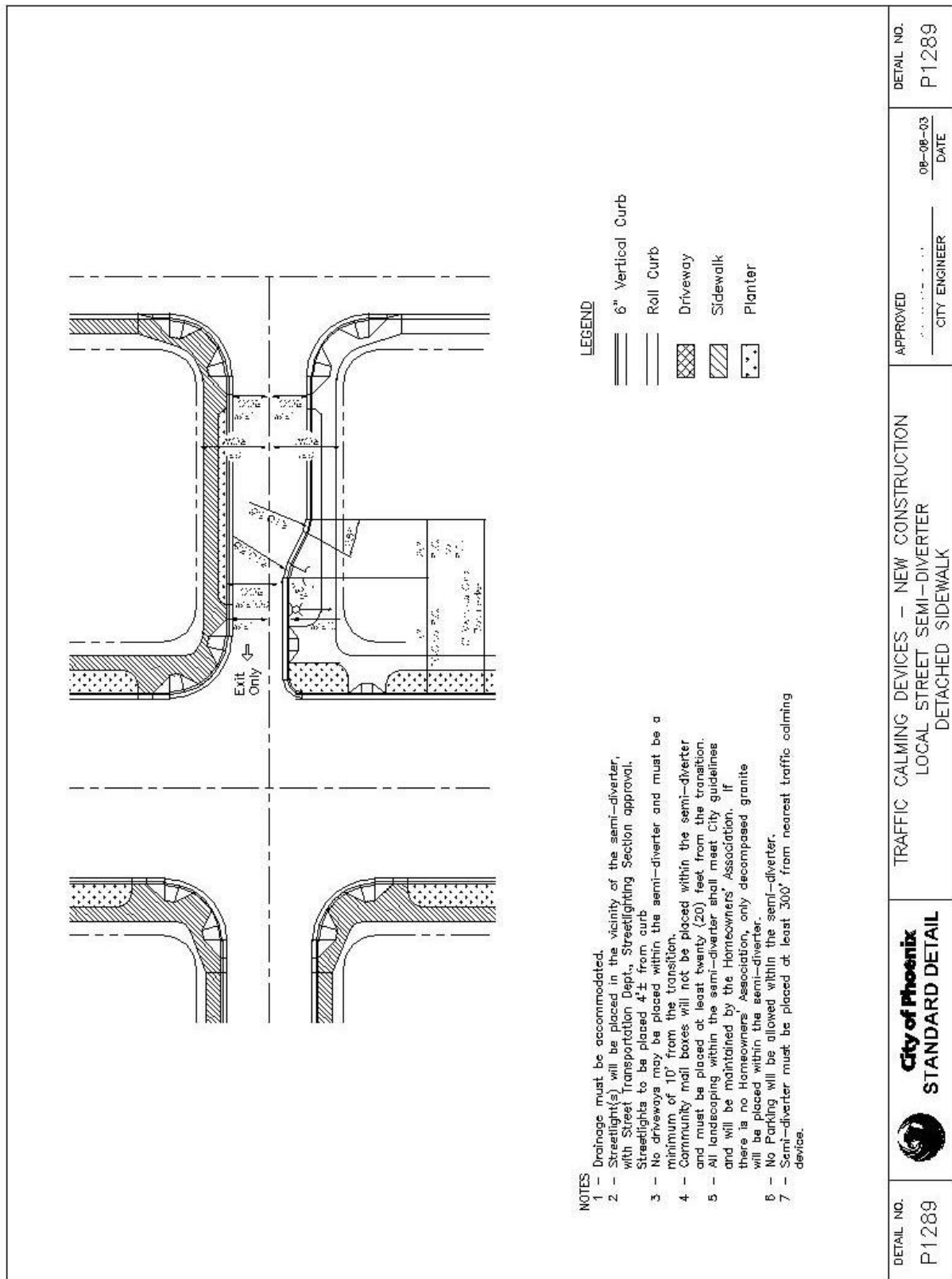
**Figure 7.7**  
**Standard Detail P-1286**



**Figure 7.8**  
**Standard Detail P-1287**



**Figure 7.9**  
**Standard Detail P-1288**



**Figure 7.10**  
**Standard Detail P-1289**

## 7.5 Traffic Circles and Roundabouts

Traffic circles and roundabouts are placed at intersections to replace either stop conditions or traffic signals. The majority of traffic circles within the City of Phoenix are at local/local intersections and functions primarily as a traffic calming device.

Currently the City is following the Federal Highways Administration's guide, "Roundabouts: An Informational Guide". For a link to the site, please see <http://www.tfhrc.gov////////safety/00-0671.pdf>

Traffic circles placed at local/local intersections will typically have a central island radius of 20' to 25'. The circulating roadway is typically 20' from face of curb to face of curb. Raised splitter islands are to be used on all approaches unless approved by the Traffic Operations Division. The design speed for neighborhood traffic circles will be 20 mph, with the posted speed following current City guidelines. See current City supplement to MAG for guidelines and examples.

Central island radii for local/collector intersections will be determined by the type of collector. All collector/local traffic circles are single lane roundabouts with single lane approaches. Residential collector intersections will follow the same guidelines as local intersections. Where the collector is designated as commercial, a larger central island radius will need to be used to accommodate larger vehicles. Truck aprons may also be used. The circulating roadway will be a minimum of 20'. See current City Supplement Details for current guidelines and examples.

Traffic circles and roundabouts for collector/collector, collector/arterial, and arterial/arterial intersections will be approved by the Street Transportation Department and will follow current guidelines.

## CHAPTER 8 - ACCESS

Access management is the control and management of every point of access on the public roadway network. The purpose of this control is to limit vehicular and pedestrian conflicts.

Sound site design is a vital part of the solution but not the only component. In Phoenix two thirds (2/3) of traffic crashes take place at driveways or are within 150 feet of an intersection.

Each new access point increases crash frequency by about 4% per mile according to the NCHRP (Report 420). Designing for safety involves minimizing conflict points and therefore help to reduce the rate of crashes.

### 8.1 Driveways

All driveways must conform to City of Phoenix Ordinance Section 31 – 44.

The following policies have been established for driveways:

- Driveways must be constructed to City standards under a permit issued by the Development Services Department.
- Single-family residential driveways should not be located within the curb radius return on a corner lot.
- Existing, unused driveways, must be replaced with curb, gutter and sidewalk built to City standards.
- The top of wings for driveways should be located a minimum of 2'6" from property lines.
- A 10 foot by 20 foot sight visibility triangle (20 foot measured along the property line) is required on both sides of a driveway.
- An accessible walkway must be provided around the perimeter of ALL driveways to provide a maximum cross slope of 50:1.
- A single parcel or contiguous parcels comprising one development should be limited to one driveway, unless traffic volume or street frontage warrants additional driveways.
- On major arterial and arterial streets, the sharing of driveways between adjacent properties and common ingress/egress easements are strongly encouraged. Existing driveways that are unnecessary or substandard should be removed or upgraded in conjunction with any new on-site or street construction.

- On major arterial and arterial streets, large developments should consolidate major driveways at 1/4 or 1/8 mile locations and align them with driveways on the opposite side of the street.
- Driveways to corner lots should be located as far away from the intersection as practical.
- Driveways are prohibited within the passenger waiting area of bus stops unless relocation of the facility is approved by Public Transit. Driveways should be located such that bus stop improvements are beyond the projection of driveway visibility triangles and drivers will be able to see around bus stop improvements, both existing and planned. Driveways are not to be located within the flat portion of the bus bay (bus standing area).
- Driveways may taper to match drive aisle width on private property (3 to 1 maximum).
- Driveway connections should be placed at locations that facilitate the efficient entry and exit of vehicles to properties on both sides of a street and minimize conflicts with transit facilities, left turn pockets as well as traffic on the streets or neighboring properties.
- City of Phoenix Standard Detail No. P1255-4 lists the driveway width policy.

**Note:** The Driveway Ordinance prohibits access from commercial property to alleys that abut residential property. Access to alleys must be applied for and shall be considered by the Development Services Director or designee. Contact Development Services for additional information.

The following is a listing of the City of Phoenix Standard Details for driveways:

- Return Type Driveways with Attached Sidewalk (P1243)
- Return Type Driveway with no Right Turn Lane (P1243-1)
- Return Type Driveway with Right Turn Lane (P1243-2)
- Driveway-Pedestrian Ramp Combination, for use at T type intersections (P1244)
- Driveway Entrance – Type I, Sidewalk Adjacent to Curb (P1255-1)
- Driveway Entrance – Type II, Detached Sidewalk (P1255-2)
- Driveway Entrance – Retrofit (P1255-3)
- Driveway Widths Policy (P1255-4)

## **8.2 Frontage/Access Roads**

Upon request for a new frontage road opening, appropriate Street Transportation Department staff (Design, Operations, Safety, etc.) will discuss the merits of the request.

If staff determines that the disadvantages outweigh the advantages from a Street Transportation standpoint, the petitioner will be so informed. If the citizen cannot be dissuaded from pursuing the matter, the following procedure will also apply.

If the staff agrees that the merits will benefit movement, and the advantages outweigh the disadvantages, the petitioner will be so informed. It is the citizen's responsibility to acquire the signatures of at least the majority of his neighbor on the streets that may be affected in traffic service and/or increased travel on their streets due to the new proposed opening.

The petitioner will then be required to notify 100% of the neighborhood that will be considered to be impacted by the new opening. Within this area, 70% of this area must sign the petition in favor of the new opening. Additionally, 100% of the neighborhood that is considered to be directly impacted by the new opening must sign the petition in favor.

If the opposition to the proposed new service road opening is extremely vocal, it is recommended that the Citizen's Assistance Office (C.A.O.) for the particular council district be contacted to settle the conflict of residents and advise the City on which direction to proceed.

In reviewing the proposed service road openings, an attempt should be made to locate the opening at points which discourage by-pass traffic and reduces the need for U-turn movements from through lanes close to the service road median which are most difficult to negotiate for even the smallest passenger cars.

## **8.3 Alleys**

Alleys are discouraged and must be approved by the Street Transportation Department. However, alleys may be required where other alleys exist within an area or the extension of existing alley or alley system is necessary. Dead-end alleys will not be permitted.

### **8.3.1 Alley Widths**

In the event that an alley is required, the width shall be 16 feet for residential alleys abutting single-family uses. For other abutting uses, an alley 20 feet in width shall be provided.



### 8.3.2 Alley Intersections

Alley intersections and sharp changes in alignment must be avoided. When intersections or alignment changes are allowed, the inside corners shall be cut off on each side to provide a tangent section between the two sides at least 15 feet long or as shown in **Figure 8.1**.

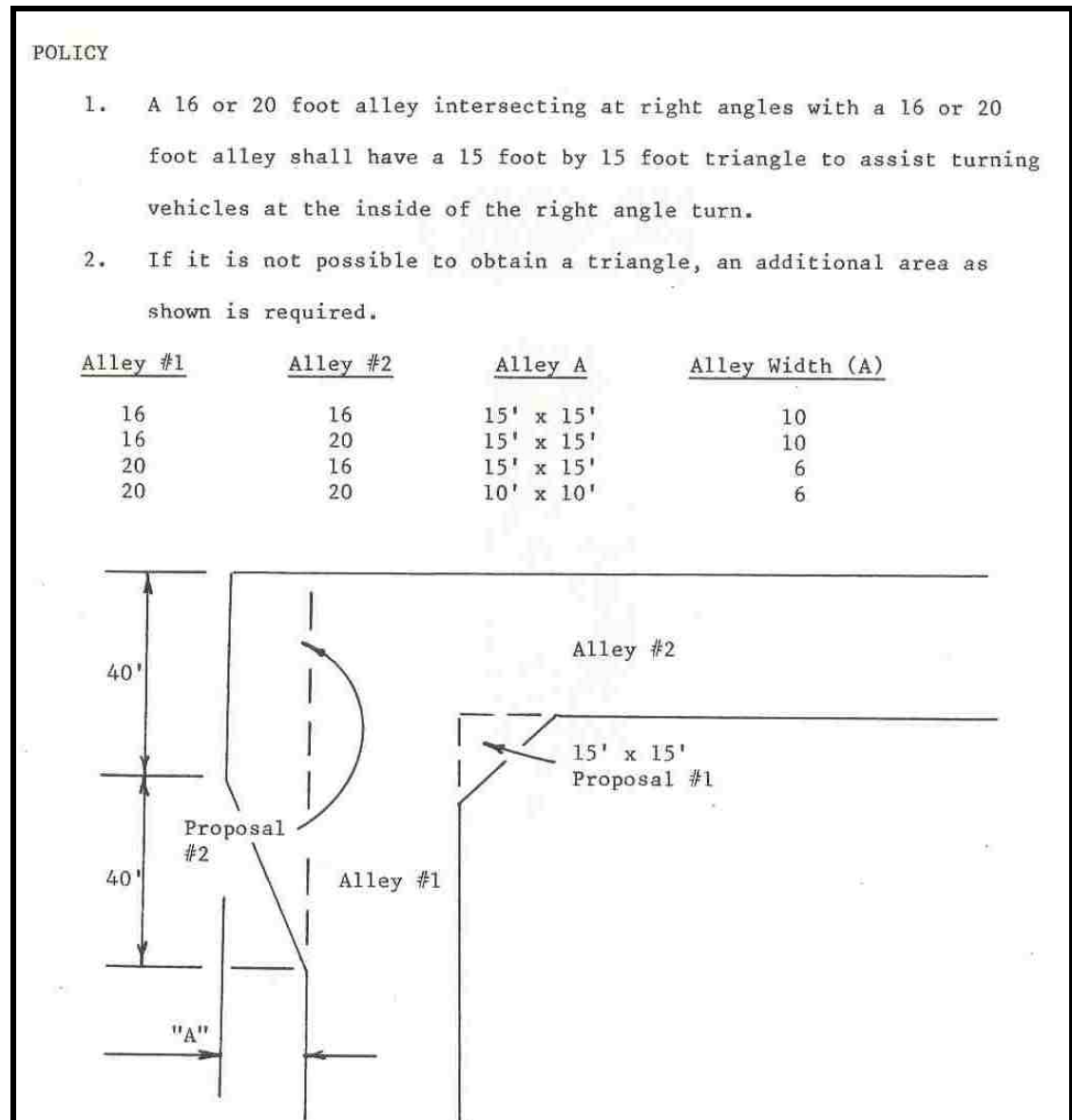


Figure 8.1  
Alley Intersections

### **8.3.3 Alley Paving**

All alleys are to be paved full width with at least 2 inches of asphalt over six (6) inches of A.B.C. or as may otherwise be approved by the City of Phoenix.

## **8.4 Parking**

### **8.4.1 On-Site Parking**

On-site parking shall be provided as per the requirements of Zoning Ordinance Section 702.

### **8.4.2 On-Street Parking**

On street parking is normally permitted on both sides of local streets adjacent to single family residential properties if the street is a minimum of 29.16 feet (back-of-curb to back-of-curb) wide.

## **8.5 Sidewalks**

Sidewalks shall be provided along all major arterial, arterial and collector streets. Sidewalks shall be a minimum of 4 feet in width on local streets and 5 feet on arterials, collector streets and on local streets with setback sidewalks. In areas with high pedestrian volumes, wider sidewalks may be required. All sidewalks shall be constructed with a maximum cross-slope of 1:50.

As per the Americans with Disabilities Act (ADA), a 5 foot by 5 foot passing area must be provided every 200 feet to allow wheelchairs to pass on all sidewalks less than 5 feet wide. Driveways and other connecting sidewalks may be used to provide the passing area, as long as the cross-slope meets ADA standards.

## **8.6 Curb Ramps**

Curb ramps shall be provided at all intersections. The following is a listing of the City of Phoenix Standard Details for curb ramps:

- Mid-Block Ramp – Type C (P1235)
- Mid-Block Ramp – Type C Modified, Detached Sidewalk (P1235-1)
- Mid-Block Ramp With 4" Roll Curb (P1236)
- Double Ramp – 25' or 30' Radius Curb Return (P1238)
- Double Ramp – 35' Radius Curb Return (P1240)
- Double Ramp – 20' Radius Curb Return (P1241-1)
- Double Ramp – Limited R/W (P1241-2)
- Single Ramp – 20' Radius Curb Return (P1241-3)
- Double Ramp – 4" Vertical Curb Return (P1242)
- Driveway-Pedestrian Ramp Combination, for use at 'T' type intersections (P1244)

## **CHAPTER 9 - SUBDIVISION STREET PLANNING**

Subdivision street plans should strive to produce the minimum number of intersections and wash crossings, and discourage through traffic. The following paragraphs describe certain other concepts and requirements.

### **9.1 Street Abandonment**

An existing street may be considered for abandonment if it is not a street indicated on the City of Phoenix Street Classification Map or an Area Plan, and will not eliminate reasonable and legal access to existing properties. The abandonment should alleviate a significant traffic problem and not create new problems. If a street is approved to be abandoned, the abandonment must occur prior to the submittal of a final plat to the City Council. If a plat is required the abandonment must occur concurrent with approval of the plat by City Council.

Alleys and excess right-of-way on any type of street may be considered for abandonment if approved by the City.

\* Refer to Article V. Abandonment of Public Rights-of-Way, Chapter 31 of City Code for additional information.

### **9.2 Cul-de-Sac Street Lengths**

A cul-de-sac street is a street that serves more than one property owner and has only one direct access to the public street system. The following requirements apply to both public and private streets. Cul-de-sac streets in residential subdivisions shall terminate in a circular right-of-way fifty feet in radius with an improved traffic turning circle forty-five feet in radius. The Development Services Department may approve an equally convenient form of space where extreme conditions justify.

See Design Guideline DG 1005A for current cul-de-sac design guidelines.

\* See Subdivision Ordinance, Chapter 32 of City Code for additional information.

### **9.3 Alternative Street Terminations**

Upon approval by the Development Services Department, alternative street terminations may be used. Design Guideline DG 1005b provides the current acceptable terminations. The Development Services Department will determine the exceptional use where these designs may be implemented on site plan controlled projects.

\* See Subdivision Ordinance, Chapter 32 of City Code for additional information.

## **9.4 Stubs For Street Extension**

Stubs for street extension are required where a street connection is necessary to serve adjacent properties that may develop at a future date. When a dead-end street is required and it serves more than four lots, a temporary cul-de-sac with a 45' radius should be provided.

\* See Subdivision Ordinance, Chapter 32 of City Code for additional information.

## **9.5 Knuckles**

Knuckles are areas on the roadway expanded to provide a turn-around and additional access or lot frontage on residential collector and local streets. Knuckles are required at intersections where each street extends in only one direction from the intersection.

Radii for knuckles are shown in COP Design Standards Guideline DG1006.

Sidewalk ramps are not required however, if they are provided they should be in accordance with Standard Detail P1242. Ramps should be provided if there are amenities on either side of the “elbow”.

## **9.6 Eyebrows**

Eyebrows are permitted between intersections to improve accessibility to odd-shaped sites. The design of a Eyebrow should be in accordance with plans approved by the City Of Phoenix Development Services Department.

## **9.7 Horizontal Alignment**

1. When tangent centerlines deflect from one and other more than ten degrees and less than seventy-five degrees, or greater than one hundred and five degrees, they shall be connected by a curve with a minimum centerline radius of five hundred feet for collector streets, or one hundred feet for local streets.
2. Between reverse curves on arterial and collector streets, there should be a tangent section of centerline not less than one hundred fifty feet long.
3. Local and collector streets intersecting an arterial route should do so at a ninety degree angle; intersections of local street should not vary from ninety degrees by more than fifteen degrees.

4. Local and collector street jogs with centerline offsets of less than one hundred and twenty-five feet should be avoided except under special circumstances. Minimum 350 foot centerline offsets are to be provided along arterial streets where left turn storage will conflict with existing intersections or major driveways.
5. Local streets intersecting a collector or arterial street should have a tangent section of centerline at least one hundred fifty feet in length measured from the right-of-way line of the major street; except that no such tangent is required when the local street curve has a centerline radius greater than four hundred feet with the center located on the major street right-of-way line.
6. Street intersections with more than four legs and y-type intersections, at which legs meet at acute angles, should be avoided.

\* See Subdivision Ordinance, Chapter 32 of City Code for additional information.

## **CHAPTER 10 - BIKEWAYS**

### **10.1 Introduction**

#### **10.1.1 Philosophy of Bikeway Planning and Design**

The City of Phoenix is committed to providing an extensive, connected, and functional bikeway system. The primary purpose of the bikeway system is to provide an alternate means of personal mobility and access to varied destinations. Bicycle transportation can be used for professional/commuting, social/recreational, or fitness/health purposes. Facilitating this alternative to the SOV by providing a bicycle-friendly city can:

- Replace the use of cars for many short trips
- Help reduce traffic congestion, air pollution, & demand for parking
- Benefit those who cannot drive or cannot afford a car
- Provide healthy recreation for families & all ages
- Help maintain Phoenix as a livable city with an outdoor lifestyle

Planning for bicycle transportation should be approached as any conventional transportation planning where the same factors of access, convenience, safety, cost, efficiency, travel demand, connections, and engineering considerations all apply. Unlike motor vehicle drivers bicyclists range from young children to the elderly, and individual cyclists present a broad cross-section of needs and skill levels. Different types of facilities need to be designed and provided to accommodate this wide user demographic and their various purposes for making trips.

#### **10.1.2 Components of Bikeway System**

On-street bike lanes are an integral section of a roadway which is marked for exclusive bicycle use. On-street bike lanes are always one-way. Bike routes may include shared streets, bike lanes, shared-use paths or multiuse trails, in any combination. Routes may be designated by signing or by placement on a map. Bikeways can be any combination of shared-streets, bike lanes, bike routes, shared-use paths or multi-use trails, and can be designated by signing, mapping, or consistent public use.

Grade-Separated Crossings are underpasses or overpasses, which serve to isolate motorized and non-motorized traffic from each other at points of intersections. Shared-use paths are paved pathways set aside for the exclusive use of human-powered travel. They are clearly separate from the road infrastructure. Paths are shared with skaters and pedestrians. In general, shared-use paths are intended for two-way traffic. Multi-use trails are made from stabilized, decomposed granite. These trails are open to equestrian, bicycle and pedestrian travel. Not all streets have a designated bicycle travel facility, but they are open to bicycles. This includes all public streets, unless specifically posted to prohibit cyclists. While the suitability of particular streets will vary - often according to the skills and preferences of the individual cyclist- the basic street grid will always provide the major foundation for bicycle travel.

### **10.1.3 Documents and References**

The following publications or their current revisions are to be referenced in conjunction with the design criteria in this book when designing bicycle or shared use paths for the City of Phoenix:

- American Association of State Highway & Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities. (New edition in 1999)
- Manual of Uniform Traffic Control Devices (MUTCD) Part 9 with Arizona revisions
- Maricopa Association of Governments Regional Bicycle Plan
- Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction
- City of Phoenix Supplement to MAG Uniform Standard Specifications
- City of Phoenix Planned Bikeway System (1987)
- City of Phoenix Trails Master Plan

## **10.2 Planning**

### **10.2.1 Location**

Providing facilities for both on- and off-street types of bikeways is not always practical but is to be encouraged, as that will accommodate the widest possible range of users, purposes, and trip destinations.

### **10.2.2 Facility Selection: On-Street**

Bike Lanes are the most desirable facility for any street with a classification of minor collector or higher. For these streets with higher volumes of traffic, the classification of a street will determine its cross-section. Parkways, major arterials, minor arterials, major collectors, minor collectors, and certain special neighborhood and rural streets have standard cross-sections that include bicycle lanes. Bike lanes would, therefore, be included on these streets whenever they are built or reconstructed as long as parking along single family homes can be accommodated along collector or neighborhood streets. These cross-sections are given in the City of Phoenix Supplement to MAG Uniform Standard Specifications. For streets that are needed to provide a connection for local or regional bikeway systems, but where a full cross-section with bicycle lanes cannot be accommodated, the following measures should be considered: (Listed starting with the most desirable.)

- Edge line stripe with bike route signs
- Bike route signs with no edge stripe

### **10.2.3 Facility Selection: Off-Street**

In planning for off-street shared-use paths and multi-use trails, the following hierarchy should apply, starting with the most desirable:

- Ten (10) or twelve (12) foot path/trail, well separated from streets, and in a natural setting
- Ten (10) or twelve (12) foot path/trail, set off from the street by at least eight (8) feet of landscaping for arterials and five (5) feet for collectors
- Ten (10) or twelve (12) foot path/trail protected from the street

Connections between different types of facilities can be very important to insure an efficient and functional system. In places, shared-use paths and multi-use trails may be used to connect sections of roadways that would otherwise dead-end. However, it is critical not to attempt to substitute a path or a sidewalk where bike lanes are warranted. Bike lanes allow direct, higher-speed travel for cyclists, unimpeded by pedestrians. Bike lanes are also one-way, going with the adjacent traffic. Paths are typically two-way; so designing a path to connect with bike lanes would require careful study and design. Bicyclist may end up riding the wrong way (against traffic) in one of the bike lanes, which is against state law.



Opportunities to provide bicycle access may occur in conjunction with public or private development, greenbelts, canal banks, flood control projects, vista corridors, or anyplace with available open space or right-of-way. It is the intention of Phoenix's bicycle planning efforts to remain flexible and open to new opportunities.

#### **10.2.4 Easements, Dedications and Abandonments**

In the case of on-street facilities, the bike lane or route is typically located within the street right-of-way (ROW). Sometimes on-street facilities may need to be connected with short sections of paved path. An example of this would be cul-de-sacs that have only one direct access to the public street system. Sometimes the cul-de-sac street can be connected to allow bicycle and foot access to reach adjacent streets, paths, trails, or property. If a private, gated community will cut off functional access for cyclists, means should be explored to maintain a public use easement on the streets and through the gates for pedestrians and cyclists.

For off-street paths/trails, ROW may need to be obtained from development stipulations, or purchased. Any easements or dedications for paths should include a clear statement of maintenance responsibilities: for the actual concrete path, any adjacent landscaping or lighting, and for maintaining proper grades and drainage along the path. Dedication of right-of-way or of public use easements for paths must be noted in the stipulations and on the site plan. This should occur in the Project Review process for new developments. If the classification of an existing or planned street is proposed to be changed, or a street easement or ROW proposed for abandonment, present and potential pedestrian and cyclist connections should be reviewed. The proposed change shall be evaluated against the needs of the bicycle program. If needed, some of bicycle and/or foot access, such as a public use easement, should be obtained.

### **10.3 Facility Design**

#### **10.3.1 General Comment**

While every effort has been made to ensure the accuracy and completeness of these guidelines, the City of Phoenix shall not be held responsible for any errors or omissions. It shall be the sole responsibility of the design engineer to ensure a proper design and the accuracy and completeness of construction documents containing their signature.

### **10.3.2 Shared Streets and Bike Routes**

It should be assumed that cyclists will ride on all streets, unless such use is expressly prohibited and posted. Many neighborhood streets function quite well as bikeways with no additional signing or marking. If these streets are needed to complete some part of the bikeway system, or to provide a connection for cyclists, the street may be designated by signs or on a map. Since cyclists will tend to use the right side of the outside lane, this area should always be built and maintained to accommodate that use. Drainage grates should be designed and installed in a manner that will not trap wheels. Longitudinal cracks, potholes, rough paving, etc. should be eliminated.

### **10.3.3 On-Street Bike Lanes**

Streets such as arterials, collectors, and certain neighborhood streets have cross-sections that include bicycle lanes. These cross-sections are in the City of Phoenix Supplement to MAG Uniform Standard Specifications. City of Phoenix bike lanes should be a minimum of four (4) feet of asphalt from the center of the lane stripe to the edge of the concrete gutter pan. A solid six-inch white stripe is used to mark the bike lane. An alternative method is to combine the lane and gutter pan as one concrete strip. In these cases it is desirable to exceed the four-foot minimum, as measured to the face of the vertical curb. Current typical bike lane widths are 6' from face of curb, 4' from edge of asphalt.

Bridges, tunnels, or any grade separation structure, should allow the full width of the physical improvements including standard bike lanes. Also note that most surface streets, even without designated bike lanes or shoulders, usually allow for some "shy distance" or permit an emergency move off the road. Bridges and tunnels with solid barriers alongside often become dangerous constriction points for bicycle travel. Therefore consideration should be given to maintaining extra width on bridges and in tunnels even if the street does not have bike lanes.

In rural areas, a paved shoulder can serve the function of a bike lane, in which case it should have a minimum of five (5) feet of paving. A bicycle lane can also be delineated with striping between an area for parallel parking and a traffic lane. In this case, the bicycle lane should be at least five (5) feet.

Parking should not be allowed in marked bicycle lanes. Raised pavement markers or curbing should not be used to delineate bike lanes.

For additional information concerning bike lanes and routes not covered in this manual, please refer to the AASHTO Guide for the Development of Bicycle Facilities, 1999.

### 10.3.4 Shared-Use Paths / Multi-Use Trails

City of Phoenix Standard Details for shared-use paths / multi-use trails are found in City of Phoenix Supplement to MAG Uniform Standard Specifications, section 429 and details P1130 and P1131

For additional information not covered in this manual, please refer to the AASHTO Guide for the Development of Bicycle Facilities. (For example, this guide provides information on minimum radii for curves, grades, sight distances, and stopping sight distances under various conditions.)

City of Phoenix shared-use paths shall have a(n):

- Minimum design speed of 20 mph.
- Typical width of ten (10) feet with a two-foot shoulder on each side.
- Width of eight (8) feet where paths can be paired so each can have one-way travel.
- Width of twelve (12) feet where heavy use is expected, especially with a high percentage of pedestrians/skaters.
- Medium broom finish on the surface. It is desirable to provide traction, but not to a degree that impedes skaters
- Material for the shoulders should allow for recovery if a user runs off the path. Substances such as turf, decomposed granite, exposed aggregate, or very low shrubs/grasses are appropriate. No spiny/thorny plants.
- An area clear of fixed objects such as poles or tree trunks for another three feet beyond the shoulder is desirable.
- Where needed, fences or railings for paths or bikeways should be 54 inches in height and be flared at the ends.
- Vertical clearance of eight feet over the path and shoulder areas.
- Grades of five percent or less. Where this is not feasible, refer to the AASHTO Guidelines. Maximum side slope is two (2) percent. Maximum cross-slope is two (2) percent.
- Alignment which is as linear as possible. Avoid compound curves. Unnecessary “meandering” reduces the effective width of the path, can create sight distance problems, and increases possibility of users running off the path.
- Adjacent grades should always direct water away from the path surface.
- Provision in tunnels to keep nuisance water off the path, and allow the water to rapidly drain or be removed. One solution is a small channel constructed with a sloping side, built on one side of the tunnel. Sump pumps are needed in areas prone to flooding.
- Lighted tunnels

- Path ramp design where the pan for any curb ramp shall be as wide as the path. The ramp should be aligned with the path, and not require users to make sudden swerves, or to be directed towards oncoming traffic.

**City of Phoenix multi-use trails shall have a(n):**

- Typical width of ten (10) feet with a two-foot shoulder on each side. No shoulder is required when trail is located in turf, curbs will be substituted in this condition.
- Width of eight (8) feet where paths can be paired so each can have one-way travel.
- Width of twelve (12) feet where heavy use is expected, especially with a high percentage of pedestrians/skaters.
- No spiny/thorny plants within ten (10) feet of the trail.
- An area clear of fixed objects such as poles or tree trunks for another three (3) feet beyond the shoulder is required.
- Where needed, fences or railings for paths or bikeways should be 54 inches in height and be flared at the ends.
- Vertical clearance of ten feet over the path and shoulder areas.
- Grades of five percent or less. Where this is not feasible, refer to the AASHTO Guidelines. Maximum side slope is two (2) percent. Maximum cross-slope is two (2) percent.
- Alignment which is as linear as possible. Avoid compound curves. Unnecessary “meandering” reduces the effective width of the path, can create sight distance problems, and increases possibility of users running off the path.
- Adjacent grades should always direct water away from the path surface.
- Provision in tunnels to keep nuisance water off the path, and allow the water to rapidly drain or be removed. One solution is a small channel constructed with a sloping side, built on one side of the tunnel. Sump pumps are needed in areas prone to flooding.
- Lighted tunnels
- Path ramp design where the pan for any curb ramp shall be as wide as the path. The ramp should be aligned with the path, and not require users to make sudden swerves, or to be directed towards oncoming traffic.

**10.3.5 Other Special Conditions**

Every attempt should be made to avoid having a path adjacent to a street. If this is unavoidable, try to achieve a separation of at least eight (8) feet, with landscaping on arterial streets and at least five (5) feet for collector streets.

Grade-separated crossings, either over or underpasses, for path/street intersections are desirable, where feasible. However, the majority of these crossings will be at-grade. Certain design practices can greatly improve these at-grade crossings, whether or not they are mid-block, controlled intersections, or driveway exits. Some practices found helpful are making the crossing a contrasting material, striping each side of the crossing, keeping median bullnoses out of the path, or elevating the path on a speed table.

### **10.3.6 Riding Surfaces**

Drain grates can be a potential problem for bicycle wheels. Careful attention should be paid to the choice and installation of drain covers. There are MAG and City of Phoenix Standards that are applicable. Gaps between the grate and its frame should not exceed ¼ inch.

Paving for bike lanes should meet MAG standards for surface smoothness of asphalt paving. Rumble strips, raised pavement markers (rpms), or raised curbs should not be used to delineate bike lanes, shared-use paths, or in bikeway crossings. Multi-use paths will have a medium broom finish. The width of expansion joints should be minimized, and the joints tooled with a small radius.

## **10.4 Traffic Controls**

### **10.4.1 Signs and Markings**

Traffic control devices for cyclists, whether they are for an on- or off-street system, must adhere to the same five (5) basic requirements as for motorists: Fulfill a need, command attention, convey a clear, simple meaning, command respect from users, and give adequate time for a proper response.

The use of colors should conform to code specifications for signs and markings: Yellow – General Warning, Red – Stop or Prohibition, Blue – Service Guidance, Brown – Recreation, Black – Regulation, White – Regulation.

All regulatory, warning and route marker signs shall be provided in accordance with the standards in the Manual on Uniform Traffic Control Devices, Part 9. In addition, the City of Phoenix has developed some signs for particular situations.

Signing and marking for bike lanes is shown in Figure 6.5. Additional information is in the AASHTO Guidelines.

For bike lanes, markings will consist of a bike or bike rider symbol. In urban areas, pavement markings will be placed at about ¼ mile intervals. In rural areas, the distance may change as judged appropriate by the City of Phoenix Street Transportation Department.

Where a bike lane continues past the left side of a right-turn-only lane, bike symbols should be placed in that continuation. On leaving an intersection, the lane stripe should start at the crosswalk or where the crosswalk would be. Approaching an intersection the stripe should be dropped about 50 feet before the intersection, unless the elimination of the bike lane will allow for a second approach lane where it will be dropped about 200 feet in advance.

#### **10.4.2 Detours and Construction**

##### **Public information:**

Any signage, publication, map, web posting, public service announcement, or other information dealing with any construction closure, restriction, or change, should include any expected effects on cyclist or pedestrian movements. This includes, but is not limited to, changes in the operation of sidewalks, multi-use paths, bike lanes, or any other bikeways.

Ideally, detours would be found or built, and will be signed by the contractor. Bikeway detours should only be used when the same type of facility can be provided, e.g., a bike lane directed to other lanes or shoulders, or to a suitable shared street. Path detours should be directed to another path or suitable sidewalk, not to an on-street facility.

**Shared Streets, Bike Lanes, Shared-Use Paths and Multi-Use Trails:**  
If a bike lane is closed, it will be signed “Bike Lane Closed” and also signed “Bikes on Roadway” for the portion where cyclists will be forced to use the traffic lane. This applies to shoulders with high bicycle use, as well as cases where the work is confined to the bicycle lane.

If the traffic lanes are narrowed for construction detours, so that a car and bicycle cannot be accommodated side-by-side, then cyclists and motorists should be directed as above. Special attention needs to be paid to construction in the bike lane or shoulder areas. Proper signing and barricading, with lights for night warning, is still required. Irregular surfaces, such as raised metal plates on shoulders or hoses laid across paths, must always be well barricaded.

Signing and barricading should anticipate night use and speeds up to 25 mph. Barricades and signs should be posted at points where people are able to choose an alternate route. When not in use, barricades, signs, etc., can not be placed or stored in bike lanes or on shoulders, paths or sidewalks. Bike lanes/shoulders shall always be restored to a good paving condition. MAG Standard 321.5.4, Asphalt Base and Surface Course, should apply.

## **10.5 Maintenance**

On-Street Bikeways will be maintained by Street Maintenance Division as part of the regular street sweeping and maintenance. Special attention should be given to drain grates, utility covers, and any surface irregularities. Off-Street Bikeways responsibility for the maintenance of a new path should be determined at the time of dedication or purchase or granting of easement. A copy of the agreement should be kept by the Parks and Recreation, Street Transportation and Finance (Risk Management & Real Estate) Departments.

Maintenance should include:

- Sweeping
- Removal of all dirt, graffiti, and pasted material
- Displaying warning signs when water is present or flooding imminent
- Clean-up after flooding
- Litter pick up
- Manual or chemical removal of weeds
- Pruning of trees/shrubs to maintain adequate clearances.
- Periodic removal of silt to maintain low flow channels away from path
- Re-striping of bike lanes when needed
- Restabilization of trail surface when needed

## CHAPTER 11 - TRANSIT

### 11.1 Bus Bays

The standard bus stop spacing is every 2 blocks. Stops may be more frequent through areas of higher intensity land uses and where special circumstances warrant this spacing. The standard bus stop location is at the far side of an intersection. Bus bays should be constructed at all arterial – arterial intersections upon new development or new Arterial Street paving projects.

The following policies have been established for bus bays:

- Bus bays should be constructed at the far side of arterial – arterial street intersections unless special circumstances require a near-side bus bay.
- Bus bays may be constructed at high volume bus stops, as approved by the Public Transit Department.
- All bus bays shall be constructed using the latest City of Phoenix Standard Details.
- Mid-block style bus bays should be constructed at mid-block bus stops and at arterial / arterial street intersections.
- Far side bus bays are discouraged and should only be constructed on arterial streets with street widths designed at cross-section “C”, “CM”, or “D” with the approval of the Street Transportation Department.

### 11.2 Bus Rapid Transit

If construction projects are adjacent to the Bus Rapid Transit (BRT) Route special provisions and procedures may be necessary. For more information contact Regional Public Transit Authority at (602) 262-7433. For a map of bus routes consult the website:

<http://www.valleymetro.org/Transit/05bbk/BusSchedules.html>.

### 11.3 Light Rail

The light rail system in Phoenix, **Figure 11.1** (Central Phoenix/East Valley starter segment) will run entirely in the street. Therefore, special roadway design considerations must be made to preserve traffic operations for this segment and all future light rail extensions.



The following design considerations must be made throughout all Phoenix light rail corridors:

- Curb returns and driveways must be designed to minimize large truck and bus turning movement encroachments onto the guideway curb and trackway, where applicable. Fences, signs, poles, etc. must be set back far enough to minimize large vehicle maneuvers onto the trackway area. A truck turning analysis may be required to demonstrate safe maneuvers into and out of driveways.
- New or modified traffic signals must be approved by the city of Phoenix Street Transportation Director and the Valley Metro Rail Director of Design and Construction, or their designees.
- Vehicular access will not be allowed across the trackway except at traffic signal locations. Non-signalized driveways and cross-streets will be right-in/right-out and will not cross the rail line.
- As a general rule, pedestrian access across the trackway will only be permitted at traffic signals. Crosswalks across the rail line will not be installed unless there is a signal or some other crossing method approved by the Streets Department and Valley Metro Rail.
- All new utility crossings under or over the trackway must be approved by Valley Metro Rail. Only Valley Metro Rail personnel (or other personnel authorized by Valley Metro Rail) are allowed to work in the trackway area.
- Developments within ¼-mile of the light rail alignment may be within the transit-oriented development (TOD) overlay area (**Figures 11.2-11.9**). The TOD ordinance establishes prohibited uses and design standards such as build-to lines, wider sidewalks, shading requirements, parking minimums, etc. The developer should consult with the Planning Department Zoning Office at (602) 495-0251 for more information.
- Drainage features along the light rail alignment should be coordinated with the Street Transportation Department Drainage Section and consistent with the drainage reports submitted for the light rail project.
- Appropriate building setbacks should be established to minimize future disruptions to new developments along future light rail alignments. It is advisable to consult with the Valley Metro Rail Planning Director before proceeding with development plans along the light rail alignment.

- Opportunities for joint-use development between the City of Phoenix, Valley Metro Rail and private developers will be evaluated for compatibility with transit use goals and community needs. These types of developments are coordinated by the city of Phoenix Downtown Development Office.
- All new development should be compatible with Valley Metro Rail's Final Environmental Impact Statement and other design and construction documents.

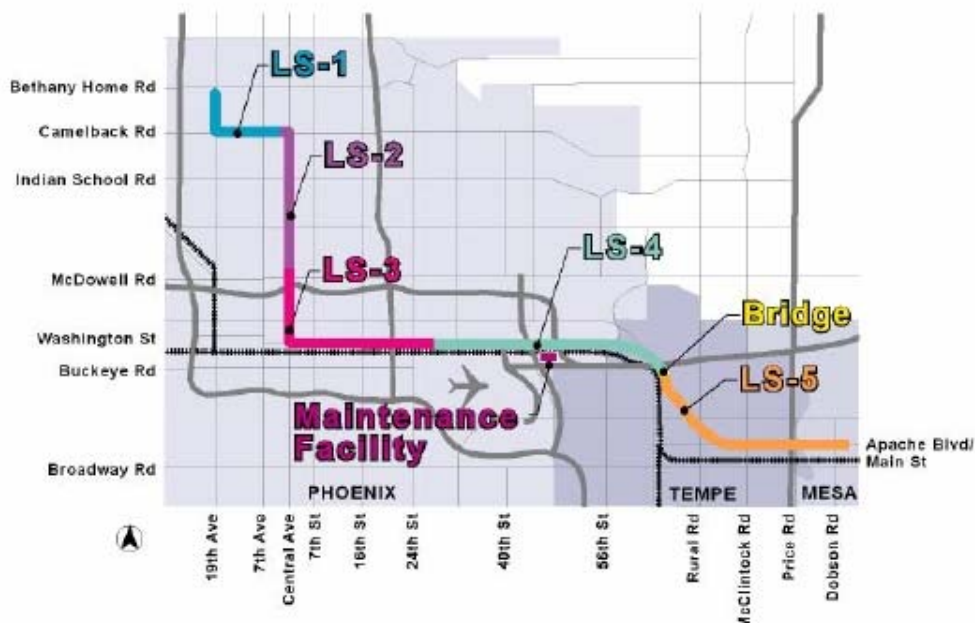
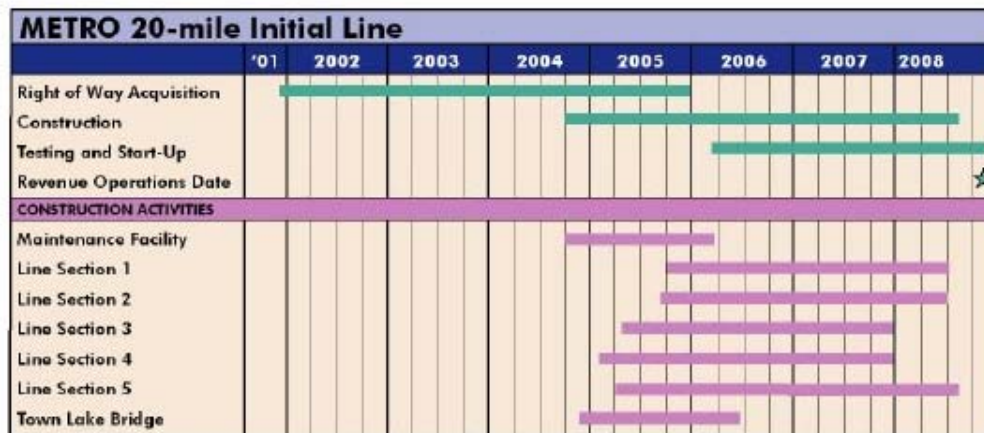
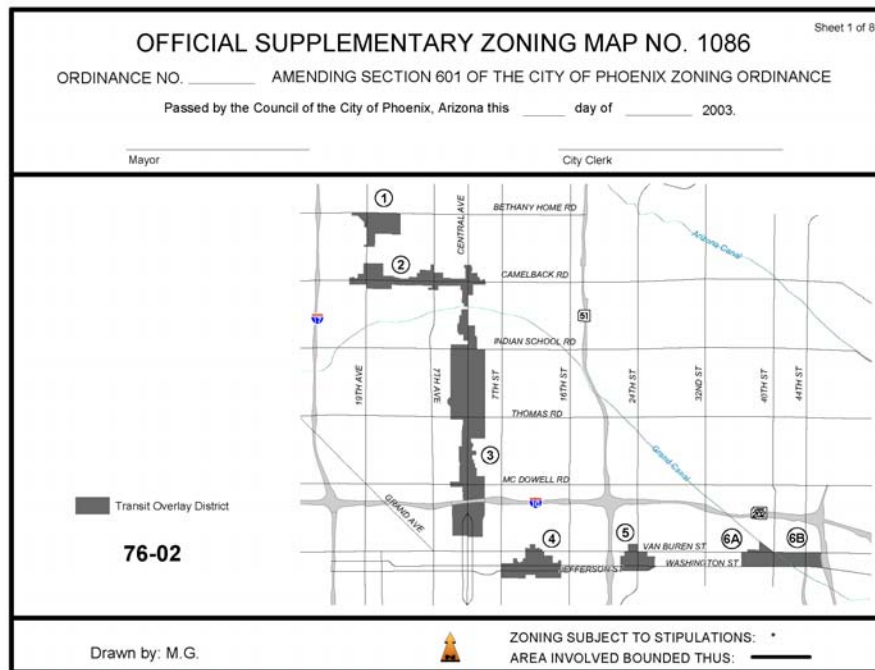
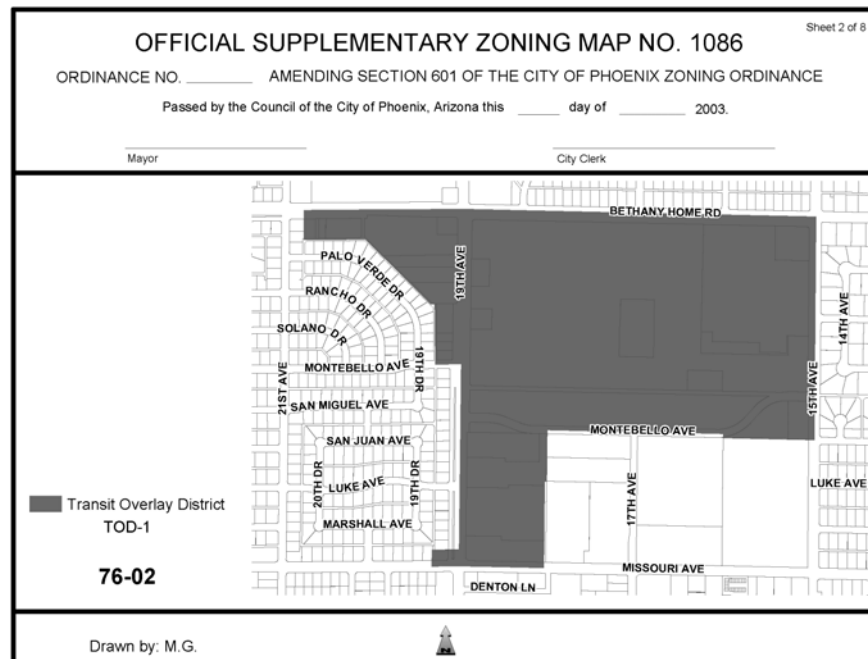


Figure 11.1

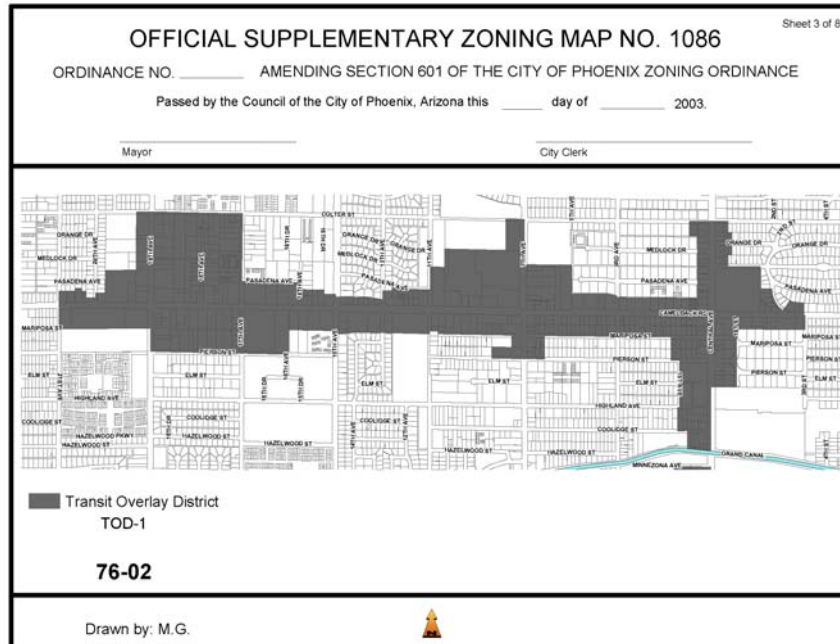
## Light Rail Transit System



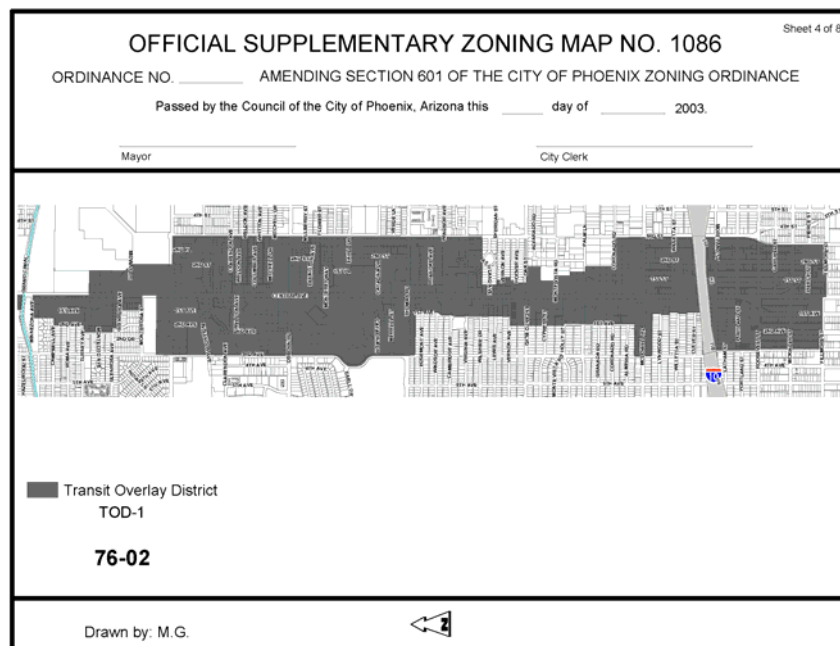
**Figure 11.2**  
**Transit Overlay District**



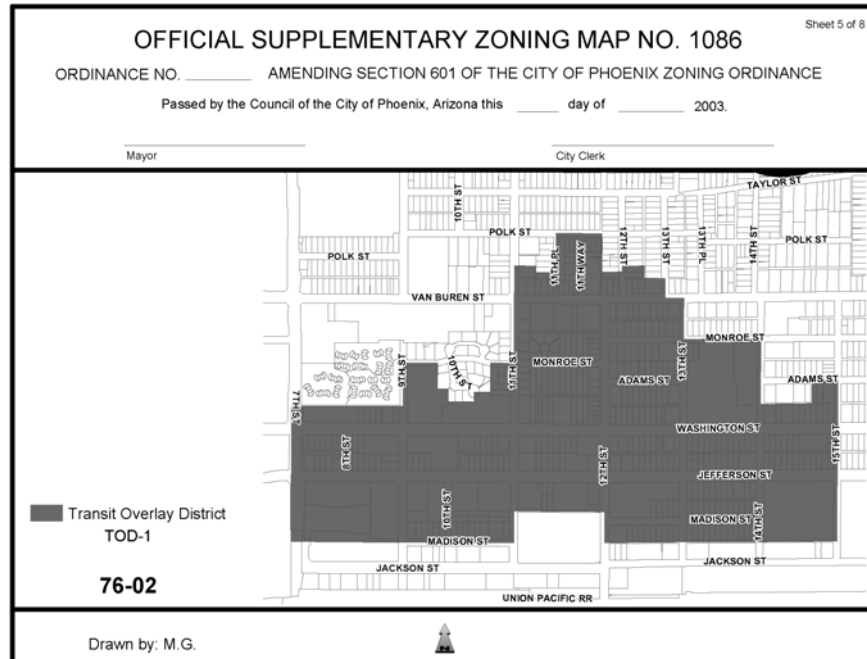
**Figure 11.3**  
**Transit Overlay District**



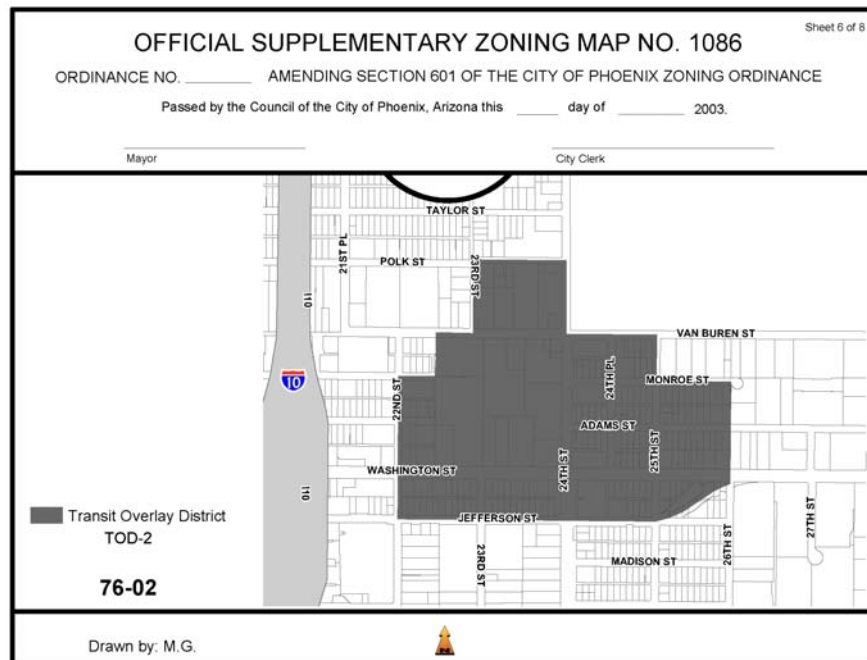
**Figure 11.4**  
**Transit Overlay District**



**Figure 11.5**  
**Transit Overlay District**



**Figure 11.6**  
**Transit Overlay District**



**Figure 11.7**  
**Transit Overlay District**



## **CHAPTER 12 - SPECIAL PROCEDURES AND FORMS**

The following special procedures and forms are to be submitted to the City of Phoenix to comply with current Federal, State, County and local rules and regulations.

### **12.1 Special Procedures**

#### **12.1.1 MAG Transportation Improvement Program**

The MAG Transportation Improvement Program (TIP) is a federally mandated program that evaluates the impacts of new roadways on the air quality in Maricopa County. The MAG TIP form shall be completed by the developer or his agent if any arterial streets are planned for improvement within two years in conjunction with a private development project.

A roadway should be submitted to the City of Phoenix if it is:

1. Classified as an arterial street on the City's Street Classification Map.
2. Adds one or more through-traffic lane(s) on an existing arterial street.
3. Or constructs a new arterial street where there was none before.

The cut-off submittal date to place a roadway in the MAG TIP for the following fiscal year is January 1<sup>st</sup>. Failure to properly place a road segment in the MAG TIP could result in an injunction against a development.

A copy of the MAG TIP form is included in 12.2.1.

Please submit MAG TIP forms to:  
Mr. Alan Hilty  
City of Phoenix  
Street Transportation Department, 5<sup>th</sup> Floor  
200 West Washington Street  
Phoenix, Arizona, 85003.

## **12.1.2 Traffic Impact Studies**

### **12.1.2.1 Guidelines**

#### **1.0 Introduction**

This document has been established to provide uniform guidelines for preparing Traffic Impact Studies (TIS) for new developments or additions to existing developments within the City of Phoenix. The guidelines are important for insuring that proper procedures and relevant details are included in the Traffic Impact Study resulting in an informative and useful study. Traffic Impact Studies provide the developer, consultant, City Council and city staff with the information necessary to provide a balance between land use and transportation infrastructure.

Consultants are requested to review this document. It is strongly recommended that consultants meet with the Street Transportation staff prior to the preparation of a TIS to discuss concerns unique to their development and to determine the scope of the study. By meeting with Street Transportation staff, issues are addressed early resulting in a quicker approval process.

A Traffic Impact Study must obtain approval from the Street Transportation Department before zoning can vest. With Planned Community Districts (PCD), a Traffic Impact Study must be submitted before the design of a Master Street Plan.

The purpose of a Traffic Impact Study is to evaluate the impact of a proposed development on the surrounding transportation system. Based on the information provided in the Traffic Impact Study, city staff determines the adequacy of the existing or planned transportation improvements. City staff will stipulate that certain items be the responsibility of the developer as a condition of development approval. Such items include additional right-of-way, street improvements, traffic signals, or transportation demand management programs that are necessary to mitigate transportation deficiencies adjacent to or on the proposed development site.

#### **2.0 Factors Warranting a Traffic Impact Study**

*A Traffic Impact Study is typically required when a proposed development generates more than 5,000 vehicle trips per day or more than 500 vehicle trips during either the morning or afternoon peak hour.*



The applicant/developer should contact the Street Transportation Department to schedule a TIS Pre-Submittal meeting.

A, TIS may also be required for one or more of the following reasons:

1. The existence of a traffic problem or concern in the local area such as severe existing congestion, an offset intersection, high accident rate, or poor site access.
2. The sensitivity of the adjacent neighborhoods or other areas where the public may perceive and adverse traffic impact.
3. Any other specific problems or concerns that may be aggravated by the proposed development.

*For developments with proposed commercial lots expected to generate 5,000 vehicle trips per day or more than 500 vehicle trips during either the morning or afternoon peak hour, an onsite circulation plan and parking analysis is required.*

### **3.0 Traffic Impact Study Content and Scope**

The following must be included in the Traffic Impact Study (not necessarily in this format or order):

#### **3.1 Introduction**

Describe the reason for the TIS, identify the project, and state its location.

#### **3.2 Description of Proposed Development**

Mention all available information such as location, land use, size, density, phasing, expected build-out year, access points, hours of operation, peak periods and existing land use.

#### **3.3 Study Area**

The study intersections and streets should be listed in the report. The size of the study area is based on the number of peak hour trips generated by a proposed development. The following criteria are used to determine the limits of the study area:

Single Phase Development < 500 peak hour trips	All Site Access Drives  Signalized and/or Potential Signalized Intersections Adjacent to development
Single Phase Development 500 >= peak hour trips <=1000	All Site Access Drives  Signalized and/or Potential Signalized Intersections within ¼ mile of Development
Single Phase Development peak hour trips >1000	All Site Access Drives  Signalized and/or Potential Signalized Intersections within ½ mile of Development
Multi-Phase Developments (such as PCDs)	Determined by the Street Transportation Department based on project size, location and surrounding traffic conditions. Typically, one (1) mile of the proposed development is analyzed.

### **3.4 Description of Surrounding Land Use**

Mention the existing and proposed land uses surrounding the proposed development and any anticipated transportation connections between the developments.

### **3.5 Description of Surrounding Transportation System**

Describe the existing streets, intersections, transit, bike and pedestrian facilities. Include information such as street classification, lane configuration and number, posted speed limits, offset intersections, existing traffic control, existing signal timing, and existing driveways across from or adjacent to the site. Also include information regarding planned improvements in the area that are not part of the proposed development.

### **3.6 Existing Traffic Counts**

State when, where, and how counts were collected and include them in the Appendix.

- All data shall be collected in accordance with latest edition of the *ITE Manual of Traffic Engineering Studies* or as directed by the Street Transportation Department.
- The data used in the study should have been collected within the past 2 years.
- Adjust counts for average conditions due to seasonal differences when necessary.
- Existing daily traffic volumes may be obtained from the Street Transportation Department's 'Average Weekday Traffic Flow' map or from our Traffic Count Section.
- The directional split should be based on existing conditions. In the case where existing peak traffic is not available, a 60/40 split should be used.
- The peak factor (k) should be based on existing conditions. If traffic data are not available, seven (7) percent of daily traffic should be used for the morning peak hour and eight (8) percent for the evening peak hour.

### **3.7 Analysis Time Periods and Study Horizon Years**

The report should mention the peak hours of the existing traffic counts, expected peak hours of the proposed development, and the time periods that will be analyzed in the study such as weekday morning peak, weekday afternoon peak, and weekday daily. Typically, morning and afternoon peak hours are analyzed except when:

- The proposed development is expected to generate no trips or few trips during either the morning or afternoon peak hours, then the requirement to analyze one or both of these peak hours may be waived by the Street Transportation Department.
- The peak hour traffic in the study area or for the proposed development occurs during a different time period than the normal morning or afternoon peak hours (for example, midday) or occurs on a weekend. In this case, additional peak hours may need to be analyzed.

**The study horizon year(s) is based on the number of peak hour trips. The following criteria are used for determining the horizon year(s):**

Single Phase Development < 1000 peak hour trips	Build-out Year Only
Single Phase Development peak hour trips $\geq 1000$	Build-out Year Five (5) Years after Build-out Year
Multi-Phase Developments (such as PCDs)	Determined by the Street Transportation Department based on project size, location and surrounding traffic conditions. Typically, each major phase of development is analyzed along with a 20-year projection after opening year.

### **3.8 Proposed Development – Trip Generation**

The latest edition of the *ITE Trip Generation* report is typically used for estimating trip generation. Other data may be used with the approval of the Street Transportation Department in the following cases:

- *ITE Trip Generation* does not include data for specific land use category.
- Only limited data are available in *ITE Trip Generation* for land use category.
- Local trip data differ from *ITE Trip Generation* rates or it is expected that the proposed development will generate trips different from *ITE Trip Generation*.

Each component of land use must be identified by the ITE land use code and variable (when applicable), size, and trip generation. The estimated trip generation must be shown for each analysis time period. Show trip reductions separately from the “raw” trip generation.

### **3.9 Proposed Development – Trip Reductions for Pass-by and/or Internal Trips**

The following trip reductions, if appropriate, may be applied subject to approval by the Street Transportation Department:

- A maximum of 15 percent may be applied for internal trips within a mixed-use development. The mixed-use must demonstrate trip interaction between office, residential and/or retail components.
- Reductions for pass-by or diverted trips may be based on ITE data or documentation of similar case in type and location.

### **3.10 Proposed Development – Mode Split**

If a mode other than vehicular travel is expected to be significant, the Street Transportation Department must approve assumptions and any reductions applied to vehicular traffic.

### **3.11 Proposed Development – Distribution**

Depending on the development, trip distribution may be based on employment and population data, surrounding land use, size of development, data collection at similar land use, planning model, and existing traffic counts. Also important is the location and accessibility of the site. Specific assumptions and data sources used for estimating trip distribution must be documented in the study.

### **3.12 Proposed Development – Assignment**

Figures must be prepared showing only the generated trips from the proposed development added to the street system. The trips should be shown for each analysis time period and horizon year (if separate phasing is expected).

### **3.13 Off-Site Future Traffic**

If a future horizon year is included in the study, the method for estimating the future traffic volumes must be documented. Depending on the proposed development and its location, growth rates, Maricopa Association of Governments (MAG) projections, and/or other traffic studies in the area may be used.

If the proposed site is surrounded by future developments or developable land, the Street Transportation Department may require that these developments be considered when estimating future traffic volumes.

**3.14 Analysis Scenarios**

The different scenarios (horizon years) analyzed in the report must be described in the study such as 'Existing Traffic Volumes + Site Phase 1 Traffic Volumes' and 'Year 2005 Traffic Volumes + Site Full Build-out Traffic Volumes'. Figures showing the total traffic volumes for each scenario and analysis time period must be included.

**3.15 Daily Traffic Volumes**

A discussion of the existing and projected daily traffic volumes should be included in relation to the existing and proposed street cross sections. This information assists in decisions regarding interim improvements and the adequacy of the 'Street Classification Map'.

**3.16 Level-of-Service Analysis**

Level-of-Service (LOS) analyses must be performed for the analysis time periods for each study intersection and site access in accordance with the latest edition of the *Highway Capacity Manual*. Each analysis scenario (horizon year) should be analyzed with and without recommended improvements. The level-of-service calculations must be included in the Appendix.

Typically, Level-of-Service 'D' is the minimum acceptable LOS at both signalized and unsignalized intersections during the peak hours. LOS 'D' may be achieved by increasing intersection capacity and/or reducing vehicular traffic demand. A LOS worse than 'D' may be accepted during the peak hours within the most densely developed sections of Phoenix with the approval of the Street Transportation Department.

**3.17 Traffic Signal Needs**

Traffic signals are only accepted when they are located to provide efficient progression. Typical spacing is at ½ mile intervals. In unique situations, the Street Transportation Department may approve signals at other spacing.

Traffic signals may only be installed when they satisfy warrants in the *Manual of Uniform Traffic Control Devices* and are approved by the Street Transportation Department. The applicant is responsible for the cost of traffic signal installations warranted by their development.

**3.18 Auxiliary Turn Lanes**

Based on anticipated traffic volumes, level-of-service, speed limits, and street cross sections, the need for right-turn and left-turn lanes at the site accesses and study intersections must be determined. Recommended storage lengths should also be included.

### **3.19 Additional Analyses**

When applicable and/or requested by the Street Transportation Department, additional traffic analyses should be included in the study such as queuing, gap, accident and speed. For large commercial developments, an internal circulation and parking study are also required.

### **3.20 Safety Concerns**

Discuss the following when applicable:

- Accident data
- Sight distance
- Alignment between driveways/streets with other driveways/streets
- Distance between intersections/driveways
- Speed
- Pedestrians and bicycles
- Bus stops

### **3.21 Improvement Analysis**

The anticipated results of any proposed or planned transportation improvements must be given in the study. The consultant may also recommend changes to planned improvements that may result in improved operating characteristics of the transportation system.

### **3.22 Conclusions and Recommendations**

Recommend improvements for safe and efficient operation of the transportation system such as:

- Street/intersection/driveway geometrics and alignment
- Auxiliary turn lanes
- Traffic control devices-signal or unsignalized
- Traffic signal operation such as timing and coordination
- Pedestrian and bicycle safety
- Traffic mitigation measures

## **4.0 Required Figures**

**Site Location** – Area map showing site location and area of influence

**Conceptual Plan of Proposed Development** – detailed figure showing conceptual plan of proposed development including access points, circulation, and land use components.

**Surrounding Transportation System** – Include all major streets, minor streets adjacent to site, planned improvements not part of proposed development, and site boundary. Also show transit, bicycle, and major pedestrian routes, if applicable, along with right-of-way widths and signal locations.

**Existing and Anticipated Area Development** – Figure showing existing and future land uses in area.

**Existing Traffic Volumes** – Include daily traffic volumes and peak hour traffic volumes. Turning movements are required for the peak hours.

**Distribution** – Figure showing portion (by percentages) of site traffic approaching and departing proposed development.

**Site Traffic** – Include daily traffic volumes and peak hour traffic volumes for each horizon year (if separate phasing is expected). Turning movements are required for the peak hours. Show circled “blow-ups” of each study intersection on the same figure.

**Off-site Future Traffic** - Include daily traffic volumes and peak hour traffic volumes for each scenario (horizon year). Turning movements are required for the peak hours. Show circled “blow-ups” of each study intersection on the same figure.

**Total Traffic** - Include daily traffic volumes and peak hour traffic volumes for each scenario (horizon year). Turning movements are required for the peak hours. Show circled “blow-ups” of each study intersection on the same figure.

**Recommend Improvements** – Show recommended geometrics, cross sections and traffic control. Include phasing if applicable.

### **12.1.3 Master Street Plans for Planned Community Development (PCD)**

A Master Street Plan is required for all PCD's. The plan must show the proposed alignment for all arterial and collector streets within and adjacent to the PCD. The design of the streets will be based on the Street Classification Map, existing improvements and the approved Traffic Impact Study.



### **12.1.3.1 Required Sheets**

A complete Master Street Plan must have the following sheets:

- Cover Sheet
- Cross-section Sheet
- Detail Sheet
- Phasing Schedule

### **12.1.3.2 Required Information**

The following information must be included on all Master Street Plan submittals:

1. Cover Sheet - include:

- Approval block
- Legend
- Plan view drawing
- General notes
- Disclosure note
- Engineer's seal
- Name of development
- Zoning case and KIVA numbers
- Developer's name
- Name of engineering firm that prepared plan and date
- Vicinity Map
- Sheet index

2. Approval Block must include - Approval lines for the Street Transportation Director, Development Services Director, and Planning Director with date.

3. Legend - minimum required symbols:

- PCD boundary line
- Right-of-way line
- Monument line
- Roadway center line
- Cross-section (ROW- traffic lanes - median width - traffic lanes)
- Traffic signal - existing and future (include developer's percentage of participation)

4. Show the following on the plan view drawing:

- All arterial and collector streets
- Right-of-way lines
- Roadway center lines
- PCD boundary lines
- Street names
- Power poles – 69kv and larger
- Curb lines

- Sidewalks
  - Median islands - openings only at arterial/collector intersections
  - Intersection flares
  - Island separated right turn lanes at signalized intersections
  - Right turn lanes
  - Bus bays
  - Traffic signals - existing and future
  - Dimensions - right-of-way, street width (face of curb to face of curb), median width, taper lengths, tangent and curve lengths, etc.
  - North arrow and scale (minimum scale should be 1" = 200')
5. Include the following General Notes: See template for current notes
- Right-of-way triangles at intersections will be 25' by 25' unless otherwise noted on the plan. Curb radii will be 35 feet unless otherwise noted on the plan.
  - Accessible ramps will be provided at all intersections including "T"s.
  - Right-of-way for bus bays will be per City of Phoenix Standard Details.
  - Reverse curves for median left-turn lanes will be 100 feet long for single left-turn lanes and 150 feet long for dual left-turn lanes. Right-turn lanes will have a taper length of 150 feet.
  - All dimensions are to face of curb.
  - Additional right-of-way and improvements beyond what is shown on this master street plan may be required for right-turn lanes and/or bus bays at the time specific development plans are reviewed by the Development Services Department.
  - Raised median island openings will normally be spaced no closer than 660 feet apart.
  - Any modifications to existing median islands will be subject to the approval of the Street Transportation Department and completed at the developer's expense.
  - Conduit and pull boxes for future traffic signals will be installed at the time of initial street construction. Signal installation will only occur after warrants have been met as determined by the Street Transportation Department.

- Curvilinear arterial and high volume collector streets will be super-elevated per AASHTO standards. Residential collector streets will not be super-elevated unless approved by the Street Transportation Department.
- Safe Intersection Sight Distance lines, per AASHTO standards, will be shown on individual improvement plans for all access points located on the inside of curved streets.

**6. Disclosure Note – Include the following:**

“I consent to the reproduction of this Master Plan for the purpose of future amendments provided that if modifications are made, the architects/engineers who make changes assume full responsibility and liability for the plan.” Sign and date.

7. The Master Street Plan will be sealed and signed by a Professional Civil Engineer registered in the State of Arizona.

8. Cross-sections for arterial and collector streets - provide the following information:

- Right-of-way width
- Easement width
- Sidewalk location and width
- Type of curb
- Pavement width
- Median width
- Roadway center line
- Street name

9. Provide enlarged intersection details for clarity - provide the following information:

- Right-of-way widths
- Easement widths
- Pavement width
- Median width
- Roadway center line
- Street name
- Taper lengths
- Pavement transitions from new construction to existing, ultimate design and between phases.
- Bus bays
- Curve data
- North arrow and scale (minimum scale should be 1" = 50')

### 12.1.3.3 PCD Master Street Plan Review Notes

Remember to read the zoning stipulations.

- Review the plans for nearby developments for compatibility.
- Development Services prefers that ½ mile collector streets have consistent names as those they align with.
- Sight lines should be shown where needed.
- Paving transition is needed between improvements and existing pavement or between improvements and improvements by others.
- 5' is recommended between sidewalk and trail. The trail should be a minimum of 8' (10' desired) with 2' clearance.
- Trails shown on the MSP cross-sections are preferred to be placed within an easement or tract, so that the COP is not required to maintain them.
- Cross-sections on MSP and Trails Master Plan must be consistent.
- We typically ask for MSP to show 404 washes and potential location of box culverts.
- Minimum sidewalk width on collectors and arterials is 5 feet.
- Sidewalk easement needs to be provided if not in ROW.
- If development is in 2 of 4 quadrants, then their responsibility for traffic signals is most likely 50% for collector and arterial intersections.
- For traffic signals that are for an arterial and arterial intersection, check to see if location is within a Impact Fee Area, if so impact fees fund the signal.
- Typically need 50 ft width of pavement on collector at its intersection with an arterial.
- Bus bays at Arterial/Arterial street intersections

1. Far side (queue jumper) – only if permitted by the Street Transportation Department
2. Mid-block – Desired design
  - Shelter bus pad at arterial/collector street intersections
  - Keep collectors at ½ mile location.
  - Entire intersection should be shown including existing and proposed improvements to check compatibility.
  - Speed limit to 1 for transitions
  - A phasing schedule must include interim pavement design between phases.

#### **12.1.3.4 Master Street Plan**

See following sheets for examples of templates to be submitted.

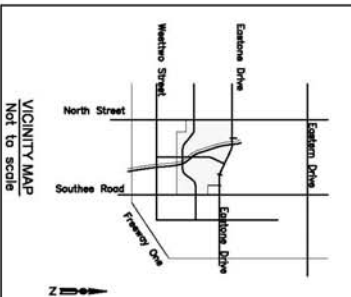
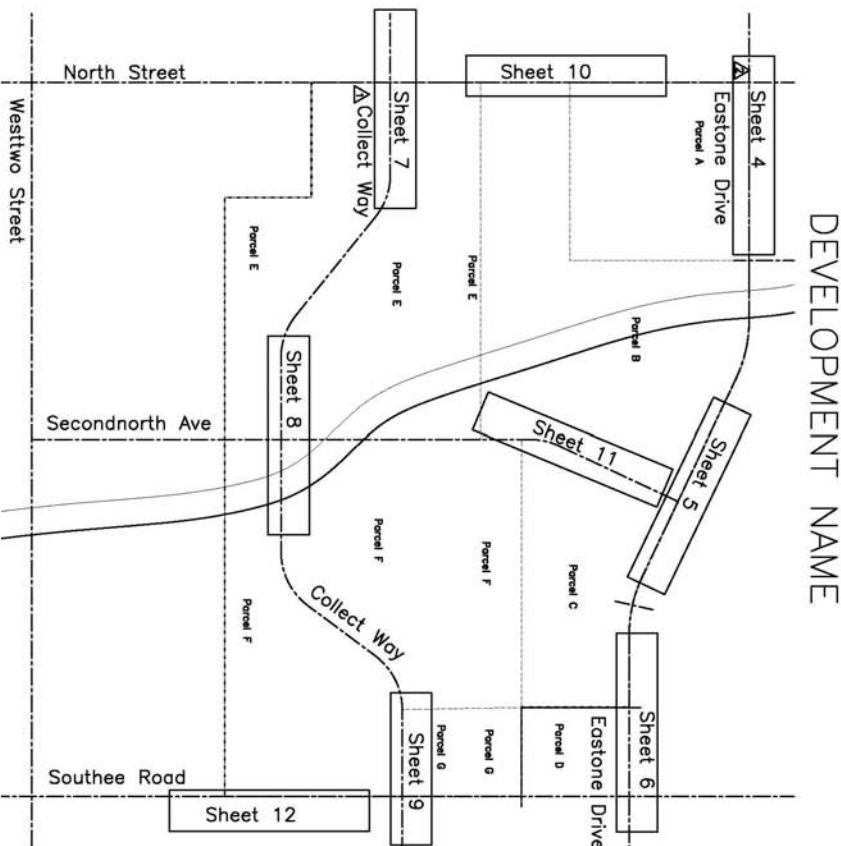
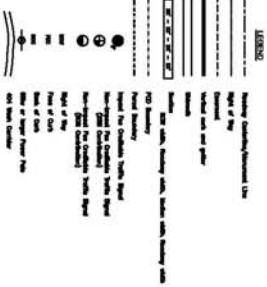
MASTER STREET PLAN GENERAL NOTES

- 1 - The cross sections and diagrams shown for the arterial and collector streets are intended to be used as a guide only. The street design must be consistent with the City of Phoenix street design standards.
- 2 - Additional right of way and improvements beyond what is shown on this master street plan may be required for, but not limited to, right turn lanes, bus bays/stop, utility appraisals, accessible ramps, vertical design and drainage, etc. The City of Phoenix Street Planning and Design Department and the Development Services and Street Transportation Departments.
- 3 - On-street parking and bike racks/collectible racks will be provided as shown on the master street plan. The City of Phoenix Street Planning and Design Department, the Development Services and Street Transportation Departments.
- 4 - Intersection sight distance (ISD) standards shall be provided by the Street Transportation Department. Intersecting streets will not be shown on individual improvement plans for all access points located on the sides of arterial streets.
- 5 - All roadway widths are to the face of curb unless otherwise noted.
- 6 - Curb radii will be 30' unless otherwise noted on the plans or as approved by the Street Transportation Department.
- 7 - Accessible ramps will be provided at all intersections including "T" intersections.
- 8 - The plans will be provided at all signalized intersections unless otherwise noted on the plans or as approved by the Public Transit Department.
- 9 - The plans will be provided at collector/arterial intersections unless otherwise noted on the plans or as approved by the Public Transit Department.
- 10 - Typical turn bay storage lengths and bays are indicated on the master street plan.
- 11 - Island median band openings will be approved by Street Transportation Department at the time improvement plans are reviewed by the Street Planning and Design Department. Median band openings are typically 600' apart.
- 12 - Island median band design will follow current City of Phoenix Street Planning and Design Department standards.
- 13 - Any modifications to adding median islands will be subject to the City of Phoenix Street Planning and Design Department and will be completed at the developer's expense.
- 14 - Island median islands will be constructed only when a roadway is built to its full width.
- 15 - Traffic Signal control and junction house will be provided at all arterial/collector and arterial/collector intersections unless otherwise approved by the Street Transportation Department. New Traffic Signal Installation will only occur when approved by the Street Transportation Department.
- 16 - All existing (underway and ultimate) is shown for information only and may not reflect final design. The City of Phoenix Street Planning and Design Department, the Development Services and Street Transportation Departments.
- 17 - Right of way boundaries of improvements will be 30' x 30' unless otherwise noted on the plans or as approved by the Street Transportation Department.

**NOTE:**  
THIS IS A TEMPLATE ONLY.  
IT IS TO BE USED AS A GUIDE.  
NOTES AND DETAILS TO BE ADJUSTED  
PER INDIVIDUAL PROJECT

REVISION	DATE	REV. BY
Added collector street name	Mo/Yr	JB
Added right turn	Mo/Yr	JB

SHEET INDEX	Cover Sheet
Sheet 1	Sections and 200 Scale Plan
Sheet 2	Roadway Segments/Intersection Detail
Sheet X	Phasing Plan



**CITY OF PHOENIX APPROVALS**

DEVELOPMENT SERVICES DIRECTOR \_\_\_\_\_ DATE \_\_\_\_\_

PLANNING DIRECTOR \_\_\_\_\_ DATE \_\_\_\_\_

STREET TRANSPORTATION DIRECTOR \_\_\_\_\_ DATE \_\_\_\_\_

**DISCLOSURE NOTE**  
I consent to the reproduction of this Master Street Plan and its modifications on maps, the architect/engineer who makes modifications, assumes full responsibility and liability for the plan.

COPYRIGHT OWNER \_\_\_\_\_ DATE \_\_\_\_\_

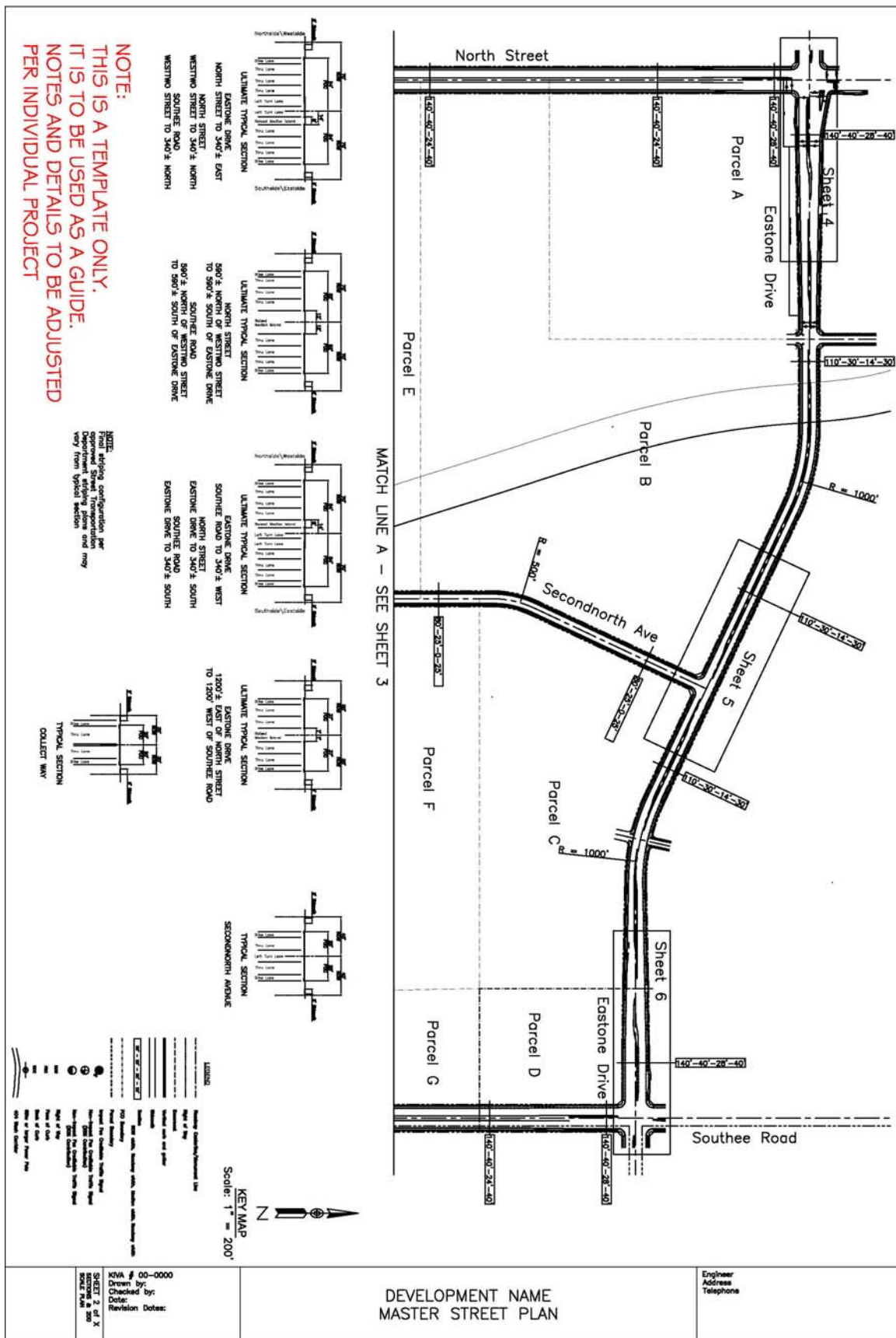
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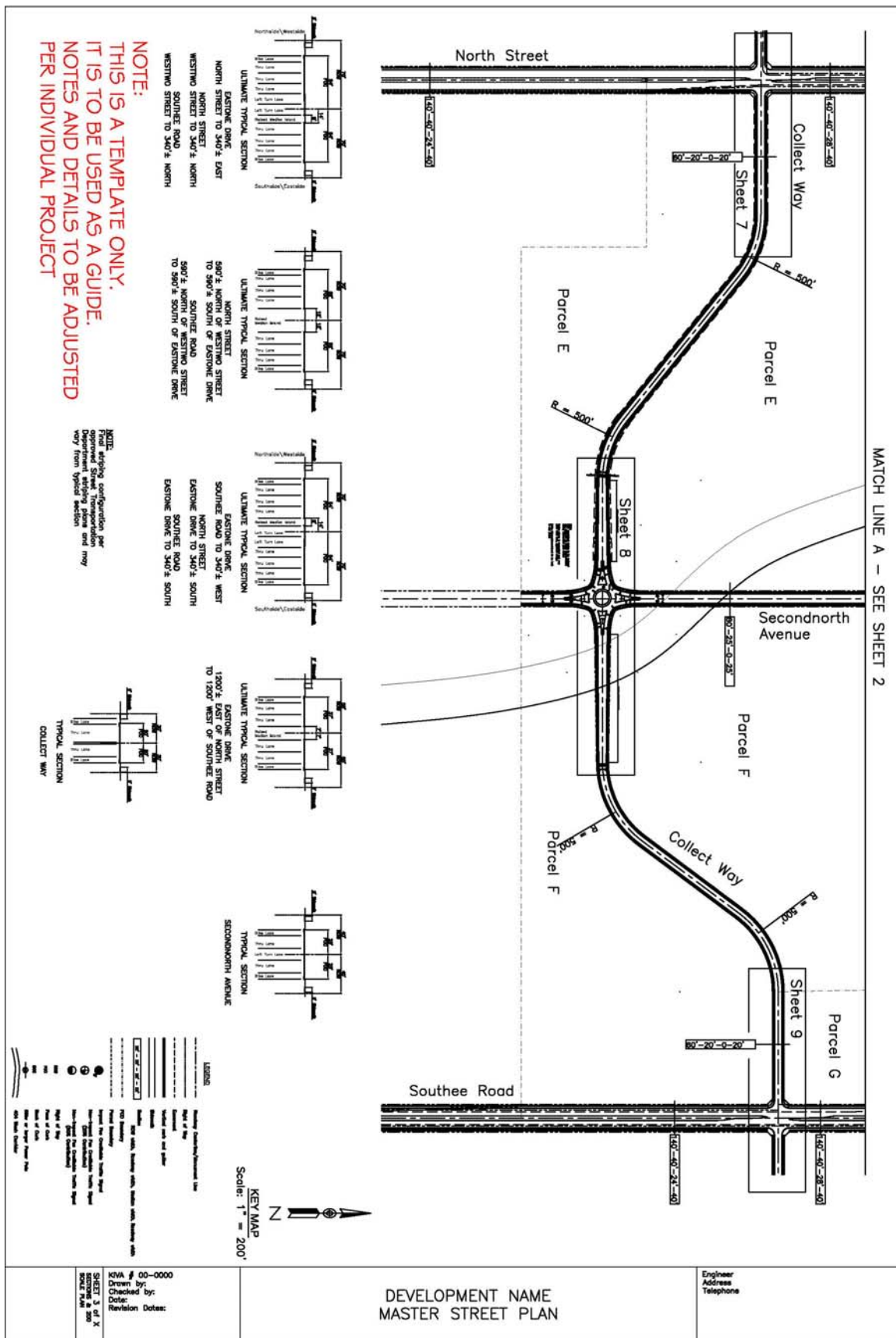
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COVER SHEET

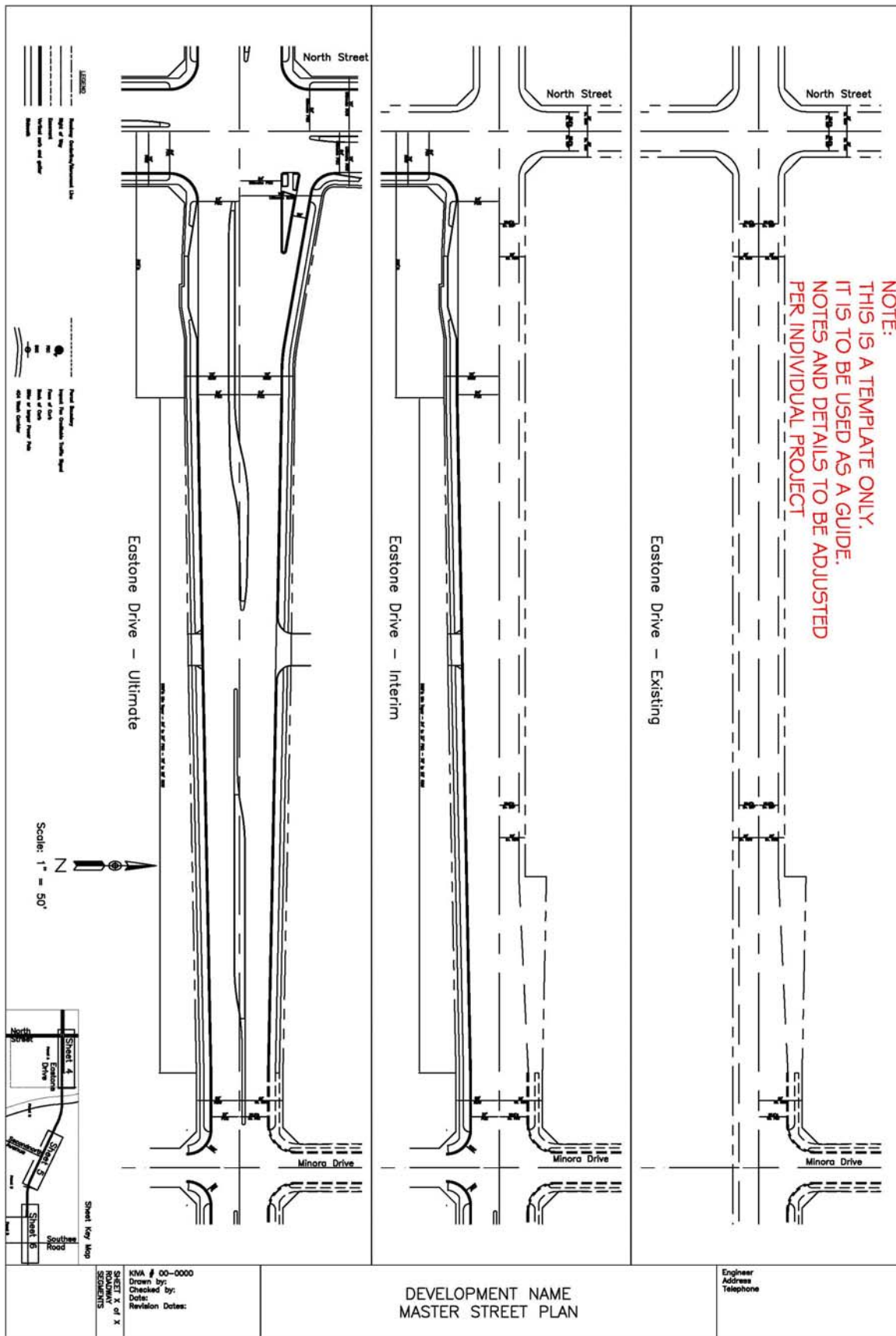
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MASTER STREET PLAN

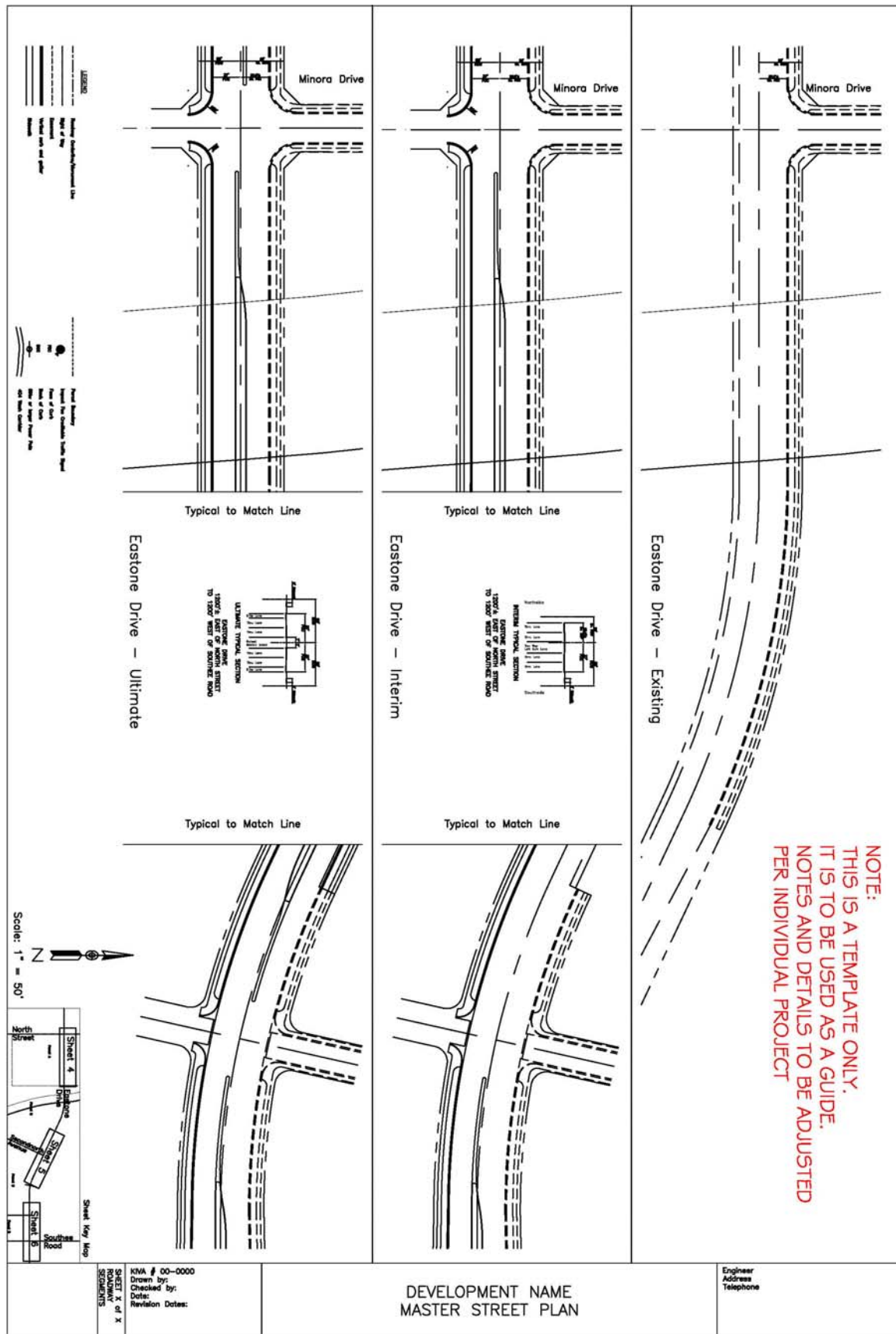
Engineer  
Address  
Telephone

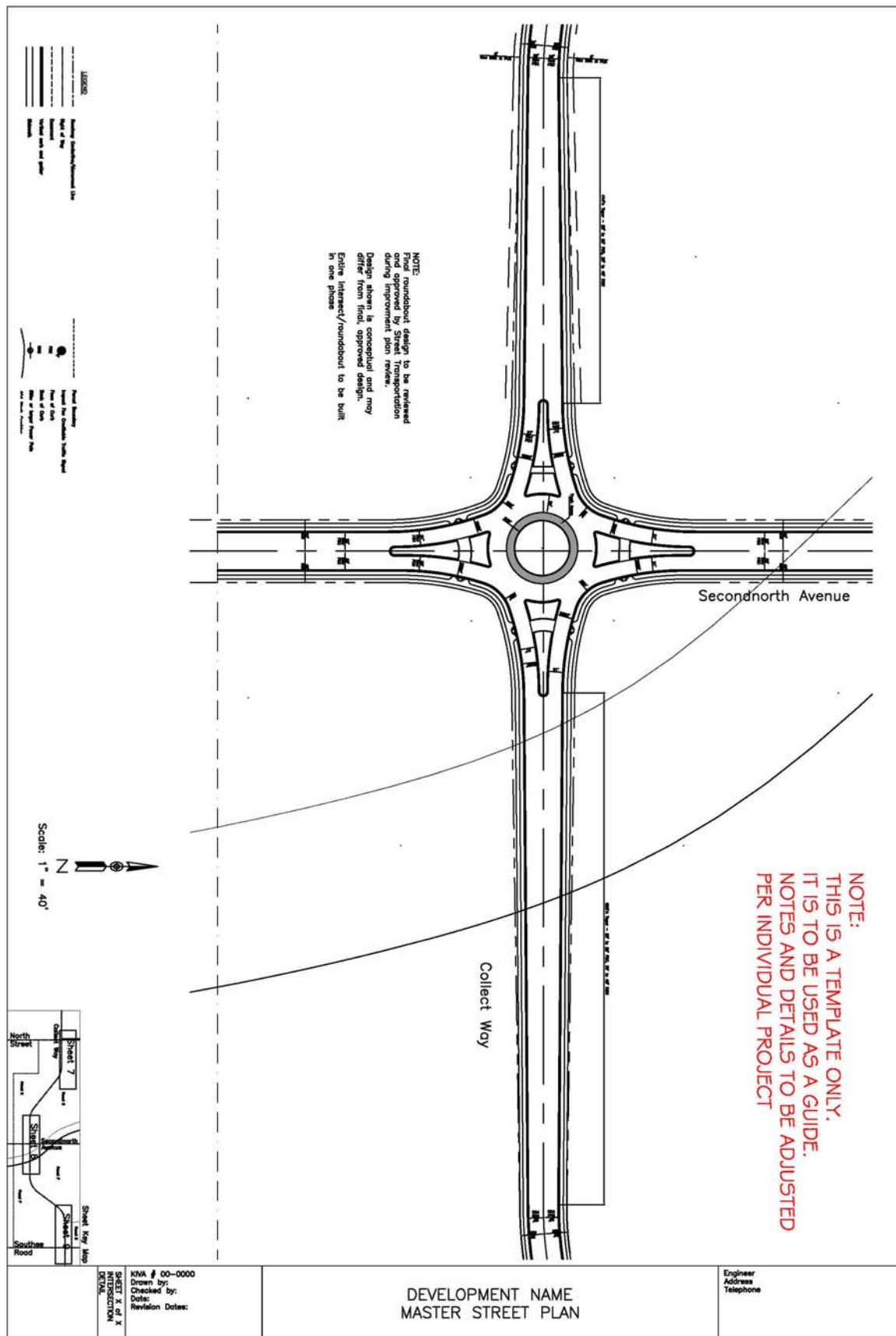












## DEVELOPMENT NAME

**ROADWAY CONSTRUCTION/PAVING LEGEND**

Symbol	Distance	Notes
[Hatched Pattern]	1	Asphalt
[Cross-hatched Pattern]	2	Gravel
[Dashed Pattern]	3	Gravel

**KEY MAP**  
Scale: \_\_\_\_\_

**REVISION**

DATE	BY	REVISION
10/1/11	JB	Added collector street name
10/1/11	JB	Added right turn

**DISCLOSURE NOTE**

I consent to the reproduction of this Master Street Plan that if modifications are made, the architect/engineer who makes modifications, assumes full responsibility and liability for the plan.

**CITY OF PHOENIX APPROVALS**

DEVELOPMENT SERVICES DIRECTOR \_\_\_\_\_ DATE \_\_\_\_\_

PLANNING DIRECTOR \_\_\_\_\_ DATE \_\_\_\_\_

STREET TRANSPORTATION DIRECTOR \_\_\_\_\_ DATE \_\_\_\_\_

**ENGINEER'S SEAL**

SEAL \_\_\_\_\_

**DEVELOPMENT NAME**

**MASTER STREET PLAN**

**Engineer Address Telephone**

#### **12.1.4 Impact Fee Areas**

Specific infrastructure financing plans have been prepared for six areas in the City of Phoenix, Ahwatukee Foothills, Northern Deer Valley, Desert View, Estrella, Laveen and North Gateway. These areas are identified on the two maps on the following pages.

Impact fees are assessed to all properties being developed in the six areas to cover the capital costs for infrastructure bridges and culverts needed in each area.



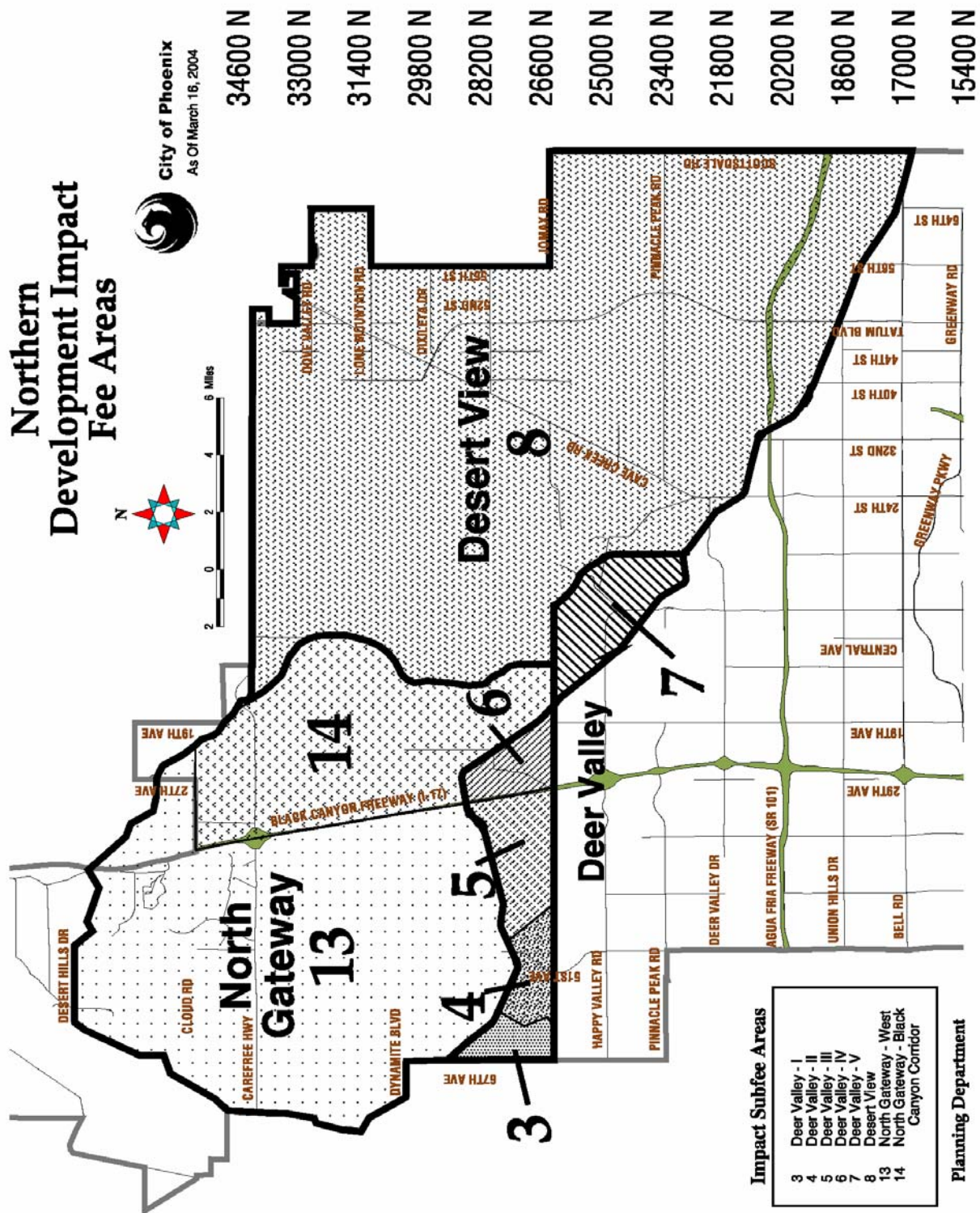


Figure 12.1

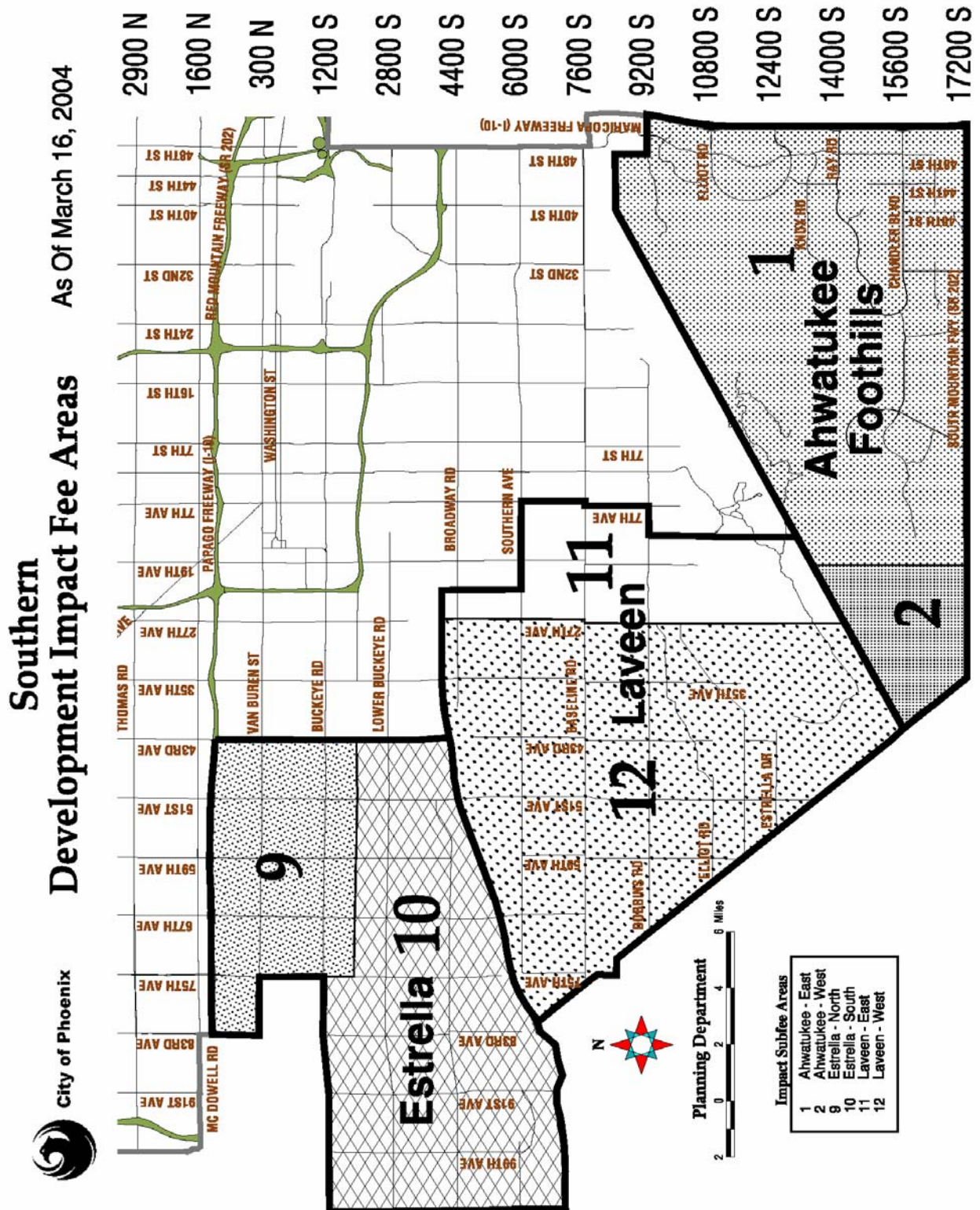


Figure 12.2

### **12.1.5 Red Border Letters**

The Red Border Letter process is the means that the City of Phoenix notifies the Arizona Department of Transportation of any proposed development project within a future Transportation Corridor. For the official form, see 12.2.3.

### **12.1.6 Infill Section**

Reserved

### **12.1.7 SRP/U.S.A. Fee Title Property**

The Federal government granted the Salt River Project (SRP) property for irrigation and power line installation. As development occurs, and streets are widened, the roadway improvements may overlap this SRP property. SRP has been willing to grant licenses for these public improvements. The Street Transportation Department has established a policy where improvements outside of the street, sidewalks, street lights, landscaping...etc., may be acceptable if placed in the USA Fee Title, but all roadway improvements, paving, curb and gutter, must be in public right-of-way.

Following is the Temporary policy on SRP/U.S.A. Fee Title Property:

*Temporary City of Phoenix Policy  
Regarding the Location of USA Fee Property Within Public Right-of-Way.  
July 19<sup>th</sup>, 2004*

*The City of Phoenix is implementing a review process and temporary policy to respond to recent issues regarding USA Fee property within public right-of-way. The intent of this review is to explore the available options for addressing USA Fee property within future development and to address issues related to existing locations where City of Phoenix right-of-way is already located within USA Fee properties. The anticipated end product of this review would be a proposed policy regarding USA Fee property in public right-of-way for City Council consideration and adoption. The review will include discussions with representatives of SRP, the development community, and property owners within SRP service areas.*



*While this review for a permanent policy is being conducted, the City is implementing a temporary policy to allow the City to address current projects and developments where this condition exists until the matter is fully resolved. As of July 19<sup>th</sup>, the City of Phoenix will not accept right-of-way nor approve preliminary or final site plans, subdivision plats, or maps of dedication that show right-of-way that will be dedicated, in whole or in part, within SRP/USA Fee property, except in the following circumstances:*

- 1) A preliminary site plan was approved prior to July 1<sup>st</sup>, 2004, which plainly identifies the location of the SRP/USA Fee property and plainly shows that the proposed right-of-way is to be encumbered by the SRP/USA Fee property; or*
- 2) The proposed right-of-way crosses the SRP/USA Fee property perpendicular and does not run parallel within the SRP/USA Fee property.*

### *Background*

*Recently during the City's internal review of several proposed developments in southwest Phoenix and after preliminary discussions with SRP, it came to the City's attention that developers and SRP, apparently without the City's knowledge and participation, were and are entering into land exchanges whereby SRP, on behalf of the United States, was receiving fee title (complete ownership of all property rights and benefits) to land that constituted a major portion of proposed public right-of-way for arterial and collector streets in the City.*

*Approximately two years ago and pursuant to a review by the US, City staff understands that SRP modified its policy regarding the grant of easements across USA fee lands that SRP administers on behalf of the US. Instead of an easement, SRP will solely issue a license whose terms, as we understand, are generally not negotiable. Under the license, a party is given permission to enter and such permission is revocable at will subject to 30 days prior notice (this license is similar to the City's revocable permit).*

*These two circumstances have created the condition whereby significant, current and proposed City infrastructure (water mains, wastewater mains, booster pump connections, arterial streets such as Broadway Road, South Mountain Avenue, 7<sup>th</sup> Street, 107<sup>th</sup> Avenue) are located on USA fee property without SRP's permission (no license issued) or where a license has been issued, the City has assumed a liability and legal risks, including health and safety risks, without the ability to control and minimize these risks.*

*Specifically, the USA fee/SRP License condition in proposed right-of-way raises three issues:*

- 1. Limitation of City's Police Powers-the City will not have jurisdiction over the subject right-of-way, and therefore, will not have the ability to preserve protect and promote public health, safety and welfare, including the ability to make economic development decisions without first obtaining SRP's/USA's approval (in some cases this may require significant time and Congressional/agency approval);*
- 2. Safety and protection of City infrastructure-the City will not be able to or receive notice of when other utilities encroach or are near our underground infrastructure making additional repairs or installation more time consuming and costly; and*
- 3. Additional costs-for City projects within properly dedicated public right-of-way, other users must generally relocate their facilities at their expense. This will not be true with a SRP license. SRP will now be able to dictate the terms and conditions of any relocation, including the requirement that the City must pay to locate the facilities of other users.*

*Accordingly, the City staff has initiated a process to review these issues related to public right-of-way or utility easements located within SRP/USA Fee property and is implementing temporary policy while this review is in process.*

### **12.1.8 Power Lines**

Certain developing areas within the City Of Phoenix are designating to have 69KV power lines undergrounded. Studies have been conducted and are now being implemented in the field. Examples of such studies include the Dobbins Road Study and the Sonoran Parkway Study. Refer to Figure X for more information on designation of underground 69KV power lines.

### **12.2 Forms**

Following are several forms to be used in connection with the above special procedures.

## MAG Transportation Improvement Program

**Developer Project Information Form**

Date: \_\_\_\_\_

Developer: \_\_\_\_\_

Address:  
\_\_\_\_\_Contact Person: \_\_\_\_\_ Phone Number:  
\_\_\_\_\_

Fill out one column for each arterial road segment:

<b>Category</b>	<b>Road Segment #1</b>	<b>Road Segment #2</b>	<b>Road Segment #3</b>
Arterial Road Name:			
From:			
To:			
Length of Road Segment (miles to nearest tenth):			
Number of Current Through Lanes:			
Direction of Travel of Current Through Lanes (ex. 2 SB/2 NB):			
Number of Lanes Being Added:			
Direction of Travel of Added Through Lanes (ex. 1 NB, 2 EB/2 WB):			
Estimated Start of Construction (month/year):			
Primary Type of Funding (Private, Bond, HURF, etc.):			
Estimated Cost of Project:			

**Answer Yes or No to the following questions:**

Are there raised medians being installed?			
Is an existing dirt road being paved?			
Are curbs being installed?			
Are paved shoulders being provided?			
Are sidewalks being installed?			
Are bus bays being installed?			
Is landscaping being provided?			

Please submit completed forms to Mr. Alan Hilty (602-262-6193), City of Phoenix, Street Transportation Department, 5<sup>th</sup> Floor, 200 West Washington Street, Phoenix, Arizona 85003.

### 12.2.2 Master Street Plan Check List

<b>Master Street Plan Checklist</b>	
<b>1. Title Block</b>	
	Name of development
	Zoning case number
	Developer's name
	Name of engineering firm that prepared plan and date
	Vicinity Map
	Disclosure Note
<b>2. Approval Block</b>	
	Street Transportation Director
	Development Services Director
	Planning Director
<b>3. Legend - minimum required symbols</b>	
	PCD boundary line
	Right-of-way line
	Monument line/Construction centerline
	Curb line
	Existing Power Poles (69kv and larger)
	Cross-section (R.O.W.- traffic lanes - median width - traffic lanes)
	Traffic signal - existing and future
	-Include developer's percentage of participation for Traffic Signal
<b>4. Plan View Drawing</b>	
	All arterial and collector streets
	Right-of-way lines
	Monument line/Construction centerline
	PCD boundary lines
	Street names
	Curb lines
	Median islands - openings and turn bays
	Intersection flares
	Right turn lanes
	Bus bays
	Traffic signals - existing and future
	Dimensions - right-of-way, street width (face of curb to face of curb), median width, turn bay lengths, taper lengths, tangent and curve lengths, etc.
	North arrow and scale (minimum scale should be 1" = 200')
<b>Provide enlarged intersection details when needed for clarity (minimum scale should be 1" = 50')</b>	

<b>Master Street Plan Checklist (continued)</b>	
<b>6. General Notes</b>	
	Right-of-way triangles at intersections will be 21' by 21' unless otherwise noted on the plan.
	Curb radii will be 35 feet unless otherwise noted on the plan.
	Accessible curb ramps will be provided at all intersections including "T"s.
	Right-of-way for bus bays will be per City of Phoenix Standard Details.
	Reverse curves for median left-turn lanes will be 100 feet long for single left-turn lanes and 150 feet long for dual left-turn lanes. Right-turn lanes will have a taper length of 150 feet.
	All dimensions are to face of curb.
	Additional right-of-way and improvements beyond what is shown on this master street plan may be required for right-turn lanes and/or bus bays at the time specific development plans are reviewed by the Development Services Department.
	Raised median island openings will normally be spaced no closer than 660 feet apart.
	Any modifications to existing median islands will be subject to the approval of the Street Transportation Department and completed at the developer's expense.
	Raised median islands will only be constructed when a street is built to its full width. If a raised median cannot be constructed with a project (i.e., only half street constructed), the developer shall deposit funds in escrow, equal to one-half the cost of the median, with the Development Services Department.
	Conduit and pull boxes for future traffic signals will be installed at the time of initial street construction. Signal installation will only occur after warrants have been met as determined by the Street Transportation Department.
	Curvilinear arterial and high volume collector streets will be superelevated per AASHTO standards. Residential collector streets will not be superelevated unless approved by the Street Transportation Department.
	Safe Intersection Sight Distance lines, per AASHTO standards, will be shown on individual improvement plans for all access points located on the inside of curved streets.
<b>The Master Street Plan will be sealed and signed by a Professional Civil Engineer registered in the State of Arizona</b>	

<b>8. Cross-sections for Arterial and Collector Streets</b>	
	Right-of-way width
	Sidewalk location and width
	Type of curb
	Pavement width
	Median width
	Roadway Center Line
	Street name
<b>Include phasing plan for improvements.</b>	

### 12.2.3 Red Border Letter

**CITY OF PHOENIX, ARIZONA****Date:** \_\_\_\_\_**TO:** \_\_\_\_\_**FROM:****SUBJECT:** Notice of Proposed Development in Future Transportation Corridor Right-of-way

- I. It has come to my attention this date that the following described proposed development would be within the future right-of-way of a planned transportation corridor.

A. Planned Transportation Corridor

1. Name \_\_\_\_\_
2. Jurisdiction
  - a. Arizona Department of Transportation \_\_\_\_\_
  - b. City of Phoenix \_\_\_\_\_
  - c. Other \_\_\_\_\_

IDENTIFY

B. Type of Proposed Development

- \_\_\_\_ 1. Subdivision or Site Plan
- \_\_\_\_ 2. Building permit for in excess of \$ \_\_\_\_\_
- \_\_\_\_ 3. Other development costing in excess of \$ \_\_\_\_\_
- \_\_\_\_ 4. Rezoning Application No. \_\_\_\_\_

C. Description of Proposed Development

1. Location \_\_\_\_\_  
\_\_\_\_\_
2. Brief description (Dollar Value of Permit \$ \_\_\_\_\_)  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

II.

OWNER'S NAME

ADDRESS

PHONE

Notify \_\_\_\_\_

The applicant Has Been Notified

\_\_\_\_\_  
YES

\_\_\_\_\_  
NO

\_\_\_\_\_  
SIGNATURE OF DEPARTMENT OR DIVISION HEAD

SUBMITTING REPORT

### **12.3 Details**

The City of Phoenix allows the use of four kinds of details – Uniform Standard Details for Public Works Construction – Maricopa Association of Governments (MAG details), City of Phoenix Supplement to MAG Details, City of Phoenix Design Details and Special Details. Any variation to or something not covered by the MAG or City of Phoenix standard details must be approved by the City and is then considered to be a Special Detail.