

La Cañada Drive

River Road to Ina Road

Final Design Concept Report

Pima County Department of Transportation

Project No. 4LCRRI

Federal Project No. STP-PPM-0(201)A

TRACS No. 0000 PM PPM SS639 03D

July 2009



Prepared by



July 7, 2009

Mr. Rick Ellis, PE
Engineering Division Manager
Pima County Department of Transportation
Public Works Building
201 N. Stone Avenue, 3rd Floor
Tucson, AZ 85701

RE: Final Design Concept Report
La Cañada Drive, River Road to Ina Road
Project No. 4LCRRI
HDR Project No. 51587

Dear Mr. Ellis:

We are pleased to submit this *Final Design Concept Report* for the above-referenced project. This report was prepared by Harold A. Evers III, PE, and reviewed by Michael H. Bertram, PE, and Robert D. Brittain, PE.

If you have any questions, please contact me at (520) 584-3629.

Sincerely,
HDR Engineering, Inc.

Michael H. Bertram, PE
Senior Project Manager

Reviewed by:

Robert D. Brittain, PE, RLS
Vice-President

Attachments

La Cañada Drive River Road to Ina Road

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Pima County Department of Transportation
201 N. Stone Avenue
Tucson, AZ 85701
Project No. 4LCRRI
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Prepared by:
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HDR Project No. 51587





Executive Summary

This project involves the widening of La Cañada Drive from River Road to Ina Road, which will convert the existing two-lane road into a four-lane arterial street. The road will have raised medians, paved bike lanes, concrete curbs and sidewalks, a public use trail, and drainage improvements. It will feature dedicated turning lanes and signals at major intersections. The entire project area is located in unincorporated Pima County, north of Tucson, Arizona. The project location and vicinity are shown in Figures 1 and 2 in the main text of this report.

Current project funding includes \$5.1 million from Regional Transportation Authority (RTA) revenue, \$29.7 million from federal Surface Transportation Program (STP) funds, and \$11.2 million from Pima County developer impact fees, for total funding of \$46 million.

In 2006, Pima County voters approved a \$2.1 billion transportation plan to be funded by a one-half cent increase in the sales tax, to be administered by the RTA. STP funds are federal funds distributed to states and metropolitan planning organizations. The Pima Association of Governments receives approximately \$17 million of STP funds annually, which are allocated to regionally significant projects in the greater Tucson area. Pima County impact fees are charged for new private development to help offset related impacts to area infrastructure, including roads. These fees must be used to improve area infrastructure.

It is estimated that this project will be advertised for construction bids in the summer of 2011. Construction is anticipated to be complete in 2013.

This section of La Cañada Drive is identified as a major arterial street in the Pima Association of Governments *2030 Regional Transportation Plan* (2006). The road widening is needed to accommodate the heavy volumes of traffic projected in 2030. It will also address vertical deficiencies in the existing roadway profile that limit stopping sight distances. Culvert installation at washes will raise the road surface above the 100-year flood. Reconstructing this road to current standards will increase traffic capacity, improve stopping sight distance, and create an all-weather roadway.

The design speed for this project is 50 mph, with a posted speed of 45 mph. The existing right-of-way, which is approximately 150 feet wide, will generally be sufficient for the four-lane arterial street. Two residences will need to be acquired, along with other minor property acquisitions. Landscaping will be provided in the median and along the roadside, along with public art. Drainage improvements will include a closed storm drain system consisting of catch basins and storm drains capable of conveying 10-year storm flows. Box and pipe culverts and channels will be designed for the 100-year storm and will replace existing wash crossings and undersized culverts.

Driveways will be provided to every property that currently has legal access to La Cañada Drive. A frontage road will be added on the eastern side of La Cañada Drive between Roller Coaster Wash and Whispering Hills Drive. Median openings will be provided at side streets at standard spacing, with priority given to those side streets with higher traffic volumes.



New traffic signals will be installed at the Orange Grove Road intersection. Signal conduit will be added at Roller Coaster Road and at La Cima Middle School to allow for the future installation of high-intensity activated crosswalk signals, if warranted. Intelligent transportation system conduit will be added along the length of the La Cañada Drive project. Lighting will be provided from River Road to Roller Coaster Road, at Orange Grove Road, and at La Cima Middle School.

An *Environmental Assessment and Mitigation Report* has been prepared to document environmental impacts resulting from the project and potential mitigation measures.



Contents

1.0	Project Overview	1
1.1	Project Location.....	1
1.2	Authorization.....	1
1.3	Previous Work.....	4
1.4	Project Need	5
2.0	Project Description.....	5
2.1	Project Type and Termini.....	5
2.2	Major Features.....	6
3.0	Project Area Characteristics.....	9
3.1	Existing Topography and Terrain.....	9
3.2	Existing Roadway.....	9
3.3	Existing Rights-of-Way.....	12
3.4	Existing Drainage	12
3.5	Existing Utilities, Signals, and Lighting.....	13
3.6	Existing Biology.....	14
3.7	Archaeological and Historic Resources.....	14
3.8	Existing Visual Resources.....	15
3.9	Existing and Future Land Use	15
3.10	Intergovernmental Agreements	16
4.0	Traffic and Accident Data.....	16
4.1	Traffic.....	16
4.2	Accidents	19
5.0	Design Standards and Criteria	21
5.1	Geometric Standards	21
5.2	Design Standards	21
5.3	Slope Standards	21
5.4	Pavement Structure.....	21
5.5	Design Speed.....	22
5.6	Drainage Design.....	22
5.7	Access Control.....	22
5.8	Cross Section Elements	22
5.9	Roadway Geometrics.....	23
5.10	Right-of-Way Width.....	23



Contents (*continued*)

6.0 Major Design Features 23

 6.1 Horizontal and Vertical Alignment 23

 6.2 Access Control..... 24

 6.3 Right-of-Way..... 24

 6.4 Drainage 27

 6.5 Earthwork Considerations 30

 6.6 Intersections..... 30

 6.7 Utilities 30

 6.8 Structures..... 31

 6.9 Pavement Design 31

 6.10 Signalization and Lighting 32

 6.11 Construction Issues..... 32

 6.12 Design Conformity and Exceptions..... 33

7.0 Social, Economic, and Environmental Considerations 34

 7.1 Biological Resources 34

 7.2 Air Quality 34

 7.3 Noise..... 35

 7.4 Hazardous Materials 35

 7.5 Historical/Cultural Resources..... 35

 7.6 Visual/Aesthetic Resources 36

 7.7 Neighborhood Impacts 36

 7.8 Community Resource Impacts 36

8.0 Public Involvement 36

 8.1 Public Participation Plan 36

 8.2 Community Advisory Committee 37

 8.3 Public Meetings 37

9.0 Agency Coordination 37

 9.1 Environmental Review 37

 9.2 Intergovernmental Agreements 38

10.0 Alternatives 38

 10.1 Ingress and Egress Alternatives..... 38

 10.2 Edge of Road Alternatives..... 39

 10.3 Metro Water Access Alternatives..... 40

 10.4 Improvements South of Roller Coaster Road..... 40



Contents (*continued*)

11.0 Conclusions and Recommendations 41
 12.0 Cost Estimate and Budget Considerations 42
 13.0 References 42
 14.0 Abbreviations and Acronyms 44

Figures

Figure 1. Project location in state 2
 Figure 2. Project vicinity 3
 Figure 3. Typical cross sections for La Cañada Drive and Orange Grove Road,
 and for La Cañada Drive with the frontage road 7
 Figure 4. Typical cross sections for La Cañada Drive and Orange Grove Road,
 showing approaches and departures 8
 Figure 5. Existing land use (River Road to Panorama Road) 10
 Figure 6. Existing land use (Orange Grove Road to Ina Road) 11
 Figure 7. Existing traffic conditions 17
 Figure 8. Future traffic conditions 18
 Figure 9. Right-of-way acquisitions 26
 Figure 10. Pavement structural sections 32

Tables

Table 1. Existing utilities 14
 Table 2. Collision data for intersections 20
 Table 3. Cross section elements 23
 Table 4. Right-of-way summary 25
 Table 5. Existing and proposed major drainage structure summary 28
 Table 6. Project cost estimate 42

Appendixes

- Appendix A – Construction Cost Estimate
- Appendix B – Stage II (30%) Construction Plans (separate volume)



1.0 Project Overview

This improvement project consists of widening La Cañada Drive from a rural, two-lane undivided road to an urban, four-lane divided arterial street between River Road and Ina Road in Pima County, Arizona. The widened road will have raised medians, paved bike lanes, concrete curbs and sidewalks, a public use trail, and drainage improvements. It will feature dedicated turning lanes and traffic signals at major intersections.

1.1 Project Location

The entire project area falls within unincorporated Pima County north of Tucson, Arizona. Figure 1 shows the project's location in the state, while Figure 2 shows the project vicinity. La Cañada Drive is a north-south arterial street that passes through a mostly residential area in the foothills of the Santa Catalina Mountains. Tucson's city limits are located approximately 1.25 miles south of River Road. The Oro Valley town limits are approximately 2.5 miles north of Ina Road. Approximately 600 feet south of River Road, La Cañada Drive's name changes to Flowing Wells Road.

The project area is located in Sections 2, 3, 10, 11, 14, and 15 of Township 13 South and Range 13 East (Tucson North, AZ, United States Geological Survey 7.5 Minute Quadrangle Map, Gila and Salt River Base Line and Meridian).

1.2 Authorization

The Pima County Board of Supervisors approved the contract for the design of this improvement project on November 20, 2006. The notice to proceed was issued by the Director of the Pima County Department of Transportation (PCDOT) on December 7, 2006.

The project budget is \$46 million. The estimated cost is \$45.2 million. A detailed construction cost estimate is contained in Appendix A. The project will use funding from the following sources:

- \$5.1 million from Regional Transportation Authority (RTA) funds
- \$29.7 million from Surface Transportation Program (STP) funds
- \$11.2 million from Pima County developer impact fees

In 2006, Pima County voters approved a \$2.1 billion transportation plan to be funded by a half-cent increase in the local sales tax. The voter-approved RTA plan included the La Cañada Drive, River Road to Ina Road project.

STP funds are distributed by the federal government to states and metropolitan planning organizations. The Pima Association of Governments receives approximately \$17 million in STP funds annually, which are allocated to regionally significant transportation projects in the greater Tucson area. This allocation of federal funding means that the La Cañada Drive project constitutes a federal action; therefore, compliance with the National Environmental Policy Act of 1969 and related federal environmental laws and regulations is required.



Figure 1. Project location in state

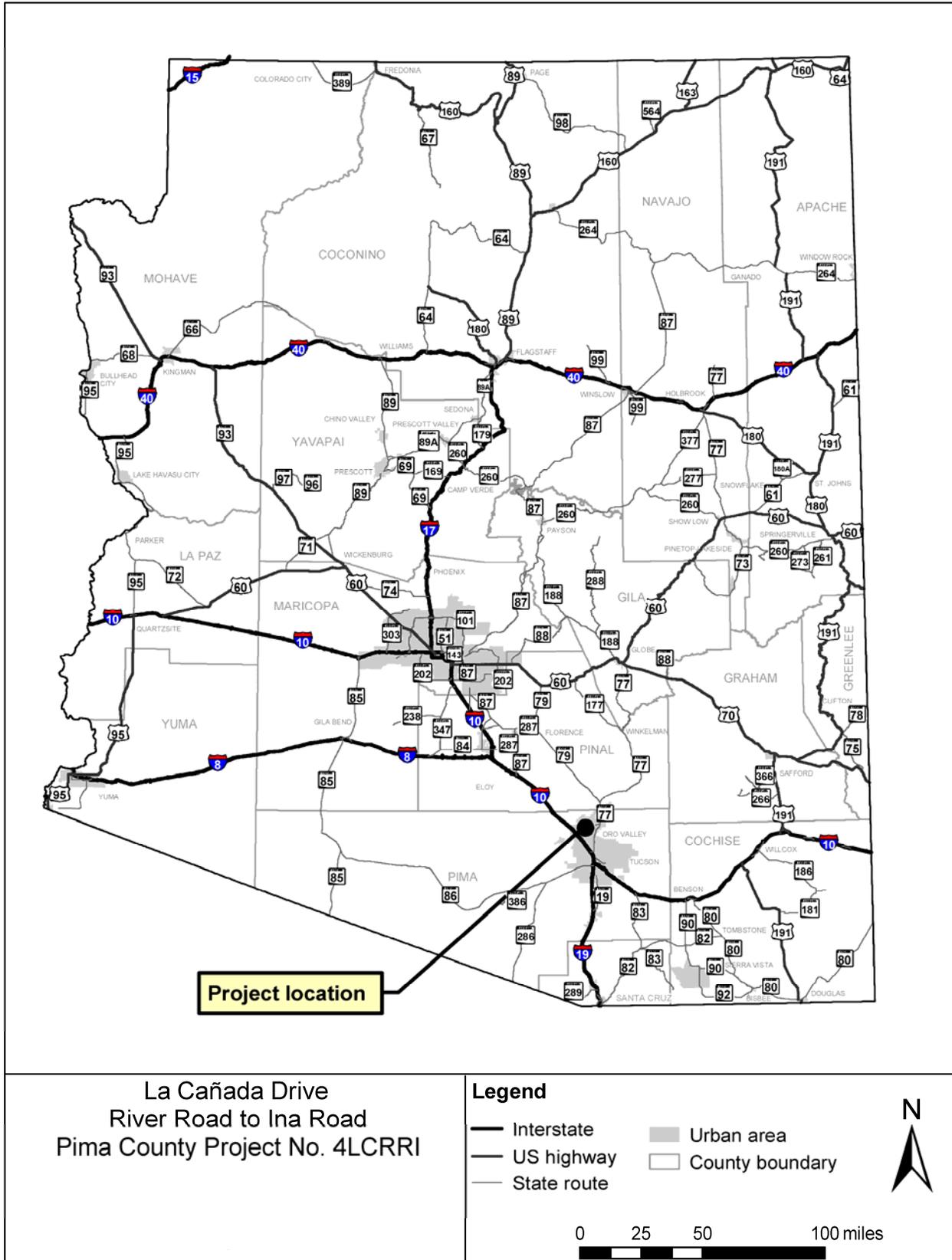
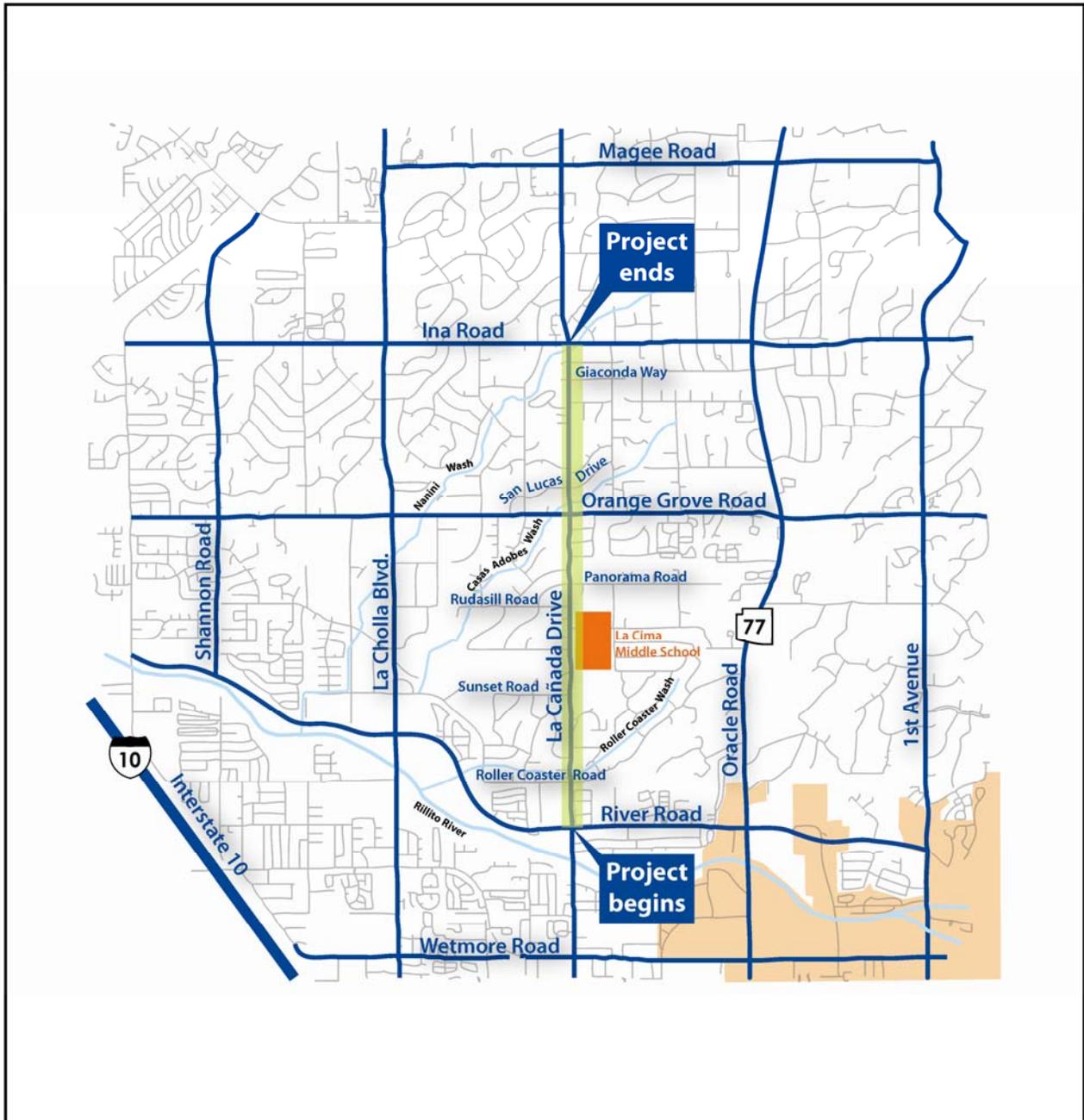
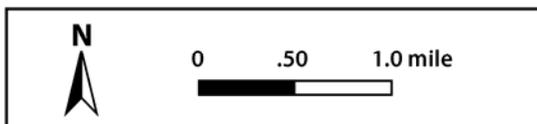




Figure 2. Project vicinity



Legend		Arterial street
		Interstate highway
		City of Tucson limits
		Project Area



La Cañada Drive: River Road to Ina Road Pima County Project No. 4LCRRI	
Federal Project No. STP-PPM-0(201)A	TRACS No. SS639 03D



Pima County impact fees are fees charged to private development to help offset related impacts to area infrastructure, such as roads. These fees are charged by Pima County and must be used for infrastructure projects that benefit the area.

This project has included extensive community involvement in accordance with the Pima County Community Participation Ordinance. The *Final Environmental Assessment and Mitigation Report* further details the public involvement activities for the project, and includes informational materials used during Community Advisory Committee (CAC) and public meetings. While a design concept report for PCDOT typically includes this information in an appendix, this report refers the reader to the *Final Environmental Assessment and Mitigation Report* because both documents are being reviewed concurrently.

1.3 Previous Work

La Cañada Drive was constructed to the current roadway grade south of Roller Coaster Road in 1975. The portion north of Roller Coaster Road was constructed in the 1940s. Existing culverts were installed in 1978 and 1979. Improvements are planned for the section of La Cañada Drive from Ina Road to Calle Concordia as part of a separate project; construction is anticipated to commence in the fall of 2009 and will encompass improvements to the La Cañada Drive intersection with Ina Road.

Because the widened roadway will follow the existing horizontal alignment, a location report was not required. Reports prepared for PCDOT for this project include:

- *Final Traffic Engineering Study for La Cañada Drive, River Road to Ina Road* (2007a), Kimley-Horn and Associates, Inc.
- *Environmental Screening: Results Memorandum, La Cañada Drive, River Road to Ina Road* (2007b), HDR Engineering, Inc.
- *Phase I Initial Site Assessment, La Cañada Drive, West River Road to Ina Road* (2007c), HDR Engineering, Inc.
- *La Cañada Drive, River Road to Ina Road, Final Roadway Design Parameters Report* (2007d), HDR Engineering, Inc.
- *Preliminary Geotechnical Report, La Cañada Drive – River Road to Ina Road* (2007e), NCS Consultants, LLC
- *La Cañada Drive, River Road to Ina Road, Final Pavement Design Summary Report* (2007f), HDR Engineering, Inc.
- *La Cañada Drive, River Road to Ina Road, Survey Report* (2007g), HDR Engineering, Inc.
- *La Cañada Drive, River Road to Ina Road, Lighting Design Report* (2008a), Kimley-Horn and Associates, Inc.
- *La Cañada Drive, River Road to Ina Road, Draft Native Plant Inventory Results* (2008b), Wheat-Scharf Associates
- *La Cañada Drive, River Road to Ina Road, Proposed Jurisdictional Determination* (2008c), HDR Engineering, Inc.
- *La Cañada Drive, River Road to Ina Road, Final Noise Report* (2008d), HDR Engineering, Inc.



- *La Cañada Drive, River Road to Ina Road, Draft Final Drainage Report, Stage II Submittal* (2008e), HDR Engineering, Inc.
- *La Cañada Drive, River Road to Ina Road, Draft Biological Evaluation* (2009a), HDR Engineering, Inc.
- *La Cañada Drive, River Road to Ina Road, Final Environmental Assessment and Mitigation Report* (2009b), HDR Engineering, Inc.

Construction is anticipated to start within the first 5 years of the RTA plan—in 2011.

1.4 Project Need

This improvement project is needed to accommodate population growth and the related increase in travel demand projected for 2030. The Pima Association of Governments *2030 Regional Transportation Plan* (2006) calls for widening La Cañada Drive between River Road and Ina Road to four lanes, with sidewalks and bicycle lanes.

La Cañada Drive is an important north–south route linking Tucson and Oro Valley. It is designated as a regional corridor by the RTA. Furthermore, the Pima County *Major Streets and Scenic Routes Plan* (1995) identifies La Cañada Drive as a “major route” within the project area.

The widening is needed to accommodate the heavy volumes of traffic projected in 2030. Furthermore, the existing roadway profile has vertical deficiencies that limit stopping sight distances for motorists—a safety concern. Drainage is another concern, with PCDOT receiving several complaints concerning stormwater problems in the right-of-way. Not only is drainage an issue at major wash crossings when traffic is delayed or detoured for the duration of high flows that occur during storms, it is also a safety concern when vehicles attempt to drive through those flooded crossings.

Constructing this project will reduce existing and future traffic congestion on La Cañada Drive by providing additional capacity and efficient intersection operation. The project will construct raised medians, left-turn lanes, and a frontage road that will concentrate turning movements, thereby improving traffic operation and reducing the number of potential collision points along the corridor. The project will provide an all-weather travel surface through drainage improvements including culvert installation and expansion. The project will also improve mobility through the provision of bike lanes, sidewalks, and a public use trail.

2.0 Project Description

This section describes the project, along with its termini and major features.

2.1 Project Type and Termini

This project involves the complete reconstruction of La Cañada Drive. The new roadway will have four travel lanes, a paved bike lane in each direction, a raised and landscaped median, and concrete curbs and sidewalks from River Road to Nanini Wash. On the western side of the road, a public use trail with a landscaped buffer will be provided from Roller Coaster Wash to Nanini Wash. The project will also include replacing existing culverts and adding new culverts at all the washes. The



intersections of La Cañada Drive with Roller Coaster Road and Kimberly Street will have right-turn lanes installed. The intersection of La Cañada Drive with Orange Grove Road will include additional right-turn and dual left-turn lanes on all four legs.

The length of the project is 2.67 miles from the northern side of the intersection with River Road (southern terminus) to Nanini Wash, which is about 300 feet south of Ina Road (northern terminus). The improvements to Orange Grove Road will extend about 1,900 feet east and 2,000 feet west of La Cañada Drive.

2.2 Major Features

The design speed for this project is 50 mph, and will be posted at 45 mph. Most of the existing right-of-way, with a width of 150 feet, will generally be sufficient to accommodate the four-lane arterial street. The typical roadway sections are shown in Figures 3 and 4. Landscaping will be provided in the median and frontage areas.

Pavement drainage improvements will include a new closed storm drain system consisting of catch basins, manholes, and storm drains capable of conveying 10-year storm flows. Box and pipe culverts and channels will be designed for the 100-year storm; they will replace existing culverts and dip wash crossings.

Existing utilities include 3-, 4-, 6-, 8-, and 12-inch water lines; 6-, 8-, 10- and 12-inch sanitary sewer lines; 1- and 2-inch natural gas lines; telephone lines; cable television lines; and overhead electric power lines. The Metropolitan Domestic Water Improvement District (Metro Water) and Western Area Power Administration (Western) are currently in the design phase to relocate a major portion of their water and electric power lines that fall inside the La Cañada Drive right-of-way; these relocations should occur prior to the construction of this project. It is anticipated that minor relocations of the other underground lines and other overhead electric power lines will be required.

Driveways will be provided to every property that currently has legal access to La Cañada Drive. Driveway turnouts will be provided at private driveways with primary addresses on La Cañada Drive. Median openings should be spaced no less than 660 feet apart, and the preferred spacing is 1,320 feet. Where there is an option of placing a median opening at side streets, priority will be given to those side streets with higher traffic volumes. A frontage road will be added on the eastern side of La Cañada Drive between Roller Coaster Wash and Whispering Hills Drive. Bus pullouts will be placed on La Cañada Drive at both the northbound and southbound departure sides of the intersections at Roller Coaster Road and Orange Grove Road.

New traffic signals will be installed at the intersection of Orange Grove Road. Equestrian push buttons and staging pads will be provided in each quadrant of the Orange Grove Road intersection. Crosswalks and signal conduit will be added at Roller Coaster Road and La Cima Middle School. The signal conduit in those locations will allow for installation of high-intensity activated crosswalk (HAWK) signals, if warranted, after construction. Intelligent transportation system (ITS) conduit will be added along the length of the La Cañada Drive project. Street lighting will continue to be provided at Orange Grove Road, at Roller Coaster Road, at two La Cima Middle School entrances, and at Kimberly Street.



Figure 3. Typical cross sections for La Cañada Drive and Orange Grove Road, and for La Cañada Drive with the frontage road

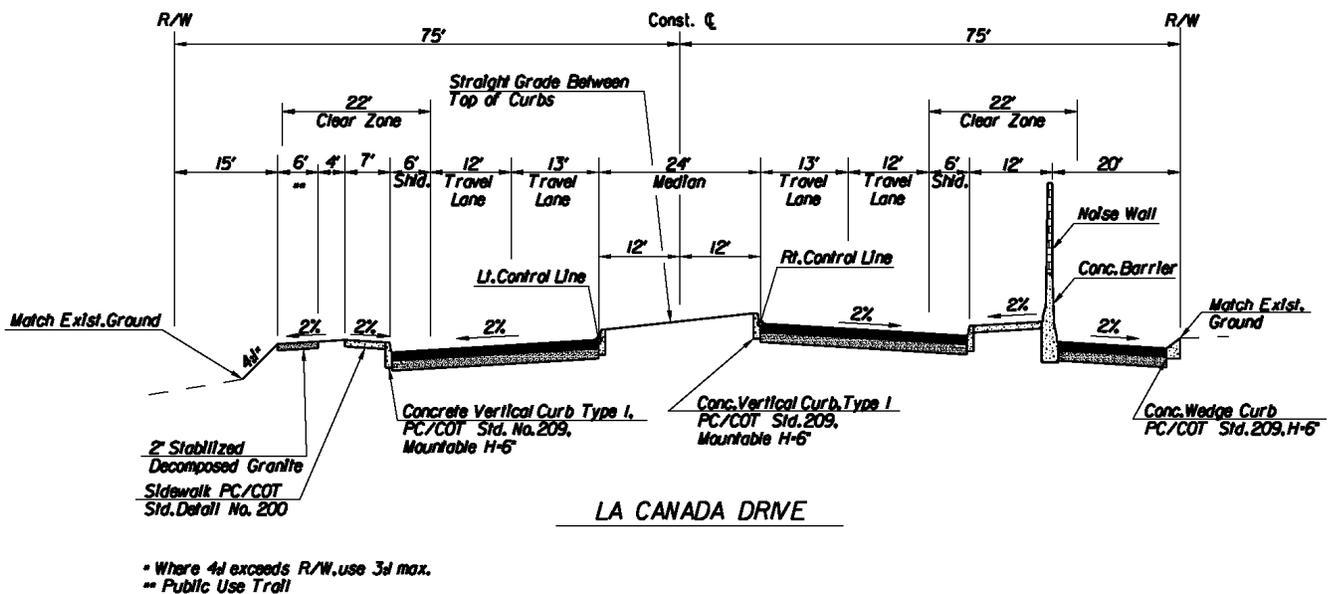
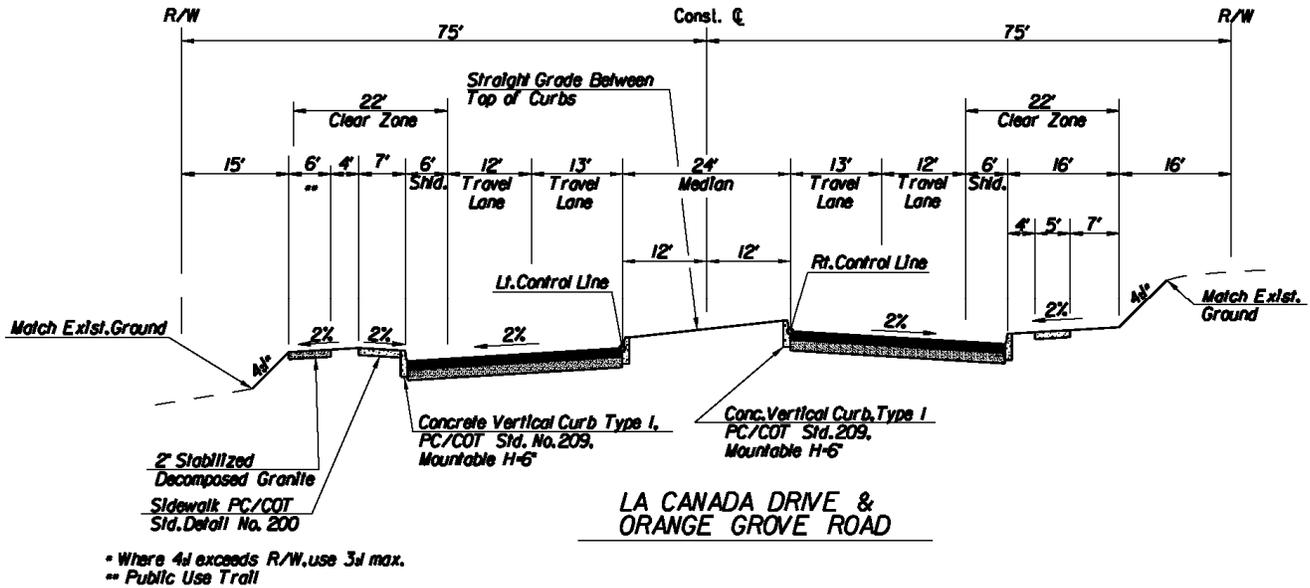
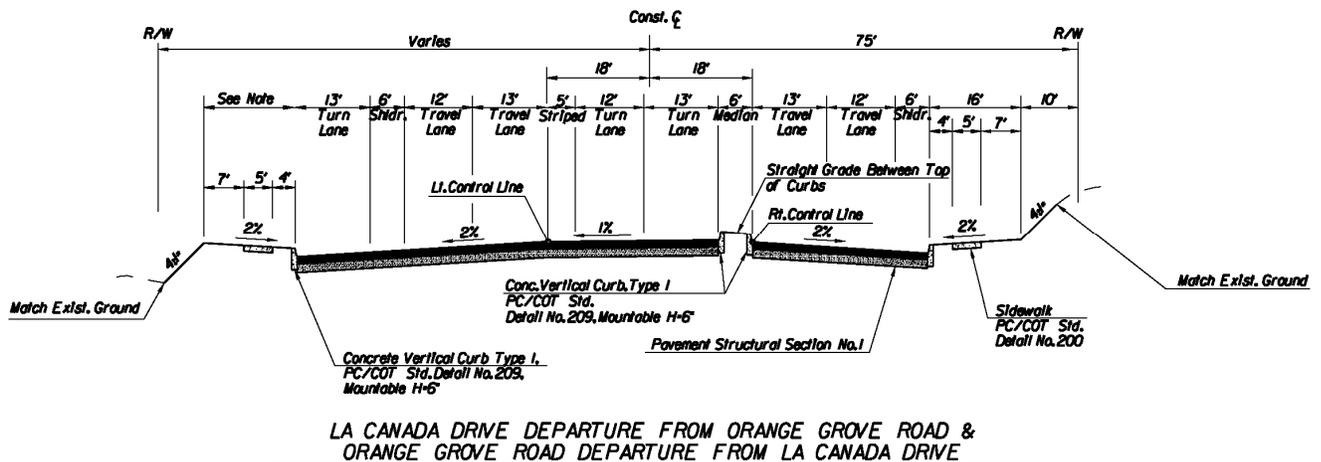
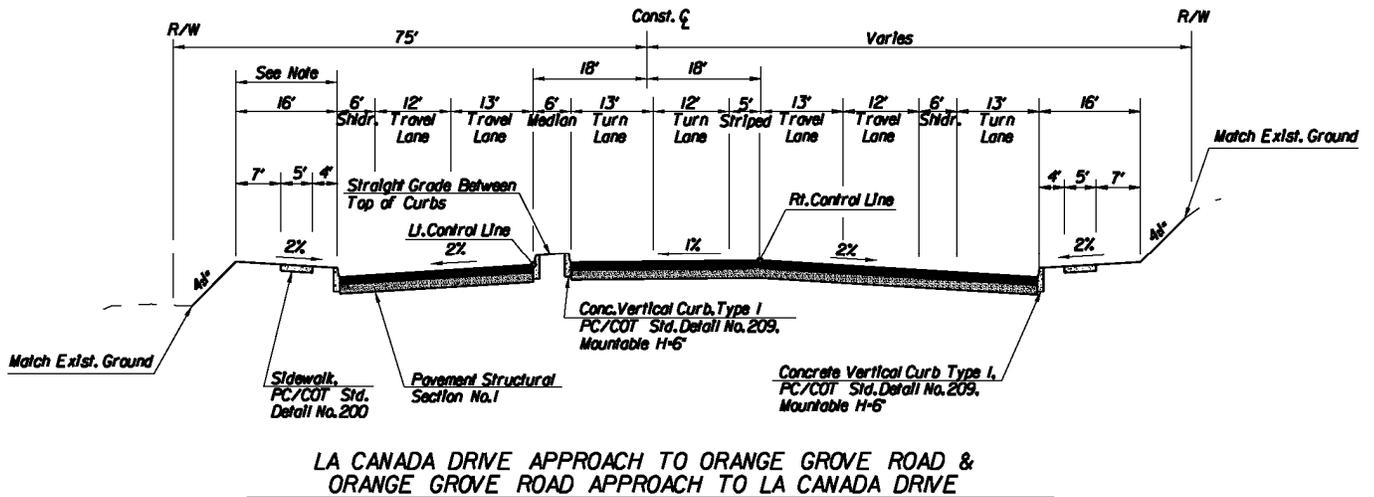


Figure 4. Typical cross sections for La Cañada Drive and Orange Grove Road, showing approaches and departures





Certain features of the project are designed to comply with the Americans with Disabilities Act requirements for accessibility. Sidewalks will meet minimum width and maximum slope criteria. At every intersection, curb ramps will be provided with a maximum slope of 12H:1V (horizontal: vertical) and truncated dome warning strips at the bottom of each ramp. At each intersection where pedestrian demand warrants, wheelchair-accessible median refuge areas will be provided. Crosswalks will have a maximum 2 percent cross slope. Traffic signals will have wheelchair-accessible push buttons. Pads for wheelchair lifts will be provided at each bus stop.

Aesthetics are an integral part of this project. Landscape improvements will be installed in the medians and in the roadway parkway to the right-of-way limit in accordance with PCDOT's landscape and irrigation guidelines and *Roadway Design Manual* (2003a). The utility companies will be consulted regarding types of vegetation to be considered for placement near overhead electric power lines. Placement of landscape improvements will consider the extensive network of existing underground utilities in the project area and conform to sight distance requirements. An artist has been selected and is currently developing conceptual and preliminary artwork plans. Artwork consisting of textured walls, color patterned walls, shade structures, hand-railing treatments, monument pieces, and sidewalk treatments are proposed.

3.0 Project Area Characteristics

This section describes existing conditions in the project area, including topography and terrain, the existing roadway, right-of-way, drainage facilities, utilities, traffic signals, lighting, biological resources, archaeological and historical resources, visual resources, existing and planned adjacent land uses, and intergovernmental agreements.

3.1 Existing Topography and Terrain

The project is located along La Cañada Drive from River Road to Ina Road. Figures 5 and 6 show the project area with associated land uses. The terrain for the project area is somewhat undulating, and slopes to the southwest. Elevations within the project area range from approximately 2,285 to 2,446 feet. La Cañada Drive is a north-south aligned roadway, and the vertical alignment of the road roughly follows the existing terrain, traversing a number of washes at- or near-grade. The cross slope along La Cañada Drive is mild with no major existing cut or fill slopes. Shallow roadside ditches are located along both sides of La Cañada Drive for most of its length in the project area.

3.2 Existing Roadway

The existing roadway from River Road north to Roller Coaster Wash is curbed and has four 12-foot travel lanes, 3-foot paved shoulders, and a 12-foot two-way left-turn lane. From Roller Coaster Wash north to Nanini Wash, the roadway lacks curbs and has two 12-foot travel lanes with 4-foot paved shoulders for most of its length. Side streets have vertical curb, wedge curb, concrete headers, or no curb. The existing surface is asphaltic concrete. The 12-foot two-way left-turn lane extends north from Roller Coaster Road to Las Lomitas Road. The road also has a northbound left-turn lane and a southbound left-turn lane at Orange Grove Road.

Figure 5. Existing land use (River Road to Panorama Road)

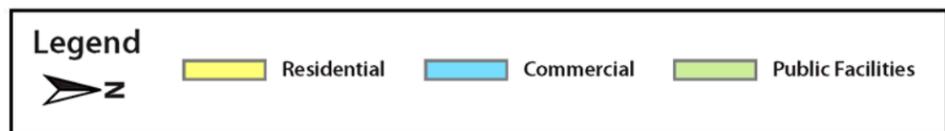
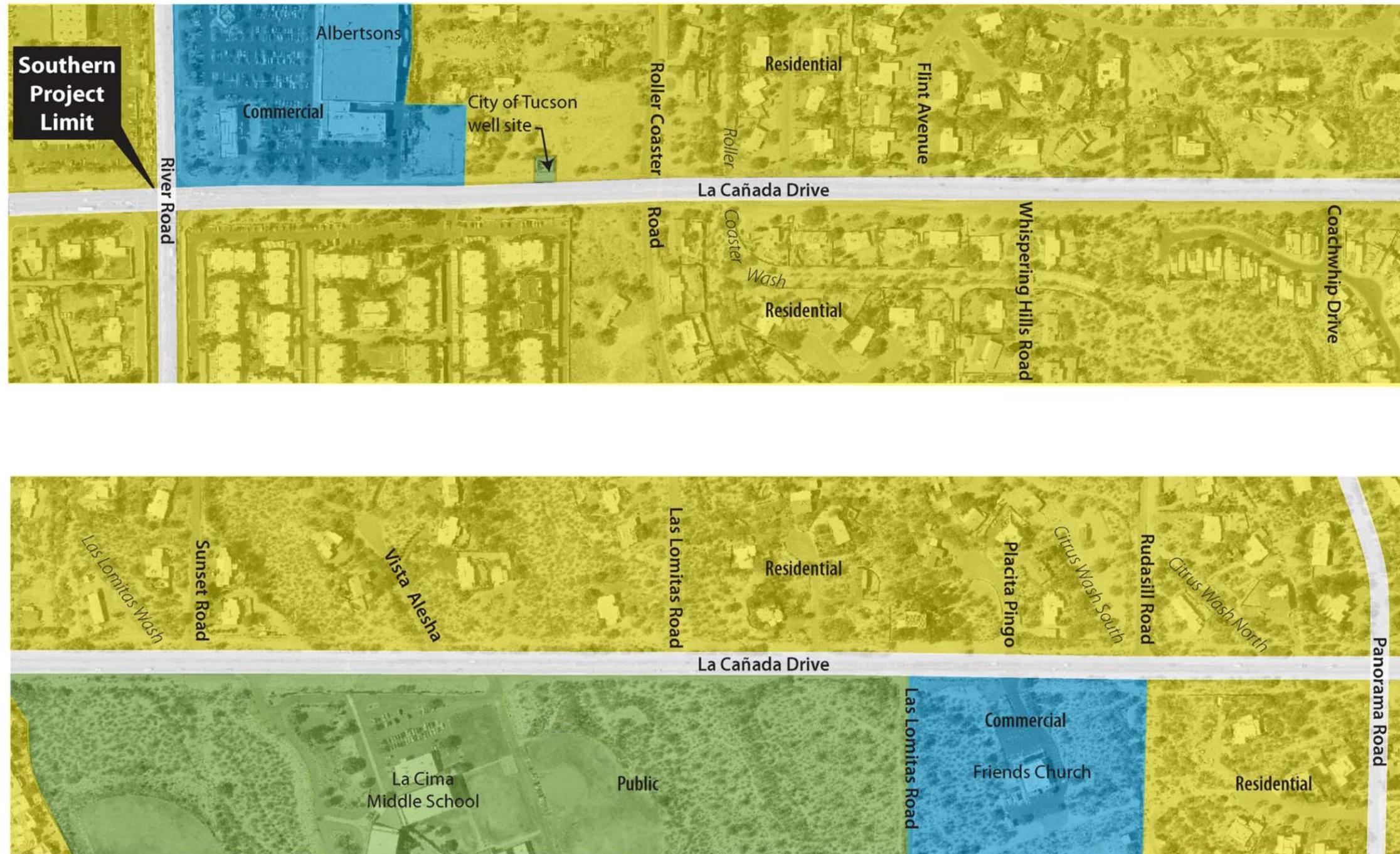
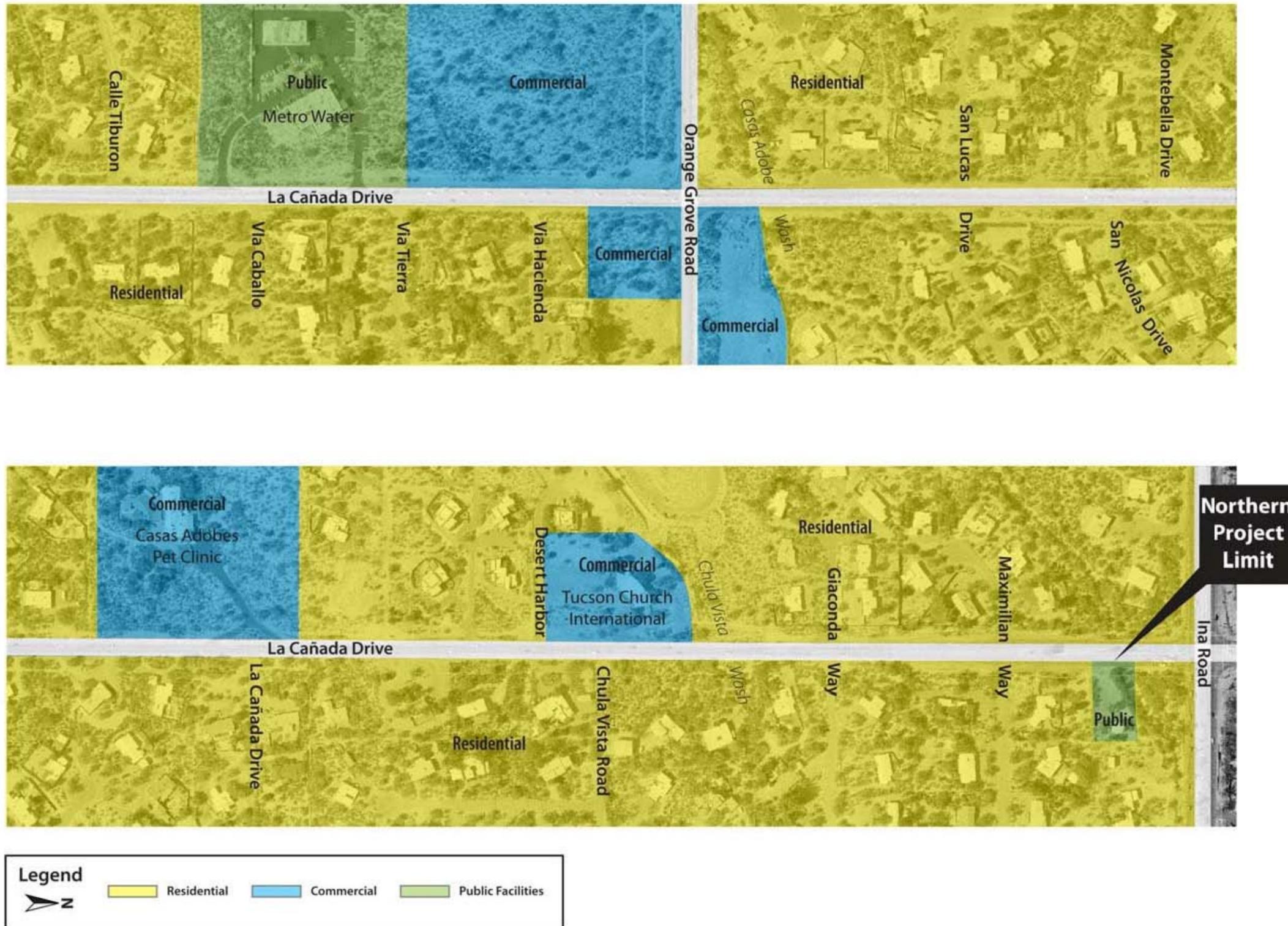


Figure 6. Existing land use (Orange Grove Road to Ina Road)





The existing horizontal alignment follows the existing section line and is straight with minor angle points and no horizontal curves. The roadway starts on the northern side of River Road and goes uphill at a grade that varies from 0.5 to 3 percent to Ina Road. The grade also has sag and crest vertical curves. The vertical curves do not meet the 50 mph design speed criterion at existing dip wash crossings. The posted speed limit is 45 mph.

3.3 Existing Rights-of-Way

La Cañada Drive has a 150-foot existing right-of-way between River Road and Ina Road, with 75 feet to the right and left of the section line. However, the following exceptions exist:

- From 5101 North La Cañada Drive through 5147 North La Cañada Drive (parcels 104-01-072C, 104-01-072B, 104-01-070B, and 104-01-0690), the western half of the right-of-way is 50 feet wide, rather than 75 feet wide.
- At 5335 North La Cañada Drive (parcel 104-01-0500), the western half of the right-of-way is 50 feet wide, rather than 75 feet wide.
- Just south of La Cima Middle School (parcel 105-06-002C), the eastern half of the right-of-way is 50 feet wide, rather than 75 feet wide.

Orange Grove Road has a 150-foot existing right-of-way, with the following exceptions:

- At the southwestern corner of La Cañada Drive and Orange Grove Road (parcel 102-11-131A), the southern half of the right-of-way is only 30 feet wide.

3.4 Existing Drainage

The project area is located within the Upper Santa Cruz and Avra Basin, a sole source aquifer designated area. There are 23 wash crossings along La Cañada Drive, and the largest two washes drain just over 1 square mile: Roller Coaster Wash, with 1.2 square miles, and Casas Adobes Wash, with 1.1 square miles. Of the 23 wash crossings, only Roller Coaster Wash is in a human-made channel. All other washes have natural channels or graded channels that are returning to a natural state.

The project area is in the foothills of the Santa Catalina Mountains. All of the drainage basins that cross this project area are on the alluvial outwash of the mountains. The existing two-lane road is oriented north–south, with the drainage occurring from northeast to southwest; therefore, most drainage crossings of the road occur at angles of 45 to 90 degrees.

The existing roadway crosses eight washes at grade (with dip crossings). During moderate to large storms, the roadway is inundated at these wash crossings, limiting access for residents, businesses, and emergency service vehicles.

The box culvert at Roller Coaster Wash is sized for a 25-year storm. The channel upstream and downstream is human-made, with concrete bank protection in curved sections. The slope of the existing channel varies from 0.5 to 2 percent. During larger storms, break outs flow south along and over La Cañada Drive. The Pima County Regional Flood Control District (RFCDD) is preparing a separate design concept report (DCR) that will determine the best option for rectifying this



situation. The RFCDD DCR will also propose the required drainage system improvements between La Cañada Drive and Oracle Jaynes Station Road and address ponding on La Cañada Drive south of Roller Coaster Road. Final design and construction of RFCDD facilities will need to be coordinated with this project. From an implementation standpoint, should the La Cañada Drive improvements precede the RFCDD improvements to Roller Coaster Wash, the La Cañada Drive improvements will be designed and constructed such that they do not exacerbate the ponding on La Cañada Drive nor the flood limits downstream of the new Roller Coaster Wash box culvert.

From River Road north to Roller Coaster Wash, the roadway is an existing five-lane road with curbs and a closed storm sewer system. The existing road from Roller Coaster Wash north to Orange Grove Road is a two-lane road with corrugated metal pipe culverts at most drainage crossings and one dip crossing. From Orange Grove Road north to Nanini Wash, the two-lane road has dip crossings and three small culvert crossings.

All of the washes upstream of La Cañada Drive have channel slopes between 1.5 and 2.5 percent, a ground cover class of “desert brush,” and a soil type that is about 50 percent “C,” 50 percent “D,” and 20 percent impervious cover (see Appendix C of the *Draft Final Drainage Report, Stage II Submittal* [PCDOT 2008e]).

All of the existing culverts were constructed in 1978 and 1979 and convey a storm flow that is less than the 100-year storm. All of the culverts between Panorama Road and River Road create breakouts that flow south to the next cross channel during large storms. The proposed culverts will convey the 100-year storm under La Cañada Drive and will eliminate breakouts for all storms less than the 100-year storm. This will return the 100-year flow to a natural condition that existed before 1978, with the effect being that some channels will see nominally more flow than they see today. It is noted that the sections of channels with increased flow are limited because all breakouts do return to the original channel at some point downstream. The proposed design will do the minimum amount of channel work upstream and downstream of the new culverts as possible, thus maintaining the channels as natural as possible.

3.5 Existing Utilities, Signals, and Lighting

The existing utilities were identified by HDR, and TBE Group provided “Level B” locations of the traceable utilities. Identified utility types and owners are listed in Table 1.

Existing traffic signals are located at Orange Grove Road. Street lights are found at the commercial area north of River Road, Roller Coaster Road, and at La Cima Middle School. La Cañada Drive does not have continuous street lighting.



Table 1. Existing utilities

Owner	Type
AT&T	Fiber optic telephone line
Comcast	Cable television line
Metropolitan Domestic Water Improvement District	3-, 4-, 6-, 8-, and 12-inch water line ^a
MCI-Verizon	Telephone line
Pima County Regional Wastewater Reclamation Department	6-, 8-, 10-, and 12-inch sanitary sewer line
Pima County Traffic Engineering Division	2-inch conduit for traffic signals
Qwest	Underground telephone line
Southwest Gas	1- and 2-inch distribution gas line
Time Warner/Xspedius	Fiber optic telephone line
Tucson Water	12-inch water line and well site
Tucson Electric Power	Overhead and underground electric power line
Western Area Power Administration (Western)	Overhead electric power line

^a New line will be installed prior to road construction.

3.6 Existing Biology

The project area is located within the Arizona Upland Subdivision of the Sonoran desert scrub biotic community. Additional vegetation communities include xeroriparian habitats along the washes and disturbed desert upland primarily along the existing road. A biological evaluation was completed to evaluate the project area’s potential to support protected species, and focuses on impacts to the lesser-long nosed bat and the cactus ferruginous pygmy owl. In addition, a native plant inventory was conducted consistent with Pima County’s Native Plant Preservation Ordinance.

For more information regarding biological resources in the project area, refer to the *Draft Biological Evaluation* (PCDOT 2009a) and the *Final Environmental Assessment and Mitigation Report* (PCDOT 2009b).

3.7 Archaeological and Historic Resources

A cultural resources survey, including a records search and a pedestrian survey, was conducted for the project area. The Class III survey was conducted in accordance with Section 106 of the National Historic Preservation Act. It identified four sites within the project’s area of potential effects: AZ BB:5:123 (ASM), a circa-1940s transmission line; AZ BB:9:81 (ASM), a trash dump; AZ BB:9:244 (ASM), a Hohokam limited use area; and AZ BB:9:268 (ASM), a Hohokam limited use area (Touchin 2009). Of the four sites within the project’s area of potential effects, one was found to be ineligible for listing in the National Register of Historic Places and one was found to lack historic integrity. Furthermore, it was determined that the two Hohokam sites would not be affected by project construction activities.



The project is likely to require the acquisition and demolition of two residences in order to accommodate the roadway widening. The evaluation of these residences concluded that one property did not meet age requirements to be considered historic. The other property was recommended as not eligible for listing in the National Register of Historic Places because of extensive recent alterations.

For more information regarding cultural resources in the project area, refer to the *Final Environmental Assessment and Mitigation Report* (PCDOT 2009b).

3.8 Existing Visual Resources

Background views along the project corridor consist of the Santa Catalina Mountains to the northeast, the Rincon Mountains to the distant east, and the Tucson Mountains to the west-southwest. The middle-ground views are a mixture of medium- and low-density residential development interspersed with native and nonnative vegetation. The foreground views are of residences, businesses, and a wide, unpaved roadway shoulder that is predominantly devoid of vegetation, with more vegetation visible at the numerous wash crossings.

For more information regarding visual resources in the project area, refer to the *Final Environmental Assessment and Mitigation Report* (PCDOT 2009b).

3.9 Existing and Future Land Use

Land use in the project area is predominantly low-density residential with some moderate- to high-density residential. Other land uses are commercial, public, church, and flood control/wash, with some vacant land located along the project area.

Land use at the signalized intersection of La Cañada Drive and River Road is a mix of high-density residential and commercial. An Albertson's shopping plaza is on the northwestern corner, a Walgreen's drugstore is on the southwestern corner, and the Sun River Apartments (a 295-unit apartment complex) is located on the northeastern corner. A residential development is located on the southeastern corner.

Between River Road and Orange Grove Road, land use is primarily residential with the exception of two schools, a church, and an office building. Lulu Walker Elementary School is located to the west of the project corridor (at 1750 West Roller Coaster Road).

La Cima Middle School is located at 5600 North La Cañada Drive on the eastern side of the road between Sunset Road and Las Lomas Road. The Friends Church is located at 5950 North La Cañada Drive (across from Placita Pingo), and Metro Water is located at 6265 North La Cañada Drive.

At the signalized intersection of La Cañada Drive and Orange Grove Road, an office complex is currently being constructed on the northeastern corner. Between Orange Grove Road and Ina Road, land use is primarily residential with the exception of a few individual residential developments on the western side of the road. The Animal Inn and Casas Adobes Pet Clinic are located at 6745 North La Cañada Drive, the Tucson Church International is located at 6901 North La Cañada Drive, and



the Villas of La Cañada—a rental condominium complex—is located at 6899 North La Cañada Drive. Zoning in the project area is predominantly Single Residence (CR-1), Transitional Zone (TR), and Single Ranch (SR).

Pima County Development Services forwards any development plans for review to ensure compatibility with the current La Cañada Drive design. At time of publication, HDR has not received any development plans from Pima County. Future coordination will be necessary to enable smooth design and construction on the part of PCDOT and developers. Refer to Figures 5 and 6 for an overview of the project area with adjacent land uses.

3.10 Intergovernmental Agreements

Two existing intergovernmental agreements (IGAs) pertain to this project. The first IGA is between Tucson Water and Pima County, which provides for a 50-50 sharing of expenses for any water lines that must be relocated to facilitate road reconstruction by Pima County. The second IGA is between the RTA and Pima County. It calls for the RTA to provide some of the funding of the design and construction of this project.

4.0 Traffic and Accident Data

This section discusses existing and future traffic conditions along La Cañada Drive, and provides data on accidents along the project corridor.

4.1 Traffic

A traffic analysis report was completed in 2007 by Kimley-Horn and Associates, Inc., to document existing and future traffic conditions and to provide recommendations for the number and length of turning lanes at intersections, location of median openings, and the need for additional traffic signals.

The current average daily traffic volumes along La Cañada Drive between River Road and Ina Road range from 19,379 to 19,644. In 2030, traffic volumes are expected to increase to between 38,100 and 42,400 vehicles per day. Although the planning level analysis indicates that a four-lane road may not meet travel demand, it is assumed that the signalized intersections will be the critical locations for providing optimal traffic conditions and therefore determine the number of lanes needed.

Intersections

The peak hour traffic volumes at the River Road and Orange Grove Road intersections were analyzed in the traffic report. The existing and proposed turning movement traffic volumes and configurations are shown in Figures 7 and 8, respectively.

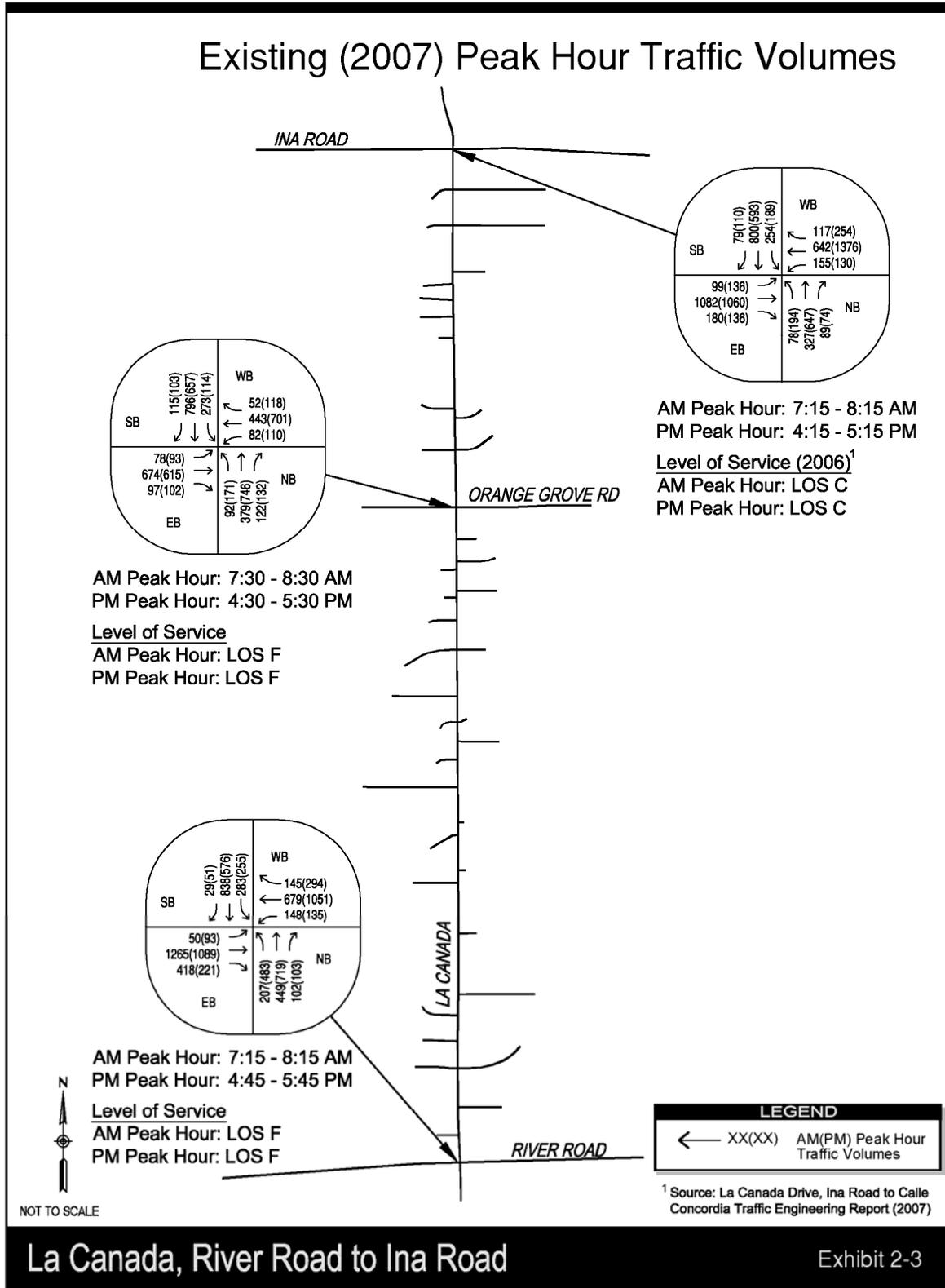
The proposed intersection improvements for River Road will be undertaken as a separate project associated with the widening of River Road, currently anticipated to occur between 2020 and 2030. The proposed intersection configuration for Orange Grove Road will meet travel demand for 2030. The intersection at Ina Road was not analyzed as part of this project, but was included in the La Cañada Drive, Ina Road to Calle Concordia project.



Figure 7. Existing traffic conditions



Kimley-Horn
and Associates, Inc.



La Canada, River Road to Ina Road

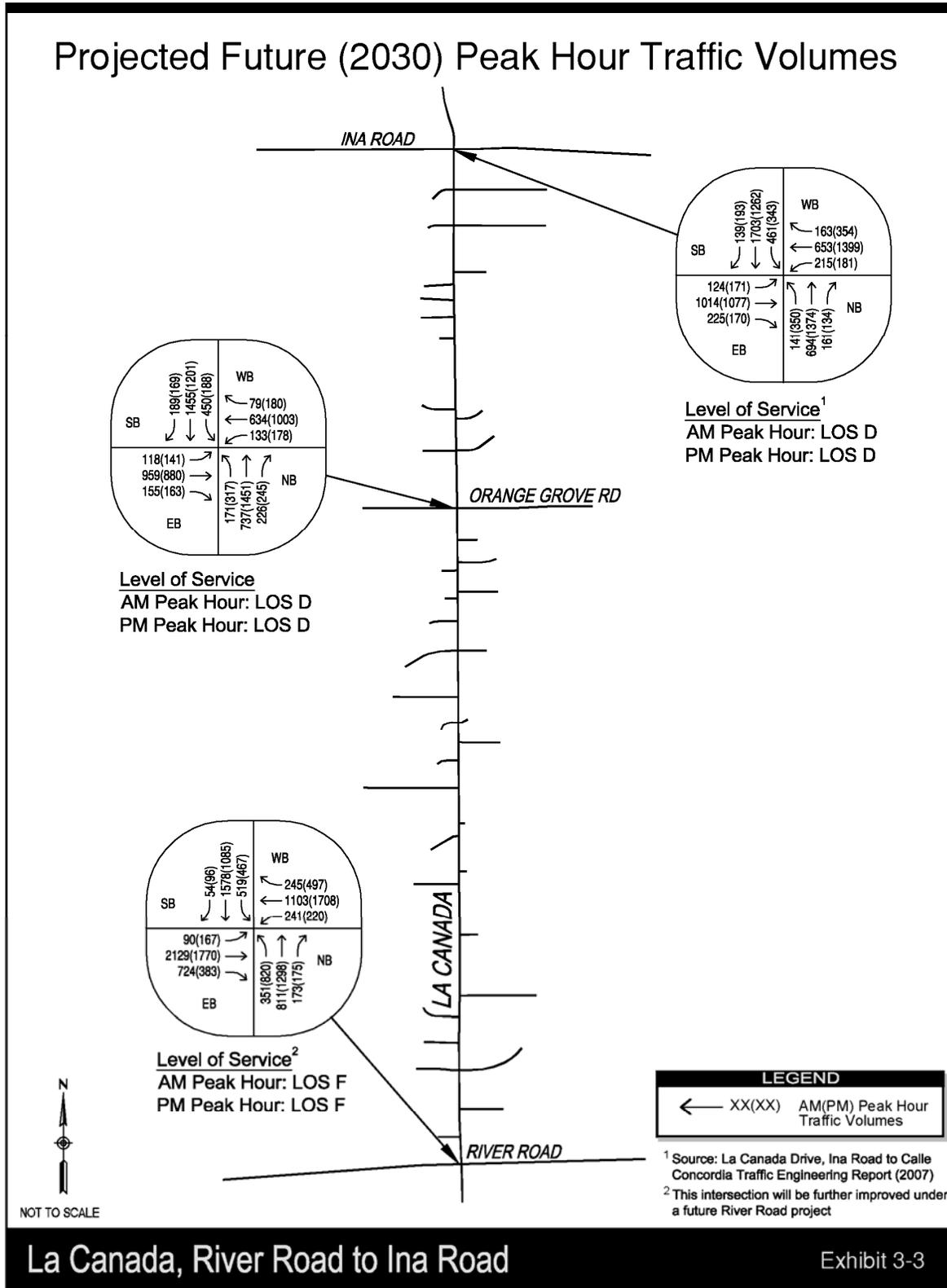
Exhibit 2-3



Figure 8. Future traffic conditions



Kimley-Horn
and Associates, Inc.





A HAWK is a traffic signal activated by pedestrians to stop traffic when they want to cross the road. HAWK warrant studies were performed at two school crosswalks: one at Roller Coaster Road (primarily serving Lulu Walker Elementary School) and one at La Cima Middle School. Results of the HAWK warrant studies performed by Pima County indicated that neither school crossing warranted HAWK installation at this time because of the low number of people using the crosswalks. However, development of project improvements, including sidewalks and the public use trail, may result in increased use of crosswalks in the future. Therefore, signal conduit will be added at both locations as part of this project to allow for future HAWK installation, should the crosswalks meet warrants in the future.

Parking, Pedestrian, and Bicycle Movements

The existing right-of-way is predominantly 150 feet wide, which encourages parking between the existing two-lane road and adjacent homes and businesses. These informal parking areas will be lost when the road improvements are made. Parking spaces that exist on private property will not be affected by these improvements.

No sidewalks are located along La Cañada Drive from River Road to Nanini Wash. Installation of sidewalks along both sides of La Cañada Drive will be part of the proposed improvements.

Several trails cross the project area. The most prominent is the Casas Adobes Loop Trail, which leads from Oracle Road to the Rillito River trail. It crosses the project area just north of the intersection of Orange Grove Road and La Cañada Drive.

According to the Pima Association of Governments *Tucson Metro Bike Map* (2007), La Cañada Drive within the project limits is classified as a bike route with a striped shoulder, bike route signs, a white edge line, and approximately 4- to 6-foot-wide paved shoulders. The 6-foot paved shoulders to be built along La Cañada Drive on the eastern side from Kimberly Street to Nanini Wash and on the western side from Roller Coaster Road to Nanini Wash will serve as bike lanes. Bike route signs and pavement markings will be provided. To prevent obstruction of the bike lane, driveway turnouts for garbage, mail, and other vehicles will be provided at private driveways with primary addresses on La Cañada Drive.

4.2 Accidents

Collision data were obtained from PCDOT's Traffic Engineering Division for the most current 3-year period—from December 1, 2003, to November 30, 2006. The data included both roadway segments and intersections in the project area. During the 3-year period, 54 collisions occurred along the road itself between River Road and Ina Road:

- 26 collisions in the 0.74 mile segment between River Road and Sunset Road
- 19 collisions in the approximately 1 mile segment between Sunset Road and Orange Grove Road
- 9 collisions in the approximately 1 mile segment between Orange Grove Road and Ina Road

The crash rate was 1.61 crashes per million vehicle miles traveled in the southernmost segment between River Road and Sunset Road, 0.88 in the middle segment between Sunset Road and



Orange Grove Road, and 0.44 in the northernmost segment between Orange Grove Road and Ina Road. These data illustrate that collisions are more likely to occur in the southern portion of the project area, near River Road.

Collision data for the intersections were recorded separately and are presented in Table 2.

Table 2. Collision data for intersections

Intersection with La Cañada Drive	Number of crashes^a
River Road	114
Roller Coaster Road	12
Neosho Place	1
Coachwhip Drive	1
Sunset Drive	2
Vista Alesha	1
Las Lomas Road (south)	2
Las Lomas Road (north)	4
Placita Pingo	1
Rudasill Road	3
Calle Kino/Panorama Road	4
Calle Tiburon	2
Orange Grove Road	76
San Lucas Drive	1
San Nicholas Drive	2
Montebella Drive	2
Tarantula Ranch Place	1
Desert Harbor Court	1
Chula Vista Road	2
Giaconda Way/Giaconda Place	2

Source: Pima County Department of Transportation Traffic Engineering Division

^a December 1, 2003, to November 30, 2006

These data illustrate that collisions are more likely to occur at major intersections along the corridor experiencing large traffic volumes, including River Road and Orange Grove Road. In both instances, the majority of crashes were rear end collisions. The 3-year average crash rate is 1.67 collisions per million vehicles at River Road and 1.64 at Orange Grove Road. In contrast, the 3-year average for Pima County intersections is 0.90. The Orange Grove Road intersection is ranked 14 out of 114 intersections in priority for improvement, and the River Road intersection is ranked 8 out of 114 for improvement.

With the exception of these two intersections, crash rates along the corridor are considered low.



The crash data collectively indicate that implementation of access management strategies are needed at these intersections. The Orange Grove Road intersection will be improved as part of this project. The River Road intersection is anticipated to be improved as part of the future River Road widening.

5.0 Design Standards and Criteria

This section presents the design standards and criteria used for the La Cañada Drive project.

5.1 Geometric Standards

The roadway will be designed in accordance with the American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets* (2004), the PCDOT *Pima County Roadway Design Manual* (2003a), the AASHTO *Roadside Design Guide* (2002), and as documented for PCDOT in the *Final Roadway Design Parameters Report* (2007d).

5.2 Design Standards

Design standards for this project described in the *Final Roadway Design Parameters Report* include the *City of Tucson and Pima County Standard Details for Public Improvements* (PCDOT 2003b), the *PCDOT and TDOT Traffic Engineering Division Pavement Marking Standards* (PCDOT 2008f), the *Guide for the Development of Bicycle Facilities* (AASHTO 1999), and the *Manual on Uniform Traffic Control Devices* (Federal Highway Administration 2003).

5.3 Slope Standards

Most cut-and-fill slopes behind the sidewalks will be 4H:1V. A slope of 3H:1V is the steepest slope allowable to limit significant problems with erosion gullies while supporting revegetation. Where a steeper slope is needed to avoid or minimize right-of-way acquisition, a maximum slope of 2H:1V stabilized with shotcrete or riprap will be used. The *Preliminary Geotechnical Report* (PCDOT 2007e) recommended that temporary cut or fill slopes not exceed 1.5H:1V to ensure stability.

5.4 Pavement Structure

Using the information contained in Section 3.13 of the *Pima County Roadway Design Manual* (PCDOT 2003a) and the *Preliminary Geotechnical Report* (PCDOT 2007e), a *Final Pavement Design Summary Report* (PCDOT 2007f) was prepared. The design criteria are as follows:

- Design period – 20 years
- Design R-value – 55
- Plasticity Index (PI) – non plastic to 10
- Percent passing a No. 200 sieve – ranges up to approximately 42%
- Resilient modulus – 26,000 psi
- Seasonal variation factor – 1.7
- Level of reliability – 95%



- Change in serviceability index – 1.4
- Minimum structural number for arterial road – 2.64

5.5 Design Speed

The design speeds for La Cañada Drive and Orange Grove Road are 50 mph, and both are posted at 45 mph. Roller Coaster Road will have a design speed of 30 mph and a posted speed limit of 25 mph. All other side streets will have a design and posted speed of 25 mph.

5.6 Drainage Design

The drainage design criteria for this project are based on the *Pima County Roadway Design Manual* (PCDOT 2003a). See Section 6.4 for additional discussion on drainage design. The drainage design criteria are summarized as follows:

Cross Drainage. These facilities will convey 50-year storm flows under the road while containing the 100-year flows with no more than a 1 foot depth in flowing or ponded water within the road. Runoff from a 100-year storm will not be allowed to overflow to adjacent basins.

Pavement Drainage. These facilities will convey 10-year flows, be free from flooding during the 10-year flood, and allow for a flow spread of up to 20 feet. During a 100-year storm, flowing or ponded water must not exceed 1 foot in depth within the road. Storm drains that convey a combination of pavement drainage and cross drainage will be sized for a 50-year storm.

5.7 Access Control

Access-control features associated with this road will be minimal. Driveways will not be allowed within 150 feet of the curb line of the major intersecting streets (River Road, Roller Coaster Road, and Orange Grove Road). Exceptions may be made for existing driveways on a case-by-case basis. Medians will be used to separate north–south traffic and limit turning movements. See Section 6.2 for additional discussion on driveways and medians.

A frontage road on the eastern side of La Cañada Drive, between Roller Coaster Wash and Whispering Hills Drive, will be provided for the homes so residents will not have to back out directly into the La Cañada Drive traffic. See Section 10.1 for additional discussion of the frontage road.

5.8 Cross Section Elements

The roadway classification for this section of La Cañada Drive is “urban arterial.” It will be designed to AASHTO and PCDOT standards as shown in Table 3.



Table 3. Cross section elements

Typical section	Width
Inside traffic lane	13 feet
Outside traffic lane	12 feet
Right-turn lane	13 feet
Left-turn lane (against curb)	13 feet
Left-turn lane	12 feet
Bike lane	6 feet
Median	24 feet (36 feet at Orange Grove Road)
Clear zone	22 feet from vehicle travel lane in accordance with AASHTO
Sidewalks	5 feet when away from curb and 6 feet when adjacent to curb
Public use trail	6 to 10 feet with 4-foot landscaped buffer

Turn lanes will be provided at intersections as recommended in the traffic report discussed in Section 4.0 of this report.

5.9 Roadway Geometrics

Based on the 50 mph design speed, the minimum radius to be used with a 4 percent superelevation is 926 feet. The minimum horizontal curve length will be 500 feet. Angle breaks of 1° 08' or less may be used in lieu of a horizontal curve. The maximum grade on this project will not exceed 3 percent.

Because the new road will have curbs, the minimum grade will be 0.5 percent. The maximum grade break without a vertical curve will be 0.5 percent, and the minimum vertical curve length will be three times the design speed (150 feet).

5.10 Right-of-Way Width

The existing right-of-way along La Cañada Drive is predominantly 150 feet in width and is centered on the existing section line (a 75-foot half right-of-way to the right and left). New right-of-way will be acquired at several locations where the existing half width is less than 75 feet, bringing the total width to 150 feet. Additional right-of-way will also be acquired along the southern edge of Orange Grove Road, west of La Cañada Drive, for similar reasons.

6.0 Major Design Features

This section describes major design features for the proposed improvements to La Cañada Drive. For a detailed account of the major design features, see Appendix B.

6.1 Horizontal and Vertical Alignment

The centerline of the reconstructed La Cañada Drive will follow the existing section line. The only angle breaks will occur at the section corners at Orange Grove Road and at Sunset Road. Angle



breaks will also occur at the quarter section corners at Roller Coaster Road, at Rudasill Road, and at 200 feet south of La Cañada Place. Deflections will be needed to keep the road centerline on top of the section line. The new roadway profile generally follows the existing grade except at instances where the profile has been raised or lowered to meet geometric standards or raised to accommodate new culverts at wash crossings. Stage II (30%) construction plans are included in Appendix B.

6.2 Access Control

Residential driveways currently access La Cañada Drive in the project area. Driveways will be provided to every property that currently has legal access from La Cañada Drive. A frontage road will be provided for six residential parcels on the eastern side of La Cañada Drive, between Roller Coaster Wash and Whispering Hills Drive to consolidate access and provide a safer connection to La Cañada Drive. Backing out from driveways onto La Cañada Drive will not be permitted for safety reasons. Where commercial driveways line up with the side streets, curb returns will be used instead of depressed curb. Future access to La Cañada Drive from vacant properties will be allowed through the Pima County permitting processes.

Pima County design guidelines direct that median openings should be spaced no less than 660 feet apart, with the preferred spacing being 1,320 feet. The traffic report recommended 17 median openings along the project length; three of those consist of two closely spaced partial median openings. At four locations, the median openings are spaced less than 660 feet to enhance neighborhood circulation and connectivity:

- Kimberly Street to Roller Coaster Road – 557 feet
- northern La Cima Middle School entrance to Las Lomas Road – 482 feet
- Las Lomas Road to Rudasill Road – 647 feet
- San Lucas Drive to Montebella Drive – 585 feet

On the western side of La Cañada Drive just north of River Road at the Albertson's southern entrance, a right-turn-in, right-turn-out driveway will be provided to restrict northbound La Cañada Drive left turns into and northbound left turns out of the Albertson's entrance. This is being done to eliminate conflicts with southbound left turns onto River Road. Albertson's patrons and delivery vehicles will still be able to use the northern entrance to this commercial complex.

6.3 Right-of-Way

Approximately 3 acres of new right-of-way are needed to facilitate the roadway improvements (see Table 4). With the exception of the two residential acquisitions, right-of-way and drainage easement acquisitions will be minor. New right-of-way is needed as follows:

- Minor acquisitions of property frontage from the vacant lot at the intersection of La Cañada Drive and Roller Coaster Road (on the southeastern side) and from 5101 North La Cañada Drive north to Roller Coaster Road.
- Minor acquisitions of property frontage beginning at the southeastern corner of La Cañada Drive and Sunset Road and running south to just beyond Las Lomas Wash. Only small



portions of the vacant properties on La Cañada Drive are needed, and the partial acquisitions are not expected to affect future development of the parcels.

- Two residential properties will be acquired and the buildings demolished. These properties are located across the street from the intersection of La Cañada Drive and Whispering Hills Drive between Roller Coaster Road and Orange Grove Road.
 - 5365 North La Cañada Drive will be acquired because the proposed right-of-way line is too close to the house and walls would undercut the house foundation.
 - 5335 North La Cañada Drive will be acquired because the new roadway slopes will make the existing home inaccessible.
- Minor acquisitions of property frontage from the vacant lot at the intersection of La Cañada Drive and Orange Grove Road (on the southwestern side).

Table 4. Right-of-way summary

Parcel	Location	Ownership	Acreage
104-01-072C	5101 North La Cañada Drive	John W. and Dena K. Hesser	0.057
104-01-072B	5101 North La Cañada Drive	John W. and Dena K. Hesser	0.026
104-01-070B	5131 North La Cañada Drive	Dona Davenport	0.106
105-07-013B	1358 West Roller Coaster Road	Sanders C. and Louise R. Watson	0.108
104-02-1710 ^a	5335 North La Cañada Drive	Albert N. and Mary Louise Martinez	0.447
104-01-0500 ^a	5365 North La Cañada Drive	James Lynn and Sheralyn F. McElhiney	0.775
105-06-002B	no address listed with County Assessor	JMK Family Properties	0.266
102-16-0740	1340 West Via Hacienda	Gina L. and Peggy N. Genova	0.032
102-16-0690	1341 West Orange Grove Road	Orange Grove Property LLC	0.078
102-11-131A	no address listed with County Assessor	Constantino T. and Nelda Panousopoulos	0.933
102-09-3970	6411 North La Cañada Drive	Manual D. Verdugo and Cecilia S. Aparisi	0.069
102-09-3980	6431 North La Cañada Drive	Kim C. and Mary Ann Stewart	0.044
Total			2.941

^a total property acquisitions

Figure 9 shows the needed right-of-way. For further detail regarding the property to be acquired, refer to Appendix B, which contains the plans showing right-of-way requirements.

Figure 9. Right-of-way acquisitions



 Right-of-Way Acquisition
 Drainage Easement



6.4 Drainage

The *Draft Final Drainage Report, Stage II Submittal* (PCDOT 2008e) discusses the cross drainage impacts and stormwater collection and conveyance of the road widening project. It has been prepared by HDR and submitted to Pima County for review.

In order to address mobility concerns and ensure an all-weather street, the *Pima County Roadway Design Manual* requires culverts be sized to convey the 50-year storm with the provision that, during a 100-year storm, no overtopping deeper than 1 foot occur and that no flows breakout to adjacent basins. For a curbed arterial street with a raised median like the proposed La Cañada Drive, both provisions—overtopping and breakout—are violated. The *Pima County Roadway Design Manual* 50-year storm specifications are not suited for La Cañada Drive because of its topography. All of the washes on this project cross La Cañada Drive going to the southwest, and the roadway slopes gradually down to Roller Coaster Wash. Cross drainage overtopping the curbing would inherently break out under the 50-year design to adjacent basins, and the headwater elevation created by a 1-foot overtopping allowance for a curbed arterial street would, in most cases, create flooding on the upstream side of a culvert without significant upstream channelization. As a result, culverts on the La Cañada Drive project are designed for the 100-year storm with provisions rather than the 50-year storm. Each design will also attempt to minimize costs and environmental impacts while maximizing hydraulic performance and serviceability.

The 100-year peak flows for each watershed were calculated as the first step. Each watershed was analyzed to determine the type of drainage improvements that would be required to convey the 100-year peak flows under La Cañada Drive. The results of these calculations and the approximate capacity of the existing storm drains are shown in the drainage report. See Table 5 for a summary of existing and proposed major drainage structures.

To remove water from the road, La Cañada Drive will have a closed storm drain system within the roadway, designed for a 10-year storm. The storm drains will outlet at the appropriate cross drainage culverts so stormwater will remain in its natural watershed.

The project will raise the roadway to eliminate dip crossings at washes. The developed condition will decrease soil erosion and water pollution associated with wind, water, and vehicle disturbance resulting from the interaction between the roadway (vehicles) and the washes.

For most of the major washes in the project area, the culvert was extended past the shoulder, and spillways, aprons, and additional side protection were designed to prevent shoulder erosion.

Two channels will require substantial downstream channel work. The Roller Coaster Wash channel is undersized, and has sedimentation problems that will require channel excavation downstream. Chula Vista Wash is an existing dip crossing that drains to a developed channel 400 feet downstream. There are seven drainage washes that will require box culverts, while the remaining small washes will require only pipe culverts.



Table 5. Existing and proposed major drainage structure summary

Wash	Station	Existing	Proposed
Roller Coaster Wash	65+48	three cell 10' × 5' RCBC ^a	five cell 10' × 5' RCBC
Las Lomitas Wash	86+59	two 60" CMP ^b	two cell 10' × 5' RCBC
La Cima School	100+25	36" CMP	60" RCP ^c
Las Lomitas Road (west)	105+15	36" CMP	60" RCP
Citrus Wash (south)	116+62	three 36" CMP	two cell 10' × 4' RCBC
Citrus Wash (north)	120+00 120+53	Dip crossing three 48" CMP	42" RCP two cell 8' x 5' RCBC
Via Caballo	130+88	Dip crossing	36" RCP
Metro Water	132+85	to Via Caballo	36" RCP
Via Tierra	135+35	24" CMP	48" RCP
Via Hacienda	138+07	36" CMP	48" × 76" HERCP ^d
Casas Adobes Wash	145+93	Dip crossing	four cell 10' × 5' RCBC
Montebella Drive (north)	160+11	30" CMP	42" RCP
6745 N. La Cañada Drive (south)	164+90	Dip crossing	two 38" × 60" HERCP
6745 N. La Cañada Drive (north)	169+02	18" CMP	42" RCP
Chula Vista Wash (south)	179+65	Dip crossing	two cell 8' × 5' RCBC
Giaconda Way	183+63	Dip crossing	43" × 68" HERCP
Alley north of Giaconda Way	184+67	to Giaconda Way	36" RCP
Casas Adobes Wash (at Orange Grove Road)	45+33	three cell 10' × 6' RCBC	four cell 10' × 5' RCBC
Via Ranchero (at Orange Grove Road)	54+82	36" CMP	48" × 76" HERCP

^a reinforced concrete box culvert

^b corrugated metal pipe

^c reinforced concrete pipe

^d horizontal elliptical reinforced concrete pipe

Roller Coaster Wash

Regarding Roller Coaster Wash, RFCD is preparing a DCR to study and make recommendations to rectify existing cross drainage problems west of La Cañada Drive along Roller Coaster Wash and to address ponding between Kimberly Street and Roller Coaster Road. The following tasks are being undertaken as part of the DCR:

Mapping. RFCD is preparing existing subsurface and overhead utility base mapping and photogrammetric mapping, including a digital terrain model, orthophotos, and digital files. It is also completing horizontal and vertical control, topographical, and right-of-way surveys and is preparing existing right-of-way plans.



Conceptual Designs for Roller Coaster Wash west of La Cañada Drive. RFCD will develop concept design plans for two Roller Coaster Wash alternatives. Alternative 1 will determine the channel configuration and impacts associated with conveying the peak 100-year discharge while also providing one parallel maintenance access road along the wash. Alternative 2 will determine the maximum allowable channel configuration and flow that can be accommodated within the existing Pima County drainageway while also providing one parallel maintenance access road along the wash. The difference in flow between the peak 100-year flow and the flow that can be accommodated with Alternative 2 will need to be diverted into a parallel conveyance system or systems.

Conceptual Design to Eliminate La Cañada Drive Flooding. RFCD will also develop concept design plans for three alternatives intended to eliminate flooding on La Cañada Drive between River Road and Roller Coaster Road. Each alternative will be evaluated in conjunction with the design of the Roller Coaster Wash improvements west of La Cañada Drive. Alternative A will determine reinforced concrete box culvert sizing and impacts to convey flood flows south along La Cañada Drive to the Rillito River. Alternative B will determine earthen channel sizing and impacts to convey floodwaters west along Roller Coaster Road to the Roller Coaster Wash. Alternative C will determine concrete-lined channel sizing and impacts to convey floodwaters west along Roller Coaster Road to the Roller Coaster Wash.

Draft and Final Roller Coaster Wash Drainage Design Concept Report. Once conceptual plans have been prepared for Roller Coaster Wash and the La Cañada Drive flooding area, draft and final Roller Coaster Wash DCRs will be prepared to document the preferred alternative, quantities, and costs. As the RFCD project progresses, the proposed improvements will need to be coordinated with the final design and construction of the La Cañada Drive, River Road to Ina Road improvements.

From an implementation standpoint, should the La Cañada Drive improvements precede the RFCD improvements to Roller Coaster Wash, the La Cañada Drive improvements will be designed and constructed such that they do not exacerbate the ponding on La Cañada Drive nor the flood limits downstream of the new Roller Coaster Wash box culvert.

Regulatory Requirements

A preliminary jurisdictional delineation for La Cañada Drive has been approved by the U.S. Army Corps of Engineers (Corps). The Corps has determined that six project area washes are under its jurisdiction: Roller Coaster Wash, Las Lomas Wash, Citrus Wash, an unnamed tributary of Citrus Wash, Casas Adobes Wash, and Chula Vista Wash (PCDOT 2008c). A Clean Water Act Section 404 Nationwide Permit 14 with a preconstruction notification will be requested for culvert construction. Regarding the Clean Water Act Section 401 water quality requirements, which are administered by the Arizona Department of Environmental Quality, the six jurisdictional washes in the project area would be conditionally certified under the terms of Nationwide Permit 14 because those washes are not classified as impaired, unique, or tribal waters.

Because the project will disturb more than 1 acre of land, the project will also require a Clean Water Act Section 402 permit for compliance with the Arizona Pollutant Discharge Elimination System



program. Section 402 compliance requires filing a Notice of Intent to use the statewide Construction General Permit with the Arizona Department of Environmental Quality and preparing and implementing a Stormwater Pollution Prevention Plan.

Federal Emergency Management Act floodplains are not identified within the project area. A Conditional Letter of Map Revision and a Letter of Map Revision are not required. The project will affect greater than one-third acre of designated riparian areas, which triggers regulation under the RFCD Riparian Ordinance. A riparian impact assessment will be prepared and, if needed, mitigation will be developed in conjunction with RFCD to compensate for impacts to regulated riparian habitat.

6.5 Earthwork Considerations

The new roadway profile was designed with consideration of two main constraints. The first constraint was the need to raise and flatten the profile over the washes so that the new larger culverts could be accommodated under the proposed roadway section. The second constraint was to match the existing grades along the side streets and adjacent parcels to minimize the need for regrading and new easements. The new profile will require embankment at the washes and excavation between the washes. The initial earthwork quantities are 73,700 cubic yards of road excavation, 7,200 cubic yards of drainage excavation, and 65,500 cubic yards of embankment.

The *Preliminary Geotechnical Report* (PCDOT 2007e) recommended that a design R-value of 55 be used for designing the new pavement structure. It also evaluated on-site soils for suitability as trench backfill for the new storm drains and determined that they are not suitable within the roadway prism but may be used outside of the roadway prism. The report recommended importing structure backfill and shading material.

6.6 Intersections

At River Road, the new roadway will tie into the existing northern leg of the intersection, maintaining the current lane configuration that includes a single left-turn lane. The existing eastern, western, and southern legs will remain unchanged.

At Kimberly Street and Roller Coaster Road, proposed improvements include northbound right-turn lanes.

Proposed improvements for the Orange Grove Road intersection include dual left-turn lanes at all four legs, single right-turn lanes at all four legs, and bus pullouts at the departure sides of northbound and southbound La Cañada Drive.

6.7 Utilities

Existing utilities were summarized in Section 3.5. The new storm drain will affect sanitary sewer line clearances; the affected sanitary pipes will be replaced with ductile iron pipe prior to the road work. The relocation of gas, telephone, water transmission, and cable television lines will be performed prior to the road construction. A new Metro Water line is being designed and will be installed prior to construction. The overhead electric power lines, including the Western lines, will also need to be relocated. A well site operated by Tucson Water is located on the western side of La



Cañada Drive just north of Kimberly Street. No accommodations will be needed for the well site, which will be unaffected by the road construction.

The overhead electric power line relocation must be performed between September and May to avoid interrupting service during the period of higher electricity demand during the warmer months. Should relocation of Tucson Water's 12-inch water line in La Cañada Drive be required, this work must occur between October and April—again, to avoid the high-demand period.

With the exception of Western, no prior rights for facilities located within the public right-of-way and owned by private utility companies have been identified. Under an existing IGA, half of the water relocation costs incurred by Tucson Water will be paid for by Pima County. Also, sewer replacement costs will be the responsibility of the Pima County Regional Wastewater Reclamation Department.

Western has prior rights to a 100-foot-wide easement from Calle Tiburon to Ina Road. Relocations and adjustments of the Western poles related to construction activities will be paid for by Pima County. These relocations are likely to occur as part of the La Cañada, Ina Road to Calle Concordia project in 2009–2010.

6.8 Structures

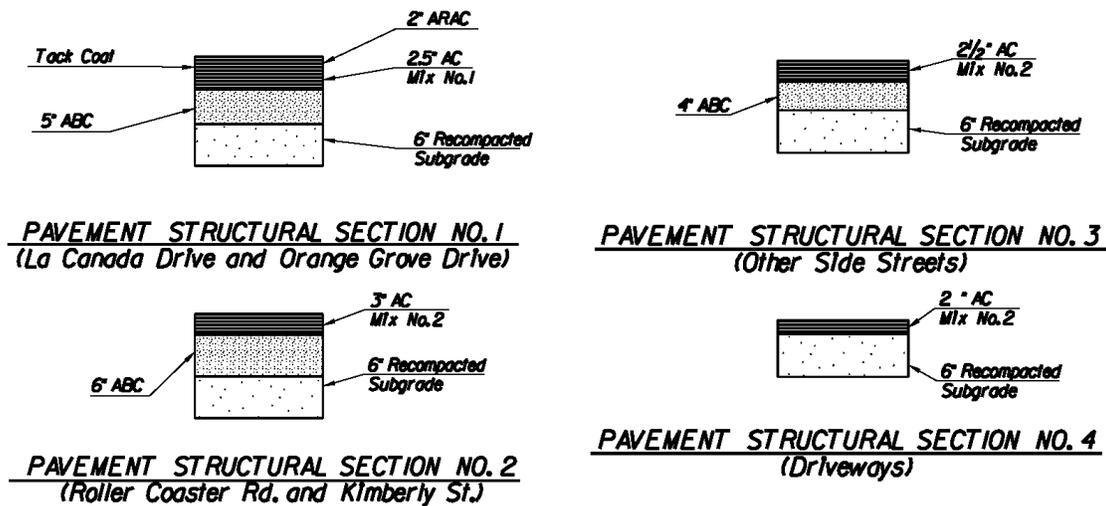
Drainage culverts, drainage pipes, drainage structures, retaining walls, and noise barrier walls will be designed and constructed according to all relevant standard details for public improvements. In addition to the standards listed in Section 5.2, the Arizona Department of Transportation structure standard drawings will also be used.

6.9 Pavement Design

Based on Section 3.13 of the *Pima County Roadway Design Manual* (PCDOT 2003a), a *Final Pavement Design Summary Report* (PCDOT 2007f) was prepared. The pavement structures recommended are as follows and as shown in Figure 10:

- La Cañada Drive – 2.0" asphalt rubber-asphalt concrete (AR-AC) over 2.5" asphalt concrete (AC) over 5.0" aggregate base (AB) over 6.0" recompacted subgrade
- Orange Grove Road – 2.0" AR-AC over 2.5" AC over 5.0" AB over 6.0" recompacted subgrade
- Kimberly Street – 3.0" AC over 6.0" AB over 6.0" recompacted subgrade
- Roller Coaster Road – 3.0" AC over 6.0" AB over 6.0" recompacted subgrade
- Frontage road – 2.5" AC over 4.0" AB over 6.0" recompacted subgrade
- Other minor side streets – 2.5" AC over 4.0" AB over 6.0" recompacted subgrade
- Driveways – 2.0" AC over 6.0" recompacted subgrade

Figure 10. Pavement structural sections



6.10 Signalization and Lighting

The traffic signals at Orange Grove Road will be reconstructed to accommodate the proposed intersection widening. Push buttons will be provided for pedestrians and equestrians in each quadrant of the Orange Grove Road intersection. HAWK signal conduit will be installed at Roller Coaster Road and La Cima Middle School to facilitate signal installation if those areas meet warrants in the future.

All intersections with side streets carrying more than 2,400 vehicles per day will receive lighting as follows: River Road, Roller Coaster Road, both entrances at La Cima Middle School, and Orange Grove Road. The lighting at River Road will remain as it currently exists. In addition, PCDOT policy requires street lighting at all crosswalks, including the school crosswalks at Roller Coaster Road and at La Cima Middle School. Conduit for ITS technology will be included along the side of La Cañada Drive between River Road and Nanini Wash.

6.11 Construction Issues

Pima County field engineering, in conjunction with the construction contractor, will determine the preferred construction sequence; however, a viable proposed construction sequencing approach is as follows:

1. Remove the existing wash culverts along the western edge of the existing roadway and place temporary concrete traffic barriers a minimum of 2 feet away from the western edge of the travel lane. Traffic will remain on the existing road as it is today with one lane open in each direction.
2. Construct the western side of the wash culverts and the western half of La Cañada Drive from River Road to Nanini Wash. Traffic will be maintained on the existing pavement of the two-lane road. Additional paving will be added to the eastern side of La Cañada Drive as required to maintain two lanes of traffic.



3. Move traffic to the new roadway built in the previous phase. Remove the existing wash culverts and the existing pavement. Build the eastern side of the wash culverts and the eastern half of La Cañada Drive from River Road to Nanini Wash.
4. Complete final striping and landscaping.

Access to all homes and businesses must be maintained during construction. While driveways are being built, temporary parking may need to be provided to the residents. Refer to Section 6.7 for seasonal considerations related to scheduling utility relocations.

6.12 Design Conformity and Exceptions

Geometric design elements of the proposed La Cañada Drive improvements were compared with recommendations contained in AASHTO's *A Policy on Geometric Design of Highways and Streets* (2004) and the *Pima County Roadway Design Manual* (PCDOT 2003a). The results for each type of design attribute are discussed for each category. The applicable roadway classification is "urban arterial."

Lane, Shoulder and Median Widths

The proposed lane widths from River Road to Kimberly Street on the eastern side of La Cañada Drive will be 11 feet with a 12-foot two-way left-turn lane. Lane widths from River Road to Roller Coaster Road on the western side of La Cañada Drive will be 11 feet. Proposed lane widths will be 12 feet for the main section. AASHTO recommends 12 feet for lane width, but finds 11 feet acceptable for a reconstructed arterial street. The *Pima County Roadway Design Manual* recommends 12 feet.

The outside paved shoulder widths on the eastern side of La Cañada Drive from River Road to Kimberly Street and on the western side from River Road to Roller Coaster Road will be 4 feet because of the constrained section. The outside paved shoulder widths will be 6 feet for the main section. AASHTO recommends 8 feet minimum for an outside shoulder. The *Pima County Roadway Design Manual* recommends 6 feet. The inside paved shoulder width is 1 foot throughout the project, in accordance with the *Pima County Roadway Design Manual*. AASHTO does not recommend a minimum so long as the median curb is mountable, as it will be on this project.

The *Pima County Roadway Design Manual* recommends a median width of 24 feet. The medians on this project will be 24 feet wide (36 feet wide at Orange Grove Road).

Vertical Alignment and Stopping Sight Distance

AASHTO recommends a minimum stopping sight distance of 400 to 475 feet for a design speed of 50 mph. This project is being designed using the Pima County requirement for a stopping sight distance of no less than 475 feet. All new vertical curves for La Cañada Drive meet this criterion.

Horizontal Alignment and Superelevation

AASHTO recommends the superelevation not exceed 12 percent for a high-speed urban street. Pima County allows a maximum superelevation rate of 4 percent for urban streets. However, there are no curves on La Cañada Drive.



Design Speed

For urban arterial streets, AASHTO recommends a design speed of 40 to 60 mph. Pima County has specified a design speed of 50 mph for this project.

Grades

AASHTO recommends a maximum grade of 6 percent for urban arterial streets in level terrain. The *Pima County Roadway Design Manual* specifies a maximum grade of 3 percent, which will be followed. Because curbs will be included on this project, a minimum grade of 0.5 percent will be maintained.

Cross Slope

The AASHTO-recommended cross slope range for travel lanes is 1.5 to 2.0 percent. The travel lanes on this project will have a cross slope of 2.0 percent.

Conclusion

No design exceptions from the AASHTO or PCDOT controlling design criteria will be necessary.

7.0 Social, Economic, and Environmental Considerations

This section discusses social, economic, and environmental considerations related to construction of the proposed improvements to La Cañada Drive.

7.1 Biological Resources

The project area is moderately to densely vegetated, primarily with native plants, including species subject to Pima County's Native Plant Preservation Ordinance and the Arizona Native Plant Law. Plants will be preserved in place, salvaged and relocated, or replaced to match existing vegetation densities of the adjacent undisturbed areas. Project landscape plans will be developed to reflect these criteria. The Arizona Department of Agriculture will be notified regarding native plant removal.

The federally listed endangered lesser long-nosed bat has the potential to use the project area for forage. A federally recognized species of concern—the cactus ferruginous pygmy-owl—has the potential to occur within the project area. A biological evaluation was conducted to determine the potential effect on these species. The results stated that the project will have no effect to either species or their habitats.

The project has the potential to affect nesting birds protected under the International Migratory Bird Treaty Act. Protocol surveys for the burrowing owl and clearance surveys for nesting birds are recommended.

7.2 Air Quality

The project will produce a temporary increase in particulate matter (i.e., dust) during construction. This impact will be short term in nature, and measures will be implemented to minimize this impact during construction. Prior to initiating any construction activities such as earthmoving, trenching, or road construction, the contractor will obtain an activity permit from the Pima County Department of



Environmental Quality. Also, prior to demolition of any building, a National Emission Standards for Hazardous Air Pollutants permit will be obtained from the Pima County Department of Environmental Quality. The contractor shall retain an Asbestos Hazard Emergency Response Certified Building Inspector to complete asbestos and lead testing of the building and conduct lead/asbestos abatement if needed.

The overall impacts of the project on air quality will be positive for the following reasons: (1) the project will decrease traffic congestion, thereby reducing emissions associated with idling vehicles and (2) the project will provide curb, thereby reducing the amount of particulate matter that is tracked onto the roadway from the currently unpaved right-of-way and released into the air.

7.3 Noise

The project will result in temporary noise impacts during project construction associated with the operation of heavy equipment. Mitigation measures are proposed to minimize short-term construction noise to the extent practicable; however, construction noise impacts will occur.

Regional growth and the increased traffic capacity from the project will result in increased traffic volumes along the roadway corridor. The resulting traffic noise levels will exceed acceptable noise levels, based on the Pima County Noise Abatement Procedure criteria of 66 dBA at 65 noise sensitive properties. Rubberized asphalt will be used in roadway construction and will result in a noise reduction. La Cima Middle School, a church, and all residential locations adjacent to the roadway were considered for noise mitigation. Noise barriers were deemed reasonable and feasible at 12 single-family residences and 6 apartment buildings. Noise barriers are recommended for construction at the following locations:

- two noise barriers located in front of the apartment buildings at the northeastern corner of River Road and La Cañada Drive
- one noise barrier located in the island to be constructed between La Cañada Drive and the frontage road along the eastern side of La Cañada Drive, north of Roller Coaster Road and south of Whispering Hills Road
- one noise barrier (two segments) located in front of the residences along the western side of La Cañada Drive, north of Neosho Place and south of Flint Avenue
- two noise barriers located on the eastern side of La Cañada Drive, between the roadway and the residences flanking Coachwhip Drive

7.4 Hazardous Materials

One potential hazardous materials site was identified: an operating service station. Project construction in this area will be limited and will not include excavation. Environmental construction monitoring is recommended for work adjacent to the service station.

7.5 Historical/Cultural Resources

A Class III cultural resources survey was conducted in accordance with Section 106 of the National Historic Preservation Act. Based on the results of the survey, the project does not have the potential to affect any cultural resources. No further cultural work is required.



7.6 Visual/Aesthetic Resources

The greatest change in visual character in this project will occur in the foreground and middle ground by converting a two-lane roadway to a four-lane roadway with sidewalks, a public use trail on the western side, and recommended noise barriers. Foreground and middle ground views will have a moderate increase in structured hardscape rather than the currently undeveloped right-of-way. The road will be raised at wash crossings, which are now dip crossings. Background views will be affected in the areas where the 6- to 10-foot-tall noise barriers will be constructed. Landscape plantings and artistic elements are recommended to soften the hardscape and improve the aesthetic appeal.

7.7 Neighborhood Impacts

The project area predominantly consists of low-density residential, with some moderate- to high-density residential near River Road. Other land uses include commercial, public (Metro Water, La Cima Middle School), churches, vacant land, and flood control/washes.

Project construction will temporarily produce dust, noise, and traffic delays within the project area. Standard measures to control dust and noise will be implemented during construction. Access to residences, schools, and businesses will be maintained during construction, but some traffic delays will be unavoidable. The traffic study identified possible alternate routes along Calle Kino/Panorama Road, Roller Coaster Road, and Rudasill Road that should be monitored for increased traffic volumes, and, if needed, traffic calming measures should be considered. The existing bike path and public use trail will be rerouted within the right-of-way during construction.

The project will result in permanent neighborhood impacts as well. The construction of raised medians and turning lanes will improve safety and operations, but will also modify current access by controlling turning movements. The project will promote overall connectivity by improving pedestrian facilities, bicycle lanes, and public use trails.

7.8 Community Resource Impacts

Project activities will temporarily disrupt current use of the right-of-way and shoulder. Bicyclists, pedestrians, and equestrians will be temporarily rerouted within the right-of-way during construction. However, the project will construct sidewalks, striped on-street bike lanes, and a public use trail that will provide enhanced recreation amenities for the corridor.

8.0 Public Involvement

This section contains a discussion of the public involvement efforts conducted for the La Cañada Drive project, including creating a public participation plan, forming the CAC, and holding public meetings.

8.1 Public Participation Plan

A public involvement plan was prepared by Gordley Design Group, Inc., and submitted to PCDOT in early 2007. This plan features public information meetings, a CAC, ongoing contact with affected parties, media relations, and the development of informational materials. The goals of the plan are to educate the public about the project's purpose and need, solicit the public's comments on the



project, review public comments, and adjust the roadway design concept to address the public concerns to the greatest extent possible within the constraints of the project, including safety and cost.

8.2 Community Advisory Committee

Six CAC meetings have been held to date. The first meeting was held to review the responsibilities of the CAC. Subsequent meetings have been held to discuss the project process, present the roadway design, present the findings of technical reports, and review artwork concepts. See the *Final Environmental Assessment and Mitigation Report* (PCDOT 2009b) for additional description of CAC activities, comments, and concerns.

8.3 Public Meetings

Public workshops were held on June 23 and June 25, 2008. Ninety people attended the June 23 workshop and 115 people attended the June 25 workshop. The project team provided aerial maps showing the roadway design and comment forms to encourage attendees to submit comments regarding the project. Additional public meetings are planned to review the *Final Environmental Assessment and Mitigation Report*, this *Final Design Concept Report*, and design plans.

In December 2008, a newsletter was distributed to the entire project mailing list. The newsletter included a message to the community from the PCDOT director, Priscilla S. Cornelio, summarizing the project history, providing estimated project costs, and responding to community petitions. The remaining content of the newsletter provided additional detail of the project description, funding sources, and completed and future tasks. It also outlined key community concerns and interests with detailed responses.

See the *Final Environmental Assessment and Mitigation Report* (PCDOT 2009b) for additional description of public involvement activities and comments/concerns.

9.0 Agency Coordination

This section contains a discussion of agency coordination efforts for the proposed improvements to La Cañada Drive, including environmental review efforts and IGAs.

9.1 Environmental Review

PCDOT will continue to cooperate with several agencies and organizations for this project, as follows:

- Federal Highway Administration – funding and environmental requirements
- Arizona Department of Transportation – administering funding and environmental requirements on behalf of the Federal Highway Administration
- RTA – funding and business outreach
- Pima Association of Governments – regional bicycle facilities
- Sun Tran – design of transit facilities (bus pullouts and stops)
- Western – relocation of utility poles and environmental requirements



- affected private and municipal utilities – impacts and relocation
- Corps – compliance with Section 404 of the Clean Water Act
- Arizona Department of Environmental Quality – compliance with Sections 401 and 402 of the Clean Water Act
- Arizona Department of Agriculture – native plant requirements
- Arizona Game and Fish Department – sensitive plant and animal species
- U.S. Fish and Wildlife Service – sensitive plant and animal species (lesser long-nosed bat)
- U.S. Environmental Protection Agency – sole source aquifer
- State Historic Preservation Office and interested tribes – impacts to cultural resources (consultation to be conducted by the Arizona Department of Transportation)
- Pima County Cultural Resources and Historic Preservation; Environmental Quality; Natural Resources, Parks, and Recreation; RFCD; and Regional Wastewater Reclamation – project coordination
- Center for Biological Diversity, Sierra Club Rincon Group, Sky Island Alliance, Tucson Audubon Society – environmental issues and concerns

9.2 Intergovernmental Agreements

Beyond existing IGAs listed in Section 3.10, no additional IGAs are anticipated to be required.

10.0 Alternatives

This section discusses the alternatives development process for the La Cañada Drive project. Alternatives were evaluated for: ingress and egress to La Cañada Drive, the edge of the roadway, access to the Metro Water facility, and improvements south of Roller Coaster Road.

10.1 Ingress and Egress Alternatives

Alternatives for ingress and egress were evaluated with regard to driveways, bus pullouts, and the frontage road.

Driveways

Driveway turnouts will be provided at each existing private driveway with a primary address on La Cañada Drive. This will provide service vehicles—such as garbage trucks, recycling trucks, and mail vehicles—a place to pull off the road without obstructing the flow of traffic in the travel lane and shoulder. An alternative to these turnouts would be to increase the proposed shoulders on La Cañada Drive from 6 to 10 feet wide. However, the turnout features will be more economical than 4 feet of additional continuous shoulder, and for this reason they are the preferred alternative.

Bus Pullouts

La Cañada Drive is designated as an express bus route by Sun Tran; and as a result of coordination with Sun Tran, bus pullouts will be needed only at Roller Coaster Road and at Orange Grove Road. Bus pullouts will be provided on La Cañada Drive at the northbound and southbound departure sides of the intersections of La Cañada Drive with Roller Coaster Road and Orange Grove Road. This feature will enable buses to use the right-turn lane—provided at all locations except



southbound Roller Coaster Road—to proceed through the intersection. The pullout will have enough space to exchange passengers without obstructing the outside travel lane and shoulder.

Frontage Road

The six parcels on the eastern side of La Cañada Drive between Roller Coaster Wash and Whispering Hills Drive will not have sufficient area for a vehicle to turn around if each access is provided under the proposed design for the widened road. As discussed earlier, backing out onto La Cañada Drive will not be permitted for safety reasons. Therefore, the preferred alternative is a frontage road that will serve these six residences.

One of the other access options would be use of circular, joint-use, and wide driveways. This option would provide suitable driveways, but would entail significant driveway changes and area requirements, which would be more disruptive for residents. Use of a frontage road will have a secondary benefit by providing space for a continuous noise barrier wall in this location. With individual driveways accessing La Cañada Drive, the proposed noise barrier wall would have gaps and, therefore, be less effective (and potentially ineffective) at reducing the noise levels.

10.2 Edge of Road Alternatives

Alternatives were evaluated with regard to walls, headwalls, trails, and sidewalks to be installed at the edge of the widened road.

On the western side of La Cañada Drive, a public use trail will travel the length of the project from Roller Coaster Wash to Nanini Wash. This public use trail requires a 6- to 10-foot-wide path sloped at 2 percent. One alternative location for this wide, flat path would be to place it along the right-of-way and to either purchase slope easements to the west of the trail or place retaining walls between the trail and the clear zone limits. This option would be substantially more costly compared with locating the trail at the eastern edge of La Cañada Drive due to the costs associated with additional retaining walls or slope easements. The preferred and currently proposed configuration is to place the sidewalk against the curb and use the 6- to 10-foot-wide path and a 4-foot landscaped buffer next to the sidewalk as part of the clear zone requirement. This configuration reduces easement requirements by 10 feet by enabling two features, a clear zone and public use trail, to be in the same location.

Cut and fill slopes start at the edge of the clear zone. Flatter slopes will be used where possible starting with 6H:1V, increasing to 4H:1V and then to 3H:1V, in order to keep the slope contained inside the right-of-way. If the 3H:1V slope will not fit inside the right-of-way, a small retaining wall will be placed outside the clear zone instead of a slope easement. Walls are the preferred alternative for three reasons: first, easements could be a contentious issue with the property owners; second, walls provide opportunities for incorporation of art; and third, the cost difference of retaining walls versus slope easements would not be great enough to override the other two factors. Most of the retaining walls will occur at the wash crossings—having the cross drainage inlets and outlets tied into the retaining walls will eliminate the need for headwalls and wing walls.



10.3 Metro Water Access Alternatives

Alternatives were evaluated to provide access to the Metro Water facility at 6265 North La Cañada Drive, which has two driveway entrances.

The initial proposed location of the Metro Water driveways was based on the need to align one of the entrances with the median opening. The median opening location was chosen for Via Caballo based on higher traffic counts compared with counts on Via Tierra. Metro Water's southern entrance would be realigned with the Via Caballo centerline, while the northern entrance and Via Tierra would keep their original alignments.

After discussions with Metro Water, it was determined that the original proposed layout would not circulate traffic to the property effectively. The vast majority of Metro Water's customer traffic enters at the northern entrance and then exits at either the northern or the southern entrance. The one-way payment window requires drivers to enter at the northern entrance. The first attempt to remedy this problem was to provide a one-way frontage road to route traffic from the southern entrance to the northern entrance. This option proved undesirable because it would require additional right-of-way, paving, and curb, and would disturb more vegetation.

When the traffic patterns were further evaluated, it was found that the Metro Water northern entrance has larger average daily traffic volumes and, therefore, should be given priority for a median opening over Via Caballo.

In the proposed configuration, Via Tierra is given the median opening location and the Metro Water northern entrance is realigned to match the Via Tierra centerline. Traffic patterns to and from Via Caballo will not be severely changed because access can be made from Via Tierra. Metro Water's southern entrance will remain as-is, and parking spaces that are removed to accommodate the realigned entrance will be replaced. This median opening alternative will also facilitate future development at the corner of La Cañada Drive and Orange Grove Road, just north of the Metro Water facility, by giving that property the opportunity of using this median opening.

10.4 Improvements South of Roller Coaster Road

Alternatives were evaluated to improve the area south of Roller Coaster Road. The initial limits of the project included an improved La Cañada Drive four-lane roadway section ending at Roller Coaster Road and then tapering to match the existing five-lane section. The existing five-lane pavement section will be milled and replaced to the north curb returns at River Road.

Extending the improved four-lane roadway section to River Road would become costly because widening would affect many features behind the curbs. The Tucson Water well site property is 50 feet off of the section line and the four-lane road section would require the well to be removed and relocated. Many existing features would also be affected, such as driveways, landscaping, catch basins, pipes, manholes, subsurface utilities, signal arms, and control cabinets. As a result, the existing curb and gutter will be removed and replaced with mountable vertical curb to provide room for 4-foot paved shoulders on the western side of La Cañada Drive from River Road to Kimberly Street and on the eastern side of La Cañada Drive from River Road to Roller Coaster Road. Bike



lanes will begin at Kimberly Street on the western side of La Cañada Drive and at Roller Coaster Road on the eastern side of La Cañada Drive.

The traffic report identifies the need for two northbound right-turn lanes, one at Kimberly Street and one at Roller Coaster Road. Medians were added from Roller Coaster Road south to Kimberly Street. The outside curb south of Roller Coaster Road will be removed to add the right-turn lanes and to maximize the taper past the well site. A right-turn-in, right-turn-out driveway will be placed at the southern Albertson's entrance to prevent northbound left-turn lane traffic turning into the shopping center and northbound left-turn lane traffic turning out of the shopping center from conflicting with the southbound left-turn lane traffic turning onto River Road.

A 6-foot sidewalk next to the curb will be provided south to the River Road crosswalk. This sidewalk will connect the apartment complex at the corner of River Road and La Cañada Drive to the grocery store development across the street. Following the street north to Roller Coaster Road, the sidewalk will give pedestrians safer access to Lulu Walker Elementary School.

11.0 Conclusions and Recommendations

This report describes the recommended design for widening and reconstructing La Cañada Drive between River Road and Ina Road in order to fulfill the project purpose and need of meeting 2030 travel demand, improving safety, and providing all-weather access.

The recommended design will meet or exceed AASHTO and Pima County standards. The design standards and criteria to be used for this project are listed in Section 5.0. Other important considerations and criteria for this project are:

- The proposed alignment will be used to prepare the final design plans.
- Rubberized asphalt will be used throughout the project to reduce roadway noise. Where feasible, noise barrier walls will be designed based on recommendations from the project-specific noise study, consistent with the Pima County Noise Abatement Policy.
- Existing native vegetation will be preserved in place, salvaged, and/or replanted in accordance with the native plant preservation plan and the landscape plan. This mitigation is expected to restore the vegetation density after construction to match the existing density of adjacent, undisturbed areas, and to approximate environmentally sensitive roadway plant mitigation requirements. Saguaros will be mitigated on a 1:1 basis.
- No new traffic signal locations are warranted for this project. Existing traffic signals at Orange Grove Road will be upgraded to accommodate the proposed roadway improvements.
- Dual left-turn lanes will be designed for all legs of the Orange Grove Road intersection. No additional improvements will be made to the River Road intersection.
- All cross drainages will be designed for 100-year storm flows using the PC-HYDRO method for the "Q" and the *Pima County Roadway Design Manual* Section 2.10 guidance to determine culvert size. The Q-100 will be used instead of the Q-50 to prevent flow from breaking out into another basin.



- The roadway drainage system will be designed for the 10-year storm with one “dry” travel lane open in each direction. For the 100-year storm, the maximum depth will be 1 foot, in accordance with Section 2.10 of the *Pima County Roadway Design Manual*.

12.0 Cost Estimate and Budget Considerations

The project cost estimate shown in Table 6 is based on the preliminary design performed to date. It will be refined as more detailed plans are prepared.

Table 6. Project cost estimate

Task	Cost
Construction	27,051,000
Artwork	270,000
Construction engineering	4,058,000
Engineering and planning	4,058,000
Environmental mitigation	200,000
Right-of-way	3,600,000
Utility relocations	700,000
Inflation	1,082,000
PCDOT contingency	4,181,000
Total	\$45,200,000

For a detailed breakdown of the construction cost, see Appendix A. Utility relocation will be, in large part, paid for by the individual utility companies. The total cost to Pima County for this project is estimated to be \$45.2 million. The budget for the project is currently \$46 million.

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14.0 Abbreviations and Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AB	aggregate base
AC	asphalt concrete
AR-AC	asphalt rubber-asphalt concrete
ASM	Arizona State Museum
CAC	Community Advisory Committee
CMP	corrugated metal pipe
Corps	U.S. Army Corps of Engineers
DCR	design concept report
HAWK	high-intensity activated crosswalk
HERCP	horizontal elliptical reinforced concrete pipe
IGA	intergovernmental agreement
ITS	intelligent transportation system
Metro Water	Metropolitan Domestic Water Improvement District
PCDOT	Pima County Department of Transportation
RCBC	reinforced concrete box culvert
RCP	reinforced concrete pipe
RFCD	Regional Flood Control District
RTA	Regional Transportation Authority
STP	Surface Transportation Program
Western	Western Area Power Administration



Appendix A

Construction Cost Estimate

ROADWAY

	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1090002	FUEL ADJUSTMENT	F.A.	25,000	\$1.00	\$25,000
2010011	CLEARING AND GRUBBING	ACRE	54	\$2,000.00	\$108,010
2030300	ROADWAY EXCAVATION	C.Y.	73,723	\$6.00	\$442,340
2030401	DRAINAGE EXCAVATION	C.Y.	7,116	\$10.00	\$71,160
2030901	BORROW	C.Y.	8,661	\$12.00	\$103,930
3030003	AGGREGATE BASE	C.Y.	22,619	\$30.00	\$678,560
4040111	TACK COAT	TON	36	\$1,000.00	\$36,330
4060001	ASPHALTIC CONCRETE (NO. 1)	TON	19,755	\$80.00	\$1,580,380
4060002	ASPHALTIC CONCRETE (NO. 2)	TON	3,103	\$80.00	\$248,260
4060500	BITUMINOUS MATERIAL PRICE ADJUSTMENT	F.A.	75,000	\$1.00	\$75,000
4130040	ASPHALTIC CONCRETE (ASPHALT-RUBBER)	TON	14,932	\$125.00	\$1,866,480
4130042	ASPHALT RUBBER MATERIAL (FOR AR-AC)	TON	1,269	\$400.00	\$507,680
4130044	MINERAL ADMIXTURE (FOR AR-AC)	TON	137	\$100.00	\$13,660
5010105	PIPE, SLOTTED, 24" DIAMETER	L.F.	400	\$150.00	\$60,000
5011012	PIPE, REINFORCED CONCRETE, CLASS III, 18"	L.F.	3,197	\$75.00	\$239,780
5011022	PIPE, REINFORCED CONCRETE, CLASS II, 24"	L.F.	284	\$100.00	\$28,400
5011023	PIPE, REINFORCED CONCRETE, CLASS III, 24"	L.F.	2,950	\$110.00	\$324,500
5011032	PIPE, REINFORCED CONCRETE, CLASS II, 30"	L.F.	135	\$120.00	\$16,200
5011033	PIPE, REINFORCED CONCRETE, CLASS III, 30"	L.F.	300	\$130.00	\$39,000
5011042	PIPE, REINFORCED CONCRETE, CLASS II, 36"	L.F.	592	\$150.00	\$88,800
5011043	PIPE, REINFORCED CONCRETE, CLASS III, 36"	L.F.	1,797	\$160.00	\$287,520
5011047	PIPE, REINFORCED CONCRETE, CLASS II, 42"	L.F.	405	\$170.00	\$68,850
5011052	PIPE, REINFORCED CONCRETE, CLASS II, 48"	L.F.	261	\$200.00	\$52,200
5011057	PIPE, REINFORCED CONCRETE, CLASS II, 54"	L.F.	60	\$240.00	\$14,400
5011058	PIPE, REINFORCED CONCRETE, CLASS III, 54"	L.F.	297	\$180.00	\$53,460
5011062	PIPE, REINFORCED CONCRETE, CLASS II, 60"	L.F.	257	\$350.00	\$89,950
5011276	PIPE, REINFORCED CONCRETE, CLASS HE III, 38" x 60"	L.F.	346	\$400.00	\$138,400
5011283	PIPE, REINFORCED CONCRETE, CLASS HE III, 48" x 76"	L.F.	292	\$700.00	\$204,400
5011302	PIPE, REINFORCED CONCRETE, CLASS HE II, 43" x 68"	L.F.	350	\$500.00	\$175,000
5030032	CATCH BASIN, PC/COT STD. DTL. 309 (DOUBLE, OFF ROAD) (D<8')	EACH	1	\$4,500.00	\$4,500
5030701	CATCH BASIN, TYPE 1, SINGLE (D=<8')	EACH	9	\$4,500.00	\$40,500
5030710	CATCH BASIN, TYPE 3, SUMP ONLY (D=<8')	EACH	1	\$4,500.00	\$4,500
5030712	CATCH BASIN, TYPE 3, L=4' (D=<8')	EACH	3	\$4,500.00	\$13,500
5030714	CATCH BASIN, TYPE 3, L=8' (D=<8')	EACH	9	\$5,000.00	\$45,000
5030716	CATCH BASIN, TYPE 3, L=12' (D=<8')	EACH	11	\$5,500.00	\$60,500
5030718	CATCH BASIN, TYPE 3, L=16' (D=<8')	EACH	20	\$6,500.00	\$130,000
5030720	CATCH BASIN, TYPE 3, L=20' (D=<8')	EACH	4	\$7,000.00	\$28,000
5030724	CATCH BASIN, TYPE 3, L=24' (D=<8')	EACH	2	\$7,500.00	\$15,000
5030730	CATCH BASIN, TYPE 4, 1-GRATE (D=<8')	EACH	2	\$3,500.00	\$7,000
5030732	CATCH BASIN, TYPE 4, 2-GRATE (D=<8')	EACH	2	\$4,000.00	\$8,000
5030775	CATCH BASIN (SPECIAL NO. 1)	L.S.	1	\$15,000.00	\$15,000
5030776	CATCH BASIN (SPECIAL NO. 2)	L.S.	1	\$30,000.00	\$30,000
5050002	STORM DRAIN MANHOLE (DTL. 302)	EACH	31	\$12,000.00	\$372,000
5150001	MISCELLANEOUS UTILITY RELOCATION	F.A.	100,000	\$1.00	\$100,000
6010002	STRUCTURAL CONCRETE (f'c=3,000)	C.Y.	3,461	\$400.00	\$1,384,400
6010201	RETAINING WALL (ADOT STD. B-18.10)	S.F.	23,981	\$60.00	\$1,438,860
6050001	REINFORCING STEEL	LB.	506,900	\$0.80	\$405,520
6050101	DOWELS	EACH	44	\$25.00	\$1,100
7040010	PAVEMENT MARKING (WHITE HOT-SPRAYED THERMOPLASTIC) (0.060")	L.F.	94,162	\$0.50	\$47,080
7040020	PAVEMENT MARKING (YELLOW HOT SPRAYED THERMOPLASTIC) (0.060")	L.F.	32,888	\$0.50	\$16,440
7040110	PAVEMENT MARKING (WHITE HOT-SPRAYED THERMOPLASTIC)(TRANSVERSE)(0.090")	L.F.	4,535	\$0.70	\$3,170
7040120	PAVEMENT MARKING(YELLOW HOT-SPRAYED THERMOPLASTIC) (TRANSVERSE) (0.090")	L.F.	3,048	\$1.50	\$4,570
7060020	PAVEMENT MARKER, REFLECTIVE, (TYPE C, CLEAR, RED)	EACH	1,595	\$4.00	\$6,380

ROADWAY

ITEM DESCRIPTION		UNIT	QUANTITY	UNIT PRICE	AMOUNT
7060025	PAVEMENT MARKER, REFLECTIVE, (TYPE D, YELLOW, TWO-WAY)	EACH	167	\$4.00	\$670
7080001	PAVEMENT MARKING (PAINTED)	L.F.	150,000	\$0.20	\$30,000
8100001	AZPDES/NPDES (ORIGINAL)	L.S.	1	\$150,000.00	\$150,000
8100011	AZPDES/NPDES (MODIFIED)	F.A.	75,000	\$1.00	\$75,000
9080001	CONCRETE CURB (PC/COT STD. DTL. 209) (TYPE 1)	L.F.	59,754	\$20.00	\$1,195,080
9080006	CONCRETE WEDGE CURB (PC/COT STD. DTL. 209)	L.F.	1,111	\$20.00	\$22,220
9080090	CONCRETE CURB TERMINAL SECTION (PC/COT STD. 212)	EACH	70	\$200.00	\$14,000
9080112	CONCRETE CURB TRANSITION (PC/COT STD. DTL. 210)	EACH	4	\$200.00	\$800
9080201	CONCRETE SIDEWALK	S.F.	162,985	\$7.50	\$1,222,390
9080280	CURB ACCESS RAMP, PC/COT STD.DTL. 207 (TYPE 1)	EACH	95	\$1,500.00	\$142,500
9080301	CONCRETE DRIVEWAY	S.Y.	3,227	\$10.00	\$32,270
910XXXX	IMPACT ATTENUATOR	EACH	1	\$15,000.00	\$15,000
9120002	SHOTCRETE (6")	S.Y.	169	\$40.00	\$6,760
9130001	RIPRAP (DUMPED)	C.Y.	695	\$80.00	\$55,600
9140001	NOISE BARRIER WALL	S.F.	19,515	\$25.00	\$487,880
9300001	INCIDENTAL ITEMS	F.A.	500,000	\$1.00	\$500,000
	REMOVALS	L.S.	1	\$500,000.00	\$500,000
	STREET LIGHTING & ITS CONDUIT	L.S.	1	\$750,000.00	\$750,000
	SIGNING	L.S.	1	\$250,000.00	\$250,000
	SIGNALS	L.S.	1	\$400,000.00	\$400,000
7010001	MAINTENANCE OF TRAFFIC	L.S.	1	\$1,800,000.00	\$1,800,000
	LANDSCAPING AND IRRIGATION	L.S.	1	\$2,000,000.00	\$2,000,000
	SUB-TOTAL ROADWAY				\$21,468,840
	MISCELLANEOUS ITEMS (20% OF SUB-TOTAL ROADWAY)	L.S.			\$4,293,768
	CONSTRUCTION SUB-TOTAL				\$25,762,608
9010001	MOBILIZATION (5% OF CONSTRUCTION SUB-TOTAL)	L.S.			\$1,288,130
	CONSTRUCTION TOTAL				\$27,050,738
	ART (1% OF CONSTRUCTION TOTAL)	L.S.			\$270,507
	CONSTRUCTION ENGINEERING (15% OF CONSTRUCTION TOTAL)	L.S.			\$4,057,611
	ENGINEERING AND PLANNING (15% OF CONSTRUCTION TOTAL)	L.S.			\$4,057,611
	ENVIRONMENTAL MITIGATION	L.S.			\$200,000
	RIGHT-OF-WAY ACQUISITION	L.S.			\$3,600,000
	UTILITY RELOCATIONS	L.S.			\$700,000
	INFLATION (4% OF CONSTRUCTION TOTAL)	L.S.			\$1,082,030
	PCDOT CONTINGENCY (~15% OF CONSTRUCTION TOTAL)	L.S.			\$4,181,503
	TOTAL	L.S.			\$45,200,000



Appendix B

Stage II (30%) Construction Plans



The Stage II construction plans are in a separate volume.