



GRANT ROAD *Improvement Plan*



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Mobility

Vitality

Sustainability



October 2010 Design Concept Report



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KHA Project # 098134001

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Special thanks are extended to representatives of Grant Road neighborhoods and Grant Road businesses, and to the community for participating and providing thoughtful input at Grant Road workshops, open houses, and community conversations.

DEDICATION

The Grant Road Improvement Plan is dedicated to the memory of Lynn Slagle who served as Task Force facilitator.

Grant Road Improvement Plan: Oracle Road to Swan Road
Design Concept Report

October 2010

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EXECUTIVE SUMMARY

Project Need and Objectives

Funding for the Grant Road improvements between Oracle Road and Swan Road Plan was authorized in May 2006 with the passage of the Regional Transportation Authority (RTA) twenty-year, half-cent sales tax. Ballot language for the voter-approved RTA transportation improvement plan states that Grant Road between Oracle Road and Swan Road will be widened and reconstructed to six lanes including streetscape, bike lanes, and sidewalk improvements. RTA project listings include Grant Road as Project 18 with \$166,850,000 in RTA and committed non-RTA funds for planning, design, right-of-way acquisition, and construction. Grant Road is designated for reconstruction over three implementation periods of the RTA Plan that spans 15 years.

The goals of the Grant Road Improvement Plan is to create a state-of-the-art multi-modal transportation corridor that integrates “best practices” for multi-modal access and design sensitivity within the unique context of Tucson’s Sonoran Desert region. In addition, it is the goal of the City to clearly demonstrate environmental and economic sustainability and integrate these features into the planning, design, and construction of the project. To this end, the City of Tucson required that the project be planned and designed using a context sensitive solutions oriented approach. The ultimate design of the roadway will be one that provides convenient access for pedestrians, bicyclists, transit users, and vehicles. It should integrate pedestrian-oriented urban design opportunities with the roadway design. The road should be friendly to cross by foot and bike, and serve to better unify neighborhoods on either side of Grant Road.

Planning and Preliminary Design Process

The City of Tucson selected the Institute of Transportation Engineer’s proposed recommended practice, *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*, for planning and preliminary design of the Grant Road Improvement Plan. The Context Sensitive Solutions (CSS) process, seeks to combine the art and science of developing places (including streets) in harmony with surrounding areas. CSS seeks to balance safety, mobility, community, and environmental goals in planning and designing a transportation project. It involves the early and continuous interaction with various community groups as stakeholders, uses an interdisciplinary team tailored to project needs, and addresses all modes of travel. It applies flexibility inherent in design standards and incorporates aesthetics as an integral part of planning and design.

Phase 1. Technical Assessment, Visioning, Design Concepts, and Roadway Alignment Concept

In Phase 1, an extensive public involvement plan was implemented and a series of technical assessments were prepared to serve as input to the Task Force in developing a vision statement and guiding principles. This was accomplished during the 10-month period from May 2007 to February 2008. The remainder of 2008 was devoted to developing design criteria, design concepts, and a conceptual roadway alignment that was approved by Mayor and Council in January 2009.

Phase 2. Preliminary Roadway Design and Community Character & Vitality Plan

In Phase 2, development of Preliminary Roadway Design Plans and a Community Character and Vitality Plan were prepared in parallel during the period February 2009 through fall of 2011. Preliminary roadway design refined and advanced the conceptual roadway alignment approved by Mayor and Council in January 2009 into an initial geometric roadway centerline for Grant Road. Preliminary roadway and associated right-of-way plans were developed for Grant Road infrastructure including roadway, drainage, access, intersections, landscape, and utility improvements. During preliminary design, support was provided to the City Real Estate Division in the form of property access design, mitigation for property impacts, and the legal descriptions for affected properties. The City Real Estate Division was responsible for property acquisition for Grant Road improvements. The outcome of Phase 2 design activities is a Design Concept Report, preliminary (30 percent) construction plans, construction cost estimates, and reconstruction sequencing plan. The 30 percent design plans are available in a separate plan set titled *Grant Road, Oracle Road to Swan Road, Roadway Improvements, 30% Construction Plans*, dated August 2010. The Final Design Concept Report contains Roadway Plans and Typical Cross Sections in Appendix A. The 30 percent construction plans prepared in Phase 2 will be advanced by the City through contracts for final project design and right-of-way acquisition.

Community character and vitality planning defines an overall vision for the future land uses that front onto Grant Road, as well as provide policy direction for the reuse of excess properties that are acquired for the Grant Road improvements.

Citizen Task Force

A 19-member Citizen Task Force was formed and approved by Mayor and Council to develop, evaluate, and select alternatives and to develop stakeholder-supported project recommendations for consideration by Mayor and Council. Task Force members were also tasked to provide effective communication between the neighborhoods, businesses, and other stakeholder groups they represent.

The Citizen Task Force represented the following groups and communities.

- Neighborhood Associations
- Businesses
- Citizen Transportation Advisory Committee
- City Manager’s office
- Disabled community
- Alternate modes community
- Regional travelers
- City Planning Commission

Vision Statement and Guiding Principles

The Vision Statement and Guiding Principles for the Grant Road Improvement Plan were created using extensive public input, technical data, and the Task Force understanding of the project goals. It was

finalized at the February 19, 2008 Task Force meeting. The Vision Statement and Guiding Principles guided the planning and preliminary design of the Grant Road Improvement Plan.

Public Involvement

The context sensitive solutions approach used to develop the Grant Road Improvement Plan combines the multi-modal transportation context with the contexts of the natural and built environment and community values obtained through a public involvement process. As a result, public involvement and education were integral elements of the Grant Road Improvement Plan and resulted in broad-based public support for the Grant Road Improvement Plan.

Existing Conditions

Grant Road between Oracle Road and Swan Road features two travel lanes in each direction separated by a two-way left turn lane, narrow bike lanes, discontinuous sidewalks, inconsistent bus stop amenities, over 400 driveways, and seven congested major intersections during the peak commuter period. On either end of the project, Grant Road is a divided six-lane arterial.

Land use along Grant Road has many assets including independent businesses, ethnic diversity, a range of non-profit and community organizations, specialized retail and services, popular restaurants and bars, a unique diversity of housing, walking, bicycling, and transit ridership. However, the current roadway and some of the uses along it provide inconsistent pedestrian and bicycling conditions, a lack of comfortable public spaces and amenities, a lack of community identity in much of the built environment, bad connectivity and challenging conditions for those driving along Grant Road, and an often confusing or haphazard land use pattern.

Recommended Design Concept

The roadway alignment concept approved by Mayor and Council in January 2009 included preliminary right-of-way limits, an conceptual roadway alignment that served as the basis for preliminary design in Phase 2, and innovative and sustainable design concepts for Grant Road which evolved from community involvement and public outreach events.

Phase 2 preliminary roadway construction plans for Grant Road evolved from the preparation of 15 percent and 30 percent construction plans and cost estimates. Fifteen percent construction plans were prepared in the summer and fall of 2009 and submitted to the City of Tucson for review in December 2009. Thirty percent construction plans were submitted to the City in August 2010. Review and comments were logged and included with the 30 percent construction plans and will be addressed as part of final project design. A key input to the development of 30 percent construction plans was a series of neighborhood conversations conducted in early 2009 on mobility, access, and streetscape. In these neighborhood conversations, public comments received on subjects such as neighborhood access to and from Grant Road, neighborhood traffic management issues, location of median openings, local access lanes, and street closures were collected and integrated into the 30 percent design plans.

Included in the 30 percent construction plans are a number of innovative and sustainable design concepts which evolved from community involvement and public outreach events.

Grant Road Innovative and Sustainable Features

Typical Street Sections

- 137-foot Street Section
- 160-foot Street Section

Streetscape

- Landscaping, Streetscape, and Public Art
- Noise Mitigation
- Water Harvesting

Intersections

- Indirect Left Turn Intersection
- Traditional Intersection
- Pelican Pedestrian Crossing
- Toucan Bicycle Crossing

Bicycle Accommodations

- 6' Bicycle Lane with 1' Buffer Stripe
- Bike Spot
- Bicycle Lane Markings in Conflict Areas

Pedestrian Accommodations

- 8' Sidewalk
- 12' Landscape Area

Transit Accommodations

- Enhanced Transit Stops and Plazas

Access Management and Parking

- Local Access Lanes
- Directional Median Openings
- Shared Access
- Cross Access
- Parking Strategies

The following reports were prepared to supplement the Final Design Concept Report.

- *Historic Properties Assessment for the Grant Road Improvement Project, Oracle Road to Swan Road* (Phase 1 Report dated June 2008)
- State of Arizona Historic Property Inventory Forms
- *Relocation Red Flag Analysis, Grant Road: Oracle Rd. to Swan Rd., An Outline of Anticipated Relocation Issues, Actions, and Recommendations for Certain Business Types Located within the Project Limits* (dated November 2007)

- *Transportation Access Management Guidelines for the City of Tucson (dated July 2010)*
- *Weaving Public Art Along Grant Road, Public Art Master Plan (undated)*
- *Summary of Individual Property Impact Mitigation Plans (dated March 2010)*
- *Technical Assessment, Utilities Overview (dated July 2010)*
- *Technical Assessment, Noise Study Report (dated July 2010)*
- *Preliminary Drainage Report (dated July 2010)*
- *Roadway Design Criteria (Dated July 2010)*
- *Construction Cost Estimate Report (dated July 2010)*
- *Community Character and Vitality Plan and Implementation Strategy (under development)*

Opinion of Construction Costs

The construction cost estimate for Grant Road Improvement Plan, based on quantities from the 30 percent construction plans is \$102,120,380 in 2008 dollars. The construction cost estimate used Arizona Department of Transportation (ADOT) 2008 Estimated Construction Costs. Right-of-way acquisition cost estimates were not developed for the 30 percent design plans.

Implementation

The development of a Grant Road reconstruction phasing plan was initiated with the analysis of candidate early intersection projects. Following the endorsement by the Grant Road Task Force of the Grant-Oracle intersection as the early intersection project, a reconstruction sequence plan for the remainder of the Grant Road Improvements was developed and endorsed by the Task Force. The recommended reconstruction phasing plan is summarized in the next table.

Streetscape, Landscape, and Public Art

The streetscape and landscape design of the improvements to Grant Road are key elements in successfully achieving a context sensitive design approach for Grant Road. When appropriately designed these can strengthen the connections between the roadway and adjacent development to create a stronger community character; and they can contribute to pedestrian and bicycle safety as well as to the speed management of traffic along a major arterial such as Grant Road. The integration of public art into the streetscape and landscape improvements can contribute to a meaningful link to community identity and the history of the Grant Road study area.

Recommended Reconstruction Sequence

RTA Construction Period	Grant Road Project	Project Limits	Segment Estimated Construction Cost	Rationale
Period 1: 2007-2011	Oracle Rd. to Stone Ave.	15th Ave. to Castro Ave.	\$11 million	<ul style="list-style-type: none"> • Constructed as the early intersection project • Construction completed in RTA Period 2
Period 2: 2012-2016	Stone to 1 st Avenue	Castro Ave. to Fremont Ave.	\$19 million	<ul style="list-style-type: none"> • Ranked highest need based on crashes and congestion • Construction completed prior to RTA Period 3 in which the railroad underpass at Grant Road and the 1st Ave., River to Grant will be constructed
	Swan Rd	Bryan Ave. to Arcadia Ave.	\$16 million	<ul style="list-style-type: none"> • Swan must be completed before Alvernon segment which is ranked as second highest need based on crashes and congestion
Period 3: 2017-2021	Campbell Ave.	Fremont Ave. to Plumer Ave.	\$15 million	<ul style="list-style-type: none"> • Completion of Campbell segment following the widening of Campbell, south of Grant and 1st Ave., north of Grant will divert traffic on Campbell north of Grant and 1st Ave., south of Grant
	Alvernon Way	Sparkman Ave. to Bryan Ave.	\$15 million	<ul style="list-style-type: none"> • Ranked as second highest need based on crashes and congestion
Period 4: 2022-2026	Country Club	Plumer Ave. to Sparkman Ave.	\$18 million	<ul style="list-style-type: none"> • Grant Road reconstruction completed in RTA Period 4 (2022-2026)

Community Character and Vitality Plan

The Grant Road Improvement Plan includes the creation of a Community Character and Vitality Plan to guide the future land use patterns, urban form of development, and economic vitality of the properties along Grant Road with the intent of taking advantage of the public investment in the expansion of the roadway and the positive improvements of the road’s design character.

The Community Character and Vitality Plan will:

- Refine current area and neighborhood plan land use and design guidance for properties along Grant Road—through an amendment to Area and Neighborhood Plans.
- Guide future land use change to achieve the community’s vision for the form and scale of future development.

- Primarily dealing with non-residential and mixed use properties, not existing single-family residential uses.
- Focus on the relationship and buffering between development along Grant Road and the neighborhoods behind.
- The City will not initiate rezoning of any properties as part of the Grant Road planning effort.

The planning efforts have been guided by the existing area and neighborhood plans for properties fronting Grant Road, the Vision Statement and Guiding Principles of the Grant Road Improvement Plan, and input received from the public during outreach and education efforts.

The concepts that have been explored have also been shaped by technical considerations of real estate development, existing policies and practices, and the urban design and land use expertise of the Grant Road team. The starting point for public input was the community conversations and the existing planning policies. Through a public involvement process and work with the Grant Road Task Force, this led to the definition of the Vision Statement and Guiding Principles for the Grant Road Improvement Plan.

Development of the Community Character and Vitality Plan will be completed in fall 2011, and will include a stand-alone planning and implementation document based on focused input from the community to address key design and policy content, and from the Citizen Task Force to achieve their endorsement of the Plan.

1 INTRODUCTION

1.1 Need for Project

Grant Road widening between Oracle Road and Swan Road is included in the 2030 Pima Association of Governments (PAG) Regional Transportation Plan (RTP) and has been included in prior PAG RTPs. The funding for the Grant Road Improvement Plan was authorized through the May 16, 2006 passage of the Regional Transportation Authority (RTA) twenty-year, half-cent sales tax. Ballot language for the voter-approved RTA transportation improvement plan states that Grant Road between Oracle Road and Swan Road will be widened and reconstructed to six lanes including streetscape, bike lanes, and sidewalk improvements and future land use strategies for adjacent property.

RTA project listings include Grant Road as Project 18 with \$166,850,000 in RTA and committed non-RTA funds for planning, design, right-of-way acquisition, and construction. Grant Road construction is designated for the second, third, and fourth RTA implementation periods beginning in fiscal year 2012 and ending in fiscal year 2026. Planning, design, and limited right-of-way acquisition began in fiscal year 2007.

1.2 Project Goals and Objectives

The goal of the Grant Road Improvement Plan as outlined in the City of Tucson request for qualifications (No. 072023) is to create a state-of-the-art multi-modal transportation corridor that integrates “best practices” for multi-modal access and design sensitivity within the unique context of Tucson’s Sonoran Desert region. In addition, it was the goal of the City to clearly demonstrate environmental and economic sustainability and integrate these features into the planning, design, and construction of the project. Other goals include enhanced multi-modal travel efficiency and connectivity as well as transit and pedestrian-oriented redevelopment.

The City of Tucson required that the project be conducted using a context sensitive solutions oriented approach. The ultimate design of the roadway will be one that provides convenient access for pedestrians, bicyclists, transit users, and vehicles. It should integrate pedestrian-oriented urban design opportunities with the roadway design. The road should be friendly to cross by foot and bike, and serve to better unify neighborhoods on either side of Grant Road.

The request for qualifications required that the planning effort include a roadway alignment study, land use and economic analyses, preliminary roadway/streetscape plans, and urban design concepts and associated land use policies. The Grant Road Improvement Plan includes an extensive public participation process that integrates the preferences and desires of area neighborhoods and businesses into the design of the roadway. The final deliverables highlight the unique and varied character that presently exists along Grant Road.

The guidance provided by the City was used to establish the following specific project objectives.

- Improve travel efficiency, connectivity, and safety for all transportation modes
- Enhance urban and economic vitality and sense of place
- Incorporate design sensitivity and environmental principles within the unique context of the Sonoran Desert
- Demonstrate innovation and best practices for future roadway development

1.3 Study Area and Project Limits

To ensure inclusiveness of the community, a study area for the Grant Road Improvement Plan was defined as Grant Road between Oracle Road and Swan Road and within one-quarter mile of the existing Grant Road centerline. The study area was considered the area in which improvements to Grant Road could influence traffic circulation, safety, and cut-through traffic. The study area boundaries and neighborhoods that are located along the Grant Road are shown in **Figure 1**.

Grant Road Improvement Plan limits have been established and are reflected in the preliminary design plans (**Appendix A**). The project limits are the extent to which construction will impact existing conditions along Grant Road and intersecting north-south cross streets. The project limits shown in the 30 percent construction plans are subject to change as design progresses to final construction documents.

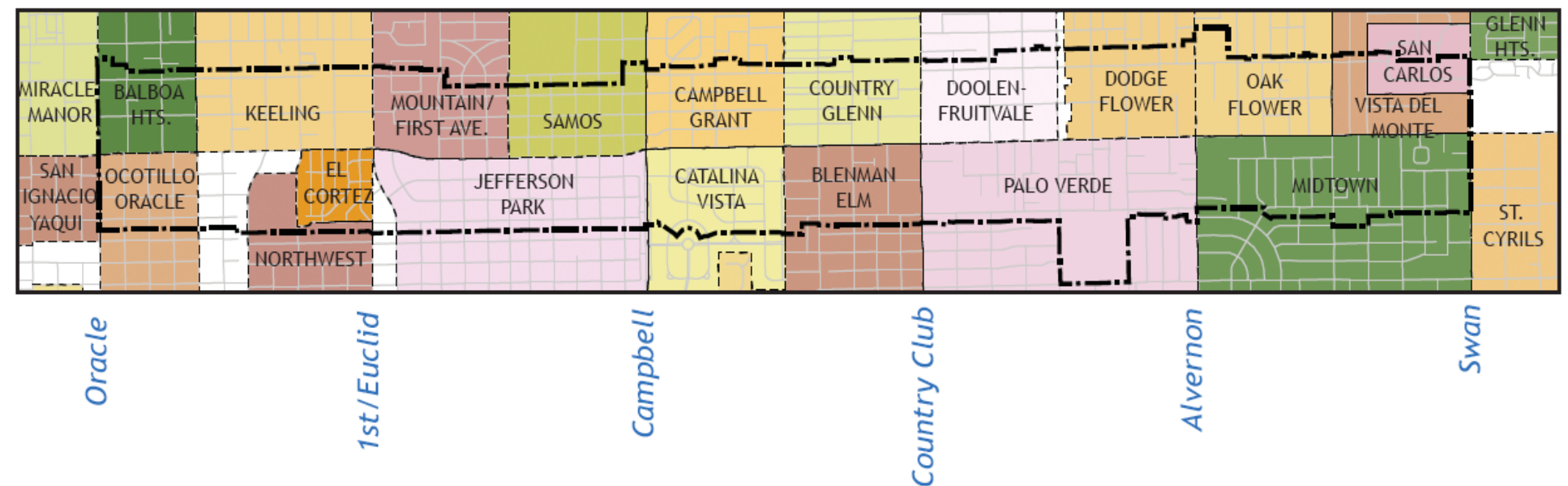
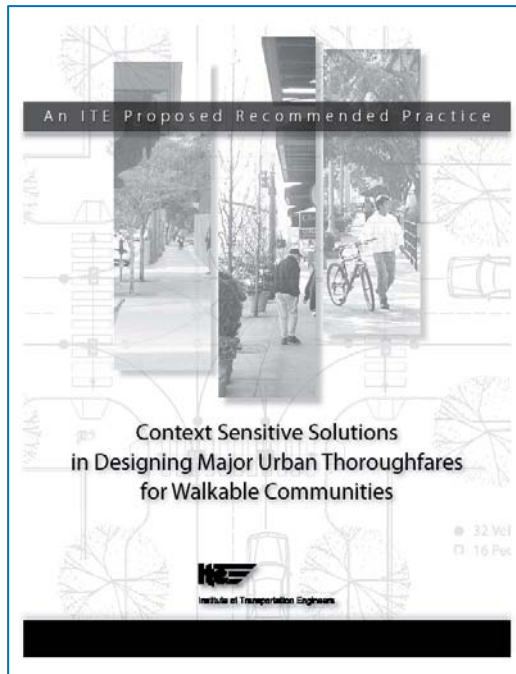


Figure 1: Study Area

2 PLANNING AND PRELIMINARY DESIGN PROCESS

2.1 Context Sensitive Solutions



The City of Tucson selected the Institute of Transportation Engineer (ITE) proposed recommended practice, *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*, for planning and preliminary design of the Grant Road Improvement Plan. The Context Sensitive Solutions (CSS) process, seeks to combine the art and science of developing places (including streets) in harmony with surrounding areas. CSS seeks to balance safety, mobility, community, and environmental goals in planning and designing a transportation project. It involves the early and continuous interaction with various community groups as stakeholders, uses an interdisciplinary team tailored to project needs, and addresses all modes of travel. It applies flexibility inherent in design standards and incorporates aesthetics as an integral part of good planning and design. In 2010, *Designing Walkable Urban Thoroughfares; A Context Sensitive Approach* (RP-036A) was approved by ITE as a recommended practice.

Phase 2. Preliminary Roadway Design and Community Character & Vitality Plan (to be completed fall 2011)

In Phase 2, development of preliminary roadway design plans and a community character and vitality plan were prepared in parallel during the period February 2009 through fall of 2011. Roadway design plans and community character and vitality planning include meetings and coordination with the Citizen Task Force, the Grant Road Technical Advisory Committee, and the Tucson Department of Transportation (TDOT) Management Team. Phase 2 also includes community workshops, informational open houses, reports to the community, and website maintenance. The Design Concept Report (this document) documents Phase 1 and Phase 2 recommendations related to the preliminary roadway design. The recommendations related to the community character and vitality plan will be documented in a separate report (Community Character and Vitality Plan and Implementation Strategies).

Preliminary Roadway Construction Plans: Preliminary roadway design refined and advanced the conceptual alignment approved by Mayor and Council in January 2009 into initial geometric roadway centerline and right-of-way alignments for Grant Road for use in preliminary property acquisition. Preliminary roadway construction and associated right-of-way plans for Grant Road infrastructure include roadway, drainage, access, intersections, landscape, and utility improvements. During preliminary design, support was provided to the City Real Estate Division in the form of property access design, mitigation for property impacts, and legal descriptions. The City Real Estate Division is responsible for property acquisition for Grant Road improvements. The outcome of Phase 2 design activities is preliminary (30 percent) construction plans, construction cost estimates, and reconstruction sequencing recommendations. Roadway plans and typical cross-sections from the 30 percent construction plans prepared in Phase 2 are included in **Appendix A** of this report. The 30 percent plans will be advanced by the City through contracts for final project design and right-of-way acquisition.

Community Character and Vitality Planning: Community character and vitality planning defines an overall vision for the future of the land uses that front onto Grant Road, as well as provide policy direction for the reuse of excess properties that are acquired for the Grant Road improvements. The Community Character and Vitality Plan contains guidelines for development and redevelopment for properties that front Grant Road. The guidelines seek to:

- Refine current area and neighborhood plan land use and design guidance for properties along Grant Road—through an amendment to Area and Neighborhood Plans;
- Guide future land use change to achieve the community’s vision for the form and scale of future development;
- Primarily dealing with non-residential and mixed use properties, not existing single-family residential uses;
- Focus on the relationship and buffering between development along Grant Road and the neighborhoods behind;
- The City will not initiate rezoning of properties as a part of this planning effort.

2.2 Planning and Preliminary Design Scope of Work

The Grant Road Improvement Plan began in April 2007 and proceeded in accordance with a detailed scope of work outlining project work activities, deliverables, and milestone deadlines. As the project evolved, the scope and schedule were refined to allow for more comprehensive public involvement, more interaction with the Citizen Task Force, and additional technical work associated with developing preliminary design plans for the 5-mile project, and land use policies and design guidelines for consideration by the Tucson Planning Commission. The project consisted of the two project phases described below and a scheduled completion in the fall of 2011.

Phase 1. Technical Assessment, Design Concepts, and Roadway Alignment Concept (completed January 2009)

In Phase 1, an extensive public involvement plan was implemented and a series of technical assessments were prepared to serve as input to the Task Force in developing a vision statement and guiding principles. This was accomplished during the 10-month period from May 2007 to February 2008. The remainder of 2008 was devoted to developing design criteria, design concepts, and a recommended preliminary roadway alignment that was approved by Mayor and Council in January 2009.

The terms “community character” and “vitality” are used because the goals of this phase are more than a simple land use map; they are also related to making Grant Road more vital in terms of:

- The character of development and landscape that form the community context for Grant Road.
- The economics of the businesses along Grant Road;
- Community life along Grant Road and in the adjacent neighborhoods;
- The urban form of development (including scale and intensity of use) and the character of development and landscape that form the community context for Grant Road; providing illustrations and recommendations to communicate the design and scale of development along Grant Road. The guidance are not prescriptive, but provide guidance that can be adopted as an amendment to the Area and Neighborhood Plans along Grant Road; and,
- Identification of opportunity sites for new development and revitalization of existing development (this would be linked to access management, replacement parking, and other land use and urban design issues that result from impacts of the roadway improvements).

2.3 Citizen Task Force

A 19-member Citizen Task Force was formed and approved by Mayor and Council to work with the Grant Road Design Team to develop, evaluate, and select alternatives and to develop stakeholder-supported project recommendations for consideration by Mayor and Council. Task Force members were also tasked to provide effective communication between the neighborhoods, businesses, and other stakeholder groups they represent and the Design Team.

The Citizen Task Force represented the following groups and stakeholders.

- Neighborhood Associations
- Businesses
- Citizen Transportation Advisory Committee
- City Manager’s office
- Disabled community
- Alternate modes community
- Regional travelers
- City Planning Commission

The following ground rules were established to define the basic responsibilities of the Task Force.

- Work as a team with community residents, business owners along Grant Road, and residents of the larger Tucson region to select the best alternatives for roadway alignment, streetscape design, and revitalization for Grant Road.
- Be subject to the Citizen Advisory Committee rules contained in the Arizona Open Public Meeting Law (ARS Sec. 38-431, ET DEQ.).

- Limit discussions to issues relating to the development of the Grant Road Improvement Plan and Grant Road between Oracle Road and Swan Road and within one-quarter mile of the existing Grant Road centerline and endpoints.
- Work with the Grant Road Design Team to identify and evaluate alternative Grant Road improvement concepts and identify preferred concepts.
- Represent the interests of the stakeholder groups they represent and help provide effective two-way communication between them and the Design Team on key issues.
- Develop consensus recommendations regarding preferred concept alternatives, along with any applicable comments, for consideration by Mayor and Council.
- Mayor and Council will make final decisions regarding the project guided by a number of factors including Task Force recommendations, technical and planning analyses, community input, legal and regulatory considerations, and financial considerations.

2.4 Technical Advisory Committee

The City organized a Technical Advisory Committee (TAC) to provide technical guidance to the Grant Road Design Team throughout the development of the Grant Road Improvement Plan. The TAC consisted of representatives from the following technical organizations within and outside of the City.

- Tucson Real Estate
- Tucson Environmental Management
- Tucson Roadway Engineering
- Tucson Historic Resources
- Tucson Traffic Engineering/ITS
- Tucson Arts Integration/Deployment
- Tucson Bus/Rail Transit Planning
- Tucson Police Department
- Tucson Bike/Pedestrian Planning
- Tucson Fire Department
- Tucson Landscape Architecture / Urban Forestry
- Tucson Utilities
- Tucson Neighborhood Planning
- Tucson Floodplain Management
- Tucson Community Services
- Tucson Public Relations
- Pima County Department of Transportation
- Tucson Transportation Development Services
- University of Arizona
- Regional Transportation Authority/PAG

To facilitate ongoing coordination with the TAC, a TAC Management Team was formed to meet regularly with the Design Team. The following ground rules were established to define the basic responsibilities of the TAC.

- Review technical decisions and technical documents relative to their areas of technical expertise.
- Meet with the Management Team and members of the Design Team to review and comment on technical issues.
- Meet with the Management Team and Design Team to provide technical guidance, information, and timely response to specific technical issues.
- Review or coordinate the review of technical decisions and technical documents at the request of the Management Team.
- Communicate project issues, accomplishments, status, and events with their respective management and organization members.

2.5 Vision Statement and Guiding Principles

The Vision Statement and Guiding Principles for the Grant Road Improvement Plan were created using extensive public input, technical data, and the Task Force understanding of the project. It was finalized at the February 19, 2008 Task Force meeting. The verbatim Vision Statement and Guiding Principles (provided below) guide the planning and preliminary design of the Grant Road Improvement Plan.

Vision Statement

The improvements resulting from the Grant Road Improvement Plan will enhance safety and balance mobility and accessibility for all users including motorists, pedestrians, bicyclists, transit riders, and those with disabilities. The Plan will direct the widening of Grant Road to six lanes, also improving its function as an urban arterial street within Tucson’s network of streets. The Plan will balance the needs of those traveling through the area on Grant Road with those who live, work, and shop along Grant Road.

The community values the scale, character, and diversity of the neighborhoods and businesses along Grant Road and the Plan will reflect these values. The Plan will recognize the diversity of residents and independent businesses along Grant Road, and will help them to revitalize the places in which they live and work.

The Plan will strive to improve the visual character and quality of Grant Road and the land uses along it, and it will define Grant Road as a unique and vital place that ultimately enhances the community and region as a whole.

The Grant Road planning process and its implementation will balance a long range vision with the definition of improvements and programs that fit within the financial resources identified for this project. It will be forward-thinking in its design, consider likely future trends and work to effect positive change to the environment and public health. It will set high standards for community involvement while providing an inspirational model for future Tucson roadway enhancements.

Guiding Principles

The Guiding Principles are organized into the following subject areas.

- Mobility and Access
- Character and Vitality
- Aesthetics and Environment
- Vision and Implementation

Mobility and Access mean moving along and connecting with uses on Grant Road — both for people living and working nearby and those passing through; both freeing up motion (mobility) and getting to specific destinations (access). Through mobility and access, the Plan will work toward sustainable transportation both for the local community and the Tucson region by doing the following:

- Balance the transportation needs of those traveling locally with those passing through Grant Road by:
 - improving Grant Road’s role in Tucson’s street network and its role for neighbors;
 - recognizing all populations using Grant Road; and by
 - increasing the efficiency of traffic flow along Grant Road while designing Grant Road and the context along it to encourage drivers to travel at safe speeds.
- Improve mobility and safety for all those traveling along and across Grant Road, including pedestrians, bicyclists, transit riders, and those with disabilities, by:
 - recognizing that Grant Road is not the exclusive domain of cars;
 - improving access for all modes of travel to neighborhoods, commercial districts, schools (including the University and community colleges), and other destinations;
 - improving the physical conditions of the roadway, and the pedestrian and bicycle environments along and crossing Grant Road and on connecting streets;
 - improving transit stops and access to them as well as considering the land uses around them; and by
 - considering land use and other needs of transit, bicycle, and walking dependent populations.
- Balance mobility along and across Grant Road with access to businesses, residences, and other destinations along and nearby Grant Road by:
 - providing safe vehicular access to properties on Grant Road;
 - facilitating regional access to businesses (including deliveries) that avoids cut-through traffic impacts to adjacent neighborhoods; and,
 - improving neighborhood access to businesses and other destinations by providing quality connections for all users.
- Ensure that roadway improvements support and enhance the community’s values regarding the character, vitality, aesthetics, and environment of Grant Road by:
 - recognizing that different sections of Grant Road may require a different balance of mobility and access

- Provide the potential for future transit options, such as bus rapid transit, modern streetcar, light rail, or other high-capacity transit in the design of Grant Road improvements with the goal of minimizing future costs for construction and right-of-way acquisition.

Character and Vitality mean the health of the places surrounding Grant Road — neighborhoods and businesses, public space and activity, and private investment. Character and Vitality define the overarching goals for aspects of the study area such as housing, neighborhoods, employment, and public space. Through character and vitality, the Plan will work to enhance, in a fair manner, the economic and social environment of neighborhoods and districts by doing the following:

- Preserve and enhance the scale and character of existing residential neighborhoods by providing appropriate transitions and buffering from Grant Road and the uses fronting onto it to the neighborhoods behind.
- Support opportunities for a range of options for housing tenancy and housing type, which serve and expand upon the diversity of residents who live along and nearby Grant Road.
- Support the viability of small, local, and independent businesses.
- Preserve and enhance opportunities for a range of employment along Grant Road, including restaurants, retail, manufacturing, construction, repair, service, professional office and medical jobs.
- Create a cohesive public realm that adds new public spaces to existing parks, plazas, schools and other community gathering places; forming an accessible network that supports and is supported by the design and function of Grant Road, and the neighborhoods and businesses along it.
- Build on the attraction and strengths of community and social service organizations to revitalize districts and enhance the public realm with activity along Grant Road.
- Develop districts with multiple uses and shared parking that will be destinations for neighborhood residents as well as people from the region at large.
- Recognize the differences in demographics, environment, scale, neighborhoods, business types, and other aspects of character; and use them to reinforce the identities of Grant Road’s Community Character Segments.
- Work to create safer environments that discourage crime and increase personal safety.
- Support and build upon ethnic diversity in relation to the social and economic vitality in the Grant Road Study Area.
- Encourage private investment that revitalizes opportunity sites along Grant Road.

Aesthetics and Environment build upon the principles set out in Character and Vitality by focusing on the details of key issues such as climate, utilities, views and the watershed. Through aesthetics and environment, the Plan will work toward human and ecological sustainability of Grant Road and the neighborhoods and districts along it to the benefit of those in the Study Area and the greater Tucson region by doing the following:

- Create an aesthetically pleasing, comfortable, inviting environment, both in the street right-of-way and in adjacent public spaces, that is framed by the buildings and landscapes that front Grant Road.

- Enhance the identities of Grant Road’s Community Character Segments through the creation of business clusters, streetscape design, and other elements.
- Capitalize on Grant Road’s natural environment and regional scenery through climate adaptation, utilization of desert plants (especially those native to the Tucson basin), topography, key views and the integration of aesthetic and environmental design.
- Capitalize on Tucson’s culture, through urban form, architectural styles, public art, and other elements.
- Mitigate utility issues including overhead wires, to the extent financially feasible.
- Mitigate watershed issues such as flooding, stormwater runoff, ecological health and water harvesting in a holistic manner.
- Mitigate noise impacts of traffic on Grant Road utilizing a range of techniques that are appropriate to the surrounding context.

Vision and Implementation mean making the vision for Grant Road’s future a reality. Through vision and implementation, in a fair manner, the Plan will work incrementally towards long-term sustainability in transportation, economy, livability and ecology by doing the following:

- Define a long-range vision as well as priorities that can be achieved within the budget and timing of the Grant Road Improvement Plan.
- Define cost-efficient and effective phases for successful implementation.
- Protect the viability of businesses during construction by maintaining their visibility, their parking, and access to them.
- Provide information and technical assistance to residential and business property owners directly impacted by the Grant Road Plan.
- Define the improvements so that the vision can be achieved incrementally with both the RTA funding base and additional public and private funding to enhance the improvements.
- Identify and give priority to the implementation of those improvements that provide the most benefit and that address those issues that are a priority concern to the public.

3 PUBLIC INVOLVEMENT

The context sensitive solutions approach used to develop the Grant Road Improvement Plan combines the multi-modal transportation context with the contexts of the natural and built environment and community values obtained through a public involvement process. As a result, public involvement and education are integral elements of the Grant Road Improvement Plan that helped gain broad-based public support for the project.

3.1 Early Community Conversations

In keeping with the City of Tucson commitment to involving the community early and often, interaction with the public began soon after the RTA Plan was passed by voters in 2006 and before the start of the Grant Road Improvement Plan in the spring of 2007. The City of Tucson sponsored a series of community conversations focused on developing a “sense of place” for Grant Road and encouraging the public to share their stories and experiences of Grant Road. A local historian set the stage for each conversation with a pictorial review of Grant Road’s past and participants were encouraged to bring their own photos, share stories and recall memories that could be added to Grant Road’s story. City Council Members from Wards 3 and 6 introduced each conversation and closed each by sharing “what we have heard” from the conversations.

Attendees worked in small groups with a map of Grant Road so they could identify areas along the roadway that were important to them and their experiences. Each conversation had pre-scripted questions for facilitators to assist the conversations taking place at each table; recorders noted the participant’s comments. An executive summary of the comments was prepared by TDOT, mailed to the conversation participants, and posted on the project website. Comments were used to inform the City’s Request for Proposals for the Grant Road Improvement Plan.

3.2 Citizen Task Force Decisions

An important factor in Task Force decisions was the consensus decision-making format the Task Force developed in their early meetings to help ensure the project moved forward and that no one’s voice went unheard. The Task Force developed five levels of consensus ranging from “I can give an unqualified ‘yes’ to the decision at hand” to “I will support the decision at hand because I trust the wisdom of the group, but I do not fully agree with the decision and need to register my view about it.” This approach to consensus was not designed to achieve 100 percent agreement, rather create an outcome that represents the best course of action, given the circumstances.

3.3 Neighborhood, Business, and Community Conversations

Phase 1 public involvement reached out to thirteen Neighborhood Associations along Grant Road, interested businesses, and non-profit organizations in addition to regional commuters and special interest groups.

As a first step, the more than 100 applicants who were not selected for the Task Force were invited to a training session where they could provide input and also receive training to become project conversation facilitators. About 40 attended. These trainees became facilitators for Conversations-in-a-Bag, designed for

small group conversations held in neighborhoods, schools, and at the workplace. The Conversations-in-a-Bag were suggested by participants at the early community conversations as an informal way to connect with groups in the community that are unable to easily attend a public meeting or workshop or for individuals who wanted to engage their neighbors, co-workers, and colleagues in the planning process. Each volunteer facilitator received their conversation bag equipped with a script, conversation pocket guide, a map of Grant Road for participants to draw and write on, markers, and a summary sheet to record the ideas shared during the conversation. Summaries of all conversations were prepared and posted to the project website.

3.4 Questions Asked to Create the Vision

The Design Team visited Neighborhood Association meetings, businesses, and other special interest groups where they made a presentation about the Grant Road Improvement Plan and asked the following questions: What do we already know about Grant Road? What characteristics of Grant Road should be preserved? What do you think will change in the future? How will these changes affect the area? What characteristics along Grant Road should be changed? What do we fear and hope for Grant Road?

In addition, community members were invited to attend community conversations about the project at their respective Ward office. A short presentation was made by members of the Design Team, and participants then worked in small groups with facilitators to provide their input in the form of written comments and drawings on maps of Grant Road.

During this visioning process there were 40 neighborhood and community conversations with more than 1,000 participants from neighborhoods, businesses, and special interest groups. The team received more than 5,000 written comments. An additional 1,200 responses were received from the project website, telephone, and other survey instruments.

Using this public input plus technical information provided by the Design Team, and their own thoughts, the Task Force created their Vision Statement and Guiding Principles for the project. The draft document was made available for public review and comment, and the final document was endorsed by the Task Force in February 2008. The Vision Statement and Guiding Principles are the foundation of the Task Force decision-making process and were incorporated into several public workshop activities. The document is posted on the project website and hard copies were available at every Task Force meeting, public workshop, and open house.

3.5 Phase 1 Workshops and Open Houses

Two series of community workshops were held in 2008 to obtain input for Task Force consideration on a variety of roadway design topics including the roadway cross-sections, pedestrian and bicycle features, transit amenities, and intersection improvements. Land use topics were also included in the workshops including landscape, buffers, replacement of lost parking, and use of excess right-of-way. The two rounds of three workshops were attended by more than 400 community representatives and led to the development of the sustainable design concepts and innovations which were endorsed by the Citizen Task Force for inclusion in the Grant Road Improvement Plan. Workshop feedback also provided input to the development

of a proposed alignment concept for Grant Road which resulted from nearly six months of Task Force analysis of multiple alignment alternatives.

Also in 2008, two business open houses provided opportunities for the business community to review the innovative design concepts under development and provide feedback on issues relating to business access, visibility, and potential future construction issues.

3.6 Public Review of the Proposed Alignment Concept

After the Task Force endorsed a proposed alignment and associated design innovations, maps and explanations were posted to the project website. A series of public open houses were held to provide an opportunity for the public to review and provide feedback on the proposed alignment concept and design innovations before going forward to Mayor and Council for consideration. The attendees were shown detailed maps of the proposed alignment and City of Tucson Real Estate staff was available to meet one-on-one with property owners and tenants. More than 500 members of the public attended and numerous comments were received. The Task Force and Design Team then considered the public comments and made refinements to the alignment and design concepts and prepared a recommended alignment. A “Report to the Community” open house was then held to give the public a review of the recommended alignment prior to consideration by the Tucson Mayor and Council.

3.7 Property Owner Notification

Prior to the proposed alignment concept being released to the general public, potentially impacted property owners and tenants were notified by certified mail and regular mail and one-on-one meetings were held with property owners that requested more information about property impacts and right-of-way needs. One-on-one meetings with property owners continued to be held in Phase 2 as the preliminary design of the Grant Road Improvement Plan progressed.

3.8 Approval by Mayor and Council

Mayor and Council approved the recommended alignment concept following a public hearing in January 2009. Residents and businesses in the Grant Road planning area were notified with a Milestone Report newsletter and the maps were posted to the project website. After the approval of the alignment, Phase 2 of the project began to advance the recommended alignment to a preliminary roadway design and to develop land use policy refinements and design guidelines for use in implementing existing neighborhood and area plans and policies.

3.9 Phase 2 Neighborhood Conversations and Workshops

After the approval of the alignment by Mayor and Council the project team and Task Force began Phase 2 of the project. A Project Update newsletter was distributed to the planning area in March 2009 which informed stakeholders in the project area and other interested community members of the Mayor and Council approval of the new alignment and design innovations planned for Grant Road. The Project Update also included plans for Phase 2 of the project and provided information on upcoming participation and input opportunities.

Similar to the beginning of the Phase 1 the project team met with Neighborhood Associations in the project area during a series of 12 neighborhood conversations, conducted in early 2009, to obtain neighborhood input on mobility, access, streetscape, and public art along Grant Road. The input received from these conversations was summarized, posted to the project website, and used in the development of access management and parking strategies for Grant Road. The strategies served as the foundation for a series of public workshops on Mobility, Access, and Public Art workshops held later in 2009.

3.10 Phase 2 Public Workshops in 2009

In June 2009 a series of public workshops were held that focused on the character and land use of the future Grant Road. Participants explored current and potential centers and districts along Grant Road and had the opportunity to begin establishing the future land use and character along Grant Road in response to the roadway and landscape improvements.

During the fall/winter of 2009 the Design Team completed the engineering of the centerline for Grant Road. During this process the alignment shifted slightly in areas along the roadway causing a number of changes in right-of-way needs for property owners. The engineering of the centerline also determined right-of-way needs, mainly limited to landscape and parking, for some properties north and south of Grant Road at major intersections where safety improvements are required. Affected property owners were notified of these changes by letter and offered one-on-one meetings with the Design Team to discuss any questions or concerns they may have.

The public had an opportunity to provide input through a series of workshops held in November 2009 that focused on mobility, access and the streetscape of the future Grant Road. The Grant Road Mobility, Access, and Streetscape Workshops offered participants an opportunity to provide input to the Citizen Task Force and to the Design Team on design features and policies for mobility, access, and streetscape elements for the Grant Road Improvement Plan. During the mobility and access activities, participants learned about the benefits of managing access, locations of median openings, and provided their input on property access. During the streetscape activities participants provided input on the preliminary design and use of streetscape, landscape, and public art to enhance access, improve safety, and create a pedestrian-friendly environment. The input and feedback received at the Mobility, Access, and Streetscape Workshops were used to refine preliminary roadway design plans, roadway access management policies, and specific streetscape design features.

3.11 Phase 2 Public Workshops and Open Houses in 2010

In January 2010 the reconstruction phasing recommendations for Grant Road were announced to the public after the Task Force endorsed the phasing at their December 16, 2009 meeting. The first segment scheduled for reconstruction is the Grant Road and Oracle Road intersection. Scheduled for construction in mid-2011 this segment would receive improvements approximately two years ahead of schedule and allow drivers, cyclists, pedestrians and other users of Grant Road a preview of the benefits and improvements planned for the entire roadway. A Milestone Report newsletter announcing the reconstruction phasing was mailed to everyone in the planning area and emailed to the project’s email distribution list. A media briefing was held on January 14, 2010 to announce the reconstruction phasing for the project and the early intersection project at Grant and Oracle. It was important to make this information available to the public at this time in order to

allow property owners and tenants on Grant Road to better prepare for the future. This information provided property owners and business owners with more certainty about when reconstruction will likely take place. They were anxious to have this information and pleased when it was provided. Some segments of Grant Road will not see construction improvements for 10 to 15 years which will allow property owners and tenants to plan for reconstruction.

Following the announcement of the reconstruction phasing a series of public workshops related to the Community Character and Vitality Plan for the roadway were held in late January 2010. These workshops offered participants the opportunity to provide input on potential concepts for improving the community, character and vitality of Grant Road through improvements to the streetscape and the refinement of area and neighborhood plans along Grant Road. The workshops involved several small group activities for participants that were related to specific segments and properties on Grant Road. The input received was used to prepare the draft Community Character and Vitality Plan for the roadway.

In March 2010, 15 percent roadway design plans were completed and a Design Open House was held with the Citizen Task Force members staffing the information stations. The public was invited to attend and see the progress the project has made to date, how past public input has been integrated, and next steps. For this Open House a unique symbol was created to emphasize the importance of public input and where it had been used in the development of the Grant Road Improvement Plan. The symbol was used on all project displays, a looping informational presentation, and to identify resource staff. The open house featured informational stations on: Public Involvement, the Community Character and Vitality Plan, Reconstruction Phasing, Access Management, Pedestrian, Bicycle and Transit amenities, Public Art, Streetscape and Landscape, Water Harvesting and Drainage, the Indirect Left-Turn, and Real Estate and Business Assistance for affected property owners and tenants. The Open House was attended by 120 people.

3.12 Community Character and Vitality Plan Public Involvement

The community character and vitality planning phase of the project will be completed in fall of 2011. Public outreach will be documented in the Community Character and Vitality Plan and Implementation Strategies Report.

3.13 Notification and Project Updates

Public notification of public meetings and workshops and project update newsletters were mailed to residents and businesses in the project area. In addition a regular mail and email contact list of more than 3,300 people throughout the region was maintained. The news media was also utilized to provide public notifications. This aspect of communication was supplemented by several members of the Task Force who received media training and participated in interviews to both newspaper and television reporters.

3.14 Individual Property Owner Meetings

A key element of the public outreach effort was to meet with individual property owners with support of City staff to present the alignment, and understand property-specific concerns and issues. Property impact mitigation strategies for significantly impacted properties were developed. The mitigation strategies included developing parking and circulation concepts that enable the business to continue to operate following Grant Road reconstruction.

4 EXISTING CONDITIONS

The Grant Road study area has many assets including independent businesses, ethnic diversity, a range of non-profit and community organizations, specialized retail and services, popular restaurants and bars, a unique diversity of housing, walking, bicycling, and transit ridership. However, the current physical environment of the road and some of the uses along it impede the ability of Grant Road to be a great street passing through a set of urban places. Inconsistent pedestrian and bicycling conditions, a lack of comfortable public spaces and amenities, a lack of community identity in much of the built environment, bad connectivity and challenging conditions for those driving along Grant Road, an often confusing or haphazard land use pattern, not taking advantage of ecological processes, inefficient parking management, and a host of other factors inhibit Grant Road from achieving its potential as a great street in a great place.



This chapter summarizes existing conditions that were documented in seven technical assessments prepared during the data collection and analysis phase (Phase 1) of the project. The technical assessments were prepared for the Grant Road study area to document study area assets, needs, and opportunities for making positive change and strengthening existing assets.

This chapter is organized to provide key findings in three categories (listed below) from each technical assessment. Additional detail is provided in the seven technical assessment reports. The technical assessments

that were used to create this summary are listed in the following table.

Technical Assessment Category	Technical Assessment
Land Use, Urban Form, and Real Estate	<ul style="list-style-type: none"> Land Use and Urban Form Assessment Real Estate Market Assessment
Environmental	<ul style="list-style-type: none"> Environmental Overview
Transportation and Infrastructure	<ul style="list-style-type: none"> Roadway/Right of Way Assessment Traffic and Safety Assessment Alternate Modes (pedestrian, bicycle, and transit) Assessment Drainage and Utilities Assessment

To supplement the technical assessments, TDOT conducted a historical assessment study which produced the report, *Historic Properties Assessment for Grant Road* and completed State of Arizona Historic Property Inventory Forms for structures located on Grant Road and on seven major north-south cross streets between Oracle Road and Swan Road. In addition, TDOT conducted the *Relocation Red Flag Analysis, Grant Road: Oracle Rd. to Swan Rd., An Outline of Anticipated Relocation Issues, Actions, and Recommendations for Certain Business Types Located within the Project Limits* (dated November 2007). These reports are not summarized in this chapter.



4.1 Land Use, Urban Form, and Real Estate

Two technical assessments were developed to describe current land use, urban form, and real estate market conditions.

4.2 Land Use

In reviewing land use characteristics within the study area, the project team considered both existing development and existing policy. The study area contains significant commercial areas and residential neighborhoods, as well as smaller areas of industrial use, scattered open spaces, and public and social service uses.

Key findings from the land use assessment are listed below:

- Existing land use policies support neighborhood preservation and enhancement, the potential for mixed use infill, and revitalization of commercial areas.
- The 2001 City of Tucson General Plan supports the study area's general existing patterns of residential neighborhoods and commercial corridors, while encouraging residential infill as part of mixed use projects, revitalization of commercial areas, and the meeting of residents' needs for goods and services. The plan encourages focusing new development in the existing urbanized area and uses

that support transit and pedestrian activity. Residential uses within the study area fall primarily under “suburban character” (less than 6 units per acre) and “mid-urban character” (up to 14 units per acre),



with a few small areas designated as “urban character” (15 units per acre and above). Commercial uses fall under “mixed use character,” as there are no “Activity Centers” designated in the study area.

- At a broad level, the city’s zoning for the study area follows current land use patterns and supports the General Plan. Some commercial designations (including C-2 and C-3) could allow for mixed use development including residential, while others (including C-1) do not allow residential uses. The distribution of commercial designations along Grant Road is inconsistent. The only industrially

zoned portion of the study area, near Stone Avenue, roughly matches existing uses. In addition, two areas have different designations in the general plan and zoning, Balboa Heights is designated urban character residential in the General Plan while it is zoned for office, and the area northwest of the intersection of Alvernon Way and Grant Road is designated mixed-use character in the General Plan while it is zoned for office.

- Area and neighborhood plans cover most of the study area. Like the General Plan, they largely call for neighborhood preservation, with measures for the incorporation of infill housing and commercial or mixed use development whose scale and character complement that of the existing area. These plans also call for more public amenities serving the neighborhoods.
- Between Oracle Road and Fontana Avenue, residential uses exist next to industrial, retail, organizations, and services in a fine-grained mix of uses, lot by lot, particularly within the lots south of Grant Road.
- The Grant Road study area has clusters of professional offices, consisting of financial and real estate services and design offices. The industrial/warehouse industry has the largest number of jobs in the study area for any business group, at 813. Approximately three-fourths of these jobs are in the construction contractor sector and are concentrated largely in the western segment of the study area.
- The shopping centers along Grant Road vary in terms of their mix of uses; some are experiencing a transition to office and service uses, in addition to their more traditional retail uses. It is typical for some shopping centers to become “grey field” sites for redevelopment as their existing buildings age and as some uses become less viable. Because of their large lots and location, shopping centers along Grant Road provide long range opportunities for possible redevelopment into higher-density mixed use development and open space.
- The study area as a whole lacks traditional public amenities such as parks, plazas, and community services, such as libraries and community recreational facilities. There are no strong connections to

existing open spaces such as the Rillito River. The only public park that fronts onto Grant Road, the triangular park west of Campbell Avenue, is poorly designed and appears to be underutilized. However, opportunities exist to leverage the presence of organizations and educational institutions mentioned above, such as the Tucson Symphony Orchestra, Doolen Middle School, and to enhance the public realm.

- The study area has about 108 separate retailers in the general merchandise and grocery categories, with about 1,100 jobs and \$244 million in annual sales. The bulk of this activity is anchored by several national chains such as Fry’s Food Stores and Wal-Mart. A variety of other retail categories, though smaller in scale, do provide a diverse and more “funky” environment with the potential to attract citywide patronage.
- At the western end of the of study area, near Oracle Road, there is an auto-oriented business cluster with a number of automobile repair shops and motor vehicle sales shops. Moving toward the central segment, there is a home furnishings cluster consisting of furniture, appliance, and lighting stores. Auto businesses are also clustered in the eastern end of the study area. Additionally, between Tucson Boulevard and Alvernon Way there are a number of antique stores. The eastern segment has more traditional strip commercial with national retailers, such as Radio Shack and Blockbuster Video.
- The study area contains numerous quasi-public uses such as social service/non-profit organizations, schools, and religious facilities. Some specific examples include: the Tucson Symphony Orchestra, Tucson Botanical Gardens, Southern Arizona Association for the Visually Impaired (SAAVI), Pima



Medical Institute, Doolen Middle School, and Tucson International Alliance of Refugee Communities (TIARC) Center.

- Vacant parcels are numerous in the western end of the study area as well as at key nodes in the eastern part of the study area. There are also a number of parcels that have land values that are higher than the value of the buildings on them, per County assessor’s data.
- The study area contains areas with more multifamily housing than typically found in Tucson. Almost two-thirds of the study area’s 8,074 housing units are multifamily or single family attached. This provides a high level of housing

choice and, in some places, a relatively high population density. However, it should be noted that the vast majority of non-single family housing is not owner-occupied, reducing choice in regard to tenancy. The study area’s overall housing density is roughly 5 units per gross acre, which is within the range of medium density single family detached housing. Currently, about 60 percent of study area residents are renters, double the countywide rate.

- The type and scale of commercial activity on Campbell Avenue, Tucson Boulevard, and Alvernon Way strongly influences the type and viability of retail development on Grant Road adjacent to these

crossing streets. This is also related to the importance of these north-south streets in bringing traffic to Grant Road from the foothills and linking Grant Road to Downtown, the University of Arizona, and other important regional uses to the south and north.

4.3 Urban Form

- In some locations, subtle topography opens views to surrounding mountains or cuts off longer views and provides a feeling of enclosure, such as the bowl-like feeling of Tucson Boulevard or the hilltop sense of Fontana Avenue.



- Most of Grant Road lacks physical characteristics to create a unique identity for the businesses, homes, and other uses along it – generally the character of the road is that of many other arterial strips in Tucson and the southwest. Yet, there are unique uses along the road that do begin to create a unique identity for Grant Road.
- Large setbacks and the placing of gas stations, drive-through restaurants and parking lots at major corners heighten the lack of enclosure and dominance of motor vehicles at intersections.
- The study area features significant views to the mountains north of the City as well as the mountains west of the City, and in some places, to downtown.
- The public-private interface on much of Grant Road, with its large setbacks, landscaping, parking, goods display, curb cuts, quasi-public space and stormwater detention creating vague distinctions between public and private realm and with the lack of sidewalks makes for a confusing and in places very uncomfortable pedestrian environment. These conditions invite further inspection for articulation and improvement.
- There is generally a poor relationship

between non-residential lots fronting on Grant Road and residential non-fronting neighborhoods.

- The transition between the traffic and commerce of Grant Road and residential neighborhoods around it is very abrupt or non-existent in many places in the study area.

- While potential revitalization districts in the western end of the study area have good connectivity to surrounding street grids, districts in the eastern end of the study area — and the strips along Grant Road between them — are largely cut off from access to the surrounding neighborhoods and need better connectivity.
- Lot depths typically range between 100 and 300 feet in depth from the existing Grant Road right-of-way; most of the larger shopping centers are 600 feet deep; and some others range from 400 to 600 feet deep.
- The study area contains two neighborhoods on the National Register of Historic Places, Catalina Vista and Blenman Elm, and a third, Jefferson Park, is in the process of petitioning for inclusion on the Register. All three areas lie between 1st Avenue and Country Club Road south of Grant Road.
- The two study area districts on the National Register of Historic Places are almost completely residential (an exception being the Walgreen's/Bookman's building). A 1990 historic building survey of portions of Grant Road deemed six buildings “irreplaceable,” all of them single family residences.
- Development along Grant Road is a product of Tucson, its culture and climate, has several specific urban form typologies, including – the courtyard, the side yard sanctuary, the wall, converted single family homes, one story multifamily, shaded patios, murals, and classic signage. There are other positive precedents in the study area, including the bicycle and streetscape improvements on Mountain Avenue; pedestrian-friendly parking lots, stormwater management provisions, and frontage roads.

4.4 Real Estate and Market Analysis

- Although the Tucson region has been and is expected to continue to be one of the fastest growing regions in the United States, with an almost 50 percent increase in population from 1990 to 2005, most of this growth is occurring in peripheral areas rather than within the city core. Over the long term, however, regional land constraints, such as habitat conservation and limited water for continued urbanization, could increase pressure for infill development in locations such as the Grant Road study area.
- Approximately 55 percent of projected total growth in Pima County between 2006 and 2025 will consist of Young Professionals (ages 20 to 34) and Empty Nesters (ages 55 to 74). These market segments often demand smaller housing units with high amenities such as views, access to transit, retail, recreation, and cultural opportunities.
- Although the Grant Road study area will continue to benefit from a strong regional housing market, it is not likely to attract a significant amount of new condominium development until or unless a higher level of urban amenities is available. Most of the new condo projects located elsewhere in Pima County are still relatively low-scale buildings that are three stories or less.
- A vast majority (85 percent) of Grant Road's retail sector businesses are “headquarters.” In most cases these are the only location for the stores. Most are also small businesses, with an average of 8 employees per establishment. Tucson residents look to Grant Road as unique in this manner. A majority of independent businesses lie on relatively shallow lots, making them more susceptible to the road widening.

- Offices offer a growing and economically viable sector for the study area that can support local business activity and possibly provide local employment opportunities. The Grant Road study area could potentially leverage its position as a well-traveled arterial with proximity to the major medical and research institutions to capture a share of the growing regional office market.
- The study area has a population that tends to have lower incomes than the County as a whole, with a median household income in 1999 of about \$26,000. This may challenge the study area’s buying power to support additional local-serving business. The western end of the study area is a part of a north-south swath through Tucson that has high levels of poverty, under-education, and unemployment. It may require a different approach than the rest of the study area. The area north of Grant Road around Alvernon Way is also lower-income in comparison to the county as a whole; but the Census Data for this area is not as conclusive in terms of income and education related demographics.
- While the study area does not have clear districts with ethnic identities, it has substantial diversity throughout. At the same time, the study area has a higher percentage of non-Hispanic white population than the city as a whole (64 vs. 54 percent). The Hispanic population of the study area is the next most populous group at 24 percent, but this is much lower than for the city as a whole at 36 percent of total population. Unlike many other parts of Tucson, which contain a clear majority of either white or Hispanic residents, the western portion of the study area is a mix of white, Hispanic, Black, Native American and Asian residents. The eastern end of the study area, centering on Alvernon Way, with its multifamily housing, social service organizations and bus connections, has emerged as a center of refugee resettlement in Tucson. The population in central part of the study area is predominantly non-Hispanic white and less diverse.
- The study area contains several “clusters” of similar business types which collectively may bring customers and clients from throughout Pima County. While many motor vehicle businesses are located on the study area’s west end, several businesses selling antiques and other home furnishings such as appliances and building materials lie in the central and eastern areas. These clustered businesses can help each other by complementing each other’s services and could help develop an identity for districts along Grant Road.

4.5 Environmental

The Environmental Overview Technical Assessment described current environmental conditions in the study area. Key findings from this technical assessment are listed below.

- The urbanization of the study area has removed most native plant and animal communities, as well as prime farmland. Remaining environmental regulatory constraints include one potential “waters of the U.S.,” as defined by the Army Corps of Engineers, in Wilson Wash; the inclusion of the study area in a “maintenance area” for CO2, as defined by US EPA; the potential for noxious weeds; and leaking underground storage tanks. As the Grant Road Improvement Plan moves forward through more detailed design and ultimately construction further environmental assessments will be prepared as needed to verify the current understanding of environmental constraints.
- Of the 31 recorded underground storage tanks located on Grant Road, 20 are documented as leaking underground storage tanks. One Hazardous Waste Treatment, Storage, and Disposal Facility is documented on Grant Road.

- Field observations in the study area revealed that the native Sonoran Desertscrub Biotic Community has been displaced as a result of urban development resulting in a landscape that is dominated by non-native and ornamental plant species.
- Areas between Campbell Avenue and Country Club (Wilson Avenue Wash), near Alvernon Way (Alvernon Wash), and between Alvernon Way and Swan Road (Midway Wash and Columbus Wash) lie within the 100-year floodplain designated by the Federal Emergency Management Agency (FEMA) and are flood prone areas that when flooded adversely impact property owners and users of Grant Road.
- The Sonoran Desertscrub community is centered at the head of the Gulf of California and encompasses the western half of the state of Sonora, Mexico, as well as large areas in southeastern California, southwestern Arizona. Common plant species include blue palo verde, yellow palo verde, desert ironwood, mesquites, cat-claw acacia, crucifixion thorn, cholla, saguaro cactus, pincushion cacti, and barrel cacti.
- The western three-fifths of the Grant Road study area drain westward into the Santa Cruz River watershed, while the eastern two-fifths drain northward into the Rillito River watershed.
- Sun, wind, and other factors create micro-climates within Tucson’s urban desert environment.
- Existing noise levels on Grant Road and increasing traffic noise will increase traffic volumes are design and land use planning issues. A range of solutions should be considered to reduce noise, including: speed management to reduce braking and acceleration of traffic, using street fronting development to buffer neighborhoods behind, selective use of well-landscaped walls, and special pavement treatments.



4.6 Transportation and Infrastructure

Four technical assessments were prepared that describe current transportation and infrastructure conditions in the study area. These are:

- Roadway/Right of Way Assessment
- Traffic and Safety Assessment
- Roadway/Right of Way Assessment
- Alternate Modes Assessment
- Drainage Assessment
- Utilities Assessment

Each of these is described below.

4.7 Roadway and Right of Way

- The voter-approved half-cent sales tax called for six travel lanes on Grant Road between Oracle Road and Swan Road, where five exist today. It also called for enhanced multi-modal travel opportunities, which includes sidewalk and transit facilities. It did not prescribe the exact design of the new Grant Road cross-section, which will emerge from the planning process. Grant Road

improvements will also include streetscape and infrastructure improvements and adjacent property redevelopment and revitalization strategies.



- Grant Road is one of several cross-town arterials that serve regional trips in the Tucson metropolitan area. Grant Road also intersects with important north-south arterials serving trips to and from downtown Tucson, the University of Arizona, Tucson International Airport, and I-10. A mature arterial grid system provides flexibility in route selection and opportunities for route diversion to avoid the adverse effects of congestion and incidents.
- Today, Grant Road is on 80 feet of right-of-way from Oracle Road to Park Avenue and from Campbell Avenue to Alvernon Way. Between Park Avenue and Campbell Avenue and between Alvernon Way and Swan Road, Grant Road is on 90 feet of right-of-way. Typically, Tucson arterial streets require at least 120 feet of right-of-way and up to 150 feet at major intersections.
- A study conducted by the Tucson Transportation Department in the mid-1980s recommended that properties on the north side of Grant Road be acquired for future widening of Grant Road between Campbell Avenue and 1st Avenue. Direction received from the City at the outset of the Grant Road Improvement Plan was to

consider other feasible alignment alternatives (in addition to the north alternative) for widening Grant Road between Campbell Avenue and 1st Avenue.

- Roadway alignment decisions should take into consideration vacant or undeveloped properties as well as properties with set-backs that allow for partial property takes to minimize impacts to structures along Grant Road. These properties also provide opportunities for other Grant Road improvements such as alternative mode amenities, open space, buffers, and new development.

- Where partial property takes affect parking supply in front of businesses, opportunities exist to convert adjacent property, especially vacant properties, to shared off-street parking to off-set the loss of parking.

4.8 Traffic and Safety

- Grant Road provides direct access to 415 residential units and 429 businesses fronting on Grant Road. Within the study area, Grant Road provides indirect access for nearly 8,075 residents and over 800 businesses.



- Traffic performance is rated unacceptable at 9 of 13 signalized intersections, based on current traffic performance criteria. Daily traffic volumes in 2007 ranged from 39,000 to 42,000 vehicles per day. The capacity of 5-lane arterial is approximately 40,000 vehicles per day.
- A total of 1,746 crashes were reported on Grant Road for the period 2003 - 2005. Rear-end crashes were the predominant type of non-intersection crashes (accounting for 64 percent of all non-intersection crashes) and at intersections (accounting for 50 percent of all intersection crashes). A principal

contributing cause to rear-end accidents occurring at non-intersection locations is the approximately 300 driveways that exist today on Grant Road between Oracle Road and Swan Road. A principal contributing cause to rear-end accidents at intersections is the congestion and delays that occurs during the commuter period.

- Daily traffic volumes recorded in 2007 range from 39,000 to 42,000 vehicles per day. There are 13 intersections with traffic signals, 35 unsignalized intersections, and 434 driveways on Grant Road between Oracle Road and Swan Road. Pima Association of Governments estimates that 2030 traffic volumes will range from 47,000 to 70,000 vehicles per day.
- Grant Road is one of several east-west arterials that span the Tucson metropolitan area. In 2007, approximately 15 percent of daily traffic on Grant Road (about 6,000 vehicles per day) is regional or through traffic - traffic that does not originate from, nor is destined for residences and businesses on Grant Road between Oracle Road and Swan Road. In 2030, regional traffic will increase to approximately 20,000 vehicles per day, or approximately 30 percent of 2030 traffic volumes.
- Increasing the number of through lanes from 4 to 6 will increase the capacity of Grant Road and will reduce current levels of congestion and delay. However, traffic volume will continue to increase on Grant Road and steps should be taken to increase the capacity of Grant Road beyond that typically provided by 6-lane arterial streets. Methods are available to increase the capacity of arterials through strategies to manage access, coordinate signal timing using advanced traffic control technologies, and alternative methods of allowing left-turn movements from Grant Road.

- Additional turn lanes and storage at intersections will reduce the level of intersection delay and congestion and increase intersection safety. Intersection improvements should also address the needs of pedestrians, bicyclists, and transit buses.
- Because Grant Road serves regional and local trips, mobility and access must be appropriately balanced. Balancing strategies including frontage roads, multi-lane boulevards, and driveway relocation or consolidation should be considered. These techniques can allow through traffic to pass more smoothly and safely while also making access to adjacent development safer and more efficient.

4.9 Alternate Modes (Transit, Bicycle, Pedestrian)

- The study area has a number of districts with higher transit ridership than the City as a whole, as well as districts with high rates of bicycle commuting. For example, 12 to 14 percent of block groups in the eastern end of the study area north of Grant Road commute to work by transit, according to the 2000 Census, compared to the city's rate of 3 percent. In the central area of the study area south of Grant Road, near the university, up to 15 percent of block groups bicycle to work and 13 percent walk to work, compared to city rates of 2 percent and 3 percent, respectively.



Grant Road improvements should address facilities and amenities for pedestrians, bicyclists, and transit users including continuous ADA-compliant sidewalks, bicycle lanes, improved pedestrian crossings, and pedestrian amenities such as buffered and shaded sidewalks, transit stop amenities, bus pull-outs, and special needs associated with schools and activity centers along Grant Road.

- Grant Road improvements should address facilities and amenities for pedestrians, bicyclists, and transit users including continuous ADA-compliant sidewalks, bicycle lanes, improved pedestrian crossings, and pedestrian amenities such as buffered and shaded sidewalks, transit stop amenities, bus pull-outs, and special needs associated with schools and activity centers along Grant Road.
- Even where Grant Road does have sidewalks, they are often narrow and not buffered from motor vehicle traffic. In addition, the pedestrian realm suffers from constant curb cuts in many places; a lack of landscaping in the right-of-way; interference from cars in parking areas overlapping the pedestrian area; and disconnected ADA facilities.
- By widening Grant Road, opportunities for a safer and more comfortable environment for pedestrians should be created. The character of the cross section, landscaping, lighting, and other streetscape elements can be used to create an identity for Grant Road and for the segments and nodes of activity along it.
- While multi-modal infrastructure and amenities are inconsistent along Grant Road, pedestrians, bicyclists, and transit users use Grant Road for a variety of commuter, recreational and everyday travel needs.

4.10 Drainage and Utilities

- Areas between Campbell Avenue and Country Club (Wilson Avenue Wash), near Alvernon Way (Alvernon Wash), and between Alvernon Way and Swan Road (Midway Wash and Columbus Wash) lie within the 100-year floodplain designated by the Federal Emergency Management Agency (FEMA) and are flood prone areas that when flooded adversely impact property owners and users of Grant Road. Corrective actions to address flooding problems are regional in nature and go far beyond the Grant Road study area. Improvements to local (Grant Road) drainage infrastructure and improved strategies for stormwater management will be included in Grant Road improvements but will not resolve all floodplain issues. Grant Road improvements will also be consistent with Federal and



local regulations that limit impacts to established floodplains.

- Public and private utility providers will be coordinated with as the design of Grant Road improvements progress. Conflicts between existing utilities and Grant Road improvements will be identified and coordination with utility providers and will result in strategies for addressing conflicts including utility betterment and relocation.
- Aging utilities, areas prone to flooding, traffic congestion, inconsistent amenities for alternate modes, and traffic safety issues adversely impact Grant Road users, and the residents and businesses located on and near Grant Road.

5 RECOMMENDED DESIGN CONCEPT

5.1 Grant Road Design Concept Development Process

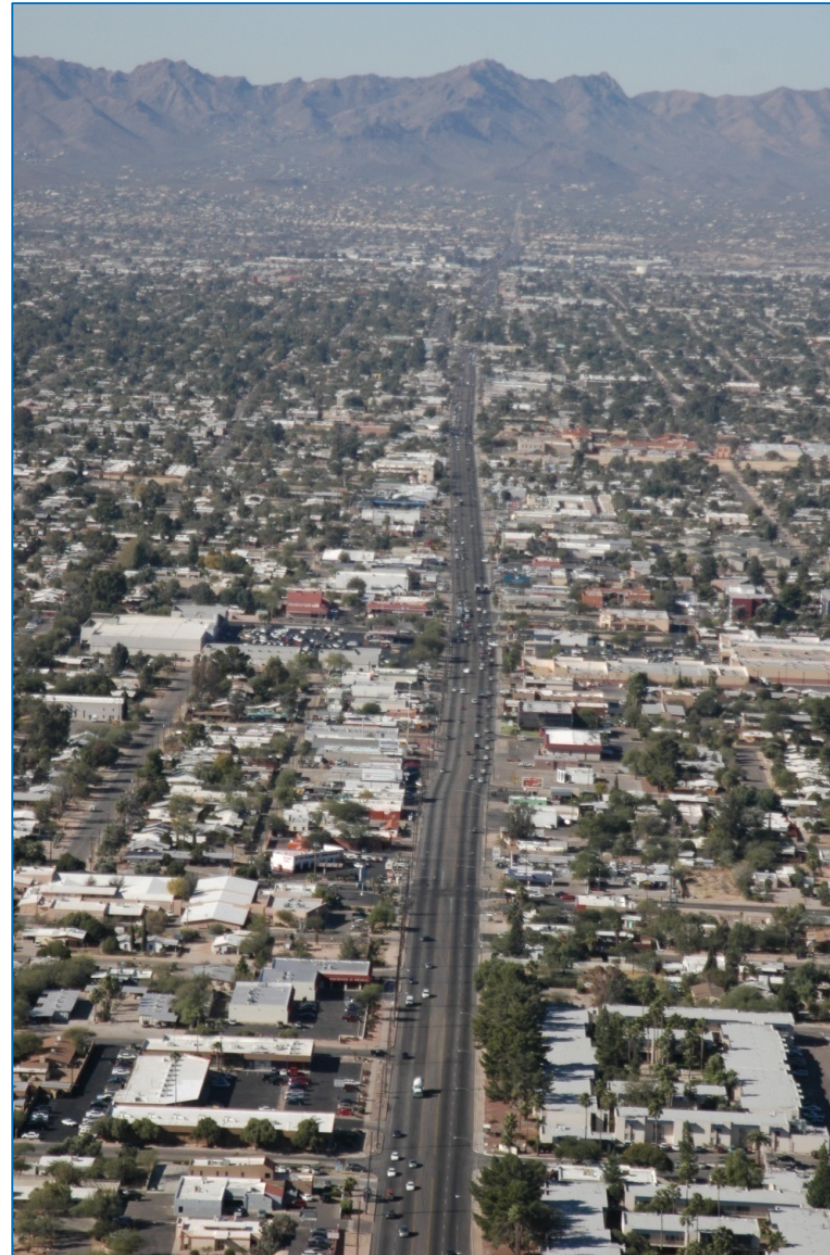
5.1.1 Roadway Alignment Concept

In January 2009, the City of Tucson Mayor and Council approved a roadway alignment concept for Grant Road. The roadway alignment concept identified preliminary right-of-way limits and an initial roadway alignment that would serve as the basis for preliminary design in Phase 2. The roadway alignment concept exhibits approved in January also included design concepts for Grant Road which evolved from community involvement and public outreach events. The design concepts that were developed are described in **Chapter 5.2**. This section of the report describes the process used for developing the roadway alignment concept, the innovative and sustainable design concepts, and key roadway design criteria necessary to design the roadway itself.

The initial roadway alignment concept was prepared using community input received in 2007 and 2008, design criteria established cooperatively with City staff and the Task Force (refer to **Chapter 6** and supplemental studies conducted by the City including the *Historic Properties Assessment for the Grant Road Improvement Project, Oracle Road to Swan Road* (Phase 1 Report dated June 2008), the State of Arizona Historic Property Inventory Forms, and the *Relocation Red Flag Analysis, Grant Road: Oracle Rd. to Swan Rd., An Outline of Anticipated Relocation Issues, Actions, and Recommendations for Certain Business Types Located within the Project Limits* (dated November 2007).

The initial roadway alignment was reviewed and refined by the Task Force in four Task Force meetings conducted in July-September 2008. The resulting roadway alignment including the innovative design features were presented to property owners and the general public in a series of three open houses in October 2008 after which the Task Force reviewed public comments and refined the preliminary alignment to a recommended alignment which was presented at an informational open house in January 2009, in advance of presentation to the Tucson Mayor and Council in January 2009.

Each of the design concepts introduced in **Chapter 5.2** evolved from public input received at community conversations and workshops conducted in 2007 and 2008 (refer to **Chapter 3**). In 2007, community input



resulted from over 40 community conversations with over 1,000 neighborhood, business, and special interest group representatives who provided over 5,000 written comments. In addition, over 1,200 responses resulted from website, telephone, and other survey instruments. In 2008, community input was received from over 500 community representatives who participated in six workshops covering design topics including roadway cross-sections, pedestrian and bicycle features, transit amenities, and intersection improvements.

The process for developing design concepts included an assessment of whether a particular design concept or idea was consistent with or contributed to specific Grant Road Guiding Principles. If the concept contributed positively to one or more of the Guiding Principles, an iterative design process was initiated to evaluate the feasibility of the concept for Grant Road. During concept development and design, a variety of perspectives were considered including those of the Technical Advisory Committee, the Tucson / Pima Bicycle Advisory Committee, the City Landscape Advisory Committee, the Tucson / Pima Historical Review Committee, and research on design best-practices. Design criteria were also reviewed from a variety of design references including those listed below.

- *A Policy on Geometric Design of Highways and Streets*, 2004, 5th Edition, American Association of State Highway and Transportation Officials
- *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*, Institute of Transportation Engineers
- *A Guide for Achieving Flexibility in Highway Design*, May 2004, American Association of State Highway and Transportation Officials
- *Guide for the Development of Bicycle Facilities*, 1999, American Association of State Highway and Transportation Officials
- *Guide for the Planning, Design, and Operation of Pedestrian Facilities*, July 2004, American Association of State Highway and Transportation Officials
- *Engineering Division Active Practices Guidelines*, as revised, Tucson Department of Transportation, Engineering Division

5.1.2 Preliminary Roadway Design Process

Phase 2 preliminary roadway design consisted of preparing 15 percent and 30 percent construction plans and cost estimates. Fifteen percent construction plans were prepared in the summer and fall of 2009 and submitted to the City of Tucson for City review in December 2009. A key input to the development of 30 percent construction plans was a series of neighborhood conversations conducted in early 2009 on mobility, access, and streetscape (refer to **Chapter 3**). In these

neighborhood conversations, public comments received in 2008 on mobility and access were summarized and presented at neighborhood meetings to obtain clarification on public concerns on subjects such as neighborhood access to and from Grant Road, neighborhood traffic management issues, Grant Road median

openings, local access lanes, and street closures. Community input on these issues will be reflected in the 30 percent design plans provided in **Appendix A**.

5.2 Innovative and Sustainable Design Concepts

The Grant Road plans include design concepts which evolved from community involvement and public outreach events. Each of these is listed in **Table 1** and described in more detail in the next sections.

Table 1. Grant Road Innovative and Sustainable Features

Typical Street Sections
<ul style="list-style-type: none"> • 137' Street Section • 160' Street Section
Streetscape
<ul style="list-style-type: none"> • Landscaping, Streetscape, and Public Art • Noise Mitigation • Water Harvesting
Intersections
<ul style="list-style-type: none"> • Indirect Left Turn Intersection • Traditional Intersection • Pelican Pedestrian Crossing • Toucan Bicycle Crossing
Bicycle Accommodations
<ul style="list-style-type: none"> • 6' Bicycle Lane with 1' Buffer Stripe • Bike Spot • Bicycle Lane Markings in Conflict Areas
Pedestrian Accommodations
<ul style="list-style-type: none"> • 8' Sidewalk • 12' Landscape Area
Transit Accommodations
<ul style="list-style-type: none"> • Enhanced Transit Stops and Plazas
Access Management and Parking
<ul style="list-style-type: none"> • Local Access Lanes • Directional Median Openings • Shared Access • Cross Access • Parking Strategies

5.3 Typical Street Sections

Three community character segment workshops were conducted in January 2008, one each for the Grant Road eastern segment (Swan Road to Tucson Boulevard), the central segment (Tucson Boulevard to 1st Avenue), and western segment (1st Avenue to Oracle Road). Feedback received from participants at the

workshops confirmed the guiding principle to balance capacity, safety, and operational (mobility) needs for vehicle, bicycles and pedestrians, with access to businesses, properties, and neighborhoods along Grant Road. Participant feedback included a desire for a street section that was wider than the City of Tucson standard section for six-lane urban arterials of 120-foot to allow more space for pedestrians, but to also minimize the street width between the curbs to reduce vehicle speeds, minimize property impacts, and to preserve businesses. **Table 2** summarizes key community input received during the January 2008 workshops.

The following table summarizes the input received from each Grant Road character segment with respect to the street section.

Table 2. Community Perspectives on Street Section

Segment	Segment Limits	Key Input
Western	Oracle to 1 st Ave.	<ul style="list-style-type: none"> • Use wider than standard cross-sections to allow for better aesthetic and multi-modal environment • Vary cross-section to fit specific situations and contexts - road doesn't have to be straight • Consider full property acquisitions rather than partial acquisitions where remaining properties would not be viable or would create an opportunity for redevelopment
Central	1 st Ave. to Tucson Blvd	<ul style="list-style-type: none"> • In areas where cross-section takes entire property on one side, use excess right-of-way to buffer and provide access to remaining homes as well as separated and enhanced bicycle and pedestrian amenities • In other areas where cross section could fit within existing buildings, consider narrower options • Consider local access lane to serve adjacent uses • Consider full acquisitions where remaining property would not be viable
Eastern	Tucson Blvd to Swan	<ul style="list-style-type: none"> • Supported a cross-section that preserves buildings and businesses • Vary the cross-section alignment and width to fit situations

The Design Team and Task Force considered public input and perspectives, and developed two typical street sections for application to Grant Road. The street sections were incorporated into the recommended alignment concept that was approved by Mayor and Council in January 2009. Each section is presented below.

137-Foot Typical Section

The 137-foot street section shown in **Figure 2** is applied to segments of Grant Road where access to land uses is not a major requirement or to segments where access control strategies can be applied to minimize the adverse impacts of access on Grant Road operations and safety.

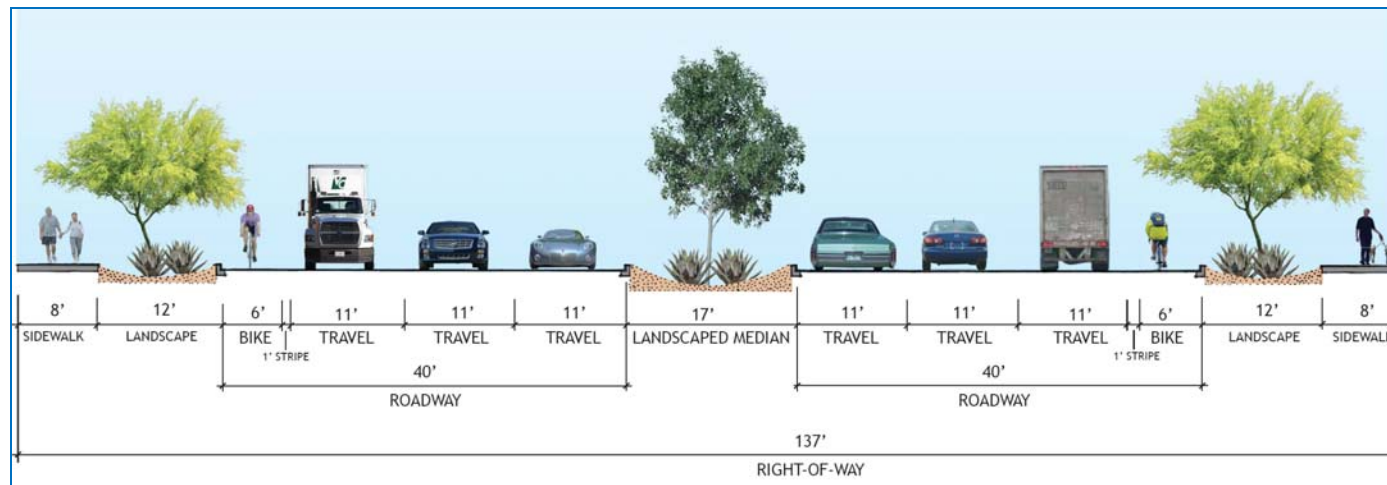


Figure 2: 137-foot Typical Street Section

- The 17-foot median was sized to support a rainwater harvesting system in combination with an enhanced storm drain system.
- The 11-foot travel lanes are proposed to minimize the street section width without compromising safety and be consistent with the “target speed” for Grant Road.
- The 6-foot bike lane with 1-foot buffer was developed in consultation with City and County staff and with a representative of the Tucson/Pima Bicycle Advisory Committee. The bike lane will be colored green in motor vehicle conflict areas.
- The 20-foot pedestrian realm includes a continuous 8-foot sidewalk and landscaped 12-foot buffer from Grant Road. The buffer is to be landscape with native plants irrigated with harvested rainwater.
- The 137-foot street section is considered as the minimum street section and reducing the median width, travel lane width, and bike lane width should not be considered. However, minor reductions in the 20-foot pedestrian realm can be considered to avoid or minimize impacts to private property.

160-Foot Typical Section

The 160-foot street section shown in **Figure 3** is applied to segments of Grant Road where access to land uses is a major requirement and segments where access control strategies cannot be implemented to minimize the adverse impacts of direct access to Grant Road. Its primary application is for areas where residential uses front onto Grant Road both to provide for access (curb cuts and on-street parking) as well as to provide additional separation and buffering from the through traffic lanes. It may also be used in locations where the nature of businesses that front onto Grant Road support a more active retail frontage that would be well-served by on-street parking and the buffering from Grant Road through traffic.

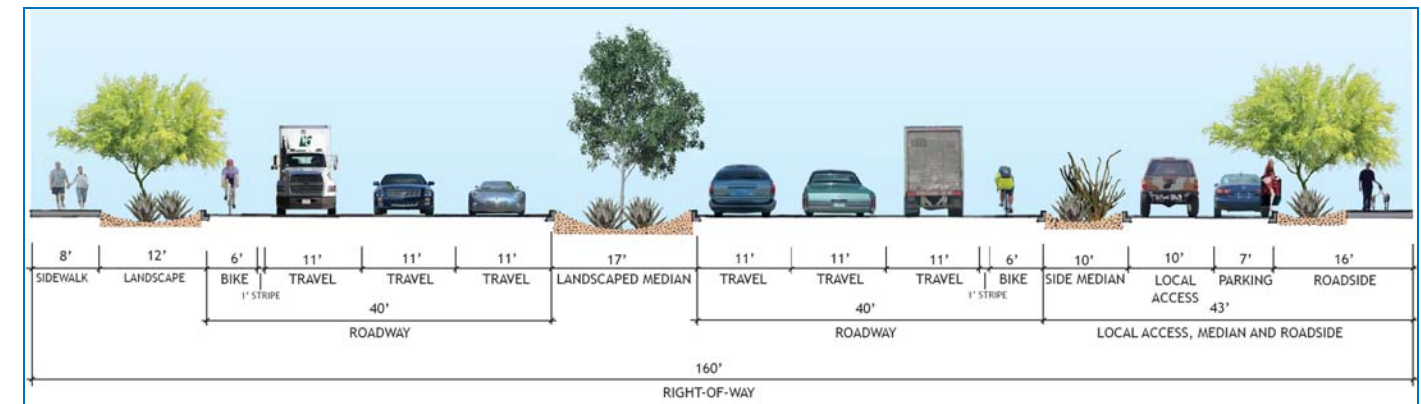


Figure 3: 160-foot Typical Street Section with Local Access Lane

- The 17-foot median in the 160-foot right of way was sized to support the rainwater harvesting system in combination with an enhanced storm drain system.
- The 11-foot travel lanes are proposed to minimize the street section width without compromising safety and be consistent with the “target speed” for Grant Road.
- The 6-foot bike lane with 1-foot buffer was developed in consultation with City and County staff and with a representative of the Tucson/Pima Bicycle Advisory Committee. The bike lane will be colored green in motor vehicle conflict areas.
- The 20-foot pedestrian realm includes an 8-foot sidewalk and landscaped 12-foot buffer from Grant Road, on the side of the street without the local access lane. The buffer is to be landscape with native plants irrigated with harvested rainwater.
- The 43-foot local access lane, side median, and pedestrian area consists of a 10-foot side median, 10-foot one-way local access lane, 7-foot parallel parking lanes, and a 16-foot pedestrian areas that includes a sidewalk and landscaped buffer. The side median and buffer is to be landscape with native plants irrigated with harvested rainwater.
- The 160-foot street section should be considered as the minimum street section and reducing the center and side median widths, travel lane width, bike lane width, and local access lane and parking lane widths should not be considered. However, minor reductions in the 20-foot and/or 16-foot pedestrian realm can be considered to avoid or minimize impacts.

5.4 Intersections

According to Pima Association of Governments (PAG) travel estimates, daily traffic volumes in 2030 on Grant Road are projected to range from approximately 48,000 vehicles (near Oracle Road) per day to more than 70,000 vehicles per day (near Alvernon Way). Analysis of these projected traffic volumes, when applied to a 6-lane arterial facility, demonstrated that several Grant Road signalized intersections will operate at unacceptable levels of delay and congestion (Level of Service E or F) in 2030 with traditional intersection improvements including dual left-turn lanes and exclusive right-turn lanes on all approaches to major intersections. It became clear to the Task Force that other alternatives should be explored for increasing intersection capacity, so that Grant Road Guiding Principles of improving mobility at major intersections could be achieved.

It was determined that the capacity provided at traditionally improved intersections can be improved through such concepts as grade-separated intersections (GSIs) or through non-traditional at-grade intersections such as indirect left-turn intersection or continuous flow intersections. It was determined early in the process that grade-separated intersections were not a viable alternative because of the significant right of way requirements, impacts to businesses and properties, and a general lack of community support for the GSI concept. As such, grade-separated intersection alternatives were not further considered. However, at the request of the City and the Citizen Task Force, the Design Team conducted research and analysis of one non-traditional at-grade intersection concept, the indirect left-turn lane intersection concept, as a possible way to increase intersection capacity, improve pedestrian travel efficiency and safety, and reduce the impacts to businesses and properties.

A review of nation-wide practices related to indirect left-turn intersections identified that the intersection concept has been operational on wide-median urban arterials in Michigan for over 30 years and has been constructed on a limited basis in North Carolina and South Carolina among a few other states. The concept however has been limited to divided multi-lane arterials with wide medians of 60-foot or wider. Operational evaluations of Michigan indirect left-turn intersections through the years have indicated significant improvements in travel time, congestion, and safety over traditional intersection concepts. The Design Team also identified that the indirect left-turn concept is being considered by local jurisdictions with narrower median widths in more developed corridors. For example, a concept design in southern California was identified on an urban arterial similar to Grant Road however the concept had not been constructed due to funding issues. The results of the national practices research was presented to City staff and the Task Force.

City staff requested the Design Team to perform traffic analyses of the concept on Grant Road for future traffic conditions. The Synchro and VISSIM traffic models were used to analyze the indirect left-turn concept at seven Grant Road intersections and compare traffic performance measures with this concept and traditional intersections. The analysis produced results similar to the benefits of indirect left-turn intersections documented in available literature. It was also determined that additional operational benefits could be achieved if traditional intersection approaches with dual left-turns and exclusive right-turn lanes were used on the north and south approaches to the indirect left-intersections. The results of the traffic modeling and analysis were presented to City staff and the Task Force.

City staff requested the Design Team to enhance the VISSIM model simulation to show traffic signing and pavement markings on Grant Road for future traffic conditions. The simulation was prepared using signing and pavement marking design criteria employed by the Michigan Department of Transportation. The simulation was presented to City staff and the Task Force and used to illustrate the intersection concept at community workshops and public open houses conducted in 2009.

The traffic analyses of the indirect left turn concept led the Design Team to recommend a combination of indirect left turn intersections and traditional intersections on Grant Road. The Task Force, at their July 12, 2008 meeting, endorsed the Design Team recommendation to construct enhanced traditional intersections and indirect left turn intersections as listed in **Table 3**.

Expressed through the Grant Road Guiding Principles, the community stated a desire to improve crossing opportunities for pedestrians to cross Grant Road. The indirect left turn intersections and other signalized intersections on Grant Road were evaluated for opportunities to increase the number of pedestrian and bicycle crossings on Grant Road. The Grant Road preliminary design concept includes 20 Pelican pedestrian crossings including 14 at indirect left-turn intersections (**Table 3**) and four Toucan bicycle signals, as listed in **Table 4**

Pelican and Toucan design concepts are explained in more detail in subsequent sections.

Table 3. Locations of Traditional Enhanced and Indirect Left Turn Intersections

Intersection Treatment	Locations
Traditional Signalized Intersection	<ul style="list-style-type: none"> • Park Ave. • Mountain Ave. • Tucson Blvd. • Columbus Blvd
Indirect Left Turn Signalized Intersection (with traditional intersection approaches on the north and south intersecting streets)	<ul style="list-style-type: none"> • Oracle Road • Stone Ave • 1st Ave • Campbell Ave • Country Club Road • Alvernon Way • Swan Road
Toucan Bicycle Crossing	<ul style="list-style-type: none"> • 6th/Fontana • Treat Ave. • Palo Verde Blvd. • Dodge Blvd.

Table 4. Pelican Pedestrian Crossings Locations

Pelican Location	Pelican is associated with Indirect Left Turn Intersection	Stand Alone Pedestrian Crossing
1. West of Oracle (14 th Ave)	✓ Oracle Road	
2. East of Oracle (approx. 10 th Ave)	✓ Oracle Road	
3. West of Stone Ave (Castro Ave)	✓ Stone Ave	
4. East of Oracle (approx. 10 th Ave)	✓ Stone Ave	
5. 4 th Ave		✓
6. West of 1st Ave (3rd Ave)	✓ 1st Ave.	
7. Freemont / Santa Rita		
8. Vine Ave.		✓
9. Vine Ave.		✓
10. West of Campbell (Warren)	✓ Campbell Ave	
11. East of Campbell (approx. Olsen)	✓ Campbell	
12. Plumer /Wilson		✓
13. Forgeus		✓
14. West of Country Club (Loretta)	✓ Country Club	
15. East of Country Club (Camilla)	✓ Country Club	
16. Rita		✓
17. West of Alvernon (west of Elaine)	✓ Alvernon	
18. East of Alvernon (Sycamore)	✓ Alvernon	
19. Bryant Ave		✓
20. Ralph Ave		✓
21. West of Swan (Venice)	✓ Swan	
22. East of Swan (Mountain View)	✓ Swan	

5.4.1 Indirect Left-Turn Intersection

The indirect left turn intersection is an intersection design that has the potential to increase vehicle capacity through the intersection, while achieving Grant Road guiding principles of improving the pedestrian environment and minimizing impacts to business and property. An indirect left turn intersection employs a combination of a U-turn followed by a right turn to replace a prohibited left turn at the main intersection, as illustrated in **Figure 4**. The indirect left turn intersection has several advantages compared to more traditional signalized intersection improvements including dual left-turn lanes and separate right-turn lanes. The primary advantage is that it reduces the number of signal phases required, significantly increasing traffic flow through the intersection. Removal of left-turning vehicles at the intersection eliminates the need

for a separate left-turn phase. The simplified signal phasing (3 phases) will allow for increased green time to be allocated to through vehicles.

Analysis of the indirect left turn demonstrates that it will benefit traffic operations, primarily as a result of the simplified traffic signal phasing at the intersection. However, it should be emphasized that the indirect left turn is not a “fix-all.” As previously documented, future traffic volumes on Grant Road will approach 60,000 to 70,000 vehicles per day. Major intersections are projected to be at or over capacity with either the traditional intersection or the indirect left turn intersection. The analysis of the indirect left turn intersection indicates that it will operate at better levels of service than traditional intersections under high traffic volume conditions. The indirect left turn will result in less delay and improved travel time due to more east/west green time allocated to Grant Road.

In addition to improving vehicular mobility, indirect left turn intersections offer advantages to pedestrians over traditional intersections with the removal of the left turn lane that results in a narrower (by approximately 20-feet) roadway which pedestrians are required to cross. A traditional intersection is approximately 130-feet wide, including turn lanes. In addition, the indirect left turn provides an opportunity to combine a Pelican pedestrian signal with each turn-around, providing additional pedestrian crossing opportunities approximately 600 to 700 feet from the main intersection.

Finally, several studies have documented a reduction in left-turn crashes at indirect left turn intersections. Other benefits and trade-offs of the indirect left turn intersection, as compared to a traditional intersection are listed in **Table 5**.

Table 5. Benefits and Tradeoffs to an Indirect Left Turn Intersection

Criteria	Traditional Left-Turn Intersection	Indirect Left-Turn Intersection
Reduces vehicle crash potential		✓
Reduces pedestrian crash potential		✓
Reduces pedestrian crossing distance		✓
Increases intersection capacity		✓
Reduces travel time		✓
Requires less right-of-way		✓
Increases travel distance		✓
Driver familiarity	✓	

A Shorter Wait at Light

- Reduces the amount of time vehicles are stopped at the intersection by 42%.

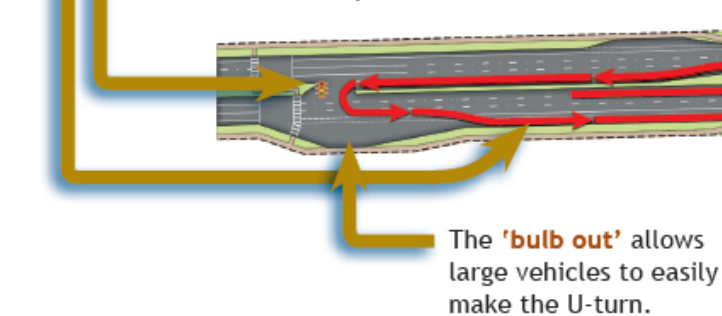
More Fuel Savings

- Reduces fuel consumption by approximately 9% for all vehicles using the intersection.

Safer

- Reduces total crashes at intersections by 16% and injury crashes by 30%.

A **traffic signal** located 600-700 feet east and west of the intersection will stop approaching traffic to allow U-turns into a **designated right-turn lane**. Drivers then return to the intersection to complete their turn.



The **'bulb out'** allows large vehicles to easily make the U-turn.

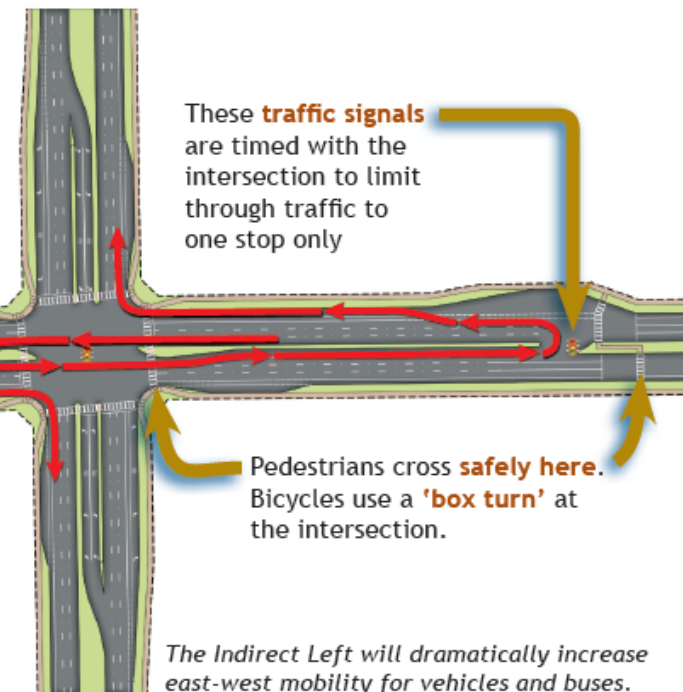


The **'bulb out'** allows U-turns for larger vehicles such as buses and semi-trucks.

Figure 4: Indirect Left Turn Intersection

Smaller Intersections

- Smaller intersection means less right-of-way needed, lower costs, and possibility of preserving existing businesses and reduces the distance pedestrians have to cross by 20 feet.



The Indirect Left will dramatically increase east-west mobility for vehicles and buses.

5.4.2 Enhancements to North-South Signalized Intersection Approaches

In response to community input and perspectives, traditional intersection approaches on Grant Road, including north-south street approaches to the indirect left turn, where feasible, will be enhanced to include pedestrian refuge islands that separate the through movements from the left turn lanes. The purpose of the pedestrian refuge islands is to increase the safety and comfort of pedestrians as they cross the intersection. Pedestrian refuge islands may be provided between the turn lanes and through lanes, as well as at the center median island as depicted in **Figure 5**.

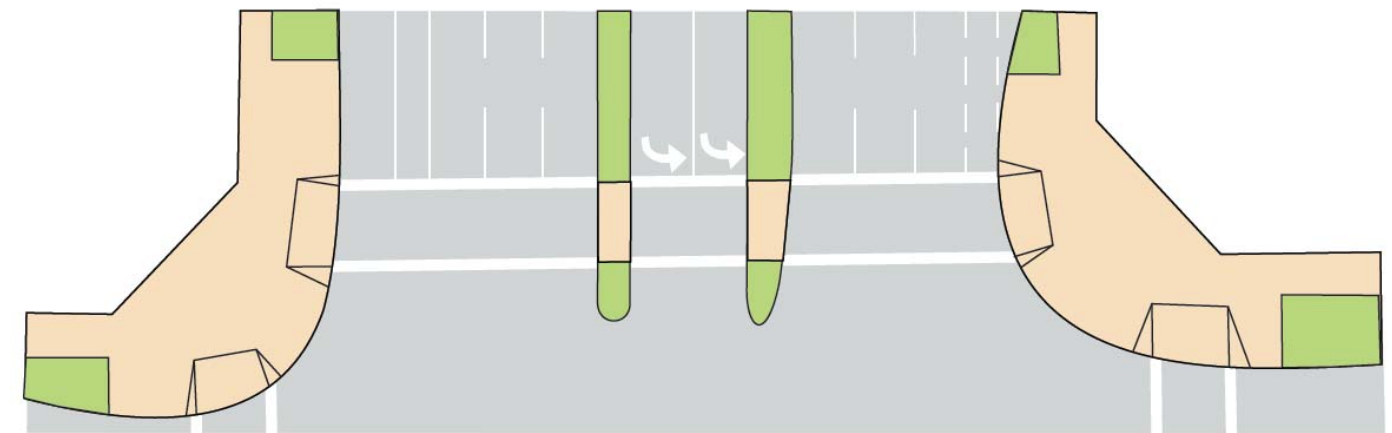


Figure 5: Intersection Pedestrian Refuge Islands

5.4.3 Pelican Pedestrian Crossings

The indirect left turn intersection provides the opportunity to construct Pelican pedestrian crossings at each indirect left turn turnaround. The PEdestrian LIGHT Control ActivationN (PELICAN) provides a two-stage crossing for pedestrians. The crossing incorporates the median island refuge between the two stages. A pedestrian presses a button to activate the first signal. When the light turns red, a "WALK" signal prompts the pedestrian to proceed to the median. The pedestrian then walks a short distance along the median to activate the second signal. A second "WALK" indication appears when the traffic signal turns red. The PELICAN uses a standard Red-Yellow-Green signal for motorists and remains green unless activated by a pedestrian (CROSSINGS, Special Pedestrian/Bicycle Beacon Signals, City of Tucson, 2009).

Pelican pedestrian crossings are associated with each indirect left turnaround (with exception to the indirect left turn east of 1st Ave and west of Park Av), as depicted in **Figure 6** and **Figure 7**. In addition, the Recommended Alignment includes stand-alone Pelicans (not associated with the indirect left turn) at the following locations:

- 4th Avenue
- East of Plumer Avenue
- Rita Avenue
- Ralph Avenue
- Between Freemont Avenue Ave. and Santa Rita Ave.
- Forgeus Avenue
- Bryant Avenue
- Vine Avenue



Figure 6: Pelican Pedestrian Crossing at ILT Turn-Around



Figure 7: Pelican Pedestrian Crossing at ILT Turn-Around with Shade Structure

5.4.4 Toucan Bicycle Signal

The Two GroUps CAN cross (TOUCAN) was designed to provide a safe crossing for two groups — pedestrians and bicyclists. The Toucan has been implemented at several locations within the City of Tucson

at locations of heavy bicycle and pedestrian crossing activity and along roadways that are prioritized for non-motorized uses such as “Bike Boulevards.” An added benefit to the TOUCAN is that motorized traffic is not allowed to proceed through these signals, decreasing the number of cars on neighborhood streets.

A TOUCAN can be activated only by bicyclists or by pedestrians. Both use a push button to activate the signal. Bicyclists respond to an innovative bicycle signal and use a special lane when crossing. Pedestrians get a standard WALK indication and have a separate, adjacent crosswalk. The system uses a standard signal for motorists (CROSSINGS, Special Pedestrian/Bicycle Beacon Signals, City of Tucson, 2009).

Figure 8 is a photo simulation of a Grant Road Toucan crossing. A schematic diagram of how vehicles navigate through a Toucan is presented in **Figure 9**. The Grant Road preliminary design concept includes Toucan crossings at Fontana/6th Ave, Treat Ave., Palo Verde Blvd., and Dodge Blvd.

The Grant Road Toucans are a modification of Toucans that have been constructed elsewhere in the City of Tucson in that the Grant Road Toucans will be the first with a divided median and a median refigure in the center of the intersection. A schematic detail of a Grant Road Toucan is presented in **Figure 8**.



Figure 8: Toucan Bicycle Crossing

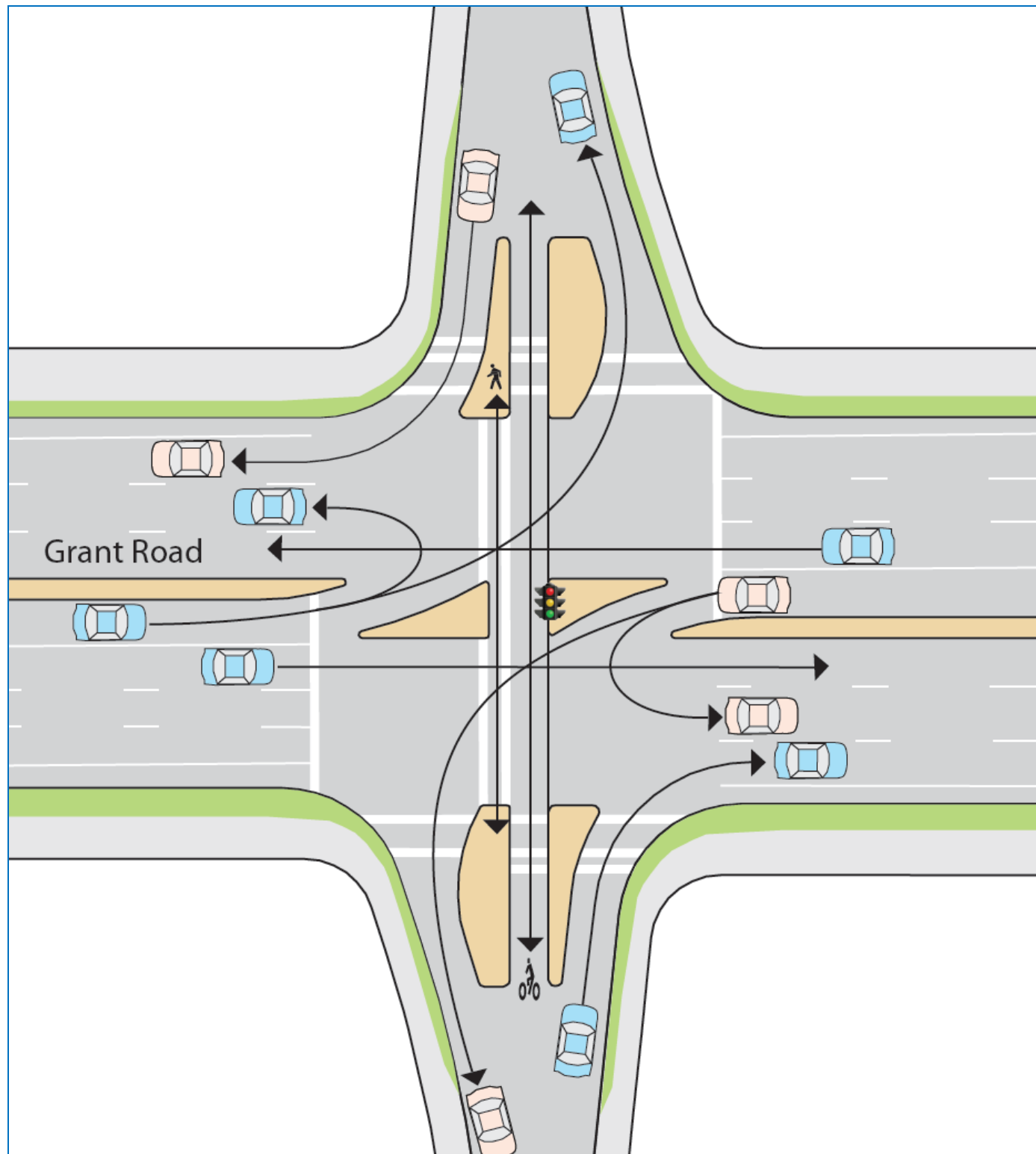


Figure 9: Grant Road Toucan Schematic

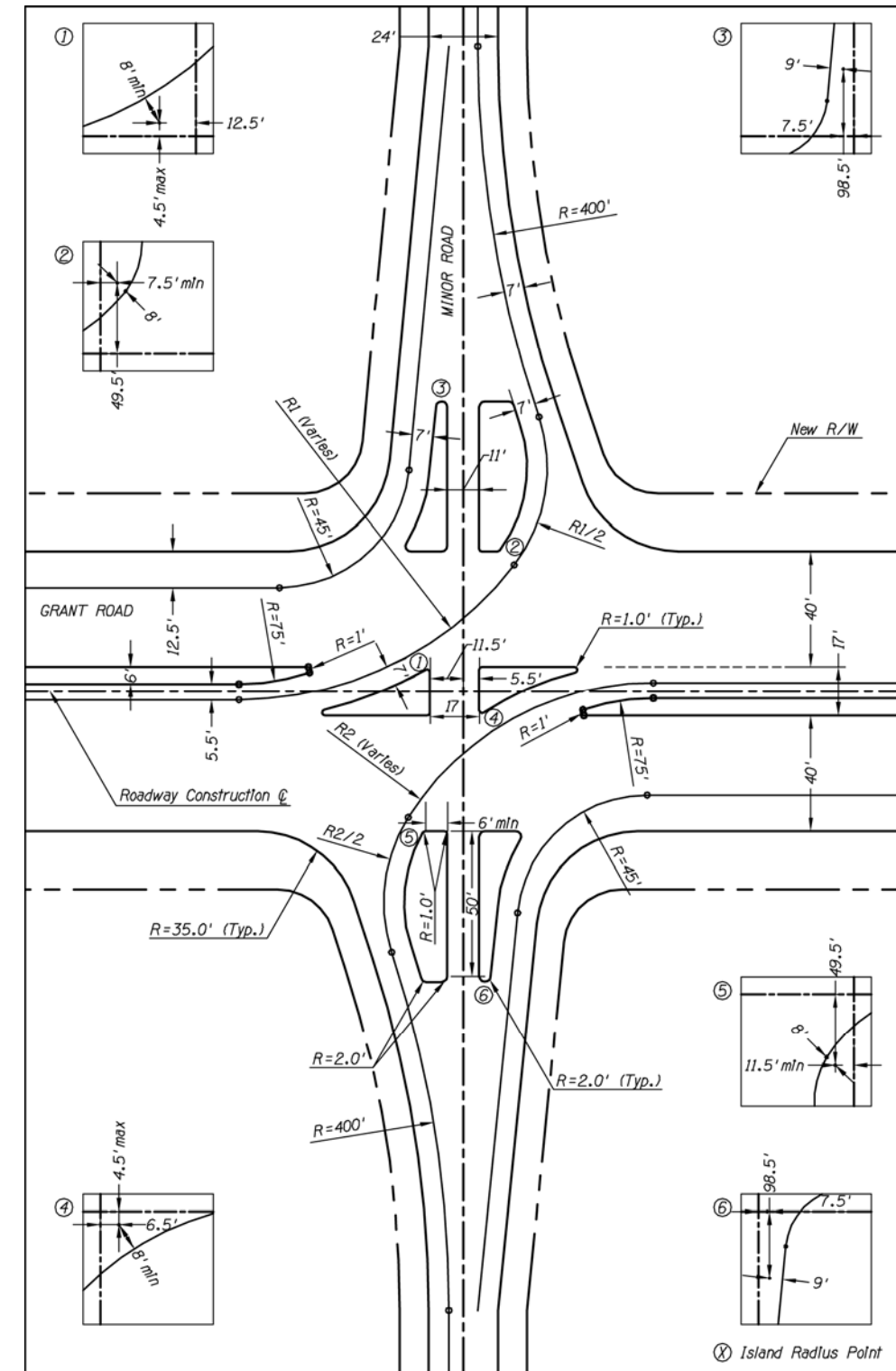


Figure 10: Grant Road Toucan Geometry

5.5 Alternate Modes

The City of Tucson is a national leader in the development and implementation of pedestrian crossings and innovative bicycle safety designs, such as the Toucan bicycle signal and the Pelican pedestrian crossing. The Grant Road Task Force has placed significant emphasis on continuing to provide excellent facilities for bicycles and pedestrians. The Grant Road Task Force Guiding Principles include several references to alternate modes as identified below (bold emphasis added).

- Improve mobility and safety for all those traveling along and across Grant Road, including pedestrians, bicyclists, transit riders, and those with disabilities, by:
 - recognizing that Grant Road is **not the exclusive domain of cars**;
 - improving transit stops and access to them as well as considering the land uses around them; and by
 - considering land use and other **needs of transit, bicycle, and walking** dependent populations.
- Provide the potential for future transit options, such as bus rapid transit, modern streetcar, light rail, or other high-capacity transit in the design of Grant Road improvements with the goal of minimizing future costs for construction and right-of-way acquisition.

The Toucan bicycle and the Pelican pedestrian signal are exemplary of the integration of bicycle and pedestrian features into Grant Road improvements. Other alternatives modes features that are integrated into Grant Road improvements, as reflected in the preliminary alignment

Alternate modes features that are recommended as part of the Grant Road Improvement Plan and reflected in the 30 percent design plans in **Appendix A**:

- Enhanced 20-foot pedestrian realm (introduced in Section 5.3)
- Flexible street sections that provide for future transit options
- Enhanced transit stops and plaza
- Enhanced bicycle lane and pavement markings
- Grant Road parallel Bicycle Boulevards

The alternate mode recommendations are discussed in more detail below.

5.5.1 Enhanced 20-foot Pedestrian Realm

The City of Tucson standard street sections generally include a 9-foot pedestrian/utility area. This will generally accommodate a 6-foot sidewalk and 3-foot landscape area.

The preliminary design concept for Grant Road enhances the pedestrian realm to 20-feet. This will accommodate an 8-foot sidewalk and a 12-foot landscape area that separates the sidewalk from the Grant Road curb. The 20-foot pedestrian realm will result in right-of-way acquisition requirements beyond what would be required with the City standard 9-foot pedestrian realm.

5.5.2 Street Section Flexibility

The standard street section that was endorsed by the Grant Road Task Force and approved by Mayor and Council provides design flexibility for future transit options such as bus rapid transit, modern street car, light rail, or other higher capacity transit technologies. The intent of the design flexibility is to minimize future costs for reconstruction and right of way should these technologies be implemented on Grant Road. **Figure 11** and **Figure 12** demonstrate that the 137-foot right of way can be modified to accommodate future transit technologies by converting an outside travel lane or the center median to a transit lane.

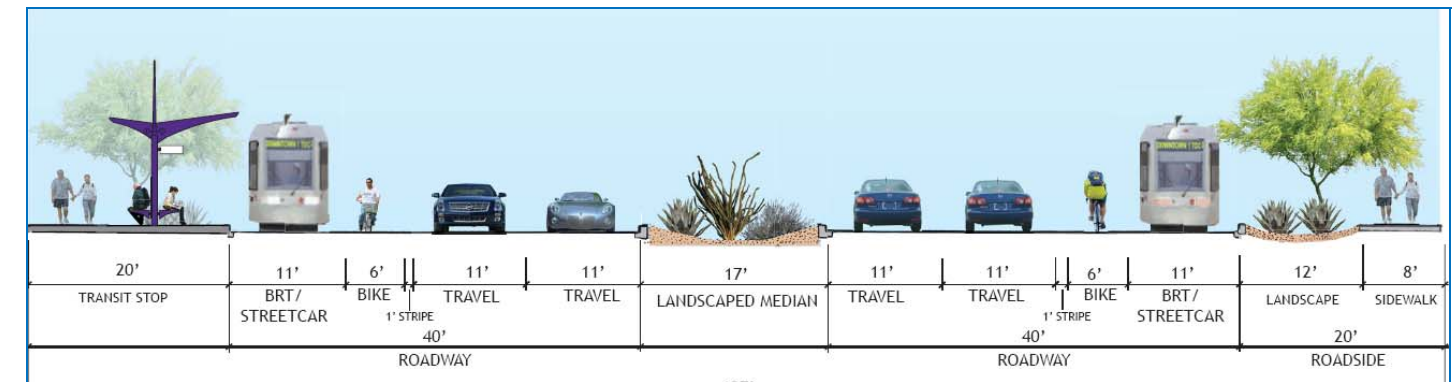


Figure 11: Standard Street Section Accommodates Future Transit (BRT)

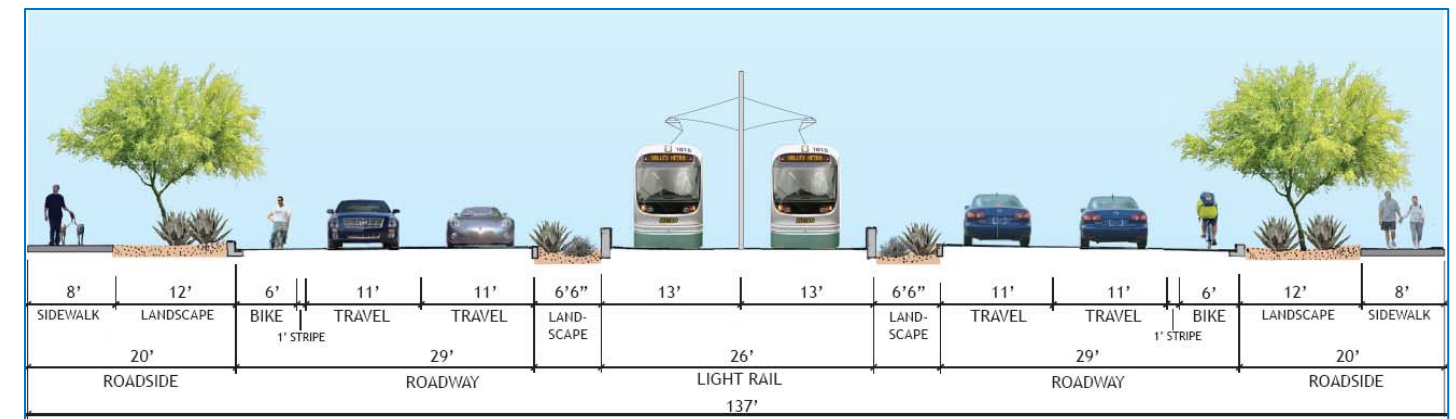


Figure 12: Standard Street Section Accommodates Future Transit (Light Rail)

5.5.3 Enhanced Transit Stops and Transit Plaza

Grant Road improvements will include enhanced transit stops. The enhanced transit stops will include shelters at every stop and amenities such as benches, bicycle parking, pedestrian level lighting, information kiosks, landscaping and shading, and connections to continuous sidewalks. Bus pullouts are provided at every transit stop. Transit stops are generally located at ¼ mile spacing.

- Transit stops and pullouts should be located as close as possible to the intersection and should be placed on the far side of an intersection, especially at intersections with marked cross walks. This will allow for the bus to wait until through traffic is stopped by a red light at the intersection, thus creating a gap in traffic flow sufficient for the bus to re-enter the through traffic lanes.
- Bus pullouts will be constructed in accordance with City of Tucson design standards where feasible. In areas where right of way is constrained, the minimum width of the bus pullout may be reduced from 12-feet to 10-feet. **Figure 14, Figure 15, and Figure 16** illustrate Grant Road bus pullouts. The width of bus pull-outs on the local access lanes is 7'.
- Bus shelters should be provided at all stops and transfer points. All bus stops must be constructed in compliance with ADA accessibility standards. TDOT requires that the wheelchair loading pads be a minimum of 9' x 5' to accommodate the bus ramp/lift plus an area for the wheelchair to easily access the ramp. A ramp and connecting sidewalk must also be provided. Single shelter pad dimensions are 4'8" x 22' long x 6" thick concrete. Double shelter pad dimensions are 6' wide x 34' long x 6" thick concrete. If a shelter is not constructed at a bus stop, the design should allow for sufficient space such that a shelter can be constructed in the future.
- An opportunity for construction of a transit plaza has been identified on the northwest corner of the Grant-Alvernon intersection. This location has also been identified as an opportunity for an active water harvesting demonstration. Other opportunity locations for transit plazas should be investigated during the final design phases of project development. Refer to transit plaza illustration in **Figure 14**.

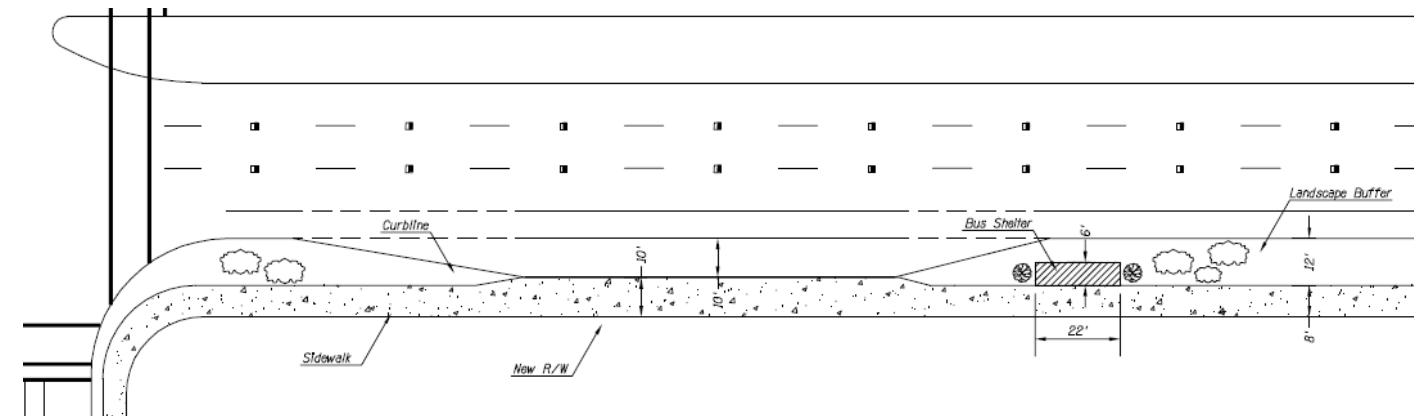


Figure 14: Typical Enhanced Transit Stop Layout with Bus Pullout

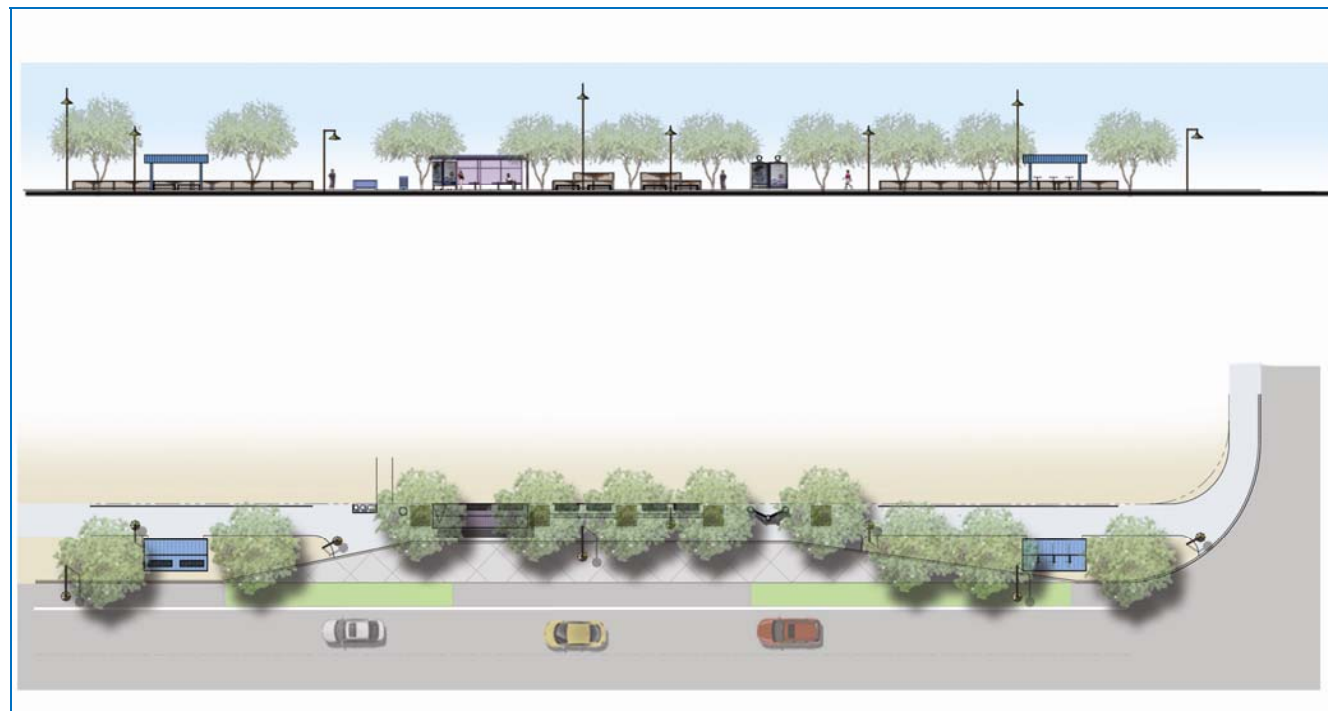


Figure 13: Enhanced Transit Stop on Grant Road



Figure 15: Typical Enhanced Transit Stop

An opportunity for construction of a transit plaza has been identified on the northwest corner of the Grant-Alvernon intersection. This intersection is the highest transit-use intersection on Grant Road, and is one of the highest transit-use intersections in Tucson. To accommodate the high level of transit use, the transit plaza may consist of over-sized shelters and shade structures, benches, shade trees, trash receptacles, drinking fountains, bicycle racks and/or lockers. This location has also been identified as an opportunity for an active water harvesting demonstration. Refer to transit plaza illustration in **Figure 16**.



Figure 16: Enhanced Transit Plaza at Grant and Alvernon

5.5.4 Enhanced Bicycle Lane and Bicycle Pavement Markings

The public expressed a desire to improve conditions for bicyclists on Grant Road. The Grant Road Design Team, in collaboration with the City of Tucson Bicycle and Pedestrian Coordinator and the Tucson-Pima County Bicycle Advisory Committee, recommend the following design innovations.

- Enhanced 6-foot Bicycle Lanes and 1-foot Buffer
- Conflict Areas Pavement Markings
- Indirect Left Turn Intersection “Bike spot”

5.5.4.1 Enhanced 6-foot Bicycle Lanes and 1-foot Buffer

The City of Tucson standard street sections generally include a 17-foot outside travel lane to accommodate a 12’ outside travel lane and a 5-foot bicycle lane. The design concept for Grant Road enhances the bicycle lane to 6-foot adjacent to a 1-foot buffer, adjacent to an 11-foot travel lane. The 1-foot buffer is anticipated to consist of a 1-foot thermoplastic application or a 1-foot white painted reflective stripe. The 1-foot buffer is responsive to bicycle community requests for increased separation from travel lanes. The 1-foot buffer and 6-foot bicycle lane is illustrated in **Figure 17**. Cross streets within Grant Road improvements will maintain a 5-foot bicycle lane, consistent with City of Tucson policy.



Figure 17: 6-foot Bicycle Lane and a 1-foot Striped Buffer

5.5.4.2 Conflict Area Pavement Markings

Intersections and locations near intersections account for a significant percent of bicycle–motor vehicle crashes. Grant Road stakeholders, and in particular representatives from the Tucson-Pima County Bicycle Advisory Committee, expressed concern about the potential for bicycles and motor vehicles to conflict in areas where vehicles turn, change lanes, or merge across bicycle lanes into right turn lanes.

The City has implemented colored pavement markings in areas where motor vehicles come into conflict with bicycles in areas where motor vehicles turn, change lanes, or merge across bicycle lanes at or near intersections. The City recently implemented a colored bicycle lane at the intersection of Grant Road and Mountain Avenue. The purpose of the green bicycle lane pavement marking is to alert motorists and cyclists to these intersection conflict areas, thereby increasing motorized vehicle yielding behaviors and potentially reducing conflicts and crashes. Green conflict area pavement markings are reflected in the Grant Road improvements in the following areas:

- Intersection approaches where the bicycle lane is placed in between the right turn lane and a through lane
- At the indirect left turn-around where u-turning vehicles may cross the bicycle lane while utilizing the turn-around area
- At bus pullouts across merging areas where the bus crosses the bicycle lane to access the bus pullout.



Figure 18: Green Conflict Area Pavement Markings

5.5.4.3 Indirect Left Turn Intersection “Bike Spot”

Grant Road stakeholders including representatives from the Tucson-Pima County Bicycle Advisory Committee, expressed concern about how bicycles make left turns at the indirect left turn intersection. To respond to these concerns, the Grant Road Design Team, in collaboration with the City of Tucson Bicycle and Pedestrian Coordinator, developed a “bike spot” pavement marking that guides cyclists in making a box-turn from Grant Road to north-south arterials, and from north-south arterials to Grant Road at the indirect left turn intersections.

The “bike spot” facilitates a “two-point left turn” or “box turn”. In this type of left turn, bicyclists proceed to the far right corner of the intersection, rotate their bicycle to turn left in the cross street, and proceed when the signal changes. The following considerations apply to the “bike spot”:

- It is placed after the crosswalk, as illustrated in **Figure 19**. Refer to 30 percent construction plans (**Appendix A**) for specific placement of the “bike spot.”
- It is applicable only to facilitate bicyclists making left turns at the indirect left turn intersection.
- Bicyclists must follow conventional rules of the road in both parts of the two-point turn, other than that they merge to the right of through traffic as they enter the intersection.
- Bicyclists must still negotiate with right-turning traffic (same as when traveling straight ahead) to enter the intersection. Right turn lanes are provided at the intersection approaches.
- The “bike spot” (**Figure 19**) facilitates the two-point turn by placing bicyclists ahead of the stop line and crosswalk, and to the left of right-turning traffic in the cross street.

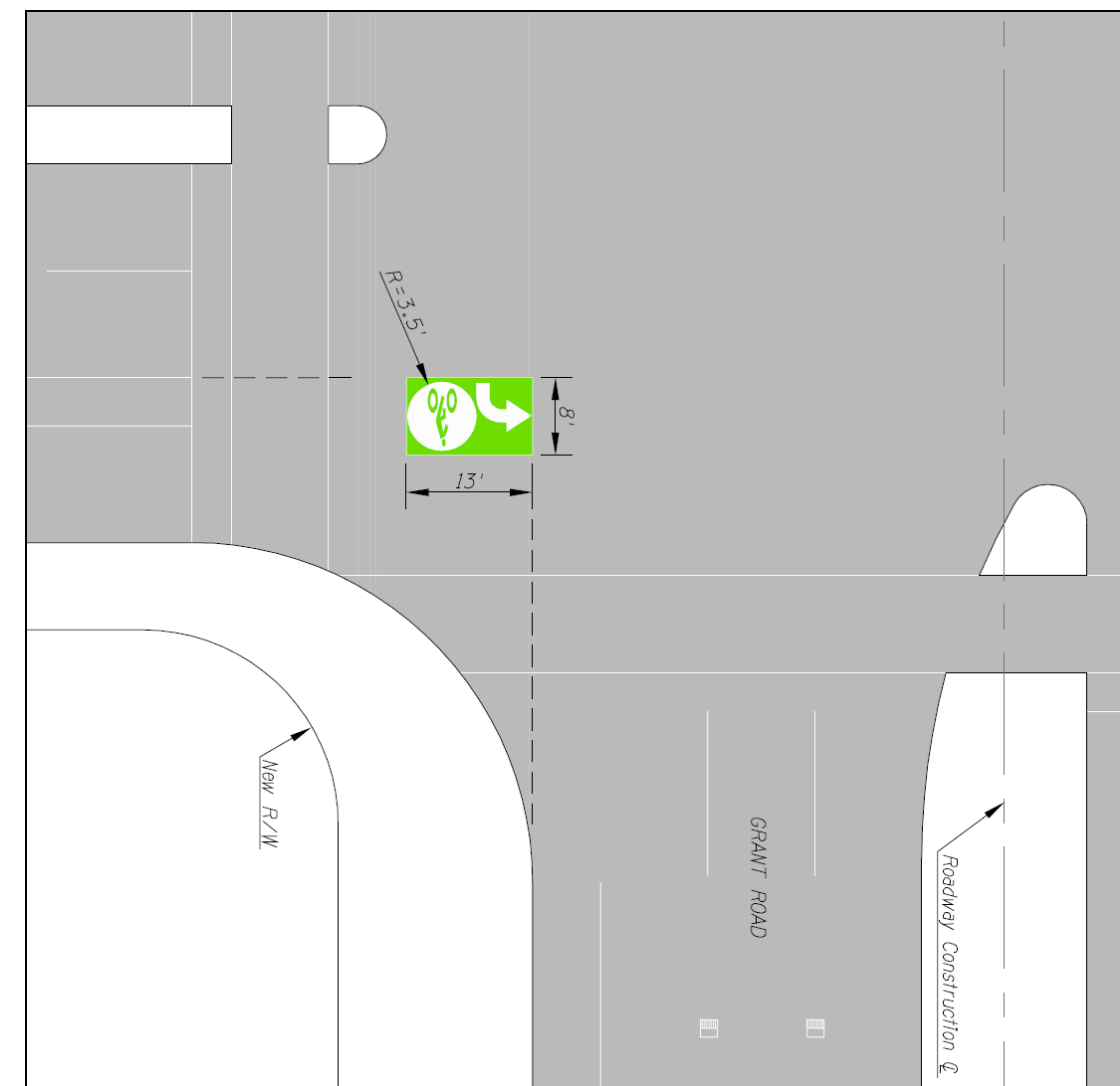


Figure 19: Indirect Left Turn Bike Spot

5.5.4.4 “Bike Box” on Mountain Ave

The City of Tucson has invested significant resources to develop Mountain Avenue as a bicycle friendly bike boulevard. Grant Road improvements will reinforce the priority of bicycles over vehicles on Mountain Avenue through construction of a “bike box” at the intersection of Mountain Avenue and Grant Road.

The “bike box” is illustrated in **Figure 20** and **Figure 21**, and consists of a green box on the road with a white bicycle symbol inside. Bicycle lanes approach and lead from the “bike box.” The “bike box” is designed to prevent bicycle/vehicle collisions, particularly “right-hook” crashes that can occur between vehicles that are turning right at an intersection and bicyclists that are going straight through the intersection.

As illustrated in **Figure 20**, the “bike box” treatment includes two stop lines. The advanced stop line is for motor vehicles. The second stop line, closer to the intersection, is for bicyclists. When the traffic light is red, bicyclists position themselves in front of the vehicles in the “bike box”. Right-turn-on-red by vehicles is prohibited. When the signal changes to green, bicyclists may go straight across the intersection or turn left.

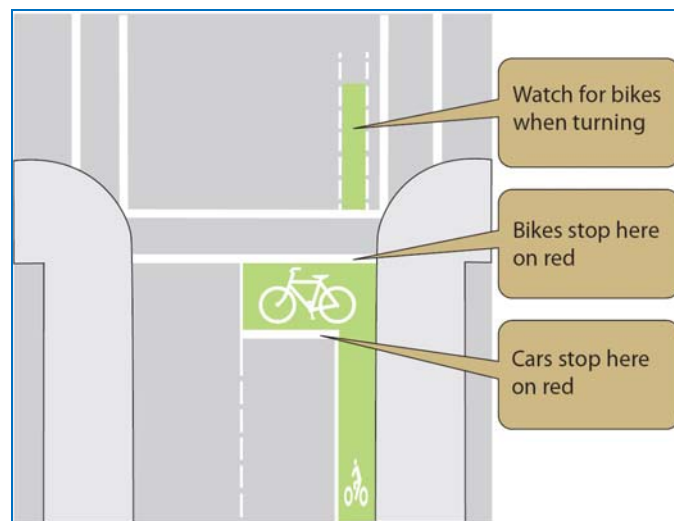


Figure 20: Schematic Diagram of Bike Box



Figure 21: Photo of Bike Box Installation

- A low-angle right-turn. Low-angle right turns slow down the speed of right-turning vehicles and improves driver visibility of pedestrians within and approaching the sidewalks
- Raised curb to provide a pedestrian refuge; pedestrian refuges are surrounded by raised vertical curb to delineate the pedestrian refuge area from the surrounding roadway
- At-grade crosswalk demarcated by pavement; the crosswalk is placed so that motorists have a clear view of the pedestrian, and both the motorist and the pedestrian have clear sight-distance and can see each other in advance of the crossing point
- Speed table in advance of the cross walk, with appropriate pavement markings
- “Pedestrian Crossing” warning signs (W11-2)
- Reduced lane-width of the approach lane for the channelized right turn, further helping to reduce vehicle speed. The pavement width in the channelized right turn lane is designed to accommodate large trucks and buses; however, edge lines and cross hatching pavement markings will be used to visually narrow the width of the channelized right turn lane to slow smaller vehicles.

Channelized right turn lanes are recommended at the following intersections:

- Grant Road/Oracle Road, eastbound to southbound
- Grant Road/Oracle Road, westbound to northbound
- Grant Road/1st Avenue, westbound to northbound
- Grant Road/Campbell Avenue, eastbound to southbound
- Grant Road/Alvernon Way, westbound to northbound
- Grant Road/Swan Road, westbound to northbound



Figure 22: Grant Road Channelized Right Turn Lane Photo Simulation

5.6 Channelized Right Turn Lanes

The indirect left turn will result in a high volume of right turning traffic at several major intersections along Grant Road. Channelized right turn lanes will be provided where right turning traffic demands exceed the capacity of a traditional right-turn lane. Grant Road channelized right turn lanes will be designed to encourage lower vehicle speeds, thus improving pedestrian safety. This will be accomplished through smaller turning radii, narrower lanes, and channelization features as illustrated in **Figure 22**, **Figure 23**, and **Figure 24**. Design elements that are incorporated into the channelized right turn include:

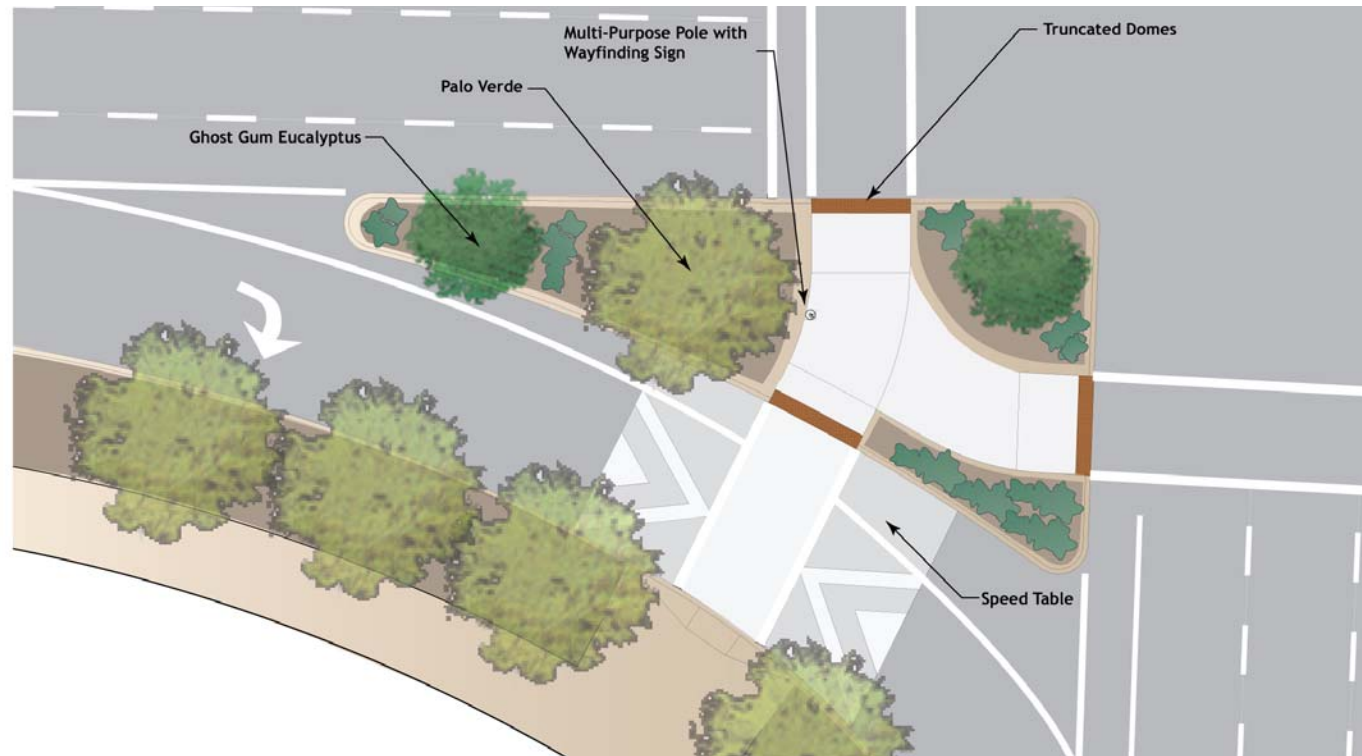


Figure 23: Grant Road Channelized Right Turn Lane

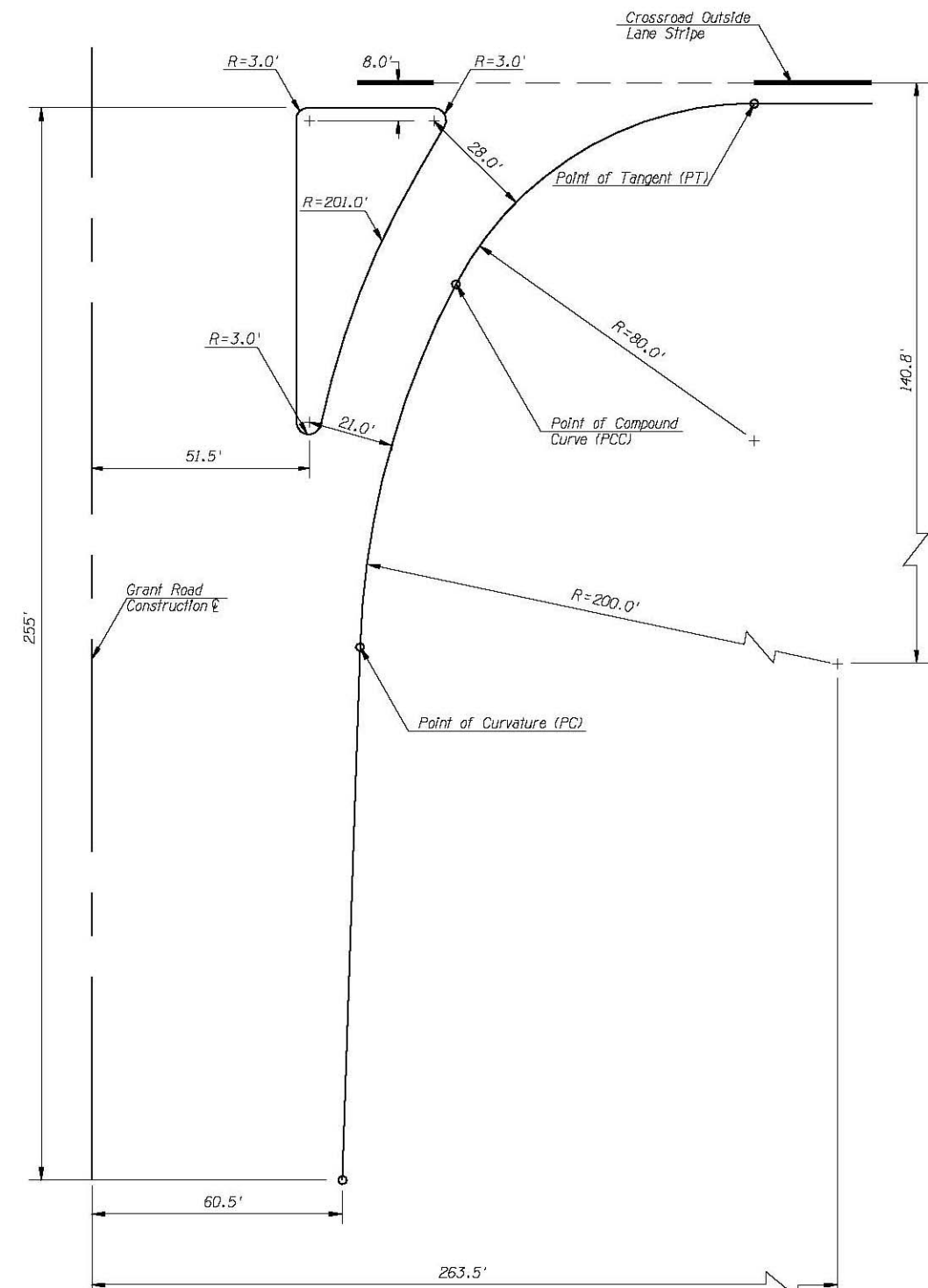


Figure 24: Grant Road Channelized Right Turn Lane Geometry

5.7 Grant Road Parallel Bicycle Boulevards



The Grant Road Task Force endorsed a recommendation to develop two bicycle boulevards that run parallel to Grant Road. The Grant Road parallel bicycle boulevards were recommended to the Task Force in response to public input received at community conversations, workshops, and open houses. The Grant Road parallel bicycle boulevards will serve as bicycle-friendly alternatives to Grant Road bicycle lanes, and will incorporate improvement features that serve to prioritize bicycles over vehicular traffic including traffic calming, bicycle signage, pavement markers, signalized traffic control at intersections with arterials, and channelization.

Two parallel bicycle boulevards are proposed: (1) Copper/Flow Bicycle Blvd, and (2) Seneca Bicycle Blvd. The recommended preliminary routing for the two Grant

Road parallel bicycle boulevards are:

- Copper/Flower Bicycle Blvd: Kelso/Copper/Flower Street/San Carlos Place Bicycle Boulevard
- Seneca Bicycle Blvd.: Ventura, Seneca, Waverly, and Justin Lane.

The bicycle boulevards are proposed to extend from Oracle Road (western limit) to Swan Road (eastern limit). The conceptual route of the bicycle boulevards is depicted in **Figure 25**.

5.8 Access Management

Access management is the design of intersections, driveways, and median openings to access land and to provide safety and mobility. Access management attempts to balance the need to provide good mobility for through traffic with reasonable access to adjacent land uses.

Benefits of access management are reduced crashes, reduced disruptions to traffic, enhanced bicycle and pedestrian environment, improved aesthetics, and reduced travel time for business customers and deliveries.

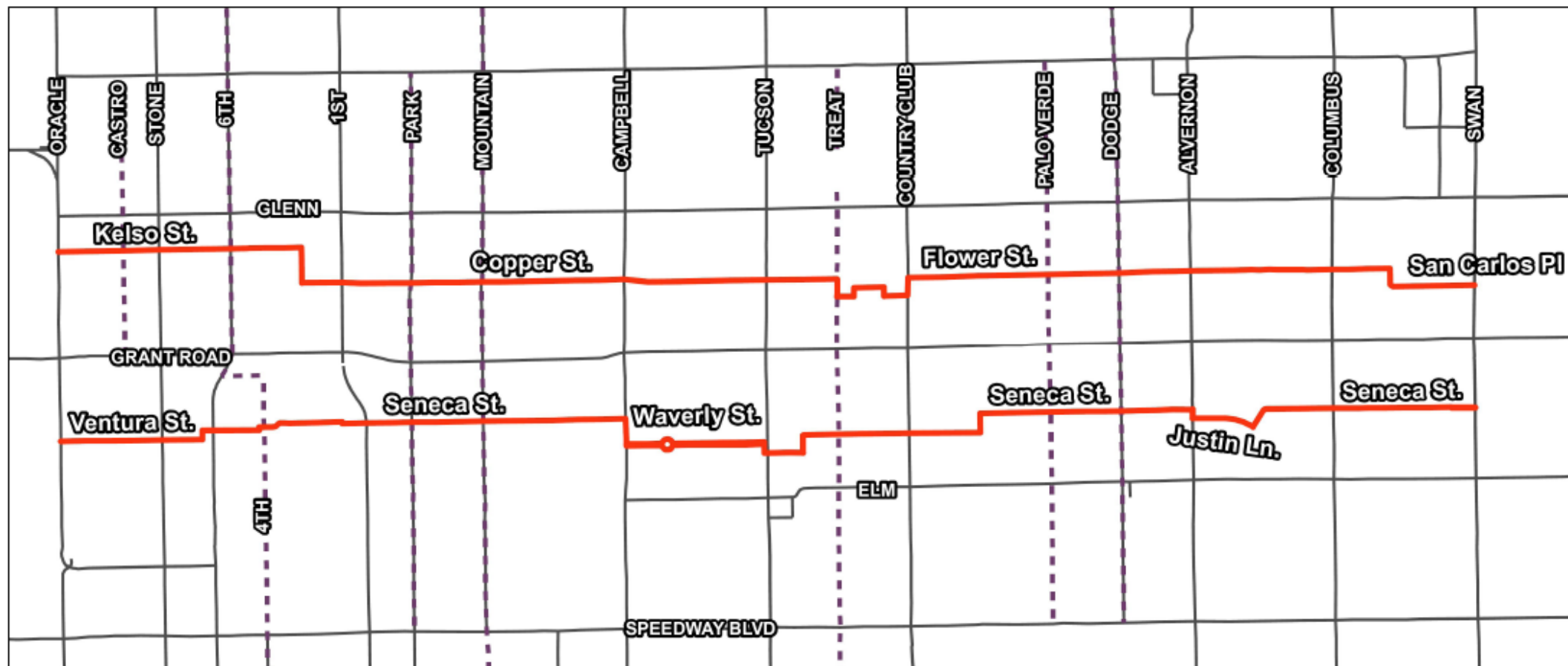


Figure 25: Grant Road Parallel Bicycle Boulevards

Currently, there are over 434 direct driveway access points from businesses and residents to Grant Road within the project limits. In many parts of Grant Road, driveway openings span for the entire frontage of the property. In many areas, vehicles are required to back on to Grant Road to leave the property. The Grant Road Design Team and Task Force recognize that access management is a critical element of an improved Grant Road. Several Grant Road Guiding Principles are directly related to improving access management:

- Balance the transportation needs of those traveling locally with those passing through Grant Road
- Improve mobility and safety for all those traveling along and across Grant Road,
- Balance mobility along and across Grant Road with access to businesses, residences, and other destinations

5.8.1 Access Management Guidelines

Grant Road improvements will be constructed consistent with *Transportation Access Management Guidelines for the City of Tucson, Revised July 2010*.

Consistent with the *Guidelines*, driveway location and spacing requirements for driveways onto Grant Road and north-south arterials and collectors, for new development or redevelopment are as follows:

- Entrance and exit drives accessing Grant Road are limited to two per 300 feet of frontage. The nearest pavement edges should be spaced at least 80 feet apart.
- There will not be any unsignalized full median openings on Grant Road. Full median openings are limited to signalized intersections.
- There should be no direct residential lot access to arterials. Direct residential lot access to collectors should be avoided in new roadway development.
- All new development should promote cross access agreements to limit the number of driveways crossing arterial and collector roadways.
- Where required to provide access to land uses, local access lanes may be considered.

Access management strategies that will be utilized on Grant Road to achieve implementation of the above guidelines and criteria include:

- Properly locate and space driveways:
- Develop shared and cross access driveway agreements
- Provide local access lanes
- Properly locate and space median openings

Each of these is discussed in more detail in the following sections.

5.8.2 Driveway Consolidation and Relocation

Studies demonstrate that crash rates increase as the spacing of unsignalized access points and driveway openings decrease, particularly for commercial entrances and exits. Vehicles entering or leaving the road at driveway operate at slower speeds than the prevailing traffic. The speed differential increases the potential for crashes, and slows roadway travel. Effective management of driveway spacing enhances corridor operations and safety.

Consolidating and relocating driveways to side streets, where feasible, will be considered in Grant Road improvements. **Figure 26** shows typical existing Grant Road conditions, where properties have multiple driveways that access Grant Road. **Figure 27** shows how driveways may be consolidated or relocated to the adjacent side street or to the rear of the property. A decision to relocate driveways to side streets should consider potential concerns from adjacent neighborhood residential areas regarding cut-through traffic.

Transportation Access Management Guidelines for the City of Tucson, Revised July 2010 states that a minimum of one hundred and fifty feet, measured at curblines, shall separate the nearest pavement edge of any entrance or exit driveway and the curblines to any signalized intersection with Grant Road, as illustrated in **Figure 28**.

In addition, consistent with the *Guidelines*, there should be no direct residential lot access to Grant Road. Direct residential lot access to cross street arterials or collectors should be avoided in new roadway development.

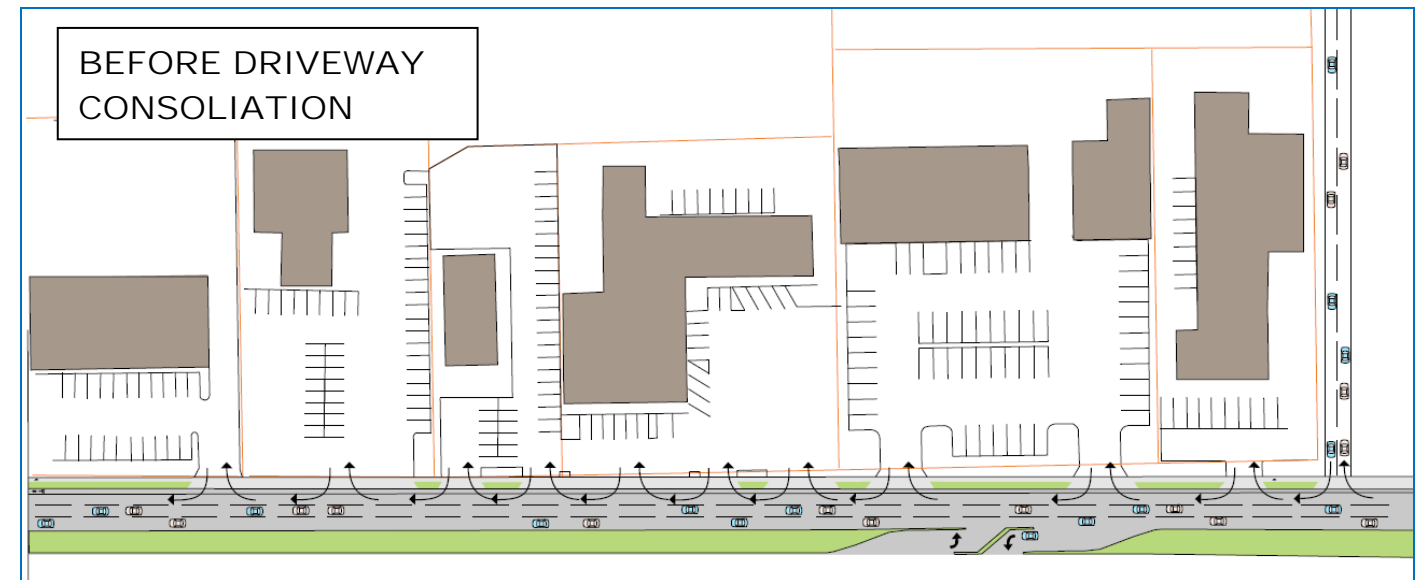


Figure 26: Consolidated and Relocated Driveways, Before Condition

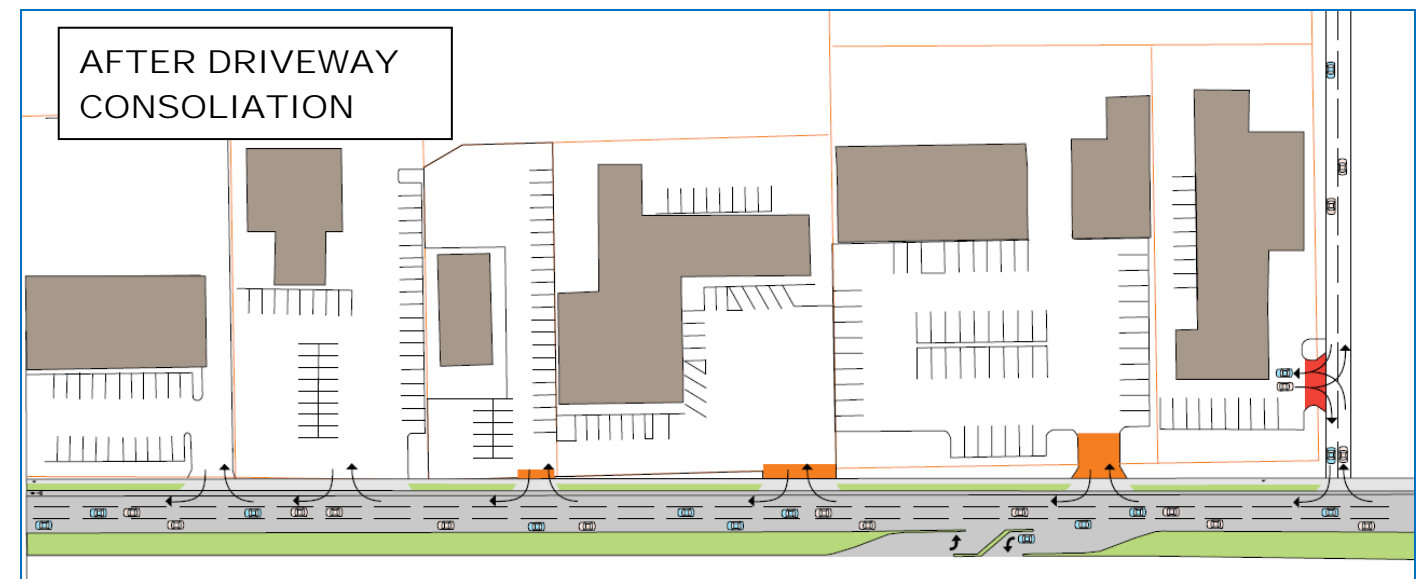


Figure 27: Consolidated and Relocated Driveways, After Condition

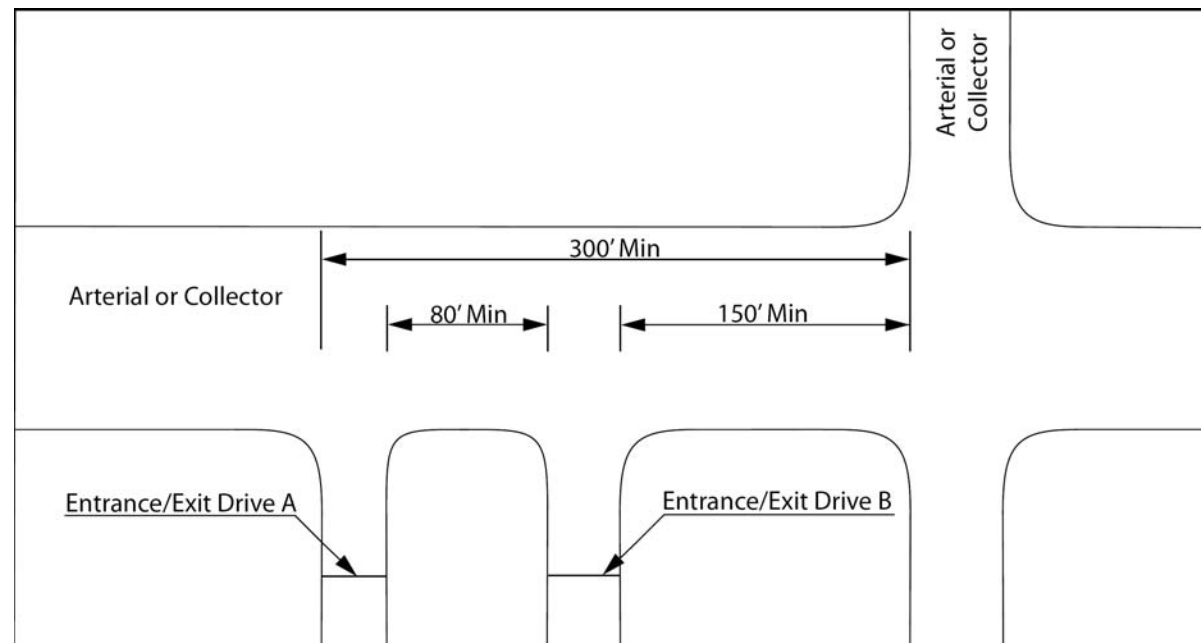


Figure 28: Driveway Spacing Requirements

Local access lanes include the following benefits:

- Reduces the number of conflict points between vehicles, pedestrians and bicyclists
- Reduces congestion by maintaining the flow of traffic
- Provides more area for landscaping
- Makes the bicycle and pedestrian friendly environment safer
- Business patrons encounter less congestion, thereby experience fewer delays accessing businesses
- Provides parking lane

5.8.3 Cross and Shared Access Management

Cross access is achieved when property owners agree to allow other parcels to cross their property to access a driveway access point. Shared access is achieved when adjacent property owners agree to share a single driveway that accesses both adjacent properties, reducing the number of driveways and conflict points along the arterial. **Figure 26** illustrates cross and shared access. These agreements enable multiple parcels to utilize a common driveway. Furthermore, inter-parcel connections can limit short trips on Grant Road. Inter-parcel connections and cross-access connections often take the form of simple driveway connections between sites, so that so that traffic moving from one to the other need not access the arterial.

In certain areas along Grant Road, particularly in commercial areas, adjacent property owners will be encouraged to coordinate access and to develop shared access or cross access agreements. Benefits of cross and shared access include:

- Reduces the number of conflict points between vehicles, pedestrians, and bicyclists.
- Reduces congestion by maintaining the flow of traffic along the arterial roadway.

- Provides more area for landscaping.
- Makes the bicycle and pedestrian environment safer.
- Business patrons encounter less congestion; thereby experience fewer delays accessing businesses.

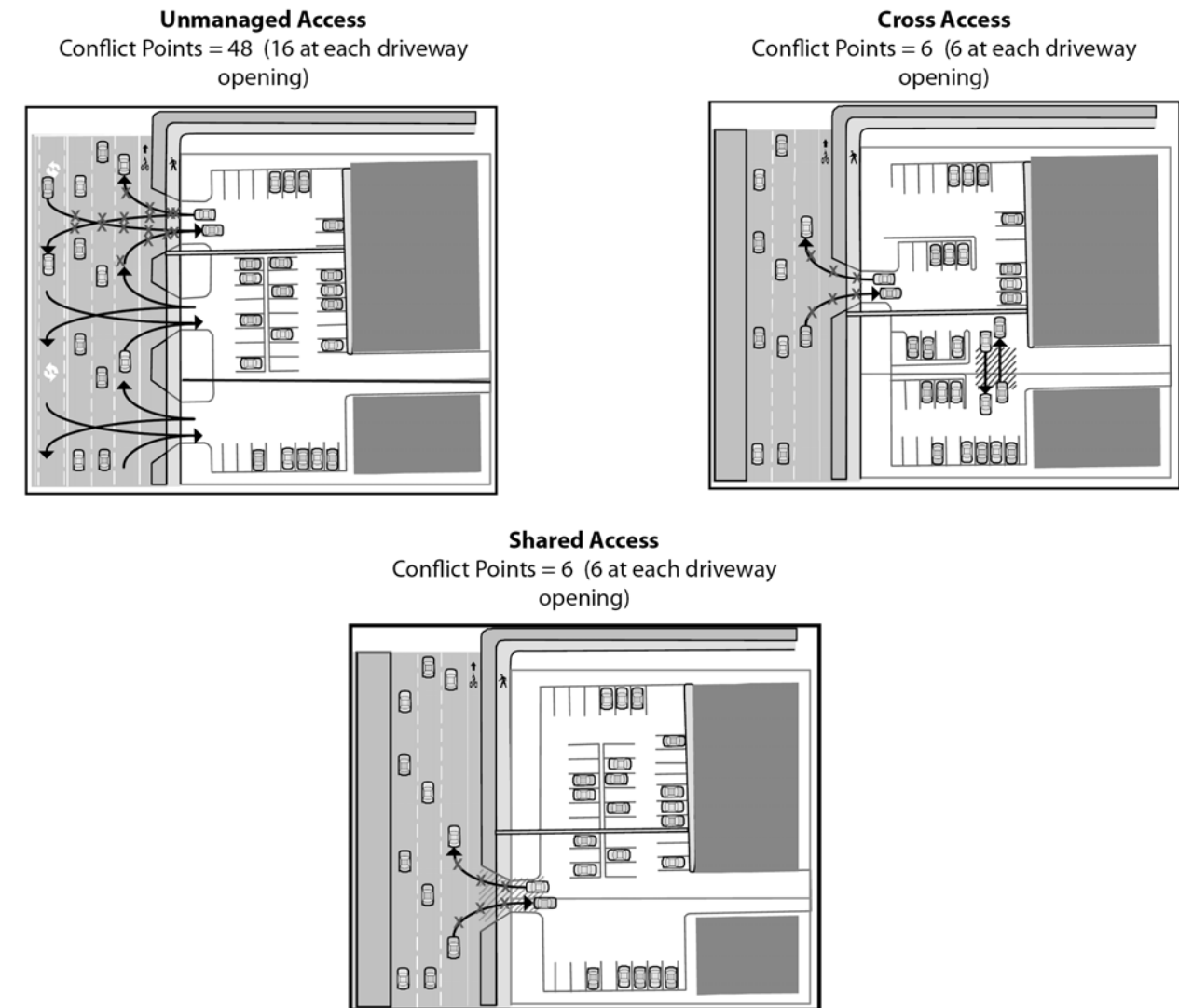


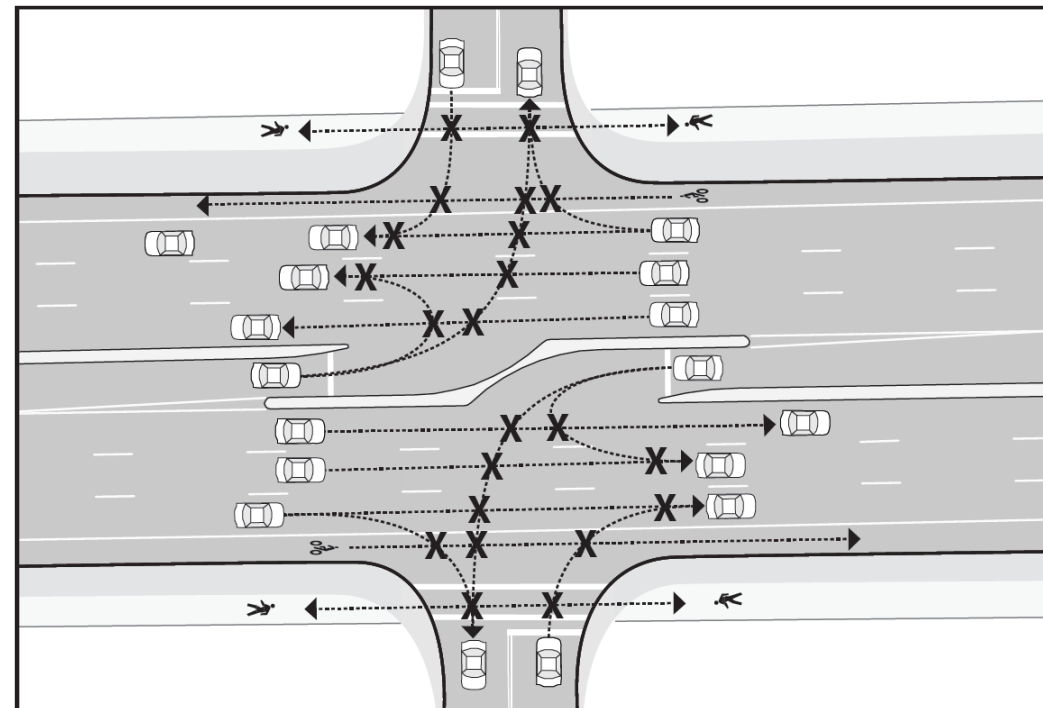
Figure 29: Unmanaged Access, Cross Access, and Shared Access

5.8.4 Median Openings

The design and spacing of median openings is critical in providing safe and efficient travel along an urban arterial. In selecting a median type, a balance is often needed between providing access to adjacent properties and ensuring adequate throughput capacity and travel speeds.

By separating oncoming traffic, and by managing turning movements, non-traversable medians offer the most significant potential to improve roadway safety and operations. The provision of a non-traversable median that separates opposing traffic effectively limits left-turns on a roadway. Safety data have shown the crash rate reduction attributable to installation of medians is up to 35 percent (*NCHRP Report 420*). Non-traversable medians prevent crossover crashes, provide room to accommodate left turn lanes for vehicles making turns to side streets, and provide refuge for pedestrians or bicyclists crossing the street.

The Grant Road Improvement Plan recommends a 17-foot wide non-traversable median. Full median openings will be limited to signalized intersections to allow traffic left-turns from north-south streets to Grant Road. There will not be any unsignalized full median openings within the project limits. Directional median openings have been recommended by the Design Team and endorsed by the Task Force to accommodate left-turns and U-turns at selected locations. Directional median openings are designed to allow left turn access from Grant Road, while limiting left turns to Grant Road. Studies have shown that directional median openings are safer than full unsignalized median openings because the number of conflict points is significantly reduced, as illustrated in **Figure 30**. The Grant Road planning and design process investigated and worked closely with the community on the location of specific median openings. In the future, it is recommended that future development comply with median openings as presented in the plan sheets included in **Appendix A**. The median opening spacing guidelines in the City of Tucson Access Management Policy should be enforced.



X = potential conflict
Number of conflicts = 22

Figure 30: Directional Median Opening Conflict Points

5.8.5 Local Access Lane

Transportation Access Management Guidelines for the City of Tucson, Revised July 2010 states that there should be no direct residential lot access to arterials. As such, direct residential access to Grant Road is not recommended. Currently, several residential lots on Grant Road have direct access to Grant Road.

An effective strategy to eliminate or reduce direct residential access to a major urban arterial is through the construction of local access lanes. Local access lanes have been constructed throughout City of Tucson, as exemplified by the local access lanes that currently exist on Grant Road east of Campbell Avenue, on the south side of Grant Road. Local access lanes on Grant Road will consist of a local street (one-way) that serves multiple properties, as illustrated in **Figure 31**.

Local access lanes include the following benefits:

- Reduces the number of conflict points between vehicles, pedestrians and bicyclists
- Reduces congestion by maintaining the flow of traffic
- Provides more area for landscaping
- Makes the bicycle and pedestrian friendly environment safer
- Business patrons encounter less congestion, thereby experience fewer delays accessing businesses
- Provides parking lane

The Grant Road Improvement Plan recommends local access lanes in the residential and commercial areas listed below.

1. Between 1st Avenue and Park Ave, south side of Grant Road
2. Between Park Avenue and Mountain Avenue, north side of Grant Road
3. Between Highland Avenue and Warren Avenue, south side of Grant Road
4. Between Norris Avenue and Tucson Boulevard, south side of Grant Road
5. Between Palo Verde Boulevard and Richey Boulevard, north side of Grant Road
6. Between Bryant Avenue and Columbus Boulevard, north side of Grant road

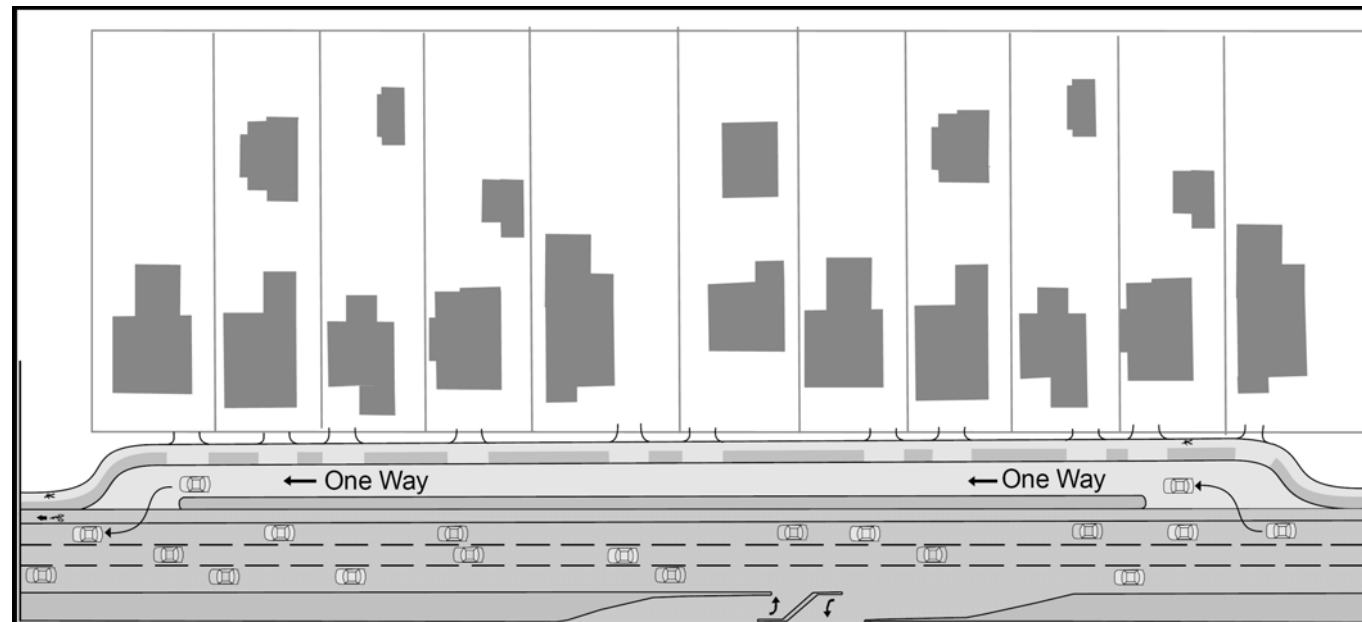


Figure 31: Local Access Lanes

5.8.6 Driveway Design

Driveways are the physical interface between a property and the roadway. In addition to proper spacing and location of driveways, proper driveway design and on-site development is critical to effective access management. The basic elements of driveway design are driveway width, curb radius, and throat length

Driveway Width: *Transportation Access Management Guidelines for the City of Tucson, Revised July 2010* identifies a maximum driveway width of 35-feet for commercial/business access. The Grant Road Improvement Plan recommends narrower driveways to enhance the pedestrian environment, wherever feasible and compatible with expected driveway operations.

Curb Radius: Preferred curb radii will depend on the type of vehicles to be accommodated at the driveway opening. *Transportation Access Management Guidelines for the City of Tucson, Revised July 2010* identifies a minimum curb return radius of 25-feet. The Grant Road Improvement Plan recommends a reduction of minimum curb radius to 15-feet at locations where truck traffic is minimal. Driveway entrances with truck traffic will generally be maintained at 25-feet.

Throat Length: The driveway throat should be of sufficient length to enable the intersection of the driveway and abutting roadway and the on-site circulation to function without interference with each other. Drivers entering the site should be able to clear the intersection of the roadway and the driveway before encountering any intersections that are part of on-site circulation. Inadequate throat length results in poor access circulation in the vicinity of the access drive. This produces congestion and high crash rates on the abutting streets as well as on site. Pedestrian/vehicular conflicts may also result from confusion caused by the complex pattern of over-lapping conflict areas.

The exit side of an access connection should be designed to enable traffic leaving the site to do so efficiently. Stop-controlled connections should be of sufficient length to store three passenger cars (one passenger car = 20 feet). **Figure 32** illustrates the recommended practices for designing driveway throat lengths.

On Grant Road, right of way constraints constrain or prohibit the opportunity for sufficient throat length with exception to large commercial centers. However, the throat length should be maximized to the extent feasible. As parcels redevelop along Grant Road, the minimum throat length should be 60', as illustrated in **Figure 32**.

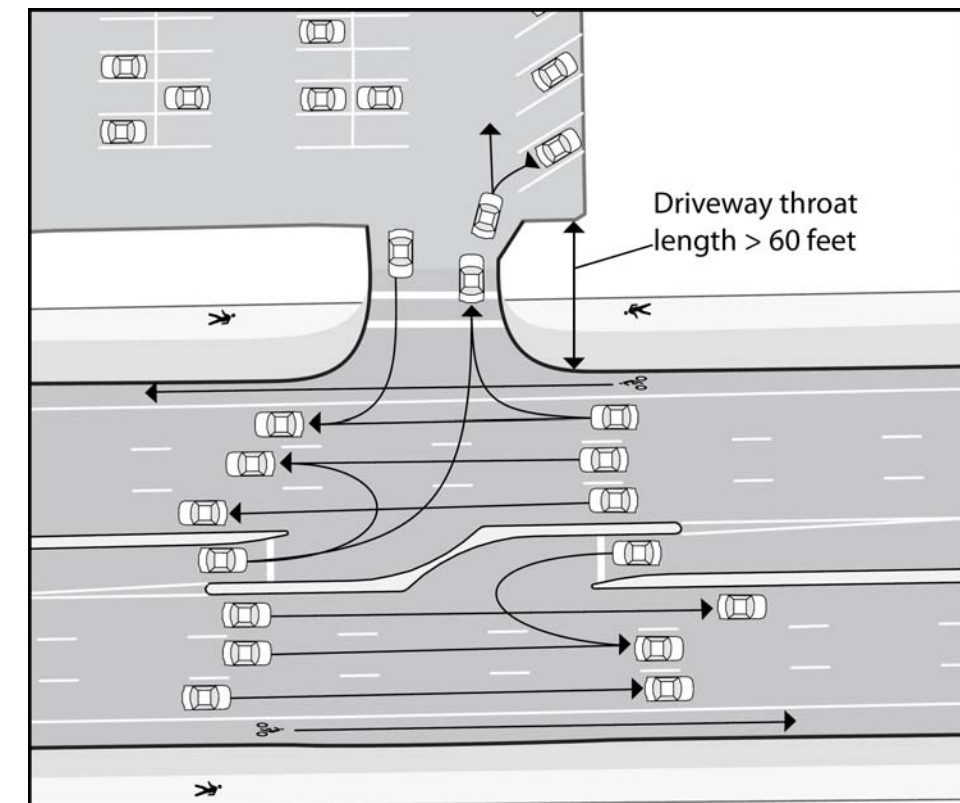


Figure 32: On-Site Driveway Throat Length Requirements

5.8.7 Recommended Access Management Practices

Table 6 summarizes City Access Management Guidelines that will be applied to Grant Road. The Design Team recognizes that the current land use configurations on Grant Road will not allow for full implementation of these guidelines in the near-term.

The Design Team recommends future collaboration with property owners to achieve implementation as practical. Full implementation can also be achieved in collaboration with redevelopment opportunities.

Table 6. Grant Road Access Management Design Criteria

Access Management Element	Design Criteria
Driveway Spacing	The Grant Road plan will comply with the existing City of Tucson access management policy, <i>Transportation Access Management Guidelines for the City of Tucson, Revised July 2010</i> for driveway spacing standards: <ul style="list-style-type: none"> Entrance and exit driveways are limited to two per 300-feet of frontage along any major roadway. The nearest pavement edges will be spaced at least 80-feet apart. All new development and redevelopment should promote sharing driveways or cross access agreements to limit the number of driveways.
Corner Clearance	A minimum of 150-feet, measured at the curb line, shall separate the nearest pavement edge of any entrance or exit driveway and the curb line to any signalized intersection.
Driveway Width	Maximum driveway width of 35-feet for commercial/business access. The Grant Road Improvement Plan encourages narrower driveways to enhance the pedestrian environment, wherever feasible and compatible with expected driveway operations.
Driveway Radius	Preferred curb radii will depend on the type of vehicles to be accommodated at the driveway opening. Curb radius will be 15' at locations where truck traffic is minimal. Driveway entrances with truck traffic will generally be maintained at 25-feet.
Driveway Profile	Driveway should be designed to provide a comfortable and safe transition for those use facility, and to accommodate the storm water drainage system.
Driveway Throat Lengths	The storage distance from curb to on-site circulation should be a minimum of 60 feet.

5.8.8 Other Access Management Planning and Design Considerations

Grant Road Mobility, Access, and Streetscape Workshops were held in fall 2009. The workshops offered participants an opportunity to provide input to the Citizen Task Force and to the Project Team on design features and policies for mobility, access, and streetscape elements for the Grant Road Improvement Plan. Input received at the Mobility and Access Workshops were used to refine preliminary roadway design plans, roadway access management policy, and specific streetscape design features that are included in the 30 percent construction plans (**Appendix A**). Participants provided input related to several feedback themes that will require consideration as Grant Road final design continues:

- Property impacts: Participants expressed concern over business access and signage. In addition, participants are interested in traffic management and business access during construction.
- Neighborhood Access and Traffic Management: There were several requests for traffic calming on the following neighborhood streets:
 - Park Ave
 - Streets accessing Grant Road from the southeast corner of Grant and Euclid, from Los Betos
 - Spring St and Cherry Ave between Norris and Campbell Ave
 - Water St, between Norris and Campbell
 - Copper St (Campbell to Country Club)
 - Loretta Dr (Campbell to Country Club)

- Goyette (Alvernon to Swan), Vista del Monte Neighborhood Association
- Estrella Ave (Oracle to Stone)
- Treat Ave
- Northway/Grant Rd
- Vine Ave (if Vine is closed)

Input received at the Mobility and Access Workshops was explored and considered in the development of the 30 percent construction plans (**Appendix A**). Input received at the Mobility and Access Workshops related to traffic calming in neighborhood streets will need to be considered in as Grant Road improvements enter final design and construction. Streets on which traffic calming and mitigation was requested include the following:

5.9 Property Impact Mitigation

The City of Tucson recognizes that the Grant Road improvements will have a significant impact on existing businesses and properties. Consistent with Grant Road Guiding Principles of “provide information and technical assistance to residential and business property owners directly impacted by the Grant Road Plan”, the City of Tucson directed the planning team to work with individual property owners for whom the Grant Road improvements will significantly impact right of way, circulation, and access.

Beginning in January 2009, the design team collaboratively contacted and collaboratively worked with property owners to further investigate right-of-way, access, and parking impacts, and identify strategies that would lessen the impacts while achieving the guiding principles of the Grant Road improvements. Considerations included review of:

- New right of way impacts to their property
- Changes to access (driveways location)
- Impacts to parking, and identification and review of possible parking solutions
- Impacts to signs

The Design Team contacted over 150 property owners and developed over 100 conceptual mitigation plans for individual properties. This process provides significant benefit to both the City, the planning team, and to the property owners. Property owners have an increased understanding of impacts to their property, and how the impacts may be mitigated. If the roadway impacts are significant enough that the property will be a full acquisition or the impacts cannot be mitigated, the advance notification to property owners enables them to make informed business decisions.

This process has been a key component to the successful development of an access management policy for Grant Road. Working with property owners, spacing between driveways that directly access Grant Road has increased to 80 feet for 95percent of the driveways. Many of the site plans include relocation and consolidation of driveways, and implementation of shared access and cross access. In many cases, parking impacts were mitigated through site reconfiguration and on-street parking.

Property impact mitigation planning has allowed for a transparent process between the property owners and the City of Tucson, and provides property owners with a better understanding of options they can consider to mitigate impacts and avoid possible relocation. The process may result in a cost savings for right of way acquisition from property impacts can be mitigated so that property owners addressed can remain onsite.

The locations of driveways and access points to properties are shown in the 30 percent construction plans (**Appendix A**). The locations of driveways and access will reflect the input received during the property impact mitigation process, as well as input received during Mobility and Access Workshops that were held in November 2009.

5.10 Right of Way

5.10.1 Right of Way Width

137-Foot Typical Section: The 137-foot street section (**Figure 33**) is applied to segments of Grant Road where access to land uses is not a major requirement or to segments where access control strategies can be applied to minimize the adverse impacts of access on Grant Road operations and safety. The 137' section consists of:

- 17-foot median
- 11-foot travel lanes
- 6-foot bicycle lane, with a 1-foot buffer between the travel lane and the bicycle lane
- 20-foot pedestrian realm, including a continuous 8-foot sidewalk and landscaped 12-foot buffer

The 137-foot street section is considered as the minimum street section and reducing the median width, travel lane width, and bike lane width should not be considered. However, minor reductions in the 20-foot pedestrian realm can be considered to avoid or minimize impacts to private property.

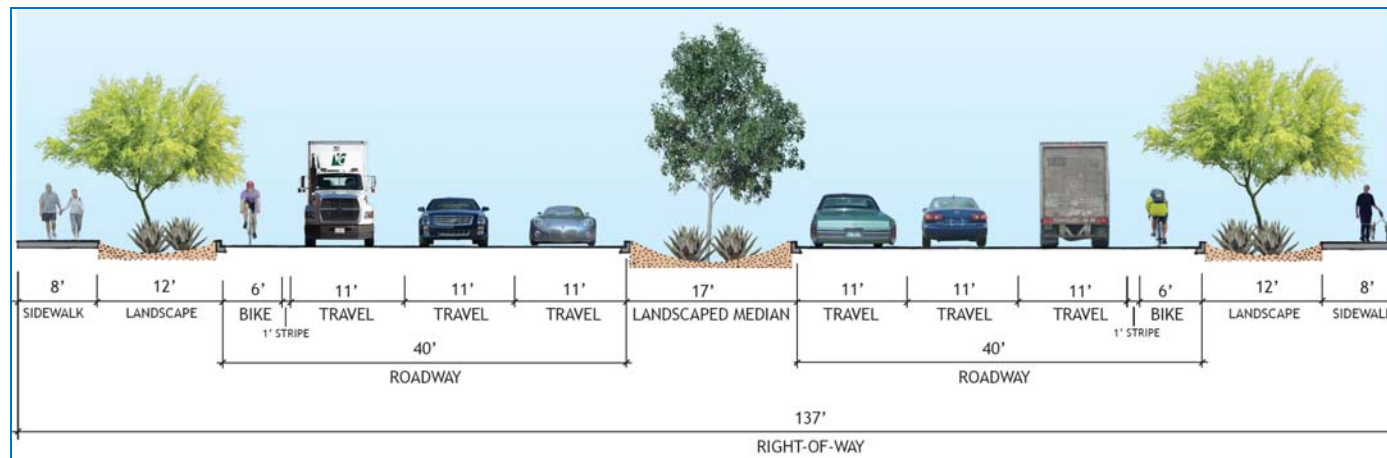


Figure 33: 137-foot Typical Street Section

160-Foot Typical Section: The 160-foot street section (**Figure 33**) is applied to segments of Grant Road where access to land uses is a major requirement and segments where access control strategies cannot be implemented to minimize the adverse impacts of direct access to Grant Road. Its primary application is for areas where residential uses front onto Grant Road both to provide for access (curb cuts and on-street parking) as well as to provide additional separation and buffering from the through traffic lanes. It may also be used in locations where the nature of businesses that front onto Grant Road support a more active retail frontage that would be well-served by on-street parking and the buffering from Grant Road through traffic. The 160-foot section consists of:

- 17-foot median
- 11-foot travel lanes
- 6-foot bicycle lane, with a 1-foot buffer between the travel lane and the bicycle lane
- 20-foot pedestrian realm, including a continuous 8-foot sidewalk and landscaped 12-foot buffer
- 43-foot local access lane, side median, and pedestrian area consisting of a 10-foot side median, 10-foot one-way local access lane, 7-foot parallel parking lanes, and a 16-foot pedestrian areas that includes a sidewalk and landscaped buffer

The 160-foot street section should be considered as the minimum street section and reducing the center and side median widths, travel lane width, bike lane width, and local access lane and parking lane widths should not be considered. However, minor reductions in the 20-foot and/or 16-foot pedestrian realm can be considered to avoid or minimize impacts.

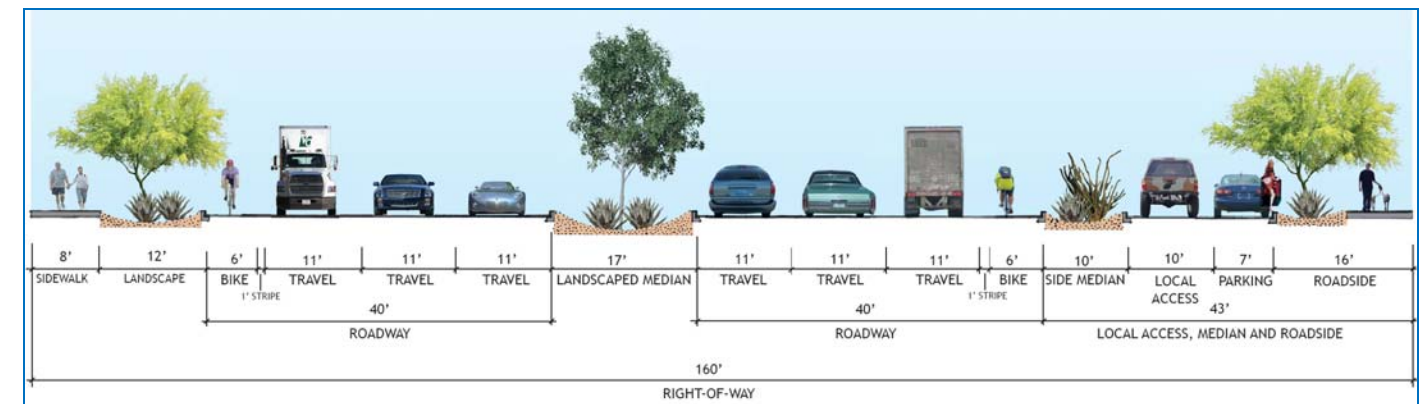


Figure 34: 160-foot Typical Street Section with Local Access Lane

5.10.2 Design Considerations

Cut and fill slopes will represent a significant design considerations that will need to be addressed in final design. Various options have been developed to address cut/fill slopes, while maintaining the desirable landscape and pedestrian amenities. Options include:

- Slope grading on full property acquisitions
- Variable sidewalk grade

- Seat walls at right of way line for cut conditions
- Walls at street side of sidewalk or at right of way line for fill conditions

Details of walls and seat walls as right of way treatments are provided in the landscape sheets of the 30 percent construction plans. An example of a seat wall for a cut condition is shown in **Figure 35** and **Figure 36**.

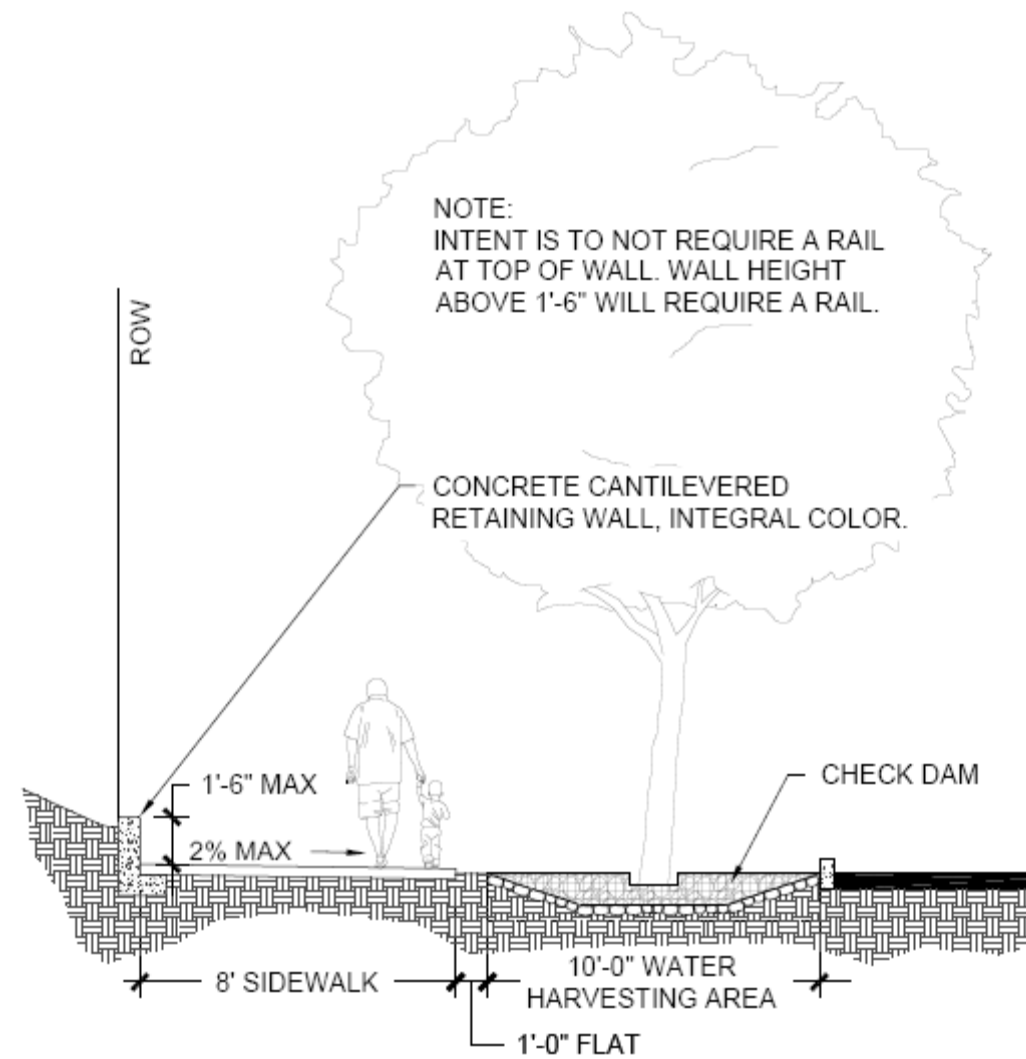


Figure 35: Example Right of Way Treatment, Cut Condition

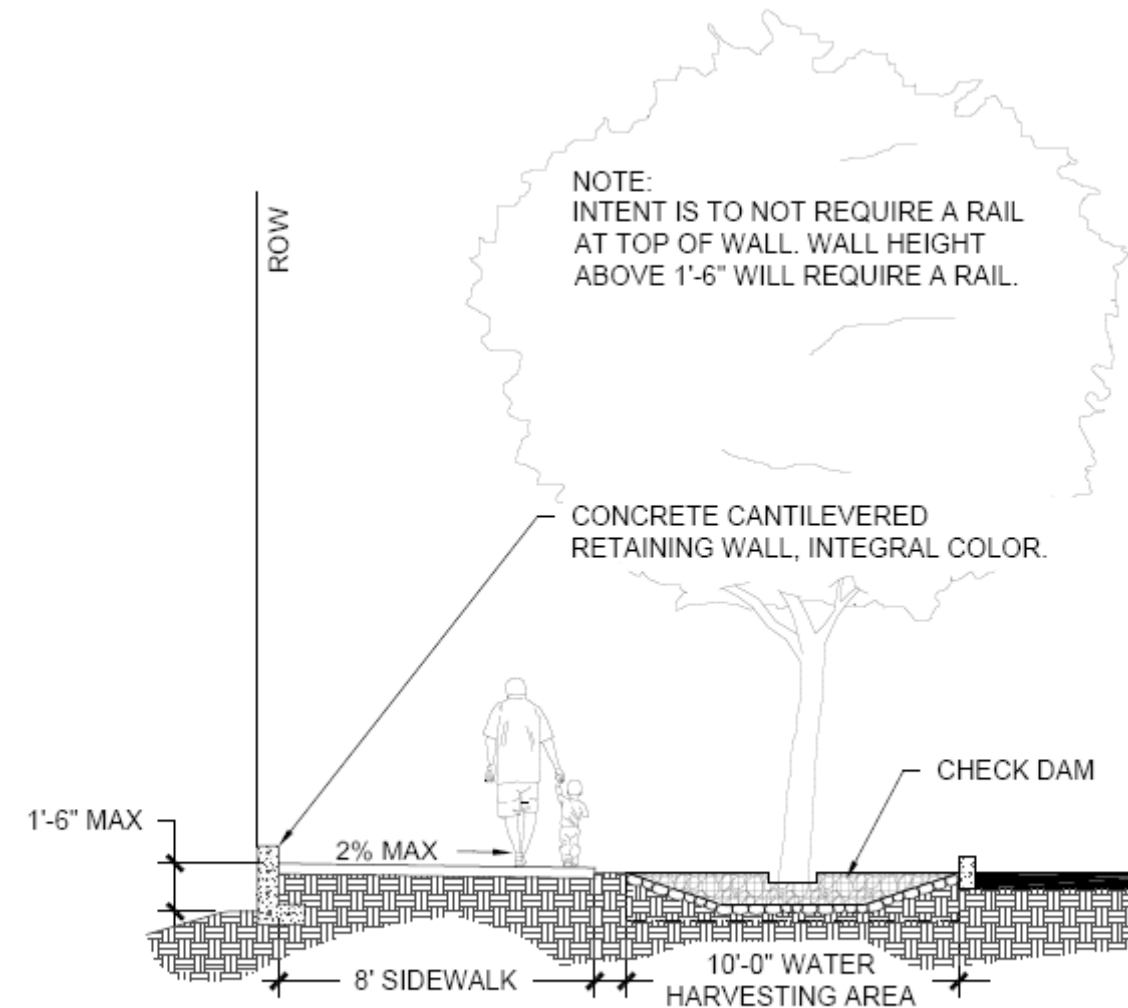


Figure 36: Example Right of Way Treatment, Fill Condition

5.11 Drainage

The Grant Road Drainage Report documents the findings of the hydrologic and hydraulic characteristics of the respective watersheds and infrastructure affecting Grant Road between Oracle Road and Swan Road. The report also provides a review of existing *Tucson Stormwater Management Study (TSMS)* data, roadway hydrologic data, existing and proposed drainage infrastructure, and serves as documentation of all the design flow rates tributary to the Grant Road project that will be used to size the recommended drainage improvements included in the roadway design.

The primary purpose of Grant Road improvements recommended drainage facilities are to improve the collection and conveyance of storm water along Grant Road to meet the City of Tucson’s drainage design criteria.

Grant Road roadway geometry, as depicted in the 30 % construction plans (Appendix A), was analyzed to verify that cross drainage was capable of being conveyed across Grant Road within the City of Tucson’s drainage design criteria. In almost all locations, offsite roadway crossing capacities have been increased, while the capacities of cross streets to the north and south remain the same. It should be noted that the majority of cross street conveyance capacities are exceeded by the offsite peak flow rates. Improvement of these conditions requires the upsizing of the major offsite drainage systems, which is beyond the scope of Grant Road improvements. As such, cross drainage will remain deficient.

5.11.1 Offsite Flows

Project area watersheds are bounded by the Santa Cruz River to the west and the Rillito River to the north. The project’s general topography slopes from south to north with approximately 120 feet of vertical fall in some of the larger watersheds. There are six major offsite watersheds. Four watersheds (Christmas Wash, Alvernon Wash, Creekside Wash, and Swan Road Wash) intersect the project and drain to the Rillito River to the north, while two watersheds (Grant Road Wash and Flowing Wells Wash) drain to the west into the Santa Cruz River. The Grant Road Improvement Plan project limits intersect these six major watersheds upstream from their ultimate discharge points (Rillito River and Santa Cruz River).

The hydrology for the greater Tucson area has been studied in the *Tucson Stormwater Management Study (TSMS)*, and the resulting recommendations were presented in *Phase II, Stormwater Master Plan* (Simons, Li & Associates, 1992-1995). The TSMS Study developed concentration points or nodes within the Grant Road project limits. These concentration points will be used as design discharges and are shown in Table 7.

Table 7. TSMS Nodes

TSMS Node	Location	Watershed	Wash	100-Year Discharge (cfs)	Date Verified
DD-N0010	Grant Rd @ Oracle Rd	Grant Road Wash	Grant Road Wash	1141	4/01
DG-N0020	Warren Ave @ Spring St	Flowing Wells Wash	No Name	627	6/05
DG-N0030	Grant Rd @ Highland Ave	Flowing Wells Wash	No Name	593	6/05
DG-N0040	Grant Rd @ Mountain Ave	Flowing Wells Wash	Mountain Avenue Wash	348	6/05
DG-N0110	Water St @ Wilson Ave	Flowing Wells Wash	No Name	1019	6/05
DG-N0120	Grant Rd @ Treat Ave	Flowing Wells Wash	No Name	419	6/05
GL-N0070	Country Club @ Seneca St	Christmas Wash	Christmas Wash	1291	Draft
GG-N0016	Grant Rd @ Belvedere Ave	Alvernon Wash	Midway Wash	1275	6/01
GG-N0035	Grant Rd @ Columbus Blvd	Alvernon Wash	Columbus Wash	813	6/01

Table 7. TSMS Nodes (continued)

TSMS Node	Location	Watershed	Wash	100-Year Discharge (cfs)	Date Verified
GG-N0055	Grant Rd @ Alvernon Way	Alvernon Wash	Alvernon Wash	1923	6/01
GD-N0010	Grant Rd @ Swan Rd	Swan Road Wash	Swan Road Wash	522	Draft

In addition to the TSMS data, additional confluence points have been identified as needing design flow rates. The Design Team completed an analysis of the project’s tributary watersheds to fully comprehend and compare (with respect to TSMS) results.

5.11.2 FEMA Floodplain

Portions of the Grant Road study area are located within a FEMA designated 100-year floodplain. All the floodplains cross Grant Road at a nearly perpendicular or oblique angle. These crossings include Wilson Avenue Wash, Alvernon Wash, Midway Wash, and Columbus Wash.

Table 8 provides a summary of the FEMA Floodplains along Grant Road. Exhibits of the existing FEMA floodplains are available in the *Grant Road Preliminary Drainage Report*.

Table 8. FEMA Floodplains Affecting Grant Road

FEMA Panel	Map Number	Revision Date	Location	FEMA Floodplain	Zone
1639K, 1643 K, 2227K	04019C1639K, 04019C1643K, 04019C2227K	8-Sep-99	Wilson Avenue	Wilson Wash	Zone AH: 100-year flood depths of 1-3 feet (usually areas of ponding); base flood elevations determined.
1643K, 2231K	04019C1643K, 04019C2231K	8-Sep-99	Alvernon Way	Alvernon Wash (street Wash)	Zone AH: 100-year flood depths of 1-3 feet (usually areas of ponding); base flood elevations determined.
1644K, 2232K	04019C1644K, 04019C2232K	8-Sep-99	Columbus Blvd	Columbus Wash	Zone AE: 100-year base flood elevations determined.

Any modifications or revisions to the Grant Road roadway profile may be considered an impact to established floodplains. City of Tucson and Pima County regulatory limits state that no encroachment may increase base flood (100-year) water surface elevations of regulatory floodplains by more than one tenth of a foot. Encroachment and impacts of the Grant Road improvements into the floodplain will need to be considered during final design. It is recommended that proposed improvements are designed such that the base flood water surface elevation does not increase; also known as a “no-rise” condition.

5.11.3 Roadway Flows/Storm Drain

The majority of Grant Road within the project limits relies on street washes with minimally sized storm drain systems that convey stormwater to their ultimate discharge locations.

Street hydraulics are a large part of the overall stormwater conveyance system considering the undersized storm drain systems and the large watershed areas that drain across the Grant Road. Within the Grant Road Improvement Plan limits, street washes are the primary conveyance system with storm drain infrastructure in place at several locations. A large regional infrastructure improvement would be required to improve Grant Road and cross streets to meet the City of Tucson's drainage design criteria and is not included as part of the Grant Road Improvement Plan. As such, the intent of 30 percent design is to minimize impacts of the street washes that cross Grant Road.

The Grant Road Improvement Plan will include raised medians. In areas that contain large cross drainage flows, medians will consist of curb cuts and erosion measures to allow flow to travel across the roadway without impeding the flow or ponding on the upstream side of the median.

Existing storm drains along Grant Road are limited to Estrella Avenue west to the Santa Cruz River, and Columbus Boulevard east to Swan Road. There are several storm drain systems within the project area along north-south streets, Mountain Avenue, Wilson Avenue, Tucson Boulevard, Country Club Road, Edith Boulevard, Palo Verde Avenue, Alvernon Way, Goyette Avenue, and Swan Road.

Grant Road preliminary plans include extensions to existing storm drain systems. The criteria used for these potential storm drain extensions was the availability of north-south cross drainage infrastructure and the existing Grant Road vertical profile. Where north-south storm drain infrastructure exists and the existing roadway profile for Grant Road permits positive drainage, potential storm drain within Grant Road can be placed and will be analyzed per City of Tucson design standards.

In areas with no major north-south drainage, no storm drain extensions are possible due to no existing outfall. City of Tucson expressed concern that the existing infrastructure was at capacity and any additional discharge would create problems with the system. The existing storm drain and roadway sections were analyzed to identify the areas that have insufficient and sufficient capacity. Identification of these areas will define the areas that future storm drains can be placed.

Storm drain extensions will be analyzed to ensure the roadway discharge peaks will not interfere with the offsite discharge peaks. The storm drain extensions will improve only the drainage along Grant Road and will not affect upstream or downstream existing conditions or properties. In a few locations, these storm drain extensions will catch offsite discharge. Any offsite discharge collected will not be diverted from its original watershed.

The Grant Road Improvement Project will include raised medians along the entire corridor. In areas that contain large cross drainage flows, medians will consist of curb cuts and erosion measures to allow flow to travel across the roadway without impeding the flow or ponding on the upstream side of the median.

City of Tucson drainage design criteria for local, collector and arterial roads is the 10-year storm event for pavement drainage and sizing of storm drains. For arterial roadways (e.g. Grant Road), runoff from the 10-year storm must be contained between the curbs of the road cross section and at least one travel lane in each direction must be free from flooding. All storm drains will be designed to contain the 10-year storm between the combined street-gutter and storm drain system.

5.11.4 Channels and Detention/Retention Basins

There are very few channels and detention/retention basins along Grant Road. As Grant Road is in a highly developed and urbanized area, new channels will be kept to a minimum. Channels will be limited to roadside and median ditches and will be utilized for pavement drainage only. No significant offsite channels are anticipated with this project.

No regional detention or retention basins are anticipated within the project due to the lack of available areas and the large flow volumes received from upstream watersheds. Smaller local retention basins will be identified to support any water harvesting that will be incorporated with the project.

5.11.5 Erosion Control

Erosion control will be required within areas with excessive erosion possibilities. Erosion control will be determined by the FHWA Hydraulic Engineering Circular No. 14.

In areas in which the median needs to be depressed to account for cross drainage across Grant Road, erosion control measures will need to be considered to protect the roadway pavement. In these areas, concrete header and/or riprap will be used to mitigate any erosion. Outlets of culverts, storm drains and channels will be analyzed to ensure no erosion to downstream properties will occur.

5.12 Traffic Signals and Traffic Operations Technology

The Task Force, at their July 12, 2008 meeting, endorsed the design team recommendation to construct both traditional intersections and indirect left turn intersections on Grant Road.

5.12.1 Signalization

There are fifteen signalized intersections within Grant Road improvements (**Table 7**). Of these fifteen intersections, seven have indirect left-turn both intersection control for east and west bound traffic. The signalized turnaround intersections will be controlled by traffic signals which are tied to the signal of the main intersection. A pedestrian crossing (Pelican) is provided at each indirect left-turn turnaround. The other eight signalized intersections consist of four Toucans and four traditional intersections.

Table 9. Locations of Traditional Enhanced and Indirect Left Turn Intersections

Intersection Treatment	Locations	
Traditional Signalized Intersection	<ul style="list-style-type: none"> • Park Ave • Mountain Ave 	<ul style="list-style-type: none"> • Tucson Blvd • Columbus Blvd
Indirect Left Turn Signalized Intersection (with traditional intersection approaches on the north and south intersecting streets)	<ul style="list-style-type: none"> • Oracle Rd • Stone Ave • 1st Ave • Campbell Ave 	<ul style="list-style-type: none"> • Country Club Rd • Alvernon Way • Swan Road
Toucan Bicycle Crossing	<ul style="list-style-type: none"> • 6th/Fontana • Treat Ave. • Palo Verde Blvd. • Dodge Blvd. 	

Signalization at the four traditional signalized intersections will consist of a standard 4-phase signalization.

Traffic signal phasing at the indirect left turn intersection will consist of elimination of left turns from east bound and west bound Grant Road to north-south cross streets. Elimination of left turns from Grant Road to north-south cross streets eliminates the number of signal phases, thereby increasing the efficiency of the intersection and improving the level of service.

A typical six-lane arterial intersection requires longer cycle lengths to provide adequate time for each movement while the indirect left turn intersection will allocate more time to through volumes. The traffic signals located at the turn-around will have the same cycle lengths as the main intersection. As a result of the removal of the left turn phase at the main intersection, the bandwidth along Grant Road is anticipated to be up to 50 to 60 seconds in both directions in the peak hours.

Discussions with City staff indicated a desire for left turn movements at the indirect left turn intersections to operate as permissive/protected, if site distance is adequate. The 30 percent construction plans depict a permitted/protected configuration for the turn-around at the indirect left turn traffic signals. The permitted phase employs a flashing yellow arrow for the turn-around movement. The protected phase employs a green arrow for the turn-around movement.

A potential signal phasing plan is shown in **Figure 37**. Coordination will improve the bandwidth and reduce the number of stops for drivers. Discussions with City of Tucson traffic signal technicians identified a need for separate cabinets and signal controllers at each of the three intersections. Communications conduit will interconnect each of the cabinets to allow for direct communications.

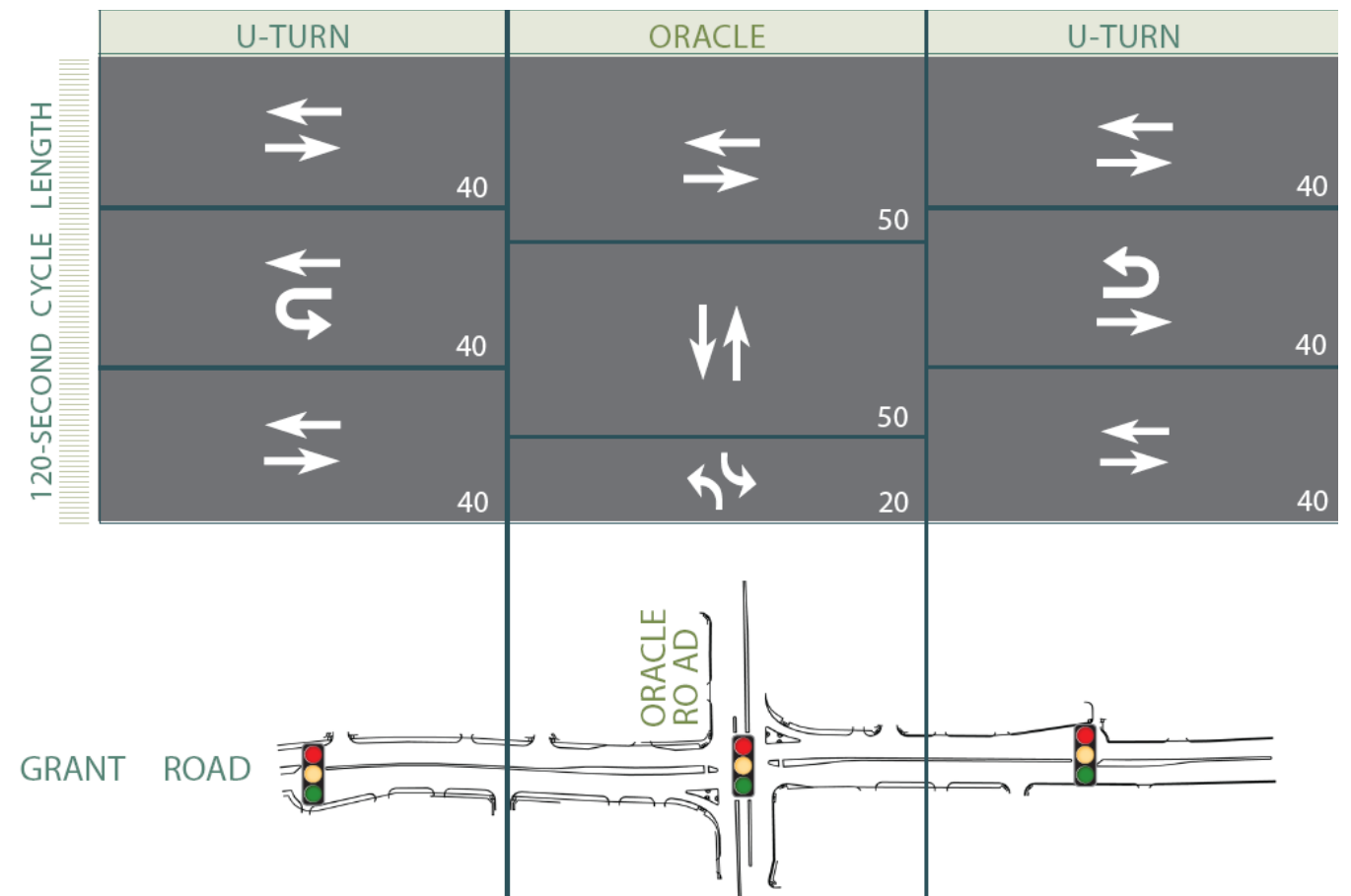


Figure 37: Sample Traffic Signal Phasing

5.12.2 Traffic Operations Technology

The Grant Road Design Team met with City traffic engineering staff and representatives of Pima Association of Governments, Intelligent Transportation Systems (ITS)- Technology and Operations Program to discuss potential ITS investments that should be considered in Grant Road improvements. Discussion items included the following:

- Pan/tilt/zoom cameras should be provided at each signalized intersection. The PAG ITS Strategic Deployment Plan identifies installation of pan/tilt/zoom cameras at major intersections as a recommended mid-term (2010-2014) project. Pan/tilt/zoom cameras facilitate traffic operations analyses and incident detection.
- Each Grant Road signalized intersection should be equipped with standard emergency vehicle pre-emption systems used throughout the City.
- Provisions should be made to facilitate fiber optic cable throughout the improvements. At minimum, each Grant Road reconstruction project should include conduit for future fiber optic cable and conduit for future power. Conduit infrastructure should include two, 2-inch conduits, and one, 4-inch conduit along Grant Road. Conduit infrastructure should be designed and installed consistent

with the *City of Tucson, Department of Information Technology, Tucson Regional Communications and Networking Standards, April 2007.*

- Each Grant Road reconstruction project should coordinate with the planned Regional Transportation Data Network. (RTDN). The RTDN, upon implementation, will provide a regional communications network for transportation.
- All signalized pedestrian (Pelican) signals and bicycle (Toucan) signals within the project should be connected into the City’s traffic signal system. via Ethernet radio. Ultimately, these will be connected via the fiber optic cable.
- Dynamic Message Signs (DMS) should be considered at key traveler decision points within each Grant Road reconstruction project limits. The DMS installed on Grant Road should be fully controllable by operators located at the City of Tucson. City staff suggested that a DMS should be considered east and west of Oracle Road on Grant Road. Other key intersections at which DMS may be considered include Alvernon Way and Campbell Avenue.

Table 10. Utilities Companies and Agencies with Utilities within Grant Road Study Area (continued)

Company	Facility
Southwest Gas	Gas
Tucson Electric Power	Electric Power
Tucson Water	Water & Reclaimed Water
Time Warner Telecommunications	Fiber Optic & Coaxial Cable
AT&T OSP Engineering	Fiber Optic
Xspedius Communications (owned by Time-Warner Telecommunications)	Communications & Fiber Optic

Utility owners were contacted to discuss the project status, and to obtain information on policies and procedures for relocations, plans for utility improvements and upgrades, and potential for participating in a joint utility corridor.

The relocation of most utilities can take place within 3 months after receiving a request by the City of Tucson to prepare relocation plans and begin relocations. Some large and/or higher volume facilities are subject to schedule and installation restrictions.

Detailed utility information is included in the Utilities Memorandum. For each of the utilities identified, the following information is provided:

- Existing Facilities
- Future Plans for Improvements
- Utility Conflicts
- Policies and Procedures for Addressing Conflicts
- Addressing Redevelopment in the Corridor
- Project Coordination

5.13.1 Utility Relocation Considerations and Costs

Of particular interest to Grant Road Task Force is the opportunity to relocate and/or underground aerial electrical lines. There are approximately 3.5 miles of Tucson Electric Power Company (TEP) overhead power lines along the project. Based on information from the TEP, a brief summary of relocation alternatives and corresponding advantages and disadvantages of each alternative are outlined in **Table 11.**

Possible locations for placement of the overhead power line within the project cross section are:

- Off the corridor - This is something TEP is willing to look at with the City’s support.
- Within the pedestrian realm - This is a desirable location for TEP.
- In the center median - It was determined that this option would require additional analysis. It was noted that there are many sections along the median where there are turn lanes within the median,

5.13 Utilities

The Grant Road Utilities Memorandum summarizes utility conflicts, and includes the following information:

- Results of coordination with utility companies during this phase of the project.
- Information on policies and procedures for utility relocations for each utility provider.
- Information about planned utility improvements and/or expansions for each utility provider.
- Research on the feasibility of undergrounding utilities.

Arizona Blue Stake was contacted to identify the utility owners in the study area. Utility companies and agencies that were identified through field research and Arizona Blue Stake reporting within the Grant Road study area are listed in **Table 10.**

Table 10. Utilities Companies and Agencies with Utilities within Grant Road Study Area

Company	Facility
AT&T	Phone
COT Facility Design and Maintenance	Electric, Water, Gas, Sewer
COT DOT Traffic Signal Division	Traffic signal, Lighting, Irrigation
COT I-net Fiber	Fiber Optic
COT Parks and Recreation	Electric
Cox Communications	CATV & Fiber Optic
MCI (Verizon)	Fiber Optic
Pima County Wastewater	Sewer
Qwest Local Networks	Telephone & Fiber Optic

reducing the true width to 6-feet, making it only feasible for the 46kV line with the longer spans. There are also plans for shade trees in the median.

- Along back of lots - This may be a costly alternative due to additional costs required for corner poles and/or guy systems at the turns. The 46kV line would require a minimum 18-ft easement for access and blow-out (distance wire sway in the wind).

Since a funding source for utility relocation or undergrounding could not be identified, TEP will provide cost estimates for relocation of the power lines to above ground locations.

Table 11. Utility Undergrounding Alternatives

Alternative	Advantage	Disadvantage	Comments
Underground both the 46kV and 14kV Lines	Better visual aesthetics and fewer restrictions to plant palette	Cost (RTA will not pay for undergrounding)	An overview of construction costs for undergrounding the 46kV line, assuming there are no prior rights are: <ul style="list-style-type: none"> • General 46kV Underground Costs: \$1,000,000 per mile: \$800,000 per mile for civil work (3-6" ducts encased in red colored concrete), \$200,000 per mile for TEP items (Conductors, riser poles, other equipment) • General distribution system underground costs (\$100/ft): \$50/ft for civil work (conduits and trenching), Easements for equipment and underground lines, \$50/ft for TEP items (conductors, equipment)
Relocate the 46kV Lines Overhead and Relocate the 14kV Lines Underground	Longer spacing between poles (up to 700 ft), less wires on pole, shorter poles	Additional cost to underground TEP distribution and other utilities, additional easements required for ground mounted equipment, restrictions to plant palette from overhead lines	
Relocate the 46kV Lines and 14kV Lines Overhead	Minimal additional costs, easier construction and sequence	Aesthetics, restrictions to plant palette	

5.13.2 Funding Opportunities for Undergrounding Utilities

The Regional Transportation Authority Funds cannot be used for undergrounding utilities. It is the policy of the RTA Board that with respect to utilities, reimbursable items for regionally funded projects are limited to utility relocations in specific cases where prior rights or agreements are in effect. However, several sources of funding from federal, state, and local agencies, in addition to special assessments, can help pay for utility relocation.

State and Local Sources -

- Local and state community improvement grants are another method of funding smaller scale undergrounding projects. Some states consider utility burial an aesthetic improvement akin to landscaping and allow communities to apply for funding to bury utilities as part of downtown and Main Street improvement grants.
- Special Assessment Districts – An Assessment District is a financing tool used to fund the cost of a construction project over a period of time. With an assessment district costs are apportioned to each parcel within the project boundary based upon the value of the special benefit conferred on that parcel. Special Assessment bonds are issued by the City on behalf of improvement districts created for a specific purpose, such undergrounding utilities. Special assessment areas are usually created through a petition by the majority of property owners in an area. Property owners in the designated districts are proportionately assessed for the principal and interest costs of repaying the bonds. The City, as trustee for improvement districts, is responsible for collecting the assessments levied against owners of property within each improvement district and for disbursing these amounts to retire the bonds issued to finance the improvements. The City of Tucson administers special improvement districts in accordance with the provisions of Arizona Revised Statute Chapter 4 of Title 48 which governs these types of taxing districts. It should be noted that all engineering fees for the undergrounding would need to be a part of an assessment district. There has not been an assessment district implemented in the City recently.

5.13.3 Joint Trenching

If utilities are placed in a joint trench, a number of utility providers can share relocation costs. The Western Underground Committee has published a guide to provide a joint use trench costing formula. A summary of this formula is provided as follows:

- Each utility shall determine the width and depth of a trench required for that utilities facility alone.
- The minimum separation between utilities sharing the joint use trench shall be 12 inches.
- The proportion of the total trenching cost applicable to each of the utilities occupying a joint use trench should be determined.

6 DESIGN CRITERIA

6.1 Geometric Design Criteria

A Roadway Alignment Design Criteria Memo was prepared to present design criteria that guided the design and development of the preliminary plans and provide the basis for final design and construction documents. Design criteria were developed for:

- Design Speed
- Design Vehicle
- Sight Distance
- Geometric Alignment
- Intersection and Signalization
- Bicycle Lanes
- Bus Pullouts
- Bus Stops and Pullouts
- Toucan Pedestrian Crossings
- Pelican Pedestrian Crossings

The design criteria were developed based on the following documents:

- A Policy on Geometric Design of Highways and Streets 2004, 5th Edition, American Association of State Highway and Transportation Officials
- Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities, Institute of Transportation Engineers
- A Guide for Achieving Flexibility in Highway Design, May 2004, American Association of State Highway and Transportation Officials
- Guide for the Development of Bicycle Facilities, 1999, American Association of State Highway and Transportation Officials

Table 12 is a summary of roadway design criteria. Selected design criteria are further discussed in the following sections.

Table 12. Roadway Geometric Design Criteria Summary

Design Element	Design Criteria
Design Year	2030
Design Speed/Posted Speed	35 mph/35 mph
Design Vehicle	Indirect Left Turn-Around/Channelized Right: WB-67 Dual Left Turn: SU (inside lane), WB-50 (outside lane) Right Turn: WB-50 Single Left Turn: WB-50 Toucans/Mountain Ave: SU (all movements)

Table 12. Roadway Geometric Design Criteria Summary (continued)

Design Element	Design Criteria
Lane Width	11-ft. curb/uncurbed – Grant Road and cross streets <i>See Roadway Design Criteria, Detail A1 and Detail A2</i>
Bike Lane Width	6-ft. plus 1-ft. buffer (7-ft. total) for outside and between lanes – Grant Road, <i>See Roadway Design Criteria, Detail A1 and Detail A2</i> 5-ft. outside lane and between lanes for cross streets
Median Width	17-ft. <i>See Roadway Design Criteria, Detail A1 and Detail A2</i>
Sidewalk Width	8-ft. min., 20-ft. sidewalk/landscape area 6-ft. min., 9-ft sidewalk landscape area for cross streets <i>See Roadway Design Criteria, Detail A1 and Detail A2</i>
Right Turn Lane Width	12 feet – Grant Road and cross streets
Left Turn Lane Width	Single: 11-ft. – Grant Road and cross streets Dual: 11-ft. inside and 12-ft. outside plus 6-ft. offset/island
Minimum Radius	1400 feet
Minimum Length of Curve/Tangents	150 feet
Indirect Left Turn-Around Layout	50-ft outside radius with linear taper <i>See Roadway Design Criteria, Detail A3 and Detail A4</i>
Cross Slope (%)	2% normal, 4% maximum
Superelevation (Max)	Normal Crown (4% maximum adverse crown)
Maximum Gradient (%)	3%
Minimum Gradient (%)	0.3% (0.5% desirable)
Curb Return Radii (Major intersections)	35 feet
Curb Return Radii (Minor intersections)	25 feet
Turn Lane Storage Length Requirements	See Exhibit B1
Design Element	Design Criteria
Left Turn Lane Taper	Single - 150 feet reverse curves Dual – 150 feet reverse curves
Right Turn Lane Taper	180 feet linear taper
Right Turn Lane Channel Return Radii	<i>See Roadway Design Criteria, Detail A5</i>
Right Turn Lane Channel Return Radii (Add Lane)	<i>See Roadway Design Criteria, Detail A6</i>

6.1.1 Design Year

As feasible, Grant Road improvements will be designed and constructed to maximize accommodation of 2030 traffic conditions, and in particular 2030 forecast traffic projections. However, it must be recognized that the overall design directive for Grant Road is set forth by RTA requirements to construct a 6-lane

roadway from Oracle Road to Swan Road. As previously described, 2030 traffic projections on Grant Road exceed the capacity of a six-lane roadway with traditional at-grade intersection improvements. The Grant Road improvements are being designed to provide maximum accommodation of future traffic projections within the constraints of a six-lane roadway.

6.1.2 Design Speed, Target Speed/Posted Speed

ITE Proposed Recommended Practice for Walkable Major Urban Thoroughfares (2006) defines concepts of target speed and design speed:

- Target Speed is the speed at which vehicles should operate on a thoroughfare in a specific context, consistent with the level of multi-modal activity generated by adjacent land uses to provide both mobility for motor vehicles and a safe environment for pedestrians and bicyclists. The target speed is usually the posted speed limit.
- Design Speed is the speed that governs certain geometric features of the thoroughfare, primarily horizontal curvature, super-elevation, and sight distance. Design speed is typically higher than the posted speed limit to result in conservative values for design criteria such as sight distance or roadway alignment. The ITE Proposed Recommended Practice recommends that the design speed be 5 mph over the target speed.

A review of ITE and AASHTO guidelines for Grant Road suggests that the posted speed limit for an “intermediate principal arterial” should be in the range of 30 to 40 mph based on driveway density, existence of a median, on-street parking, signal density, pedestrian activity, and roadside development. ITE further recommends that a maximum speed limit of 35 mph be used for target speed on walkable streets like the future Grant Road. A posted speed of 35 mph offers the following:

- Is consistent with functional class of roadway, per the City of Tucson Major Streets and Routes Plan.
- Is consistent with other major corridors in City of Tucson. For example, the speed limit on Speedway Blvd is 35 mph.
- Provides a walkable and bikeable environment consistent with Grant Road Guiding Principles, and balances the need for safety, access, and regional mobility.

The Task Force approved the design team recommendation for the following:

- Target speed: 35 mph
- Posted speed limit: 35 mph
- Design speed: 35 mph

6.1.3 Design Vehicle

In keeping with the Context Sensitive Solutions approach to planning and designing Grant Road improvements, ITE recommends the use of a design vehicle and a control vehicle. Each is defined in the *ITE Proposed Recommended Practice* (2006) as follows:

- A Design Vehicle must be accommodated without encroachment into the opposing traffic lanes.
- A Control Vehicle less-frequently uses a facility and must be accommodated, but encroachment into the opposing traffic lanes, multi-point turns, or minor encroachments are acceptable.

The design vehicle influences such design criteria as lane width and curb radii. Typically the largest vehicle that can use a thoroughfare is selected as the design vehicle. However, in some areas it is not practical or desirable to choose the largest vehicle because of impacts on pedestrian crossing distances, speed of turning vehicles, or other community goals for the thoroughfare. Of particular importance is the selection of appropriate control and design vehicles for use in defining curb radii at streets that intersect with Grant Road.

For Grant Road improvements, the Task Force approved the design team recommendation for the following:

- Design vehicle City Bus
- Control vehicle: WB-57 and WB-76 (see **Table 12**).

6.1.4 Lane Widths

ITE Proposed Recommended Practice for Walkable Major Urban Thoroughfares (2006) emphasizes that street width is necessary to support desirable elements such as bicycle lanes and landscape median. However, excessively wide streets create barriers for pedestrians and encourage higher vehicle speeds. The ITE Proposed Practice states that on lower-speed urban thoroughfares (35 mph or less operating speed), a range of lane widths from 10 to 12-foot is appropriate (excluding gutter pan), and lanes that are 11-foot wide are appropriate under most circumstances. An 11-foot travel lane is consistent with AASHTO guidelines including *AASHTO’s Guide for Development of Bicycle Facilities* (1999) and recommendations in *A Guide for Achieving Flexibility in Highway Design* (2004b).

Benefits of narrower lane widths include a reduction in pedestrian crossing distance, and fewer impacts in right-of-way constrained environments such as Grant Road. For Grant Road improvements, the Task Force approved the design team recommendation for the following:

- Travel lanes: 11-foot wide travel lanes on Grant Road (curb and uncurbed).
- Right turn lanes: 12-foot wide for Grant Road and cross streets
- Single Left turn lanes: 11-foot wide for single left turn lanes on Grant Road; 12-foot wide for left turn lanes on north-south cross streets.
- Dual left turn lanes: 11-foot for include lane, and 12-foot wide for outside lane. Dual left turn lanes will also include a 6-foot median island that separates the left turn lanes from the through lanes. The median island is a pedestrian enhancement as described in **section 5.4.2**.

6.1.5 Sight Distance

Adequate sight distance is fundamental to the safety goals of the Context Sensitive Solutions approach to planning and designing Grant Road improvements. AASHTO criteria for stopping and intersection sight distance based on design speed should be used in the design of Grant Road.

6.1.6 Horizontal and Vertical Alignments

The design of horizontal and vertical curves is a controlling feature of roadway design which is affected by speed and affects speed. The public expressed a desire to maintain vertical alignment variations in Grant Road but also identified locations on Grant Road where adequate sight distance does not exist. Similarly, the public expressed a desire to maintain and increase the frequency of horizontal curves as a community asset and for speed control. The use of AASHTO design for urban streets is recommended by the *ITE Proposed Recommended Practice (2006)* and the low-speed urban design criteria (no super-elevation) are well-suited to the context of Grant Road.

Minimum horizontal curves were determined based on AASHTO design criteria, and considering *ITE Proposed Recommended Practice (2006)*. Determination of minimum horizontal radius for Grant Road was determined considering *AASHTO Policy on Geometric Design of Highways and Streets (2004)* requirements for offset, length of curve, and length of tangent:

- *AASHTO Policy on Geometric Design of Highways and Streets (2004)*, Exhibit 3-47, Calculated and Design Values for Traveled Way Widening on Open Highway Curves (Two-Lane Highways, One-Way or Two-Way).
- *AASHTO Policy on Geometric Design of Highways and Streets (2004)*, page 229, General Controls for Horizontal Alignment
- *AASHTO Policy on Geometric Design of Highways and Streets (2004)*, Exhibit 3-16, Minimum Radii and Superelevation for Low-Speed Urban Streets

6.2 Pavement Design Criteria

Design of flexible pavements will be simplified and condensed guideline based on current AASHTO guidelines developed by the City of Tucson Department of Transportation (TDOT). The TDOT guideline is identified as the Engineering Division's Active Practice Guideline (APG), dated June 1, 1987.

Design of rigid pavements will follow current AASHTO guidelines, modified for TDOT axle loading correction for busses as identified in Table 4 of the Flexible Pavement Design APG.

6.3 Drainage Design Criteria

Hydrologic and hydraulic design guidelines have been developed based on the following documents:

- Standards Manual for Drainage Design and Floodplain Management in Tucson, Arizona, Simons, Li & Associates, Inc., December 1989, Revised July 1998 (City of Tucson Drainage Manual)
- Federal Highway Administration (FHWA) Hydraulic Engineering Circular No. 14, Third Edition – Hydraulic Design of Energy Dissipators for Culverts and Channels
- City of Tucson and Pima County Standard Details for Public Improvements, 2003

Analysis and design of storm drains will follow Chapter 10 of the Design Manual. Chapter 4 of the Design Manual will be followed to determine pavement peak discharges. Storm drain catch basins and associated details will follow the City of Tucson and Pima County Standard Details for Public Improvement manual.

6.4 Street and Intersection Lighting Design Criteria

A photometric analysis of the Grant Road improvements was performed using the GE IES file 451002 for a 400 Watt High Pressure Sodium, Type III distribution and full cutoff lenses at a 40 foot mounting height.

The proposed street lighting was designed to meet the *Pima County Department of Transportation Street Lighting and ITS Conduit Design Manual* guidelines and the *City of Tucson and Pima County Standard Details For Public Improvements, 2003*. The design criteria and standard details used are as follows:

- *Roadway Classification/Lamp Wattage/Mounting Height/Spacing (Per PCDOT Street Lighting Manual, Sheet 6-02)*: Major Commercial Classification/400W Lamp/40' Mtg Ht/60'-70' staggered spacing.
- *Distribution Type (Per PCDOT Street Lighting Manual, Sheet 6-00)*: Type III.
- *Lighting Design Criteria (Per PCDOT Std Details, T-324)*: Minimum average maintained horizontal illumination - 2.0 foot-candles, Maximum average-to-minimum uniformity ratio - 3:1.
- *Street Light Pole (Per PCDOT Std Details, T-446)*: Type E Street Light Pole w/ 20-foot bent mast arm.
- *Light-Loss Factor (ADOT Std, PCDOT does not list a standard LLF)*: 0.81.

The results of the photometric analysis using the above criteria are provided in **Table 14**. The light pole layout that was used in the photometric analysis is contained in the lighting plan sheets of the 30 percent construction plans.

Table 13. Grant Road Improvements Photometric Analysis

Grant Road Improvements Segment		Average	Average/Min.
15 th Ave to Oracle Road	WB	2.65	2.94
	EB	2.70	2.90
Oracle Road to Stone Avenue	WB	2.03	2.94
	EB	2.22	3.00
Stone Avenue to 1 st Avenue	WB	2.40	2.93
	EB	2.37	2.82
1 st Avenue to Park Avenue	WB	2.40	2.86
	EB	2.10	3.00
Park Avenue to Mountain Avenue	WB	2.31	2.31
	EB	2.43	2.89
Mountain Avenue to Campbell Avenue	WB	2.37	2.82
	EB	2.29	2.76
Campbell Avenue to Tucson Boulevard	WB	2.53	2.81
	EB	2.21	2.99
Tucson Boulevard to Country Club Road	WB	2.56	2.88
	EB	2.38	2.98
Country Club Road to Alvernon Way	WB	2.29	2.97
	EB	2.31	2.96
Alvernon Way to Columbus Boulevard	WB	2.37	2.96
	EB	2.35	2.90
Columbus Boulevard to Swan Road	WB	2.44	2.90
	EB	2.38	2.98
Swan Road to Arcadia Avenue	WB	2.37	2.58
	EB	2.43	2.83
Oracle Road	NB	2.30	2.91
	SB	2.43	2.93
Stone Avenue	NB	3.52	2.98
	SB	3.38	2.99
1st Avenue	NB	3.12	2.86
	SB	3.24	2.89
Mountain Avenue	-	4.20	2.12

Table 13. Grant Road Improvements Photometric Analysis (continued)

Alvernon Way	NB	3.15	2.94
	SB	3.04	2.98
Swan Road	NB	2.96	2.87
	SB	3.00	2.94

7 NOISE ANALYSIS

Applicable thresholds of significance for the project are Arizona Department of Transportation (ADOT) Noise Abatement Policy (2005) standards. Noise sensitive receivers are considered impacted if noise levels approach or exceed Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC) (**Table 14**) or substantially exceed existing noise levels.

Table 14. Noise Abatement Criteria

"A"-Weighted Sound Level in Decibels (dBA)

Activity Category	LAeq1h	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, cemeteries and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: 23 CFR 772

The NAC at Activity Category B land uses (67 dBA) is applied at primary outdoor areas of frequent human use, such as backyards and patios. The NAC at Activity Category E land uses (52 dBA) is applied inside the façade facing the roadway. The Guidelines for ADOT Noise Study Reports states "an outside-to-inside noise reduction factor of 20 dBA may be assumed." Therefore, the effective NAC at the exterior façade is 72 dBA.

ADOT defines the approach level as 3 dBA below the NAC. Therefore, noise levels of 64 dBA or higher at Activity Category B land uses or noise levels of 69 dBA or higher at Activity Category E land uses would constitute an impact. ADOT defines 'substantial' as 15 dBA.

Sound level measurements were conducted along the project area. Four long-term (24-hour) and 25 short-term (20-minute) measurements were performed. Simultaneous traffic counts were conducted with the short-term measurements.

The FHWA Traffic Noise Model (TNM) version 2.5 was used to estimate existing noise levels. The model used the existing alignment and building locations, obtained from the CAD files of the project area (KHA 2009). The model was validated using the observed field data. The existing vehicle speed on Grant Road

and all 4-lane and 6-lane cross streets was assumed to be the current speed limit of 40 miles per hour (mph); the existing vehicle speed on 2-lane cross streets was assumed to be 30 mph. Roadways were assumed to operate at the upper threshold of Level of Service (LOS) C. For Grant Road and 4-lane cross streets, this corresponds to an hourly bidirectional volume of 2,360 vehicles; for 6-lane cross streets, 3,830 vehicles; and for 2-lane cross streets, 840 vehicles. The traffic mix was assumed to be 96 percent cars, 2 percent medium trucks, 0.75 percent heavy trucks, 0.5 percent buses, and 0.75 percent motorcycles, based on the traffic counts conducted during the short-term sound level measurements.

TNM was also used to estimate future noise levels with implementation of the project. The realignment and widening of Grant Road, and associated improvements to cross streets, were also obtained from the CAD files. Existing buildings that would be removed as a result of the project were removed from the model. The vehicle speed on the realigned and widened Grant Road was assumed to be the design speed of 35 mph. The LOS C hourly bidirectional volume of 3,830 vehicles was used on the realigned and widened Grant Road. No other modeling parameters were modified.

It was assumed that all project roadway improvements would use rubberized asphalt. ADOT guidance indicates that noise levels from roadways with rubberized asphalt are expected to be 3 dBA lower than normally predicted by TNM 2.5. Therefore, all future noise levels reported by the model were reduced by 3 dBA.

The results of the model indicate future unabated noise levels would approach or exceed the NAC at the locations as described in **Table 15**. These locations are exhibited in the Noise Study Report. The largest predicted noise level increase was approximately 4 dBA. Consideration of noise abatement analysis to determine feasible and reasonable methods to reduce the noise level at the impacted receptor areas is warranted. In accordance with 23 CFR 772, alternative noise abatement measures for reducing or eliminating noise impacts along the proposed corridor should be evaluated for all noise-sensitive receptors which would exceed the NAC.

Noise abatement measures for these locations have not been developed. Abatement measures will be determined in conjunction with each Grant Road final design project. Identification of appropriate abatement measures should be coordinated with Grant Road land use planning, and streetscape and landscape design. Several types of abatement to consider include:

- Acquisition of Rights-of Way – This abatement measure would serve to provide additional property alongside the proposed facility on which to construct noise barriers or to provide a buffer zone in which no noise sensitive land use would be permitted. However, due to the residential and other developments already existing along the corridor, the acquisition of ROW to create buffer zones would result in disruptive relocations and is therefore not recommended.
- Alteration of Horizontal and Vertical Alignments – Alignment modifications as a means of noise abatement would be infeasible due to the presence of the existing Grant Road and existing development in the area.
- Traffic Management – Measures such as traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, and modified speed limits would

prevent Grant Road from serving its intended purpose. Exclusive lane designations would be inappropriate for a project of this scope and would not reduce traffic-generated noise levels. Therefore, traffic management measures are not recommended.

While the above abatement measures were determined to be not appropriate for the project, other measures were found to be effective:

- **Barrier System** – An abatement measure that is deemed to be effective is the installation of noise barriers, which would diffract sound waves and block the line-of-sight between the roadway traffic and noise sensitive receivers. These barriers would therefore provide a reduction in noise levels.

The City policy details potential issues with the use of sound walls. The City policy identifies several disadvantages associated with noise barrier walls located on urban streets. These disadvantages include the following:

- It is difficult to design effective noise barrier walls for locations where driveways, alleys, side streets or drainage facilities require openings in the walls that substantially reduce their effectiveness.
 - Walls can cause conflicts with sight distance requirements at intersections and driveways.
 - Noise barrier walls located close to the roadway can constitute fixed object hazards to vehicles.
 - Noise barrier walls interrupt the views from the residences.
 - The walls frequently attract graffiti and require continuous and costly maintenance.
 - The walls interfere with the Tucson Police Department’s crime surveillance program. The Tucson Police Department has determined that surveillance and reporting of crimes by neighborhood residents and passing motorists has been the most effective means of monitoring and reporting neighborhood criminal activity.
 - The City cannot clean up trash and remove graffiti from the sides of the walls facing the residences without trespassing. In practice, this means that the side of the walls that cannot be directly accessed from the main roadway cannot be effectively maintained.
 - The construction of noise barrier walls significantly changes the visual character of the neighborhood. Frequently, the walls become the dominant visual feature of the roadway corridor.
- **Landscape Buffers** – Natural terrain features between the roadway and receiver can reduce noise. Earthen berms with heights equal to noise walls in the same location can provide an increased noise reduction of up to 3 dBA. Standard landscaping of flat ground provides minimal noise reduction; to achieve a 5-dBA reduction, a 100-foot-deep and 16-foot-tall stand of broadleaf trees is needed.

To evaluate the effectiveness of one abatement option, noise barrier walls at the edge of the right-of-way or at the property line of the impacted representative receptors were considered at the locations listed in **Table 15**. Evaluated noise barrier walls had an initial height of 6 feet, with incremental increases of 2 feet. Noise barrier walls were found to be an effective form of abatement at 11 of the 12 impacted areas.

At R20, the widening of Alvernon Way would move the right-of-way to within a foot of the eastern façades of the multifamily residential complex. Additionally, the driveway on the east is the only access point to the

complex. Therefore, a noise barrier wall on the eastern side of the complex is not feasible. The existing outdoor usable areas are primarily on the eastern side of the buildings. These areas would be removed as part of the project. As such, the remaining outdoor usable areas would be along the north side of the south building and along the south side of the north building, adjacent to the access driveway. A 5-dBA reduction in the noise level at these areas can be provided with 6-foot-high sound walls on the east side of these areas and along the full east-west depth of the access driveway.

Table 15 shows the results of the noise barrier wall abatement analysis. Abated noise levels below the NAC are shown in bold. Barrier heights generating 5 dBA or more of insertion loss were considered feasible and are shown in bold.

Table 15. Future Predicted Noise Impacts (dBA Leq)

Receptor	Location Description	Peak Hour Traffic Noise Level								
		Existing	Future	Activity Category	NAC	Impact Type	6-Foot Barrier		8-Foot Barrier	
							Leq	Insertion Loss	Leq	Insertion Loss
R2	South side of Grant Road, east of 9 th Avenue (between 9 th Avenue and Stone Ave).	67	66	B	67	Approach	61	5	-	-
R3	South side of Grant Road, between Avenida El Capitan and 2 nd Avenue.	65	65	B	67	Approach	59	6	-	-
R3A	South side of Grant Road, between Avenida El Capitan and 2 nd Avenue.	65	64	B	67	Approach	60	4	56	8
R3B	South side of Grant Road, between Avenida El Capitan and 2 nd Avenue.	65	65	B	67	Approach	59	6	-	-
R3C	South side of Grant Road, between Avenida El Capitan and 2 nd Avenue.	65	66	B	67	Approach	60	6	-	-
R10	North side of Grant Road, between Warren and Campbell	63	64	B	67	Approach	58	6	-	-
R10C	North side of Grant Road, between Warren and Campbell	66	65	B	67	Approach	59	6	-	-
R16	Doolen Middle School, ball park fields located on the north side of Grant Road, east of Country Club	65	65	B	67	Approach	58	7	-	-

Table 15. Future Predicted Noise Impacts (dBA Leq) (continued)

Receptor	Location Description	Peak Hour Traffic Noise Level									
		Existing	Future	Activity Category	NAC	Impact Type	6-Foot Barrier		8-Foot Barrier		
							Leq	Insertion Loss	Leq	Insertion Loss	
R17	Adobe Manor Mobile Lodge, located on the north side of Grant Road, west of Sparkman Blvd.	62	66	B	67	Approach	60	6	-	-	
R20	North of Grant Road, on the west side of Alvernon Way	65	65	B	67	Approach	-	-	-	-	
R26	Crossroads Trailer Park Estates, located on the south side of Grant Road, between Mountain View Ave and Arcadia Ave.	62	64	B	67	Approach	58	6	-	-	
R26A	Crossroads Trailer Park Estates, located on the south side of Grant Road, between Mountain View Ave and Arcadia Ave.	68	66	B	67	Approach	59	7	-	-	

8 PROJECT IMPLEMENTATION

8.1 Opinions of Construction Costs

The construction cost estimate for Grant Road Improvement Plan, based on quantities from the 30 percent construction plans is \$102,120,380 in 2008 dollars. The construction cost estimate used ADOT 2008 Estimated Construction Costs and the following unit price assumptions for design elements that did not lend themselves to quantity estimates at the 30 percent design stage:

- Fiber Optic Line: \$180,000 per mile
- Street Lighting: \$478,250 per mile
- Signing: \$15,000 per Construction Segment
- Utility Line Adjustments: \$922,400 per mile

A detailed summary of project quantities and costs are provided in **Table 16**. The total construction cost also reflects the costs associated with incremental construction during the RTA construction period which spans 2012 to 2026. Right-of-way acquisition cost estimates were not developed by the Grant Road Design Team.

Table 16. Grant Road Preliminary Overall Construction Cost Estimate

ITEM No.	ITEM	UNIT	30 % Preliminary Estimate		
			DATE: 07/27/10		
			QUANTITY	UNIT PRICE	AMOUNT
2020014	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.SUM	1	\$1,829,000.00	\$1,829,000.00
2020020	REMOVAL OF CONCRETE CURB	L.FT.	84,706	\$2.00	\$169,412.00
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	9,470	\$2.00	\$18,940.00
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS AND SLABS	SQ.FT.	272,667	\$2.00	\$545,334.00
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	513,549	\$5.00	\$2,567,745.00
2020034	REMOVAL OF SIGNS	L.SUM	1	\$62,500.00	\$62,500.00
2020041	REMOVAL OF PIPE	L.FT.	2,929	\$50.00	\$146,450.00
2020052	REMOVE (SLOTTED DRAIN)	L.FT.	243	\$65.00	\$15,795.00
2030401	DRAINAGE EXCAVATION	CU.YD.	15,960	\$3.00	\$47,881.27

Table 16. Grant Road Preliminary Overall Construction Cost Estimate (continued)

ITEM No.	ITEM	UNIT	30 % Preliminary Estimate		
			DATE: 07/27/10		
			QUANTITY	UNIT PRICE	AMOUNT
2050001	GRADING ROADWAY FOR PAVEMENT	SQ.YD.	466,703	\$4.00	\$1,866,812.00
3030023	AGGREGATE BASE, CLASS 3	CU.YD.	94,293	\$40.00	\$3,771,720.00
4010011	PORTLAND CEMENT CONCRETE PAVEMENT (11")	SQ.YD.	32,338	\$40.00	\$1,293,520.00
4040111	BITUMINOUS TACK COAT	TON	197	\$300.00	\$59,100.00
4060017	ASPHALTIC CONCRETE (SURFACE COURSE, 2" THICK)	TON	43,819	\$60.00	\$2,629,140.00
4060018	ASPHALTIC CONCRETE (BASE COURSE, 4"THICK)	TON	87,634	\$60.00	\$5,258,040.00
6110203	PROTECTIVE RAILING	L.FT.	1,492	\$100.00	\$149,200.00
7010120	POST BARRICADE	EACH	42	\$1,450.00	\$60,900.00
7060080	PAVEMENT MARKER, REFLECTIVE, RAISED CERAMIC DOME (8" DIA)	EACH	339	\$50.00	\$16,950.00
9080041	CONCRETE CURB (PC/COT STD. DTL. 209)(TYPE 2)	L.FT.	145,933	\$9.00	\$1,313,397.00
9080043	CONCRETE WEDGE CURB	L.FT.	1,170	\$10.00	\$11,700.00
9080242	CONCRETE SIDEWALK (PC/COT STD. DTL. 200)(4', 6', & 8' WIDTH)	SQ.FT.	476,400	\$3.50	\$1,667,400.00
9080293	CONCRETE SIDEWALK RAMP (ADOT STD. DTL. C-05.30, 3 OF 7 MODIFIED)	EACH	9	\$800.00	\$7,200.00
9080296	CONCRETE SIDEWALK RAMP (PC/COT STD. DTL. 207, 1 OF 5)	EACH	138	\$1,200.00	\$165,600.00
9080297	CONCRETE SIDEWALK RAMP (ADOT STD. DTL. C-05.30, 5 OF 7)	EACH	1	\$1,000.00	\$1,000.00
9080298	CONCRETE SIDEWALK RAMP (PC/COT STD. DTL. 207, 4A OF 5)	EACH	272	\$1,000.00	\$272,000.00

Table 16. Grant Road Preliminary Overall Construction Cost Estimate (continued)

Table 16. Grant Road Preliminary Overall Construction Cost Estimate (continued)

ITEM No.	ITEM	UNIT	30 % Preliminary Estimate		
			DATE: 07/27/10		
			QUANTITY	UNIT PRICE	AMOUNT
9080299	CONCRETE SIDEWALK RAMP (PC/COT STD. DTL. 207, 5 OF 5)	EACH	1	\$1,200.00	\$1,200.00
9080300	CONCRETE SIDEWALK RAMP (PC/COT STD. DTL. 207, 4A OF 5 MODIFIED)	EACH	21	\$2,000.00	\$42,000.00
9080302	CONCRETE SIDEWALK RAMP (ADOT STD. DTL. C-05.30, 2 OF 7 MODIFIED)	EACH	18	\$2,000.00	\$36,000.00
9080305	CONCRETE DRIVEWAY (COT STD. DTL. 206)	SQ.FT.	17,100	\$6.00	\$102,600.00
9080306	CONCRETE DRIVEWAY (COT STD. DTL. 206 MODIFIED)	SQ.FT.	64,910	\$10.00	\$649,100.00
9080602	CONCRETE BUS SHELTER PAD (SINGLE-4'8" x 22')	SQ.FT.	2,259	\$4.00	\$9,034.60
9080603	CONCRETE BUS SHELTER PAD (DOUBLE-4'8" x 34')	SQ.FT.	2,697	\$4.00	\$10,789.29
9140031	TRASH RECEPTACLE (ABOVE GROUND)	EACH	58	\$1,500.00	\$87,000.00
9140084	SHADE STRUCTURE	EACH	23	\$10,000.00	\$230,000.00
9140085	TENSILE SHADE STRUCTURE	EACH	11	\$35,000.00	\$385,000.00
9140101	SCORING/SANDBLAST TREATMENT	SQ.FT.	77,013	\$2.00	\$154,026.00
9140401	TREE GRATE (STREETSCAPE)	EACH	167	\$1,200.00	\$200,400.00
9144012	BENCH	EACH	39	\$2,750.00	\$107,250.00
9159001	SEAT WALL	L.FT.	192	\$80.00	\$15,360.00
5010025	PIPE, CORRUGATED METAL, 36"	L.FT.	48	\$80.00	\$3,840.00
5010030	PIPE, CORRUGATED METAL, 42"	L.FT.	537	\$220.00	\$118,140.00
5011500	PIPE, REINFORCED CONCRETE (18")	L.FT.	51	\$160.00	\$8,160.00

ITEM No.	ITEM	UNIT	30 % Preliminary Estimate		
			DATE: 07/27/10		
			QUANTITY	UNIT PRICE	AMOUNT
5011501	PIPE, REINFORCED CONCRETE (24")	L.FT.	3,780	\$185.00	\$699,300.00
5011502	PIPE, REINFORCED CONCRETE (30")	L.FT.	571	\$205.00	\$117,055.00
5011503	PIPE, REINFORCED CONCRETE (36")	L.FT.	779	\$245.00	\$190,855.00
5011504	PIPE, REINFORCED CONCRETE (42")	L.FT.	619	\$375.00	\$232,125.00
5011505	PIPE, REINFORCED CONCRETE (48")	L.FT.	348	\$420.00	\$146,160.00
5011507	PIPE, REINFORCED CONCRETE (60")	L.FT.	83	\$540.00	\$44,820.00
5011510	PIPE, REINFORCED CONCRETE (38" ELLIPTICAL)	L.FT.	24	\$300.00	\$7,200.00
5011511	PIPE, REINFORCED CONCRETE (96")	L.FT.	161	\$650.00	\$104,650.00
5011512	PIPE, REINFORCED CONCRETE (21")	L.FT.	79	\$170.00	\$13,430.00
5011513	PIPE, REINFORCED CONCRETE (60" ELLIPTICAL)	L.FT.	164	\$580.00	\$95,120.00
5030182	DROP INLET (WITH GRATE)	L.FT.	606	\$2,250.00	\$1,363,500.00
5030183	DROP INLET (MATCH EXISTING, 6.0' WIDTH)	L.FT.	127	\$3,800.00	\$482,600.00
5030184	DROP INLET (MATCH EXISTING, 8.5' WIDTH)	L.FT.	91	\$5,000.00	\$455,000.00
5030211	TRENCH DRAIN (STREETSCAPE)	L.FT.	216	\$60.00	\$12,960.00
5030212	CONCRETE TRENCH DRAIN	L.FT.	100	\$200.00	\$20,000.00
5030604	CONCRETE CATCH BASIN (PC/COT STD. DTL. 308)(Wing=4')	EACH	19	\$4,000.00	\$76,000.00

Table 16. Grant Road Preliminary Overall Construction Cost Estimate (continued)

Table 16. Grant Road Preliminary Overall Construction Cost Estimate (continued)

ITEM No.	ITEM	UNIT	30 % Preliminary Estimate		
			DATE: 07/27/10		
			QUANTITY	UNIT PRICE	AMOUNT
5030605	CONCRETE CATCH BASIN (PC/COT STD. DTL. 308)(Wing=8')	EACH	10	\$5,000.00	\$50,000.00
5030606	CONCRETE CATCH BASIN (PC/COT STD. DTL. 308)(Wing=12')	EACH	6	\$8,000.00	\$48,000.00
5030607	CONCRETE CATCH BASIN (PC/COT STD. DTL. 308)(Wing=16')	EACH	31	\$12,000.00	\$372,000.00
5042000	MISCELLANEOUS SANITARY SEWER WORK	L.SUM	1	\$120,000.00	\$120,000.00
5041996	DRAINAGE STRUCTURE (HEADWALL)	EACH	1	\$6,000.00	\$6,000.00
5050075	MANHOLE (PC/COT STD. DTL. 302)	EACH	40	\$4,000.00	\$160,000.00
5090110	SEWER MANHOLE ADJUSTMENT	EACH	119	\$2,000.00	\$238,000.00
5101000	WATER LINE RELOCATION	L.SUM	1	\$4,850,000.00	\$4,850,000.00
5110001	MISCELLANEOUS UTILITY RELOCATIONS	F.A.	1	\$103,000.00	\$103,000.00
9080512	SCUPPER (PC/COT STD. DET 205.5, TYPE 3)	EACH	2	\$6,000.00	\$12,000.00
6080000	SIGNING	L.SUM	1	\$100,000.00	\$100,000.00
6080001	WAYFINDING SIGNS	EACH	45	\$3,000.00	\$135,000.00
6080004	BUSINESS/GATEWAY SIGN	EACH	64	\$10,000.00	\$640,000.00
7010001	MAINTENANCE AND PROTECTION OF TRAFFIC	L.SUM	1	\$6,570,000.00	\$6,570,000.00
7040003	PAVEMENT MARKING (WHITE SPRAYED THERMOPLASTIC)(0.060")	L.FT.	180,249	\$0.20	\$36,049.80
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	49,512	\$0.40	\$19,804.80

ITEM No.	ITEM	UNIT	30 % Preliminary Estimate		
			DATE: 07/27/10		
			QUANTITY	UNIT PRICE	AMOUNT
7050020	PAVEMENT MARKING, PREFORMED, TYPE I, LEGEND (BIKE)	EACH	24	\$350.00	\$8,400.00
7050023	PAVEMENT MARKING, PREFORMED, TYPE I, SINGLE ARROW	EACH	306	\$130.00	\$39,780.00
7050026	PAVEMENT MARKING, PREFORMED, TYPE I, LEGEND (ONLY)	EACH	79	\$130.00	\$10,270.00
7060015	PAVEMENT MARKER, RAISED, TYPE D	EACH	3,009	\$3.50	\$10,531.50
7060018	PAVEMENT MARKER, RAISED, TYPE G	EACH	940	\$3.50	\$3,290.00
7080001	PERMANENT PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	141,681	\$0.05	\$7,084.06
7080121	PERMANENT PAVEMENT MARKING (PAINTED SYMBOL) (ARROW)	EACH	306	\$45.00	\$13,770.00
7080211	PERMANENT PAVEMENT MARKING (PAINTED LEGEND) (BIKE)	EACH	24	\$70.00	\$1,680.00
7080221	PERMANENT PAVEMENT MARKING (PAINTED LEGEND) (ONLY)	EACH	79	\$45.00	\$3,555.00
7080302	CONCRETE SPEED TABLE (3" HEIGHT)	EACH	6	\$7,000.00	\$42,000.00
7080303	CONCRETE SPEED TABLE (6" HEIGHT)	EACH	4	\$3,000.00	\$12,000.00
7310010	POLE (TYPE A)	EACH	88	\$1,500.00	\$132,000.00
7310050	POLE (TYPE E)	EACH	50	\$3,250.00	\$162,500.00
7310130	POLE (TYPE Q)	EACH	27	\$5,000.00	\$135,000.00
7310140	POLE (TYPE R)	EACH	62	\$140.00	\$8,680.00
7310195	POST (PEDESTRIAN PUSH BUTTON)	EACH	31	\$1,000.00	\$31,000.00

Table 16. Grant Road Preliminary Overall Construction Cost Estimate (continued)

Table 16. Grant Road Preliminary Overall Construction Cost Estimate (continued)

ITEM No.	ITEM	UNIT	30 % Preliminary Estimate		
			DATE: 07/27/10		
			QUANTITY	UNIT PRICE	AMOUNT
7310200	POLE FOUNDATION (TYPE A)	EACH	88	\$1,200.00	\$105,600.00
7310240	POLE FOUNDATION (TYPE E)	EACH	50	\$2,000.00	\$100,000.00
7310310	POLE FOUNDATION (TYPE Q)	EACH	27	\$3,000.00	\$81,000.00
7310320	POLE FOUNDATION (TYPE R)	EACH	62	\$3,000.00	\$186,000.00
7310390	PEDESTRIAN PUSH BUTTON POST FOUNDATION	EACH	31	\$1,000.00	\$31,000.00
7310551	MAST ARM (20 FT.) (TAPERED)	EACH	139	\$2,200.00	\$305,800.00
7310570	MAST ARM (30 FT.) (TAPERED)	EACH	1	\$2,500.00	\$2,500.00
7310590	MAST ARM (40 FT.) (TAPERED)	EACH	26	\$2,750.00	\$71,500.00
7310600	MAST ARM (45 FT.) (TAPERED)	EACH	21	\$2,900.00	\$60,900.00
7310620	MAST ARM (55 FT.) (TAPERED)	EACH	25	\$3,500.00	\$87,500.00
7310650	MAST ARM (65 FT.) (TAPERED)	EACH	16	\$4,000.00	\$64,000.00
7310810	REMOVE AND SALVAGE EXISTING LIGHTING POLE	L.SUM	1	\$200,000.00	\$200,000.00
7320040	ELECTRICAL CONDUIT (1 1/2") (PVC)	L.FT.	2,700	\$10.00	\$27,000.00
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	17,500	\$11.00	\$192,500.00
7320090	ELECTRICAL CONDUIT (4") (PVC)	L.FT.	20,150	\$15.00	\$302,250.00
7320420	PULL BOX (NO. 7)	EACH	149	\$750.00	\$111,750.00
7320421	PULL BOX (NO. 7) (WITH EXTENSION)	EACH	37	\$1,000.00	\$37,000.00
7320650	CONDUCTORS	EACH	37	\$10,000.00	\$370,000.00

ITEM No.	ITEM	UNIT	30 % Preliminary Estimate		
			DATE: 07/27/10		
			QUANTITY	UNIT PRICE	AMOUNT
7320770	FIBER OPTIC CABLE	L.SUM	1	\$1,000,000.00	\$1,000,000.00
7320831	BATTERY BACK UP CABINET (UPS) AND FOUNDATION	EACH	37	\$525.00	\$19,425.00
7330060	TRAFFIC SIGNAL FACE (TYPE F)	EACH	461	\$900.00	\$414,900.00
7330130	TRAFFIC SIGNAL FACE (TYPE Q)	EACH	44	\$1,000.00	\$44,000.00
7330135	TRAFFIC SIGNAL FACE (TYPE R)	EACH	28	\$1,000.00	\$28,000.00
7330210	TRAFFIC SIGNAL FACE (PEDESTRIAN) MAN/HAND)	EACH	202	\$525.00	\$106,050.00
7330220	PEDESTRIAN PUSH BUTTON	EACH	212	\$280.00	\$59,360.00
7330310	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE II)	EACH	272	\$200.00	\$54,400.00
7330330	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE IV)	EACH	64	\$400.00	\$25,600.00
7330340	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE V)	EACH	88	\$400.00	\$35,200.00
7330350	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE VI)	EACH	9	\$400.00	\$3,600.00
7330360	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE VII)	EACH	57	\$400.00	\$22,800.00
7330400	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE XI)	EACH	202	\$400.00	\$80,800.00
7330510	SIGN (STREET NAME)	EACH	74	\$500.00	\$37,000.00
7330630	REMOVE TRAFFIC SIGNALS	EACH	15	\$10,000.00	\$150,000.00

Table 16. Grant Road Preliminary Overall Construction Cost Estimate (continued)

Table 16. Grant Road Preliminary Overall Construction Cost Estimate (continued)

ITEM No.	ITEM	UNIT	30 % Preliminary Estimate		
			DATE: 07/27/10		
			QUANTITY	UNIT PRICE	AMOUNT
7340040	CONTROL CABINET (TYPE IV)	EACH	36	\$24,000.00	\$864,000.00
7340105	CONTROL CABINET FOUNDATION	EACH	36	\$1,500.00	\$54,000.00
7340110	SERVICE PEDESTAL CABINET	EACH	36	\$5,000.00	\$180,000.00
7340125	SERVICE PEDESTAL CABINET FOUNDATION	EACH	36	\$1,500.00	\$54,000.00
7350000	LOOP DETECTOR TRAFFIC COUNTER SYSTEM	EACH	66	\$30,000.00	\$1,980,000.00
7350810	PRE-EMPT SENSORS	EACH	93	\$600.00	\$55,800.00
7360050	LUMINAIRE (HORIZONTAL MOUNT) (HPS 400 WATT)	EACH	141	\$500.00	\$70,500.00
7360132	STREET LIGHTING	L.SUM	1	\$2,630,300.00	\$2,630,300.00
7360190	PHOTO ELECTRIC CONTROL (STREET LIGHT)	EACH	88	\$200.00	\$17,600.00
7360332	PEDESTRIAN SAFETY LIGHTING	EACH	764	\$4,700.00	\$3,590,800.00
7370200	TEMPORARY TRAFFIC SIGNALS	EACH	14	\$120,000.00	\$1,680,000.00
7370399	ELECTRICAL SERVICE	EACH	23	\$5,000.00	\$115,000.00
8000001	MAINTENANCE	MONTH	36	\$1,200.00	\$43,200.00
8020012	FINE GRADING	L.SUM	1	\$54,300.00	\$54,300.00
8030120	ROCK MULCH (3" - 6" SCREENED)	SQ.FT.	297,169	\$2.50	\$742,922.50
8030122	ROCK MULCH (1" SCREENED)	SQ.FT.	445,754	\$0.60	\$267,452.40
8051001	WEED ERADICATION (FORCE ACCOUNT WORK)	L.SUM	1	\$30,250.00	\$30,250.00
8060066	PRUNING & SHAPING TREES, SHRUBS & PLANTS	L.SUM	1	\$42,400.00	\$42,400.00

ITEM No.	ITEM	UNIT	30 % Preliminary Estimate		
			DATE: 07/27/10		
			QUANTITY	UNIT PRICE	AMOUNT
8061005	TREE (15 GALLON)	EACH	2,569	\$165.00	\$423,885.00
8061111	GROUND COVER (ONE GALLON)	EACH	590	\$5.00	\$2,950.00
8061298	SHRUB (FIVE GALLON)	EACH	641	\$16.00	\$10,256.00
8061300	ACCENT (5 GALLON)	EACH	4,018	\$32.00	\$128,576.00
8061604	CACTUS (SAGUARO) (6' TO 8' IN HEIGHT)	EACH	127	\$700.00	\$88,900.00
8070200	WATER HARVESTING	L.SUM	1	\$132,600.00	\$132,600.00
8070201	CHECK DAMS	EACH	290	\$1,200.00	\$348,000.00
8080002	IRRIGATION	L.SUM	1	\$958,500.00	\$958,500.00
TOTAL CONSTRUCTION COST					\$63,232,433.21
			Construction Survey & Layout @	1.5%	\$948,486.50
			Mobilization @	8.0%	\$5,058,594.66
			Erosion Control @	1.0%	\$632,324.33
			Water/Dust @	1.0%	\$632,324.33
			Contingency @	15.0%	\$9,484,864.98
			Quality Control and Testing @	2.0%	\$1,264,648.66
			Right of Way Acquisitions @	0.0%	\$0.00
			Construction Administration @	15.0%	\$9,484,864.98
			Design Engineering @	10.0%	\$6,323,243.32
			Administration @	8.0%	\$5,058,594.66
TOTAL PROJECT COST					\$102,120,380.00

8.2 Reconstruction Phasing Plan

The development of a Grant Road Improvement Plan reconstruction phasing plan was initiated with the analysis of candidate early intersection projects. Following the endorsement by the Grant Road Task Force of the Grant-Oracle intersection as the early intersection project, a reconstruction sequence plan for the remainder of the Grant Road Improvements was developed and endorsed by the Task Force.

8.3 Early Intersection Project

During 2008 and 2009 public outreach events, comments were received requesting consideration of an early project to highlight the innovative design concepts included in the Grant Road Improvement Plan. This request was taken to City staff, Ward offices, and the Citizen Task Force and support was received for initiating an early project. Subsequent coordination with RTA representatives determined that funding for an early project would be considered.

In June 2009, a process for developing an early project was prepared in consultation with TDOT staff. The process included the following steps:

- Define candidate early projects and conduct an analysis of each using criteria related to need for the project, opportunity of highlighting innovative design concepts, constructability, construction costs, and property impacts and costs
- Present the preferred early project to City and TAC staff for review and comment
- Present the analysis to RTA representatives to determine the level of support and funding for the preferred early project
- Present a recommended early project to the Task Force for their consideration and endorsement
- If endorsed, request RTA funding for design and right-of-way acquisition for the early project

The definition of candidate early projects recognized that the principle design concept to be featured for any project should be the indirect left-turn intersection, recommended for seven major Grant Road intersections. As a result, the initial candidates for the early project were defined as an early “intersection” projects at the following intersections: Oracle, Stone, 1st Avenue, Campbell, Country Club, Alvernon Way, and Swan.

Initial candidates were screened for constructability in terms of intersection constructability and transition to existing Grant Road and constructability of storm drain system extensions and enhancements. The definition of project limits for each of the seven candidate early intersection projects could be defined to accommodate storm drain system extensions and enhancements. However, transition to existing Grant Road was determined to be problematic for the Grant-Stone intersection and the Grant-1st intersection. It was also determined that Grant-Alvernon Way intersection would benefit by combining the project limits to include intersection improvements at Grant-Swan and Grant-Alvernon Way. The screening process resulted in the following six candidates for the early intersection project:

- Grant-Oracle
- Grant-Campbell
- Grant-Country Club

- Grant-Alvernon Way
- Grant-Swan
- Grant-Alvernon Way and Grant-Swan (combined into a single project)

Each early intersection candidate project was evaluated based on the categories listed below to facilitate identification of a preferred early intersection project.

- Project limits
- Design features (innovative Grant Road design features included in the project limits)
- Safety and congestion
- Property impacts
- Estimate of probable cost
- Estimated construction duration

The preferred early intersection project was selected as the combined Grant-Alvernon Way and Grant-Swan intersection on the basis of need for the project in terms of safety, congestion, and pedestrian activity. However, coordination with RTA determined that the cost for this project was not feasible from a funding availability perspective given other scheduled RTA funding commitments. Reconsideration of a preferred early intersection project identified the following two candidates which were supported by the RTA and TDOT staff for presentation to the Citizen Task Force.

- Grant-Oracle
- Grant-Swan

On July 28, 2009 the Task Force endorsed the Grant-Oracle intersection as the early intersection project. Final design for the Grant-Oracle Intersection Improvements Project commenced began in July 2010.

8.4 Reconstruction Phasing Concept

A reconstruction phasing concept was recommended to and endorsed by the Grant Road Task Force on December 16, 2009. Development of the reconstruction phasing concept resulted from an analytical assessment of reconstruction phasing options that considered the following.

- Construction project limits
- RTA funding schedule and project construction and right-of-way cost
- Project delivery duration
- Coordination with other projects
- Community perspectives
- Project need based on a review of safety and congestion

8.4.1 Construction Project Limits

Six projects were initially defined, including the early intersection project described above, to achieve logical project termini with project construction costs in the range of \$15 million to \$30 million each.

Construction project limits were also defined to allow for logical extensions and enhancements to the existing storm drain system and transitions from the construction project to existing Grant Road. The construction projects are listed below.

- Oracle intersection, 15th Ave. to Castro
- Stone -1st Avenue segment, Castro to Fremont
- Campbell segment, Fremont to Plumer
- Country Club segment, Plumer to Sparkman
- Alvernon segment, Sparkman to Bryant
- Swan segment, Bryant to Arcadia

8.4.2 RTA Funding Schedule

Meetings with representatives of the RTA were conducted to determine the extent to which construction funds would become available to fund design, utility relocation, right-of-way acquisition, and construction. It was confirmed that the construction of Grant Road improvements would take place through RTA construction periods 2 (covering fiscal years 2012-2016), 3 (covering fiscal years 2017-2021), and 4 (covering fiscal years 2022-2026). It was also determined that construction funds remaining after the construction of the early intersection project should assume a uniform distribution over construction periods 2 through 4. This assumption would provide approximately \$45 million in each of the 3 construction periods.

8.4.3 Project Delivery Duration

Each construction project was reviewed with respect to the time required to design and construct the project. It was determined that each project would require approximately 3 to 4 years to design and construct. The project schedule will typically require the following durations.

- Consultant Selection and Final Design, 18 months (including 6 months for consultant selection and contract negotiation and 12 months for design)
- Right-of-way Acquisition & Relocation, 1-2 years before reconstruction start
- Utility Clearance, 12 months before reconstruction start
- Construction, 12- 15 months

8.4.4 Coordination with Other Projects

City of Tucson was consulted to identify existing and future projects in the vicinity of Grant Road. Several projects such as the 4th Avenue Bike Boulevard Design (University to Prince) and the Campbell Avenue Streetscape Project (Grant Road to Fort Lowell) are ongoing projects that have been coordinated with during the Grant Road project. Neither of these projects is expected to impact or be impacted by the construction of Grant Road improvements. Another planning project, the Oracle Area Revitalization Plan recently completed the development of a revitalization planning document which will be used as input to the design of the early intersection project at Grant-Oracle.

Two other projects however were identified which will influence the construction of Grant Road improvement.

- 1st Avenue, River to Grant will widen 1st Avenue to a 6-lane roadway with bike lanes and sidewalks. This project is RTA roadway improvement #14 which is scheduled for construction in RTA period #3 (fiscal year 2017-2021). Total funding for the project is \$71.4 million.
- Railroad Underpass at Grant Road will expand the railroad underpass, east of I-10 to accommodate 6-lanes on Grant Road. This project is RTA roadway improvement #15 which is scheduled for construction in RTA period #3 (fiscal year 2017-2021). Total funding for the project is \$37.4 million.

8.4.5 Community Perspectives

A survey form was distributed to property owners and tenants fronting onto Grant Road via business return mail and the project website. The survey asked for public input on reconstruction phasing. A total of 27 surveys were returned. A review of the survey forms identified three comments related to reconstruction phasing: two comments suggested that the project be constructed from west to east and one comment stressed the need to coordinate with RTA roadway improvement project #14 (1st Avenue, River to Grant) described above.

8.4.6 Project Need

Other criteria used to evaluate reconstruction phasing included a needs assessment based on the history of traffic crashes (accidents) and congestion for each construction project. Crash history was reviewed and summarized for a three year period, 2003 to 2005. Crashes were stratified by frequency, type, and severity. Congestion was determined through a comparison of available roadway capacity and the peak hour traffic volumes in 2007. The Stone-1st Avenue segment ranked first (in highest need) in both crash history and congestion. The Alvernon segment and the Country Club segment ranked second and third respectively. The Campbell segment and Grant-Oracle intersection ranked as the lowest need among the reconstruction projects.

8.4.7 Recommended Reconstruction Sequence

The recommended reconstruction phasing plan summarized in **Table 17** was presented to and endorsed by the Grant road Task Force.

Table 17. Recommended Reconstruction Sequence

RTA Construction Period	Grant Road Project	Project Limits	Segment Estimated Construction Cost	Rationale
Period 1: 2007-2011	Oracle Rd. to Stone Ave.	15th Ave. to Castro Ave.	\$11 million	<ul style="list-style-type: none"> • Constructed as the early intersection project • Construction completed in RTA Period 2

Table 17. Recommended Reconstruction Sequence (continued)

RTA Construction Period	Grant Road Project	Project Limits	Segment Estimated Construction Cost	Rationale
Period 2: 2012-2016	Stone to 1st Avenue	Castro Ave. to Fremont Ave.	\$19 million	<ul style="list-style-type: none"> Ranked highest need based on crashes and congestion Construction completed prior to RTA Period 3 in which the railroad underpass at Grant Road and the 1st Ave., River to Grant will be constructed
	Swan Rd	Bryan Ave. to Arcadia Ave.	\$16 million	<ul style="list-style-type: none"> Swan must be completed before Alvernon segment which is ranked as second highest need based on crashes and congestion
Period 3: 2017-2021	Campbell Ave.	Fremont Ave. to Plumer Ave.	\$15 million	<ul style="list-style-type: none"> Completion of Campbell segment following the widening of Campbell, south of Grant and 1st Ave., north of Grant will divert traffic on Campbell north of Grant and 1st Ave., south of Grant
	Alvernon Way	Sparkman Ave. to Bryan Ave.	\$15 million	<ul style="list-style-type: none"> Ranked as second highest need based on crashes and congestion
Period 4: 2022-2026	Country Club	Plumer Ave. to Sparkman Ave.	\$18 million	<ul style="list-style-type: none"> Grant Road reconstruction completed in RTA Period 4 (2022-2026)

9 STREETScape, LANDSCAPE, AND PUBLIC ART

9.1 Introduction

The streetscape and landscape design of the improvements to Grant Road are key elements in successfully achieving a context sensitive design approach for Grant Road. When appropriately designed these can strengthen the connections between the roadway and adjacent development to create a stronger community character; and they can contribute to pedestrian and bicycle safety as well as to the speed management of traffic along a major roadway such as Grant Road. The integration of public art into the streetscape and landscape improvements can contribute to a meaningful link to community identity and the history of the Grant Road study area. One of the most important considerations in the design of the Grant Road street cross sections was the provision of adequate space within the right-of-way to support a healthy and vibrant pedestrian environment animated by the landscape, street furnishing, public art, and other streetscape elements of the design concept, as depicted in **Figure 38** and **Figure 39**.

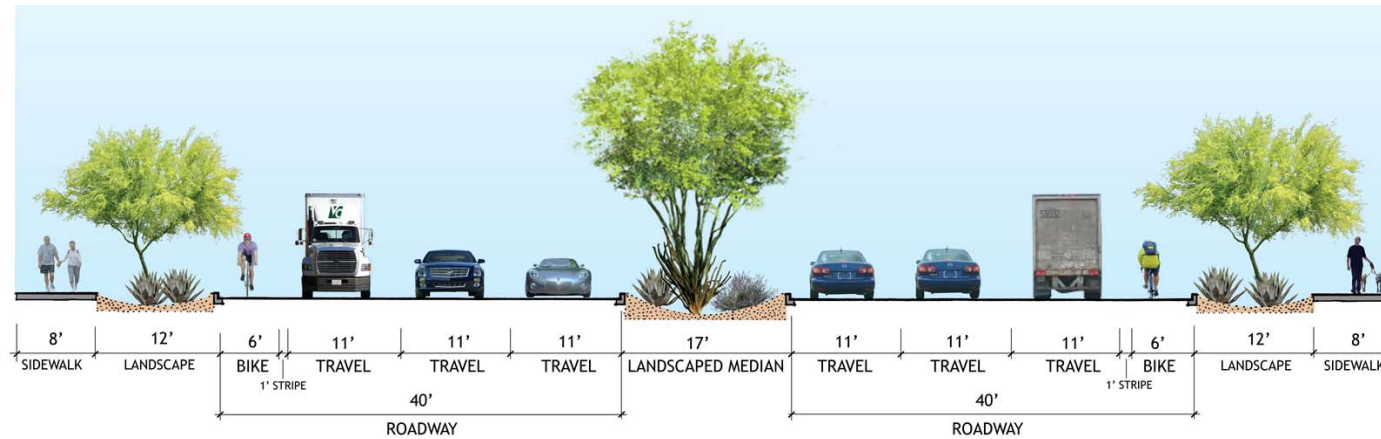


Figure 38: 137-foot wide Standard Street Cross Section

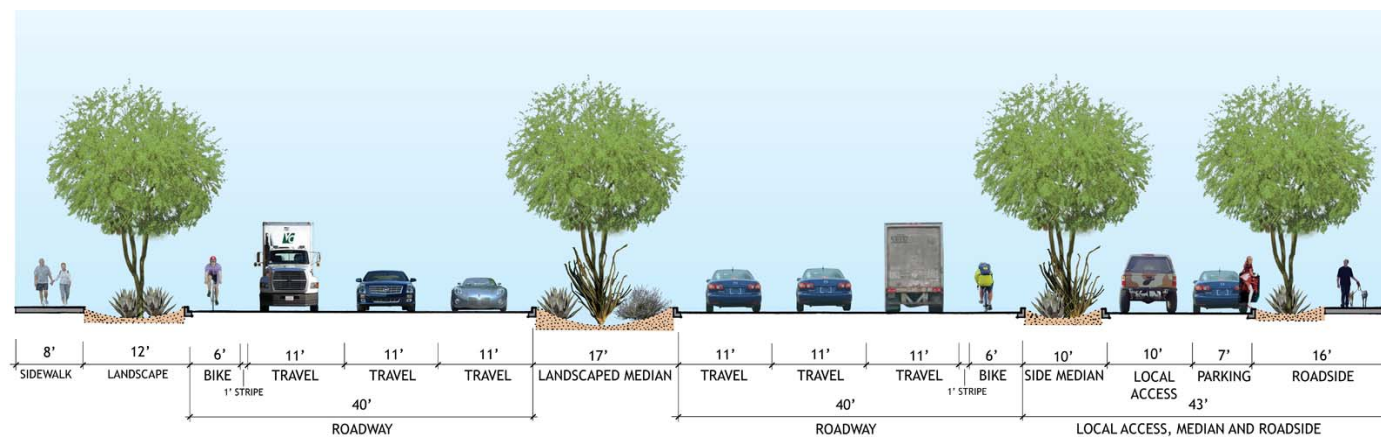


Figure 39: 160-foot wide Standard Street Cross Section

9.2 Starting Points for the Concept

The streetscape concept was derived from technical considerations, design expertise, and input from the public. The starting point for public input was the community conversations and the existing planning policies for the study area. A public involvement process and work with the Grant Road Task Force led to the definition of the project’s Vision Statement and Guiding Principles.

9.2.1 Vision Statement and Guiding Principles

The following are the elements of the Vision Statement and Guiding Principles that are directly related to the streetscape, landscape, and public art for Grant Road:

Vision Statement Excerpts

The Plan will strive to improve the visual character and quality of Grant Road and the land uses along it, and it will define Grant Road as a unique and vital place that ultimately enhances the community and region as a whole.

Relevant Design Guidelines

Mobility and Access

1.2 Improve mobility and safety for all those traveling along and across Grant Road, including pedestrians, bicyclists, transit riders, and those with disabilities, by:

- Improving the physical conditions of the roadway, and the pedestrian and bicycle environments along and crossing Grant Road and on connecting streets.
- Improving transit stops and access to them as well as considering the land uses around them.

1.4 Ensure that roadway improvements support and enhance the community’s values regarding the character, vitality, aesthetics, and environment of Grant Road.

Character and Vitality

2.8 Recognize the differences in demographics, environment, scale, neighborhoods, business types, and other aspects of character; and use them to reinforce the identities of Grant Road’s Community Character Segments.

Aesthetics and Environment

3.1 Create an aesthetically pleasing, comfortable, inviting environment, both in the street right-of-way and in adjacent public spaces, that is framed by the buildings and landscapes that front Grant Road.

3.3 Capitalize on Grant Road’s natural environment and regional scenery through climate adaptation, utilization of desert plants (especially those native to the Tucson basin), topography, key views and the integration of aesthetic and environmental design.

9.2.2 Streetscape to Enhance Community Character

The context sensitive design approach that has been used in the planning and design of the new Grant Road leads to a streetscape design that is different from the more typical approach of working with city standards and then identifying some elements, such as trees and pedestrian lighting, that create a unified design identify for the entire redesigned roadway. The approach used in the design of Grant Road is to have some elements that are common to the entire length of the project, some that are used to highlight repeating elements, such as the indirect left turn intersections, and others that are used to reinforce the particular character of segments of Grant Road.

9.2.2.1 Maintenance of Streetscape

Like all elements of the Grant Road improvements, the streetscape elements will need to be maintained over time. For example, just as there is the need to program for, fund, and undertake the cost of restriping the roadway periodically, so is there the need to program for, fund, and undertake the trimming of trees and emptying of trash receptacles. The costs of on-going maintenance and longer-term replacements costs have been considered in the design of the streetscape and selection of materials for the streetscape. Landscape designs have been refined through course of the project in response to maintenance comments from Tucson Department of Transportation staff. The design concepts in this report seek to minimize maintenance costs while achieving the guiding principles of the project. The guiding principles of the project recognize that cost is an issue—

- 4.5 *Define the improvements so that the vision can be achieved incrementally with both the RTA funding base and additional public and private funding to enhance the improvements.*
- *Identify and give priority to the implementation of those improvements that provide the most benefit and that address those issues that are a priority concern to the public.*
 - *Identify and pursue additional sources of funding early in the process to ensure that the desired improvements can be implemented.*

9.2.3 Rainwater Harvesting

One of the most frequent issues raised in the feedback received during the 2008 neighborhood, business, and community conversations was interest in the concept of water harvesting to support native landscaping in the median and pedestrian buffer areas. Since the Grant Road Improvement Plan will include enhancements to and expansion of the existing Grant Road storm drainage system to collect and convey localized stormwater to regional drainage facilities, research was conducted on rainwater harvesting system concepts that irrigate median and roadside vegetation, combined with storm drainage systems to manage stormwater runoff, and provide for infiltration and water quality improvement, as feasible and appropriate. It was determined and communicated to the public and the Citizen Task Force that a combined storm drainage and rainwater harvesting system is not a solution to major flooding along Grant Road. Water harvesting techniques can however be combined with an enhanced storm drainage system to capture and control runoff so that flooding does not increase, and these techniques can also improve the vigor of plant growth and reduce the extent of irrigation that is required.

Rainwater harvesting is the process of slowing and storing stormwater flows for the direct use of vegetation. It can also help to remove pollutants and particulate matter from stormwater runoff, which is a major source of non-point source pollution that is harmful to ground and surface water bodies. There are many techniques that can be adapted to meet specific needs, but all are designed to collect and redistribute the water to plants and/or to infiltrate into the ground. The common water harvesting techniques that are currently being used in Tucson are basins, swales, and French drains. These techniques both individually and when used together break up the flow of runoff and allow the water to be absorbed by plants or recharge the groundwater; and also can spread and delay peak runoff volumes. The possible water harvesting techniques for Grant Road resulted from an analysis of the conditions affecting floodwater patterns along Grant Road. These techniques range from passive water harvesting systems, which are commonly used in Tucson currently, to more active techniques. The three rainwater harvesting techniques that were reviewed for possible integration to the Grant Road Improvement Plan are passive, hybrid, and active, see **Figure 40**. The passive technique collects runoff from streets and sidewalks (see **Figure 41**) Check dams are used in long linear areas, to slow the water's flow and promote infiltration (see **Figure 42**). The hybrid technique allows the rainwater runoff to be moved and stored in appropriate vegetated locations, and would rely on gravity flow and infiltration for the most part with minimal or no mechanical equipment. The active approach moves the rainwater runoff to appropriate locations, stores the rainwater runoff, and then pumps it into areas that have a greater need for irrigation.

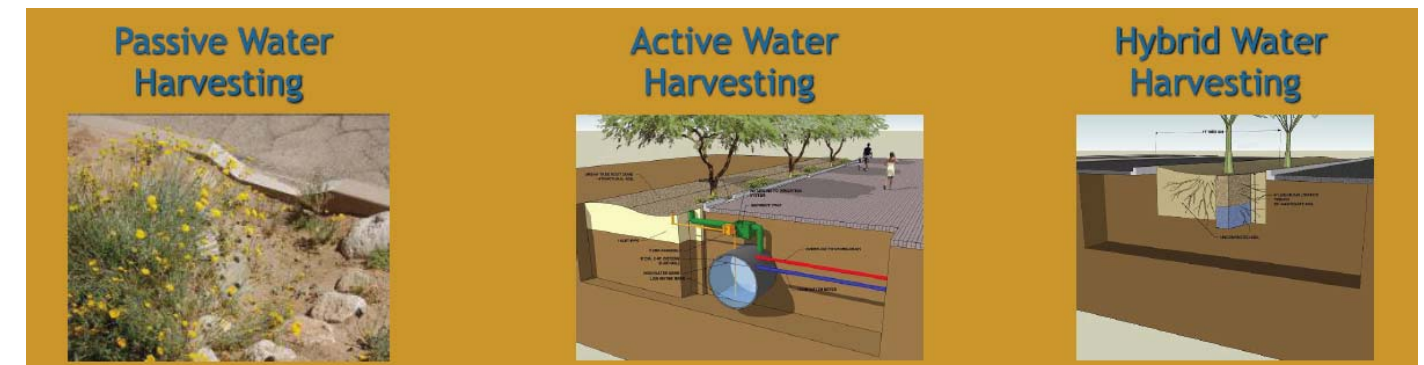


Figure 40: Three Rainwater Harvesting Techniques

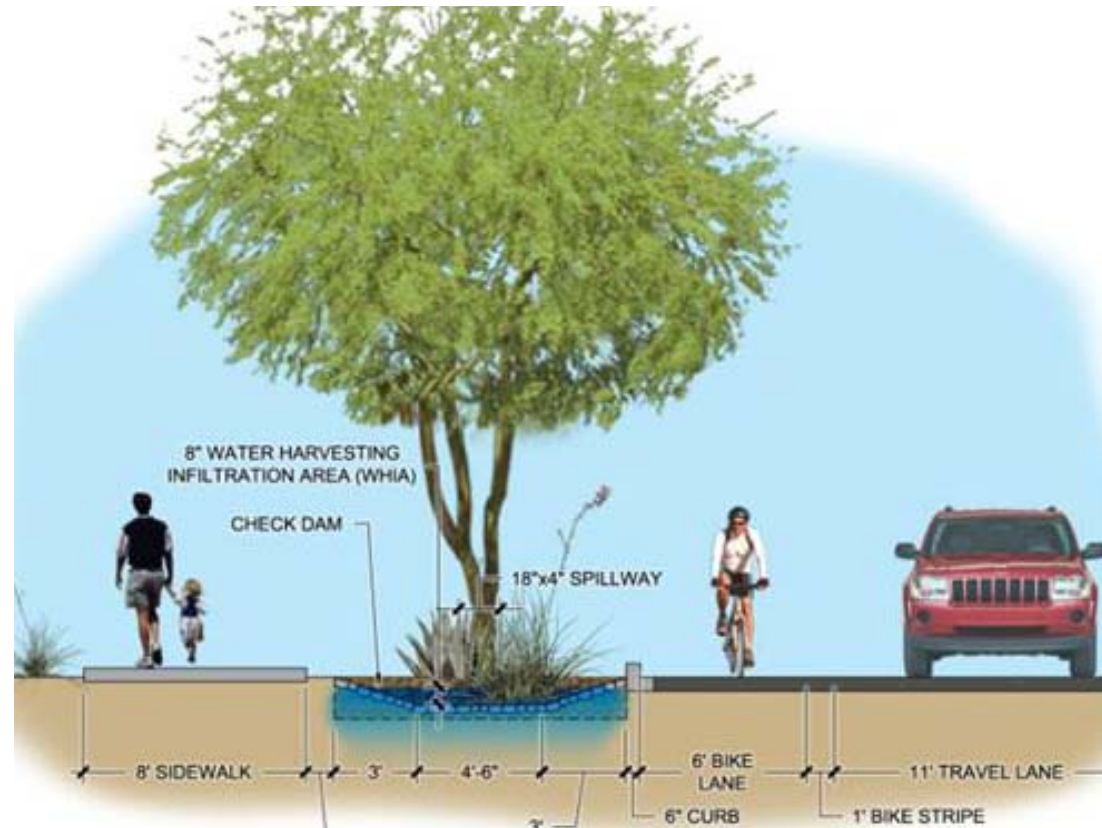


Figure 41: Passive Rainwater Harvesting

The Rainwater Harvesting Segments Map, **Figure 43**, shows possible Grant Road locations for the different techniques described above. The entirety of Grant Road will incorporate passive water harvesting techniques. Areas with limited rainwater harvesting capacity (limited surface area), but with potential to benefit street trees should be analyzed for possible inclusion of hybrid rainwater harvesting techniques. Such areas include those adjacent to compacted soils such as bus stop and medians. The active locations are associated with the major north-south cross drainages and the low points longitudinally along Grant Road. These areas have the greatest capacity for active rainwater harvesting. These locations are not meant to dictate what rainwater harvesting techniques must be used or their exact location, but are illustrative of where the techniques could be considered as part of ongoing design. Final design teams should evaluate rainwater harvesting opportunities as design advances beyond 30 percent. In addition, the following should be considered when deciding on rainwater harvesting locations and techniques.

- Consider the implementation of rainwater harvesting techniques as part of a public education and interpretation program. The public outreach will help to define reasonable expectations of what rainwater harvesting is and what it is not. Creative interpretation of rainwater harvesting at public gathering spaces (bus shelters, plazas, and high pedestrian activity areas) can meet public art and public education priorities. In addition, the use of these techniques, and interpretive signs providing information explaining the concepts, can help to educate the public about Tucson's recently adopted rainwater harvesting requirements for private development.
- Incorporate rainwater harvesting elements and structures into public art projects at prominent locations. These could be coordinated with bus shelters, architectural and/or shade elements, and pocket parks.
- Coordinate fire-hydrant tests with rainwater harvesting system. Hydrant tests could be timed and directed to benefit rainwater harvesting system and landscape.
- A Rainwater Harvesting Improvement Districts should be considered and could prove beneficial at commercial and mixed-use redevelopment areas. The district could help to support off-site improvements and connect off-site water harvesting systems to a larger overall system.
- Consider landscape growing seasons, water needs, color pallets, typical size, drought and freezing tolerances, and years it takes to become established.
- Coordinate with a hydrologist to create a detailed grading plan for the design and implementation of rainwater harvesting along Grant Road. This should include over flow and control systems, and provide clear direction to the contractor.
- Perform further research on water savings. At this stage in the planning process it is difficult to determine an accurate savings analysis since there are so many variables.

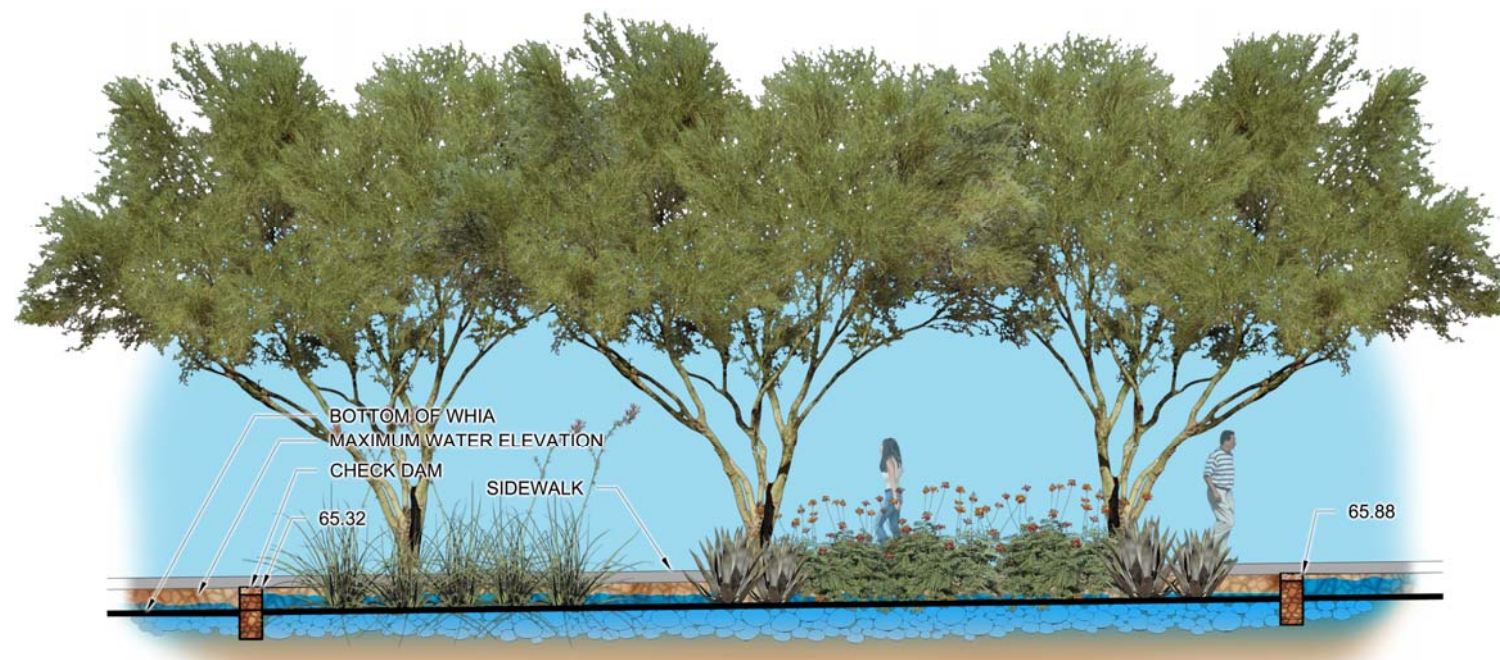
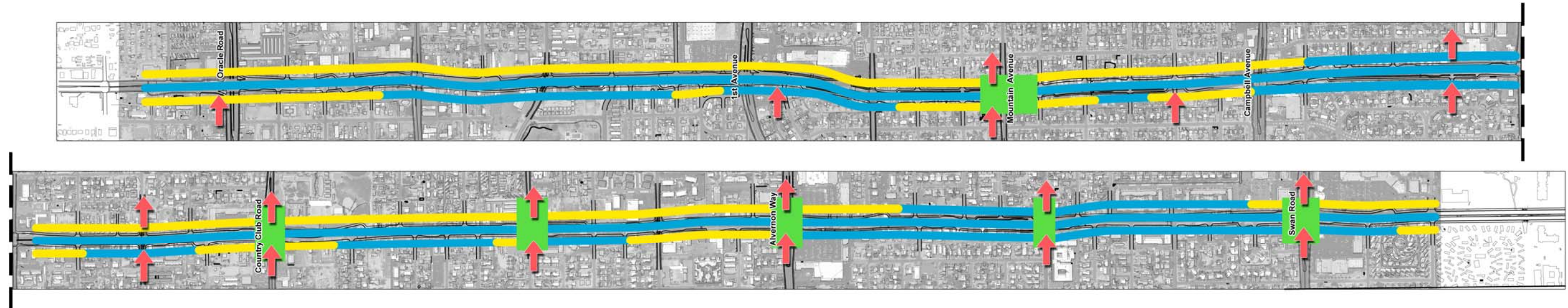


Figure 42: Passive Rainwater Harvesting - Check Dams



LEGEND

Passive Water Harvesting

Components

- Surface flow only
- Curb cuts to direct water to landscaped areas
- Grading and contouring to direct and slow water

Location

- Throughout corridor:
 - Typical roadway sections: median
 - Super Elevated roadway sections: median & high road side
 - Double Crown roadway sections: median & road sides



Hybrid Water Harvesting

Components

- Curb cuts to direct water to inlet
- Large underground perforated pipe holds water for percolation
- Subsurface improvements to increase percolation and storage capacity in landscaped areas for prolonged use (more porous subsurface soils)

Location

- Typical roadway sections: road sides
- Super Elevated roadway sections: low road side

Active Water Harvesting

Components

- Subsurface storage in cisterns for later use
- Curb cuts direct water to inlets
- Filtering, pumping, and distribution to irrigation system

Location

- Locations must meet two requirements:
 - Bottom of the water shed, greatest availability of water to store
 - Adjacent to new storm sewer to collect overflow

Storm Drainage

- Most logical location(s) to intercept water from storm drainage flows

Figure 43: Water Harvesting Segments

9.2.4 Use of Desert Plants

Grant Road’s guiding principles encourage the use of desert plants, “*especially those native to the Tucson basin.*” The intent is both environmental and cultural. From an environmental perspective, use of desert plants, when selected appropriately, will support low or no irrigation demands, particularly when combined with rainwater harvesting; and this will also be supportive of native fauna that live within the urbanized areas of Tucson. From a cultural perspective, the use of native plants and plants from local history, such as the Ghost Gum Tree, is reflective of the unique character of the Tucson basin. This is reflected in the landscape plant palettes that are discussed below, as is the unique character of Tucson that can be reflected by the use of other plant species that have been historically and successfully used in the urban and rural areas around Tucson. While the vast majority of plant species used on Grant will be native, a limited number of regionally appropriate and adapted species will be used due to their special characteristics and benefits such as low water use, low maintenance requirements, historical significance, and aesthetics.

9.2.5 Public Art in Streetscape Design

A Public Art Master Plan was prepared as an additional planning element for the Grant Road Improvement Plan and was coordinated with the Tucson/Pima Arts Council. The Public Art Master Plan will be used as the starting point for the integration of public art into the final design of the Grant Road improvements and will be used to select final design artists or artists teams for future art projects as different segments of roadway advance to final design and construction. The Master Plan follows the Grant Road Vision Statement and Guiding Principles.

The main principles are:

- Coordinated vision for public art
- Balance of criteria and needs of stakeholders and users
- Provides a conduit for expression of neighborhoods
- Coordinated vision with the Grant Road Improvement Project
- Provides a guide for implementation

Organization of the Plan

The Plan is organized around three broad themes and provides recommendations on potential locations for art, the type of art, and potential materials.

- **Provides site types and locations:** Site types would include art as streetscape components located near the transit stations, art as gateways at major intersections, or art imbedded in the pavement of the sidewalks, cross walks, and median islands.
- **Provides a matrix of terms:** This matrix mixes scale (how big is it?) with genre (what kind of art?) with form (what configuration?), and theme (what does the art say?). These terms are used to guide each and every layer of the recommendations.
- **Guides the content of the artwork:** The overall approach is to utilize the three themes of Environment and Ecology, History and Memory, and Culture and Identity as organizing threads throughout the corridor. In some cases, continuity will be achieved through the suggestion of artist teams to create a singular project that takes several years to complete; in other cases continuity will be achieved by the

distribution of artworks by several artists who will create projects with a similar theme and scale and form at a series of locations along the roadway.

Series of Recommendations

Figure 44 illustrates the conceptual structure of the Public Art Master Plan. The three themes are ever present and interwoven along Grant Road. While there are several artists involved in creating artworks, the three themes will provide some structure and cohesion to the public art. Each of the recommendations in the Public Art Master Plan indicates one or more of the three themes.

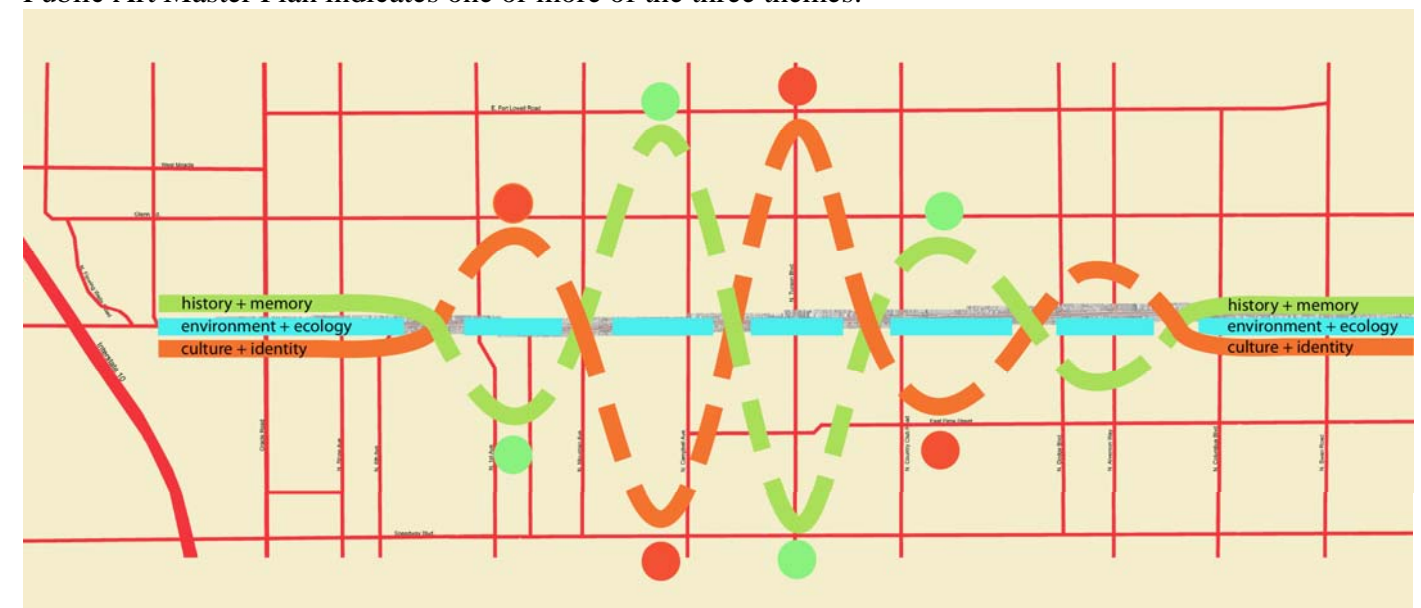


Figure 44: Public Art Themes

The following public art recommendations are included in the Public Art Master Plan. Each of these recommendations requires close collaboration with the team that is designing each phase of the Grant Road improvements.

1. Extra Large-Scale Thread Art Project

It is recommended that an extra large-scale project be crafted from the vision and skill of the final design artists to make a collection of related artworks that compositionally and thematically form a whole. This project would add unity to the Grant Road improvements, and lay the groundwork for the other art opportunities. An extra large-scale water reclamation project is recommended to run the entire length of roadway. It is recommended that one artist be chosen, and that preliminary design work be done with the Design Team to lay the groundwork. This artist/artist team would need to work very closely with the Design Team members to ensure a coordinated approach. There are several community-identified flooding areas as well as designated Flood Plain areas. In coordination with the Design Team, these may provide locations for a sequence of Art/Water Harvesting devices. Possible approaches include creating a sequence of reclamation devices that feed planting areas (as in the “Grow Vine Street” Project illustrated in **Figure 45**),

creating a series of passive water harvesting zones as art elements, or using art elements to call attention to the ecology of water resources.



Artist Buster Simpson, "Growing Vine Street"

Figure 45: Example Water Reclamation Art Project

2. Large-Scale Gateway Art Projects

It is recommended that a sequence of approximately five "gateways" projects be commissioned at major intersections to announce various districts/community hubs along Grant Road, see **Figure 46** which illustrates a gateway art project. These will emphasize both the individual character of each district, as well as, the concept of continuity for the Grant Road corridor. Each Gateway should be created by an individual artist or artist team and have its own unique identity and approach.



Artist: Brian Borrello, "Silicon Forest"

Figure 46: Example Gateway Art Project

3. Medium-Scale Streetscape Art Projects

Three streetscape projects are recommended for the major sections of Grant Road (Western, Central, and Eastern). **Figure 47** illustrates a street furniture art project. These projects may propose solar lighting, shade structures, street furniture, recycling stations, street light attachments, and bus-stop related amenities. They should reference the history of the specific location or Tucson itself. It is recommended that the artworks be located close to the bus stops. Approaches may range between a small number of objects located near a bus stop to a larger collection of small elements along the entire section.



Artist: Anne Leuck Feldhaus "Suite Chicago Dogs"
Hand-Painted fiberglass furniture for the Suite Home Chicago Public Art Project

Figure 47: Example Street Furniture Art Project

4. Pavement and Wall Art Projects

It is recommended that this opportunity be implemented as surface art that interprets the unique flora and fauna of Tucson on the ground and vertical surfaces, see **Figure 48**. They may be located in heavily used pedestrian areas such as adjacent to bus stops, on sidewalks, walkways, and medians associated with toucan and pelican type road crossings, and on the vertical surfaces of raised bed planters or retaining walls. It is recommended that they be organized within the six phases of construction. These projects may be imbedded directly into the sidewalk or median island pavement. These small-scale works will provide a sense of discovery and delight for pedestrians of all ages. They may also provide neighborhood identification and markers for specific places. The many facets of the flora and fauna of the region should be interpreted and transformed with pattern and color alterations. Rather than literal and predictable solutions, the artwork should offer layers of meaning and depth. Artworks should offer a diversity of expression and interpretation, and thereby inspire reflection from repeat viewings of the projects.



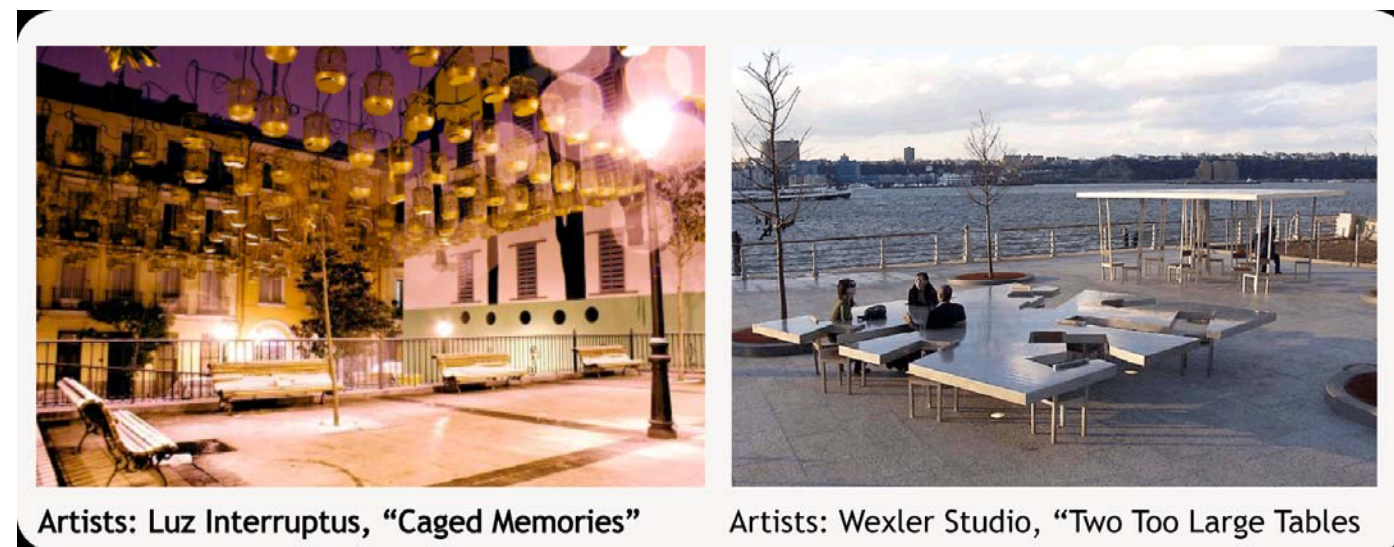
Artists: Claudia Reisenberger and Franka Diehnelt of Merge Conceptual Design, "It Leaves"

Colorful plant motifs representing the local flora of East Los Angeles including Bird of Paradise and Eucalyptus enliven this retaining wall. The layered patterns create a lace-like quality that move from dense to more open patterns.

Figure 48: Example Surface Art Project

5. Special Places Art Projects

The community has identified several spots along Grant Road that may be used as art plazas, pocket parks, or outdoor rooms. While some of these spaces may fall under “Public-Private Partnerships,” others may be the result of remnant parcels from the road alignment. In this case, underutilized areas may be transformed into spatial artworks, see **Figure 49**. It is anticipated that the potential for these places will become more evident as the design and construction of the roadway proceed. The community has informally identified several spots including many open areas in the Western segment of Grant Road, the Southeast corner of Grant and Euclid, the area within and adjacent to the Dollan Middle School, the Northeast corner of Grant and Alvernon, the area outside of the Tucson Botanical Garden, and just east of the Northeast corner of Grant and Columbus.



Artists: Luz Interruptus, “Caged Memories”

Artists: Wexler Studio, “Two Too Large Tables”

Figure 49: Example Spatial Art Project

6. Public-Private Art Projects

The community expressed the desire to create opportunity for façade and other building improvements to business and other stakeholders along the roadway. While there are many architectural “treasures” such as historic houses, signs, and mid-century buildings; the aesthetics of the street would vastly improve with artworks connected to the structures. Opportunities exist for “façade art” in settings such as areas of blank walls or glass, see **Figure 50**. Other options include enlivening blank stretches of parking lot edges with “art elements.”



Artist: Ned Kahn, “Technorama Façade”



Figure 50: Example Façade Art Project

7. Temporary Art Projects

The Grant Road Improvement Plan will be constructed over the next fifteen years. For each of the six phases of construction, temporary protective fencing and scaffolding will be installed along the roadway. These surfaces provide a canvas for a range of quick temporary artworks see **Figure 51**. These pieces are an opportunity for beginning and emerging artists to test ideas and experiment. The public then experiences an outdoor exhibition on an otherwise blank skin along the public right-of-way.



Artist: Maya Barkai, “Walking Men 99”
photographs of 99 pedestrian traffic lights
icons from cities around the world



Artist: Klein Dytham, “Green Green
Screen” graphic patterns alternate with
soil-filled burlap pockets of plants

Figure 51: Example Temporary Art Project

Implementation of the Public Art Master Plan

It is the intent that the Grant Road Public Art Master Plan (PAMP) be used by the City, the selected final design public artists, and the involved public as a guide and framework by which all parties might find a way to participate in the idea that along Grant Road there will be a coordinated and meaningful assembly of public art. To this end, the PAMP has fashioned maps and appendices that delineate the publicly expressed content areas for artists to consider. Furthermore, it denotes a system that specifies the opportunities and places in the public realm, plus encourages ideas for public/private partnerships in the publicly visible realm. It was with this purpose that the PAMP planning effort had open participatory meetings and workshops during which the stakeholders and concerned citizens were encouraged to give shape and voice to their ideas and concerns in order that the PAMP be sympathetic and embedded with a public conscience.

As the public art calls are issued, the PAMP should be referenced in both the structure of the call for artists and the spirit exhibited by the artist selection committee. Artists should be encouraged to read the Grant Road PAMP to better understand the desires of the stakeholders and their expressed needs. The PAMP can also be used by the design teams that prepare the final designs for the individual phase of Grant Road's implementation, so that the urban designers and landscape architects can integrate design concepts from the PAMP into their designs for streetscape and landscape.

9.3 Streetscape Zones and Major Features

The streetscape for Grant Road is being designed to both support the unique character of the centers and districts along the road, and to highlight major transportation design features as features that occur repeatedly along the entire length of the road.

The streetscape for Grant Road consists of landscape plantings, paving design, railings, sunshades, bus and other pedestrian shelters, signs and monuments (for businesses, districts, neighborhoods, and other information), retaining and seating walls, and other design elements that define the character of Grant Road, particularly for pedestrians and in relation to the built context along the road.

9.3.1 Streetscape Design Analysis

In the analysis of the Grant Road landscape, four areas of influence have been identified: Streetscape Zones, Streetscape Design Elements, Streetscape Elements, and Streetscape Variables.

- **Streetscape Elements** which are the plants, paving techniques, and other individual elements that are used within each Streetscape Zones; these are the individual design elements that are applied in the Streetscape Zones and Features.
- **Streetscape Zones** define which portions of Grant Road are design with which streetscape and palettes and the linkage between the design character of the roadway and adjacent context.
- **Streetscape Variables** are one set of factors used to determine the location criteria for Streetscape Elements, see discussion of pedestrian-supportive areas in section 9.3.4 Streetscape Variables.
- **Streetscape Design Features** are those features that repeat along Grant Road, such as the Indirect Left Turn major intersections and turn-arounds, the Pelican and Toucan crossings, the minor intersections that do not have the Indirect Left Turn treatment, etc.

Together the analyses of these three areas of influence shape the Grant Road Streetscape Concept.

9.3.2 Streetscape Elements

Within each Streetscape Zone an array of Streetscape Elements is applied within Grant Road; plants, walls, paving, bus stops, median streetscape, and street furniture. Some are specific to the Zone and others are used throughout the roadway. It is the specification and locations of these elements which gives each zone and ultimately, the roadway, its visual character. The Streetscape Elements for Grant Road fall within three categories, namely: Landscape, Hardscape, and Street Furniture. Each of these types of elements helps to establish a corridor-wide identity for the street while also shaping the character of individual areas.

Streetscape elements will provide both specific functions and aesthetics. Functional aspects include:

- Micro-climate for pedestrians
- Shade for urban heat island mitigation
- Visual access to business and visual screening to residences
- Opportunities for rainwater percolation/use
- Property value increase
- Pedestrian safety and comfort
- Creation of a human scale
- Creation and enhancement of community character and identity

Aesthetic aspects include:

- Visual identification and cues
- Sense of place
- Softening of the urban hardscape environment

In some cases, hardscape, street furniture, and other elements of the overall streetscape design can serve functions often served by landscape alone, such as shade, providing a rhythm and scale to the character of the street. This use of streetscape elements can be particularly effective where there is not enough land, water, or air space. Likewise, landscape can be used to help streetscape elements serve their traditional functions, such as providing visual cues for areas with higher levels of pedestrian activity, see discussion of pedestrian-supportive areas in section 9.3.4 Streetscape Variables.

A key aspect of the streetscape design for Grant Road is that elements often serve multiple functions. A sign can both direct pedestrians or motorists to destinations and establish the identity of the surrounding community; a shade structure can also catch and harvest rainwater; and many elements can also serve as public art.

The following sections for Landscape, Hardscape and Street Furniture provide more detail as to how each achieves the goals and functions outlined above.

9.3.2.1 Landscape

The landscape is a major component of the streetscape and, as discussed above, provides functional and aesthetic benefits to Grant Road. The public perception of the landscape is a major component of how Grant Road will be perceived by drivers, pedestrians, and those who work, shop, and live along Grant Road and the areas around it. An understanding and appreciation of the unique context of the Sonoran Desert and the history of Tucson are a major factor in the successful implementation of the landscape along Grant Road.

Landscape planting palette

The plant material is grouped into two types of palettes, one is the indicator plants for each Streetscape Zone, and the other is the general plant palette which is used throughout the corridor.

Table 18. Grant Road Zone Non-Indicator Planting Palette

Variable	Non-Indicator Planting Palette
<i>Plants requiring no irrigation beyond water harvesting</i>	
Accents	<ul style="list-style-type: none"> • Carnegiea gigantea – Saguaro • Fouquieria splendens – Ocotillo
<i>Plants requiring no irrigation beyond water harvesting after a three year establishment period</i>	
Shrubs	<ul style="list-style-type: none"> • Eracameria laricifolia – Turpentine Bush • Ephedra viridis – Mormon Tea • Larrea divaricata – Creosote • Simmondsia chinensis – Jojoba
Accents	<ul style="list-style-type: none"> • Agave Murphei – Murphey's Agave • Euphorbia antisyphilitica – Candelaria • Opuntia vs. – Prickly Pear • Pachyereus marginatus – Mexican fence post

Table 18. Grant Road Zone Non-Indicator Planting Palette (continued)

Variable	Non-Indicator Planting Palette
<i>Plants requiring supplemental irrigation.</i>	
Shrubs	<ul style="list-style-type: none"> • Calliandra eriophylla – Fairy Duster • Leucophyllum vs. – Texas Rangers • Dalea pulchra – Bush Dalea • Dodonaea viscosa – Hopseed Bush • Ruellia californica – Sonoran Desert Ruellia • Salvia clevelandii – Cleveland Sage • Salvia greggi – Chihuahuan Sage
Accents	<ul style="list-style-type: none"> • Dasyliirion acrotriche – Green Desert Spoon • Dasyliirion texanum – Texas Sotol • Dasyliirion wheeleri – Desert Spoon • Hesperaloe nocturna – Night Blooming Hesperaloe • Nolina vs. – Nolin

Zone Indicator Plant Palettes: Each Streetscape Zone will have a specific set of plants which will dominate the zone and will occur in no other Zone. The set of indicator plants will consist of a Desert tree class, shrub, accent plant, and ground cover. A listing of the indicator plants is included in the discussion of each Zone, below.

Non Indicator Plant Palettes: Table 18 provides a list of plants which can be used throughout Grant Road. The key to the use and location of these plants will be their water requirements and how they function.

Soil Volume: Roadside areas that will be landscaped will not be compacted. The minimal compaction will aid in percolation of harvested rainwater as well promote healthy tree r or zone growth. Based on the typical roadside planter width of 12' is estimated that each tree will have approximately 600 cubic feet of uncompacted soil (12-foot x 25-foot x 2-foot depth). Trees in roadway medians will have an estimated 850 cubic feet of uncompacted soil.

Where non-compaction of planting area is not a feasible option, the soil in the landscape zone will be aerated to a depth of 2-foot before the trees and landscaping are installed. This report proposes that future design teams (with each reconstruction project) investigate the possible use of structural soils for locations where trees are in grates and/or cannot achieve the non-compaction proposed above. These areas might include bus stops, trees in walkways and other hardscape areas; also, see the discussion on tree grates in section 9.3.2.3 Street Furniture. As structural soils are not readily installed in the region, the use of

structural soils at the bus stops in the Phase 1 Oracle Intersection project could become a test case study for City of Tucson. The city can monitor these installations and decide if they want to follow this approach in other locations on Grant Road or throughout the city.

Landscape variables

The following set of variables is overlaid on the basic concepts for landscaping the roadway to determine the location and extent of conditions that affect landscape treatments. These variables include the following:

- **Sight Visibility** – Identifying areas along the roadway with height restrictions based on sight visibility requirements for the safety of vehicles, bicycles, and pedestrians that are moving along and across Grant Road; this includes maintaining visibility for those in wheel chairs.
- **Viewshed Analysis** – Determining what can and cannot be seen from specific locations to identify opportunities and constraints created by viewsheds. Specifically, views of important roadway functions such as; traffic signals, pedestrian crossings, and bus pull-outs, off-site vistas, business and wayfinding signage will be identified for framing and negative views such as loading zones and maintenance areas for screening.
- **Water Harvesting Zones** – locating the type of water retention techniques to be used along the roadway.
- **Pedestrian and Bicycle Circulation Patterns** – Identify circulation paths and conflicts for walkers and cyclist each other and with vehicular traffic patterns.

9.3.2.2 Hardscape

Hardscape will primarily consist of paved surfaces including sidewalks, crosswalks, pedestrian refuges, and the Indirect Left Turn “Turn-Around” area. These surfaces provide not only sturdy, durable surfaces for driving and/or walking, but also visual cues for motorists, visual narrowing of the roadway to a more approachable scale and for speed management, opportunities for management of rainwater through permeability, and opportunities for public art in the scoring and other finishing treatments of concrete. Hardscape also includes retaining or other decorative walls.



Figure 52: Example Scoring Pattern

Paving

Paving will generally consist of scored concrete which will be relatively easy to install and maintain. Consideration should be given to the applicability of any paving patterns to the variable conditions along the roadway. Repeating the pattern along the length of the roadway and having a pattern that is flexible in terms of paving width can provide the desired flexibility for a paving pattern that can meet the varying sidewalk conditions along Grant Road. The color and scoring pattern will be coordinated with the selected streetscape furnishings, reflect the local design aesthetic, and will be unique to Grant Road. Pavement color and finish should also take into consideration the desire for low reflectance to minimize heat island effects. Error! Reference source not found. shows the type of scoring technique that will likely be used. Public art can also be integrated into paving in key locations along Grant Road, see section 9.2.5 Public Art in Streetscape Design for additional discussion.

Finally, the use of any special coloring of pavement that will be driven over by vehicles, particularly in the Indirect Left Turn turnaround areas, needs to be carefully considered, because over time tire wear and oil from vehicles can discolor the treatment and result in an unsightly and worn appearance to the roadway.

Walls

Walls on Grant Road will primarily include retaining walls and seating walls. Walls are an opportunity for public art, see section 9.2.5 Public Art in Streetscape Design for additional discussion.

9.3.2.3 Street Furniture

The remaining streetscape for Grant Road includes lighting, shade structures, signs, and other elements. These elements will work with the landscape and hardscape to create a safe, comfortable, and compelling environment along Grant Road that complements the roadway and engages with the surrounding land uses.

Ensemble of Street Furniture

Grant Road preferred street furniture (Error! Reference source not found.) will have a sleek, simple modern look that subtly contrasts with the landscape treatments for Grant Road; and which will create a unique identity within the design aesthetic of streets in Tucson. Ease of installation and maintenance, overall availability, material and installation cost will also be considered in terms of final furniture selection. Selected streetscape elements generally will have a light silver metallic powder coat finish. The color will enhance the sleek, modern style of the furnishings and the lighter color will absorb less heat throughout the day; this will also allow galvanized finished items, such as standard bicycle racks to blend in with the overall streetscape. The preferred style should allow for more continuity in character and design over the 15-year build out of the Grant Road improvements. It is likely that manufacturers may change or discontinue some of the selected street furnishing elements, but over the recent years manufacturers have consistently developed models of street furnishings with a sleek and more modern appearance, including the use of silver metallic finishes. It can be expected that this style will remain current over the next 15 years. An alternative streetscape palette (Figure 54) that is a contemporary interpretation of more traditional-styled streetscape furnishings has also been developed, but is not recommended.

Custom pole

A signature multipurpose pole is a simple element that can provide an ‘identity’ element for Grant Road’s streetscape. This pole can provide both a unifying feature for the corridor while its multipurpose uses allow for the community character of different areas along Grant Road. The pole can be used to support and create signs, vertical shade elements, horizontal shade elements, screens, water harvesting elements, “green screens,” decorative elements in the narrow 6-foot median, and railings. The pole would have three variations depending on the size needed, 7 feet, 15 feet, and 25 feet.

Figure 55 shows what a custom Grant Road pole could look like, and how it would be used to achieve the design goals and Guiding Principles of the project. The design of the pole is related to the preferred pedestrian light pole design, should a different light pole be the final selection. Consideration should be given to redesigning the pole if a different pedestrian light pole is selected for construction.

Lighting: Luminaire



Lumec: Capella (preferred)



Note: Luminaire will be installed on custom pole, not on pole shown



Architectural Area Lighting: Flex (alternate)



Bollard



Hess: Paris (in Silver)

Tree Grate



Ironsmith: Market Street (location dependent)



River stone instead of grate (location dependent)

Seating



LandscapeForms: Austin (preferred)



Forms & Surfaces: Balance (alternate)

Receptacle



LandscapeForms: Austin (preferred)



Forms & Surfaces: Dispatch (alternate)

Figure 53: Street Furniture Ensemble

Lighting: Luminaire



Lumec: Dolmus



Hess: Augusta

Tree Grate



Ironsmith: Palm

Bollard



Fairweather: B-8

Seating



Victor Stanley: FS-20 (no armrests)



LandscapeForms: Town Square

Receptacle



LandscapeForms Presidio



LandscapeForms Washington Square



Victor Stanley RTC-40

Figure 54: Alternate Street Furniture Ensemble

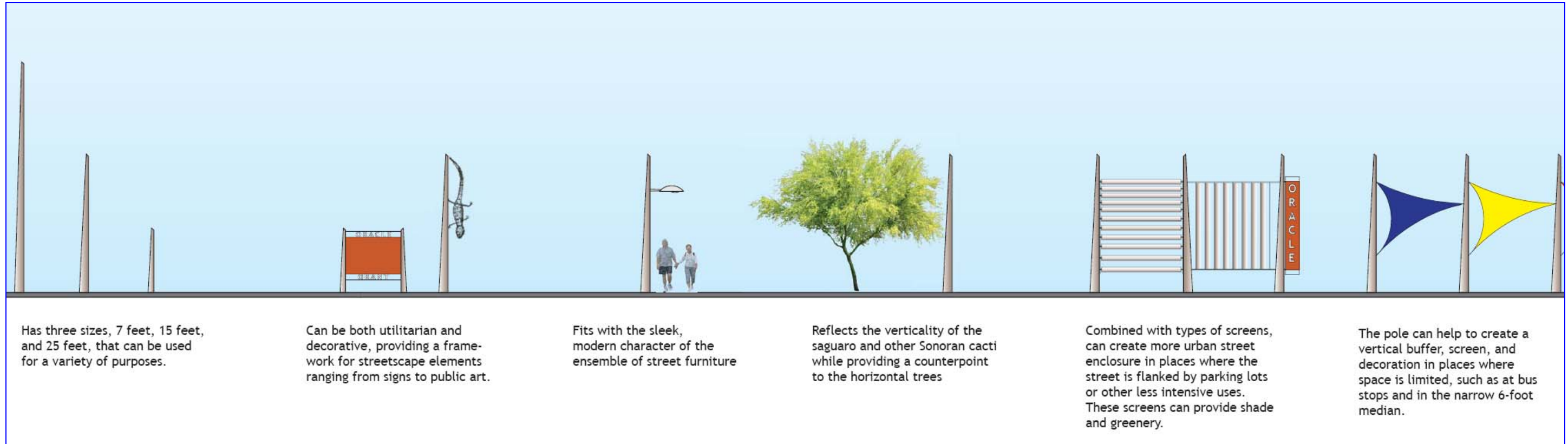


Figure 55: Custom Pole Concept and Applications

Tensile shade fabric

Tensile fabric is also an element that can be used with a variety of structures while providing a flexible design element that can unify the corridor with a consistent strong visual and material appearance while creating character for individual areas through variations in color or form; see **Figure 56** which shows examples of tensile shade fabric applications from manufacturers Tensile Shade Products of Tucson. Shade structures are proposed for use at right-turn islands, Pelicans, and potentially bus stops in pedestrian-supportive areas. They could also be used in the smaller pocket park spaces within the right of way of Grant Road and within the Alvernon Transit Plaza. Shade structures are relatively easy to maintain with their fabric being designs to weather well and they can be easily cleaned with a water spray; many manufacturers provide a 10-year UV warrantee. Shade structures can be made as pieces of public art in and of themselves, and it is also possible to project onto them in the evening and at night as pieces of temporary or permanent art.



Figure 56: Example Tensile Shade Fabric Applications

Lighting

Lighting is an important aspect of the Grant Road streetscape concept. Lighting can be used to improve roadway and pedestrian safety, and particularly can be used to highlight areas with more pedestrian activity. At the same time a balance must be struck to avoid over-lighting both for energy conservation and night sky concerns; and in relation to both the capital and on-going maintenance budgets for the project.

Street and Pedestrian Pole Mounted Lighting

In addition to the standard roadway lighting, pedestrian safety lighting will be provided in areas with high pedestrian volumes, where pedestrian safety is a concern, and where conflicts between motorists and pedestrian may occur, such as at crosswalks, bus stops, driveway access points with frequent traffic, and Indirect Left Turn turnarounds. More pedestrian safety lighting has been included in the pedestrian-

supportive areas, and as Grant Road improvements are implemented over the next 15 years, attention should be given to other potential pedestrian-supportive areas that will come into fruition over time (see section 9.3.4 Streetscape Variables).

Pedestrian lighting (**Figure 57**) will be placed at a lower height than roadway lights, typically 11-15 feet, and is spaced more frequently, around 25-40 feet, in order to provide even lighting with minimal shadows and glare. All pedestrian lighting will have full cut-offs in order to be Dark Sky Compliant and therefore reduce potential light pollution. Pedestrian light poles will be the 15 foot custom light poles described earlier and the preferred luminaire is the Capella CPLS with an HID lamp and flat lens optics manufactured by Lumec.



Figure 57: Preferred Luminaire, Photo (left) and Rendering on Custom Grant Road pole (right)

Benches and Seating

Seating will be placed in areas with high pedestrian frequency such as around bus stops and in the medians of some pedestrian crossings. The seating will be a combination of manufactured benches from the streetscape furnishings palette and concrete seat walls, discussed in the earlier wall section. Fences and railings may also provide an additional “leaning bar” for passengers at bus stops and in the median at pelican intersections. Seating color and material selection has given consideration to user comfort in intense sun and heat as well as maintenance. Concrete seat walls will have metal, or other appropriately designed elements as, skateboard deterrents installed every 3 feet in a style with will compliment the general streetscape palette. The preferred bench is the Austin Bench manufactured by Landscape Forms with a cantilevered base, aluminum slats, and optional armrests (**Figure 58**).



Figure 58: Preferred Bench (with arms)

Trash Receptacles

Trash receptacles will be placed at intervals along Grant Road, and particularly in areas with higher pedestrian activity, such as bus stops. In order to reduce waste and encourage recycling, a pair of receptacles can be used, one for trash and one for recycling. Receptacles will have hinged side doors to allow for easier access and trash removal by maintenance staff. At large transit stops, or other locations with a high pedestrian volume, more than one trash receptacle may be necessary. The preferred receptacle model is the Austin Receptacle with a side opening, manufactured by Landscape Forms (**Figure 59**). The City of Tucson will need to establish the responsibility for and funding source for regular emptying of the trash receptacles and the maintenance of these streetscape elements.

Newspaper and Information Distribution Dispensers

In order to prevent the unsightly collection of random, messy newspaper racks that often are placed near areas with high pedestrian traffic by vendors, uniform, attractive newspaper racks should be selected and provided in proximity to bus stops. The newspaper racks should coordinate with the rest of the streetscape furnishings. The City of Tucson will need to establish procedures for allowing publishers to utilize the dispensers and establish responsibility for and funding source for management and regular maintenance of the dispensers.

Bollards

Bollards will be provided at locations such as crosswalks, especially at median refuges, and at any other areas of high conflict between pedestrians and motorists in order to provide a level of protection and safety. Some bollards may also incorporate a traffic “push button” at pedestrian intersections. The preferred bollard is the Paris 1100, manufactured by Hess.

Tree Grates

Tree grates may be provided for the trees planted in the sidewalk and plaza spaces where there is a higher amount of pedestrian activity and maximum walkable area is needed, such as where the double rows of trees are associated with the Indirect Left Turns. Tree grates allow additional air and water to reach the street trees and protect irrigation and tree roots while allowing pedestrians to circulation over the tree pit. Maintenance of tree grates is also an issue. Maintenance of the tree grates is important both to make certain that as trees grow they do not have their trunks become “girded” or cut by the tree grate. While tree grates are designed for regular removal and cutting to maintain an adequate opening around tree trunks, it is recommended that an 18 to 24 inch opening be provided in the tree grate at initial installation in order to extend the period before maintenance is needed. The installation must provide either a low “rail” around the opening or rock/gravel to protect pedestrians from tripping on the wider than standard grate opening. The selected tree grate design and material will coordinate with the rest of the streetscape palette. Tree grates also provide the opportunity to integrate design themes into the patterning of the grate and may incorporate a modern Southwest design motif or public art design. The selected grates are ADA compliant and ADA compliance should also be provided if public art is integrated into the tree grate designs. The preferred tree grate is the Market Street grate manufactured by Ironsmith in either an unfinished grey cast iron or a powder coat finished aluminum to match the other streetscape furnishings (**Figure 60**).



Figure 59: Preferred Trash Receptacle



Figure 60: Preferred Tree Grate

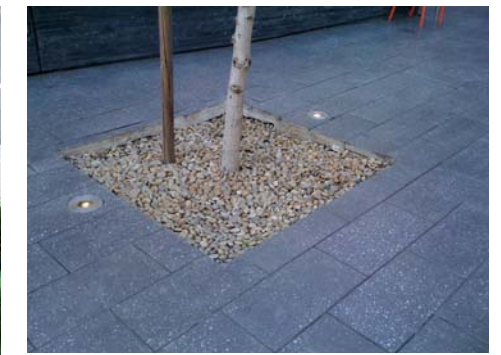


Figure 61: Alternative Tree Pit Concept with Gravel or River Stones

In areas with lower pedestrian frequency, other material may be used around the tree pit, such as local gravel or river stones that will function similarly to a tree grate. This will visually link the tree pits with the rainwater harvesting features and other rock highlights in the main 12 foot wide planter strip (**Figure 61**).

Flags and Banners

Flags and banners have several potential applications along Grant Road. At bus stops, flag signs may potentially inform the passengers as to which stop they are at, what routes stop there, and where the front of the bus will stop. Flags and banners could be hung from the light poles or their own dedicated custom poles and could be used to announce upcoming community events, exhibitions, or be used to identify that you are in a particular district or center. Banners tend to have a more commercial connotation and should not be used within residential districts.

Signs

Signs are a critical part of the Grant Road streetscape. They point the way toward destinations along the road while also creating and enhancing the identity of places along and near it, see **Figure 62**. The following types of signage will be placed as part of the Grant Road project:

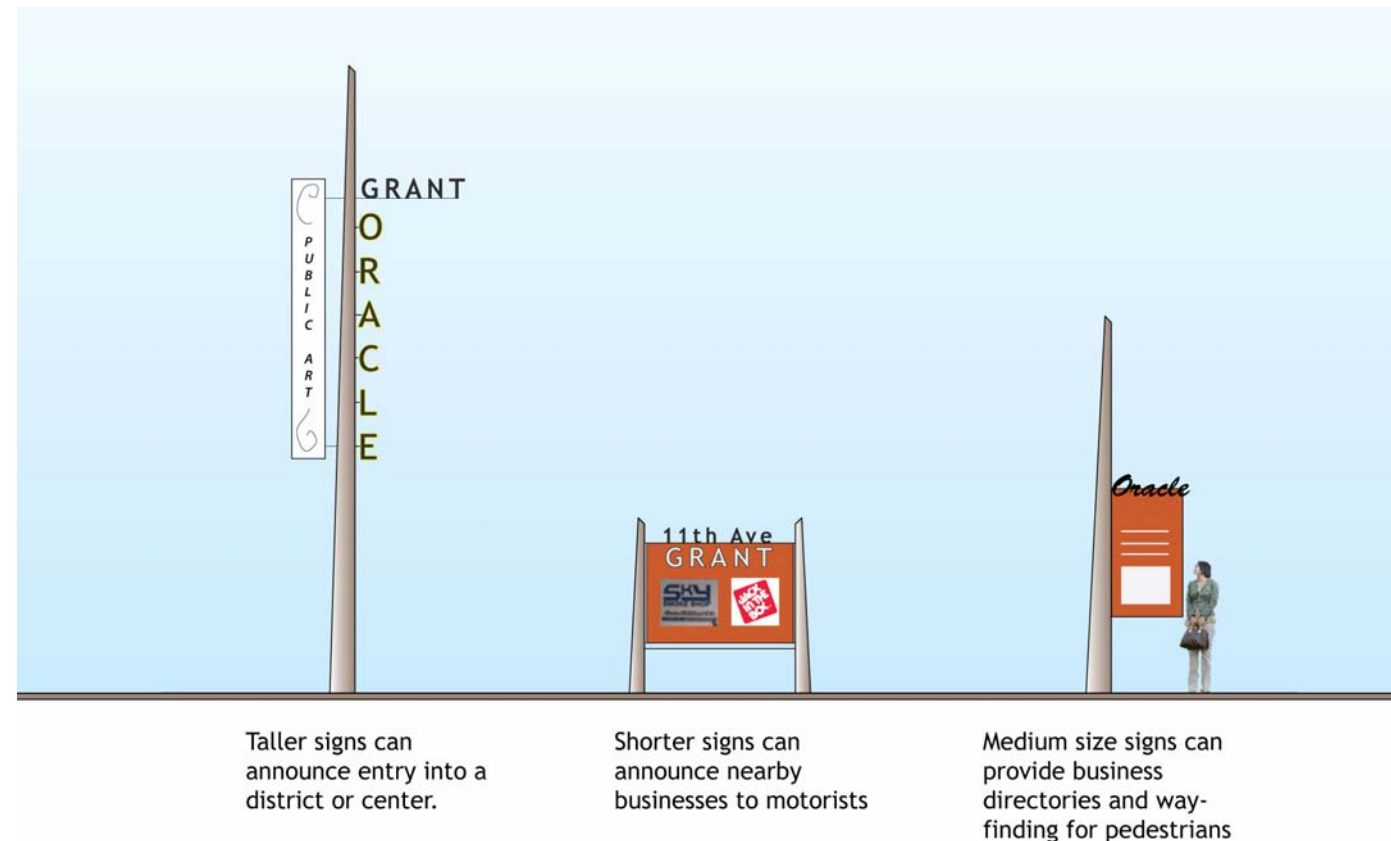


Figure 62: Sample Sign Design Concepts

Business and Shared Parking Signs

One of the biggest concerns from business owners regarding the Grant Road reconstruction has been the ability of motorists to identify businesses and other destinations with the addition of street trees, especially

because the number of driveways leading off Grant Road will be consolidated. While the degree to which street trees will hamper sightlines toward businesses and their signs will be limited, the concept has emerged to provide business signs in the landscaped area between the sidewalk and the roadway. The signs for various businesses would be grouped together on one sign in proximity to a shared driveway or a side road that provides access to the group. Such signs also provide the opportunity to include the name of the district, center, or neighborhood to strengthen the identity of the area. Similarly, signs should also be provided that indicate where shared off-street parking is provided either through agreement between property owners and businesses, through a business or district management group, or as public parking.

Center and District Gateway/Identity signs

Signs in the roadway median or along the landscaped areas along the sides can announce arrival into a center, district, or neighborhood. These are major opportunities to integrate signage with public art, based on the Public Art Master Plan.

Banners

Similar to the Gateway/Identity signs above, banner signs can help create identity for an area of the corridor, but in a smaller form that often repeats.

Pedestrian Wayfinding Signs

In pedestrian-heavy areas such as bus stops, major intersections, mixed-use centers, and public spaces, signage scaled for people on foot will point the way to nearby destinations. Bus stops also provide the opportunity to provide signs for pedestrians to help them find their way to local destinations.

9.3.3 Streetscape Zones

This section defines the three streetscape zones for Grant Road and the elements that are common and specific to each of them:

- Residential Zone
- Mixed Use Districts and Centers Zone
- Pedestrian Mixed Use Centers Zone

Figure 63 illustrates the application of the zones to the entire length of the Grant Road Improvement Project, as well as indicating the key transportation design features that will get specific streetscape design treatments.

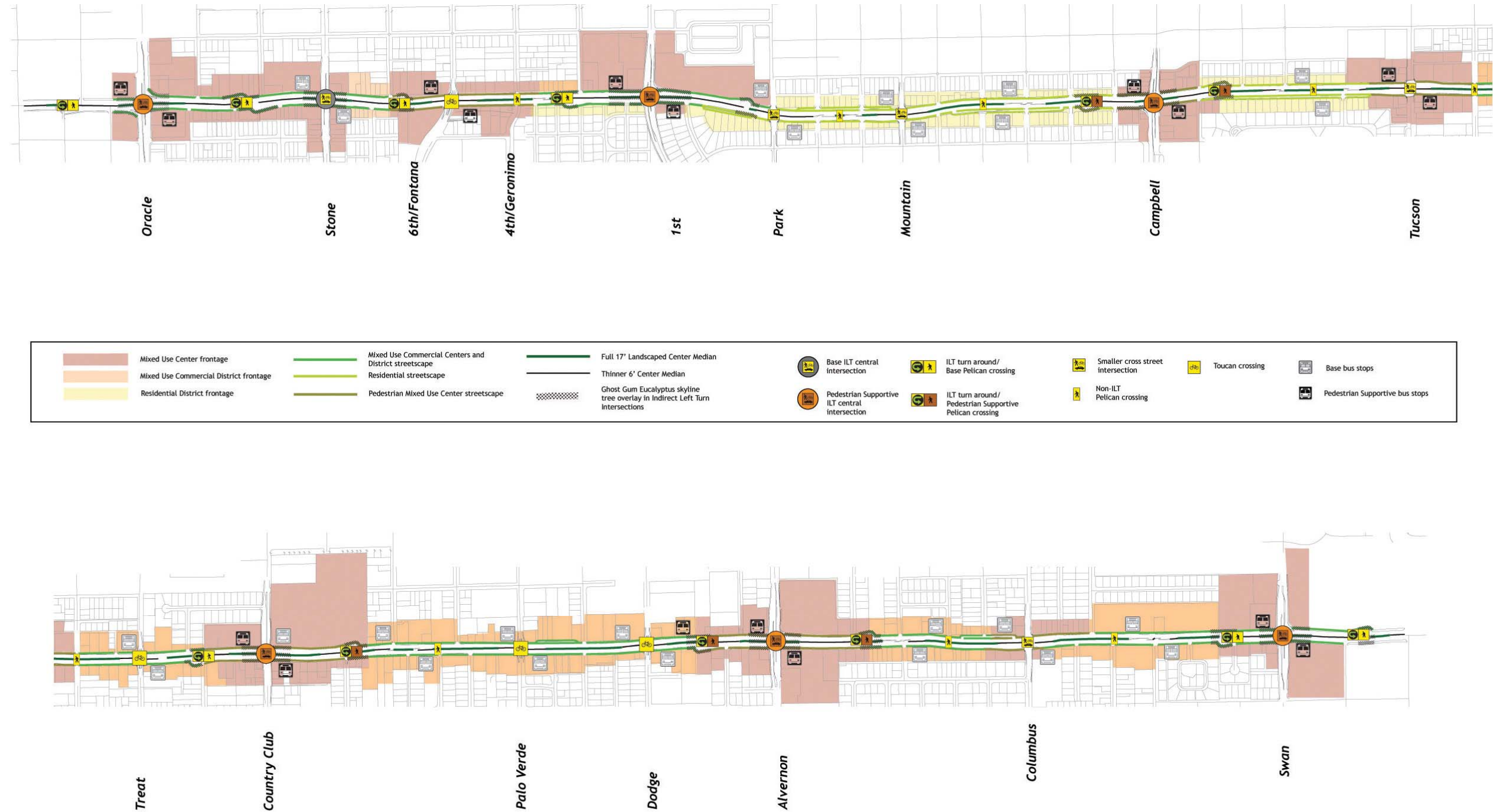


Figure 63: Mapping of Streetscape Zones, Key Transportation Features, and Median Widths over a Diagram of Center and District Types

9.3.3.1 Residential Zone

This zone (**Figure 64**) is characterized by older neighborhoods in the locations where homes front onto one or both sides of Grant Road. The new roadway in this zone will be characterized by local access lanes on one side and new development or open space on the opposite side. Important ways the streetscape can affect and improve the visual character of the roadway are:

- Minimize the use of walls or barriers within and adjacent to the right-of-way to keep the streetscape as open as possible to allow for visual monitoring of activity happening along the roadway.
- Use trees on both sides of the roadway and in both medians to increase the amount of shade within the zone.
- Use sidewalks that provide direct path of travel along the roadway to encourage convenient pedestrian travel.
- Utilize rainwater harvesting techniques to support a healthy landscape.
- Give the zone its unique character by using key indicator plants and zone-specific design elements, such as neighborhood gateway features, wayfinding signage, and paving details (**Figure 65**).



Figure 64: Residential Zone

Landscape Palette

The landscape planting palette for the residential zone is listed in **Table 19**.

Table 19. Grant Road Residential Zone Indicator Planting Palette

Zone	Zone Indicator Planting Palette
Residential Zones	<ul style="list-style-type: none"> • Trees: Acacia farnesiana – Sweet Acacia, Chilopsis Linearis – Desert Willow • Shrubs: Encelia farinosa –Brittle Bush • Accents: Agave palmeri – Palmers Agave, Muhlenbergia capillaris ‘Regal Mist’ – Pink Mulhy, Muhlenbergia rigida ‘Nashville’ – Nashville Mulhy, Yucca vs. – Yucca species • Ground Cover: Calylophus hartwegii - Calylophus

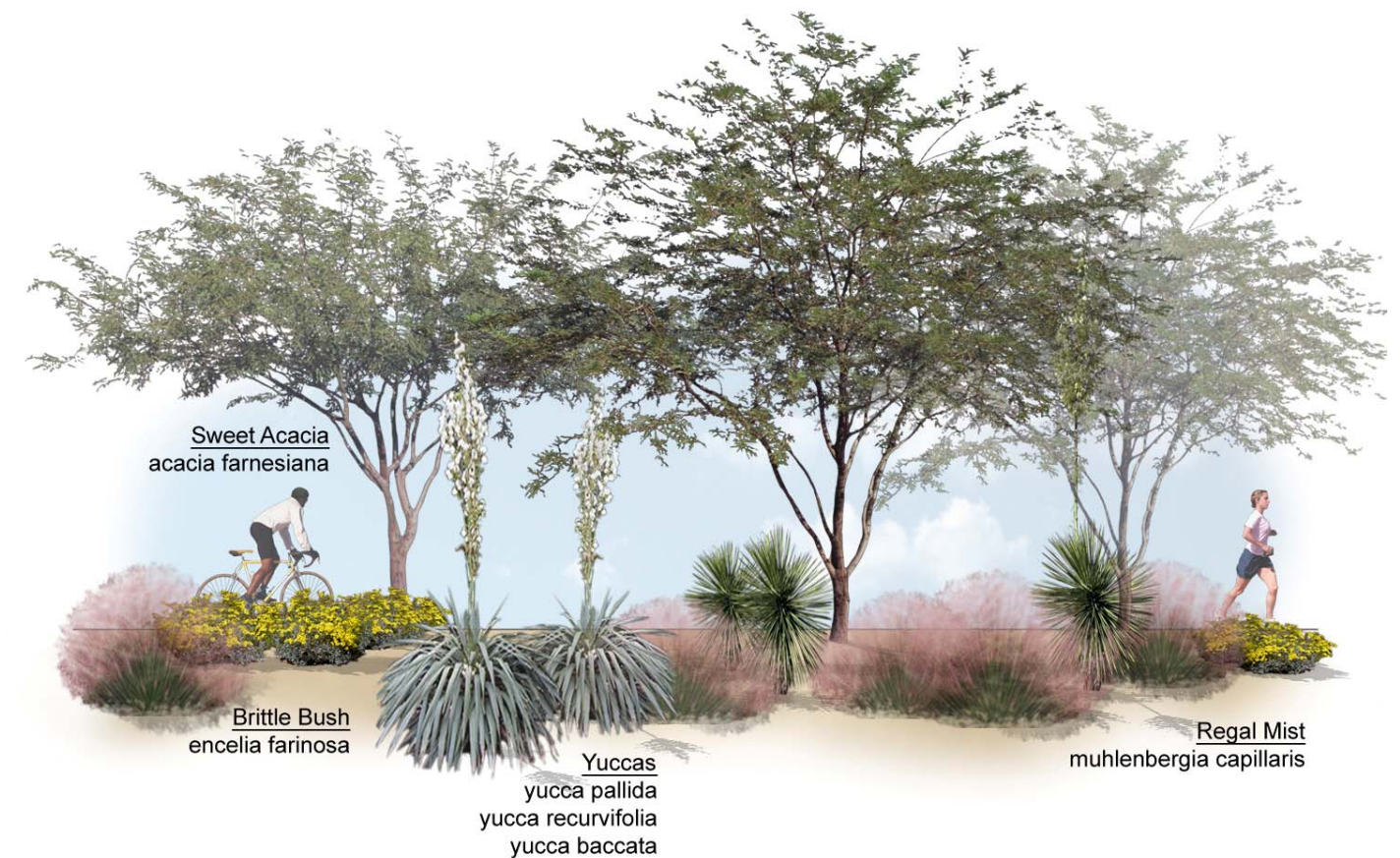


Figure 65: Residential Zone Plants

9.3.3.2 Mixed Use Districts and Centers Zone

This zone is currently characterized by strip commercial development, typically on both sides of the roadway (Error! Reference source not found.). Visual analysis of the existing context demonstrates the need for organization and reduction of stimuli within this zone. It is also the intent of the Community Character and Vitality Plan that is being developed for properties along Grant Road, that these areas become more mixed use with varying emphasis on commercial, industrial, service, and residential development, as well as having a change in character to support pedestrian activity. Important ways the streetscape can affect and improve the visual and physical character of the roadway are:

- Limit the number of curb cuts and incorporate district and shared parking lots
- Provide for signage within the right-of-way to identify retail clusters, individual businesses, and district parking locations.
- Use the landscape to separate the sidewalk from the roadway to support pedestrian activity
- Work with the property owners to effectively screen parking while minimizing the width of buffers
- Use rainwater harvesting techniques to support a healthy landscape
- Create gathering places along the roadway, such as bus plazas, pocket parks and pedestrian rest areas
- Give the zone its unique character by using key indicator plants (**Figure 67**) and zone-specific design elements, such as signs and monuments, fences, walls, shade structures, and paving details.

Landscape Palette

The landscape planting palette for the mixed use district and centers zone is listed in **Table 20**.

Table 20. Grant Road Mixed Use District and Centers Zone Indicator Planting Palette

Zone	Zone Indicator Planting Palette
Mixed Use Districts and Centers Zones	<ul style="list-style-type: none"> • Trees: Cercidium 'Desert Museum' – Desert Museum Palo Verde, Prosopis velutina – Velvet Mesquite, or Hybrid Mesquite • Shrubs: Caesalpinia pulcherrima - Red Bird of Paradise • Accents: Agave weberii – Weber's Agave, Pedilanthus macrocarpus - Candelilla • Ground Cover: Lantana montevidensis alba – White Trailing Lantana



Figure 66: Mixed Use Districts and Centers Zone

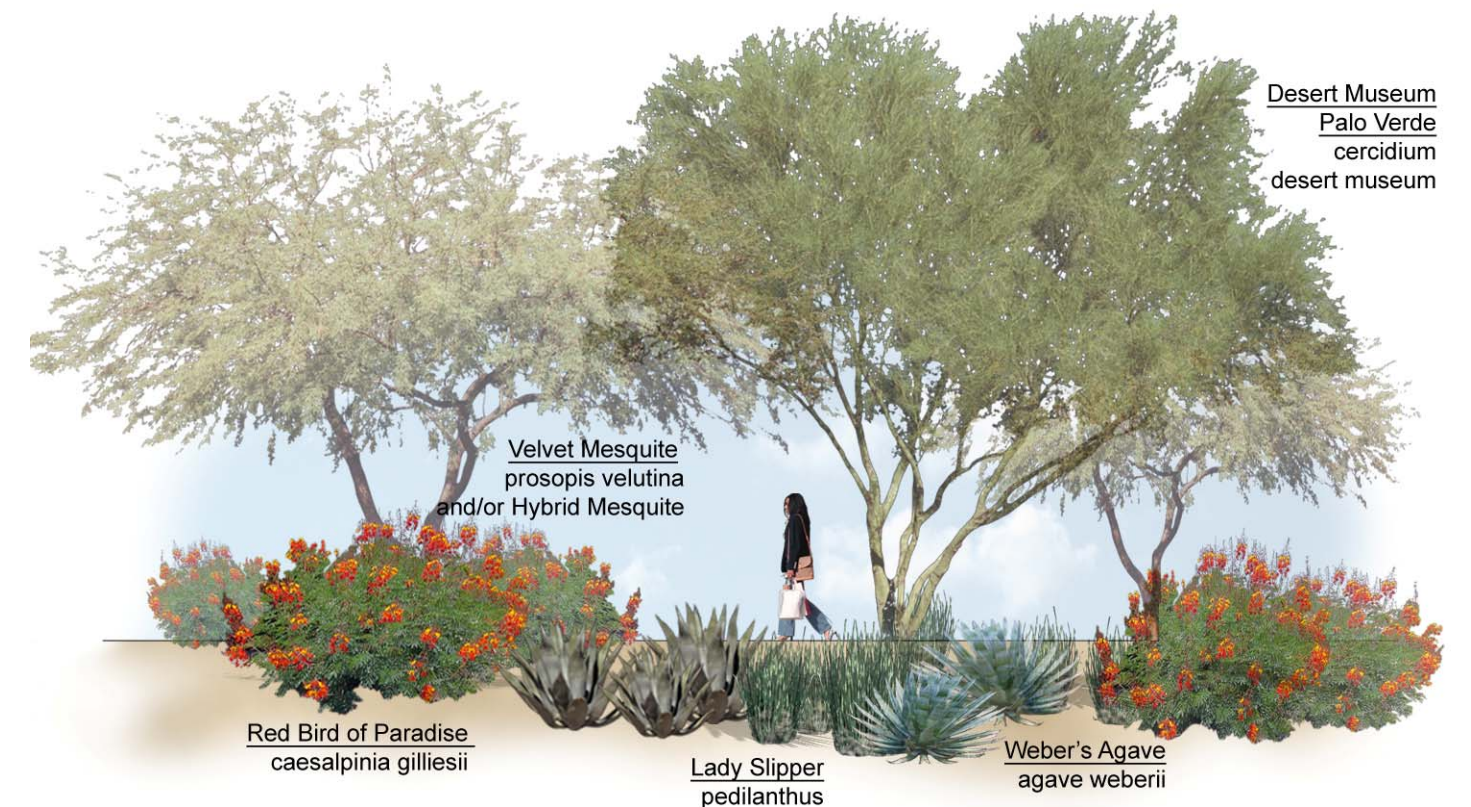


Figure 67: Mixed Use Districts and Centers Zone Plants

9.3.3.3 Pedestrian Mixed Use Centers Zone

This zone occurs in the Centers that are expected to have the most pedestrian activity and street-fronting uses as defined in the Community Character and Vitality Plan (**Figure 68**). The design characteristics of this zone will also be applied in the portion of Grant Road from the west indirect left turn intersection to the east

indirect left turn intersection and is characterized by indirect left turn lanes, signalized pedestrian crossings and a major intersection in the middle. It is applied in these locations, because many of the indirect left turns occur within the Centers described above, and because the indirect left turns are also locations that are expected to have relatively high levels of pedestrian activity, because of transit rider activity associated with crossing bus service and pedestrian activity associated with the commercial districts that occur along most major roadways that cross Grant Road. Important ways the streetscape can affect and improve the visual and physical character of the roadway are:

- Limit the number of curb cuts and incorporate district and shared parking lots
- Provide for signage within the right-of-way to identify retail clusters, individual businesses, and district parking locations.
- Use the landscape and streetscape elements to separate the sidewalk from the roadway to support pedestrian activity while maintaining visibility to street-fronting businesses
- Work with the property owners to effectively screen parking while minimizing the width of buffers
- Use rainwater harvesting techniques to support a healthy landscape
- Create special places along the roadway, such as bus plazas, pocket parks and pedestrian crossings and rest areas; and supporting the creation of open spaces, outdoor dining, and other activity on private property that enhances the pedestrian character of these zones.
- Give the zone its unique character by using key indicator plants (**Figure 69**) and zone-specific design elements, such as signs and monuments, signature banners, shade structures (both along sidewalks and over the Pelican crossings associated with the indirect left turns in this zone), fences, seat walls and paving details.

Table 21. Grant Road Pedestrian Mixed Use Centers Zone Indicator Planting Palette

Zone	Zone Indicator Planting Palette
<i>Pedestrian Centers Zone</i> <i>Mixed Use</i>	<ul style="list-style-type: none"> • Trees: Cercidium praecox – Palo Brea, Eucalyptus papuana – Ghost Gum • Shrub: Caesalpinia gilliesii – Yellow Bird of Paradise • Accent: Agave Americana – Century Plant, Agave salmiana – Salm’s Agavae, Hesperaloe parviflora – Red Yucca • Ground Cover: Lantana ‘New Gold’ – New Gold Lantana



Figure 68: Mixed Use Districts and Centers Zone

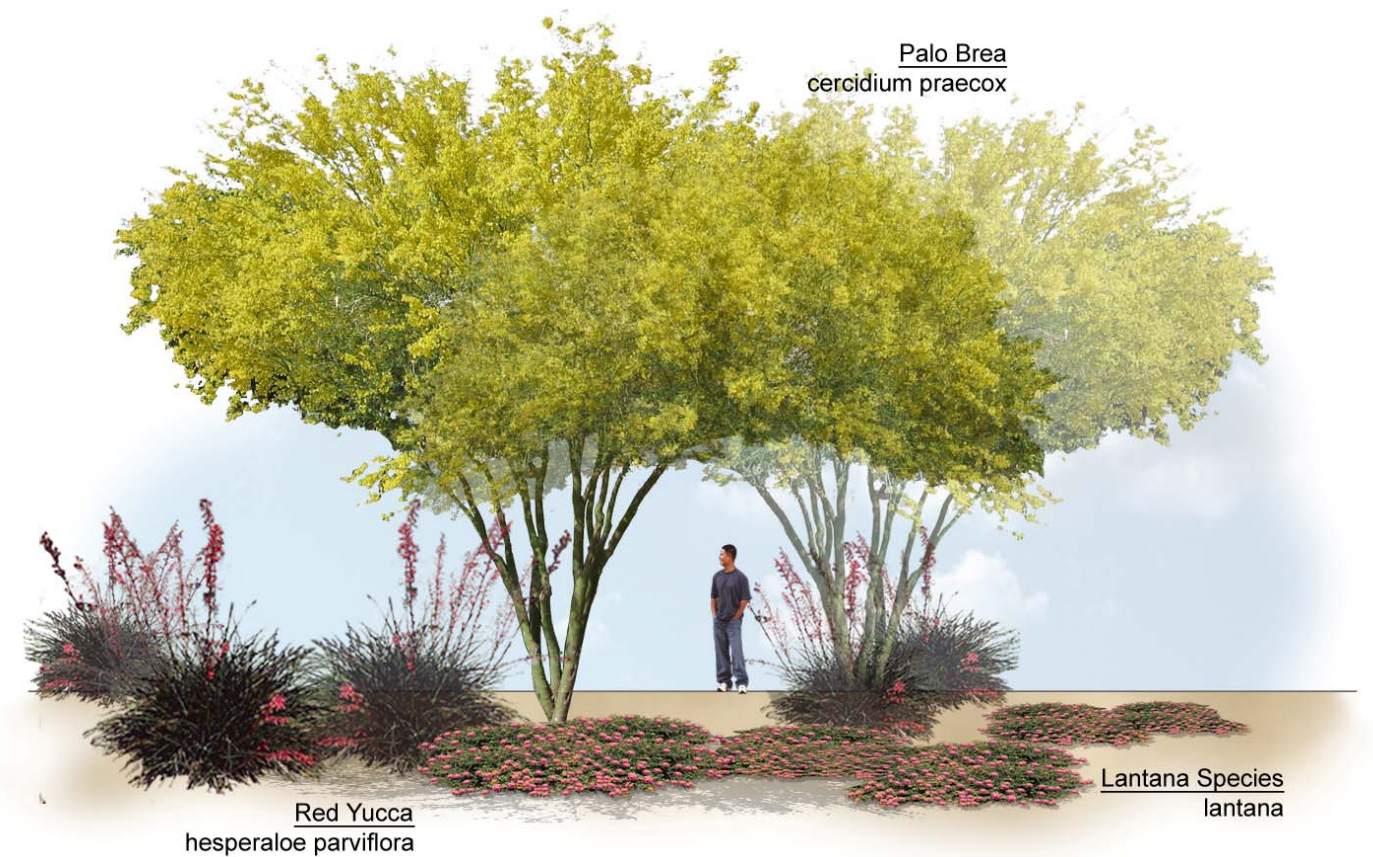


Figure 69: Mixed Use Districts and Centers Zone Plants

Landscape Palette

The landscape planting palette for the residential zone is listed in **Table 21**.

9.3.4 Streetscape Variables

Streetscape variables are the set of factors used to determine the location criteria for Streetscape Elements in the Grant Road Improvement Plan. These include overhead utilities, the level of pedestrian activity, and the potential for outside sources of funding for landscape maintenance and/or installation. These factors have been considered in the preparation of the 30 percent construction plans for streetscape and will need to be monitored as conditions change over the next 15 years of implementation.

9.3.4.1 Relationship of Overhead Utilities and Street Trees

Tucson Electric Power (TEP), and the other utilities that use their poles for overhead wires, have standards for maintaining clearances from street trees. The landscape concepts have taken these standards into consideration in specifying the species of trees and where they are located within the cross section of the roadway (see **Figure 70** and **Figure 71**). Near the Indirect Left Turn intersections and turnarounds, the TEP poles will need to be taller, 75 feet, in order to provide clearances around the traffic signal mast arms and poles. This allows for the taller Ghost Gum Trees to be planted in these locations as well. Throughout the remainder of Grant Road, where overhead utilities exist, a 65 foot pole will provide the desired clearance from the Palo Verdes and other “lower slung” trees that are within the landscape palettes. Coordination with TEP will determine the pole height for each of the Grant Road reconstruction projects.

9.3.4.2 Pedestrian-supportive Areas

Pedestrian-supportive areas of Grant Road are those places where higher levels of pedestrian activity exist, or can be expected in the near future. Given the higher levels of pedestrian activity a higher-level of improvements should be provided as these investments will provide safety and comfort to a larger number of pedestrians. Additional streetscape elements that should be included in pedestrian-supportive areas include:

- A higher number of pedestrian safety lights to provide more extensive and in some locations more intensive lighting;
- Vertical and horizontal shade structures to provide additional shade for pedestrians in those locations where they tend to wait (i.e.; transit stops, pedestrian crossings, and Pelicans);
- Bollards to provide a higher level of safety in relation to traffic; and,
- Benches and seat walls.

Design concepts for pedestrian-supportive areas are illustrated along with “base” improvements in later portions of this section of the design concept report.

The following locations along Grant Road have been identified as being current pedestrian-supportive areas, as the 15-year implementation of the Grant Road improvements proceeds additional areas may be identified:

- Oracle intersection extending to the two adjacent bus stops;
- 6th and Fontana Toucan crossing extending to the two adjacent bus stops;
- Campbell intersection extending to the Pelican crossings at the two indirect left turn turnarounds;
- Tucson intersection extending to the two adjacent bus stops;
- Country Club intersection extending from the bus stop to the west to the indirect left turn turnaround to the east;
- Alvernon intersection extending from the SAAVI bus stop to the west to the indirect left turn turnaround to the east; and,
- Swan intersection extending to the two adjacent bus stops.

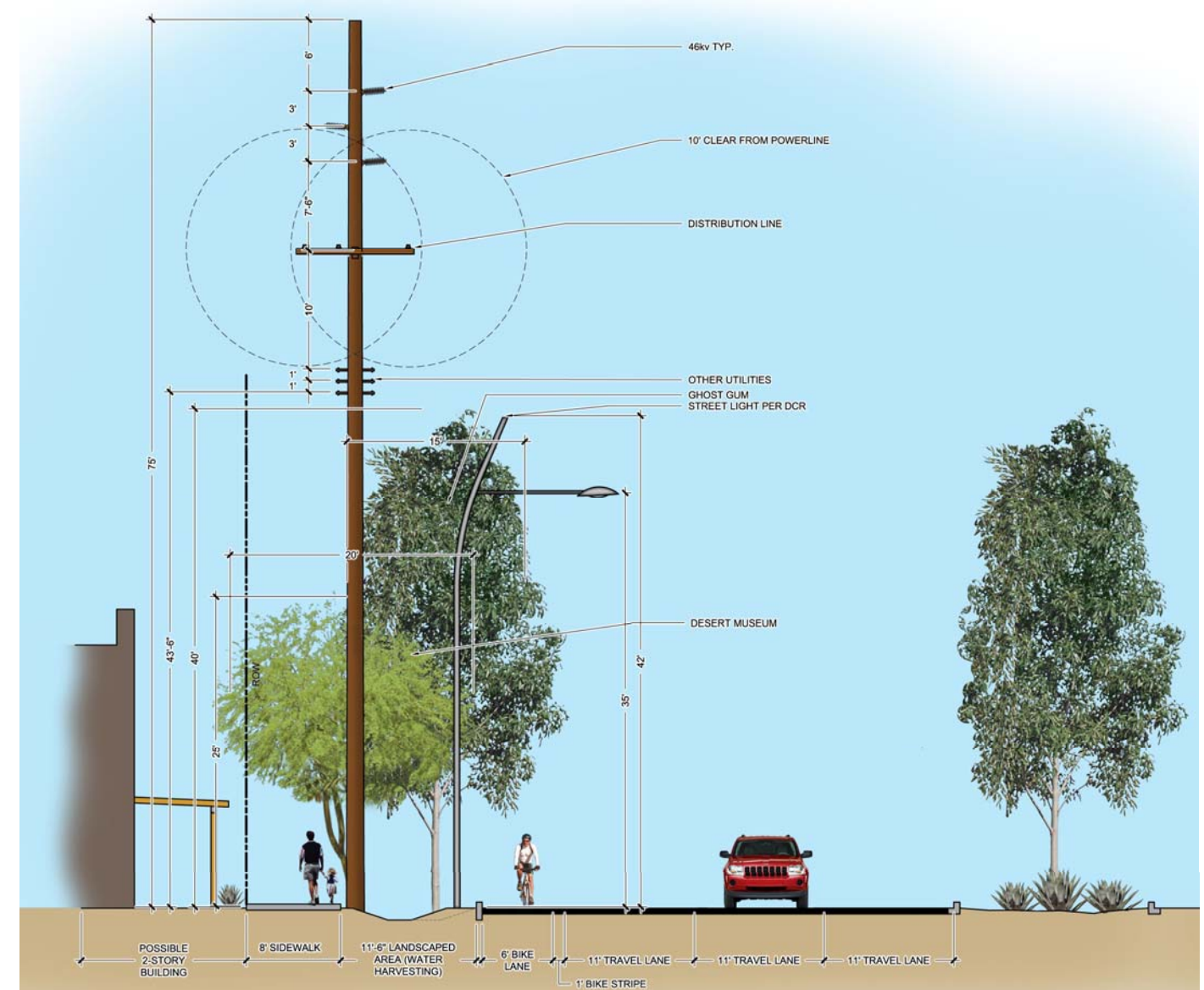


Figure 70: Ghost Gum and Palo Verde in Relation to Overhead Utilities

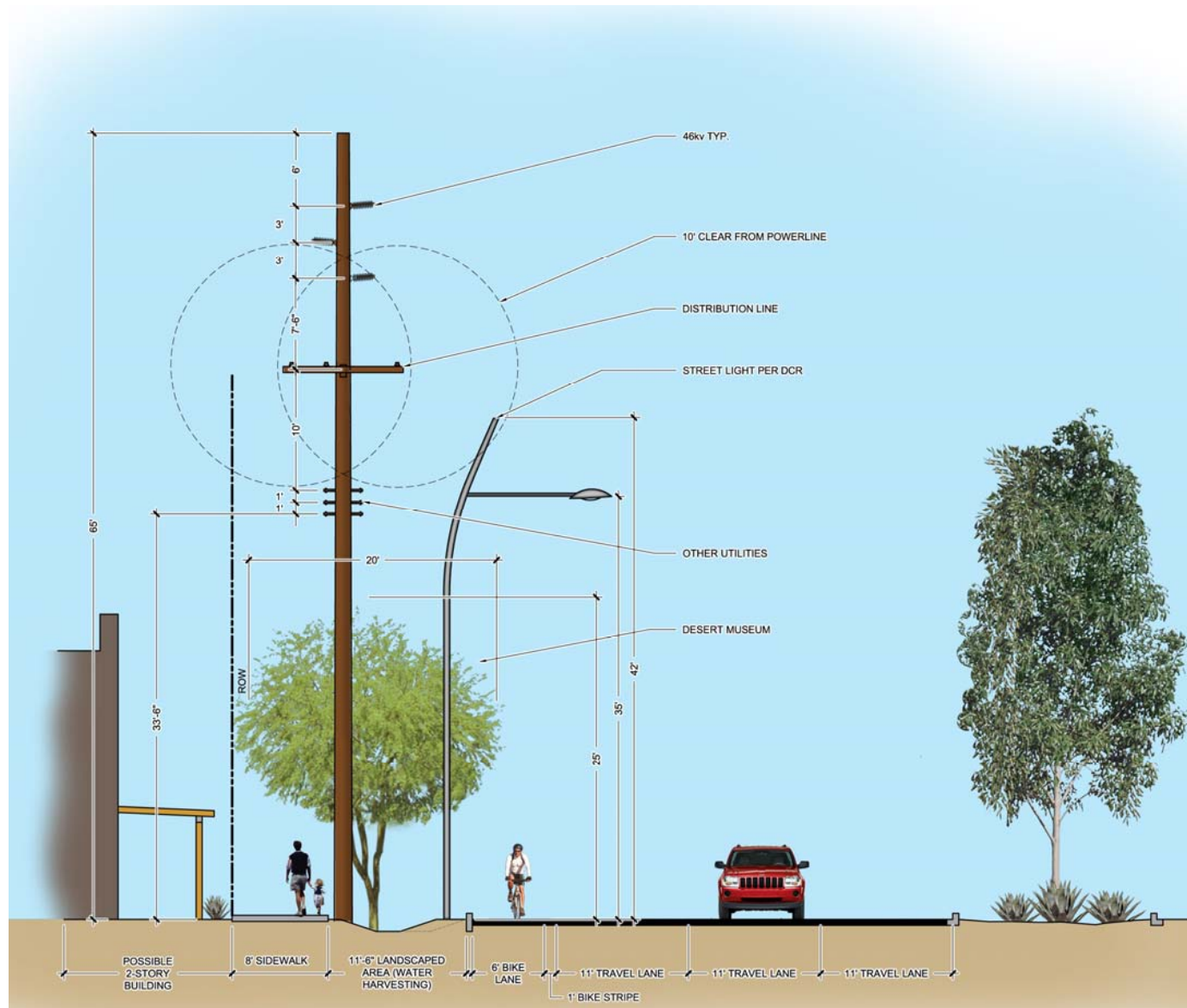


Figure 71: Palo Verde in Relation to Overhead Utilities

9.3.4.3 Potential Outside Sources of Landscape Funding

Historically and currently, the City of Tucson Transportation Department has been relatively constrained in terms of funding to provide for the maintenance of landscape. The landscape design concepts and the 30 percent landscape construction plans have been prepared with these constraints in mind. Yet the potential exists for future enhancement either from public or private sources. First, it is possible that over the next 15-years that public funding for landscape maintenance could increase. Therefore, as the implementation of the Grant Road Improvement Project proceeds, as each phase of final design gets underway the design team

should discuss the status of landscape funding at that time and make appropriate adjustments to the extent and type of landscaping while maintaining the character and intent of the streetscape concepts. Secondly, it is possible that some adjacent property owners may desire more landscaping or some additional species that may require higher-levels of maintenance. The Transportation Department could then negotiate with property owners, business groups, or other private entities to achieve an installation and maintenance agreement. Other implementation strategies for streetscape enhancement will be developed as part of the Grant Road Community Character and Vitality Plan.

9.3.5 Streetscape Design Features

9.3.5.1 Median Streetscape Concept

Medians in Grant Road play several important roles, they provide:

- Space for turn lanes and therefore visibility for traffic safety is particularly important in some locations;
- Space for the refuge of pedestrians crossing the six-lane roadway;
- Potential space for rainwater harvesting; and,
- Space for landscape and streetscape that can create interest and shade, as well as break down the large expanse of the roadway to a more human scale.

Largely due to the intermittent need for left-turn and U-turn pockets, medians on Grant Road are designed in two widths: 17 feet and 6 feet with approximately one half of the roadway having medians of each width. The difference between these widths creates the need for different streetscape design approaches.

9.3.5.1.1 17-Foot Median

The 17-foot median will occupy approximately half of the length of the Grant Road corridor. In general, the landscape on the 17-foot median will mirror the landscape along the sidewalk on either side of the street to strengthen the visual impact of the streetscape treatment for various zones along the roadway. In Residential zones, the 17-foot medians, like the sidewalk frontage, will have acacia trees; in the Mixed Use District and Center zones, the 17-foot medians will have mesquite trees; and so on.

One key requirement for trees in the median will be that their canopies maintain adequate (13-foot 6-inch) clearance, where they extend beyond the face of curb, for trucks and other large vehicles moving through the adjacent travel lanes.

Unlike typical arterial street design, which features left turn pockets at major intersections, Grant Road will have its full median width at its 7 major intersections due to the Indirect Left Turn. This creates the opportunity to bring the full landscape treatment, including trees, up to the intersection at Indirect Left Turn major intersections. This also allows for a significant pedestrian refuge in the Grant Road pedestrian crossing at these major intersections. For further discussion of the streetscape design for Indirect Left Turns, see section 0.

In addition to the refuges at the crossings of major intersections, the medians will also accommodate the Pelican crossings at the Indirect Left Turn turn-arounds other Pelicans not associated with Indirect Left Turns, Toucan crossings, and minor signalized street crossing refuges. These refuge areas will work with the trees to create pleasant places to pause in the crossing of Grant Road, and could feature other pedestrian amenities, such as shade structures, seating, or public art.

Depending on the localized surface drainage pattern on Grant Road, the 17-foot medians can be valuable areas in which to harvest rainwater. As mentioned in the previous rainwater harvesting section, the majority of rainwater harvesting will be “passive,” in which runoff on the roadway flows into the landscaped area through an opening in the curb and can infiltrate into the ground while providing irrigation to plants in the median. Some areas in the 17-foot median may also be suitable for the “hybrid” approach, see the previous Rainwater Harvesting section for further discussion.

9.3.5.1.2 6-Foot Narrow Median

The narrow 6-foot median occupies approximately half of the length of the Grant Road corridor. It occurs in areas where center left turn or U-turn lane is provided. Many of the landscape and streetscape goals for the narrow 6-foot median are the same as the wide — to use native or drought-tolerant plants or other elements to create a more human-scale, inviting pedestrian environment while making motor travel safe — but the ways to achieve these goals are different.

The 6-foot-wide median does not allow enough room for trees, and so landscape will consist of appropriate groundcover, shrubs, and cacti. In order to achieve the desired vehicular speed management and community character goals for Grant Road, these narrow medians will still need vertical elements to define the space and provide visual interest. Vertical elements that can be used within the 6-foot median include: cacti such as saguaros, other vertical desert plants such as ocotillos, and streetscape elements such as railing or the signature poles.

These medians could also include public art in a sequential or linear pattern that would not only break down space but also create visual interest near intersections, where many of the narrow medians are located.

9.3.5.1.3 Local Access Lane and Side Median

The local access lanes are a refinement of the frontage roads that can be found along portions of Grant Road and other major streets in Tucson. The streetscape treatment of the local access lanes and medians is designed to further distinguish the difference between Grant Road as a major thoroughfare and the local access lane as a slower moving roadway with the primary function of providing access to adjacent residences or businesses.

One design concept to further reinforce the distinction of the local access lane that can also contribute to the sustainability goals of the project is the potential to use a permeable paving treatment in the local access lane and the intersections with adjacent residential streets (see Error! Reference source not found. and **Figure 73**). Also, the use of a concrete “lip” at the entry points between the local access lane and the through lanes of Grant Road will define a threshold and encourage traffic calming leading into adjacent neighborhoods.



Figure 72: Local Access Lane

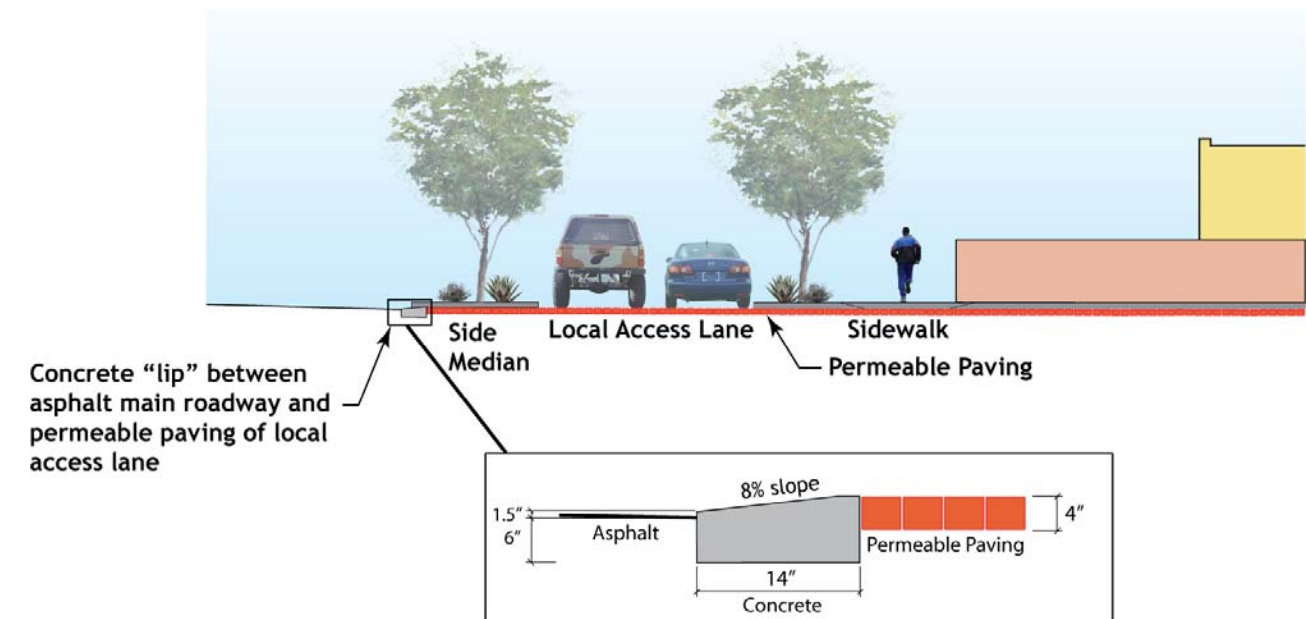


Figure 73: Potential Permeable Paving at Local Access Lane

9.3.5.2 Indirect Left Turn

The Indirect Left Turn is largely a mobility-driven concept in that it improves traffic flow at major intersections and provides a higher-quality pedestrian crossing of Grant Road. But the unique form taken on by Indirect Left Turn intersections also creates opportunities for landscape and streetscape (**Figure 74**). The pairing of the intersection with the two turnarounds stretches beyond the typical spatial parameters of standard arterial intersections. The average Grant Road indirect left turn intersection system runs nearly a quarter mile, and includes several distinct areas. In the center is the intersection itself; on either side are areas where left-turning vehicles queue in a turn pocket to turn around; and at the far edges are the turn-around areas themselves. Each type of area provides its own appropriate treatment and opportunities for landscape and streetscape. The different pieces also have the potential to underscore the Center land use concept.



Figure 74: Grant Road Indirect Left Turn “Turn-Around” Area

The streetscape design treatment for the Indirect Left Turns provides a rhythm to the experience of passing through the length of the intersections elements. The design compresses the viewshed at the intersection, opens it up beyond the intersection and re-compresses it at the turn-around. This is opposite to a typical roadway intersection design where the viewsheds are open as a result of less landscaping and more pavement and then compress as the median enlarges past the intersection. This unique characteristic of Grant Road will create large intersection spaces, which are contained by landscaping on both sides and at both ends. Important ways the streetscape can affect and improve the visual character of the roadway are:

- Control the signage within the right-of-way and provide signage opportunities at specific locations, which recognize the unique nature of the indirect left turn lanes.

- Compress intersections with formal plantings of Ghost Gum Eucalyptus trees and contain the sides of the intersection spaces with formal plantings of Desert Museum Palo Verde paired with Ghost Gum Eucalyptus trees.

9.3.5.2.1 Major intersection

In addition to the visual compression achieved by the streetscape treatment at the major intersections, other key aspects of the design treatment enhance the pedestrian safety and comfort in crossing the legs of the major intersection, see Figure 77. The 17-foot medians provide the opportunity to integrate landscape plantings and other design elements to create a safe and comfortable pedestrian refuge.

Other important aspects of the intersection streetscape include the potential for corner plazas at a few of the major intersections, such as Alvernon Way. These corner plazas could synergize with adjacent transit stops, and could be appropriate places for more active water harvesting techniques.

Grant Road Medians/Pedestrian Refuges

The 17-foot wide medians along Grant Road provide the unique opportunity when integrated in the Indirect Left Turn to provide a large pedestrian refuge in the middle of the crosswalks of Grant Road. This provides an opportunity to bring pedestrians into closer proximity of a major rainwater harvesting feature. It was also suggested through the public outreach that seniors and others could benefit from seating within the refuge area. Error! Reference source not found. and **Figure 76** illustrate a design concept for a pedestrian-supportive median refuge area which utilizes a centralized grate over a channel connecting the rainwater ‘oasis’ areas that can be an educational feature for pedestrians crossing Grant Road. While **Figure 77** and **Figure 78** illustrate the base improvements at a pedestrian refuge without the pedestrian safety light and other streetscape features of the pedestrian-supportive treatment.

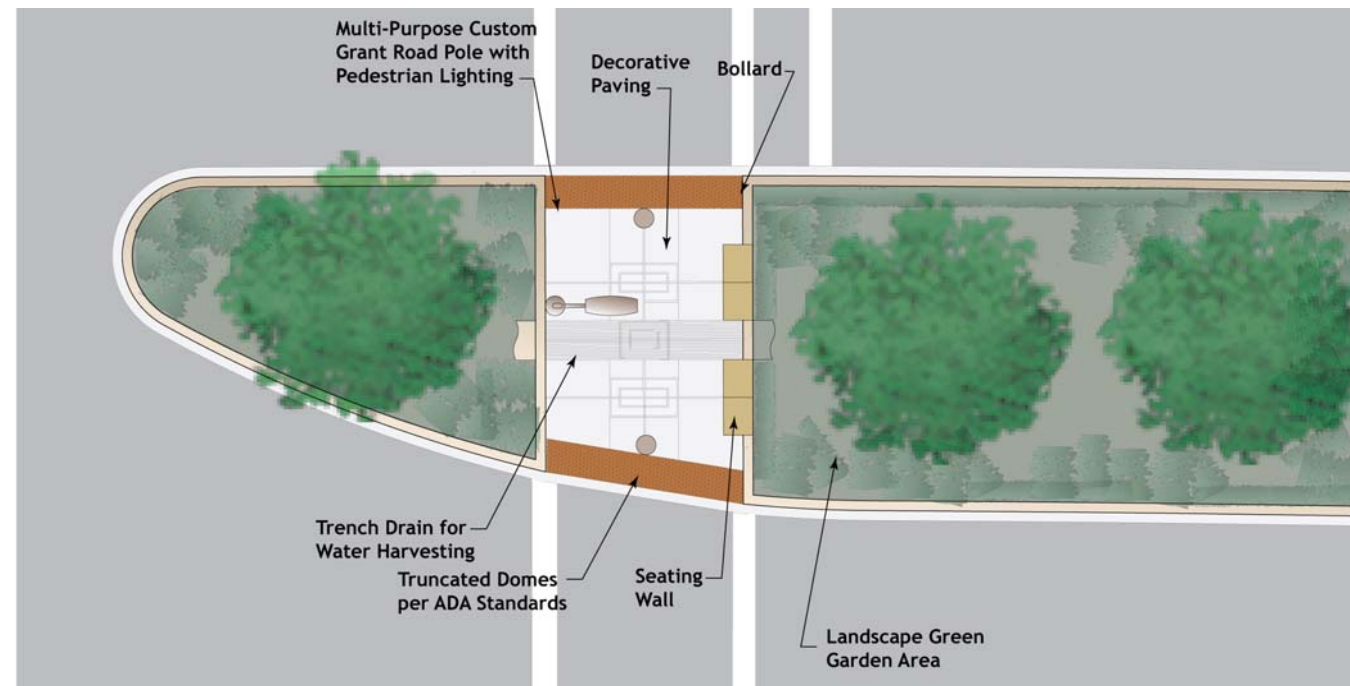


Figure 75: Plan View of Pedestrian-supportive Median Pedestrian Refuge

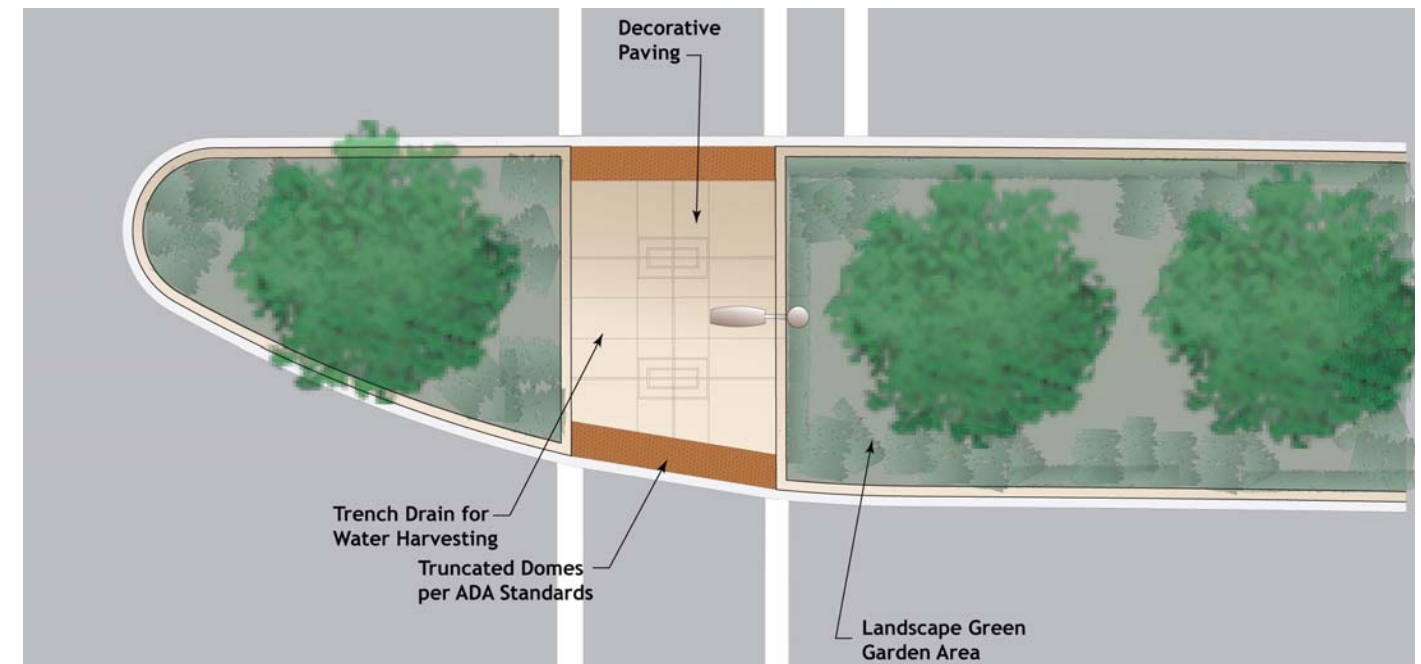


Figure 77: Plan View of Base Median Pedestrian Refuge

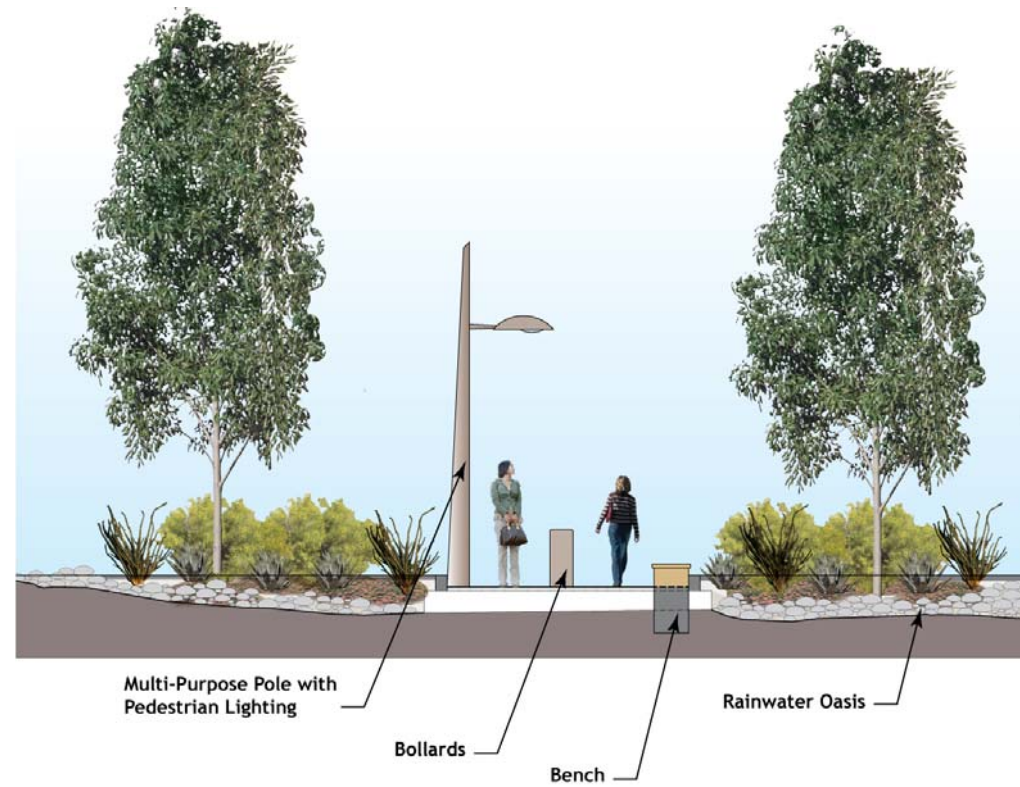


Figure 76: Elevation View of Pedestrian-supportive Median Pedestrian Refuge

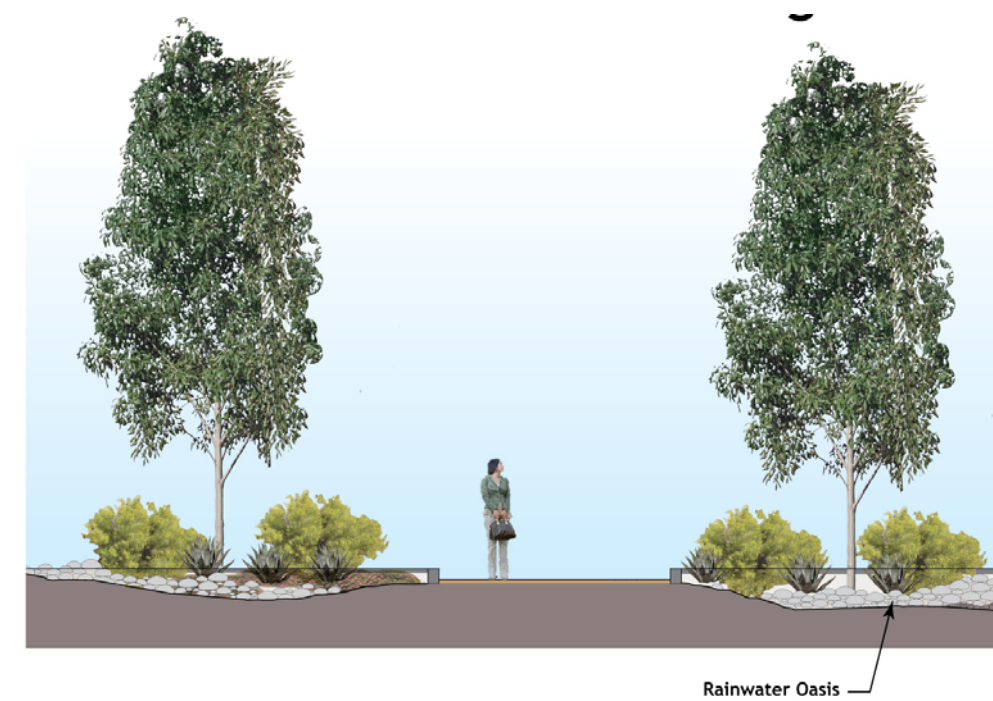


Figure 78: Elevation View of Base Median Pedestrian Refuge

Perpendicular Street Medians and Pedestrian Refuges

The crossings of the streets that intersect Grant Road will in many cases be more of a challenge for pedestrians than the crossings of Grant Road itself. Pedestrian refuges, areas within the crosswalk protected by a raised median on either side, should be provided at any intersection that is at least 4 lanes wide (see **Figure 79**). At major intersections where double-left turns are required, the design concept is to provide a raised median between the left turn lanes and the parallel traffic lanes as well as the standard raised median between the opposing lanes and the left turn lanes. This breaks up the crossing into manageable distances for pedestrians between those places where they may be in conflict with traffic. The wider of these medians will be provided with a pedestrian crossing push button and in the cases of pedestrian-supportive crossings will have a pedestrian safety light.

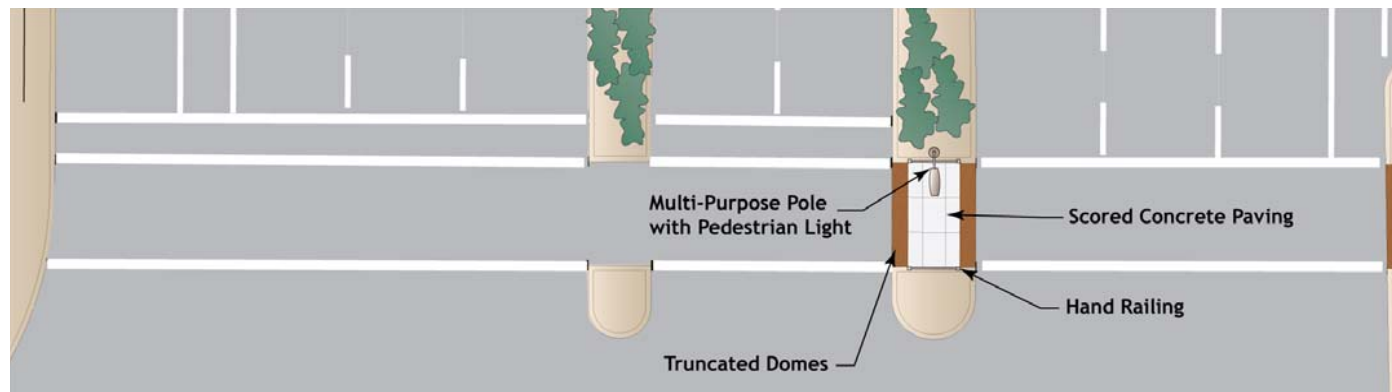


Figure 79: Medians and Pedestrian Refuges at Major North-South Cross Street to: Grant Road (double left turn lanes between medians) Refuge

Channelize right turn with pedestrian “island”

Channelized right turns are needed from a vehicular traffic perspective when a signal controlled right turn movement would lead to excessive congestion. This is a particular concern along Grant Road, because the use of indirect left turns at major intersections increase the number of right turn movements as vehicles return to the intersection to make a right turn “to complete their left turn movement.” Channelized left turns can also make pedestrian movements through intersections more of a challenge, as drivers making the right turn may expect to have unimpeded movement. As discussed elsewhere in this design concept report, the channelized right turns for Grant Road will be designed to control vehicular speed and provide for safer pedestrian crossings while maintaining the vehicular benefits of a non-signal controlled intersection.

The streetscape design for the “islands” at channelized right turns, the area where pedestrians wait to cross the main road segments of the intersection are intended to create a comfortable – shaded and buffered – location for pedestrians to wait for signal protection to move through the major intersection. The base improvements provide a speed table crossing across the channelized right turn, a wayfinding sign to direct pedestrians to surrounding destinations and bus stops, and landscaping for buffering, shading, and general comfort, see **Figure 80** and **Figure 81**. Pedestrian-supportive right turn islands provide additional streetscape elements in recognition of the higher level of pedestrian activity in the area. These elements

include a tensile shade structure, pedestrian safety lighting, bollards, and a seat wall, in addition to the base design elements see **Figure 82** and **Figure 83**.

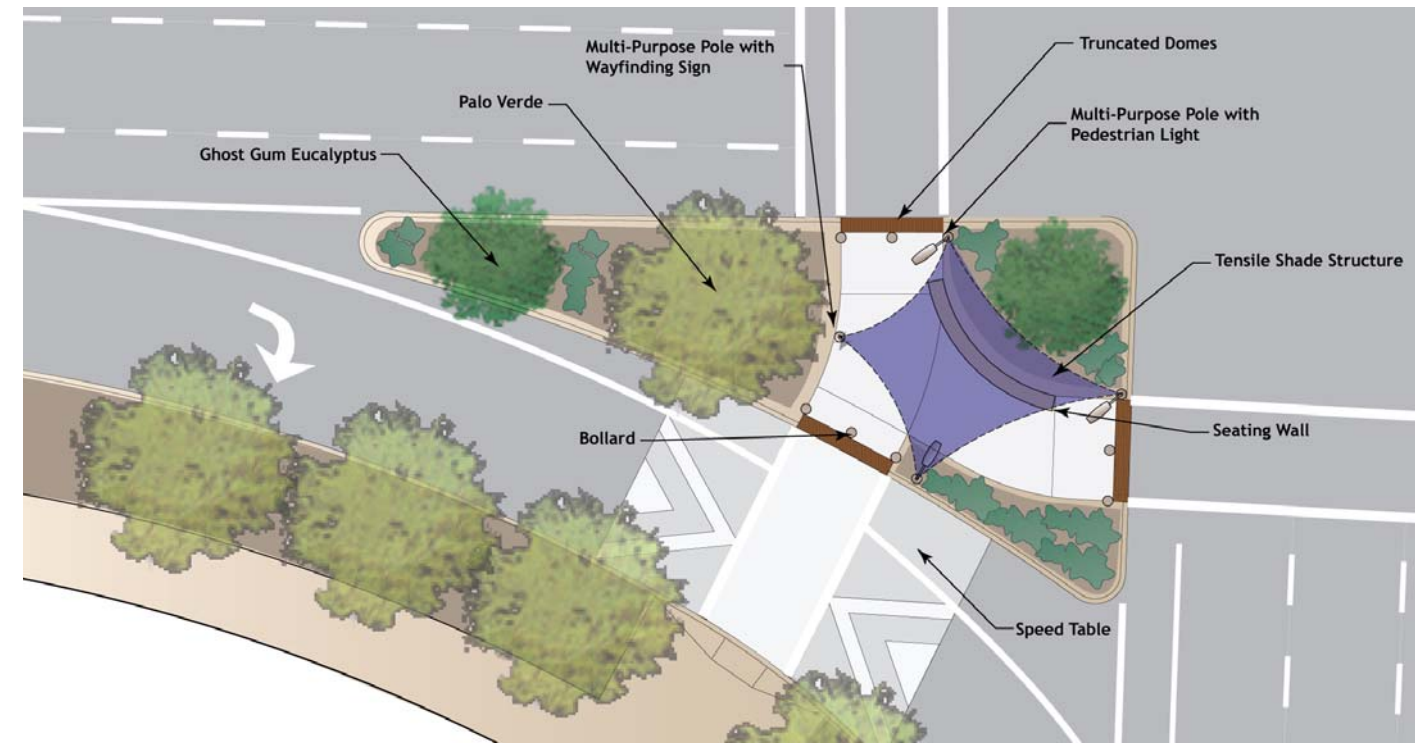


Figure 80: Plan View of Pedestrian-supportive Channelized Right Turn Lane Pedestrian Refuge

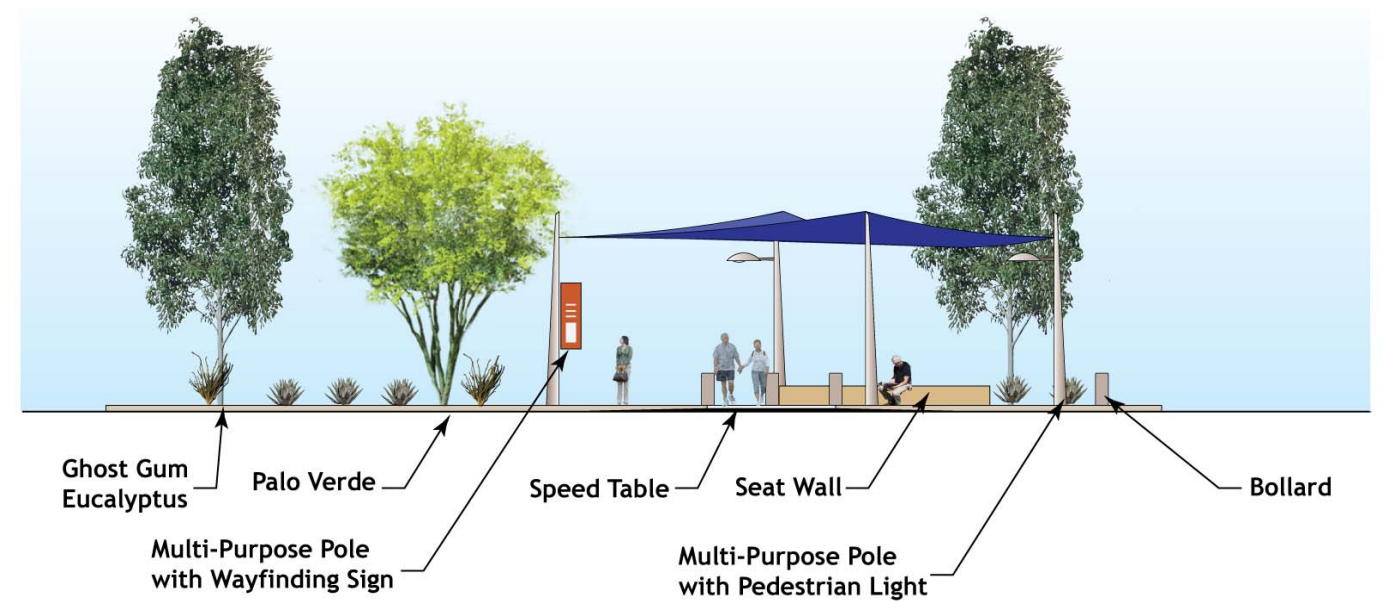


Figure 81: Elevation View of Pedestrian-supportive Channelized Right Turn Lane Pedestrian Refuge

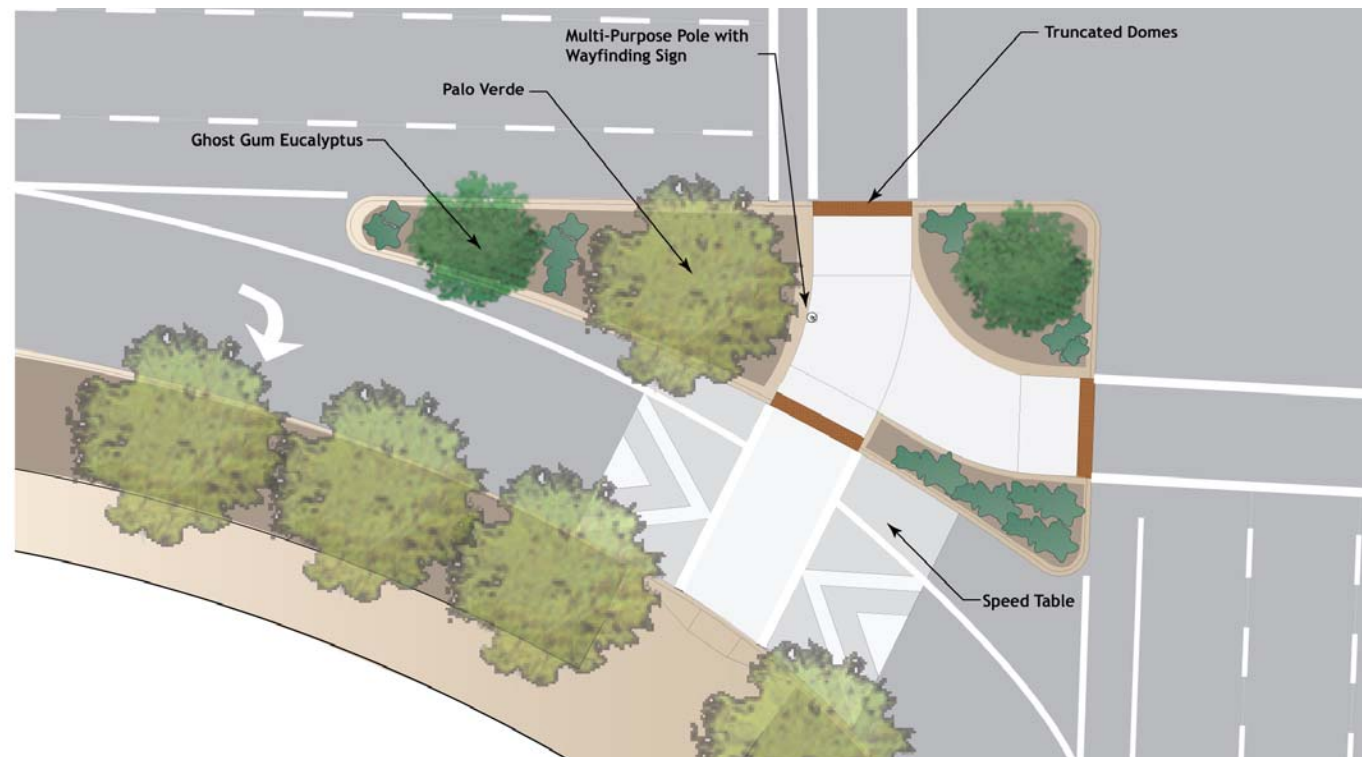


Figure 82: Plan View of Base Channelized Right Turn Lane Pedestrian Refuge

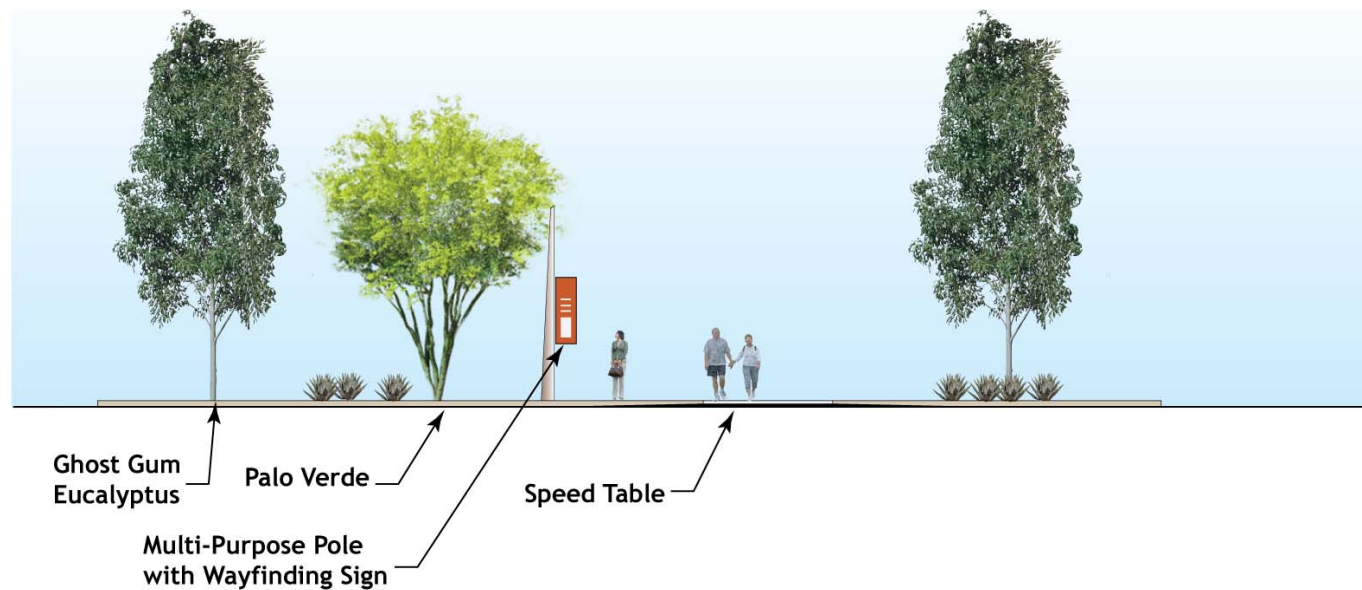


Figure 83: Elevation View of Base Channelized Right Turn Lane Pedestrian Refuge

9.3.5.2.2 Left-turn lane segment

The areas of the Indirect Left Turn on either side of the main intersection are where cars queue in the long, single left turn pocket. This is an important but challenging part of the streetscape—important because these areas usually lie within what will likely be mixed use pedestrian-oriented centers; but challenging in that the only space to provide landscaped relief of the 8 vehicle travel and turn lanes is a 6-foot-wide median, see **Figure 84**.

As was stated in the median concept, the 6-foot median will feature vertical cacti and other landscaping to create a sense of enclosure. Linear or sequential public art could also make an impact here because of the location in the Center.

9.3.5.2.3 Turn-around intersection

The Indirect Left Turn turn-around is the area where vehicles queuing in the left turn pocket make the U-turn that will send them into the right turn lane where they can complete the indirect left turn sequence on the Grant Road cross street. This area accommodates a large area of pavement needed for semi-trucks and other large vehicles to make the U-turn movement. The turnaround also presents opportunities in the signalized crossing of Grant Road for a Pelican pedestrian crossing, see below, and in the potential for public spaces or rainwater harvesting “oases” in the areas of remnant right-of-way that often result in the turn-around “bulb” area.



Figure 84: Grant Road Indirect Left Turn Major Intersection Area

On the outside edge of the U-turn, the median returns to a wide 17-foot median, allowing for an area of the larger trees that are at the main intersection, and a more “compressed” pedestrian space around the turn-around.

The large amount of hardscape necessary for U-turning semi-trucks may reduce or compromise the goal of the turn-around area being a pedestrian-oriented place. This can be alleviated partly by using decorative concrete paving in the turn-around areas that will receive less use, see **Figure 85**. This provides both visual interest and will help with the speed management of vehicles traveling along Grant Road and for vehicles that are making a right turn to access driveways and streets that are located in some of the ILT “bulb” areas. The concept for paving this area is that the portion of the concrete paving in the “bulb” area would be separated from the bicycle lane and the transition to the right turn lane by a raised wedge curb, only trucks and other large vehicles would mount this curb. Some ILT turnaround areas have parking lot driveway and minor streets connecting through the “bulb” area to Grant Road. These areas should get a concrete pattern that is less frequent than the remaining “bulb” area in order to direct vehicles to travel primarily through these paths.

Because the turn-around area lies at the edge of many Centers, it could also serve as a “gateway” or transition zone, announcing arrival into a more pedestrian area and providing information about businesses or identifying signs.

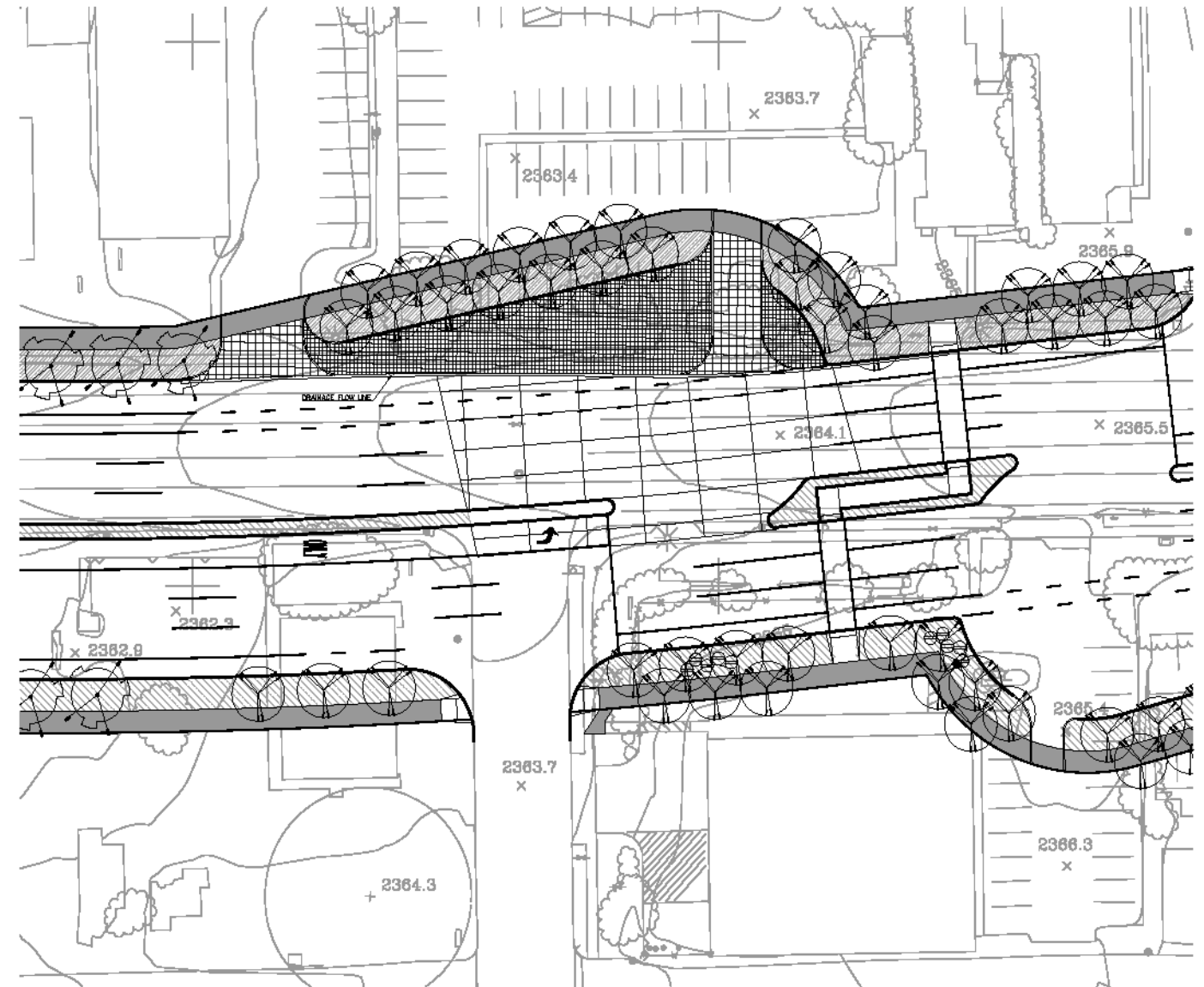


Figure 85: Scoring pattern study for turn-around area of Indirect Left Turn

9.3.5.2.4 Indirect Left Turn - Pelican

Another key aspect of the turn-around streetscape is the Pelican crossing at nearly every turn-around. The Pelican takes advantage of the 17-foot median to provide a large pedestrian refuge area that can accommodate a tensile shade structure in pedestrian-supportive areas. In all cases Pelicans should have railings to guide pedestrians through the crossing; this is an opportunity for the integration of public art into the streetscape of Grant Road (see **Figure 86** and **Figure 87**). Pelicans in pedestrian-supportive areas should also be provided with additional pedestrian safety lighting (see **Figure 88** and **Figure 89**).

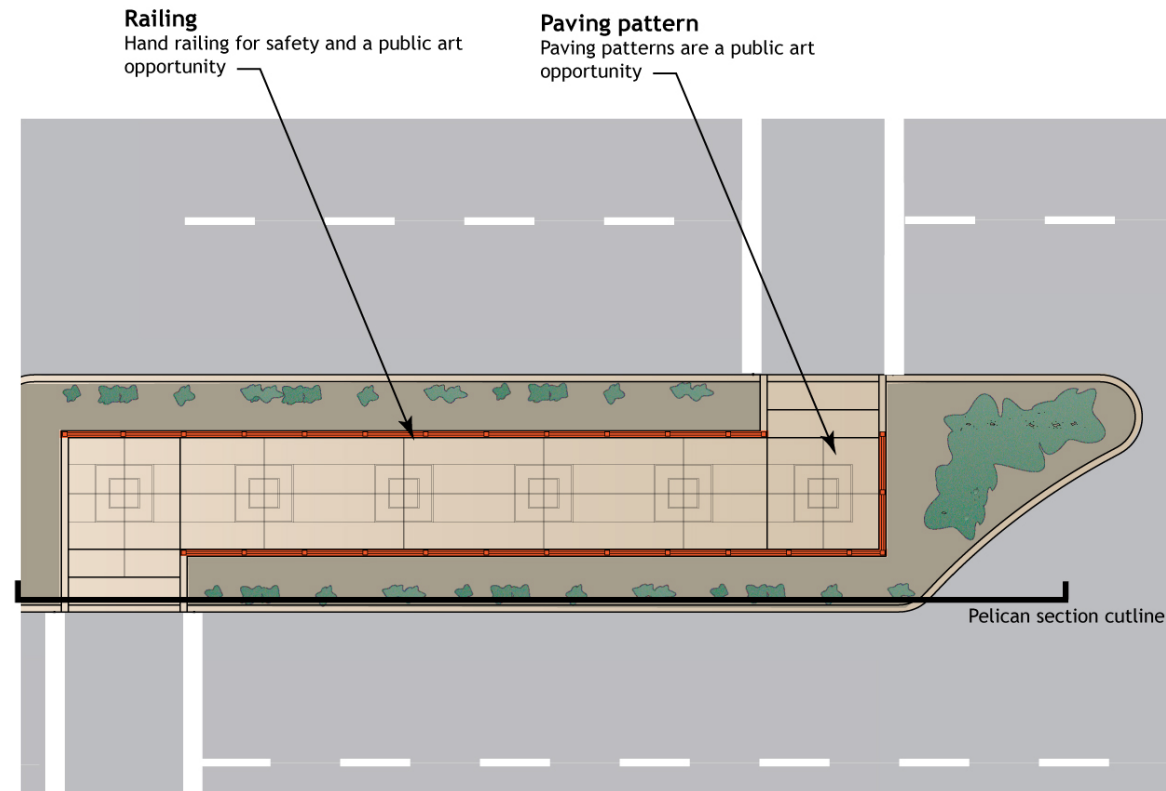


Figure 86: Plan View of a Base Pelican in the Indirect Left Turn-Around Area

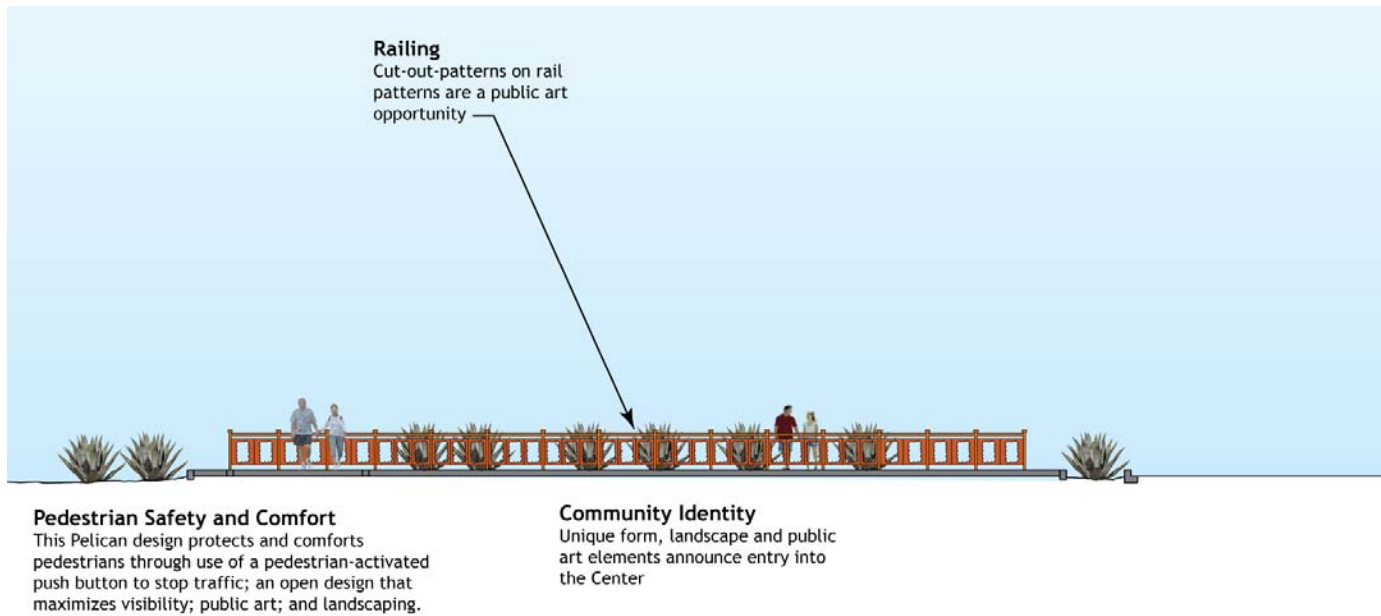


Figure 87: Section/Elevation of a Base Pelican in the ILT Turn-Around Area

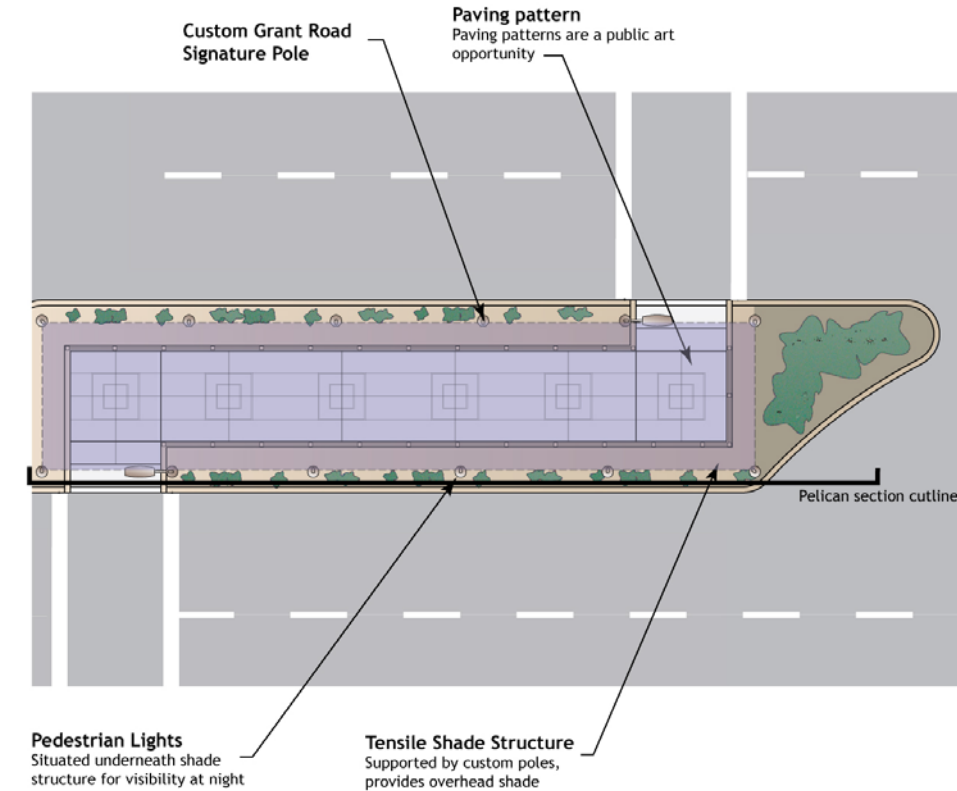


Figure 88: Plan View of a Pedestrian-supportive Pelican in the Indirect Left Turn-Around Area

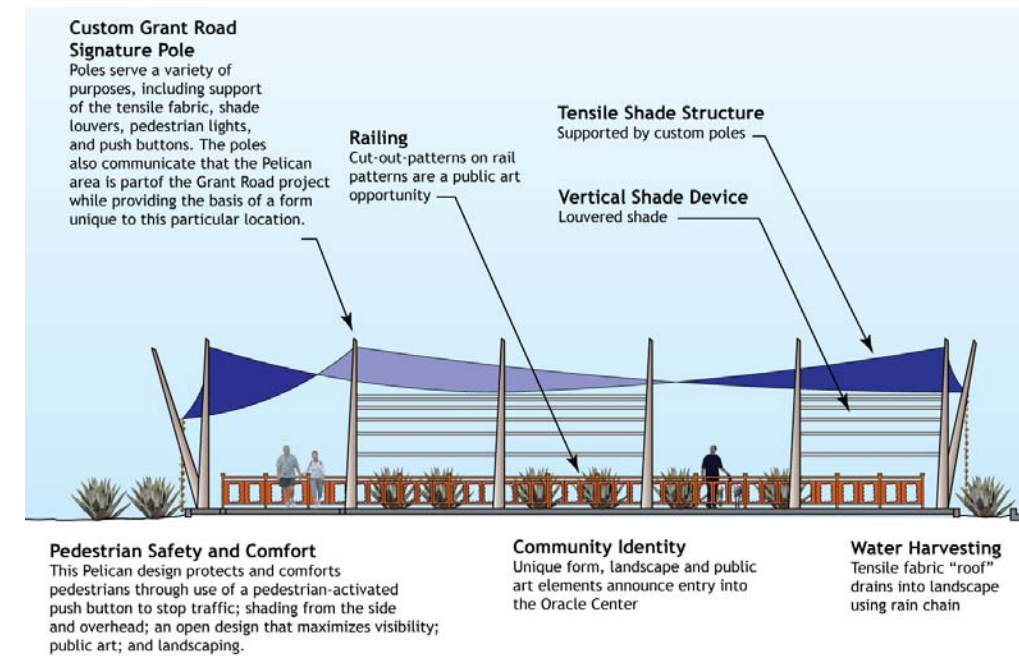


Figure 89: Section/Elevation of a Pedestrian-supportive Pelican in the ILT Turn-Around Area

9.3.5.3 Toucan Crossing

The Toucan crossing was developed by the City of Tucson to accommodate a signalized crossing of minor arterial and collector streets by both bicycles and pedestrians while controlling some vehicular movements from these streets as a neighborhood traffic calming and bicycle and pedestrian safety tool. As discussed elsewhere, the Toucan crossings of Grant Road are a new feature that includes design refinements given that Grant Road is a major divided roadway.

Like the Indirect Left Turn, the design of the Toucan was driven by the mobility and access necessary for bikes, pedestrians and autos. Yet the Toucan design also yields some interesting streetscape design opportunities that improve its functional qualities and support the community character and other goals for the streetscape of Grant Road. The “shadow” of the 17-foot wide median creates the opportunity for a pedestrian and bicycle refuge in the center of Grant Road, see **Figure 90**.

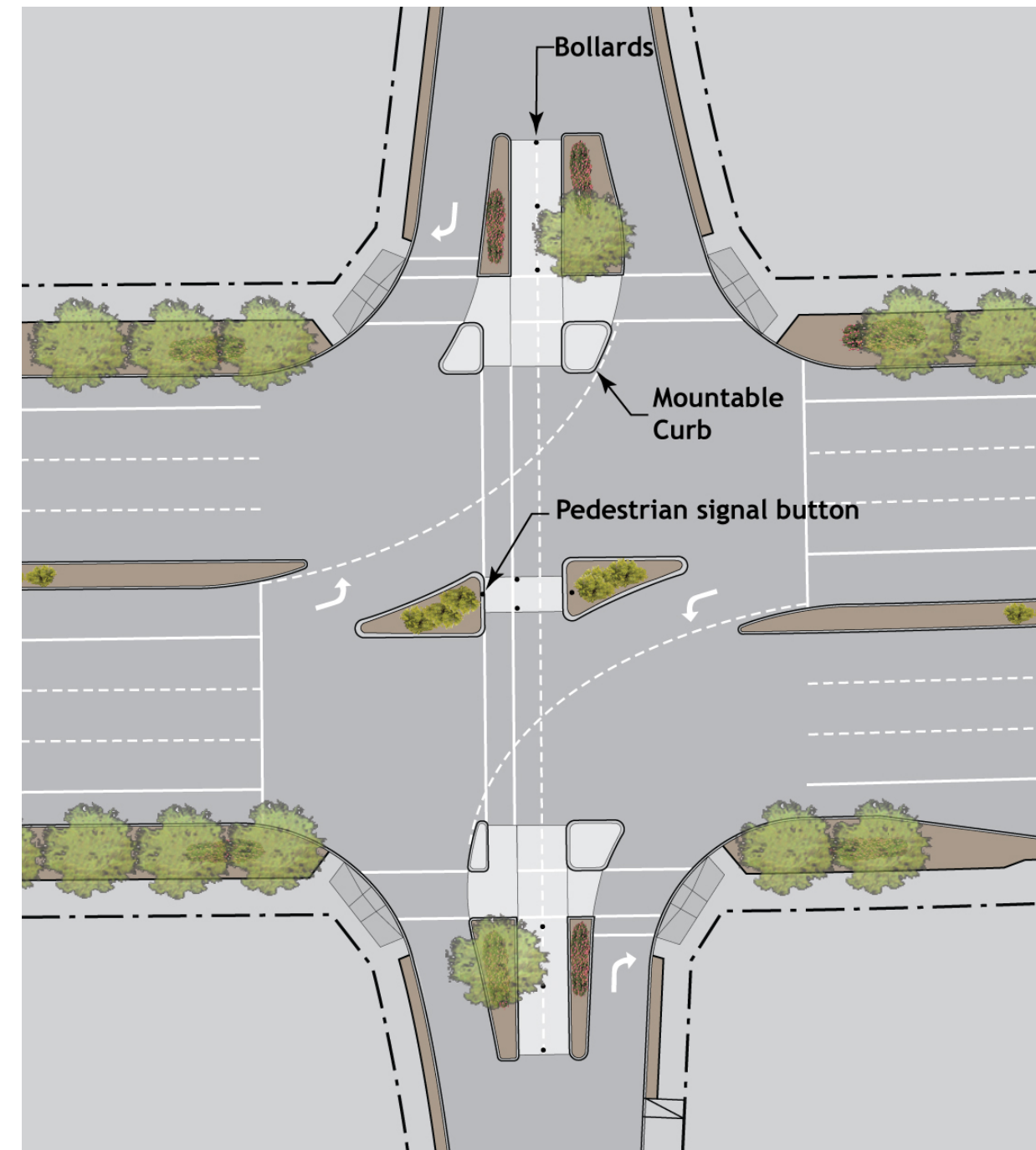


Figure 90: Plan View of Toucan Crossing

9.3.5.4 Bus Stops

All bus stops along Grant Road will be greatly enhanced from their condition today, meaning that they will include shelters, pedestrian-scale lighting, kiosks with neighborhood information and business directories,

and other amenities such as trash receptacles. Similar to the other streetscape elements there are both base and pedestrian-supportive design concepts with the pedestrian-supportive design adding elements to the base concept making it relatively easy to upgrade base bus stops in the future. The amenities of the base bus stops are illustrated in **Figure 91** and **Figure 92**.

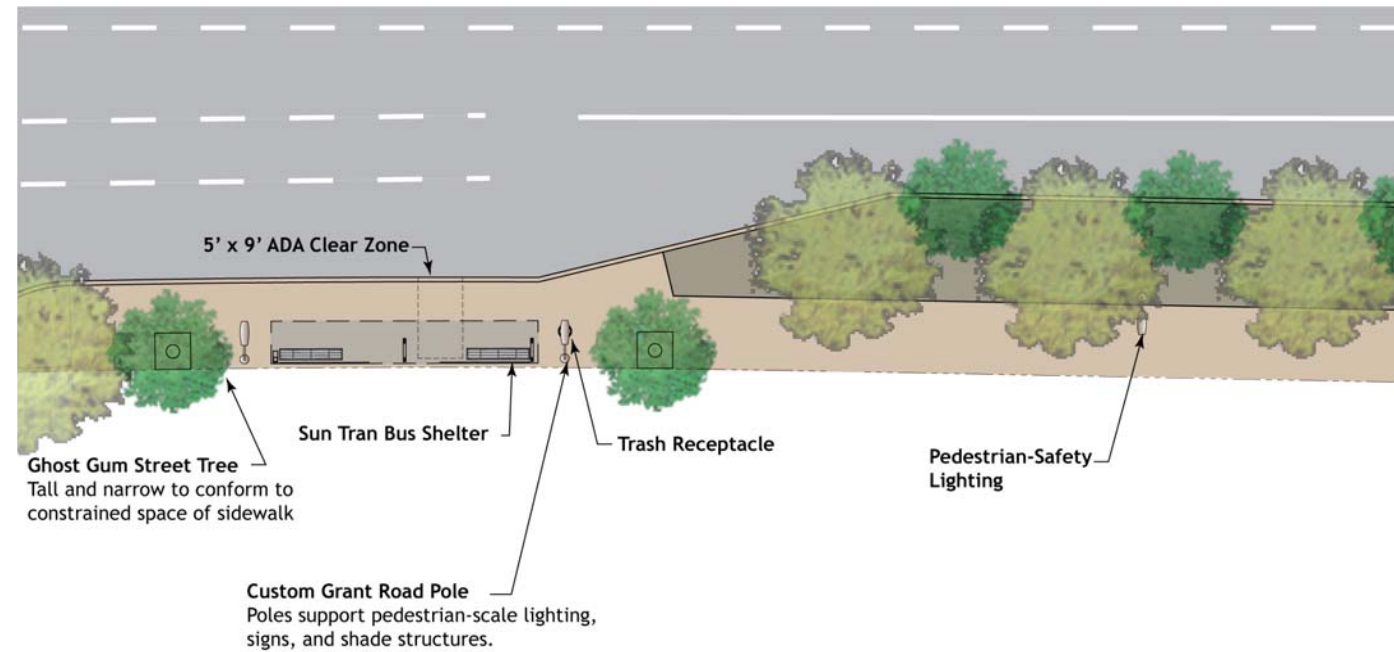


Figure 91: Plan View of a Base Bus Stop

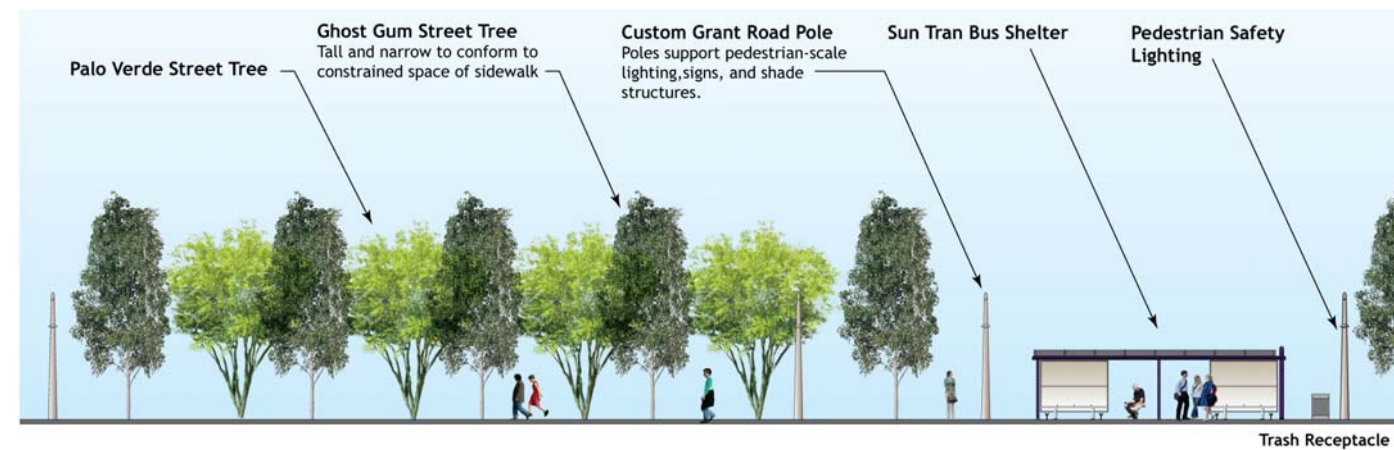


Figure 92: Section/Elevation of a Base Bus Stop

These amenities will be organized around the approximately 200-foot-long bus pullout that will be part of every Grant Road bus stop. Pedestrian lighting will be interspersed around the entire enhanced bus stop area, and linking the bus stop to nearby pedestrian crossings of Grant Road. In general, more pedestrian lighting is provided at pedestrian-supportive bus stops. Street trees will continue through the bus stop to

provide additional shade and if necessary a fence or screen will delineate the bus stop area from adjacent land uses such as parking lots. Pedestrian-supportive bus stops also include additional passenger waiting areas with two benches and a vertical sunshade screen as illustrated in **Figure 93** and **Figure 94**.

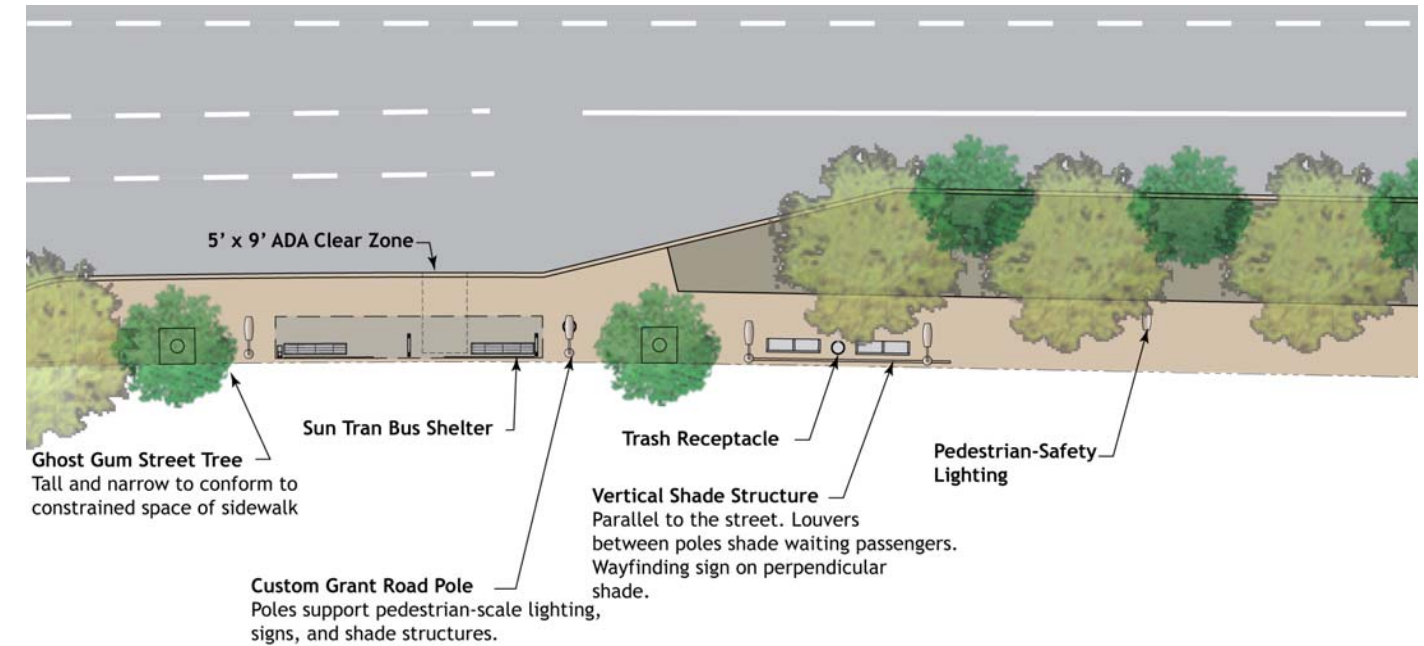


Figure 93: Plan View of a Pedestrian-supportive Bus Stop

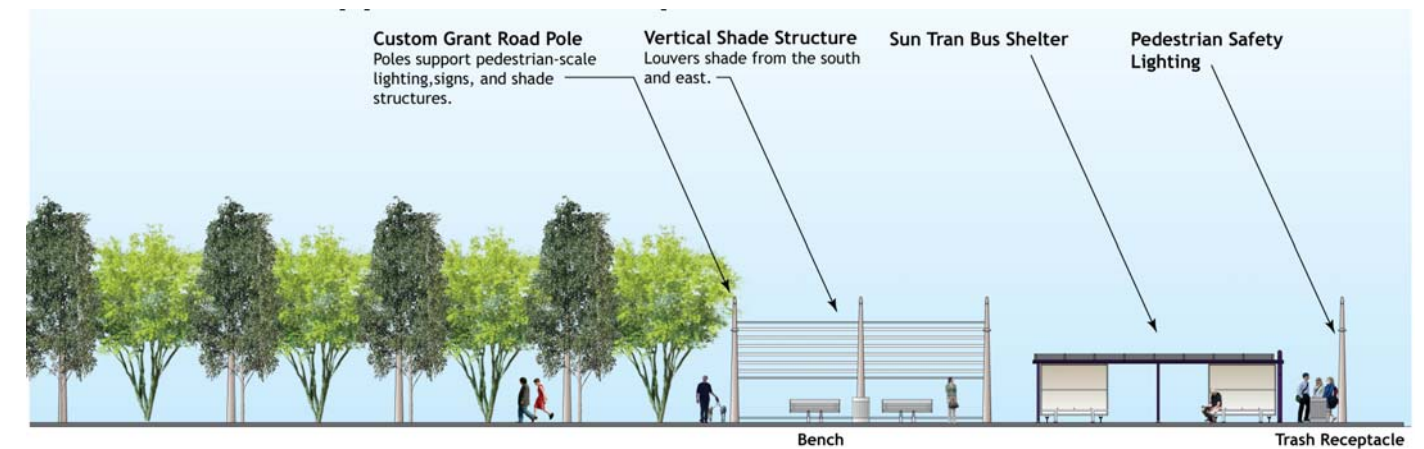


Figure 94: Section/Elevation of a Pedestrian-supportive Bus Stop

It should also be noted that there are both 18-foot and 30-foot standard shelters that will be used along Grant Road. Typically, the smaller shelter is the standard with the larger shelter being provided when ridership reaches adequate levels. The design concept for the bus layouts locates all streetscape elements, with the exception of the trash receptacles, so that the elements will work with either an 18-foot or a 30-foot shelter

at the stop. This provides flexibility for changes in ridership over time while minimizing the expense of any shelter changes.

Several bus stops are located on the median of a local access lane which presents the challenge of getting transit riders to cross the local access lane between the stop and the sidewalk in a safe and convenient location (**Figure 95**). This is facilitated by providing a raised crosswalk with a speed table which helps to highlight the crossing for pedestrians while contributing to speed management of the vehicles on the access lane. Also, transit riders will have their circulation focused between the shelter and the crosswalk by minimizing the concrete paving at the stop on the median. As with other stops the concrete area and the streetscape elements will be located to work with either of the two shelter sizes. The design concept illustrates a covered trench drain adjacent to the speed table in order to manage stormwater within the access lane; in some locations this may be designed to feed into a water harvesting feature in the adjacent landscaped areas.

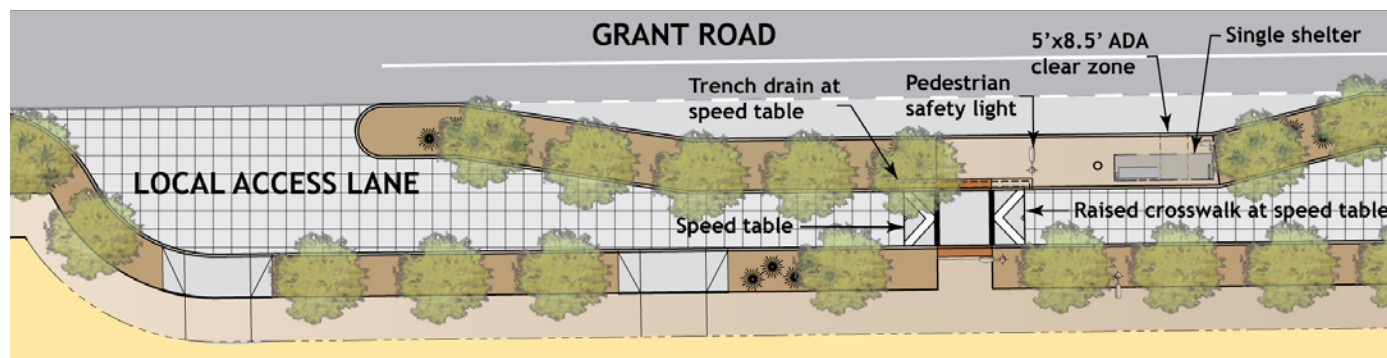


Figure 95: Plan of Bus Stop at Local Access Lane Median

The enhanced bus stops present several opportunities for public art, either integrated in the many amenities or in the small public spaces that will exist at most bus stops. Public art could in turn help bus stops become identifiers for the centers, districts or neighborhoods they serve.

Special bus stops – there are two bus stops along Grant Road that are provided to primarily serve transit and bus service other than Sun Trans buses. One of these is a bus stop near to the Southern Arizona Association for the Visually Impaired (SAAVI) which will primarily serve shuttles and as a drop-off location for their clientele. The other is the longer bus pull out that will be provided in front of Doolen School for school bus service. The SAAVI stop can be designed similarly to the other bus stops along Grant Road, the potential for special design features such as a tactile wayfinding sign and public art designed to relate with SAAVI clientele should be considered in the final design of this stop. For the Doolen School stop a design concept has been prepared that provides for increased landscaping both within the public right of way and within the school property that ties in with the landscape character of the street. The visual buffering of the landscape will be important in this area, as it is likely that the realignment and improvements to Grant Road will result in the removal of the trees that exist today between the school buildings and Grant Road (Error! Reference source not found.). In addition, the provision of pedestrian

safety lighting along the sidewalk should be provided for given the times of year when students may be present early in the morning or after dusk.

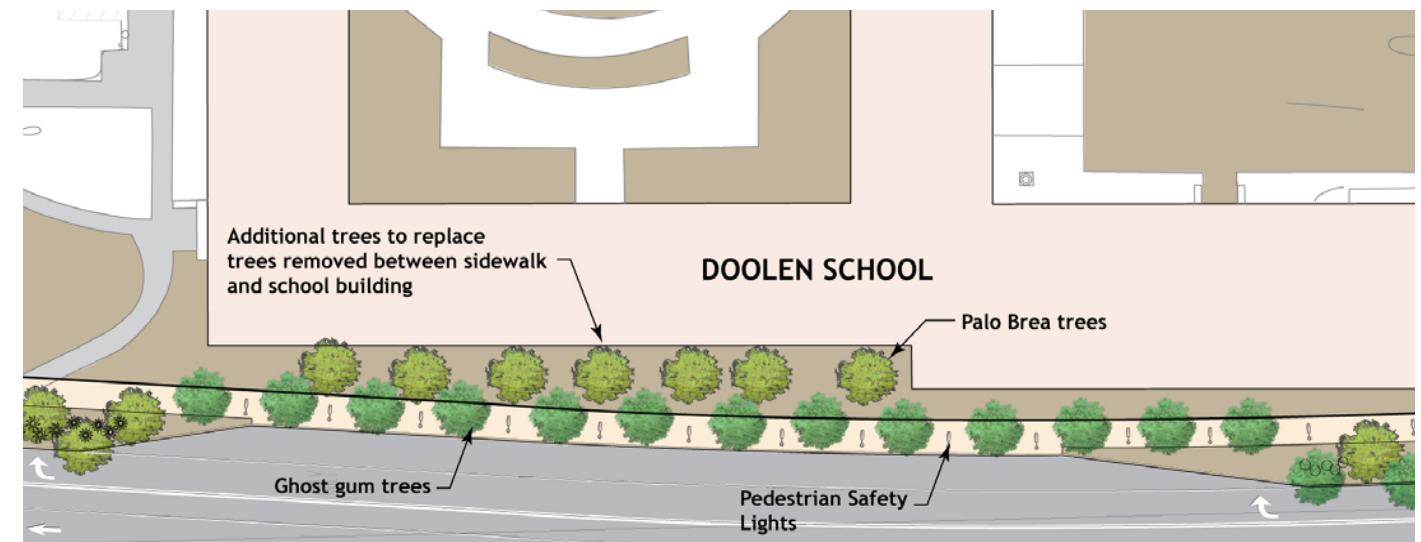


Figure 96: Plan of Bus Pull Out at Doolen School

9.3.5.5 Minor Street Intersection

These are the signalized intersections on Grant Road that are not Indirect Left Turns, including Fontana, Park, and Columbus. These intersections do not have the benefit of a 17-foot median for the crossing of Grant Road because they have left turn lanes on Grant Road. The pedestrian refuges for these crossings must be fit into the 6-foot medians.

9.3.5.6 Special Streetscape Treatments adjacent to Public Spaces

There are several locations along the frontages of Grant Road where either public spaces exist today (the triangle park west of the Campbell intersection) or where new public open spaces could be provided in the future (the Alvernon Transit Plaza, several small pocket parks within the right of way, and other opportunities). The design of these open spaces can be integrated with the streetscape treatment along Grant Road to greatly enhance the public realm of the street while also making these open spaces more visible from the street which should enhance their use and safety. Three of these locations are highlighted in the following sections.

9.3.5.6.1 Alvernon Transit Plaza

During the final design of several phases of the Grant Road Improvement Project properties will be acquired that are partially utilized for the roadway and opportunities may exist to use the excess property for another public use, such as an open space. In some cases these open spaces can be an enhancement to the surrounding area and provide for additional pedestrian and transit rider comfort and safety. One example is the northwest corner of Alvernon and Grant. This location has high volumes of pedestrian activity and transit ridership, and in addition a high concentration of multifamily housing exists in the surrounding area while relatively little public open space is available in the area. The surrounding residents, passing shoppers,

and transit riders could use the open space for passive recreation and gaining a respite from surrounding activity.

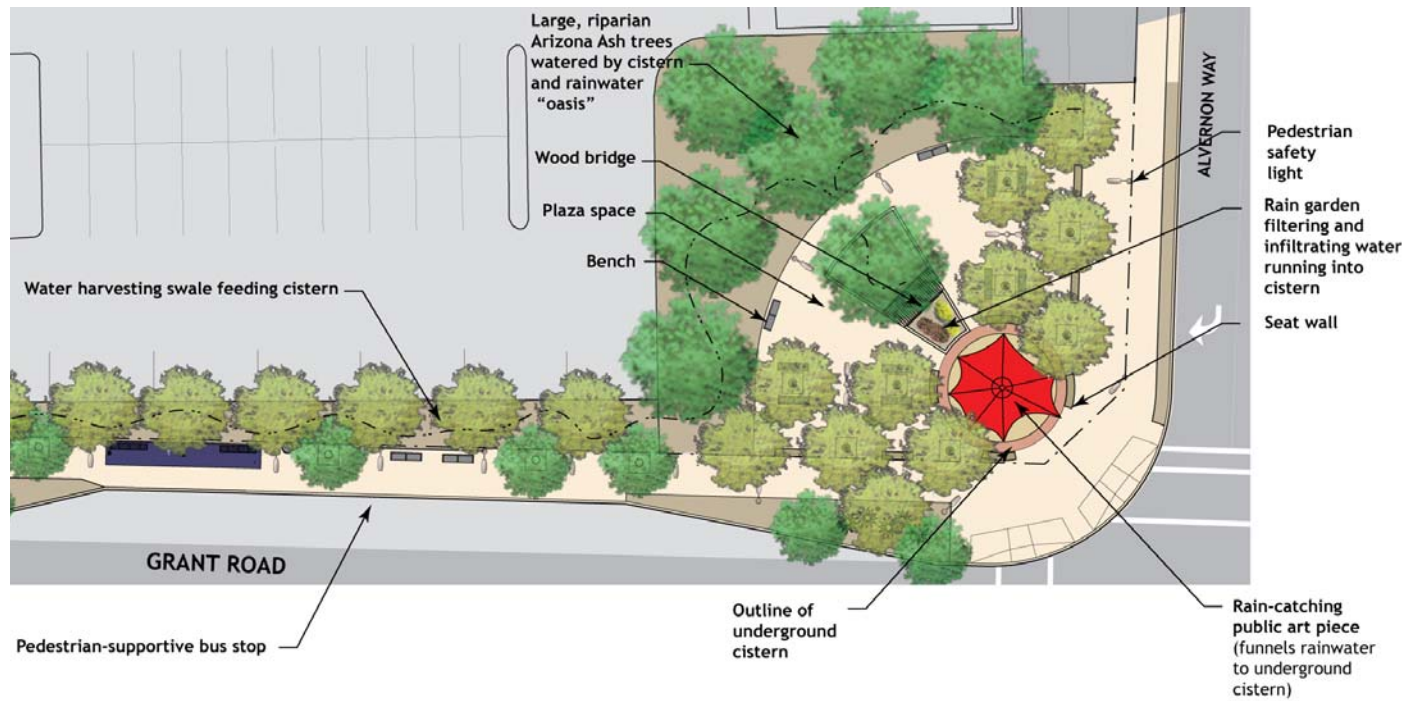


Figure 97: Plan of Alvernon Transit Plaza

Figure 97 and **Figure 98** illustrate a design concept that visually integrates the adjacent bus stop along Grant Road with the transit plaza. A rainwater harvesting swale could be provided between the adjacent parking and the bus stop as a buffer and piece of green infrastructure. The swale could flow to a rain water detention area between the hardscaped plaza and surrounding parking areas. Rainwater could flow through a swale to a cistern at the corner of the plaza that could be “capped” with a public art piece functioning as a shading device and “rain catcher”; see **Figure 99** for an example rain catcher photograph. A small pump could use water from the cistern to maintain Arizona Ash trees planted in the detention/rainwater oasis.

The design concept for the Transit Plaza serves multiple functional and educational purposes at this prominent location within the Grant Road project area.

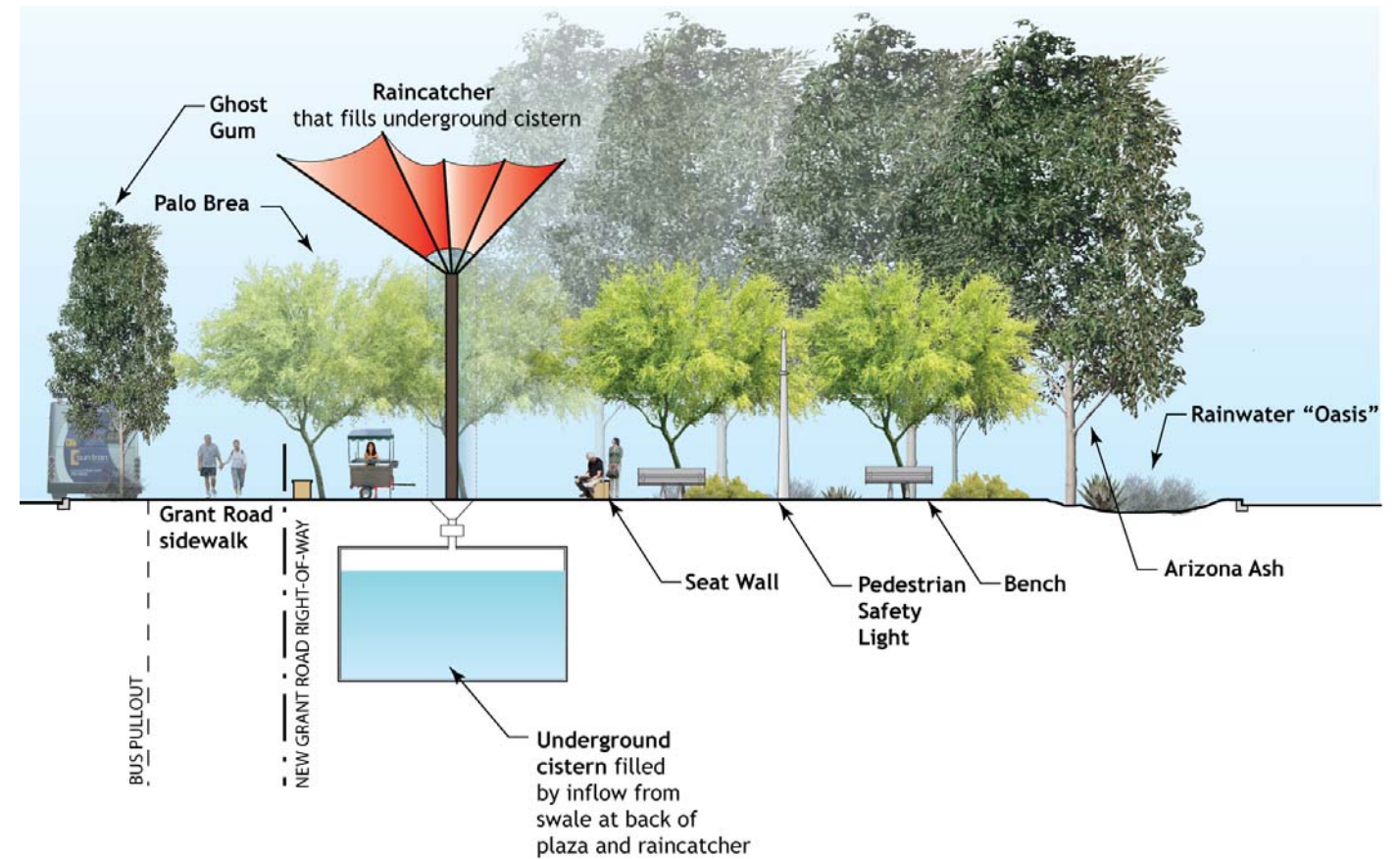


Figure 98: Section/Elevation of Alvernon Transit Plaza



Figure 99: Rainwater “Catchers” (Source: Landscape Architecture)

9.3.5.6.2 Campbell Triangle Park

The triangle park at the northwest corner of Campbell and Grant Road is the only public open space along Grant Road in the project area, and it is very underutilized. There is also a publicly owned parcel used for stormwater detention adjacent to the park at the corner of the two streets. These two spaces are not integrated with each other and the pedestrian realm along Grant Road does not take advantage of these adjacent public spaces. **Figure 100** and **Figure 101** illustrate a design concept for taking advantage of this confluence of public space to the benefit of the pedestrian realm along Grant Road. Transit riders waiting at the adjacent bus stop help to achieve the goal of activating the park and increasing safety for its potential users.

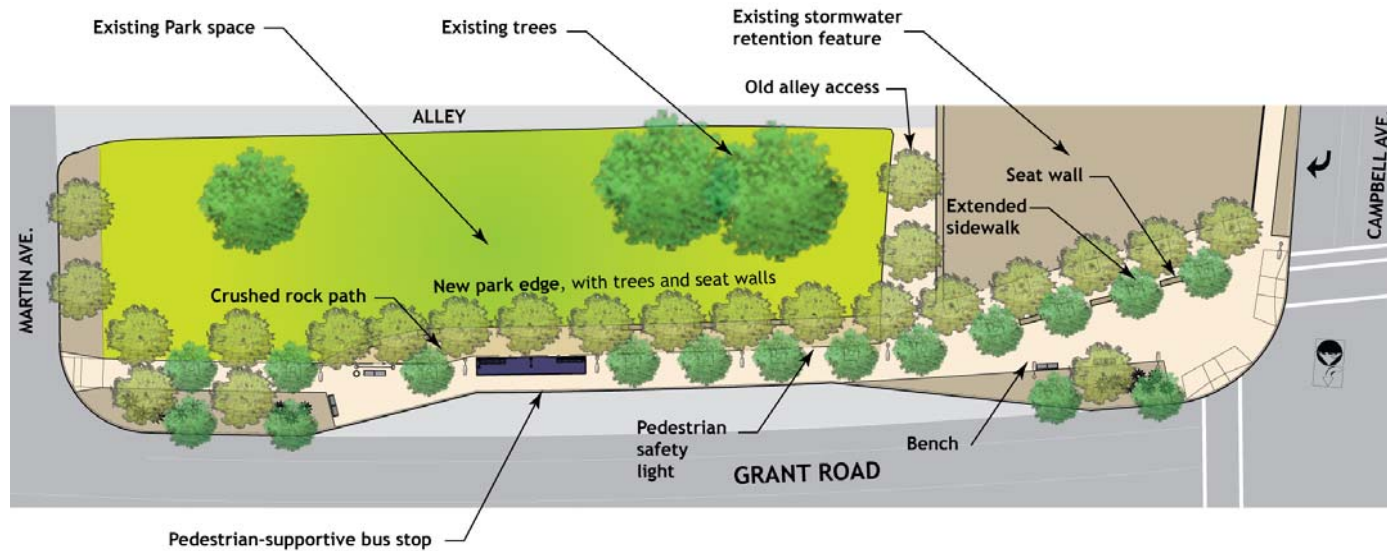


Figure 100: Plan of Campbell Triangle Park

The design concept flairs open the sidewalk at the corner of Grant and Campbell to make a small plaza space that ties together the pedestrian circulation from the crosswalks and the sidewalks that converge here and opens up a vista from the corner towards the bus stop. Benches and seat walls provide opportunities for pedestrian to stop and appreciate the landscape, and at the park edge a crushed rock path could be provided along the edge of the park allowing park users to use the seat walls as well as transit riders.

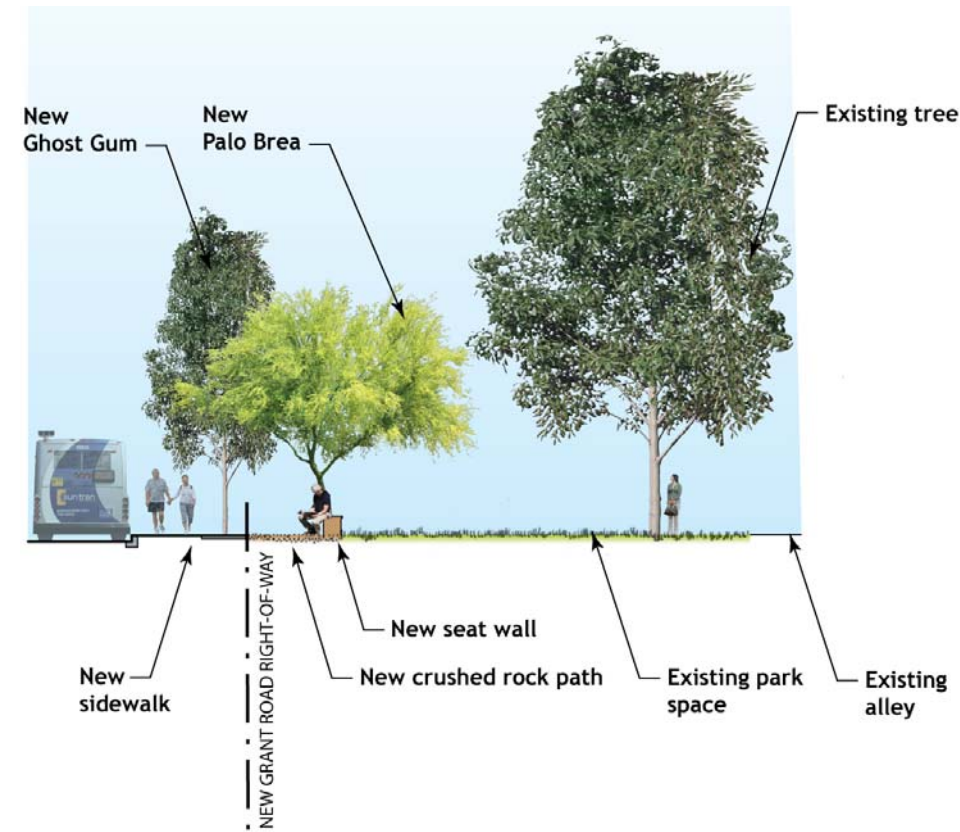


Figure 101: Section/Elevation of Campbell Triangle Park

9.3.5.6.3 Pedestrian Realm Opportunities

Several opportunities exist for unique pedestrian realm design treatments in locations where the new roadway alignment shifts away from the existing alignment for a short distance. These places can become pocket parks, larger water harvesting and landscape features, etc. An area with this condition exists at the northeast corner of Campbell and Grant, see **Figure 102**. The existing right of way aligns with the front of the commercial buildings in this area while the alignment of the future Grant Road shifts to the south as it passes through the intersection. This allows for the sidewalk to widen into a small plaza space in front of the adjacent storefronts; café or restaurant tables can be placed in front of the businesses while maintaining the desired 8-foot or more width to the sidewalk.

At several places along the future Grant Road, at the ends of local access lanes and adjacent to indirect left turn turn-arounds, the shift in alignment of portions of the road leaves a widened corner with the public right of way. These areas can become small park spaces and enhanced water harvesting areas. **Figure 103** illustrates a pocket park and rainwater harvesting oasis at the southeast corner of Warren Avenue where a Pelican crossing comes into the south side of the street. This space also provides an additional buffer to adjacent residences and allows the sidewalk along Grant Road to extend straight across Warren to the sidewalk along the adjacent local access lane to the west.

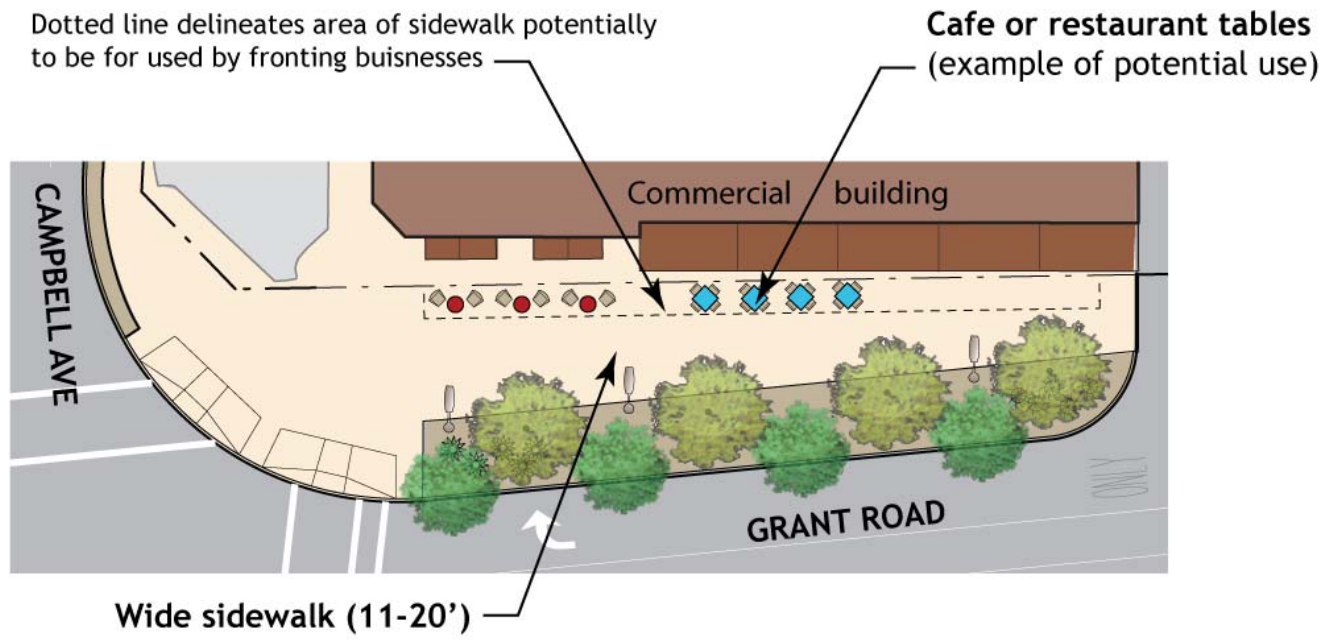


Figure 102: Plan of Campbell Intersection Northeast Corner

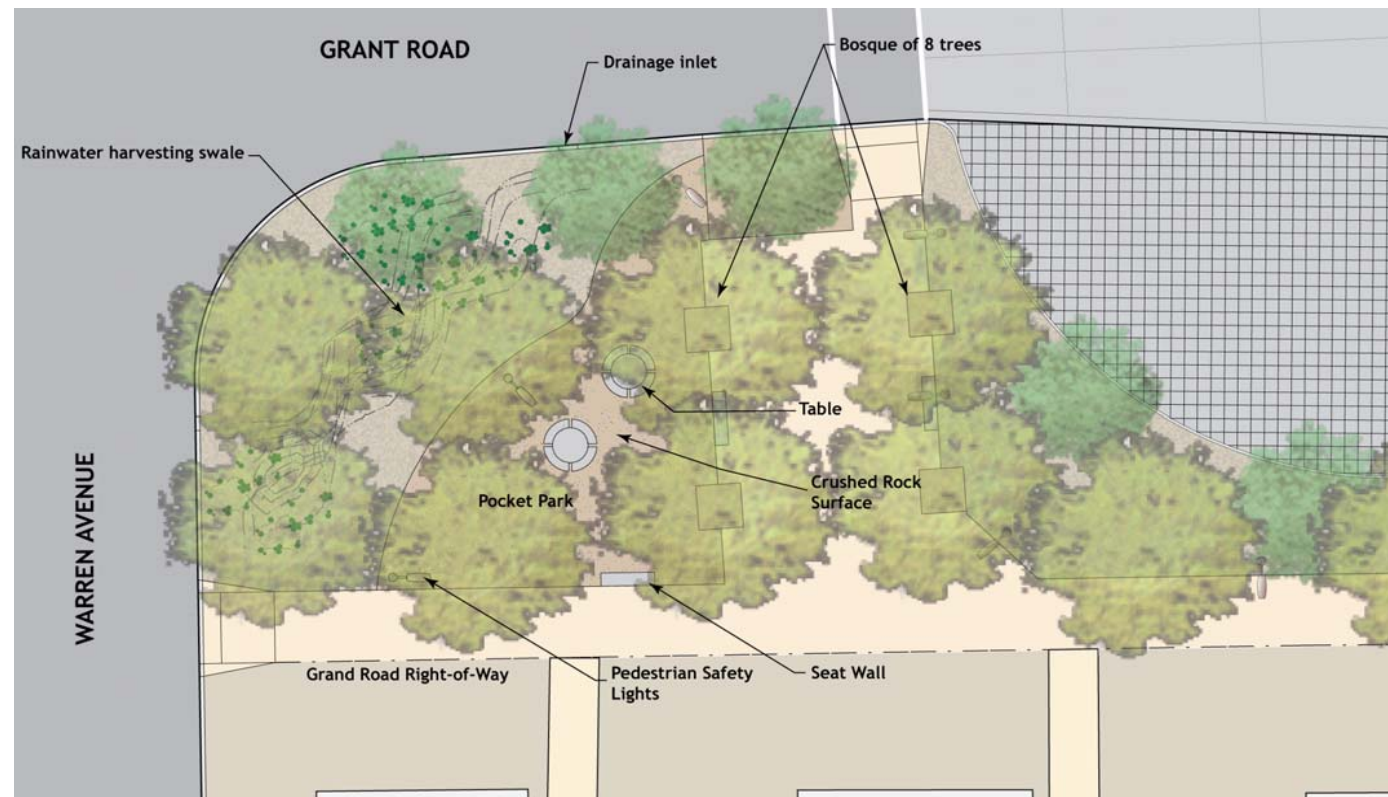


Figure 103: Plan of Pocket Park at Warren Avenue Intersection

10 COMMUNITY CHARACTER AND VITALITY PLAN

The Grant Road Improvement Plan includes the creation of a Community Character and Vitality Plan (CC&V Plan) to guide the future land use patterns, urban form of development, and economic vitality of the properties along Grant Road with the intent of taking advantage of the public investment in the expansion of the roadway and the positive improvements of the road's design character.

The Community Character and Vitality Plan will:

- Refine current area and neighborhood plan land use and design guidance for properties along Grant Road—through an amendment to Area and Neighborhood Plans;
- Guide future land use change to achieve the community's vision for the form and scale of future development;
- Primarily dealing with non-residential and mixed use properties, not existing single-family residential uses;
- Focus on the relationship and buffering between development along Grant Road and the neighborhoods behind;
- The City will not initiate rezoning of any properties as part of the Grant Road planning effort.

10.1 Starting Points for the Plan

The CC&V planning efforts have been guided by the existing area and neighborhood plans for these properties, the Vision Statement and Guiding Principles of the Grant Road Improvement Project, and the on-going public involvement and education efforts of the project.

The concepts that have been explored have also been shaped by both technical considerations of real estate development, existing policies and practices, and the urban design and land use expertise of the planning team and city staff. The starting point for public input was the community conversations and the existing planning policies for the study area. Through a public involvement process and work with the Grant Road Task Force, this led to the definition of the Vision Statement and Guiding Principles for the Grant Road Improvement Project.

10.2 Vision Statement and Guiding Principles

The following are elements of the Vision Statement and Guiding Principles that are most related to the CC&V effort.

Vision Statement Excerpts

The community values the scale, character, and diversity of the neighborhoods and businesses along Grant Road and the Plan will reflect these values. The Plan will recognize the diversity of residents and independent businesses along Grant Road, and will help them to revitalize the places in which they live and work.

The Plan will strive to improve the visual character and quality of Grant Road and the land uses along it, and it will define Grant Road as a unique and vital place that ultimately enhances the community and region as a whole.

Guiding Principles

Character and Vitality

Character and Vitality mean the health of the places surrounding Grant Road — neighborhoods and businesses, public space and activity, and private investment. Character and Vitality define the overarching goals for aspects of the study area such as housing, neighborhoods, employment, and public space. Through character and vitality, the Plan will work to enhance, in a fair manner, the economic and social environment of neighborhoods and districts by doing the following:

- 2.1 **Preserve and enhance the scale and character of existing residential neighborhoods** by providing appropriate transitions and buffering from Grant Road and the uses fronting onto it to the neighborhoods behind.
- 2.2 **Support opportunities for a range of options for housing tenancy and housing type** which serve and expand upon the diversity of residents who live along and nearby Grant Road.
- 2.3 **Support the viability of small, local, and independent businesses.**
- 2.4 **Preserve and enhance opportunities for a range of employment** along Grant Road, including restaurants, retail, manufacturing, construction, repair, service, professional office and medical jobs.
- 2.5 **Create a cohesive public realm** that adds new public spaces to existing parks, plazas, schools and other community gathering places; forming an accessible network that supports and is supported by the design and function of Grant Road, and the neighborhoods and businesses along it.
- 2.6 **Build on the attraction and strengths of community and social service organizations** to revitalize districts and enhance the public realm with activity along Grant Road.
- 2.7 **Develop districts with multiple uses and shared parking** that will be destinations for neighborhood residents as well as people from the region at large.
- 2.8 **Recognize the differences in demographics, environment, scale, neighborhoods, business types, and other aspects of character; and use them to reinforce the identities of Grant Road's Community Character Segments.**
- 2.9 **Work to create safer environments that discourage crime and increase personal safety.**
- 2.10 **Support and build upon ethnic diversity** in relation to the social and economic vitality in the Grant Road Study Area.
- 2.11 **Encourage private investment** that revitalizes opportunity sites along Grant Road.

Aesthetics and Environment

- 3.1 **Create an aesthetically pleasing, comfortable, inviting environment**, both in the street right-of-way and in adjacent public spaces, that is framed by the buildings and landscapes that front Grant Road.
- 3.2 **Enhance the identities** of Grant Road's Community Character Segments through the creation of business clusters, streetscape design, and other elements.
- 3.4 **Capitalize on Tucson's culture**, through urban form, architectural styles, public art, and other elements.

Vision and Implementation

- 4.6 **Rely on policies and programs** in addition to physical improvements in achieving the vision.
- 4.7 **Coordinate new development and revitalization with new and existing amenities and multimodal infrastructure.**

10.3 Overview of Area and Neighborhood Plans

Area and neighborhood plans are an instrument of Tucson's land use policies that sit between the Comprehensive Plan of the entire city and the zoning ordinance that is applied to specific zoning districts. Area and neighborhood plans are the policy documents that are referred to when a property owner decides to rezone their property. The plans provide policies, and for some plans land use designations, that define the range of potential future zoning designations that would be applicable to a property; however, the policies of the area and neighborhood plans tend to be general, some plans are over 10 years old, and are not always strongly related to the goals and issues that stakeholders have identified during the Grant Road CC&V planning process.

Still, most of existing plans define centers and districts of activity along Grant Road, similar to what is being proposed in the Grant Road Plan.

10.4 Centers and Districts – an organizing structure for Grant Road

The CC&V planning effort has identified a series of centers and districts that have specific use, built form, and community character considerations (Error! Reference source not found.). These characteristics are based on a combination of existing conditions, market feasibility, and the desires and needs of property owners and the surrounding community.

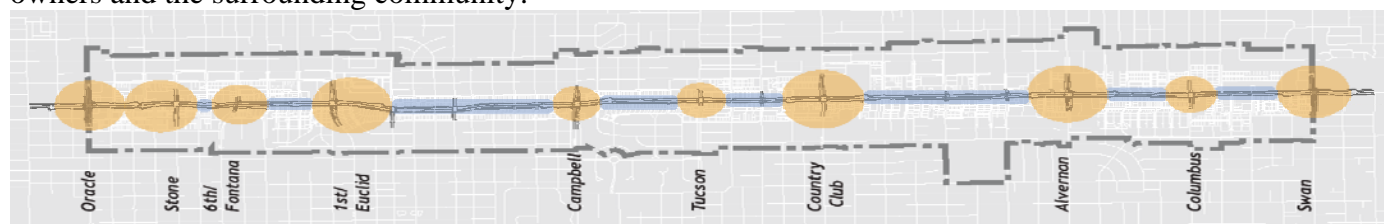


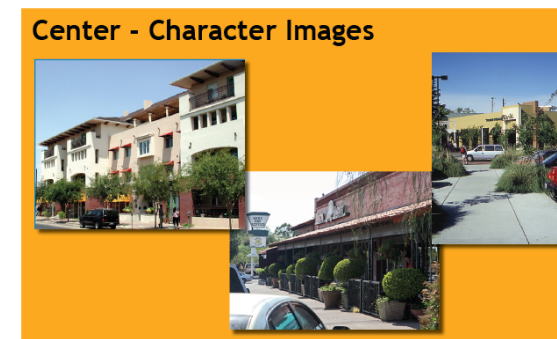
Figure 104: Centers and Districts along Grant Road

Centers

Centers are areas where concentrations of activities occur around the intersection of Grant Road with other major roads, such as Oracle, Tucson Boulevard, and Alvernon. Centers are destinations with a mix of uses that vary in size, scale, and diversity of uses. Centers may provide services to the region, and may also be designed to be compatible with the residential neighborhoods around them.

Districts

Districts are the more linear areas that line Grant Road between the Centers, and they provide support uses. Districts have a certain character and set of uses that typically includes a smaller scale and different building orientation. While some Districts contain auto-serving uses, they also should support pedestrian and bicycle movement along Grant Road.



The location and design characteristics of the Centers and Districts along Grant Road are being determined by a combination of:

- Analysis of existing characteristics and market opportunities
- Existing policies of the Area and Neighborhood Plans along Grant Road
- Feedback from property owners and businesses
- Input from the broader public through the Grant Road public participation process

10.5 Key Community Character and Vitality Issues

The CC&V Plan will address a number of key issues. The following highlights several issues that are most strongly related to the design within the right-of-way of the future Grant Road.



10.5.1 Contribute to Pedestrian Activity and Safety

The use of a context sensitive design approach in developing the roadway and streetscape design for Grant Road will result in a future road that creates a more pedestrian supportive environment. The CC&V Plan will set guidelines and policies to create the pedestrian supportive context that will take best advantage of Grant Road's redesign. Design concepts that the CC&V Plan will support include:



Grant Road's redesign. Design concepts that the CC&V Plan will support include:

- Providing for "eyes on the street" by orienting buildings so that they provide entries and windows in proximity to Grant Road. The occupants of the building see what is happening on the street, and people moving along Grant Road, particularly along its sidewalks and public spaces, know that they are being observed. This helps to create a safer and more active street life along Grant Road.
- Allowing for and encouraging outdoor seating for restaurants and cafes, and outdoor display for retail and service establishments in support of pedestrian activity.



- Provide on-site public gathering places with shade and shelter from the weather, and high-quality lighting at night.
- Provide pedestrian circulation from the public sidewalk to adjacent buildings are shaded and well lit.
- When parking must front onto Grant Road, provide a buffer between the parking and the sidewalk. The photos illustrate (above) a good and a bad example of how parking can front onto a sidewalk.

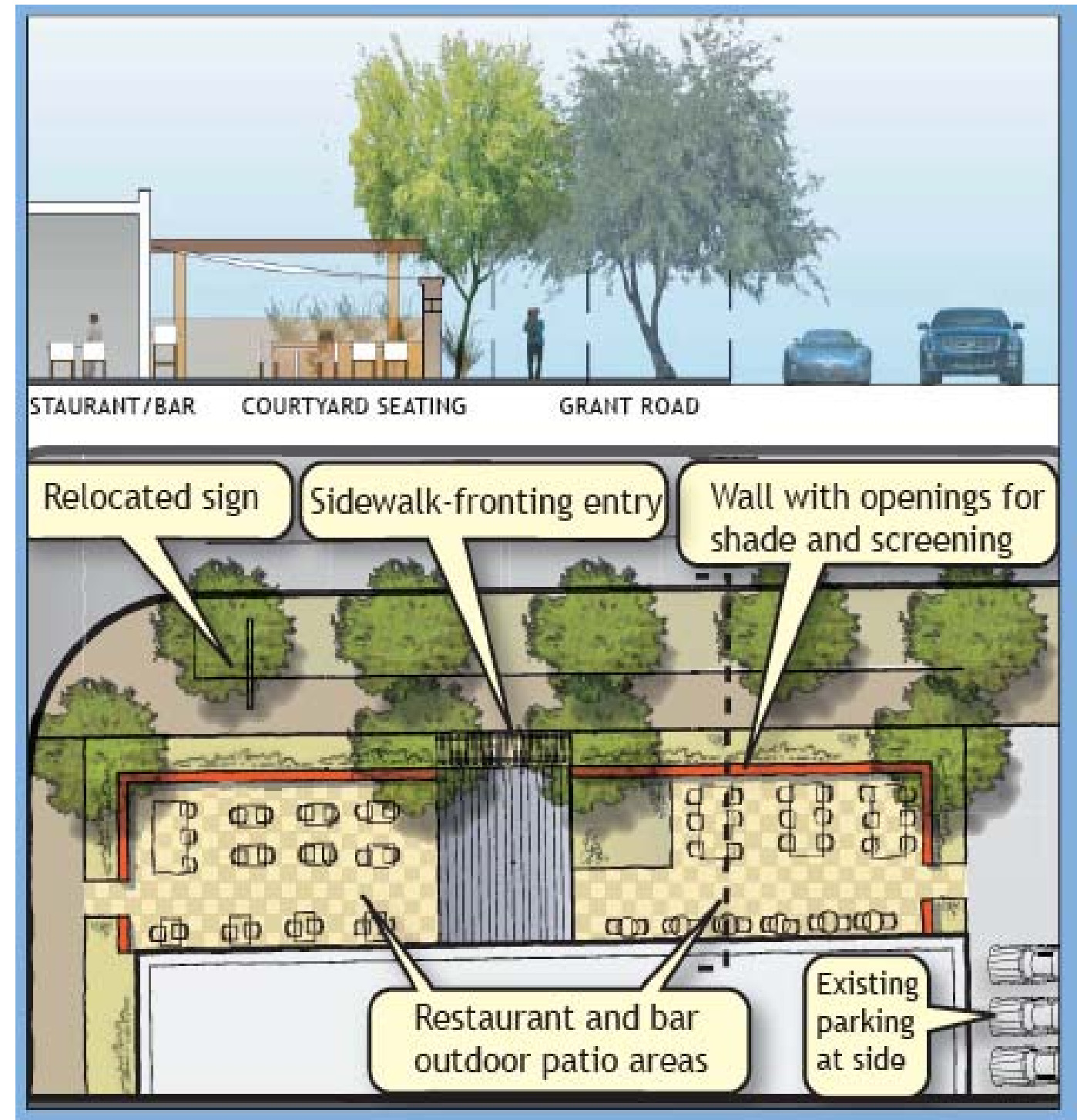
10.5.2 Outdoor Seating

The character and safety of the public realm along Grant Road can be strengthened by providing outdoor seating that brings activity adjacent to the sidewalk. To do this effectively, the visibility of dining and other activities must be balanced with the need to provide a comfortable environment for patrons. The illustrated design (**right**) concept provides a wall with some open areas so that this balanced character is achieved.

10.6 Protecting and Enhancing Neighborhoods

The existing mismatch between the regional traffic and auto-oriented nature of Grant Road and the quieter residential character of most adjacent neighborhoods has led to much discussion of the need to protect neighborhoods from the negative aspects of Grant Road; many policies of the area and neighborhood plans address this issue. The CC&V Plan will define guidelines for the transition of building massing to the

smaller scale of neighborhoods, buffering, and other site design issues. But it will also include discussion of design concepts that are more closely related to the transportation functions of Grant Road.



An urban design approach for the creation of “gateway” neighborhood traffic calming feature has been developed, **as illustrated in the concepts and photos below**. This design feature can be used at the transition point between neighborhoods and commercial areas on the smaller streets that intersect with Grant Road. The combination of a neck-down and speed-table can provide both a gateway and a small public gathering place.



10.7 Next Steps for the Grant Road Community Character and Vitality Plan

Development of the Community Character and Vitality Plan (CC&V) will continue through the remainder of 2010 and much of 2011, and will result in a stand-alone document, focused outreach to the community to address key design and policy content, and on-going work with the Citizen Task Force to achieve their endorsement of the Public Review Draft of the CC&V Plan. It is currently expected that the Public Review Draft will be released in the early spring of 2011 with the Planning Commission and Mayor and Council hearings occurring in the late spring and summer of 2011.

APPENDIX A – GRANT ROAD, ORACLE ROAD TO SWAN ROAD, FINAL DESIGN CONCEPT REPORT, ROADWAY PLANS AND TYPICAL SECTIONS

The Grant Road, Oracle Road to Swan Road, Final Design Concept Report, Roadway and Drainage Improvements, 30% Construction Plans, were reviewed by City of Tucson staff. Comments provided by City staff were logged and are part of the Construction Plans dated October 2010.

CITY OF TUCSON, ARIZONA
GRANT ROAD
 ORACLE ROAD TO SWAN ROAD

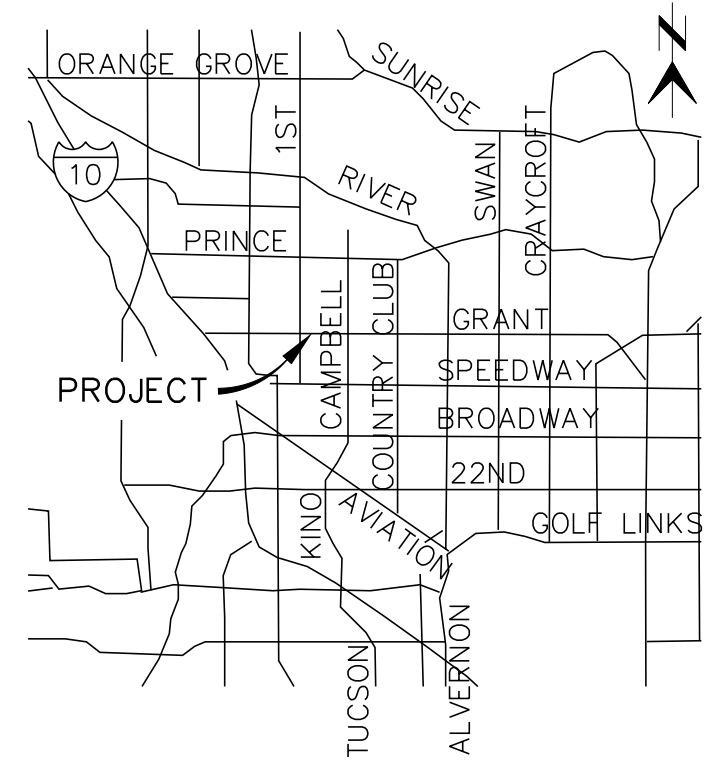
FINAL DESIGN CONCEPT REPORT
ROADWAY PLANS AND TYPICAL SECTIONS

PROPOSED CONSTRUCTION BEGINS EAST OF N 15TH AVENUE AND ENDS WEST OF N ARCADIA AVENUE.
 THE 5.49 MILES OF NEW ROADWAY IMPROVEMENTS INCLUDE A SIX LANE DIVIDED ROADWAY,
 LOCAL ACCESS LANES, MULTI-USE LANES, MEDIANS, DRAINAGE IMPROVEMENTS,
 INDIRECT LEFT TURN BAYS, WATER HARVESTING CELLS, BUS PULLOUTS, AND NEW TRAFFIC SIGNALS.

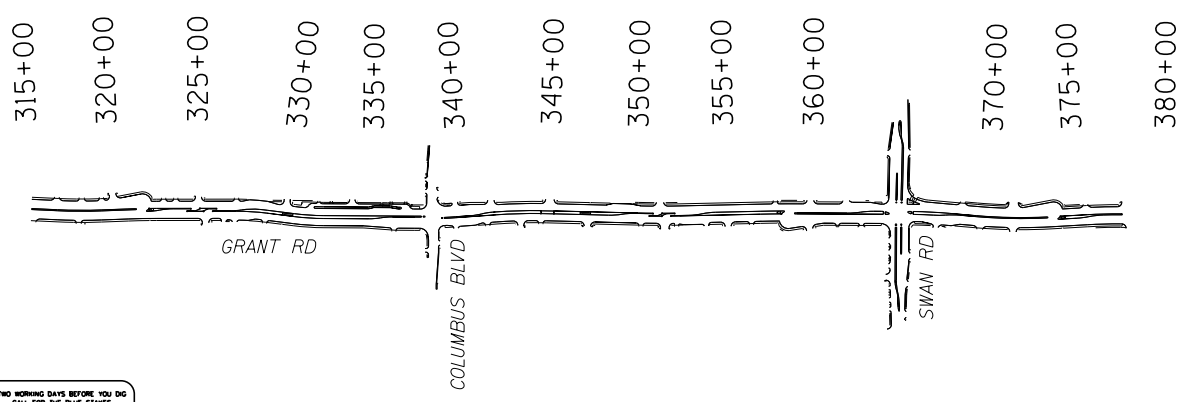
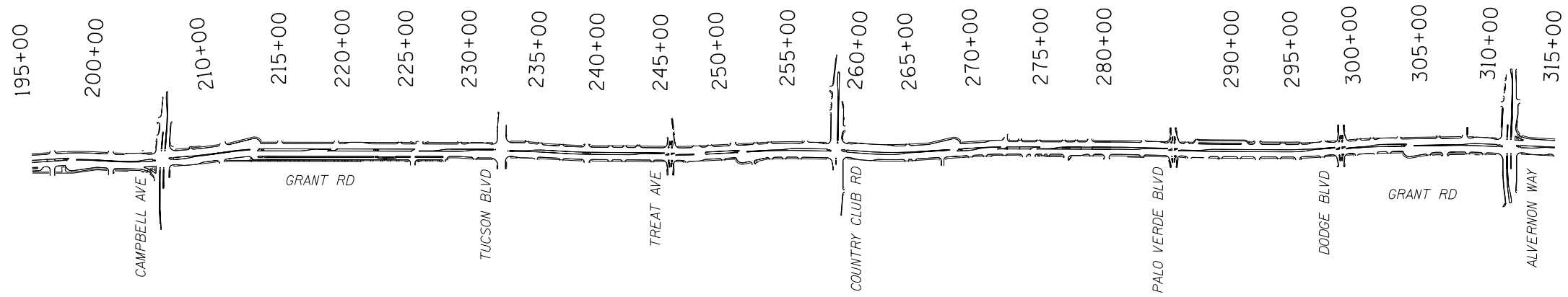
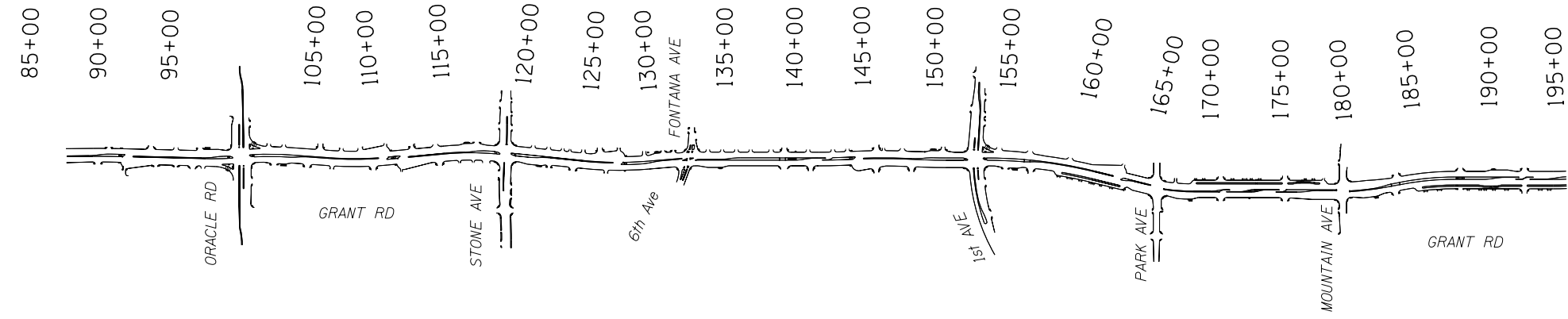
LOCATION MAP

Sections 35, 36
 T-13-S, R-13-E
 Sections 31, 32, 33, 34, and 35
 T-13-S, R-14-E
 Sections 2, 1
 T-14-S, R-13-E
 Sections 6, 5, 4, 3, and 2
 T-14-S, R-14-E

Pima County, Arizona
 Scale: NTS



SCALE: 1"=500'



INDEX OF SHEETS

Sheet No.	Sheet Description
1	Cover Sheet
2	General Note Sheet
3-12	Typical Roadway Section Sheets
13-95	Roadway Plan Sheets

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TRAFFIC PLANNING & DESIGN ADMINISTRATOR			
STREETS AND TRAFFIC MAINTENANCE			TRANSPORTATION DIRECTOR
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ABBREVIATIONS

ε	Centerline
Δ	Delta
⊙	Phase (Traffic)
AC	Asphalt Concrete
Ave	Avenue
Blvd	Boulevard
CB	Catch Basin
CATV	Cable Television
COMM	Communications
Const	Construction
Corr	Correlation
D	Degree of Curvature
Dr	Drive
Dtl	Detail
E	Easting
Elev	Elevation
EP	Edge of Pavement
Exst	Existing
Ext.	External
FL	Flow Line
Fnd	Found
FO	Fiber Optic
Invt	Invert
KV	Kilo Volts
L	Length
Lt	Left
MH	Manhole
N	Northing
OH	Overhead
PC	Point of Curvature
PCC	Portland Concrete Cement
PC/COT	Pima County/City of Tucson
Ped	Pedestrian
PGL	Profile Grade Line
PI	Point of Intersection
Pl	Place
POB	Point of Beginning
POE	Point of End
PT	Point of Tangency
PVC	Point of Vertical Curvature
PVI	Point of Vertical Intersection
Pvmt	Pavement
PVRC	Point of Reverse Vertical Curvature
R	Radius
R/W	Right-of-Way
Ref No.	Reference Number
Rd	Road
Rt	Right
S	Slope
SSD	Stop Sight Distance
Sta	Station
Std	Standard
St	Street
Swlk	Sidewalk
T	Tangent
TEP	Tucson Electric Power
Typ	Typical
VC	Vertical Curve

LEGEND

SYMBOL DESCRIPTION

Centerline and Station

Catch Basin

Single Vertical Curb/EP

Detectable Warning Strip

Right-of-Way Line

Cut Slope

Fill Slope

Chain Link Fence

Storm Drain Pipe

Underground Power Line

Telephone Line

Sewer Line

Overhead Line

Natural Gas Line

Water Line

Property Line

Section Line

Utility Valve

Manhole

Fire Hydrant

Utility Pole

Street Light

Pole Mounted Sign

Vegetation

Bike Spot

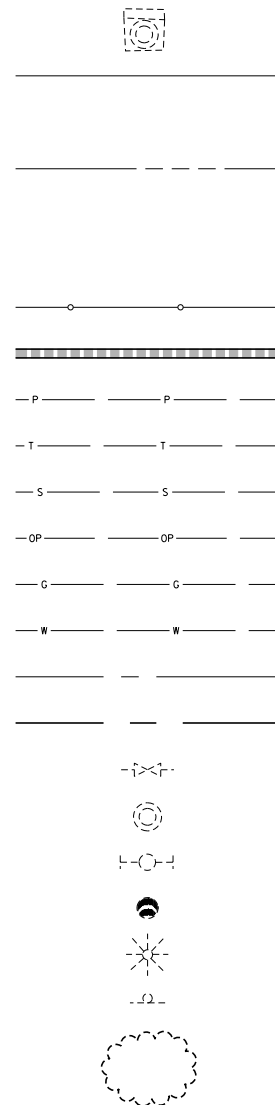
AC Pvmt

PCC Pvmt/Swlk

Landscaping

Water Harvesting

EXST



NEW



GENERAL NOTES

- 1 New Landscaping Features. Refer to LS sheets for Landscaping Plans.
- 2 New Vertical Curb Type 2, H=6", Per COT/PC Std D11 209
- 3 New Storm Drain. Refer to SD sheets for plan and profiles.
- 4 New 4-ft Sidewalk Per COT/PC Std D11 209
- 5 New 6-ft Sidewalk Per COT/PC Std D11 209
- 6 New Concrete Driveway Per "Roadway Design Criteria Memo" (page 26)
- 7 New Asphalt Driveway
- 8 New 8-ft Sidewalk Per COT/PC Std D11 209 (Modified)
- 9 New Water Harvesting Features. Refer to LS sheets for Landscaping Plans.
- 10 New Bus Pullout Per "Roadway Design Criteria Memo" (page 23) and Streetscape Plans.
- 11 Pelican Pedestrian Crossing Per "Roadway Design Criteria Memo" (page 24) and Streetscape Plans.
- 12 Indirect Left Turnaround Per "Roadway Design Criteria Memo" (page 18)
- 13 Double Bus Shelter (4'-8" x 34'). Refer to S Sheets for Streetscape layout and details.
- 14 Single Bus Shelter (4'-8" x 22'). Refer to S Sheets for Streetscape layout and details.
- 15 Raised Crosswalk Table Per "Roadway Design Criteria Memo" (page 22) and Streetscape Plans.
- 16 Channelized Right Turn Lane Per "Roadway Design Criteria Memo" (page 19) and Streetscape Plans.
- 17 Channelized Right Turn Lane, with Add Lane, Per "Roadway Design Criteria Memo" (page 20) and Streetscape Plans.
- 18 Toucan Pedestrian and Bicycle Crossing Per "Roadway Design Criteria Memo" (page 25) and Streetscape Plans.
- 19 New Apron Driveway Per COT/PC Std D11 206
- 20 New Reflective 8" Diameter White Ceramic Dome (3' On-Center Spacing)
- 21 New Concrete Wedge Curb Per COT/PC Std D11 209

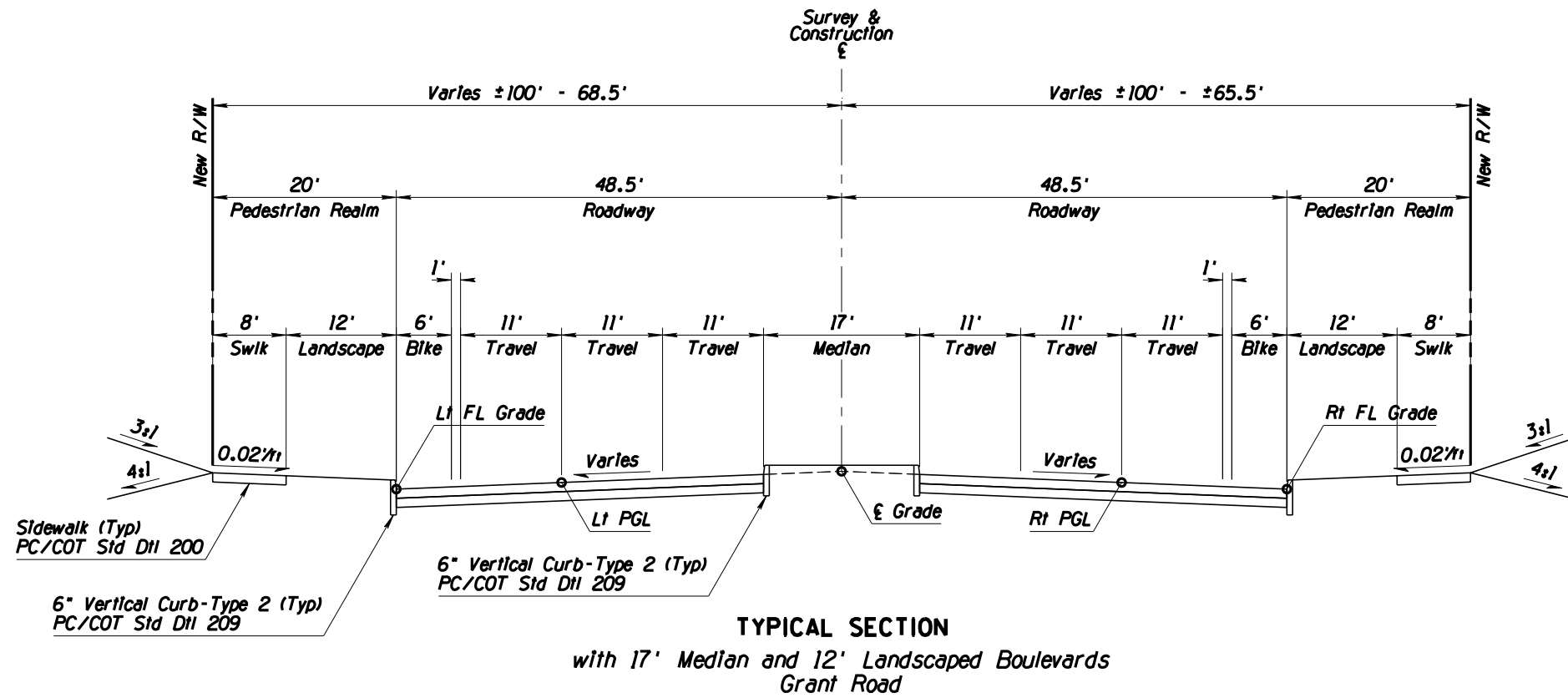
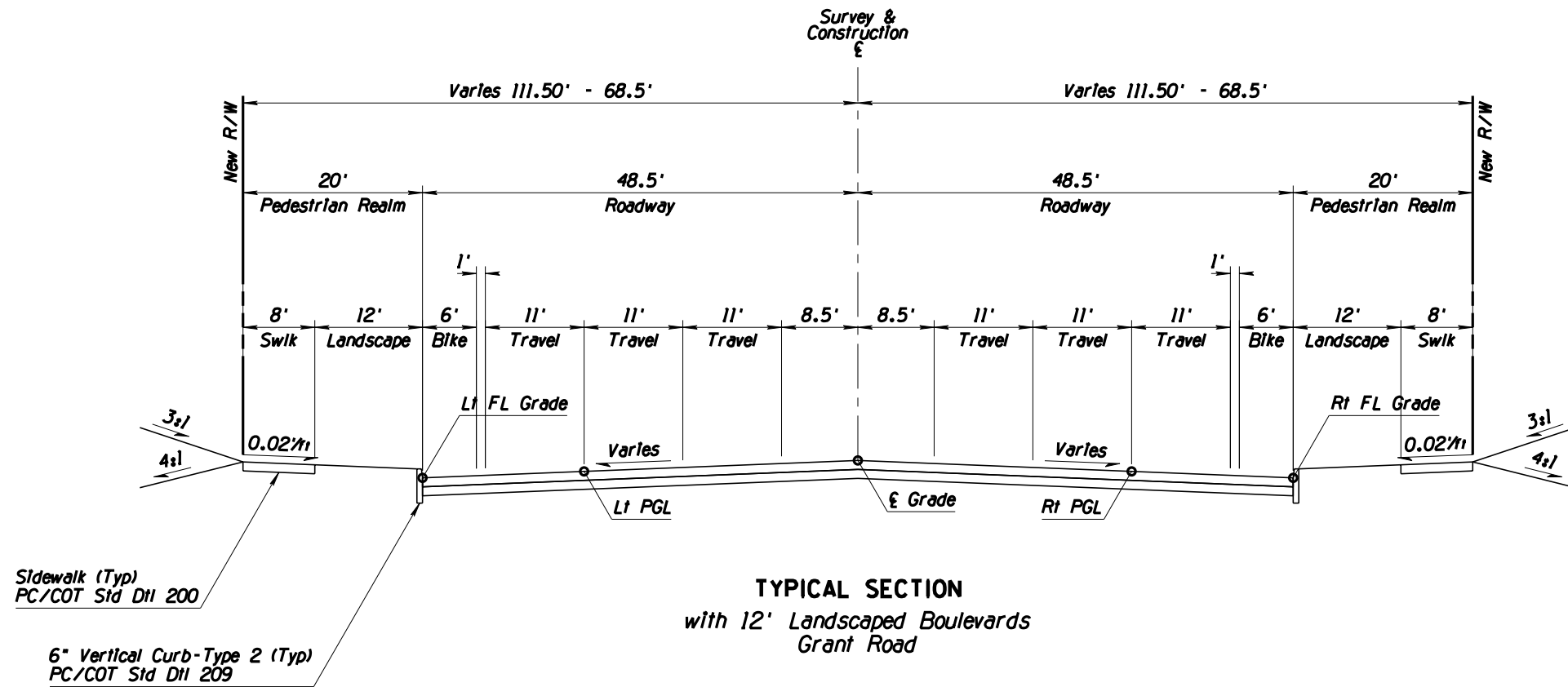


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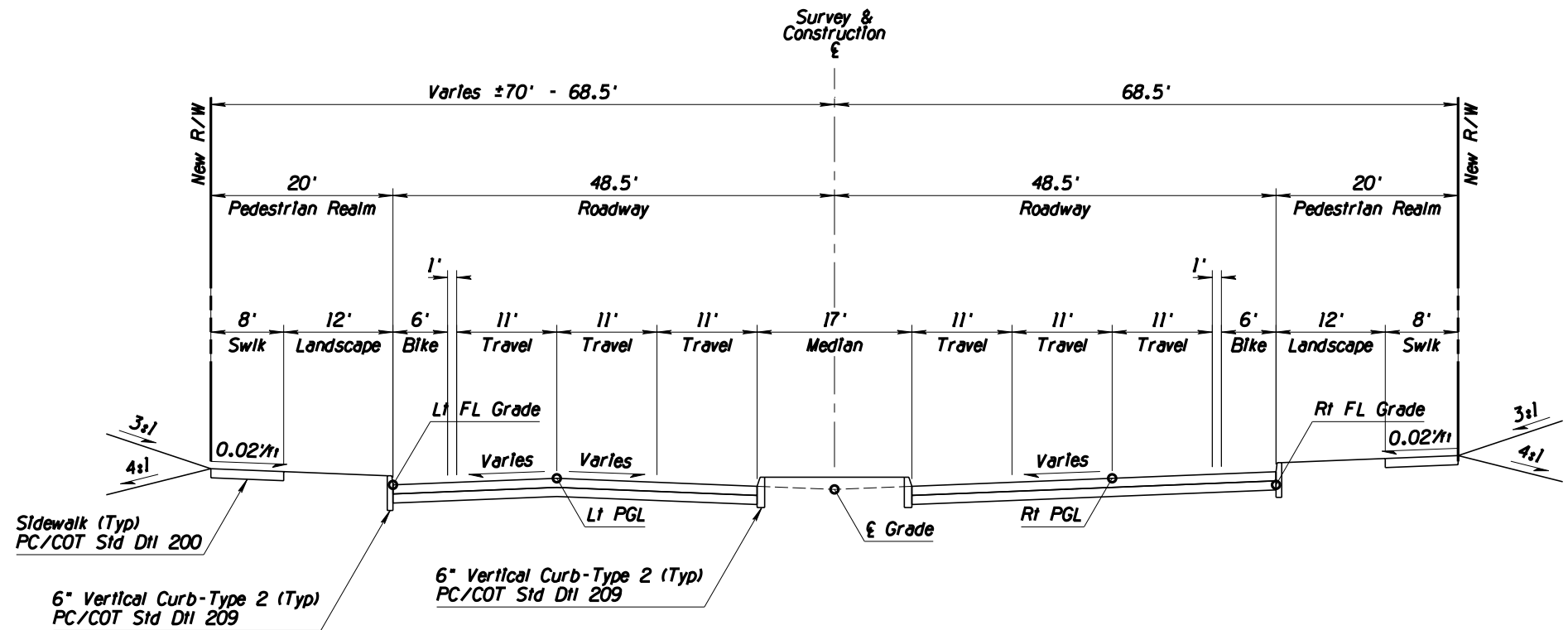
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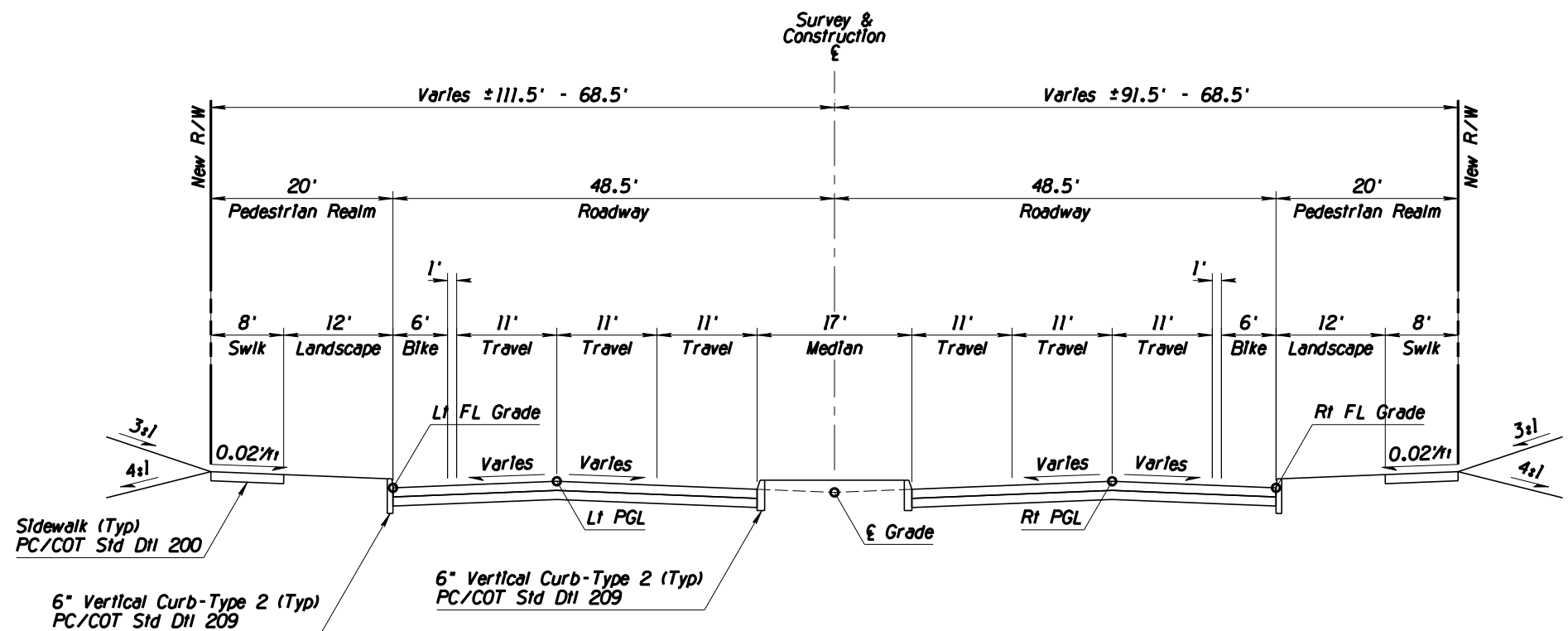
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GRANT ROAD TYPICAL SECTIONS				
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TYPICAL SECTION
with Crown and Superelevated Sections, 17' Median and 12' Landscaped Boulevards
Grant Road



TYPICAL SECTION
with Double Crowns, 17' Median and 12' Landscaped Boulevards
Grant Road



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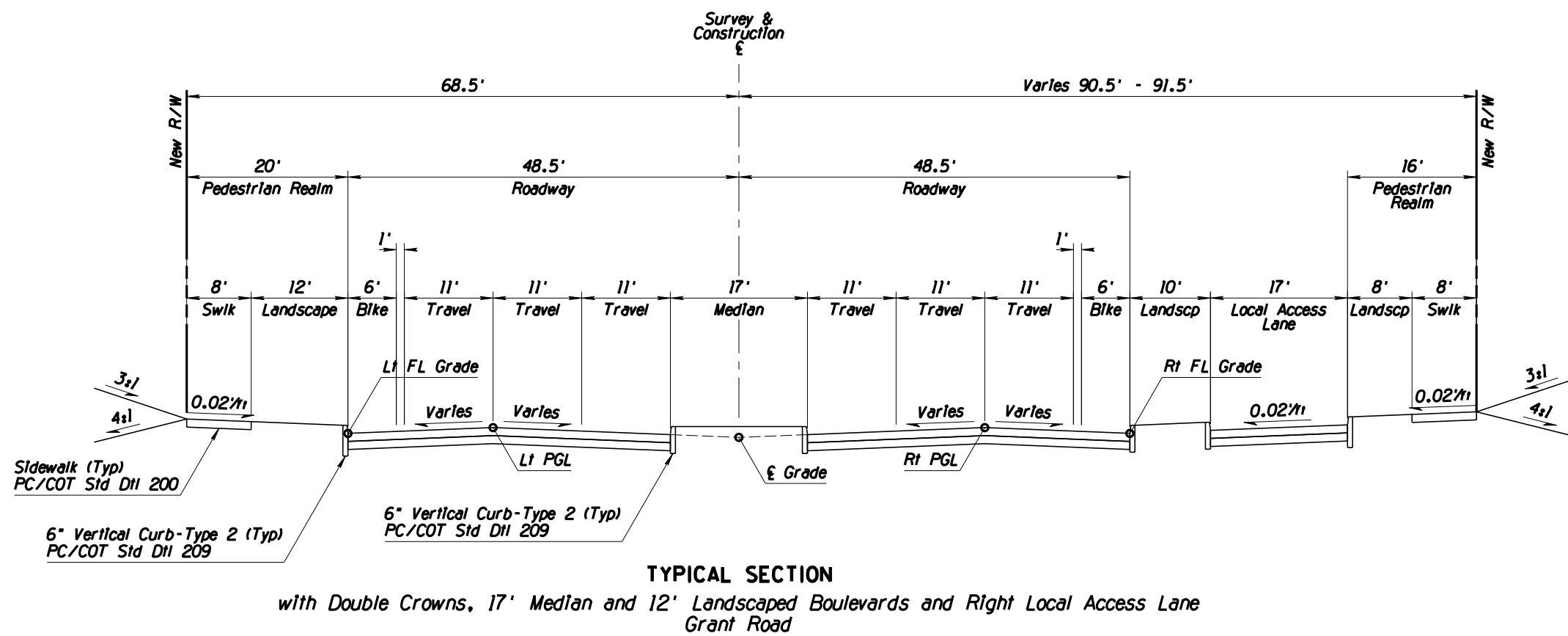
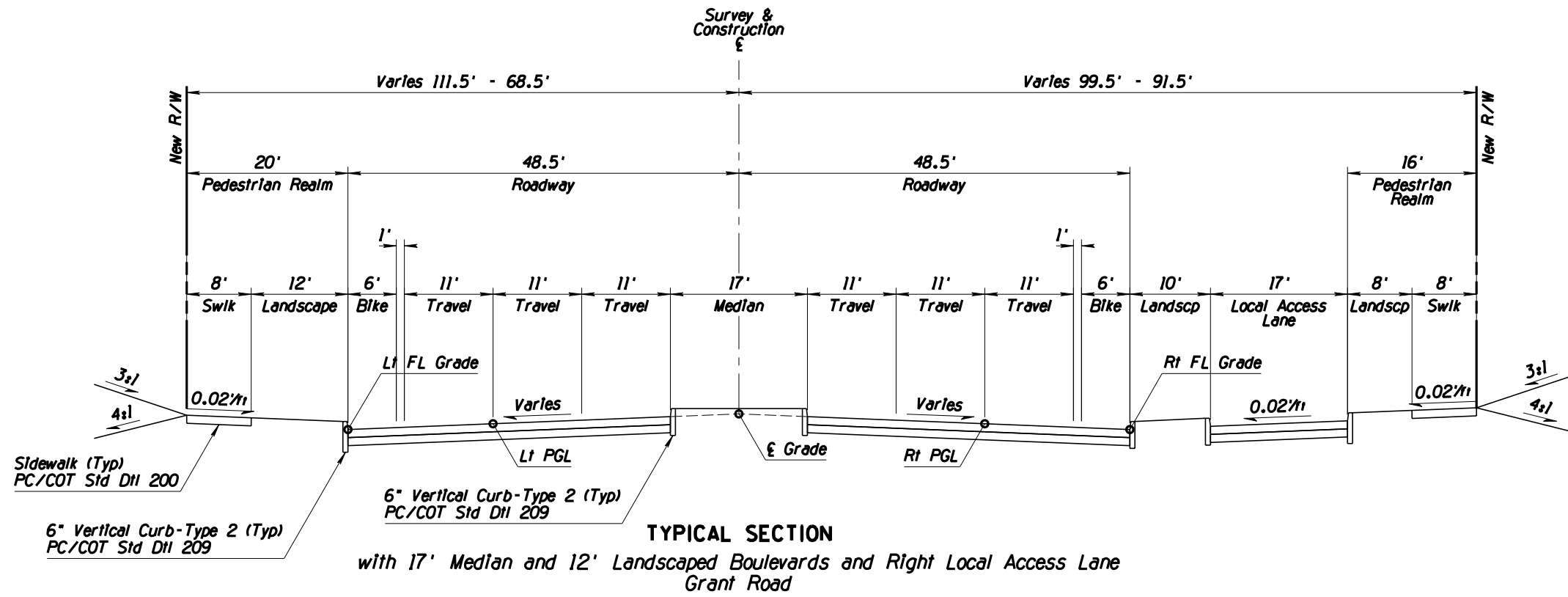
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TYPICAL SECTIONS

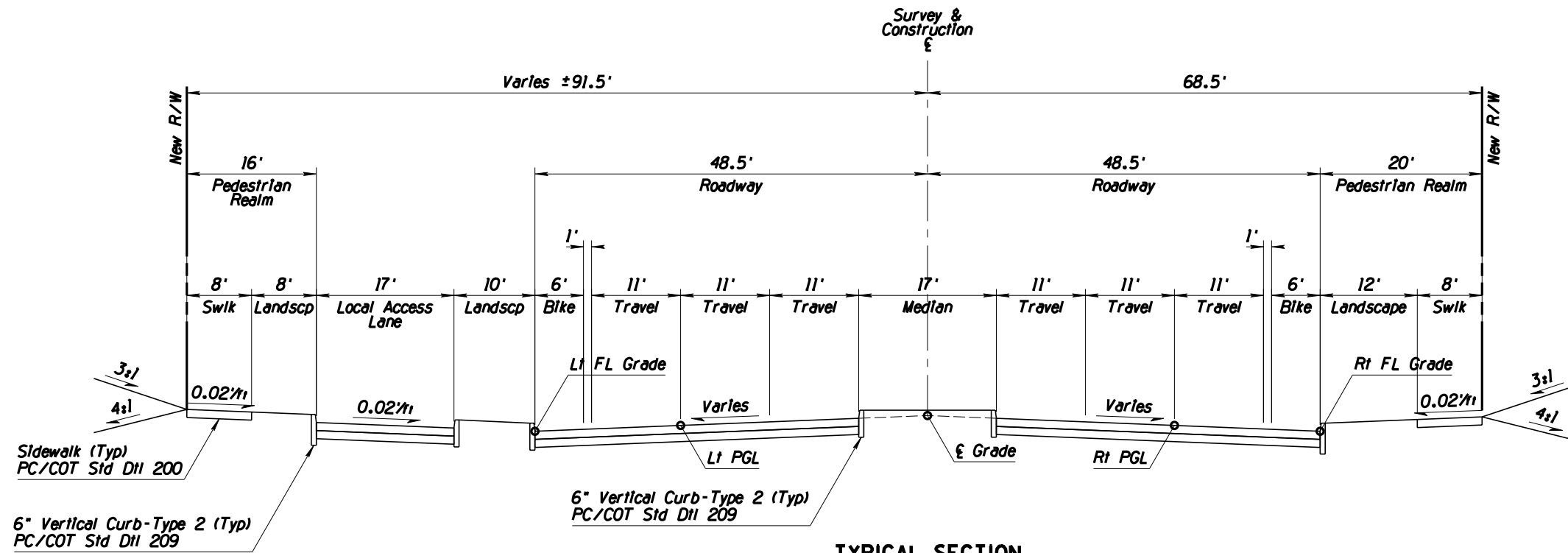
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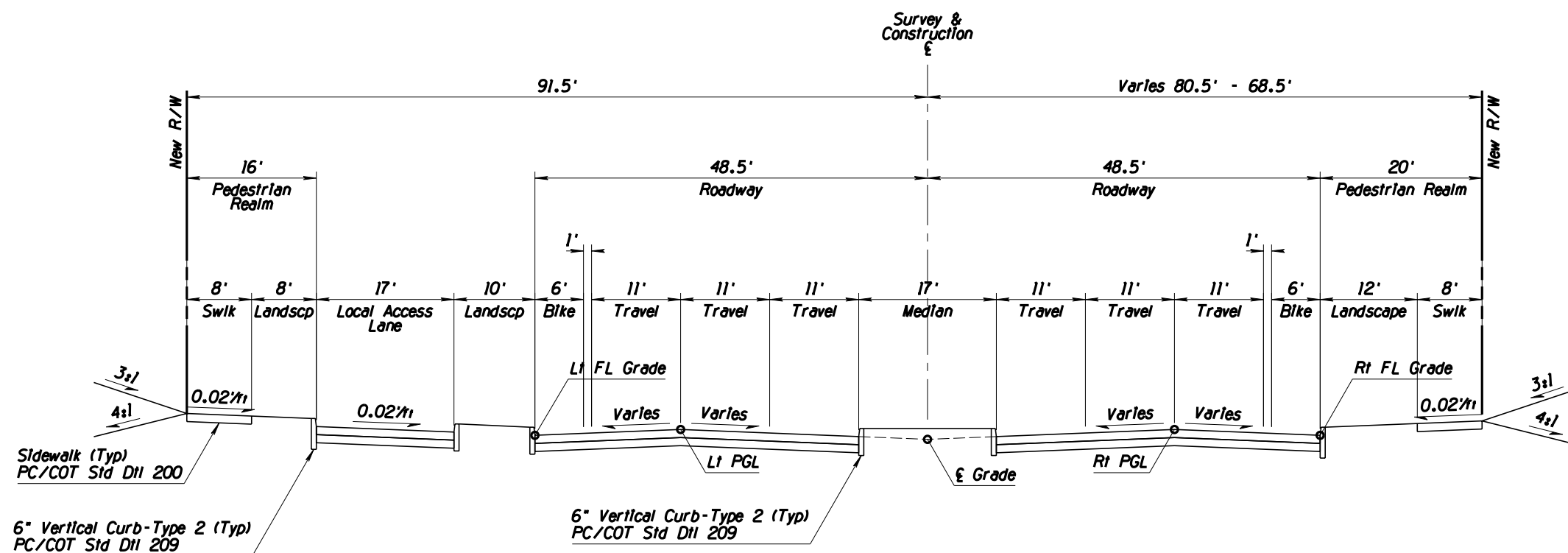


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TYPICAL SECTION
with 17' Median and 12' Landscaped Boulevards and Left Local Access Lane
Grant Road



TYPICAL SECTION
with Double Crowns, 17' Median and 12' Landscaped Boulevards and Left Local Access Lane
Grant Road



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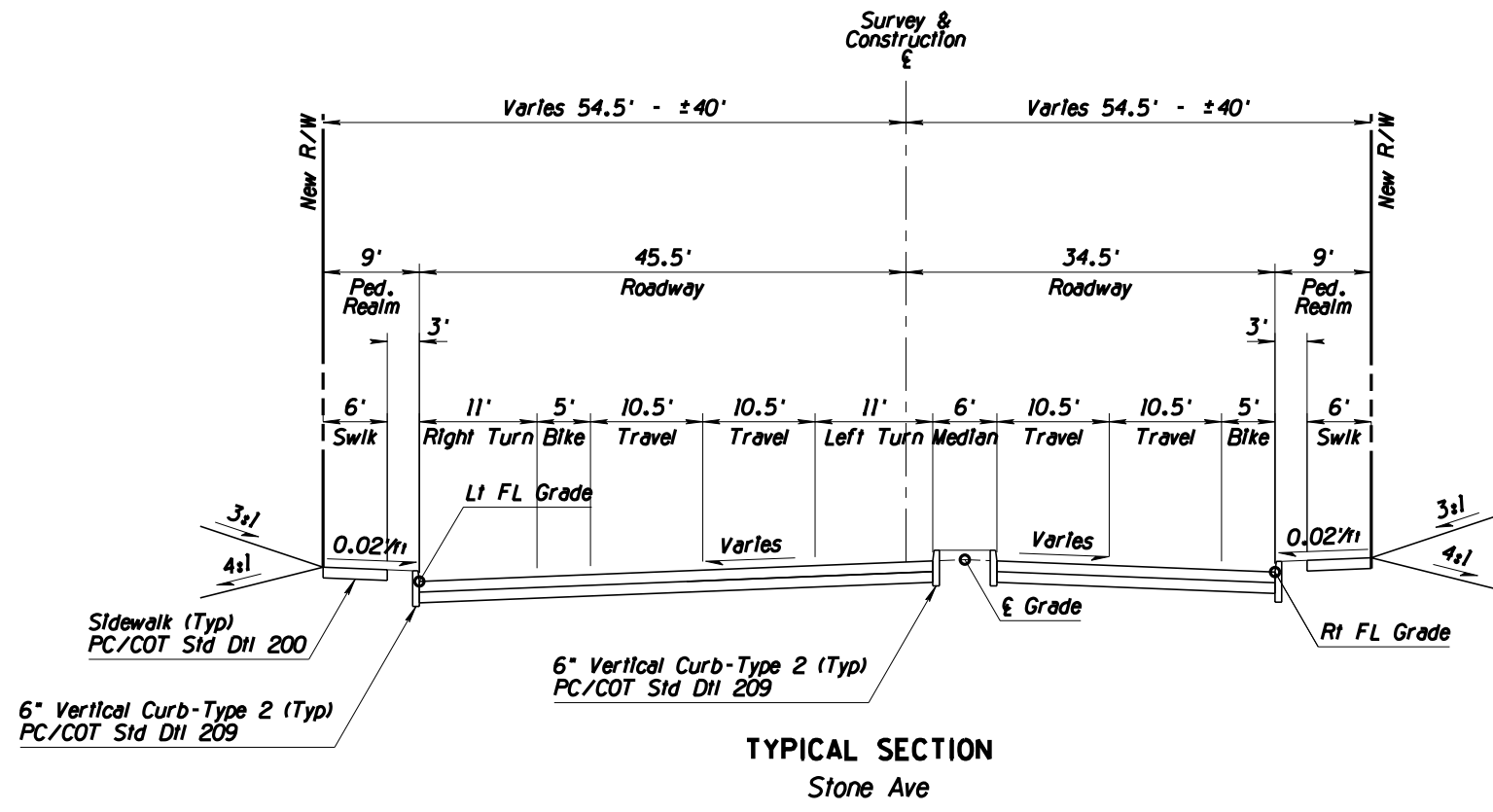
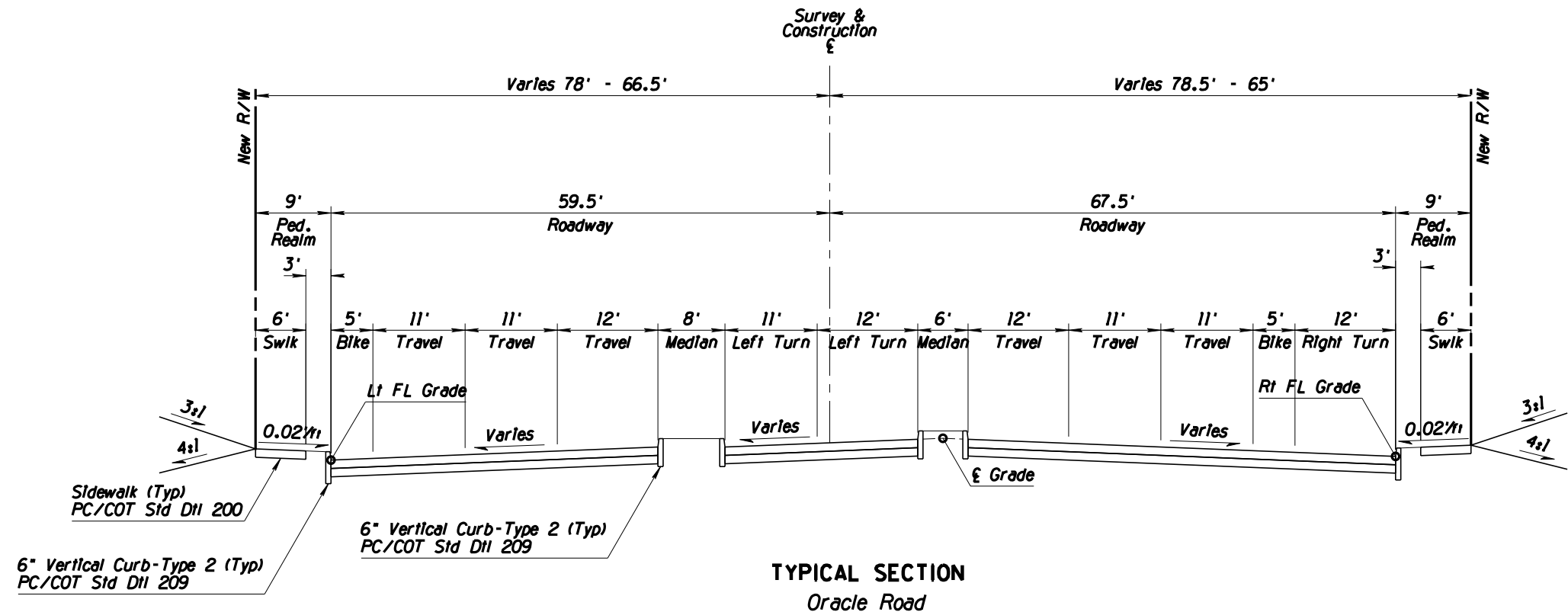
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CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

GRANT ROAD
TYPICAL SECTIONS

CITY OF TUCSON	DSGN. BY <i>RL</i>	08/10	REF.	SCALE: NTS
	DRWN. BY <i>RL</i>	08/10		
	CHKD. BY <i>RL</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

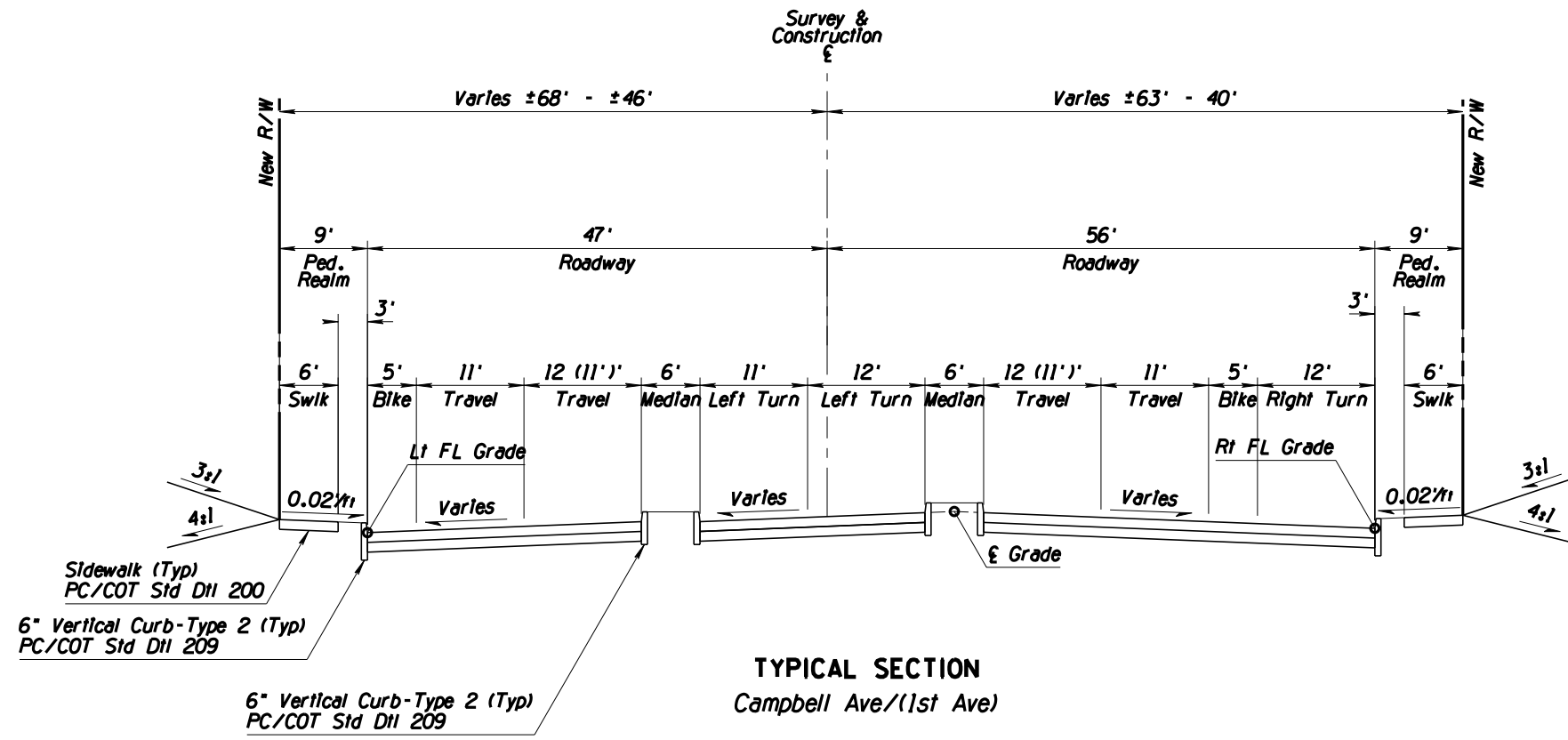


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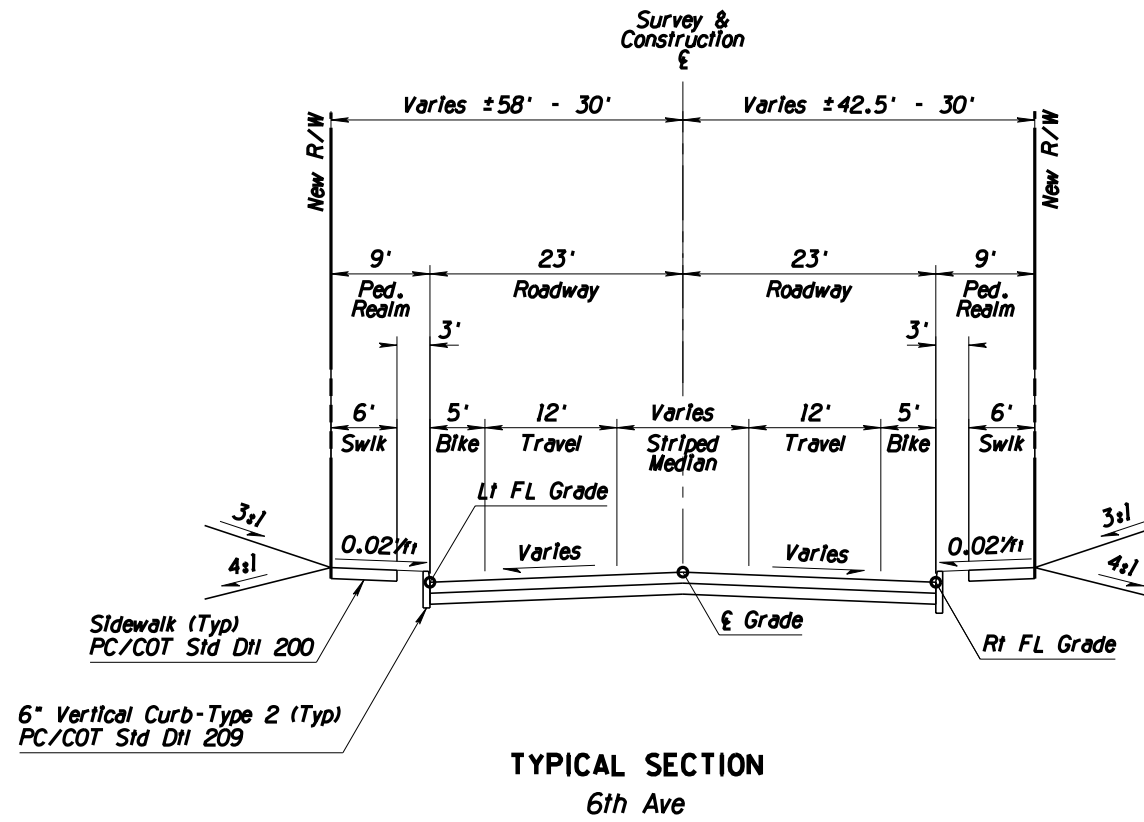
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	ORACLE ROAD/STONE AVE TYPICAL SECTIONS			
		DSON. BY <i>RL</i> 08/10 DRWN. BY <i>RL</i> 08/10 CHKD. BY <i>RL</i> 08/10	REF. _____ SCALE: NTS PLAN NO. _____	? OF 362



TYPICAL SECTION
Campbell Ave/(1st Ave)



TYPICAL SECTION
6th Ave

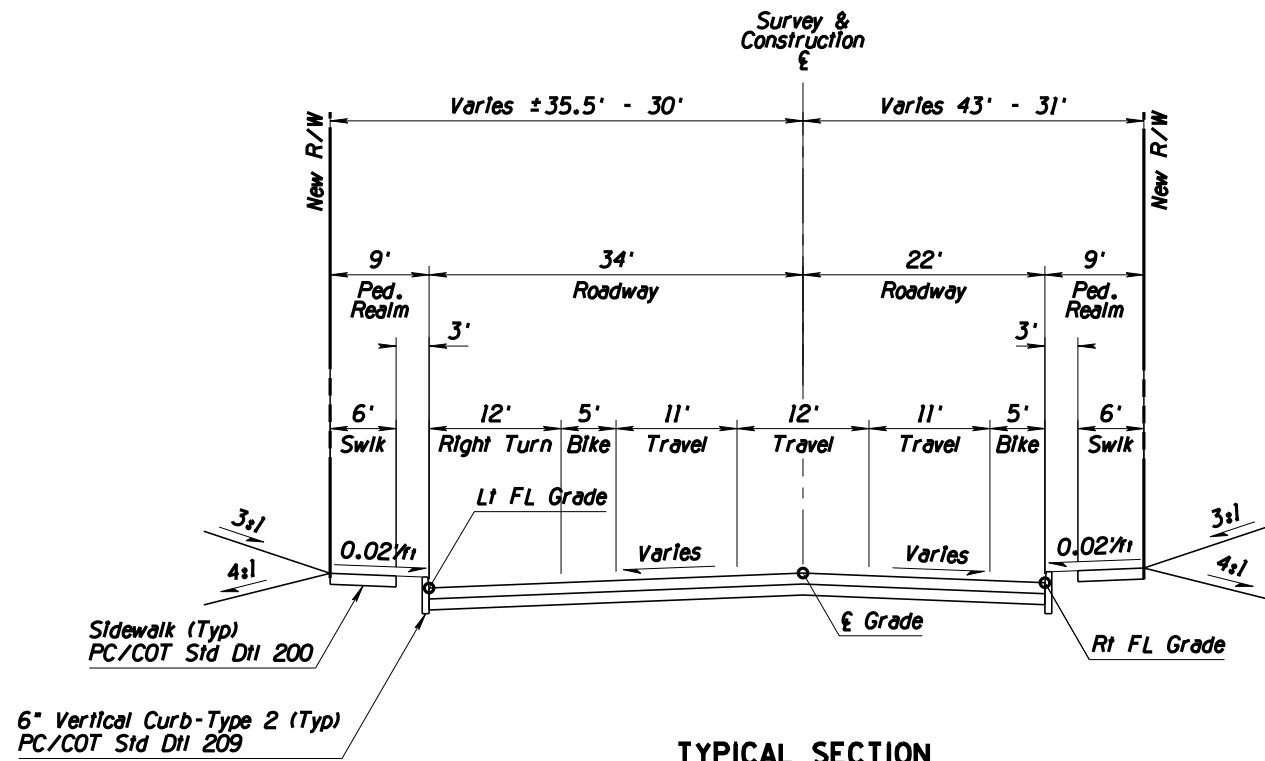


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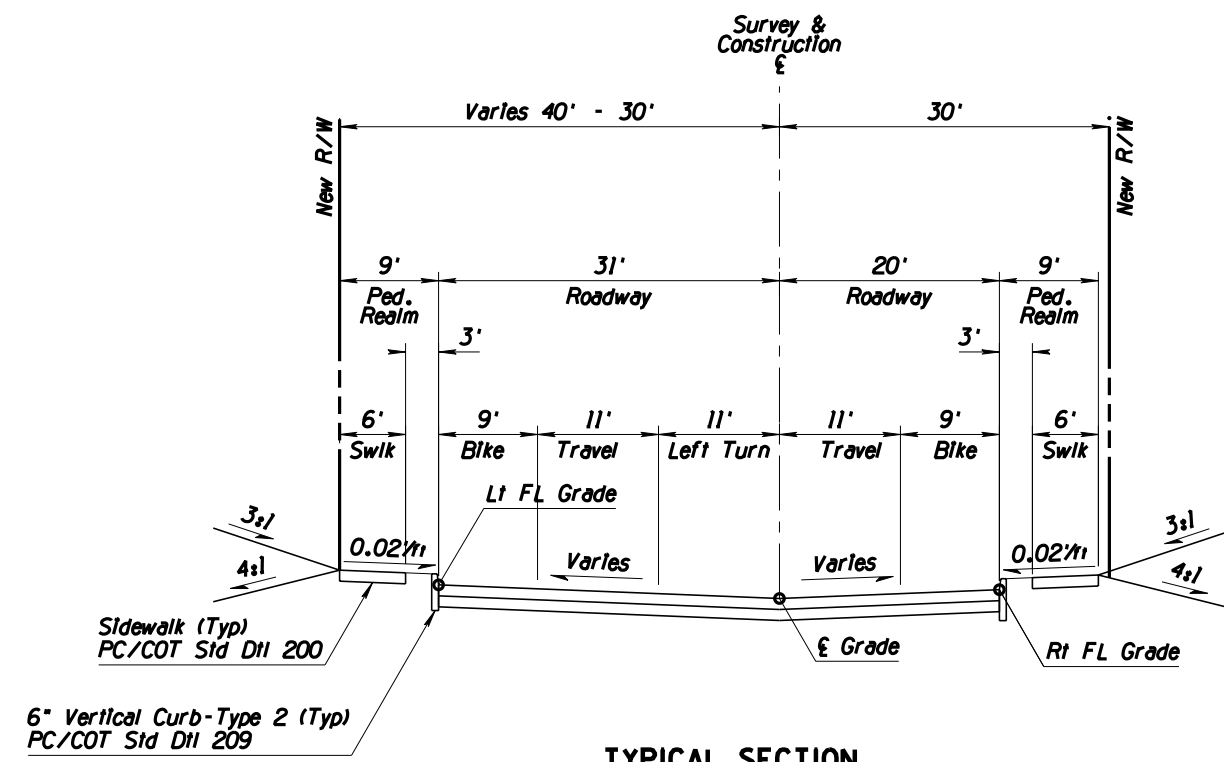
NO.	DATE	REVISION	BY	CHKD.	APPR.

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CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION			
1ST AVE/CAMPBELL AVE/6TH AVE TYPICAL SECTIONS			
CITY OF TUCSON	DSGN. BY <i>RL</i>	08/10	REF. _____ SCALE: NTS
	DRWN. BY <i>RL</i>	08/10	_____
	CHKD. BY <i>RL</i>	08/10	PLAN NO. _____



TYPICAL SECTION
Park Ave

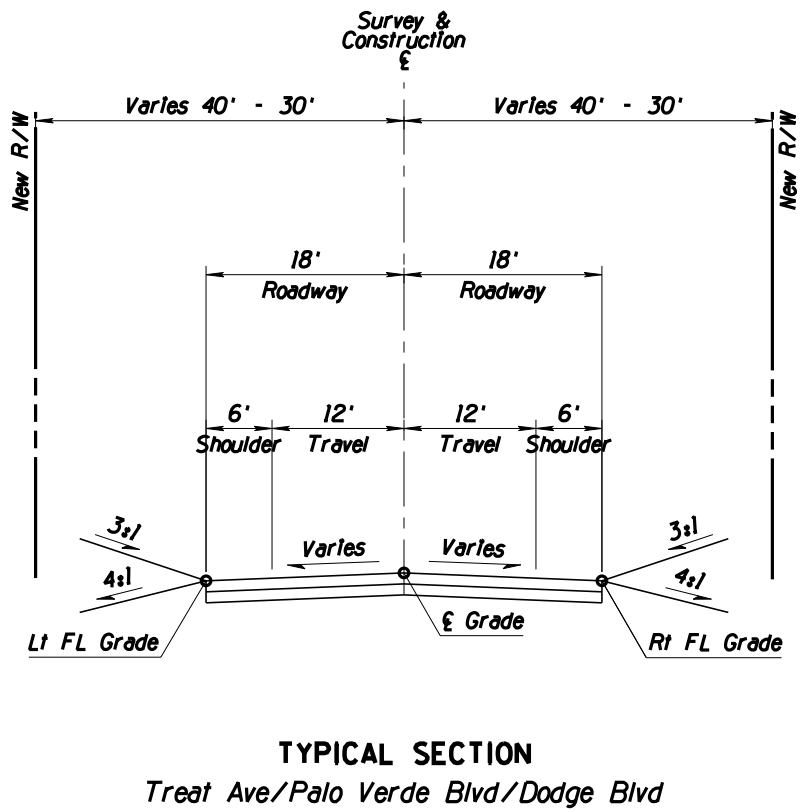
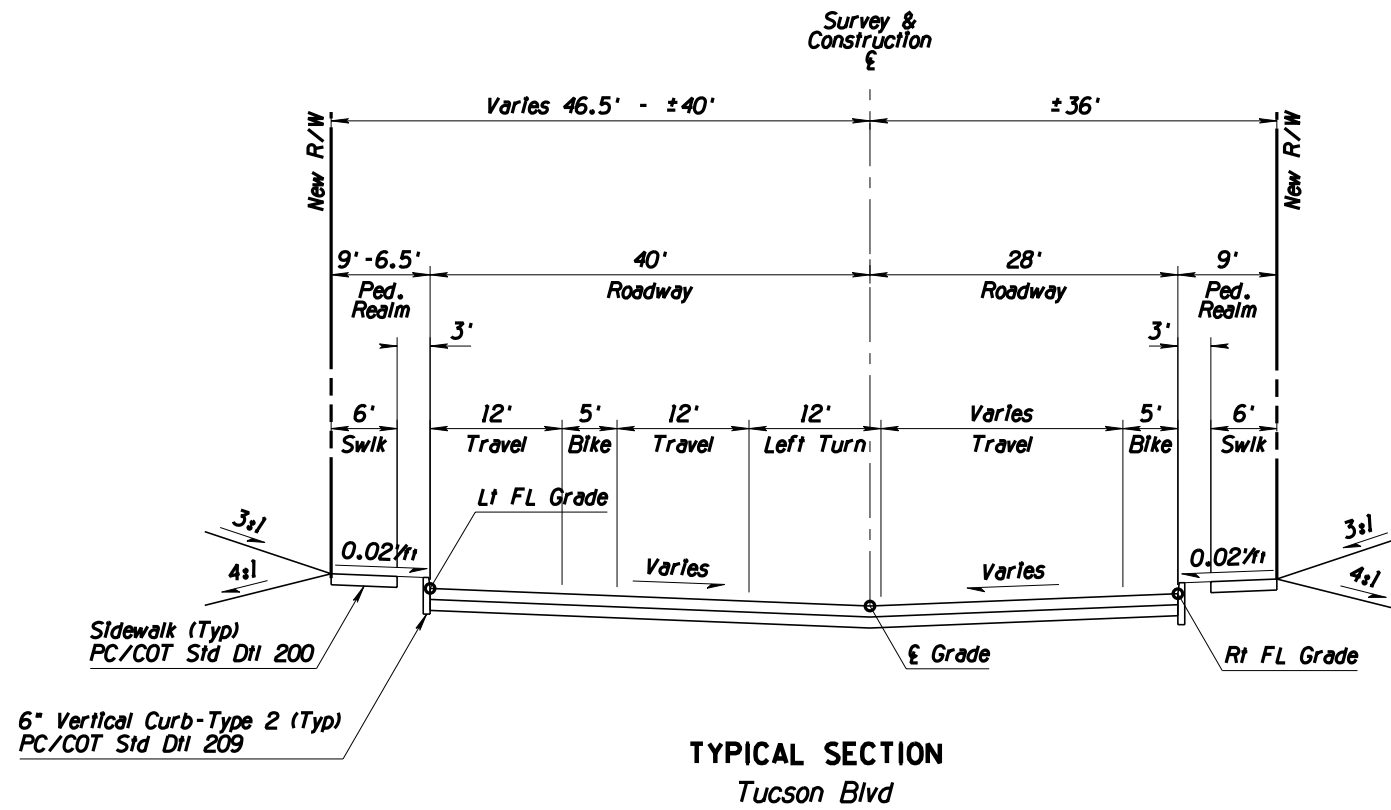


TYPICAL SECTION
Mountain Ave

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	PARK AVE/MOUNTAIN AVE TYPICAL SECTIONS			
		DSN. BY <i>RL</i> 08/10 DRWN. BY <i>RL</i> 08/10 CHKD. BY <i>RL</i> 08/10	REF. _____ SCALE: NTS PLAN NO. _____	3 OF 362

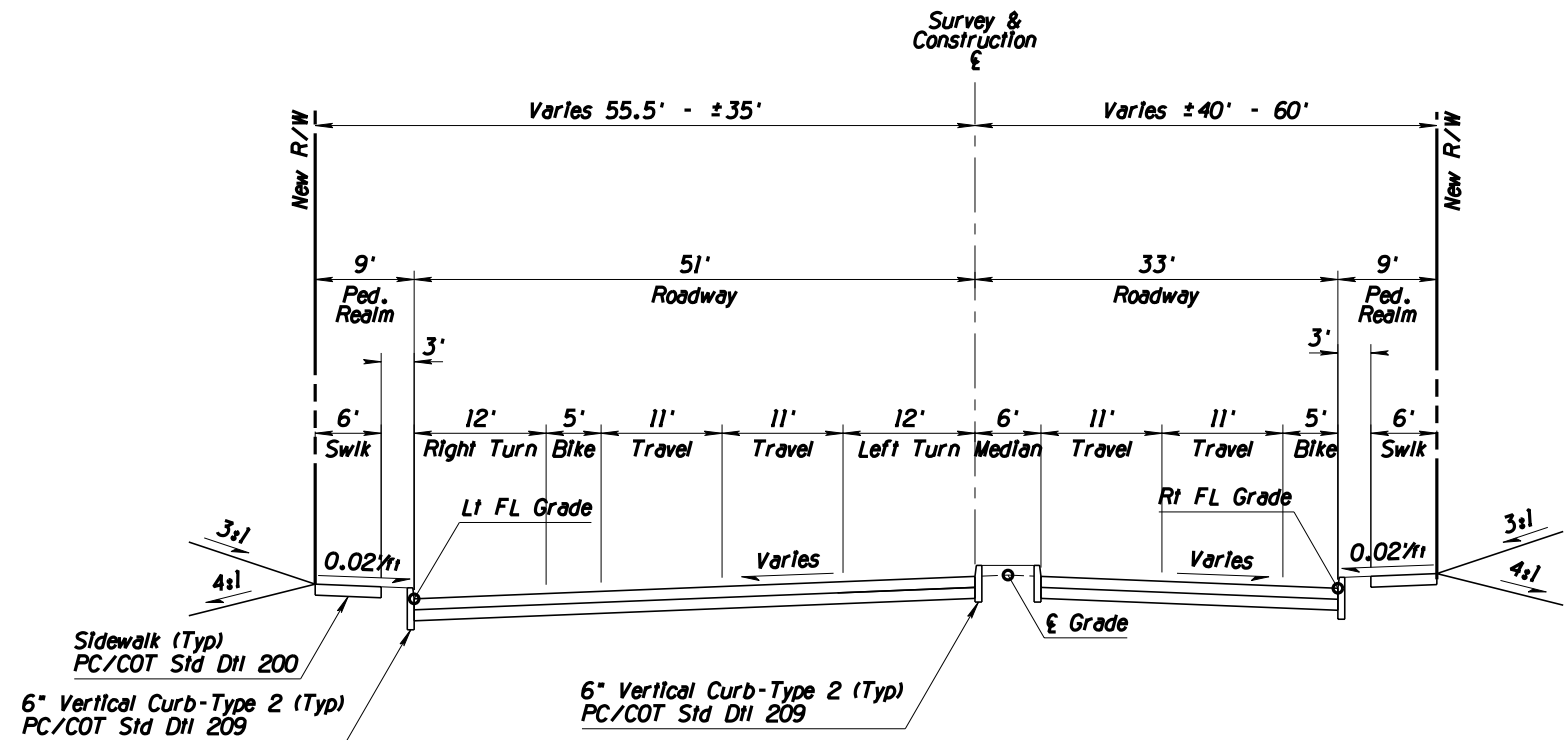
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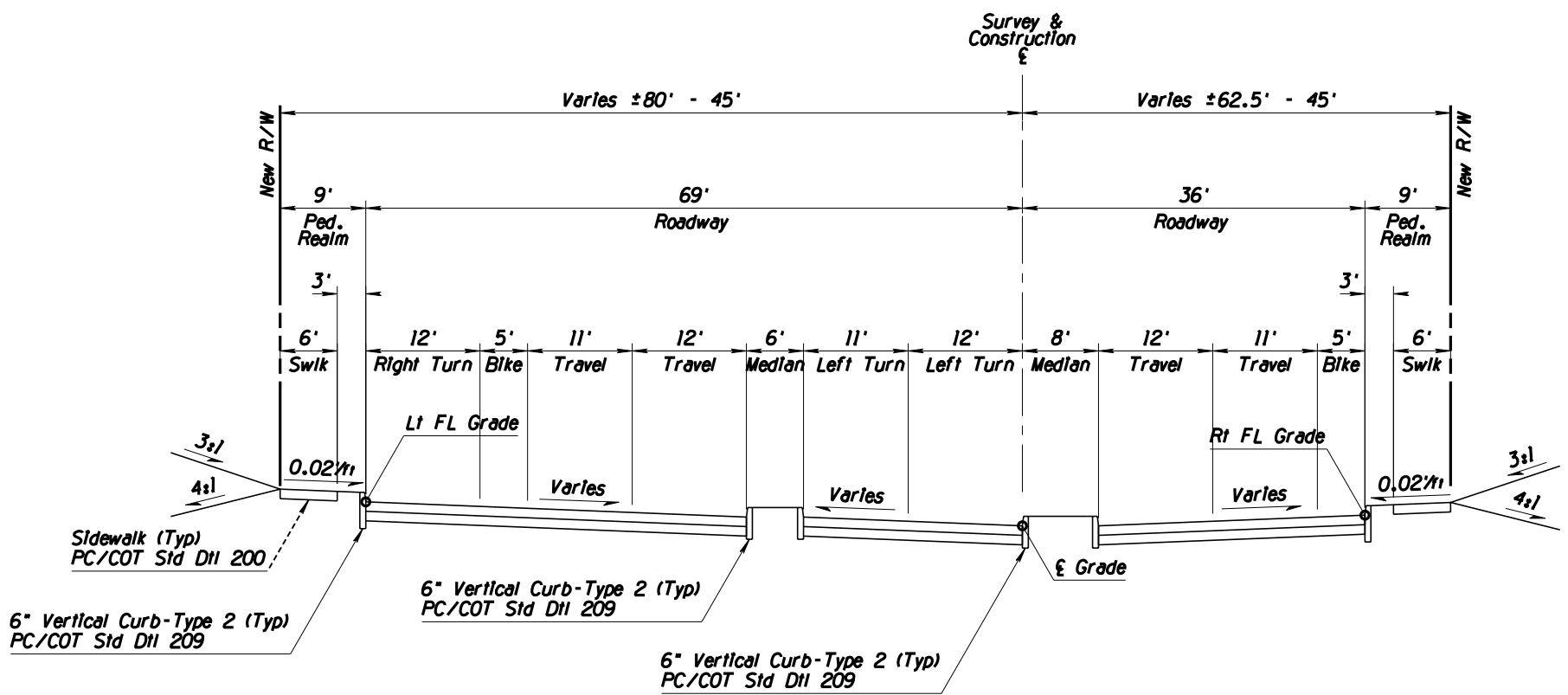
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	TUCSON BLVD/TREAT AVE/PALO VERDE BLVD/DODGE BLVD TYPICAL SECTIONS			
		DSN. BY <i>[Signature]</i> DRWN. BY <i>[Signature]</i> CHKD. BY <i>[Signature]</i>	08/10 08/10 08/10	REF. _____ SCALE: NTS PLAN NO. _____

NO.	DATE	REVISION	BY	CHKD.	APPR.



TYPICAL SECTION
Country Club Road

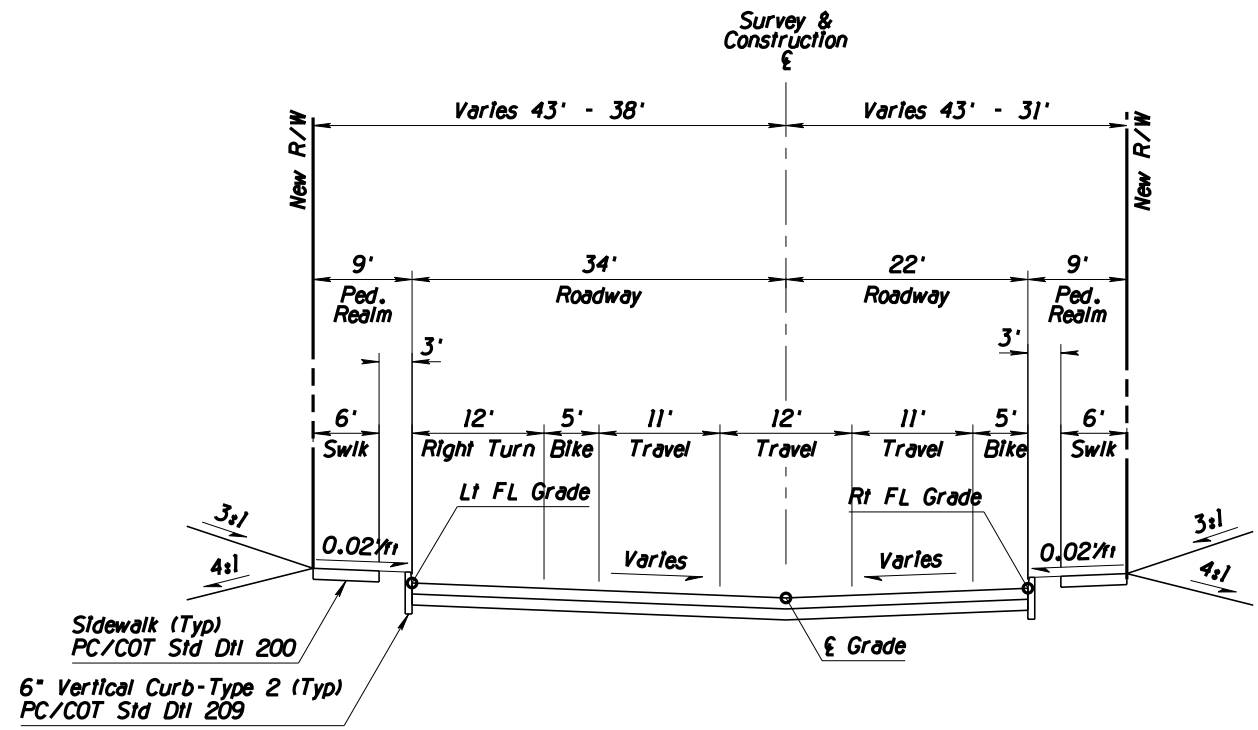


TYPICAL SECTION
Alvernon Way

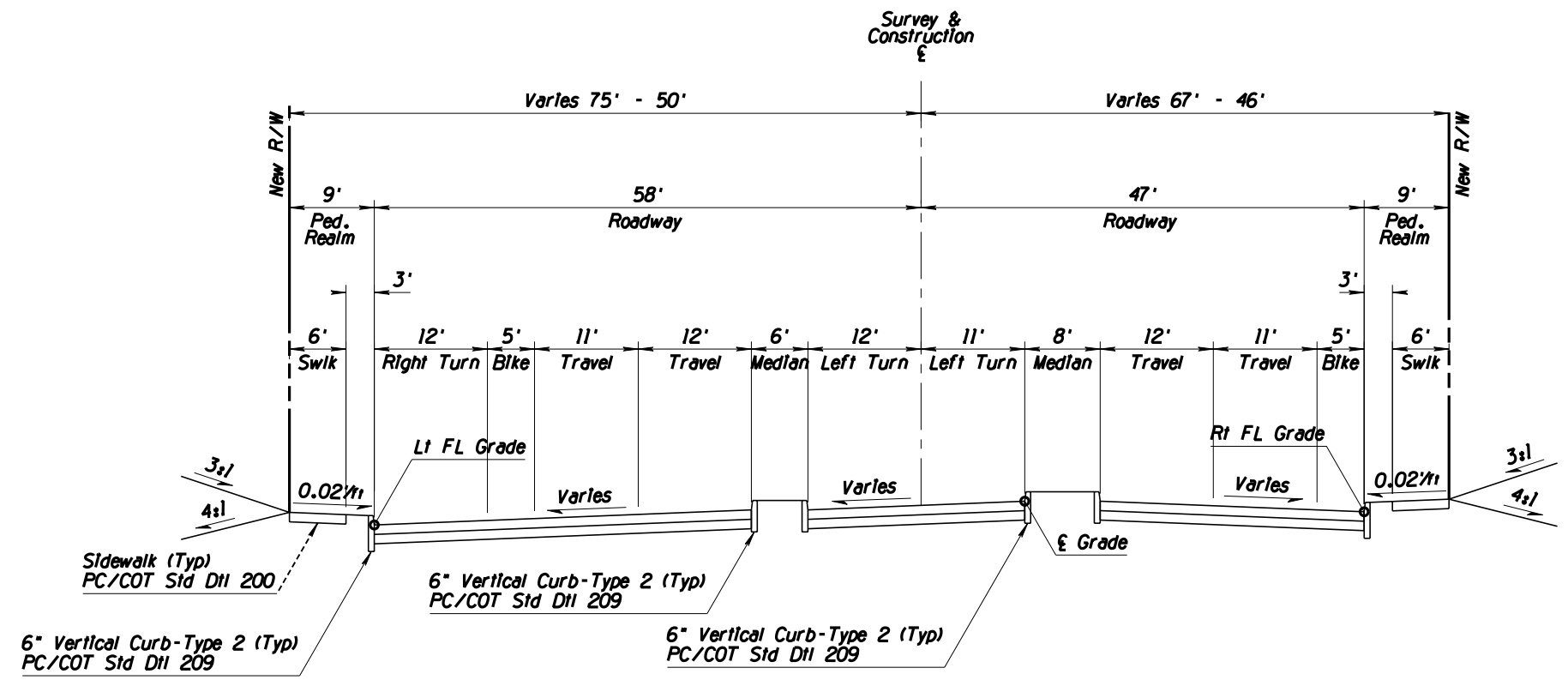
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	COUNTRY CLUB ROAD/ALVERNON WAY TYPICAL SECTIONS				
	DESIGNED BY: <i>[Signature]</i> DRAWN BY: <i>[Signature]</i> CHECKED BY: <i>[Signature]</i>	08/10 08/10 08/10	REF. _____ SCALE: NTS	PLAN NO. _____	

NO.	DATE	REVISION	BY	CHKD.	APPR.



TYPICAL SECTION
Columbus Blvd



TYPICAL SECTION
Swan Road

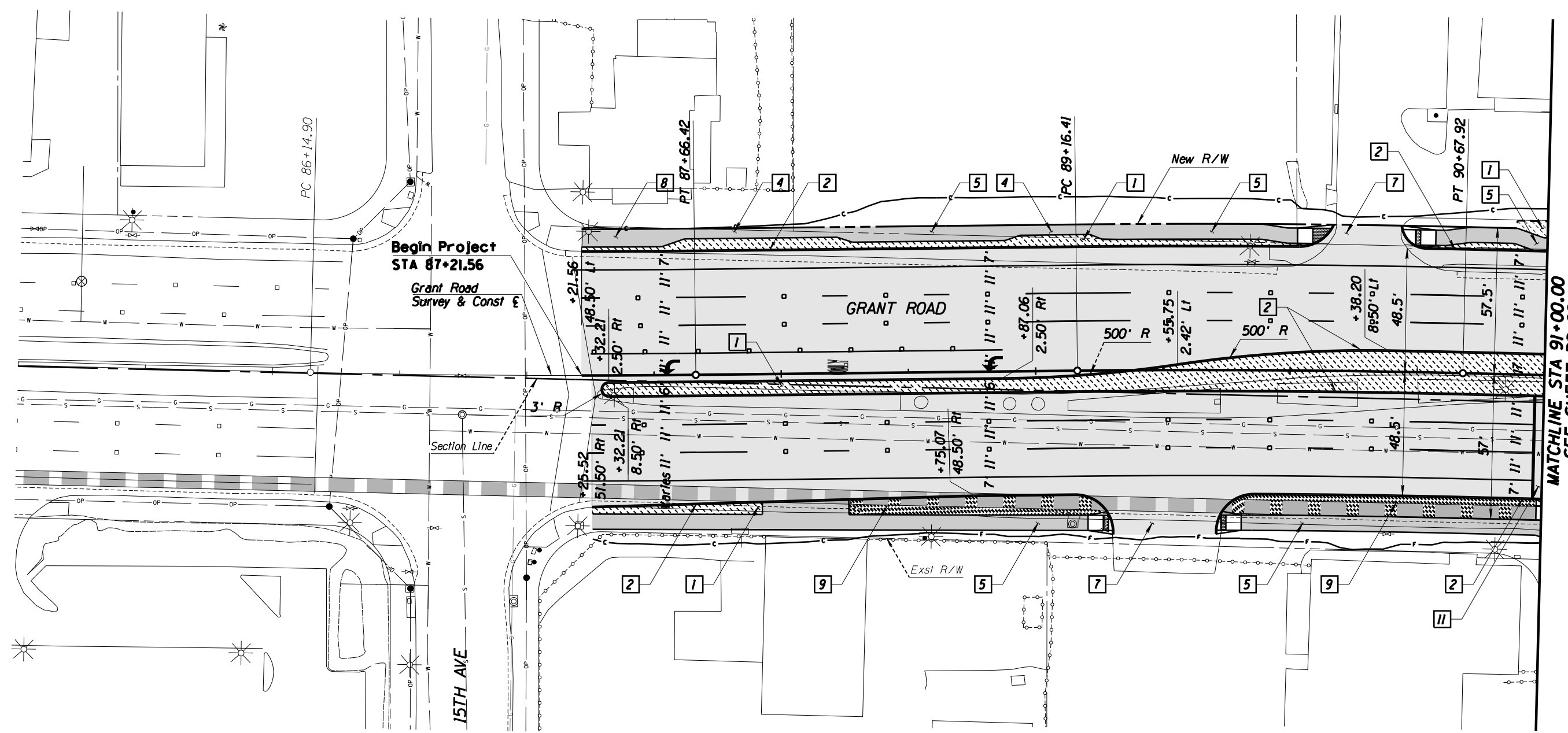


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		COLUMBUS BLVD/SWAN ROAD TYPICAL SECTIONS				
	DSN. BY <i>RL</i> 08/10	REF. _____ SCALE: NTS	PLAN NO. _____		12 OF 362	
	DRWN. BY <i>RL</i> 08/10	CHKD. BY <i>RL</i> 08/10				

85+00 86+00 87+00 88+00 89+00 90+00 91+00



MATCHLINE STA 91+00.00
SEE SHEET RD 02

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

SCALE: 1"=20'

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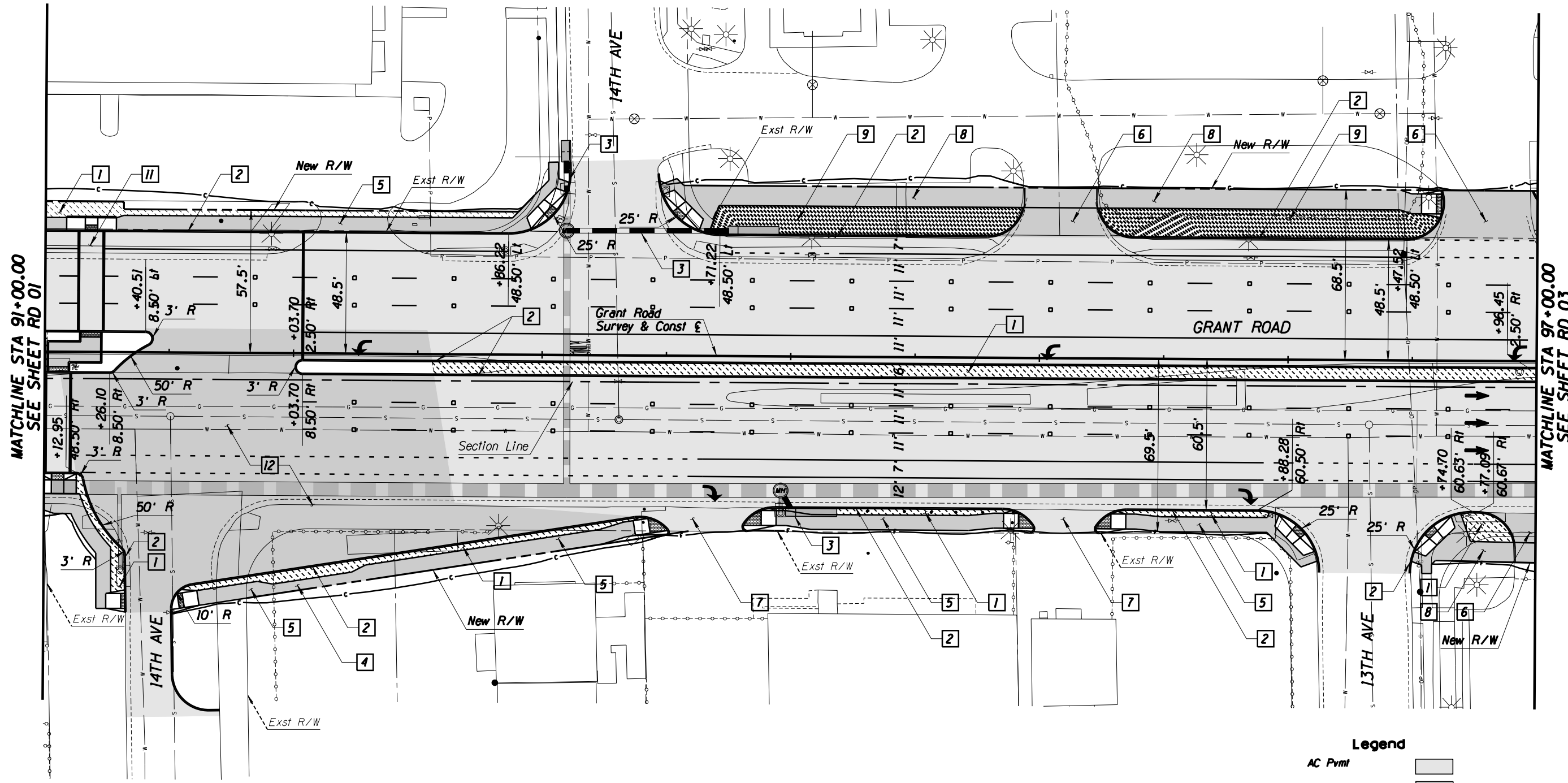
PRELIMINARY
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CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION			DSN. BY <i>RL</i> 08/10 DRWN. BY <i>ML</i> 08/10 CHKD. BY <i>RL</i> 08/10	REF. _____ SCALE: 1"=20' H.	13 OF 362
GRANT ROAD PLAN SHEET STA 85+00 to STA 91+00					

NO.	DATE	REVISION	BY	CHKD.	APPR.



91+00 92+00 93+00 94+00 95+00 96+00 97+00

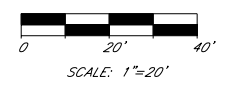


MATCHLINE STA 91+00.00
SEE SHEET RD 01

MATCHLINE STA 97+00.00
SEE SHEET RD 03

Legend

- AC Pvm
- PCC Pvm/Swik
- Landscaping
- Water Harvesting



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GRANT ROAD
PLAN SHEET
STA 91+00 TO STA 97+00



DSGN. BY <i>bl. [signature]</i>	08/10	REF.	SCALE: 1"=20' H.	14 OF 362
DRWN. BY <i>bl. [signature]</i>	08/10			
CHKD. BY <i>bl. [signature]</i>	08/10	PLAN NO.		

NO.	DATE	REVISION	BY	CHKD.	APPR.



97+00

98+00

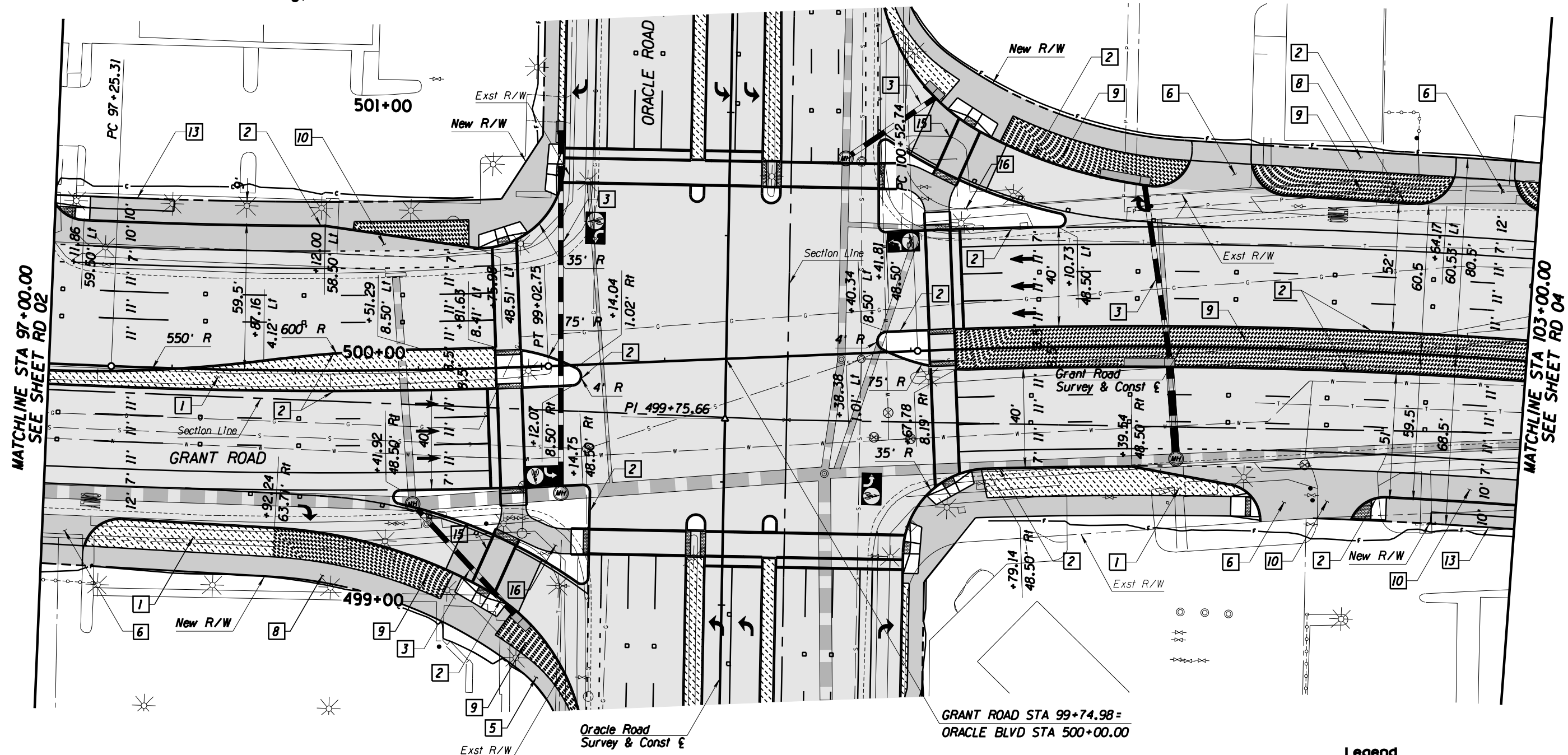
99+00

See Sheets RD52-53 for North Leg Oracle Road Geometry

101+00

102+00

103+00



See Sheets RD51-52 for South Leg Oracle Road Geometry

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

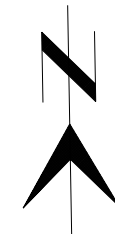


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET		STA 97+00 TO STA 103+00	
CITY OF TUCSON	DESIGN BY: <i>[Signature]</i>	08/10	REF.	SCALE: 1"=20' H.	15 OF 362
	DRWN BY: <i>[Signature]</i>	08/10			
	CHKD BY: <i>[Signature]</i>	08/10	PLAN NO.		

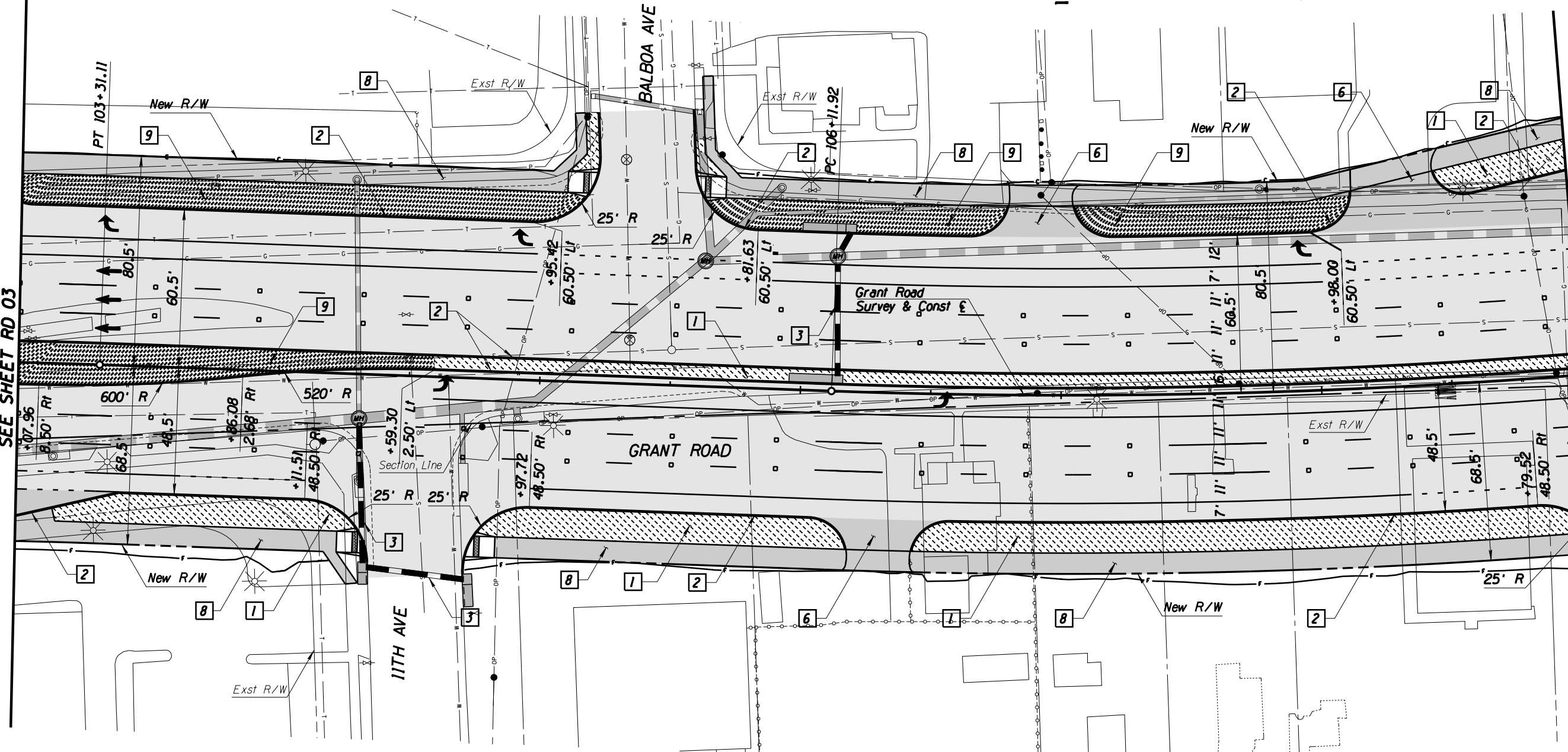
NO.	DATE	REVISION	BY	CHKD.	APPR.



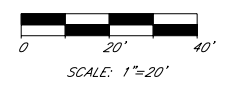
103+00 104+00 105+00 106+00 107+00 108+00 109+00

MATCHLINE STA 103+00.00
SEE SHEET RD 03

MATCHLINE STA 109+00.00
SEE SHEET RD 05



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting



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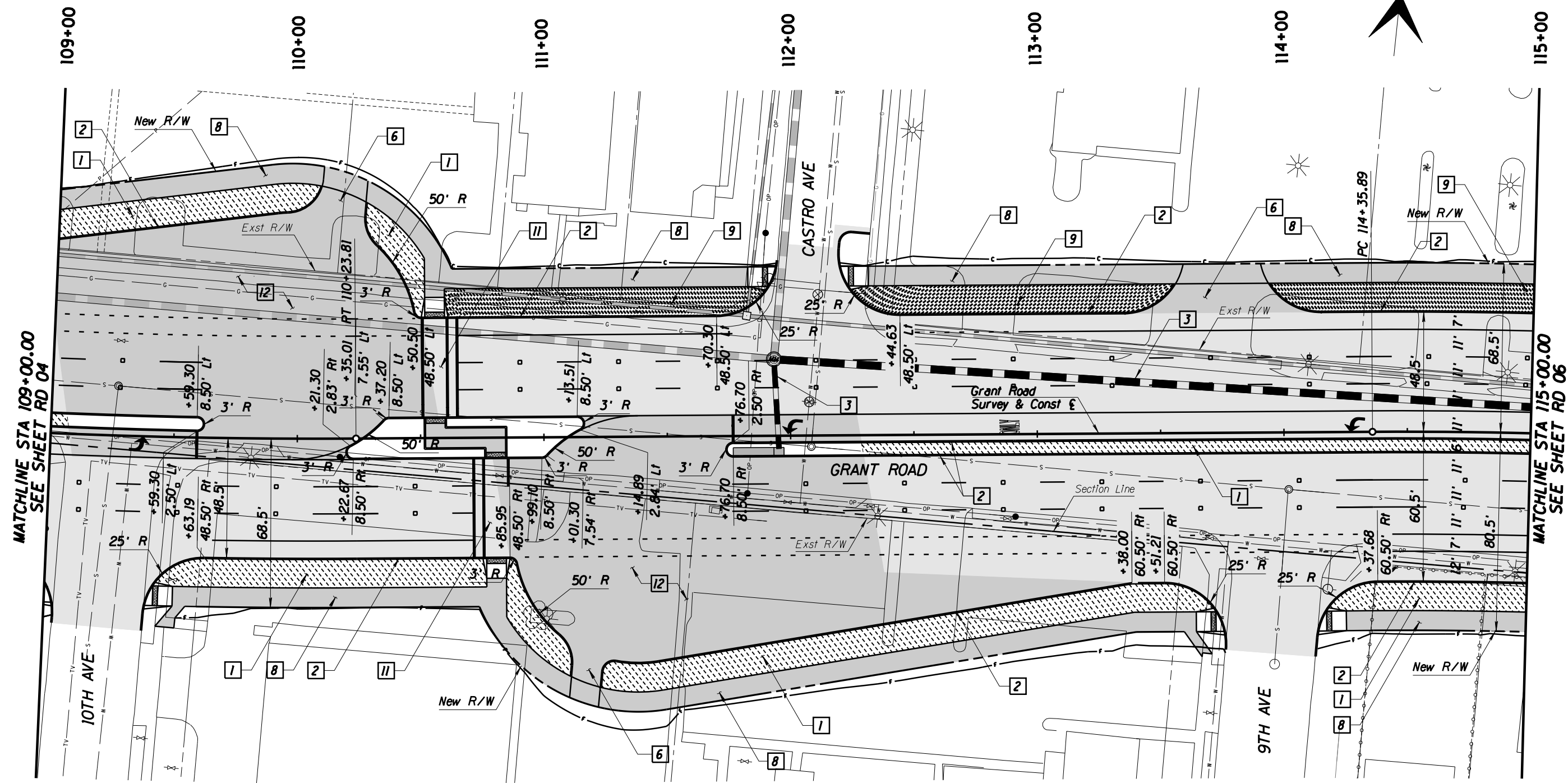
GRANT ROAD
PLAN SHEET
STA 103+00 TO STA 109+00



DSGN. BY <i>ll</i>	08/10	REF.	SCALE: 1"=20' H.
DRWN. BY <i>ll</i>	08/10		
CHKD. BY <i>ll</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

362
OF
362



MATCHLINE STA 109+00.00
SEE SHEET RD 04

MATCHLINE STA 115+00.00
SEE SHEET RD 06

Legend

- AC Pvmf
- PCC Pvmf/Swik
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- Water Harvesting



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GRANT ROAD
PLAN SHEET
STA 109+00 to STA 115+00

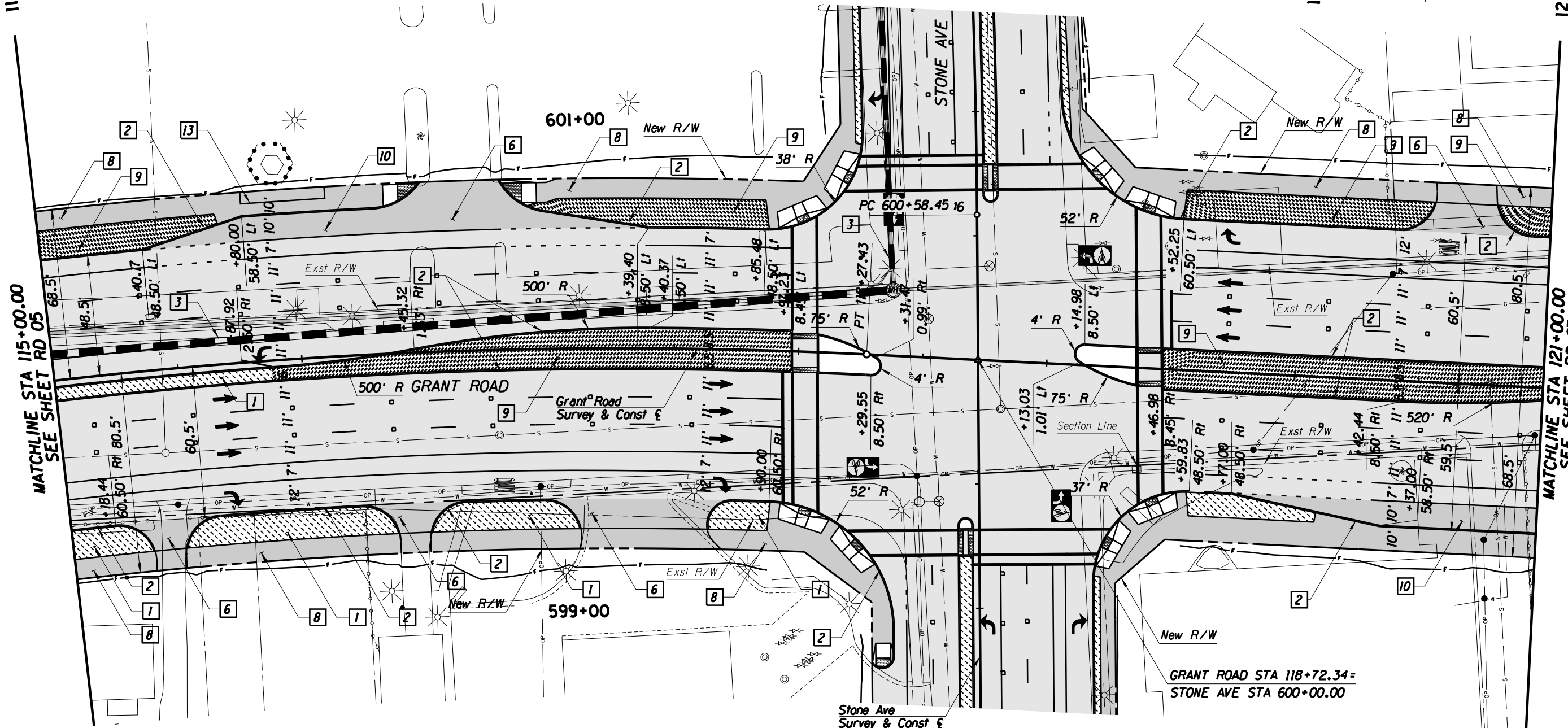
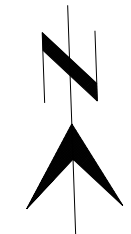


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DRWN. BY <i>bl. [signature]</i>	08/10			OF
CHKD. BY <i>bl. [signature]</i>	08/10	PLAN NO.		362

NO.	DATE	REVISION	BY	CHKD.	APPR.

115+00 116+00 117+00 118+00 120+00 121+00

See Sheets RD55-56 for North Leg Stone Ave Geometry



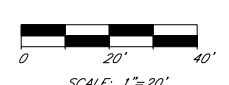
MATCHLINE STA 115+00.00
SEE SHEET RD 05

MATCHLINE STA 121+00.00
SEE SHEET RD 07

See Sheets RD54-55 for South Leg Stone Ave Geometry

GRANT ROAD STA 118+72.34 =
STONE AVE STA 600+00.00

- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting



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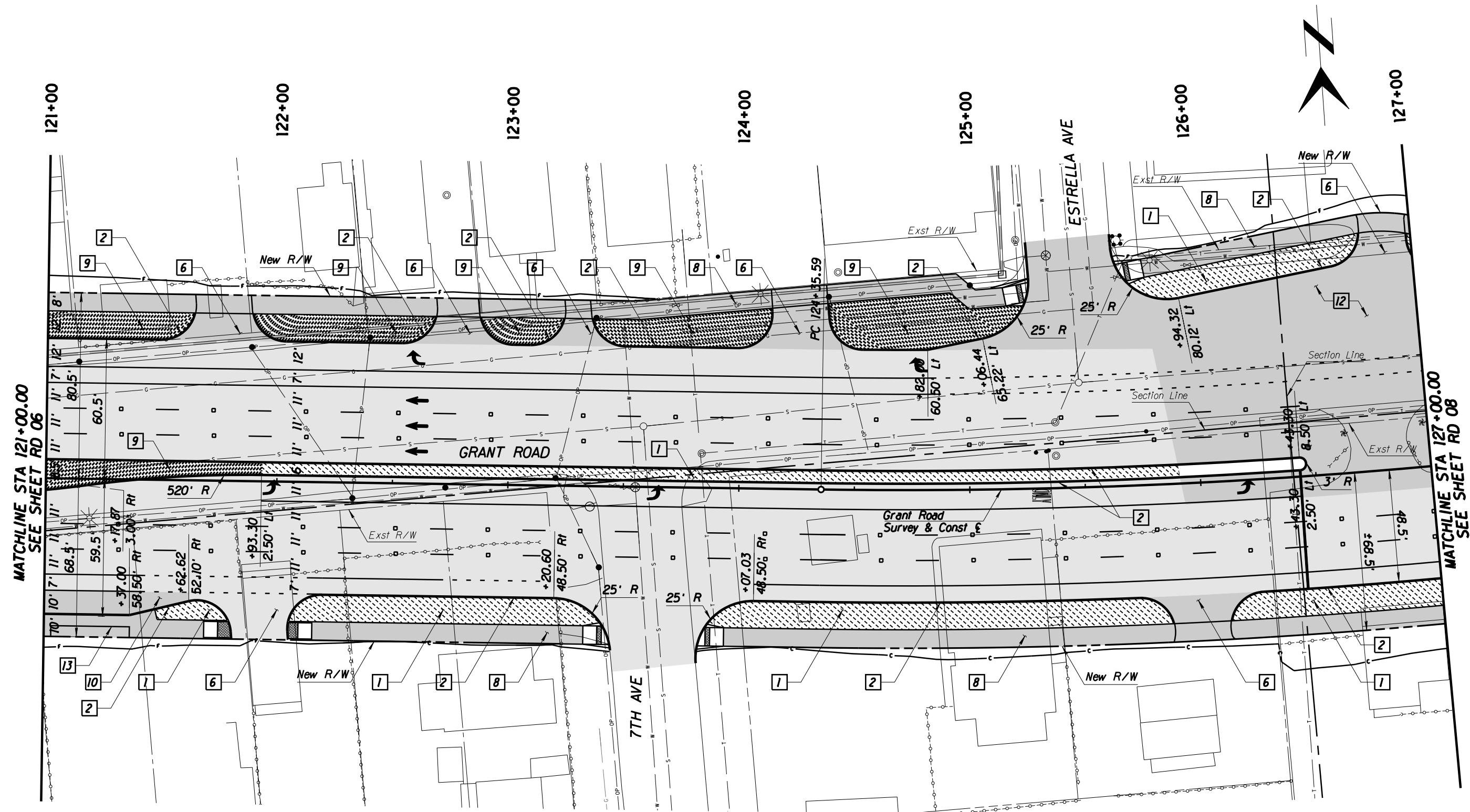
NO.	DATE	REVISION	BY	CHKD.	APPR.

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GRANT ROAD
PLAN SHEET
STA 115+00 TO STA 121+00

	DSON. BY <i>[Signature]</i> 08/10 REF. SCALE: 1"=20' H.	12 OF 362
	DRWN. BY <i>[Signature]</i> 08/10	
	CHKD. BY <i>[Signature]</i> 08/10 PLAN NO.	

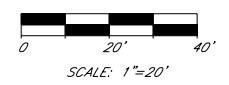


MATCHLINE STA 121+00.00
SEE SHEET RD 06

MATCHLINE STA 127+00.00
SEE SHEET RD 08

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

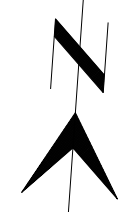
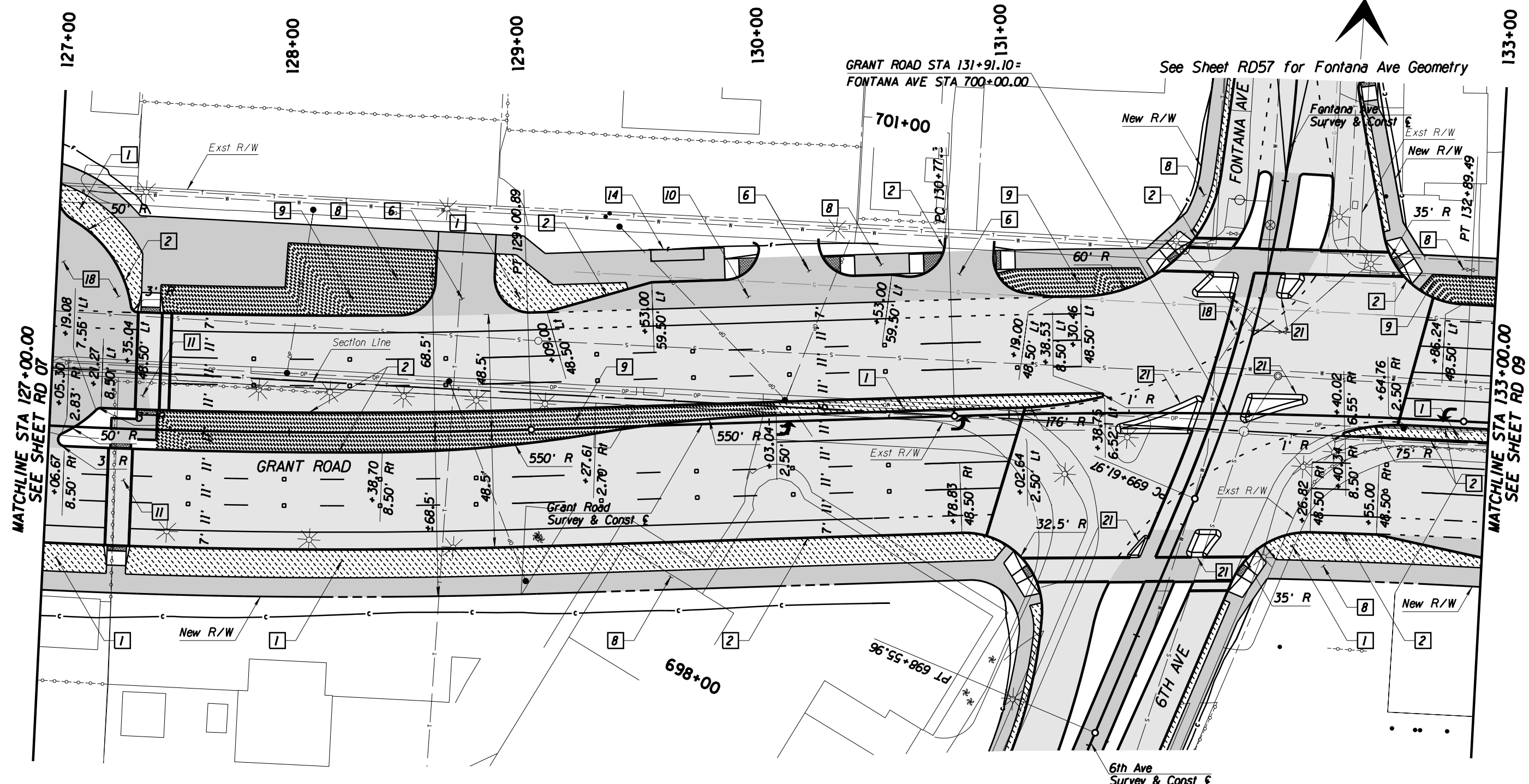


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CITY OF TUCSON	DSGN. BY <i>A. [Signature]</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>M. [Signature]</i>	08/10		
	CHKD. BY <i>R. [Signature]</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



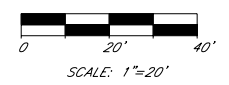
GRANT ROAD STA 131+91.10 = FONTANA AVE STA 700+00.00
 See Sheet RD57 for Fontana Ave Geometry

MATCHLINE STA 127+00.00
 SEE SHEET RD 07

MATCHLINE STA 133+00.00
 SEE SHEET RD 09

6th Ave Survey & Const E
 See Sheet RD57 for 6th Ave Geometry

- Legend**
- AC Pvmf [Pattern]
 - PCC Pvmf/Swik [Pattern]
 - Landscaping [Pattern]
 - Water Harvesting [Pattern]

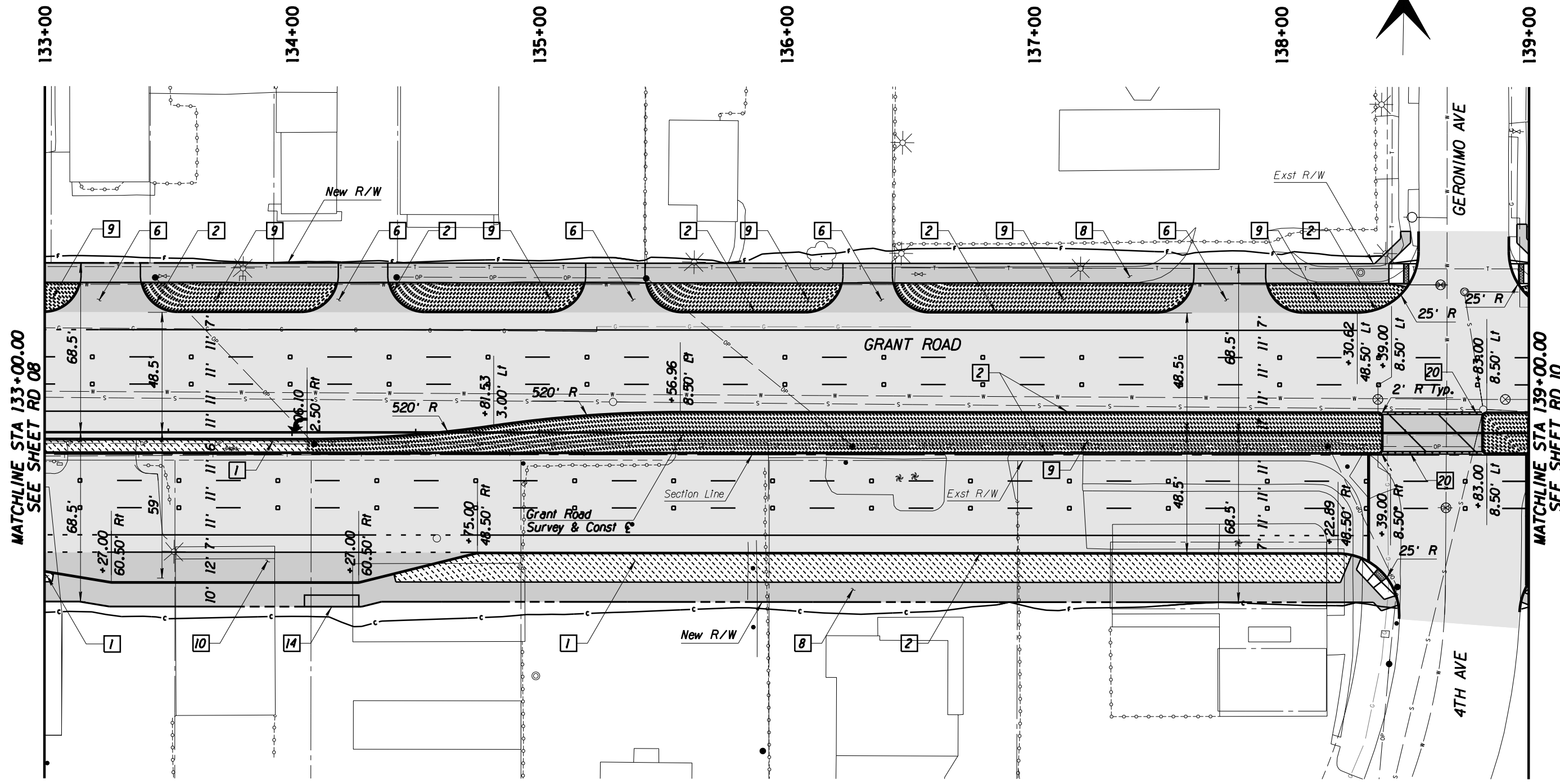


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GRANT ROAD PLAN SHEET STA 127+00 TO STA 133+00		OF	
DESIGN BY: [Signature]	08/10	REF.:	SCALE: 1"=20' H.
DRAWN BY: [Signature]	08/10		
CHKD. BY: [Signature]	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

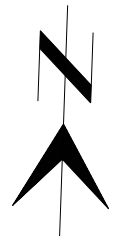


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 133+00 TO STA 139+00		21 OF 362
DESIGN BY: <i>RL</i>	08/10	REF.	SCALE: 1"=20' H.	21 OF 362
DRAWN BY: <i>RL</i>	08/10	PLAN NO.		
CHKD BY: <i>RL</i>	08/10			

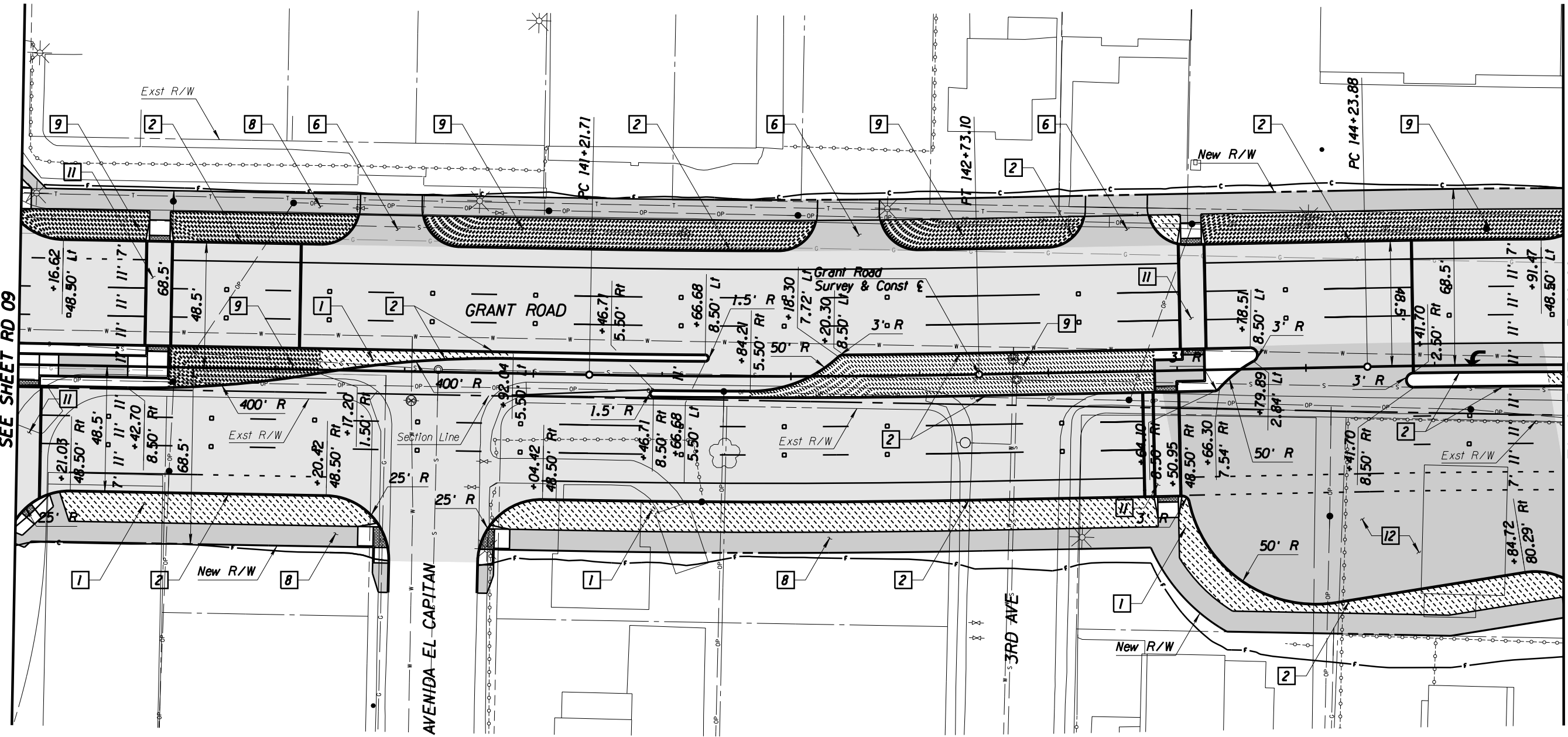
NO.	DATE	REVISION	BY	CHKD.	APPR.



139+00 140+00 141+00 142+00 143+00 144+00 145+00

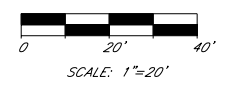
MATCHLINE STA 139+00.00
SEE SHEET RD 09

MATCHLINE STA 145+00.00
SEE SHEET RD 11



Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

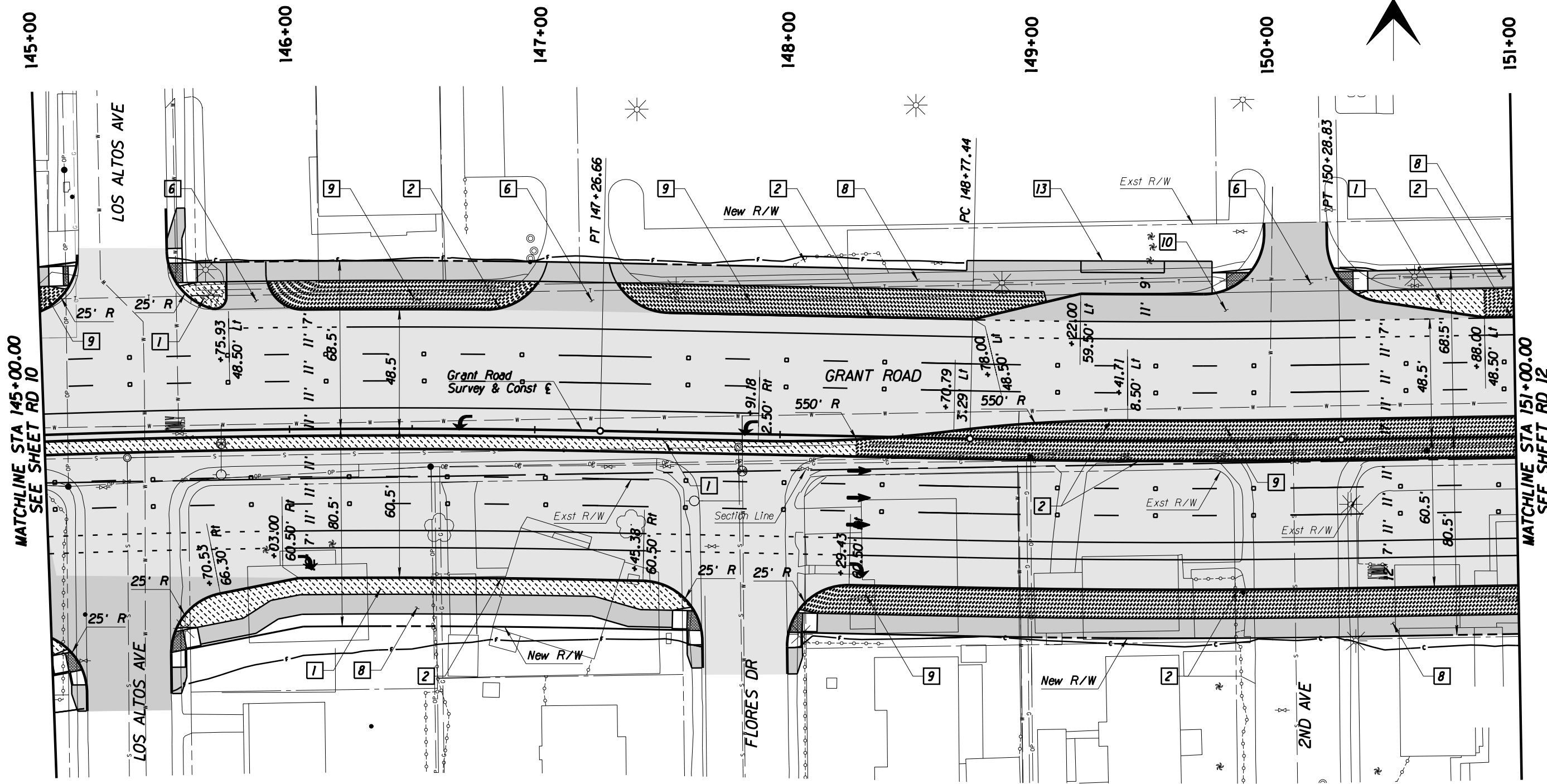


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 139+00 TO STA 145+00	
DESIGN BY: <i>[Signature]</i>	08/10	REF.:	SCALE: 1"=20' H.
DRAWN BY: <i>[Signature]</i>	08/10		
CHKD. BY: <i>[Signature]</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

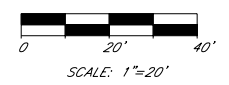


MATCHLINE STA 145+00.00
SEE SHEET RD 10

MATCHLINE STA 151+00.00
SEE SHEET RD 12

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



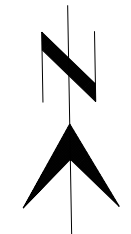
PRELIMINARY
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CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

GRANT ROAD
PLAN SHEET
STA 145+00 to STA 151+00

	DSGN. BY <i>bl. [signature]</i>	08/10	REF.	SCALE: 1"=20' H.	23 OF 362
	DRWN. BY <i>bl. [signature]</i>	08/10			
	CHKD. BY <i>bl. [signature]</i>	08/10	PLAN NO.		

NO.	DATE	REVISION	BY	CHKD.	APPR.



151+00

154+00

155+00

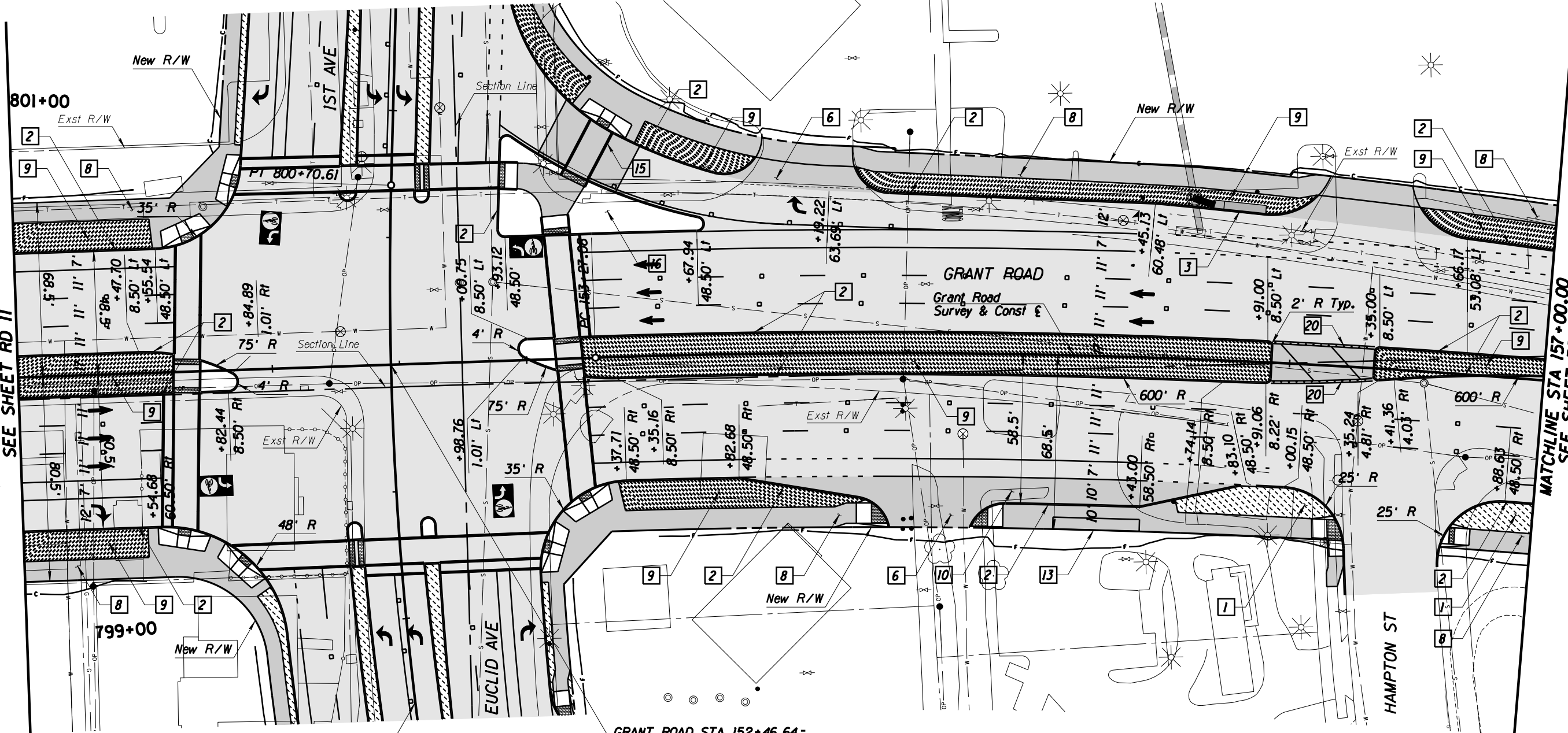
156+00

157+00

See Sheets RD59-60 for 1st Ave Geometry

MATCHLINE STA 151+00.00
SEE SHEET RD 11

MATCHLINE STA 157+00.00
SEE SHEET RD 13

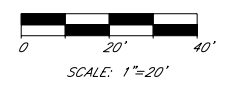


See Sheets RD58-59 for Euclid Ave Geometry

GRANT ROAD STA 152+46.64 =
1ST AVE STA 800+00.00

Legend

- AC Pvmf
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- Water Harvesting



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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

GRANT ROAD
PLAN SHEET
STA 151+00 TO STA 157+00



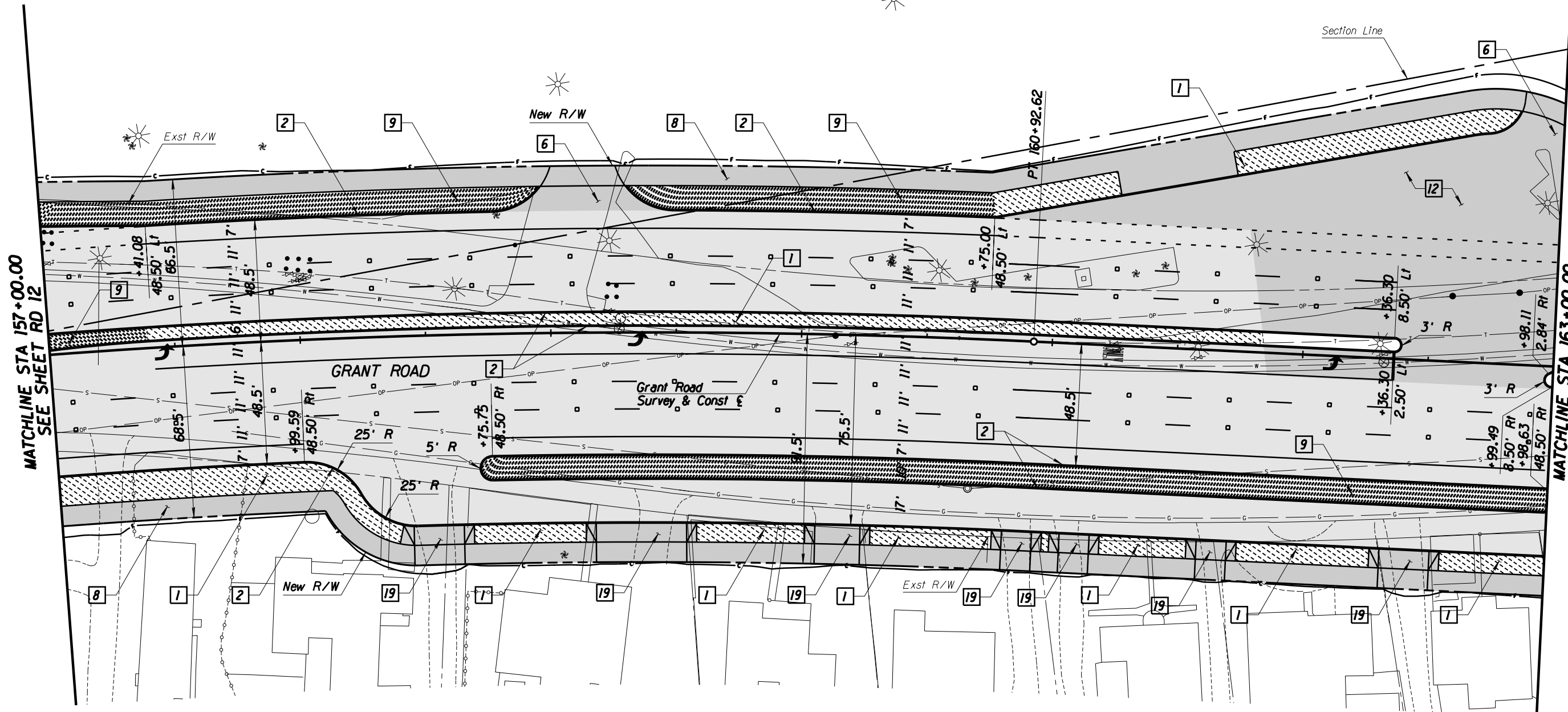
DSGN. BY <i>bl. [signature]</i>	08/10	REF.	SCALE: 1"=20' H.	24 OF 362
DRWN. BY <i>bl. [signature]</i>	08/10			
CHKD. BY <i>bl. [signature]</i>	08/10	PLAN NO.		

NO.	DATE	REVISION	BY	CHKD.	APPR.

157+00 158+00 159+00 160+00 161+00 162+00 163+00

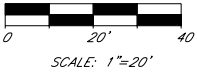
MATCHLINE STA 157+00.00
SEE SHEET RD 12

MATCHLINE STA 163+00.00
SEE SHEET RD 14



Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

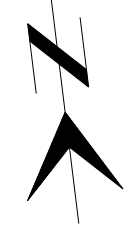


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 157+00 TO STA 163+00		NO. 3 OF 362
CITY OF TUCSON	DSGN. BY <i>R. [unclear]</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>M. [unclear]</i>	08/10		
	CHKD. BY <i>R. [unclear]</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



See Sheet RD62 for North Leg Park Ave Geometry

Park Ave Survey & Const E

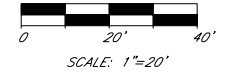
Grant Road Survey & Const E

See Sheets RD61-62 for South Leg Park Ave Geometry

GRANT ROAD STA 165+58.32 = PARK AVE STA 900+00.00

Legend

- AC Pvmt
- PCC Pvmt/Swift
- Landscaping
- Water Harvesting



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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

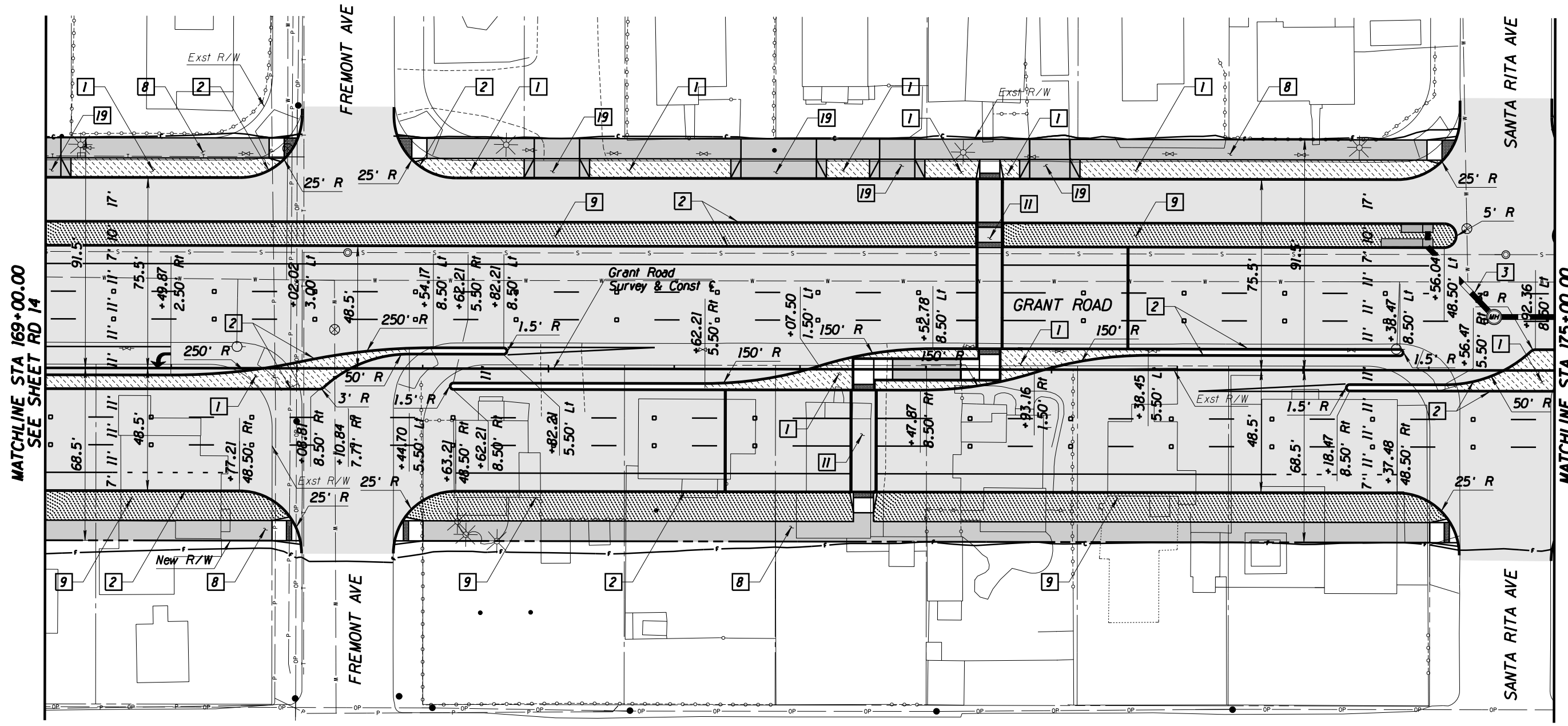
GRANT ROAD
PLAN SHEET
STA 163+00 TO STA 169+00

	DSGN. BY <i>ll</i>	08/10	REF.	SCALE: 1"=20' H.	4 OF 362
	DRWN. BY <i>ll</i>	08/10			
	CHKD. BY <i>ll</i>	08/10	PLAN NO.		

NO.	DATE	REVISION	BY	CHKD.	APPR.



169+00 170+00 171+00 172+00 173+00 174+00 175+00



MATCHLINE STA 169+00.00
SEE SHEET RD 14

MATCHLINE STA 175+00.00
SEE SHEET RD 16

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



SCALE: 1"=20'

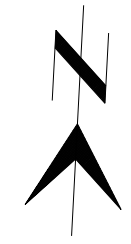


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		27
GRANT ROAD PLAN SHEET STA 169+00 TO STA 175+00		OF 362
CITY OF TUCSON	DSON BY <i>[Signature]</i> 08/10 REF. SCALE: 1"=20' H. DRWN BY <i>[Signature]</i> 08/10 CHKD BY <i>[Signature]</i> 08/10 PLAN NO.	27 OF 362

NO.	DATE	REVISION	BY	CHKD.	APPR.

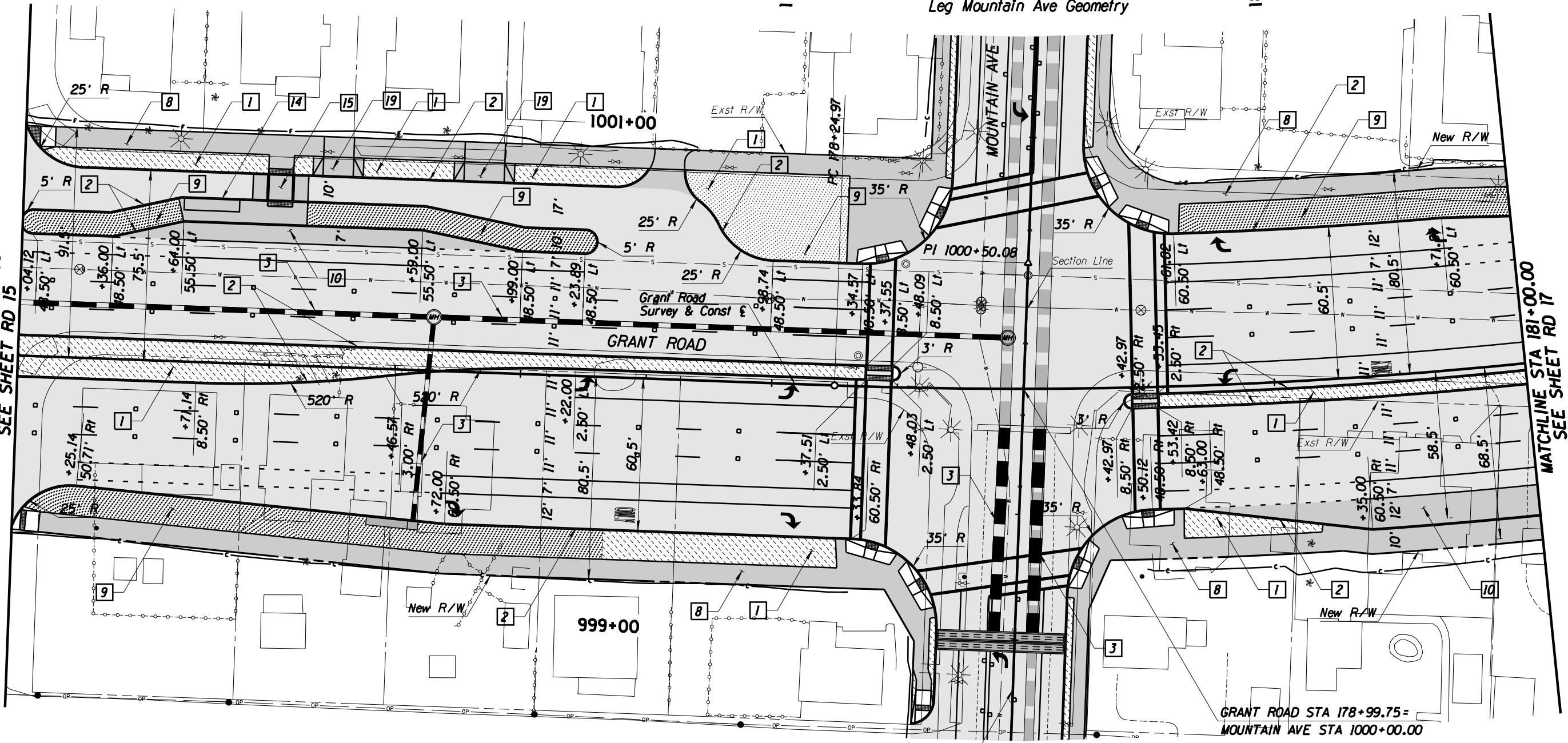


175+00 176+00 177+00 178+00 180+00 181+00

See Sheets RD63-64 for North Leg Mountain Ave Geometry

MATCHLINE STA 175+00.00
SEE SHEET RD 15

MATCHLINE STA 181+00.00
SEE SHEET RD 17



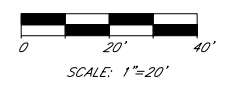
Grant Road Survey & Const

Mountain Ave Survey & Const
See Sheets RD63-64 for South Leg Mountain Ave Geometry

GRANT ROAD STA 178+99.75 =
MOUNTAIN AVE STA 1000+00.00

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

GRANT ROAD
PLAN SHEET
STA 175+00 to STA 181+00



DESIGN BY	08/10	REF.	SCALE: 1"=20' H.
DRAWN BY	08/10		
CHKD. BY	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

22 OF 362

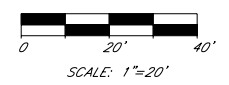


MATCHLINE STA 181+00.00
SEE SHEET RD 16

MATCHLINE STA 187+00.00
SEE SHEET RD 18

Legend

- AC Pvmt
- PCC Pvmt/Swik
- Landscaping
- Water Harvesting

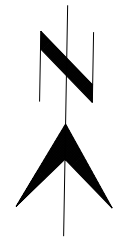


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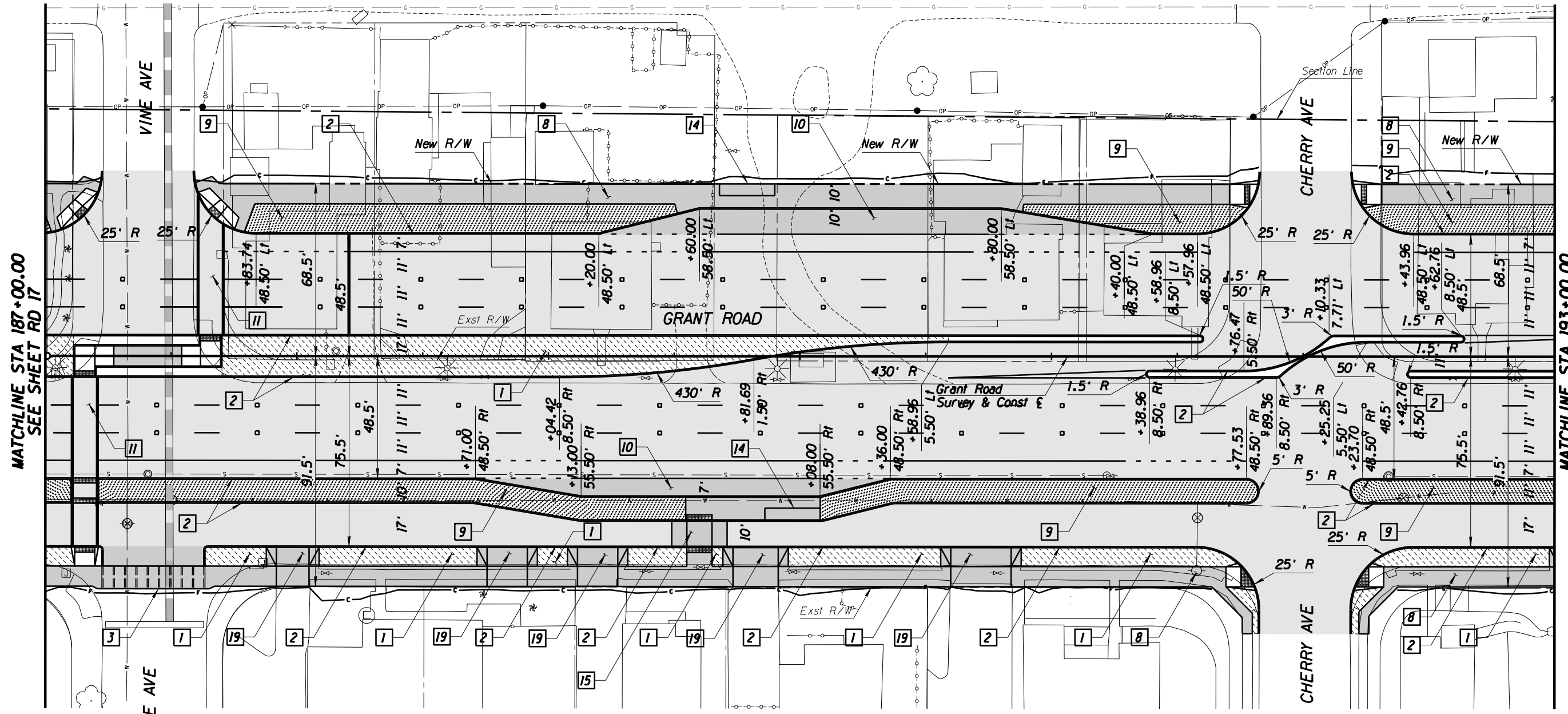
PRELIMINARY
30%
NOT FOR
CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION				7
GRANT ROAD PLAN SHEET STA 181+00 TO STA 187+00				OF
	DSGN. BY <i>bl</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>bl</i>	08/10		
	CHKD. BY <i>bl</i>	08/10	PLAN NO.	
				362

NO.	DATE	REVISION	BY	CHKD.	APPR.



187+00 188+00 189+00 190+00 191+00 192+00 193+00



MATCHLINE STA 187+00.00
SEE SHEET RD 17

MATCHLINE STA 193+00.00
SEE SHEET RD 19

- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting



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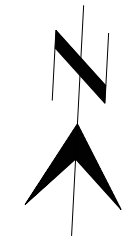
GRANT ROAD
PLAN SHEET
STA 187+00 TO STA 193+00



DSGN. BY <i>ll</i>	08/10	REF.	SCALE: 1"=20' H.
DRWN. BY <i>ll</i>	08/10		
CHKD. BY <i>ll</i>	08/10	PLAN NO.	

30
OF
362

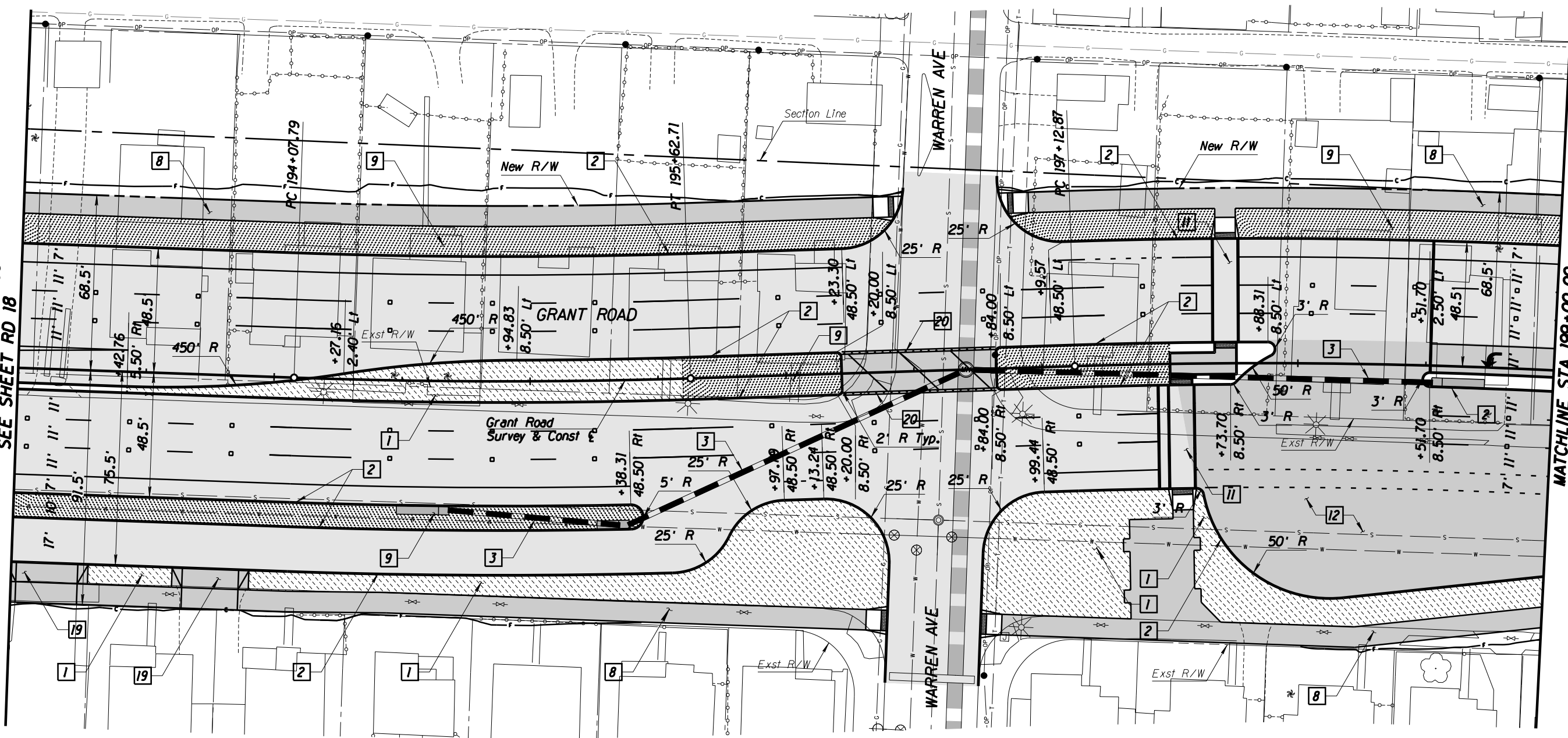
NO.	DATE	REVISION	BY	CHKD.	APPR.



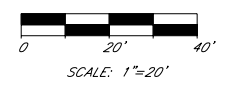
193+00 194+00 195+00 196+00 197+00 198+00 199+00

MATCHLINE STA 193+00.00
SEE SHEET RD 18

MATCHLINE STA 199+00.00
SEE SHEET RD 20



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

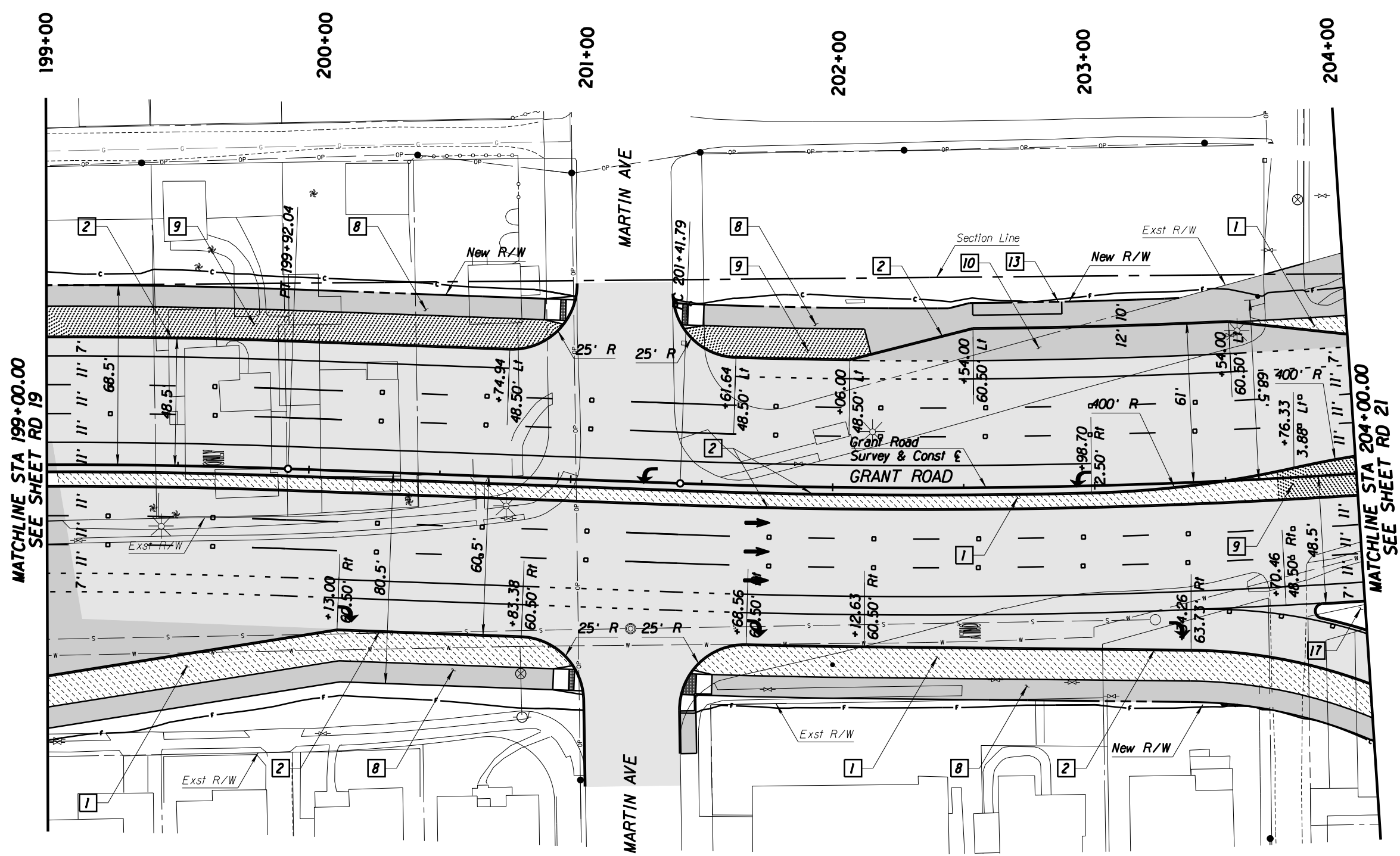
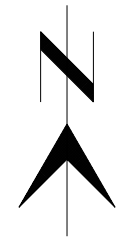


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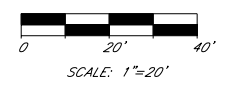
PRELIMINARY
30%
NOT FOR
CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 193+00 TO STA 199+00		31 OF 362
CITY OF TUCSON	DESIGN BY <i>[Signature]</i>	08/10	REF.	SCALE: 1"=20' H.
	DRAWN BY <i>[Signature]</i>	08/10		
	CHKD. BY <i>[Signature]</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

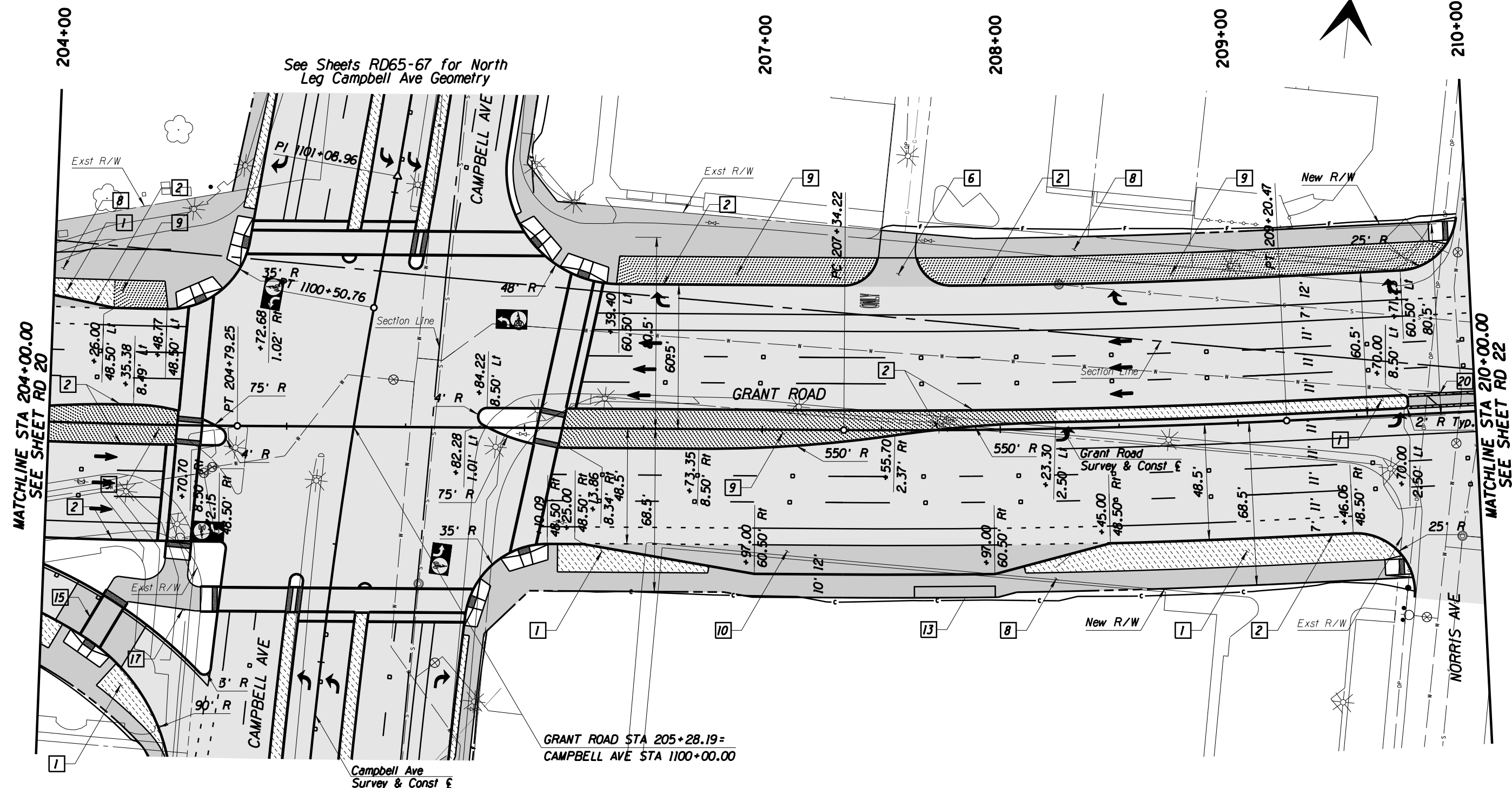


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 199+00 to STA 204+00		30% OF 362
CITY OF TUCSON	DSGN. BY <i>R. HARRIS</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>M. HARRIS</i>	08/10		
	CHKD. BY <i>R. SWIS</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



MATCHLINE STA 204+00.00
SEE SHEET RD 20

MATCHLINE STA 210+00.00
SEE SHEET RD 22

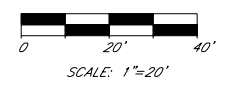
See Sheets RD65-67 for North
Leg Campbell Ave Geometry

See Sheets RD66-67 for South
Leg Campbell Ave Geometry

GRANT ROAD STA 205+28.19=
CAMPBELL AVE STA 1100+00.00

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION			DSN. BY <i>RL</i> 08/10 DRWN. BY <i>ML</i> 08/10 CHKD. BY <i>RL</i> 08/10	REF. _____ SCALE: 1"=20' H.	33 OF 362
GRANT ROAD PLAN SHEET STA 204+00 TO STA 210+00					

NO.	DATE	REVISION	BY	CHKD.	APPR.

210+00

211+00

212+00

213+00

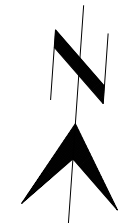
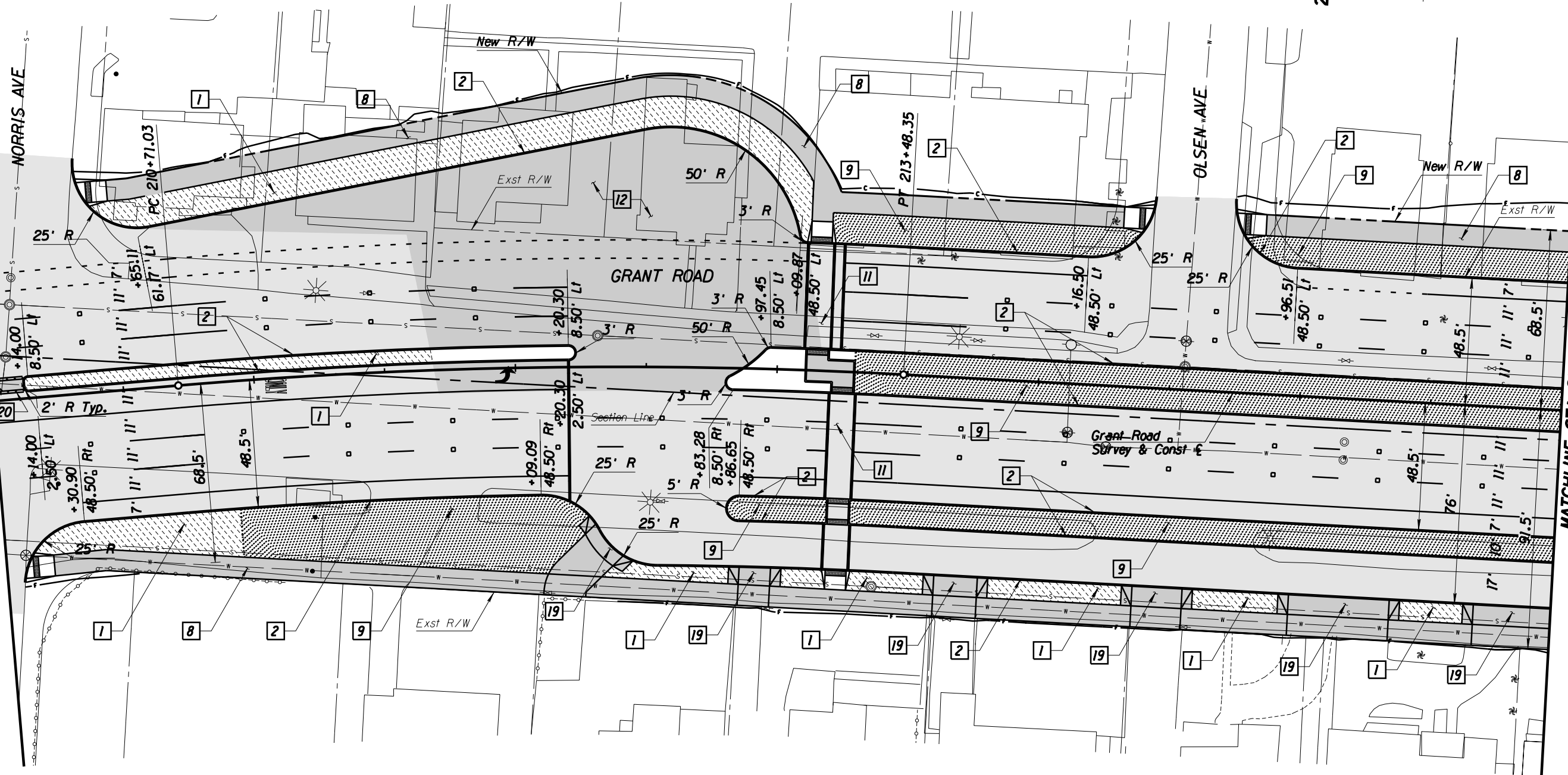
214+00

215+00

216+00

MATCHLINE STA 210+00.00
SEE SHEET RD 21

MATCHLINE STA 216+00.00
SEE SHEET RD 23



Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 210+00 TO STA 216+00		34 OF 362
CITY OF TUCSON	DSGN. BY <i>Al. [Signature]</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>Al. [Signature]</i>	08/10		
	CHKD. BY <i>Al. [Signature]</i>	08/10	PLAN NO.	

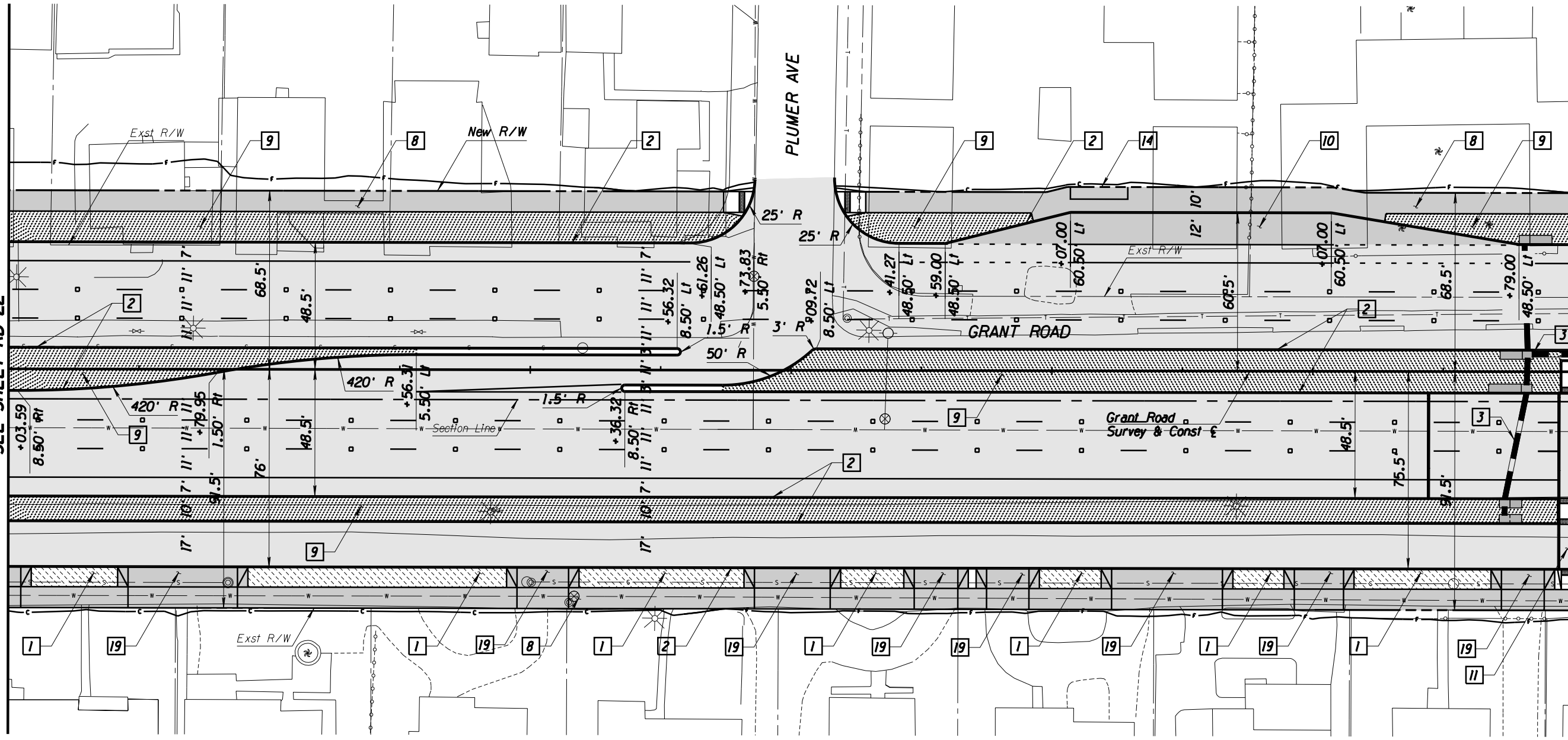
NO.	DATE	REVISION	BY	CHKD.	APPR.



216+00 217+00 218+00 219+00 220+00 221+00 222+00

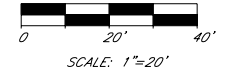
MATCHLINE STA 216+00.00
SEE SHEET RD 22

MATCHLINE STA 222+00.00
SEE SHEET RD 24



Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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**GRANT ROAD
PLAN SHEET
STA 216+00 TO STA 222+00**



DSGN. BY <i>RL</i>	08/10	REF.	SCALE: 1"=20' H.	33 OF 362
DRWN. BY <i>ML</i>	08/10			
CHKD. BY <i>RL</i>	08/10	PLAN NO.		

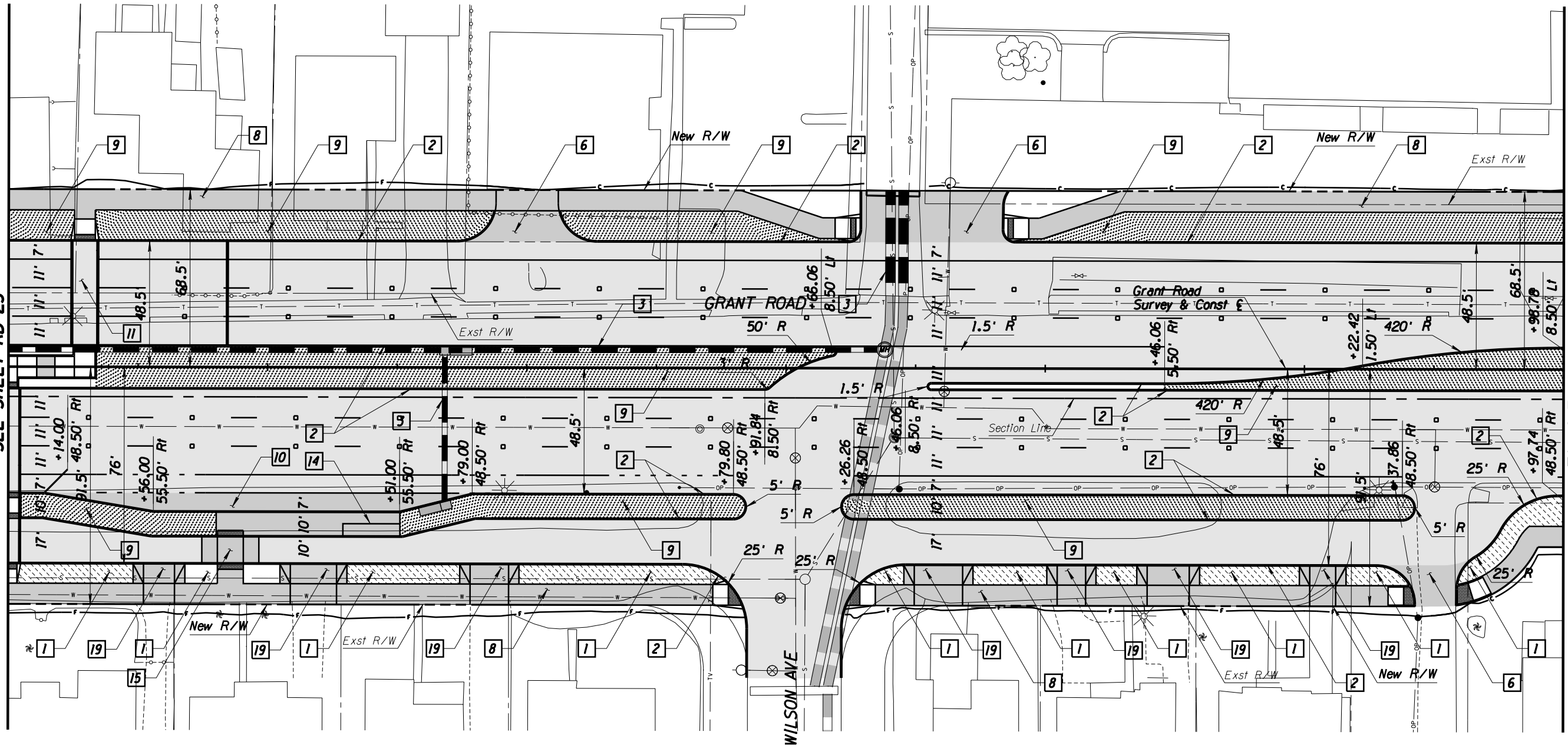
NO.	DATE	REVISION	BY	CHKD.	APPR.



222+00 223+00 224+00 225+00 226+00 227+00 228+00

MATCHLINE STA 222+00.00
SEE SHEET RD 23

MATCHLINE STA 228+00.00
SEE SHEET RD 25



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting



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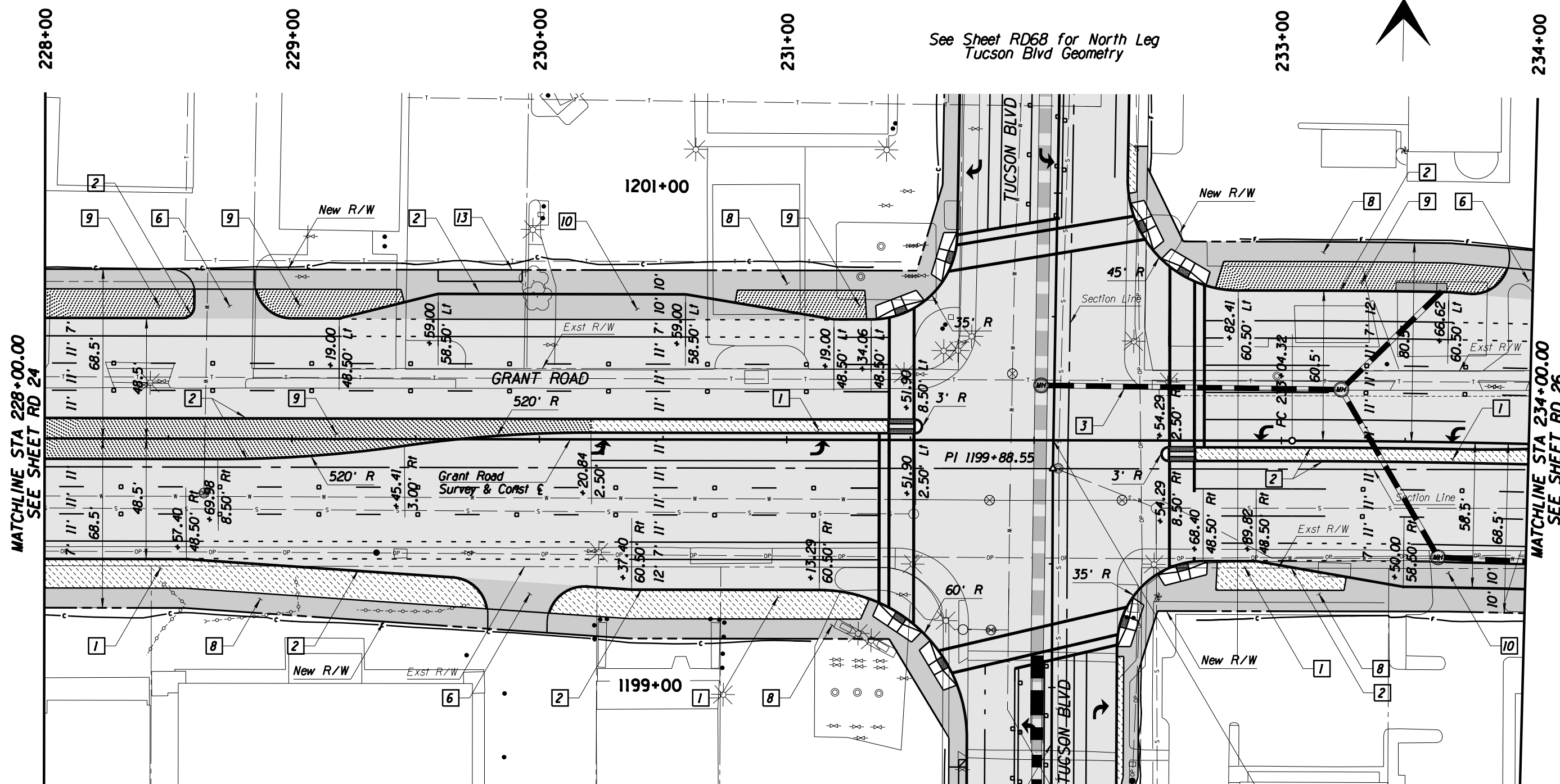
PRELIMINARY
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CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 222+00 TO STA 228+00		30% OF 362
CITY OF TUCSON	DSGN. BY <i>[Signature]</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>[Signature]</i>	08/10		
	CHKD. BY <i>[Signature]</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



See Sheet RD68 for North Leg Tucson Blvd Geometry



Tucson Blvd Survey & Const E
See Sheets RD68-69 for South Leg Tucson Blvd Geometry

GRANT ROAD STA 232+07.79 =
TUCSON BLVD STA 1200+00.00

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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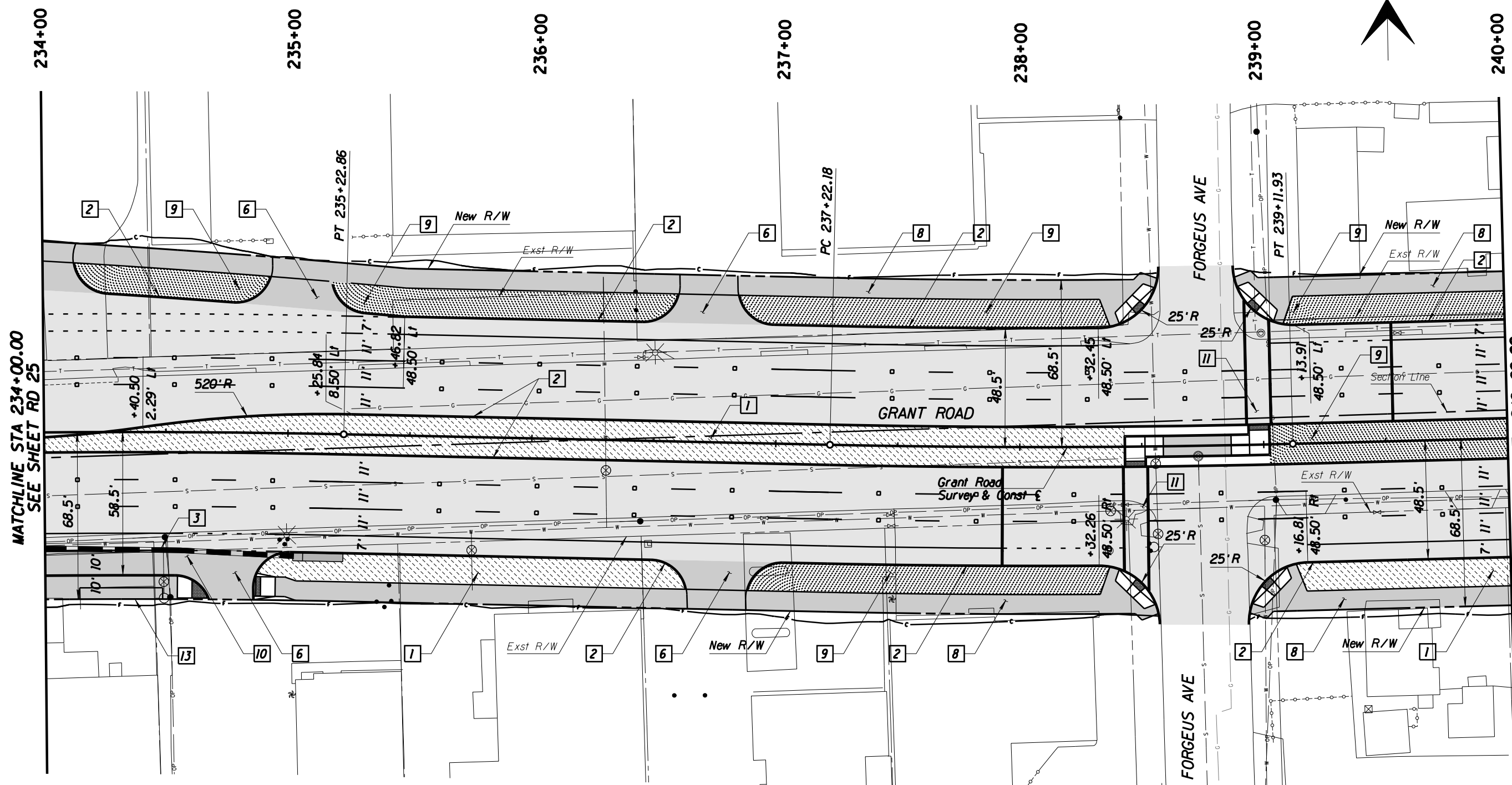
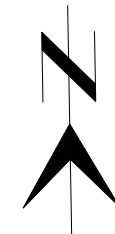
PRELIMINARY
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NOT FOR
CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

GRANT ROAD
PLAN SHEET
STA 228+00 TO STA 234+00

	DSGN. BY <i>RL</i>	08/10	REF.	SCALE: 1"=20' H.	37 OF 362
	DRWN. BY <i>ML</i>	08/10			
	CHKD. BY <i>RL</i>	08/10	PLAN NO.		

NO.	DATE	REVISION	BY	CHKD.	APPR.



MATCHLINE STA 234+00.00
SEE SHEET RD 25

MATCHLINE STA 240+00.00
SEE SHEET RD 27

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

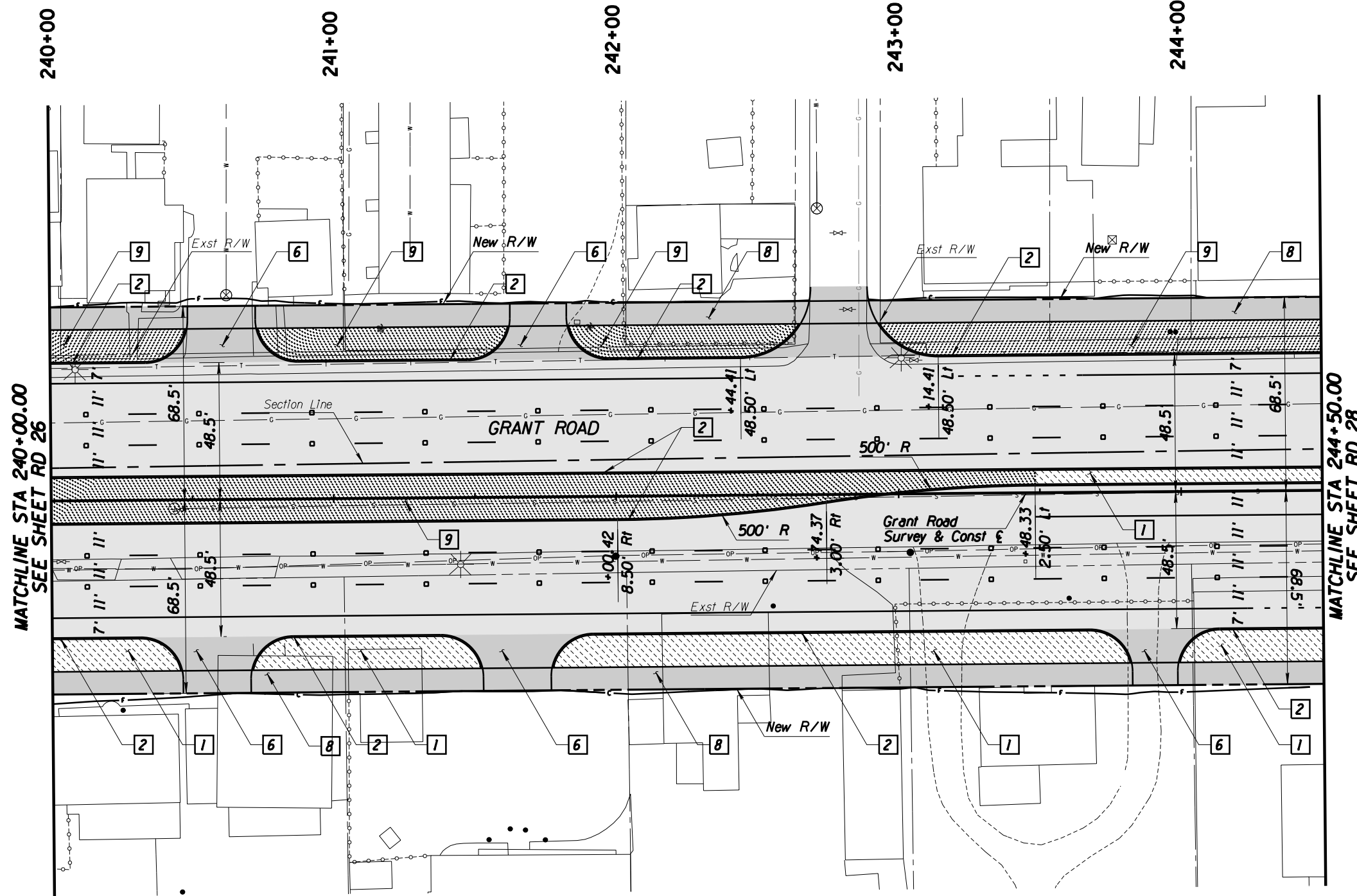
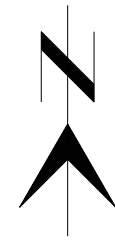


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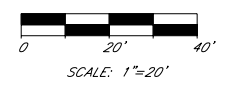
PRELIMINARY
30%
NOT FOR
CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 234+00 TO STA 240+00		OF 362
CITY OF TUCSON	DSGN. BY <i>AL [signature]</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>AL [signature]</i>	08/10		
	CHKD. BY <i>AL [signature]</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

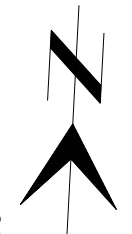


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 240+00 to STA 244+50		33 OF 362
CITY OF TUCSON	DESIGN BY <i>[Signature]</i>	08/10	REF.	SCALE: 1"=20' H.
	DRAWN BY <i>[Signature]</i>	08/10		
	CHKD. BY <i>[Signature]</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



245+00 246+00 247+00 248+00 249+00 250+00

See Sheet RD70 for North Leg Treat Ave Geometry

Treat Ave Survey & Const E

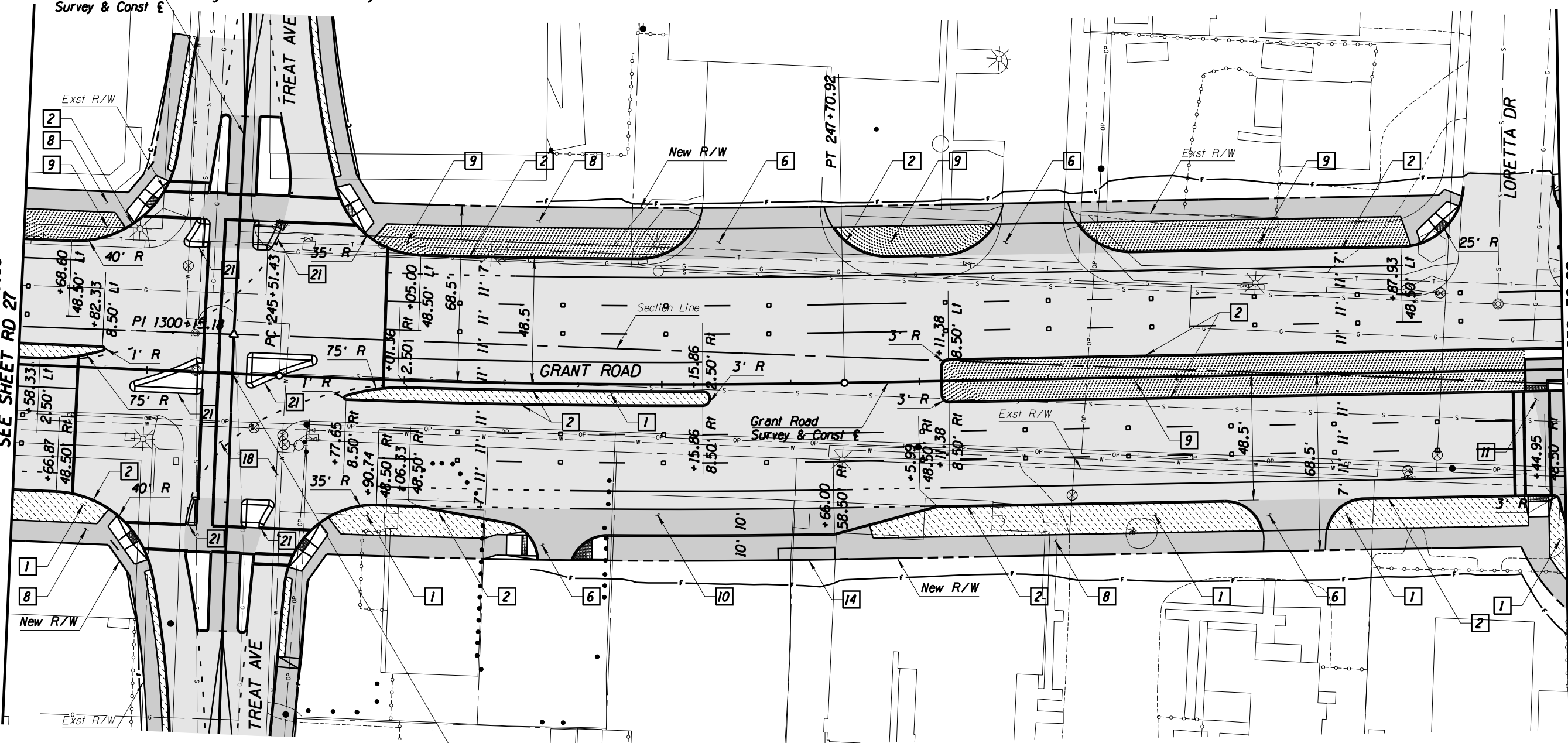
Exst R/W

New R/W

Exst R/W

MATCHLINE STA 244+50.00
SEE SHEET RD 27

MATCHLINE STA 250+50.00
SEE SHEET RD 29

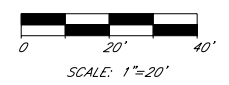


See Sheet RD70 for South Leg Treat Ave Geometry

GRANT ROAD STA 245+33.15 =
TREAT AVE STA 1300+00.00

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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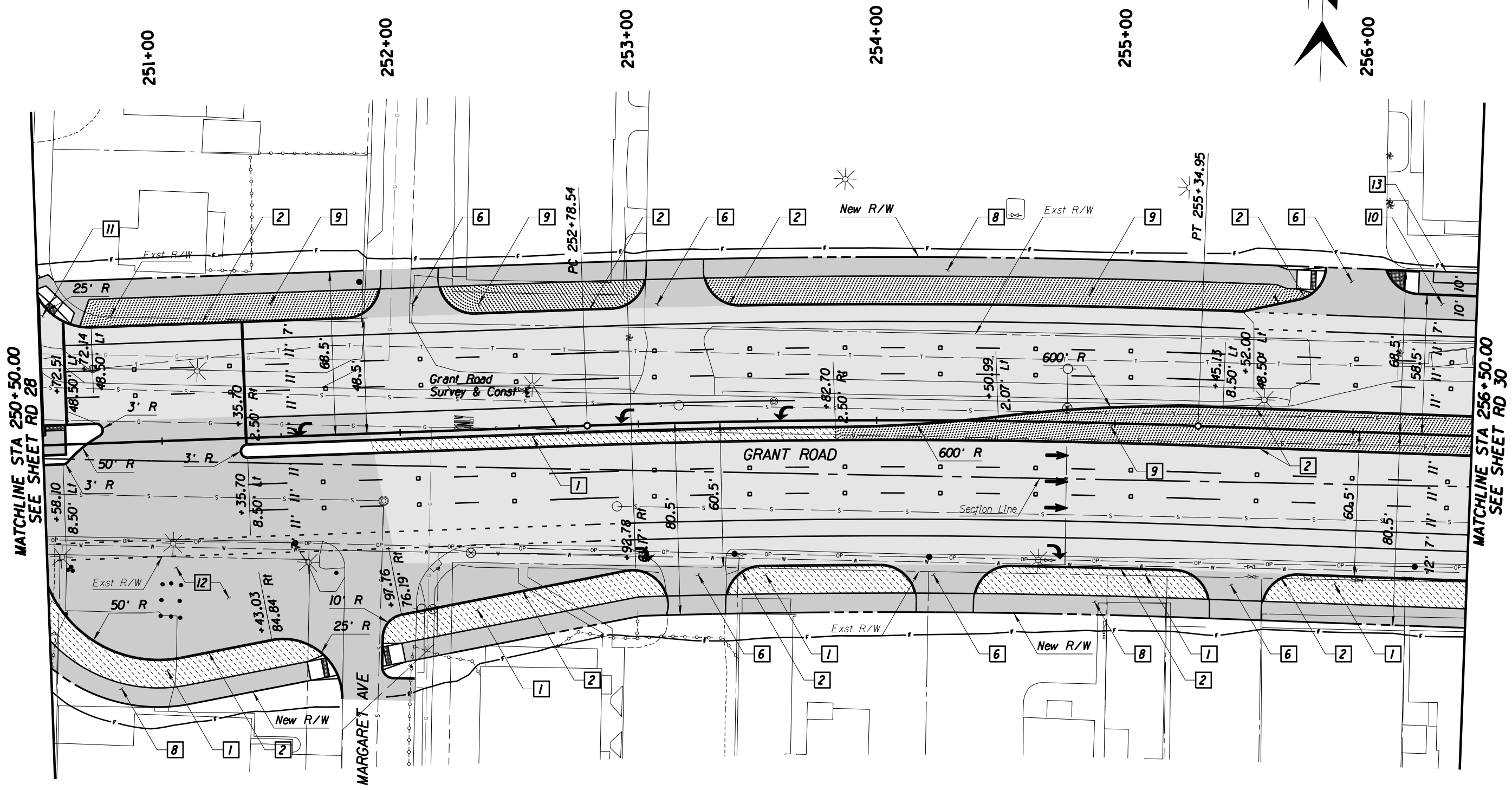
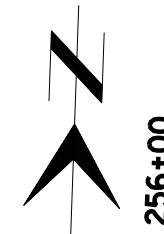
DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

GRANT ROAD
PLAN SHEET
STA 244+50 TO STA 250+50



DSGN. BY <i>ll</i>	08/10	REF.	SCALE: 1"=20' H.
DRWN. BY <i>ll</i>	08/10		
CHKD. BY <i>ll</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



MATCHLINE STA 250+50.00
SEE SHEET RD 28

MATCHLINE STA 256+50.00
SEE SHEET RD 30

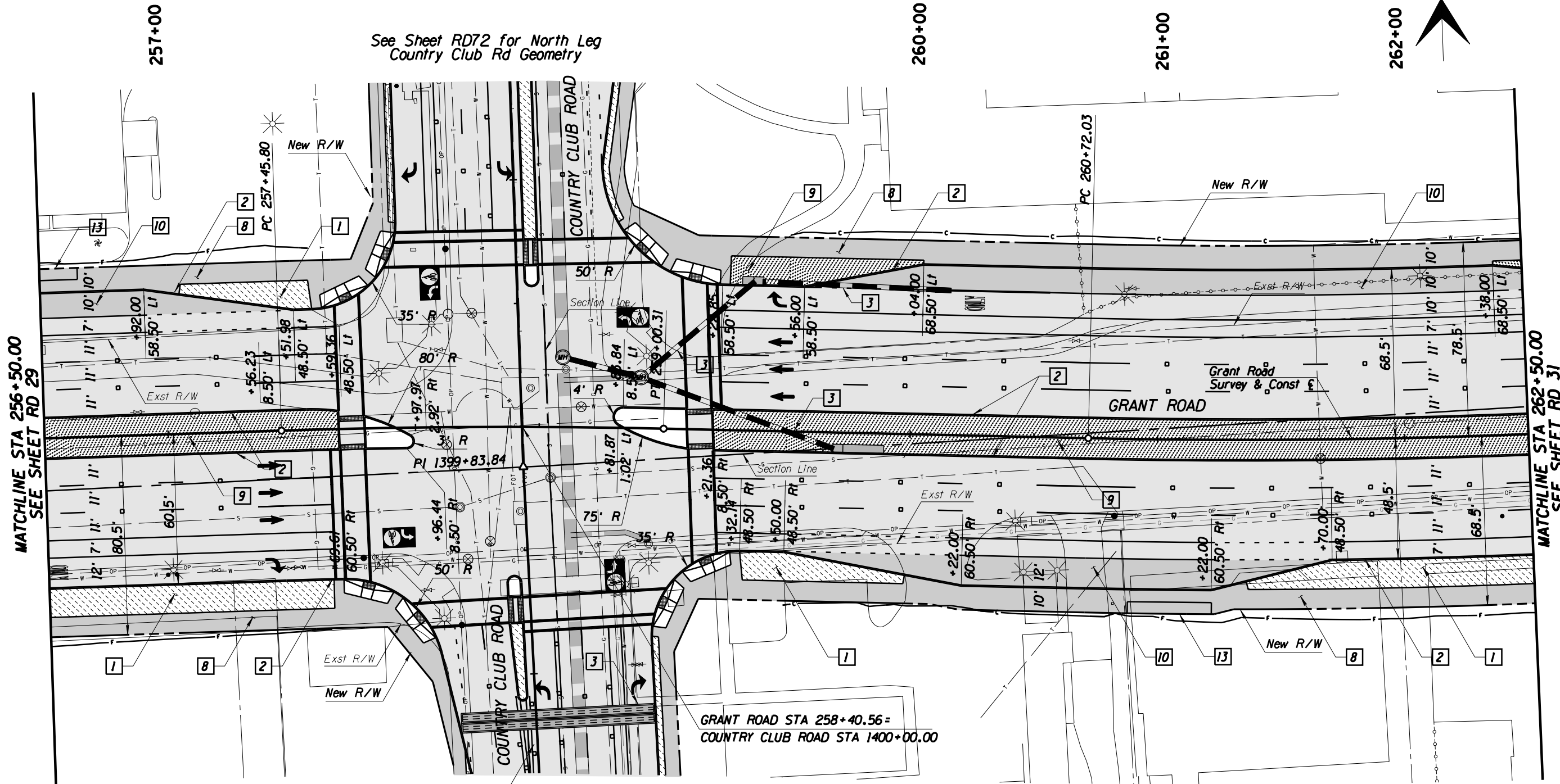
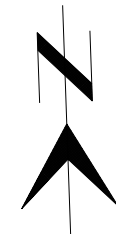
Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

0 20' 40'
SCALE: 1"=20'

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		GRANT ROAD PLAN SHEET STA 250+50 TO STA 256+50			
CITY OF TUCSON	DSGN. BY <i>ll</i>	08/10	REF.	SCALE: 1"=20' H.	41 OF 362
	DRWN. BY <i>ll</i>	08/10	PLAN NO.		
NO.	DATE	REVISION	BY	CHKD.	APPR.



See Sheet RD72 for North Leg Country Club Rd Geometry

MATCHLINE STA 256+50.00
SEE SHEET RD 29

MATCHLINE STA 262+50.00
SEE SHEET RD 31

GRANT ROAD STA 258+40.56 =
COUNTRY CLUB ROAD STA 1400+00.00

Country Club Road Survey & Const E
See Sheets RD71-72 for South Leg Country Club Rd Geometry

- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

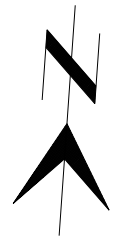
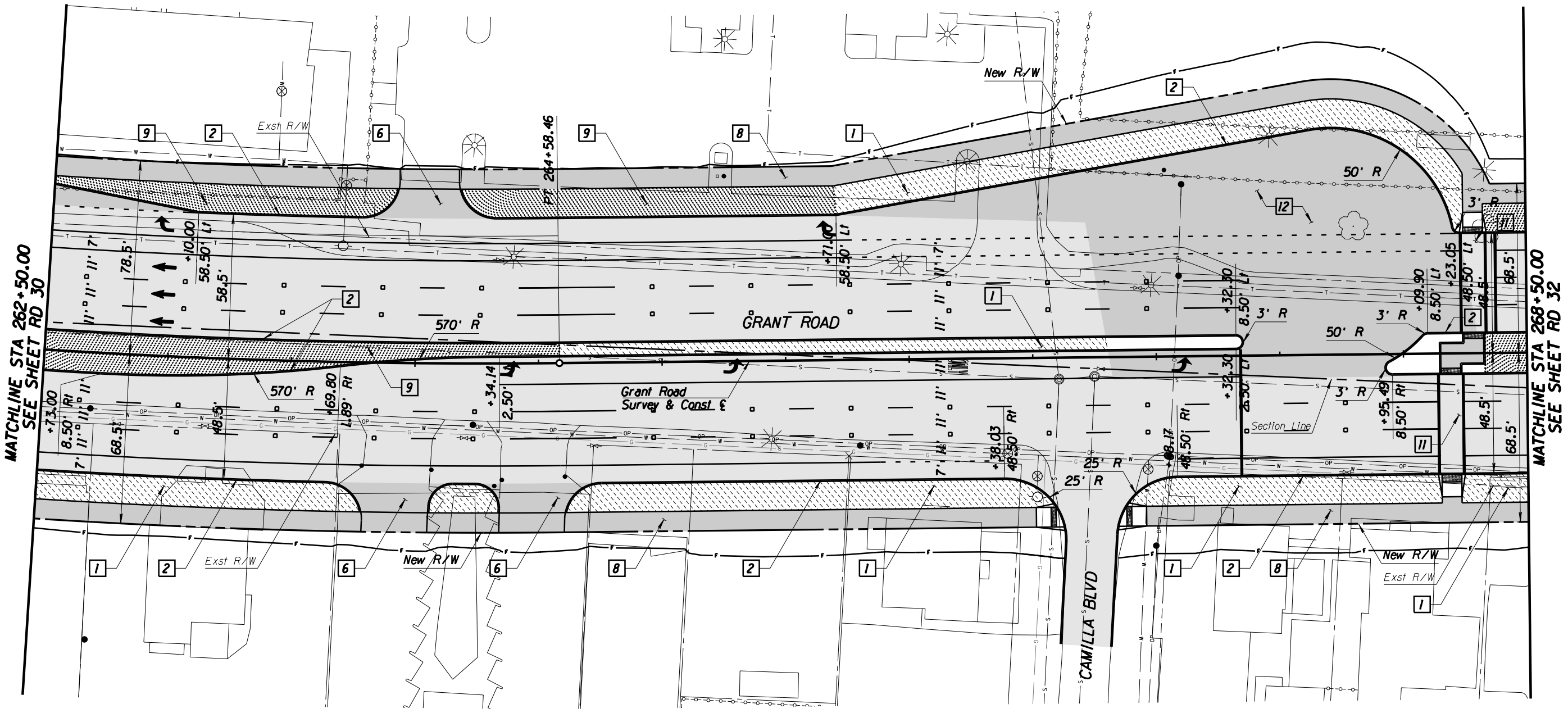


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	GRANT ROAD PLAN SHEET STA 256+50 TO STA 262+50			
		DSN. BY <i>[Signature]</i> 08/10 DRWN. BY <i>[Signature]</i> 08/10 CHD. BY <i>[Signature]</i> 08/10	REF. _____ SCALE: 1"=20' H.	42 OF 362
	PLAN NO. _____			362

NO.	DATE	REVISION	BY	CHKD.	APPR.

263+00 264+00 265+00 266+00 267+00 268+00



MATCHLINE STA 262+50.00
SEE SHEET RD 30

MATCHLINE STA 268+50.00
SEE SHEET RD 32

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

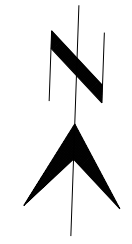


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GRANT ROAD PLAN SHEET STA 262+50 TO STA 268+50					

NO.	DATE	REVISION	BY	CHKD.	APPR.



274+00

269+00

270+00

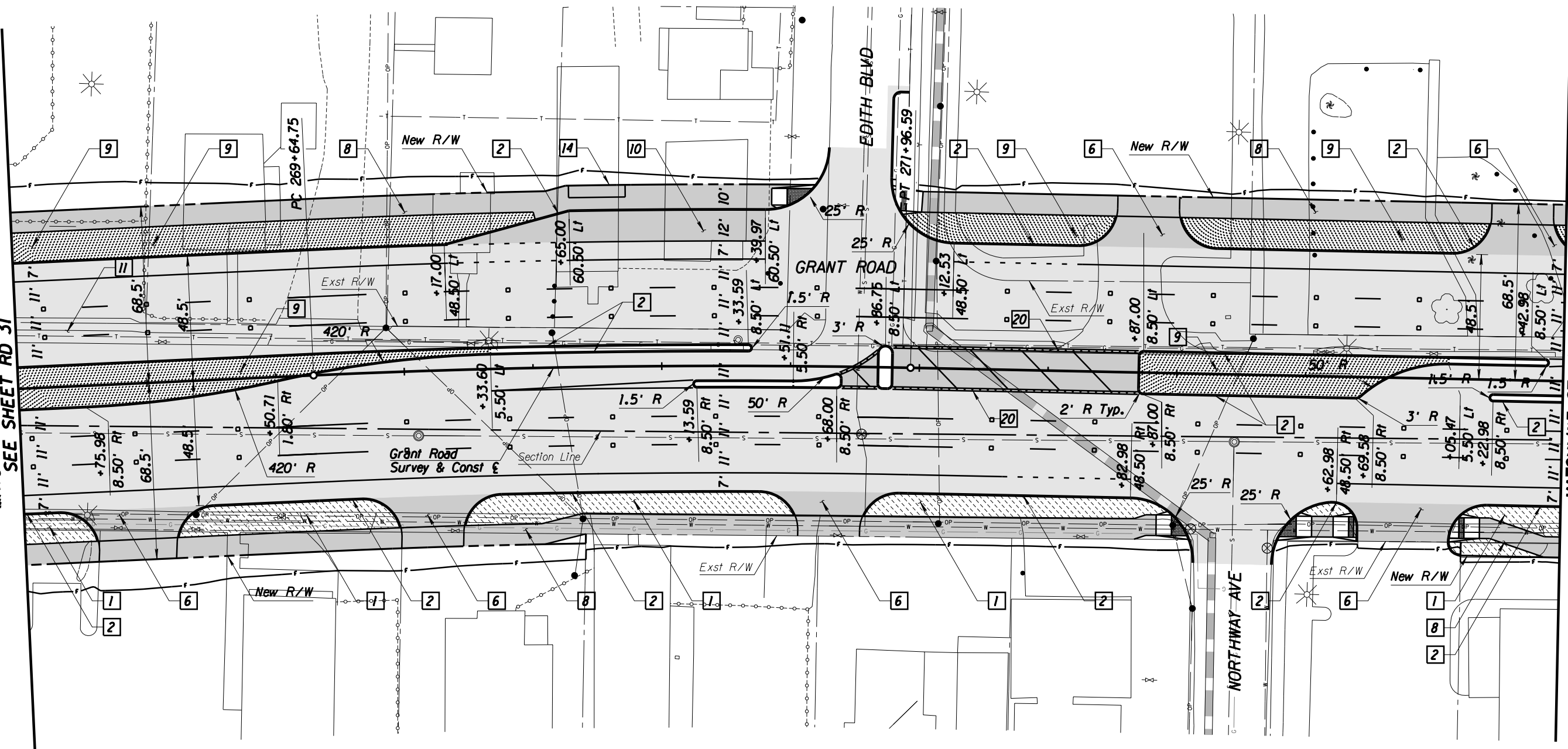
271+00

272+00

273+00

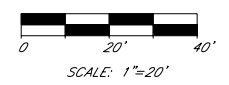
MATCHLINE STA 268+50.00
SEE SHEET RD 31

MATCHLINE STA 274+50.00
SEE SHEET RD 33



Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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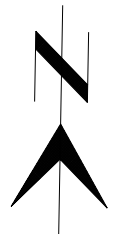
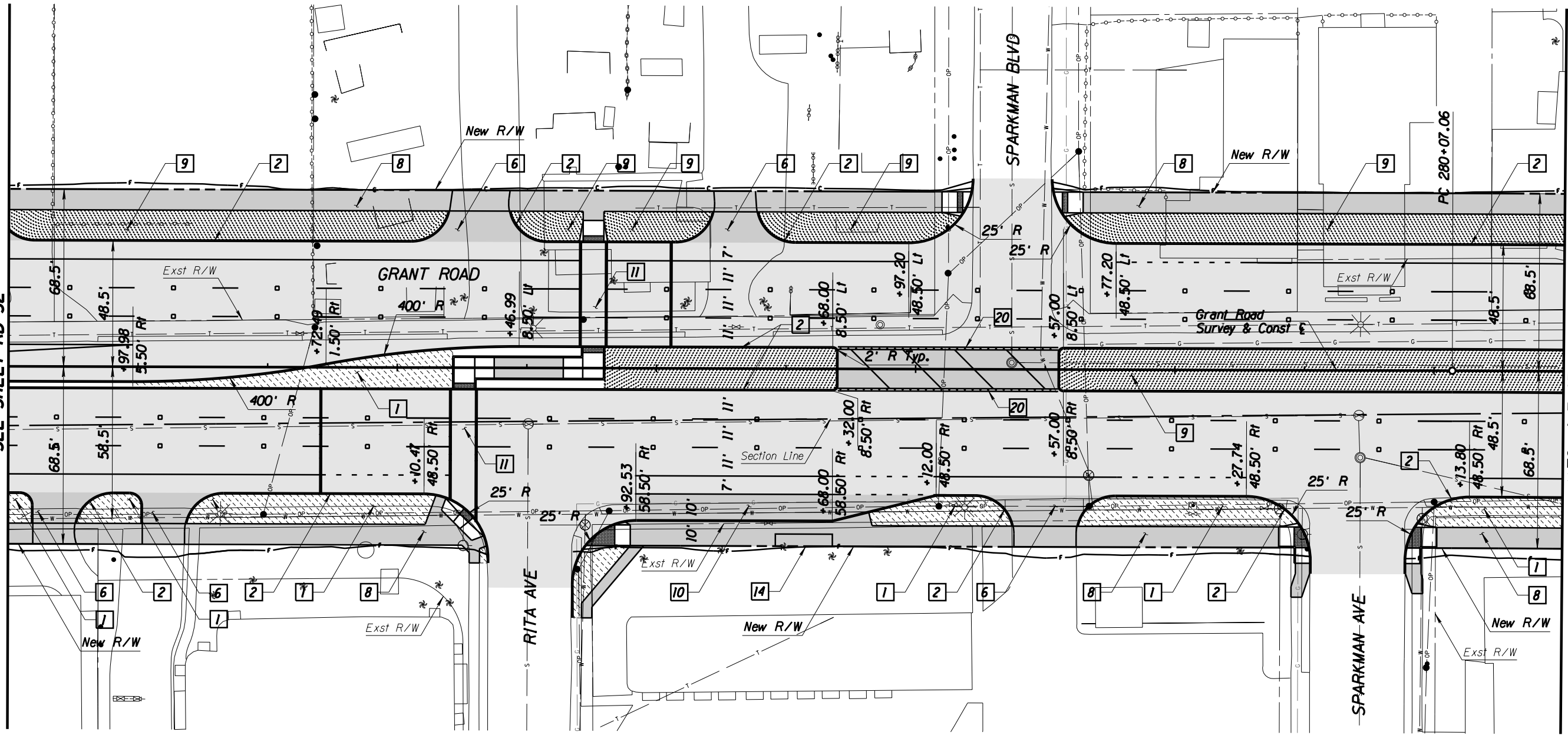
**GRANT ROAD
PLAN SHEET
STA 268+50 TO STA 274+50**

<p>CITY OF TUCSON</p>	DSN. BY <i>AL</i> 08/10 REF. _____ SCALE: 1"=20' H.	44 OF 362
	DRWN. BY <i>AL</i> 08/10	
	CHKD. BY <i>AL</i> 08/10 PLAN NO. _____	

275+00 276+00 277+00 278+00 279+00 280+00

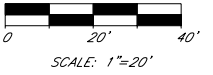
MATCHLINE STA 274+50.00
SEE SHEET RD 32

MATCHLINE STA 280+50.00
SEE SHEET RD 34



Legend

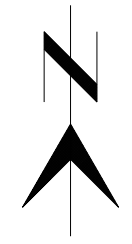
- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 274+50 TO STA 280+50		45 OF 362
CITY OF TUCSON	DSGN. BY <i>bl. [signature]</i>	08/10	REF. _____	SCALE: 1"=20' H.
	DRWN. BY <i>bl. [signature]</i>	08/10	PLAN NO. _____	
NO. DATE REVISION BY CHKD. APPR.				



281+00

282+00

283+00

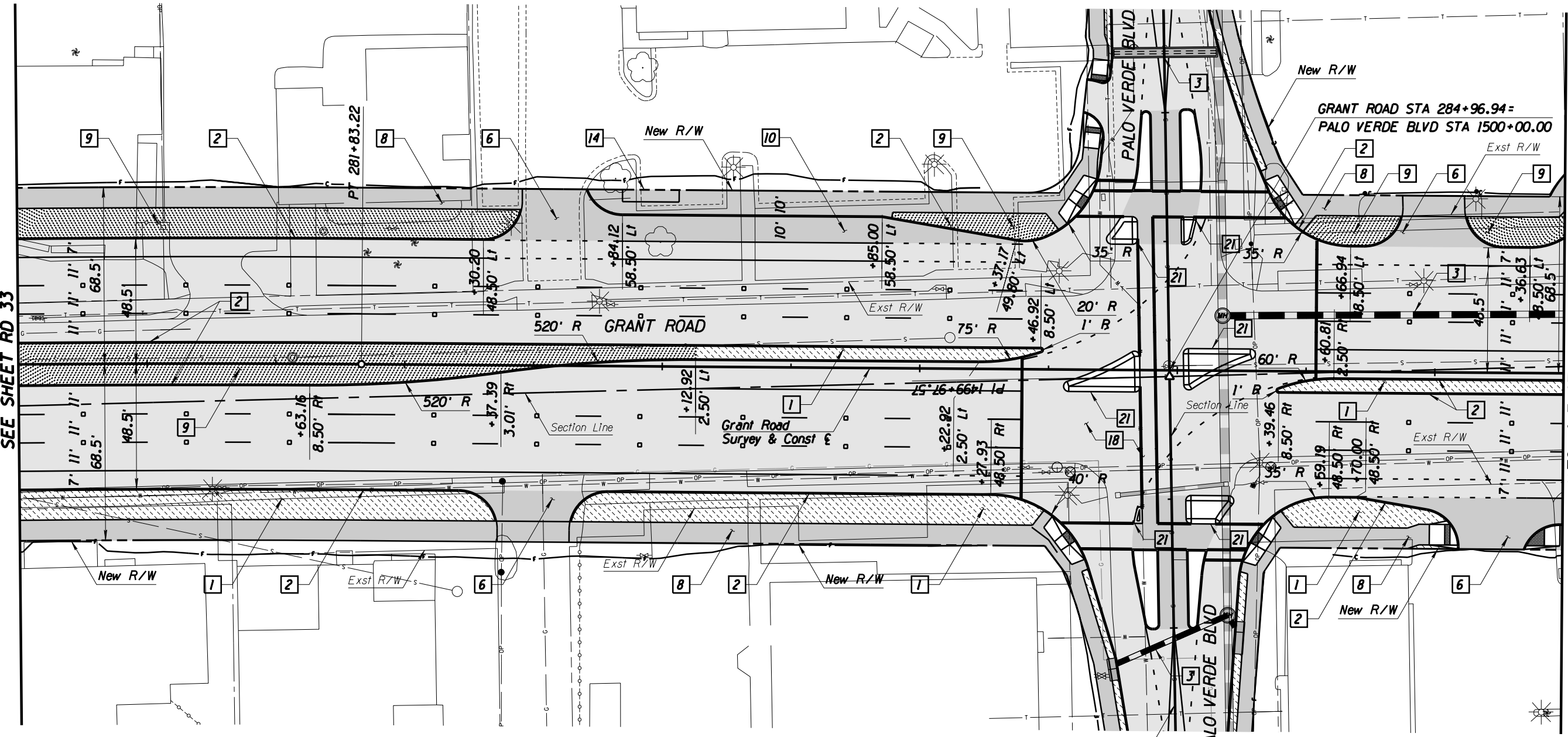
284+00

286+00

See Sheet RD74 for North Leg
Palo Verde Blvd Geometry

MATCHLINE STA 280+50.00
SEE SHEET RD 33

MATCHLINE STA 286+50.00
SEE SHEET RD 35



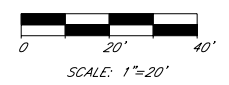
GRANT ROAD STA 284+96.94 =
PALO VERDE BLVD STA 1500+00.00

Palo Verde Blvd
Survey & Const E

See Sheet RD74 for South Leg
Palo Verde Blvd Geometry

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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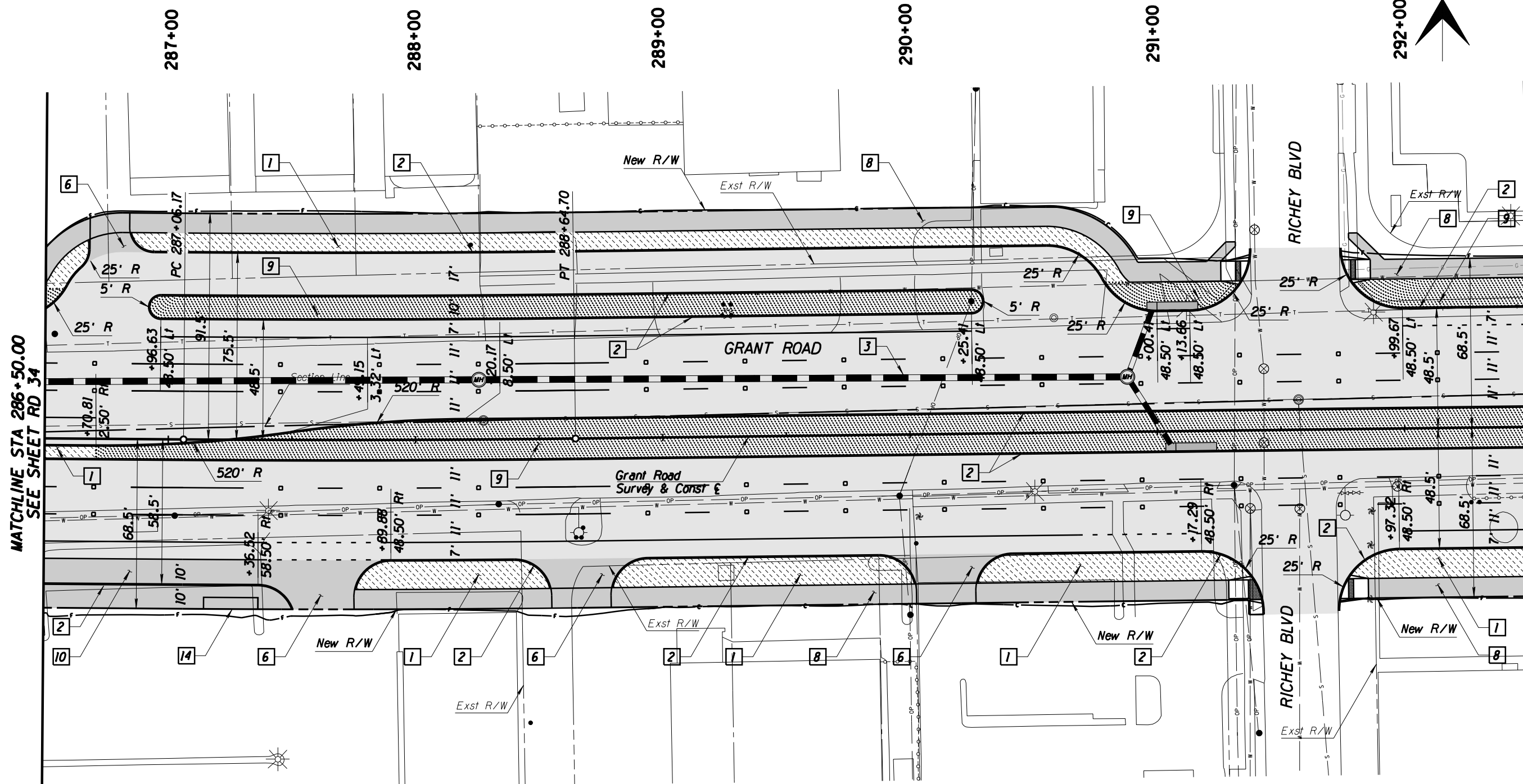
DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

GRANT ROAD
PLAN SHEET
STA 280+50 TO STA 286+50



DSGN. BY <i>RL</i>	08/10	REF.	SCALE: 1"=20' H.	40
DRWN. BY <i>RL</i>	08/10			OF
CHKD. BY <i>RL</i>	08/10	PLAN NO.		362

NO.	DATE	REVISION	BY	CHKD.	APPR.



MATCHLINE STA 286+50.00
SEE SHEET RD 34

MATCHLINE STA 292+50.00
SEE SHEET RD 36



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

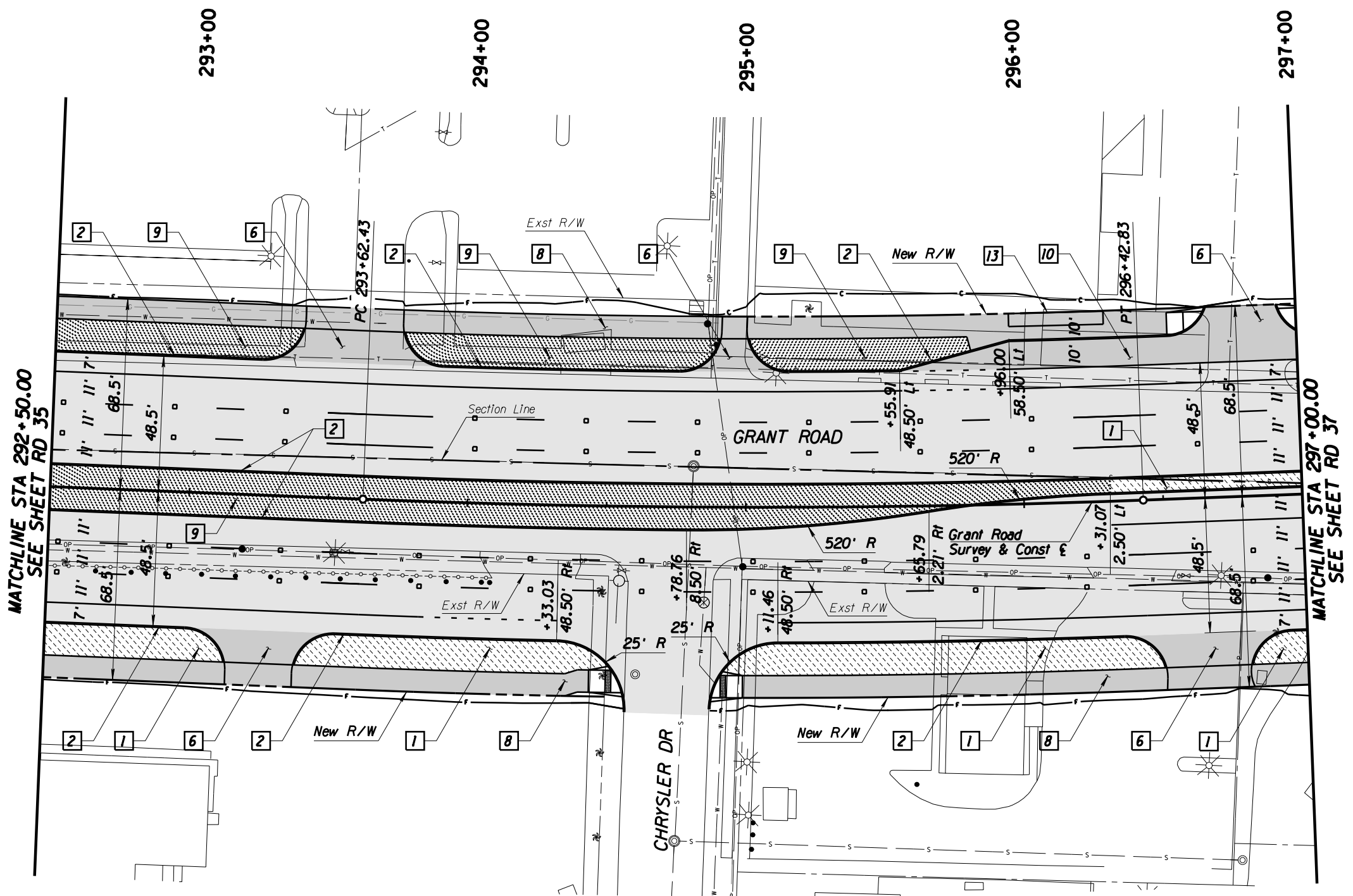
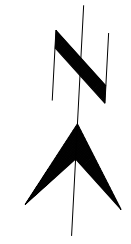


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 286+50 TO STA 292+50		2015
CITY OF TUCSON	DSGN. BY <i>[Signature]</i>	08/10	REF.	SCALE: 1"=20' H
	DRWN. BY <i>[Signature]</i>	08/10		47
	CHKD. BY <i>[Signature]</i>	08/10	PLAN NO.	OF 362

NO.	DATE	REVISION	BY	CHKD.	APPR.

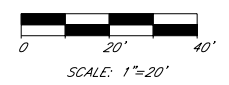


MATCHLINE STA 292+50.00
SEE SHEET RD 35

MATCHLINE STA 297+00.00
SEE SHEET RD 37

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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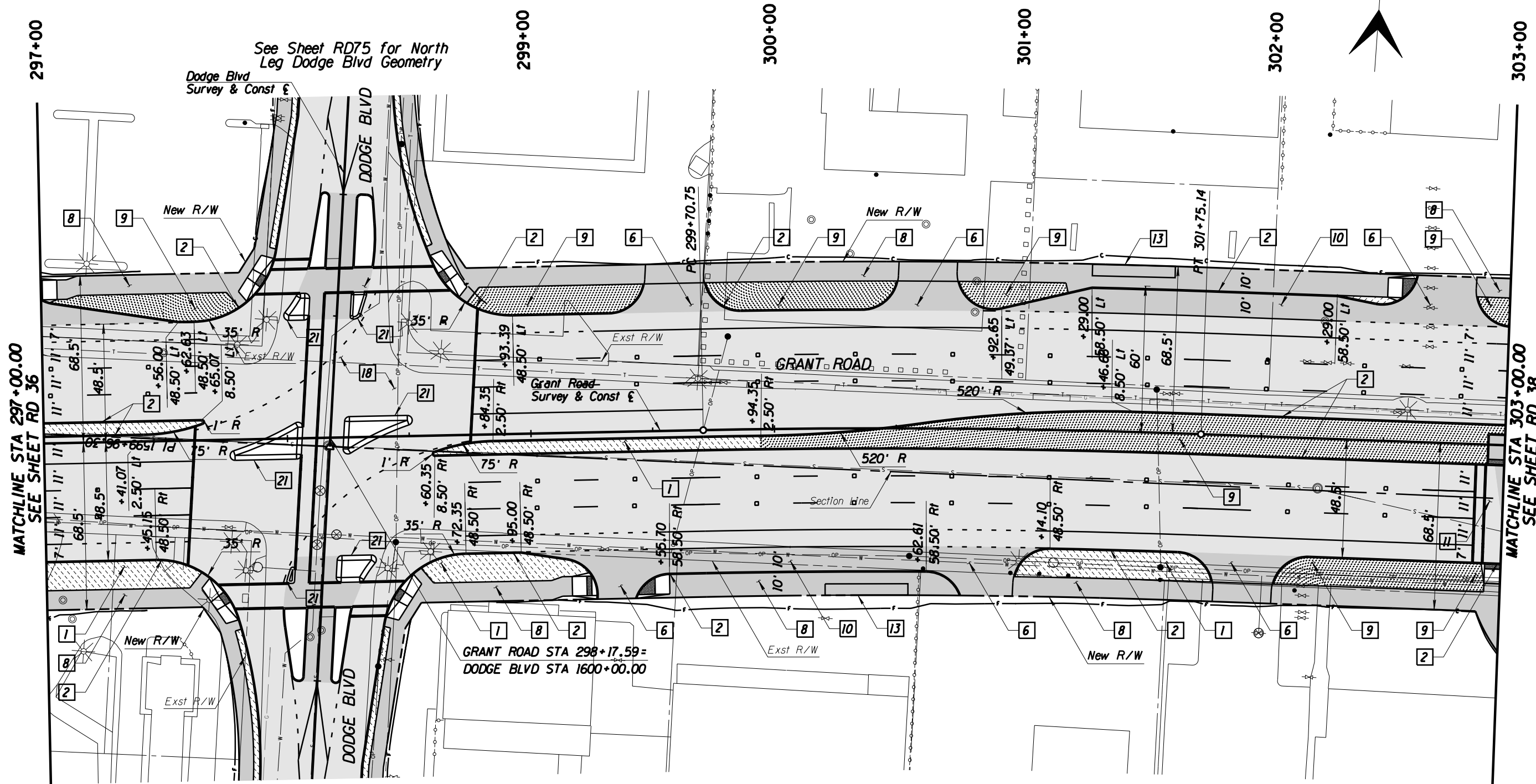
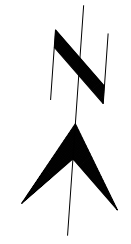
NO.	DATE	REVISION	BY	CHKD.	APPR.

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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

GRANT ROAD
PLAN SHEET
STA 292+50 TO STA 297+00

	DSON. BY <i>RL</i> 08/10	REF.	SCALE: 1"=20' H.	20
	DRWN. BY <i>RL</i> 08/10			OF
	CHKD. BY <i>RL</i> 08/10	PLAN NO.		362



See Sheet RD75 for North Leg Dodge Blvd Geometry

See Sheet RD75 for South Leg Dodge Blvd Geometry

MATCHLINE STA 297+00.00
SEE SHEET RD 36

MATCHLINE STA 303+00.00
SEE SHEET RD 38

GRANT ROAD STA 298+17.59=
DODGE BLVD STA 1600+00.00

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

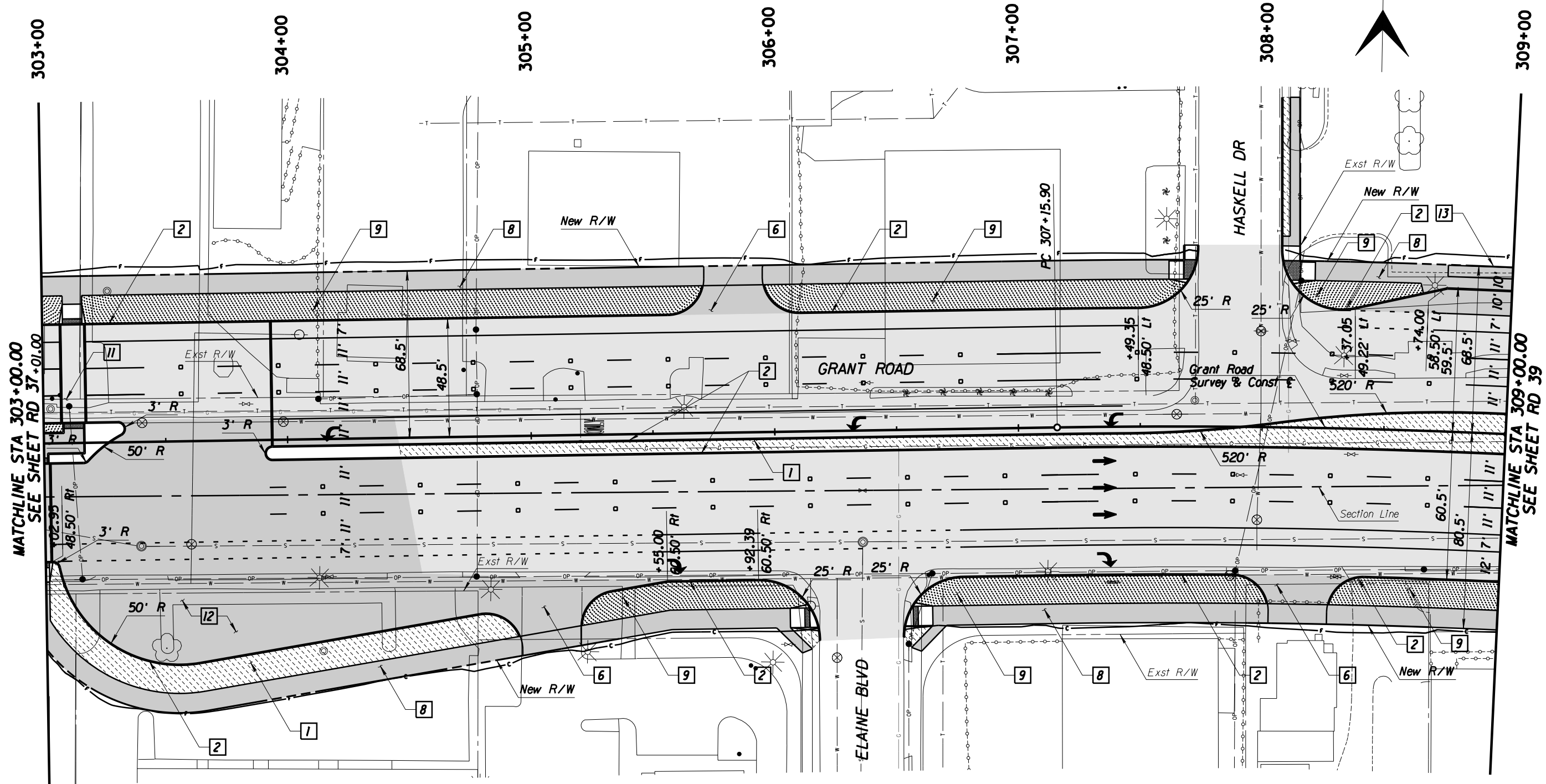


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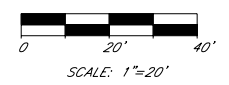
PRELIMINARY
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 297+00 TO STA 303+00		43 OF 362
CITY OF TUCSON	DSGN. BY <i>AL [Signature]</i>	08/10	REF.	SCALE: 1"=20' H
	DRWN. BY <i>AL [Signature]</i>	08/10		
	CHKD. BY <i>AL [Signature]</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

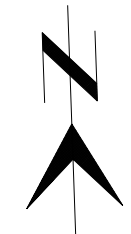


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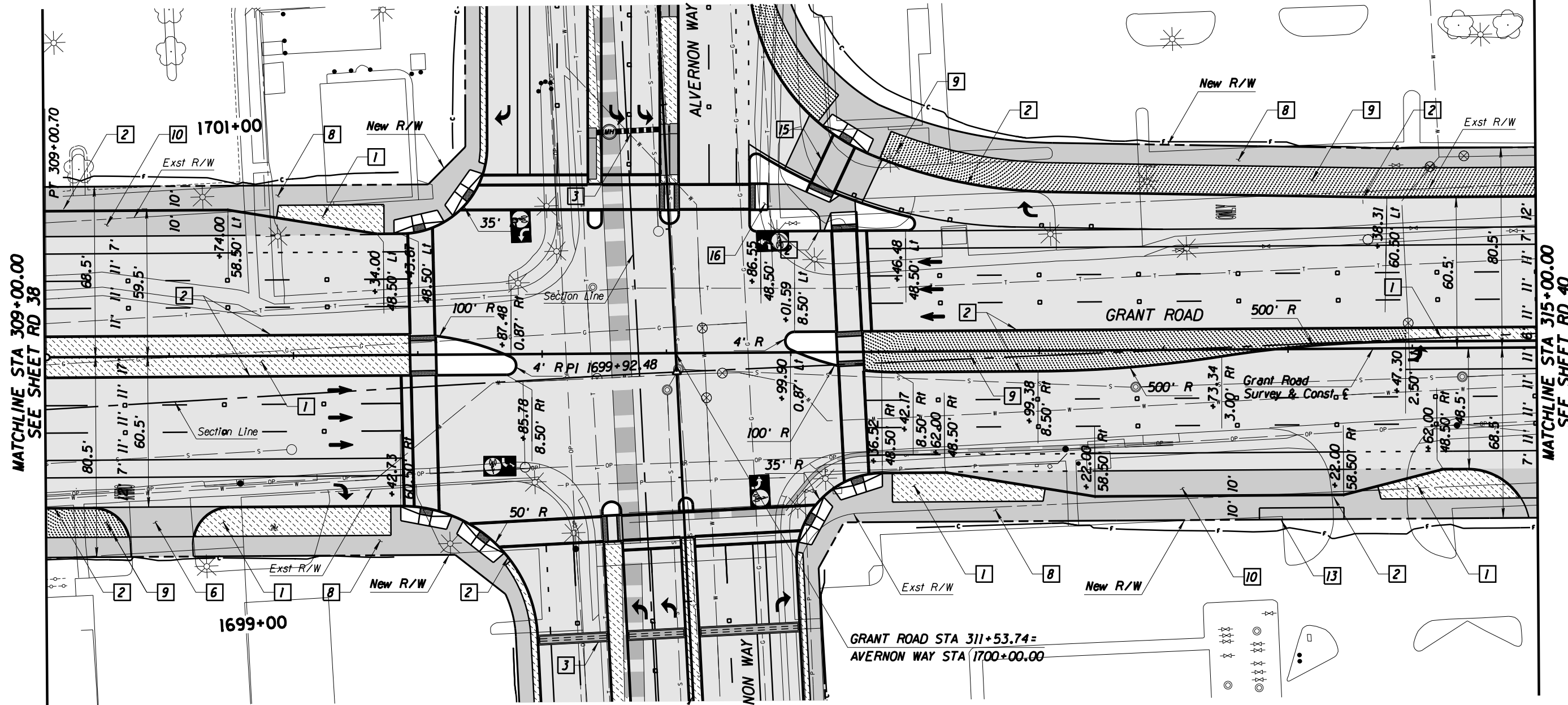
**PRELIMINARY
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 303+00 to STA 309+00	20 OF 362
CITY OF TUCSON	DSON. BY <i>[Signature]</i> 08/10 REF. _____ SCALE: 1"=20' H. DRWN. BY <i>[Signature]</i> 08/10 CHD. BY <i>[Signature]</i> 08/10	PLAN NO. _____	362 OF 362

NO.	DATE	REVISION	BY	CHKD.	APPR.



309+00 310+00 See Sheets RD77-78 for North Leg Alvernon Way Geometry 312+00 313+00 314+00 315+00



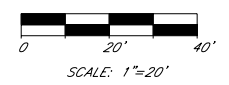
MATCHLINE STA 309+00.00
SEE SHEET RD 38

MATCHLINE STA 315+00.00
SEE SHEET RD 40

Alvernon Way
Survey & Const E
See Sheets RD76-77 for South Leg
Alvernon Way Geometry

GRANT ROAD STA 311+53.74 =
ALVERNON WAY STA 1700+00.00

- Legend**
- AC Pvmt
 - PCC Pvmt/Swik
 - Landscaping
 - Water Harvesting



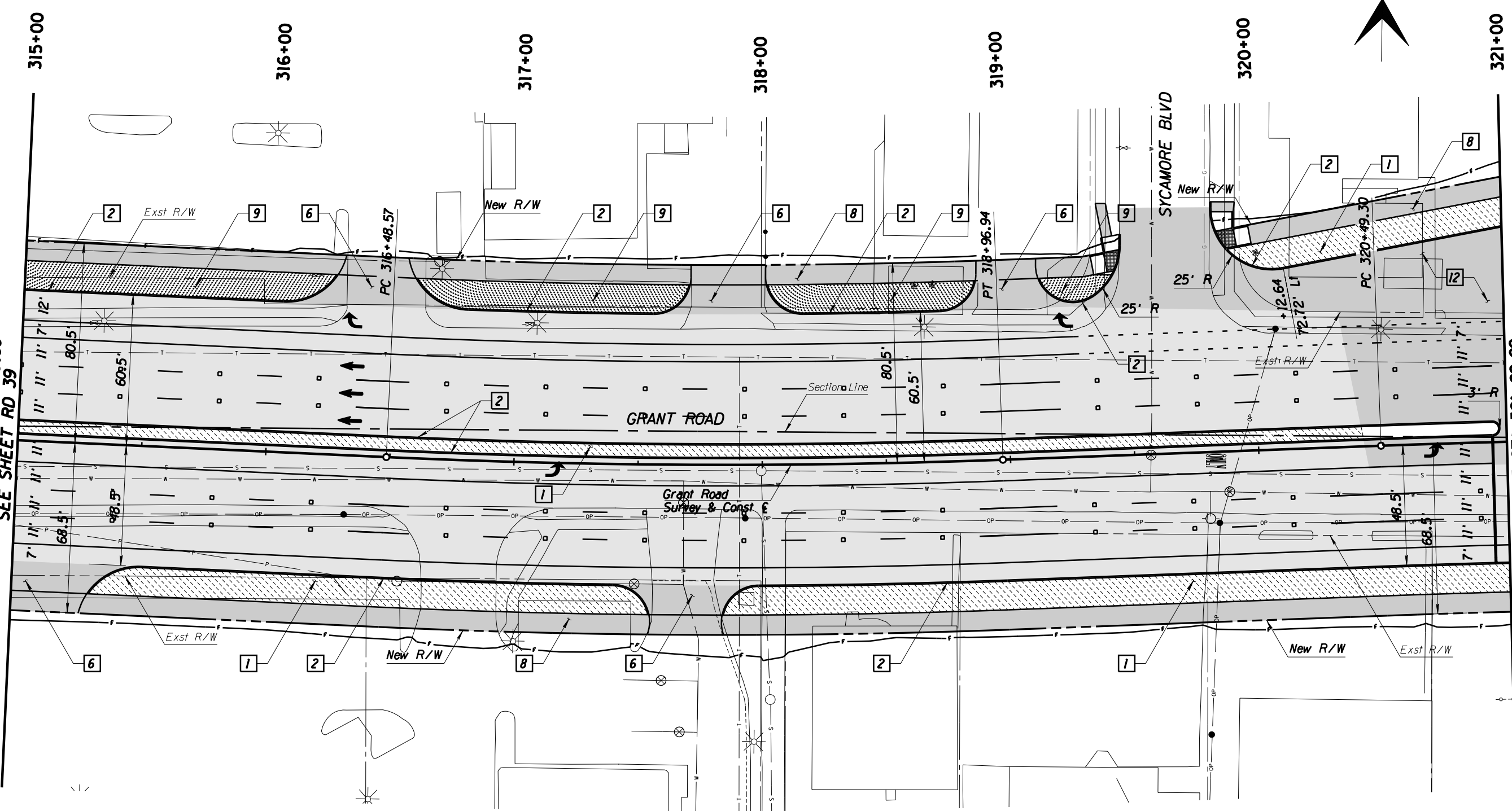
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 309+00 to STA 315+00		2010
CITY OF TUCSON	DSGN. BY <i>ll</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>ll</i>	08/10		
	CHKD. BY <i>ll</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

2010
OF
362

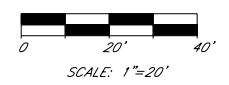


MATCHLINE STA 315+00.00
SEE SHEET RD 39

MATCHLINE STA 321+00.00
SEE SHEET RD 41

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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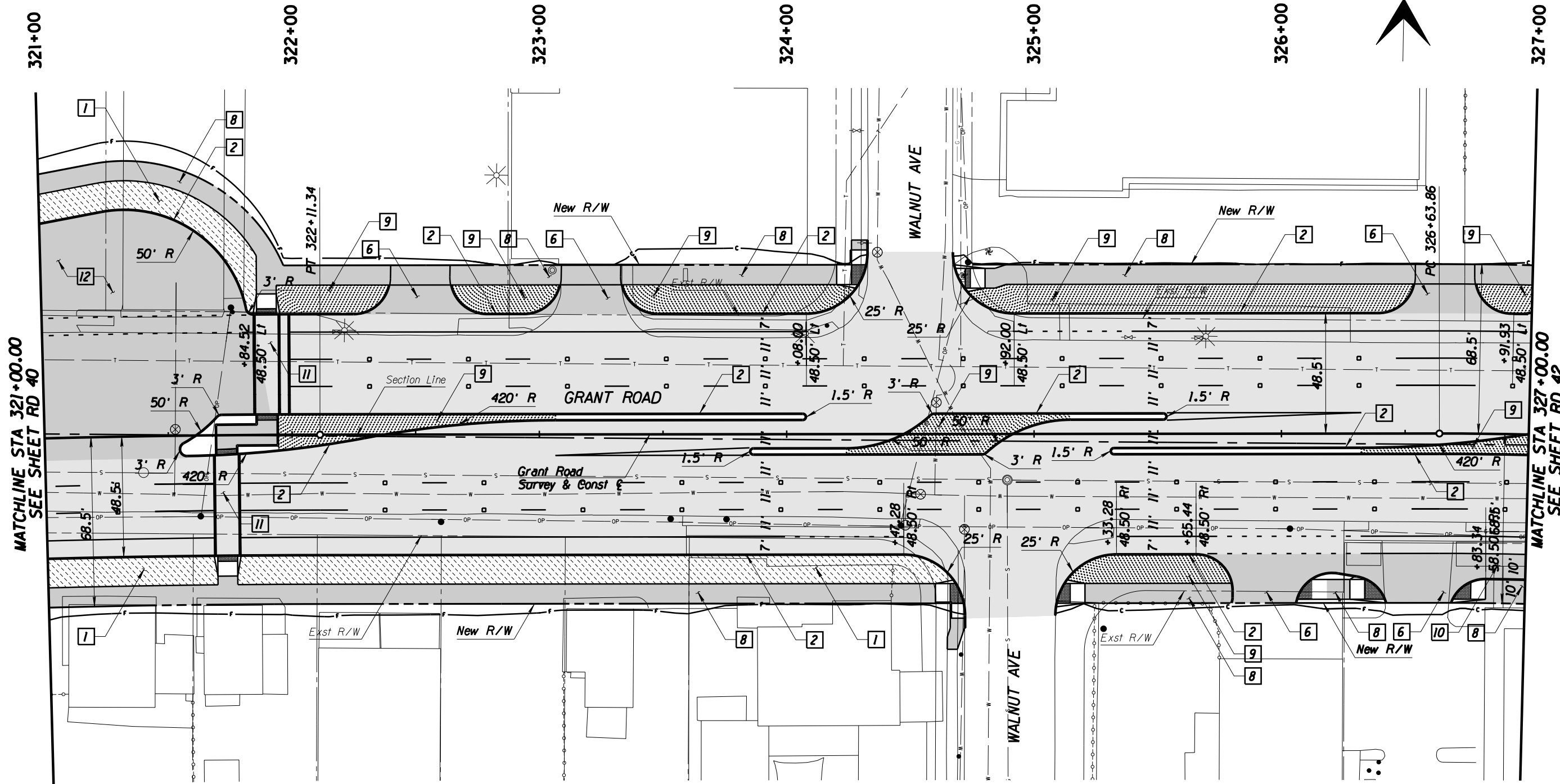
GRANT ROAD
PLAN SHEET
STA 315+00 TO STA 321+00



DSGN. BY <i>ll</i>	08/10	REF.	SCALE: 1"=20' H.
DRWN. BY <i>ll</i>	08/10		
CHKD. BY <i>ll</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

362
OF
362

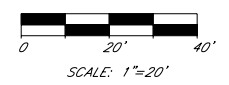


MATCHLINE STA 321+00.00
SEE SHEET RD 40

MATCHLINE STA 327+00.00
SEE SHEET RD 42

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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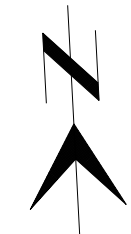
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

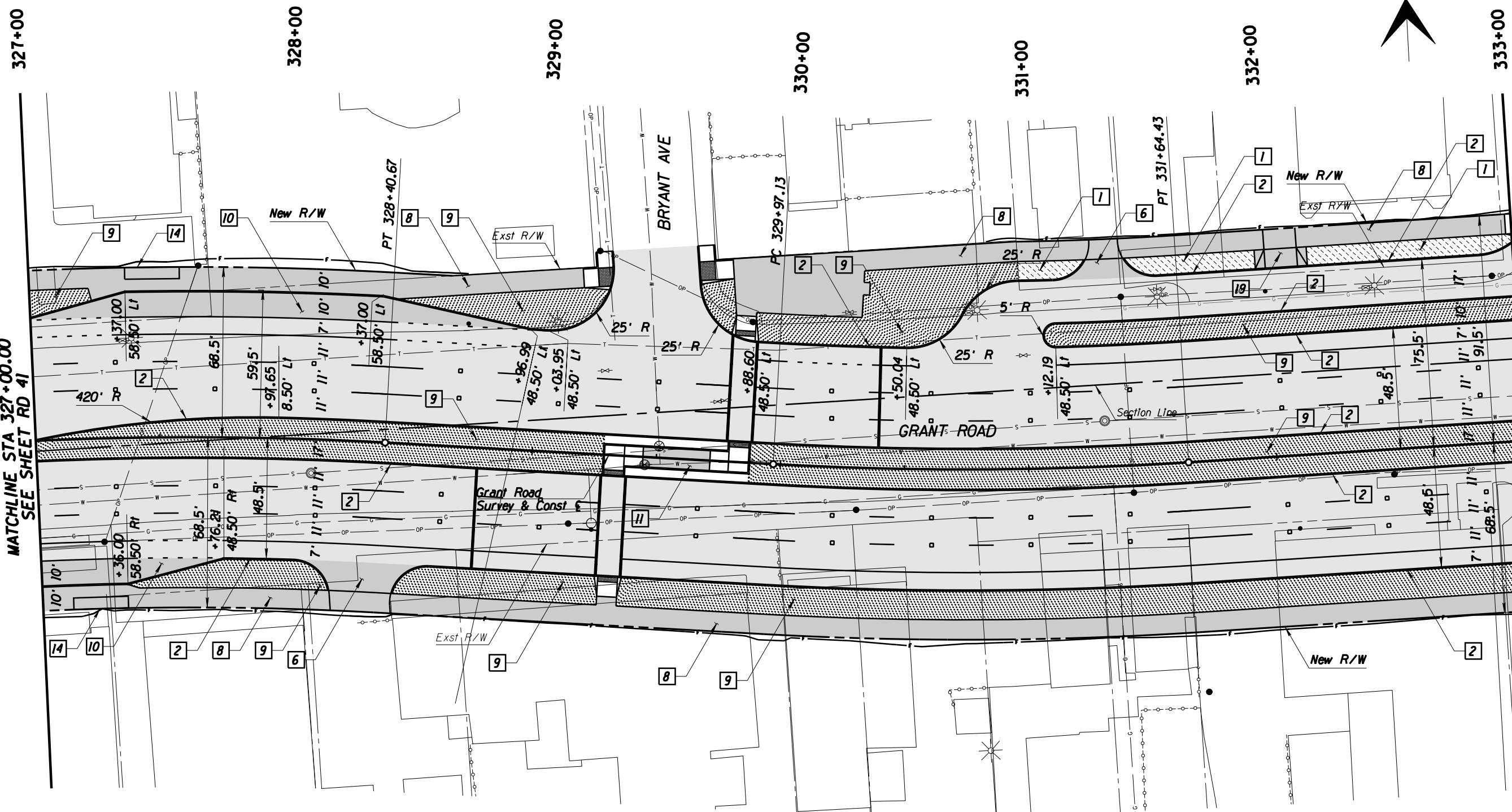
GRANT ROAD
PLAN SHEET
STA 321+00 TO STA 327+00

CITY OF TUCSON	DSGN. BY <i>RL</i>	08/10	REF.	SCALE: 1"=20' H.	PC: 4 OF 362
	DRWN. BY <i>RL</i>	08/10			
	CHKD. BY <i>RL</i>	08/10	PLAN NO.		

NO.	DATE	REVISION	BY	CHKD.	APPR.



MATCHLINE STA 327+00.00
SEE SHEET RD 41



MATCHLINE STA 333+00.00
SEE SHEET RD 43

Legend

AC Pvmf	
PCC Pvmf/Swik	
Landscaping	
Water Harvesting	

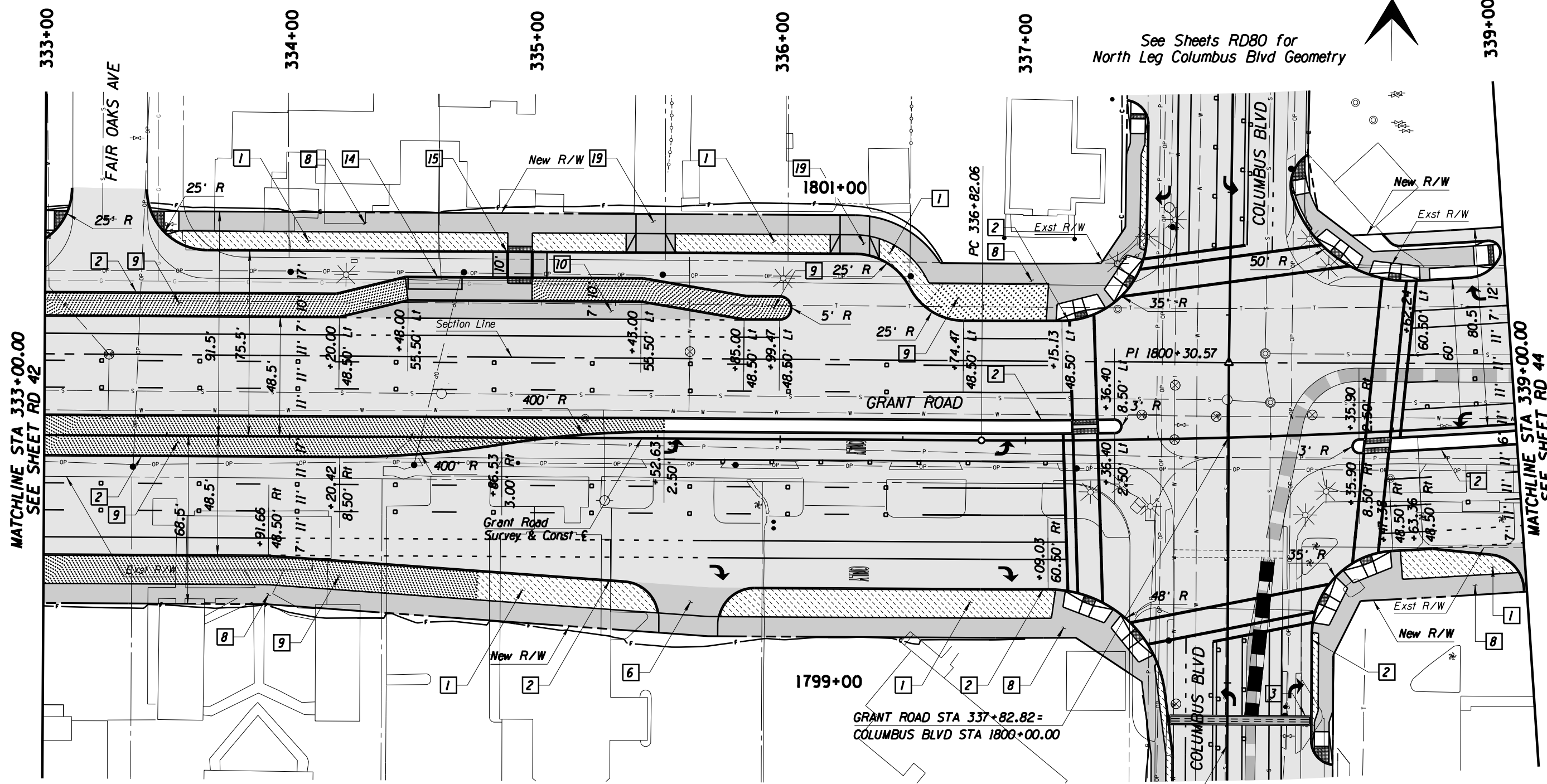


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	GRANT ROAD PLAN SHEET STA 327+00 TO STA 333+00		
	DSN. BY <i>[Signature]</i> 08/10 DRWN. BY <i>[Signature]</i> 08/10 CHKD. BY <i>[Signature]</i> 08/10	REF. _____ SCALE: 1"=20' H PLAN NO. _____	
NO. DATE REVISION BY CHKD. APPR.			



See Sheets RD80 for North Leg Columbus Blvd Geometry



MATCHLINE STA 333+00.00
SEE SHEET RD 42

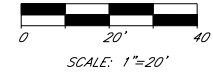
MATCHLINE STA 339+00.00
SEE SHEET RD 44

GRANT ROAD STA 337+82.82 =
COLUMBUS BLVD STA 1800+00.00

See Sheets RD79-80 for South Leg Columbus Blvd Geometry

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



SCALE: 1"=20'



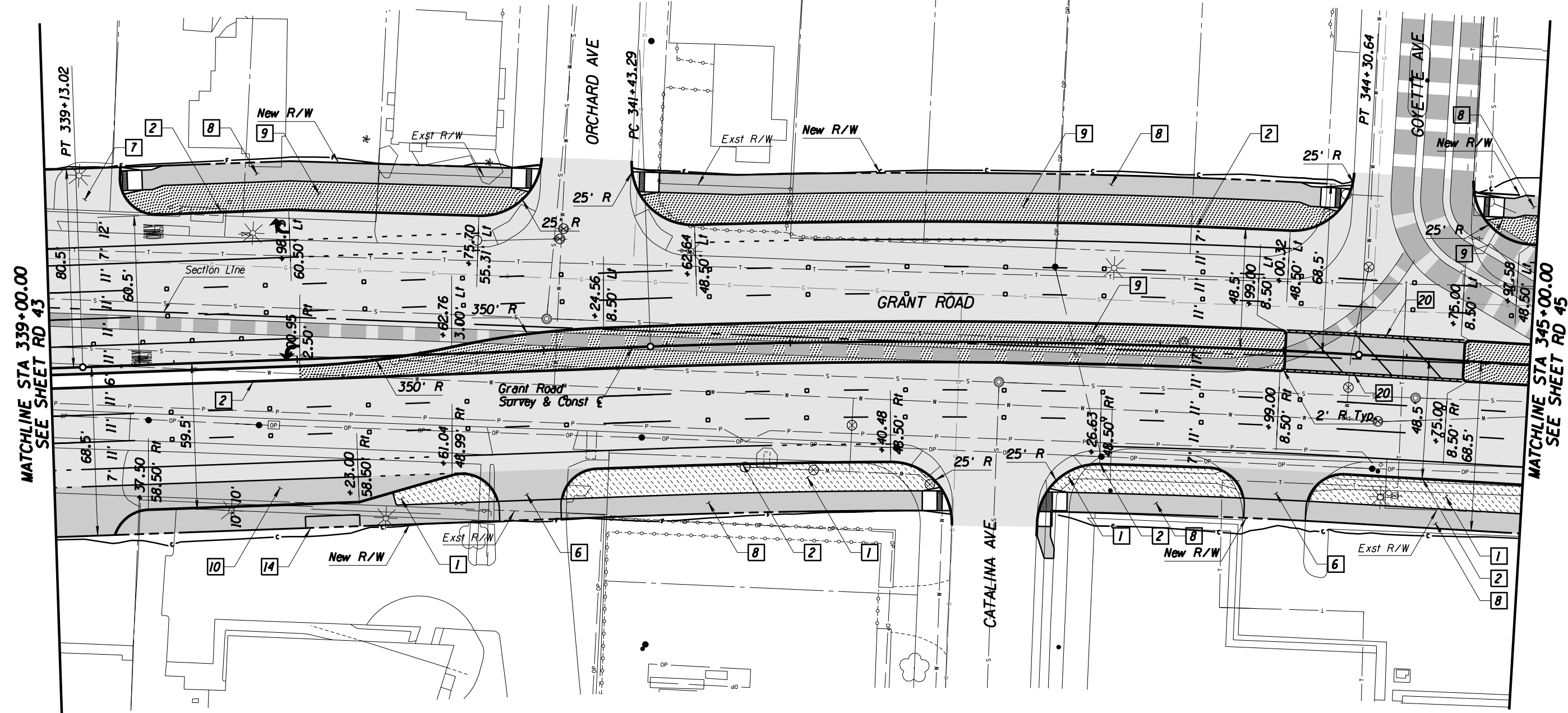
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 333+00 TO STA 339+00		2014
CITY OF TUCSON	DSGN. BY <i>ll</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>ll</i>	08/10		
	CHKD. BY <i>ll</i>	08/10	PLAN NO.	362

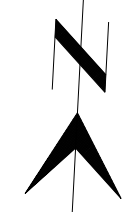
NO.	DATE	REVISION	BY	CHKD.	APPR.

339+00 340+00 341+00 342+00 343+00 344+00 345+00

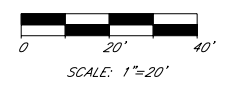


MATCHLINE STA 339+00.00
SEE SHEET RD 43

MATCHLINE STA 345+00.00
SEE SHEET RD 45



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting



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GRANT ROAD
PLAN SHEET
STA 339+00 TO STA 345+00

CITY OF TUCSON	DSGN. BY <i>Al. [Signature]</i>	08/10	REF.	SCALE: 1"=20' H.	362 OF 362
	DRWN. BY <i>Al. [Signature]</i>	08/10			
	CHKD. BY <i>Al. [Signature]</i>	08/10	PLAN NO.		

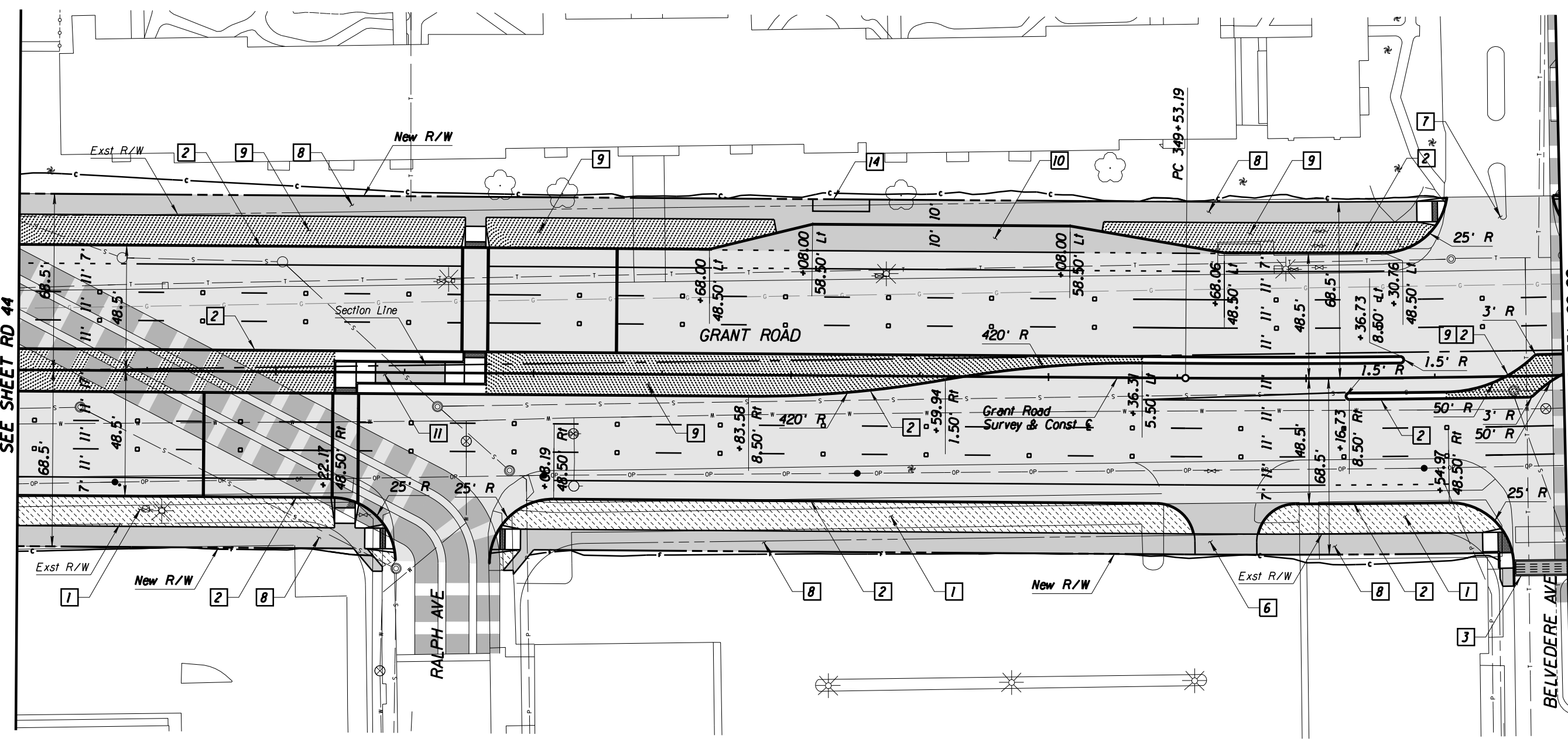
NO.	DATE	REVISION	BY	CHKD.	APPR.



345+00 346+00 347+00 348+00 349+00 350+00 351+00

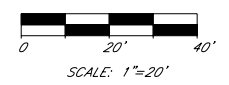
MATCHLINE STA 345+00.00
SEE SHEET RD 44

MATCHLINE STA 351+00.00
SEE SHEET RD 46



Legend

- AC Pvmt
- PCC Pvmt/Swik
- Landscaping
- Water Harvesting



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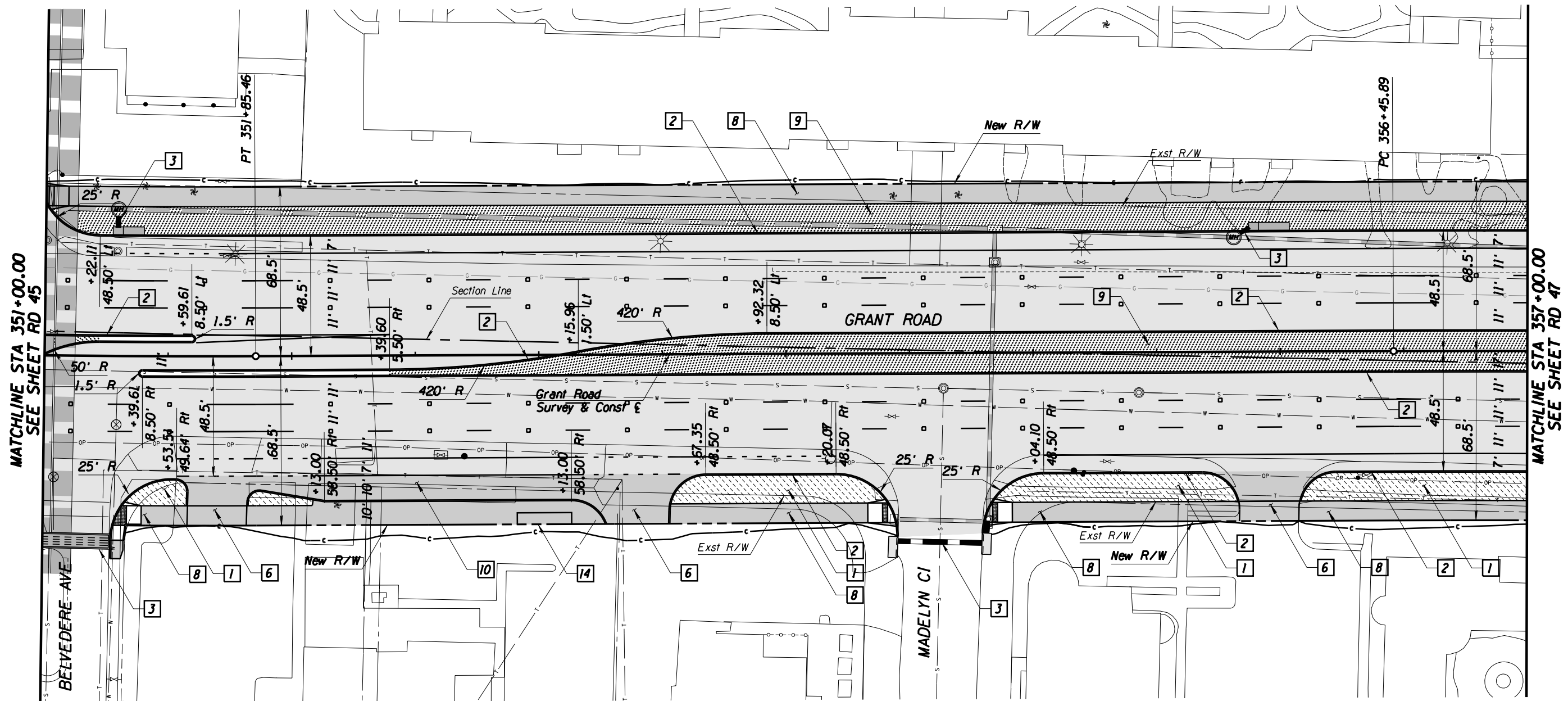
PRELIMINARY
30%
NOT FOR
CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION			
GRANT ROAD			
PLAN SHEET			
STA 345+00 to STA 351+00			
	DSGN. BY <i>ll</i>	08/10	REF. _____
	DRWN. BY <i>ll</i>	08/10	SCALE: 1"=20' H.
	CHKD. BY <i>ll</i>	08/10	PLAN NO. _____
			2043 OF 2053 57 OF 362

NO.	DATE	REVISION	BY	CHKD.	APPR.



351+00 352+00 353+00 354+00 355+00 356+00 357+00



MATCHLINE STA 351+00.00
SEE SHEET RD 45

MATCHLINE STA 357+00.00
SEE SHEET RD 47

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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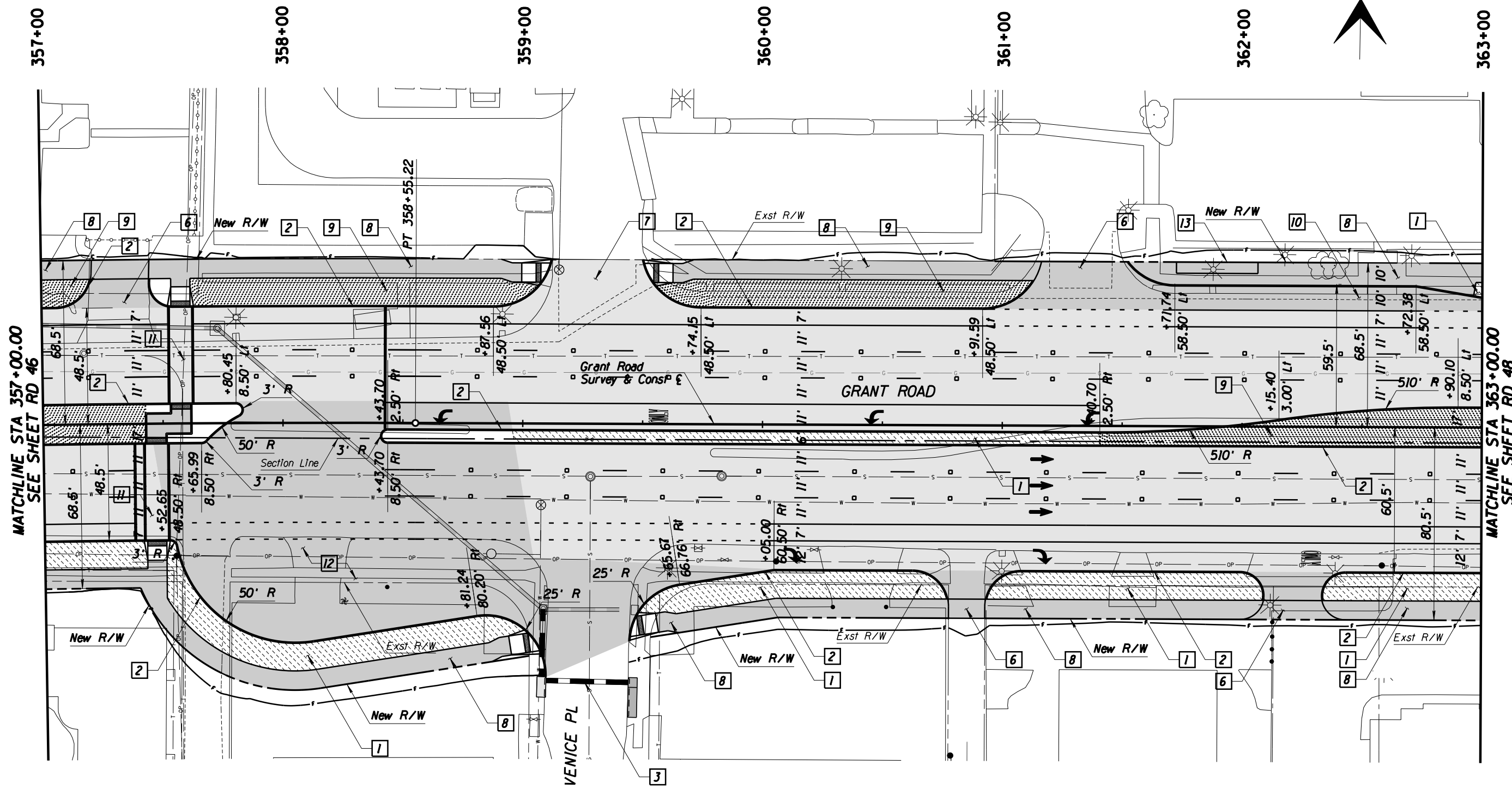
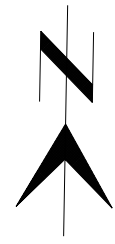
GRANT ROAD
PLAN SHEET
STA 351+00 TO STA 357+00



DESIGN BY: *[Signature]* 08/10 REF: _____ SCALE: 1"=20' H
DRAWN BY: *[Signature]* 08/10
CHKD BY: *[Signature]* 08/10 PLAN NO. _____

NO.	DATE	REVISION	BY	CHKD.	APPR.

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OF
362



MATCHLINE STA 357+00.00
SEE SHEET RD 46

MATCHLINE STA 363+00.00
SEE SHEET RD 48

Legend

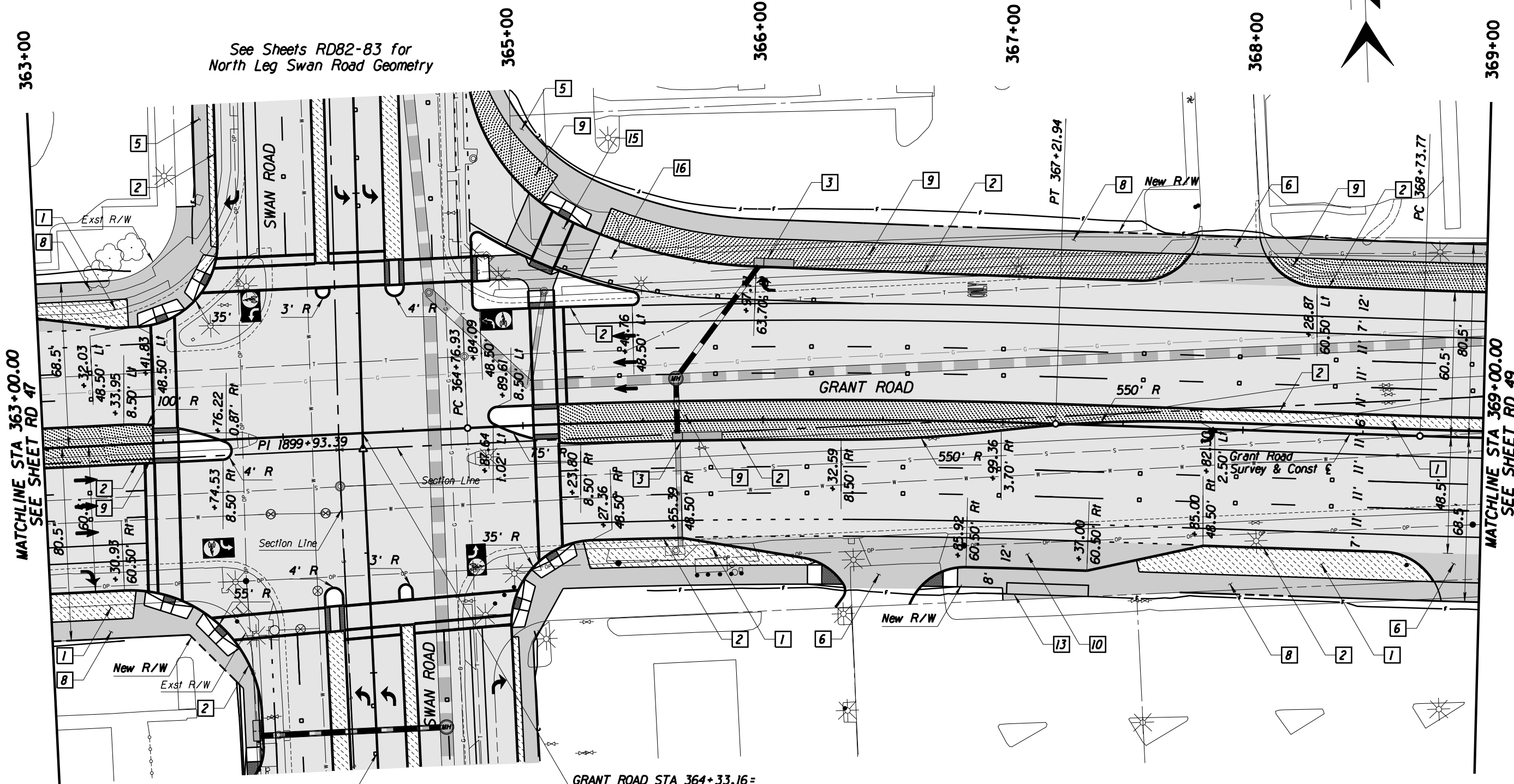
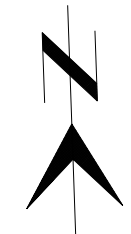
- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

0 20' 40'
SCALE: 1"=20'

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	GRANT ROAD PLAN SHEET STA 357+00 TO STA 363+00		
	DESIGNED BY: <i>[Signature]</i> 08/10 DRAWN BY: <i>[Signature]</i> 08/10 CHECKED BY: <i>[Signature]</i> 08/10	SCALE: 1"=20' H. PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



See Sheets RD82-83 for North Leg Swan Road Geometry

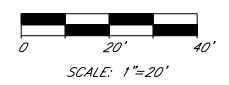
See Sheets RD81-82 for South Leg Swan Road Geometry

GRANT ROAD STA 364+33.16 = SWAN ROAD STA 1900+00.00

MATCHLINE STA 363+00.00 SEE SHEET RD 47

MATCHLINE STA 369+00.00 SEE SHEET RD 49

- Legend**
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 - Water Harvesting



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GRANT ROAD
PLAN SHEET
STA 363+00 TO STA 369+00



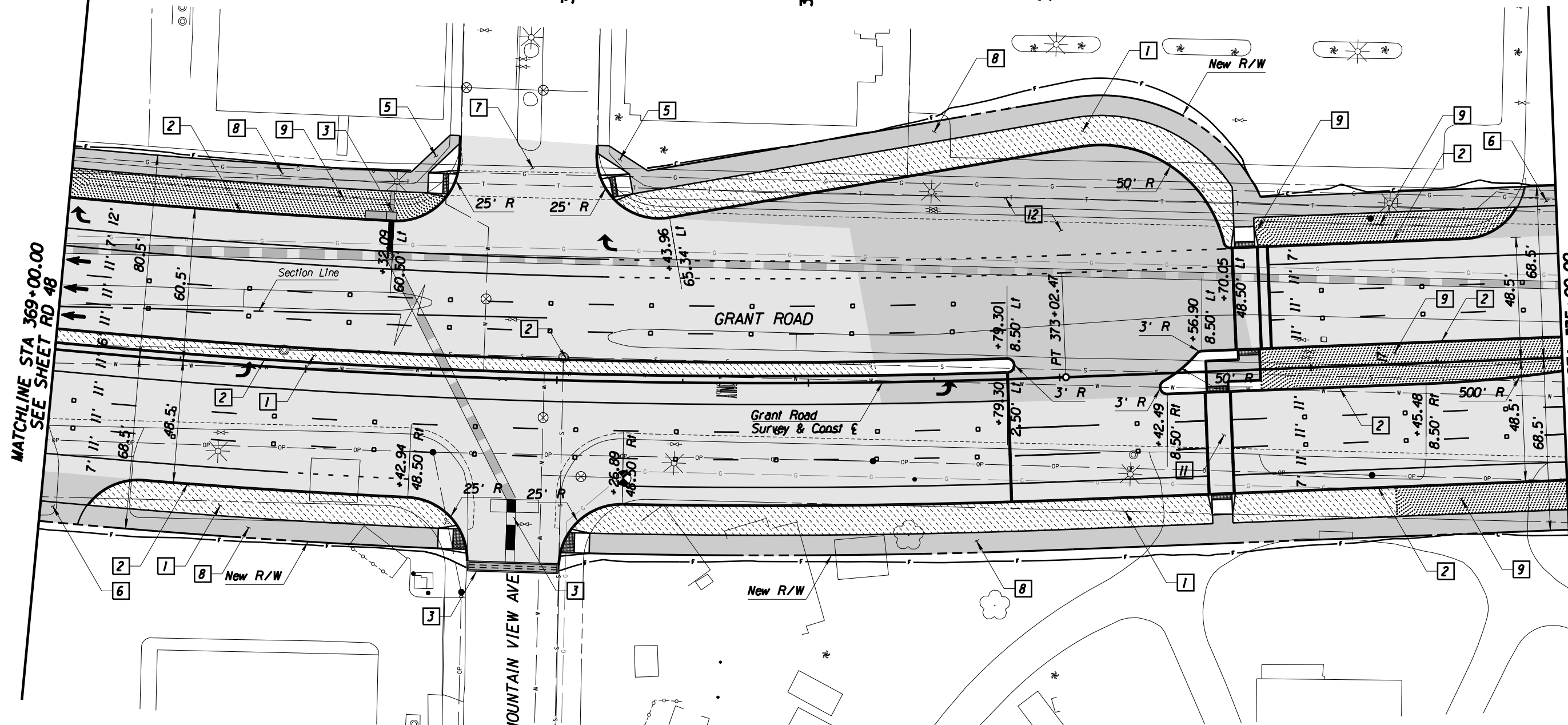
DSGN. BY <i>bl</i>	08/10	REF.	SCALE: 1"=20' H.
DRWN. BY <i>bl</i>	08/10		
CHKD. BY <i>bl</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

24 OF 362



369+00 370+00 371+00 372+00 373+00 374+00 375+00

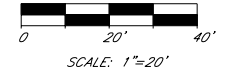


MATCHLINE STA 369+00.00
SEE SHEET RD 48

MATCHLINE STA 375+00.00
SEE SHEET RD 50

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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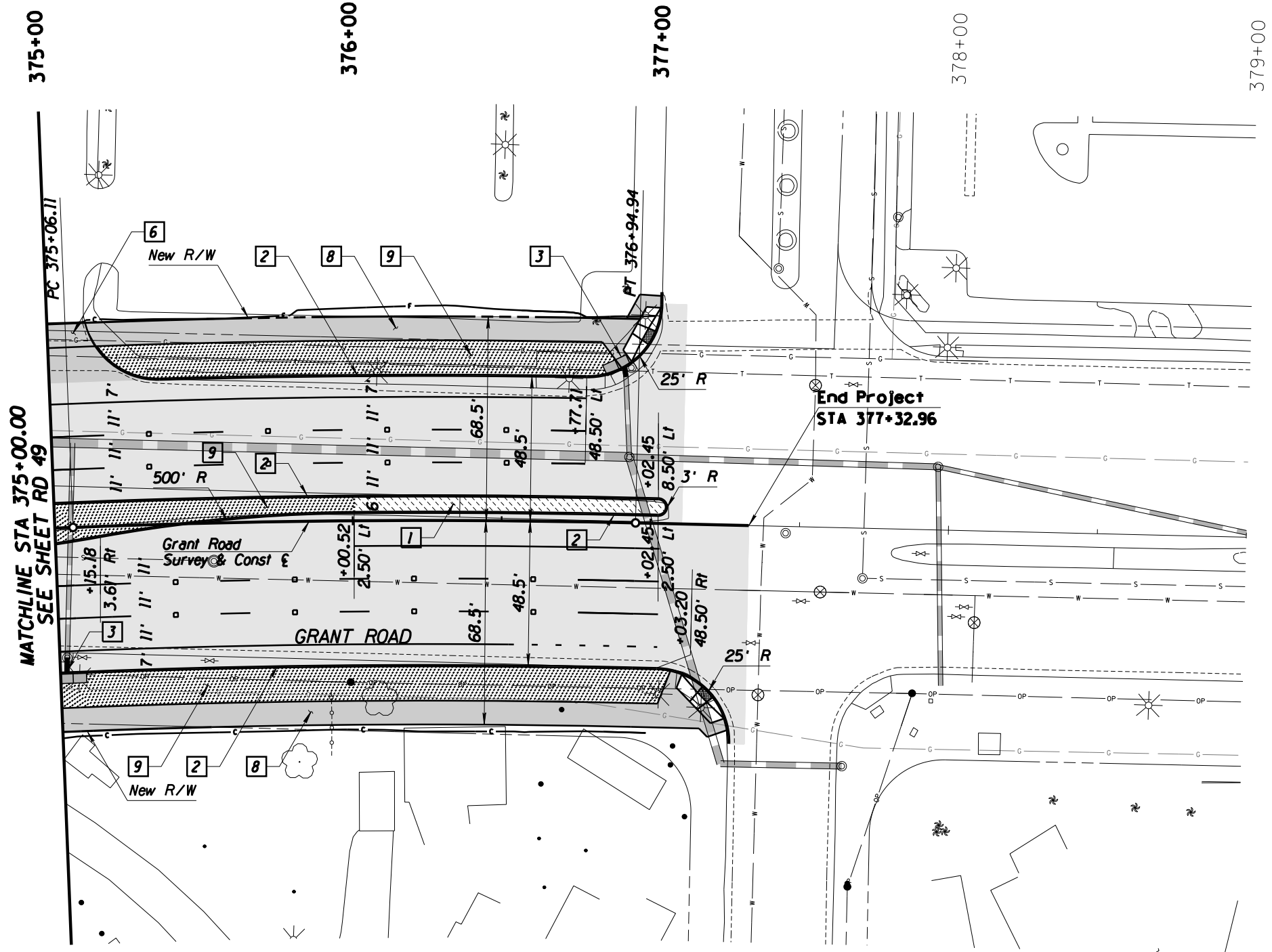
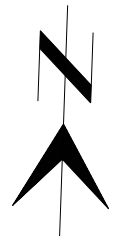
PRELIMINARY
30%
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CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

GRANT ROAD
PLAN SHEET
STA 369+00 TO STA 375+00



DESIGN BY: <i>[Signature]</i>	08/10	REF.	SCALE: 1"=20' H.	7042
DRAWN BY: <i>[Signature]</i>	08/10			OF
CHKD. BY: <i>[Signature]</i>	08/10	PLAN NO.		362



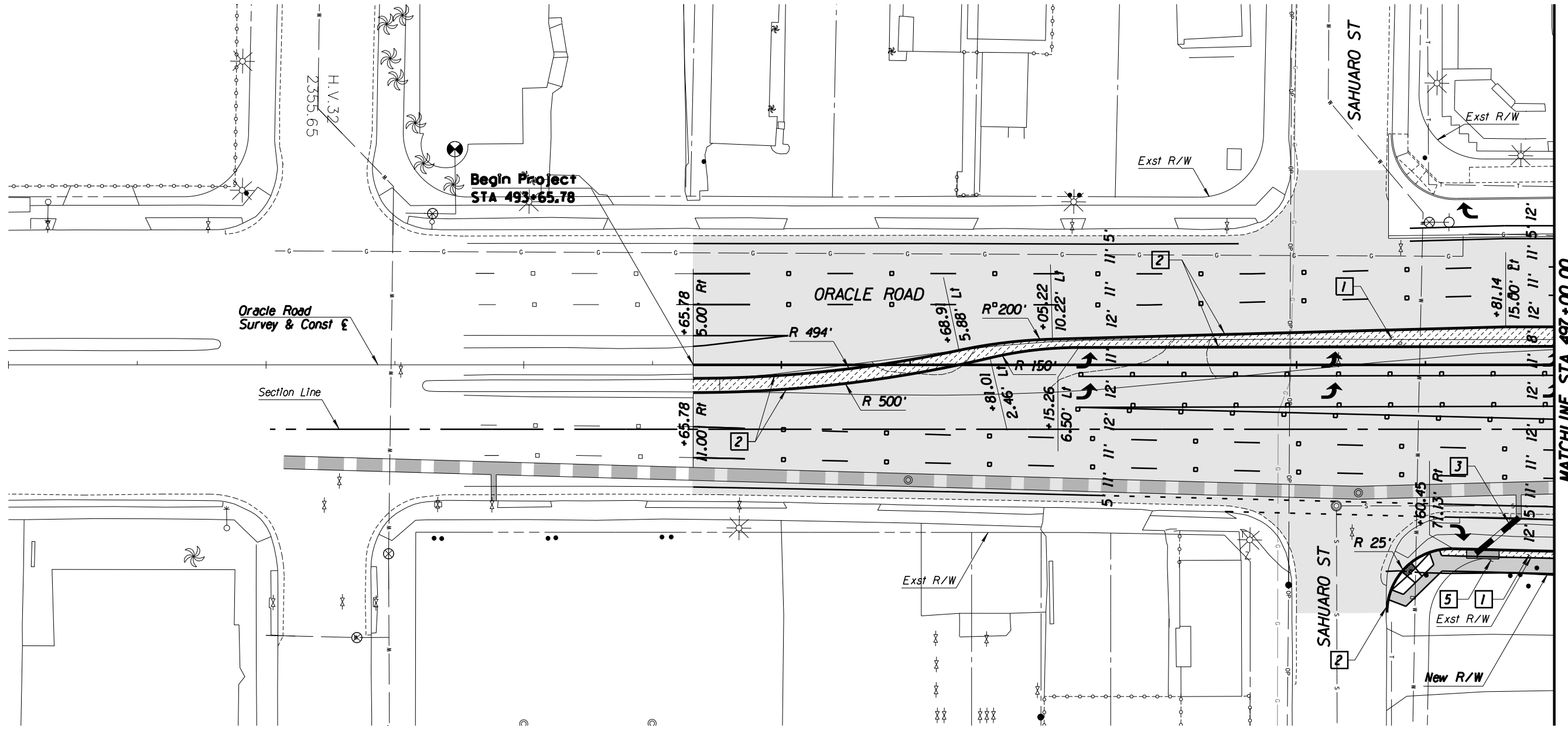
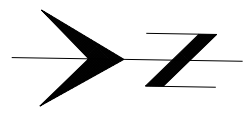
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		GRANT ROAD PLAN SHEET STA 375+00 to STA 379+00		1 OF 3
CITY OF TUCSON	DSGN. BY <i>al. [signature]</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>al. [signature]</i>	08/10		
	CHKD. BY <i>al. [signature]</i>	08/10	PLAN NO.	362

NO.	DATE	REVISION	BY	CHKD.	APPR.

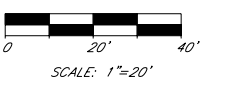
491+00 492+00 493+00 494+00 495+00 496+00 497+00



MATCHLINE STA 497+00.00
SEE SHEET RD 52

Legend

- AC Pvmf [hatched box]
- PCC Pvmf/Swik [dotted box]
- Landscaping [diagonal lines box]
- Water Harvesting [cross-hatched box]



SCALE: 1"=20'

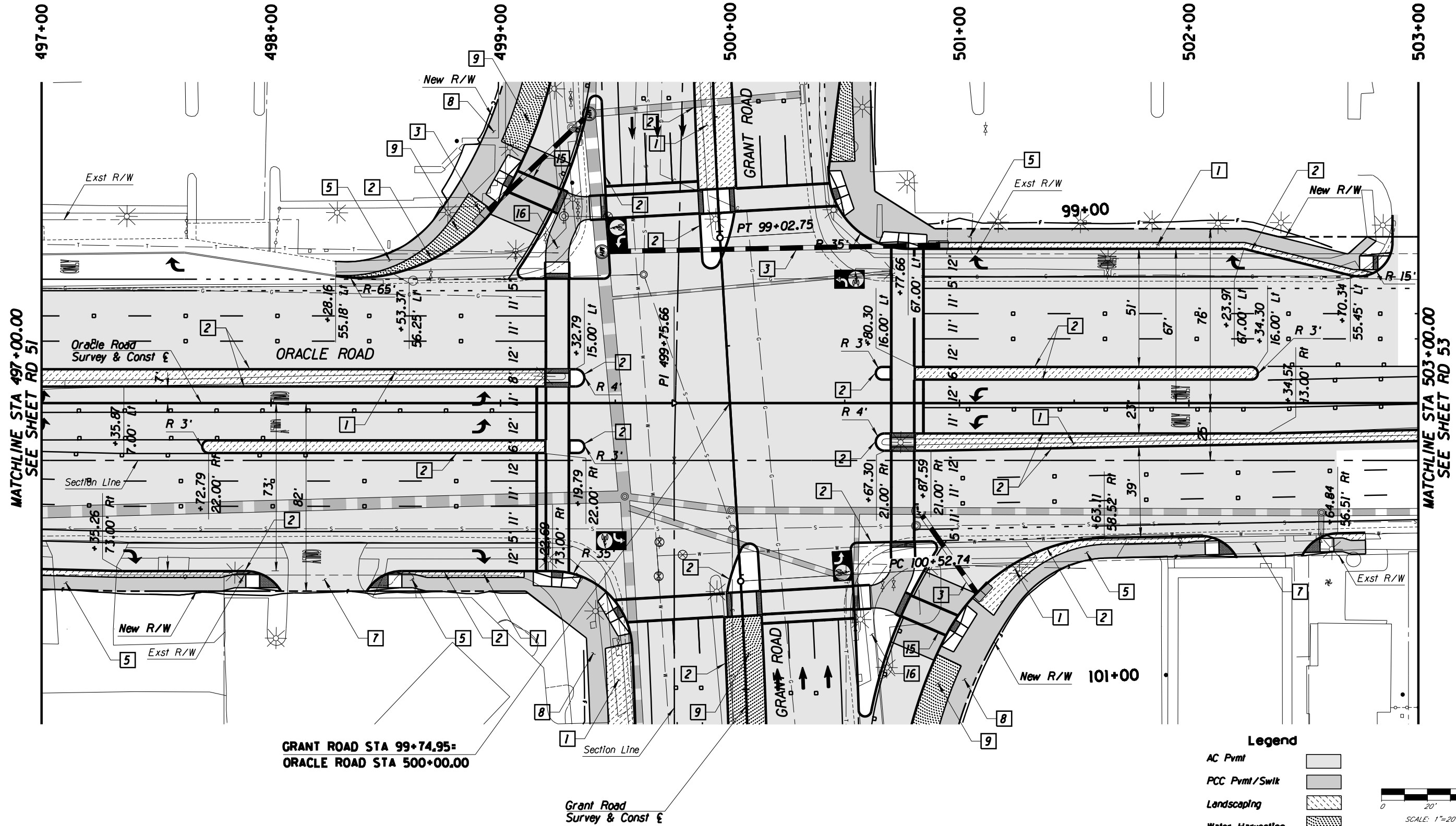
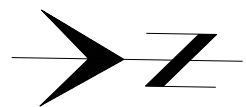


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION			ORACLE ROAD PLAN SHEET STA 491+00 TO STA 497+00		REF. _____ SCALE: 1"=20' H PLAN NO. _____
DSGN. BY <i>bl haggins</i>	08/10			DRWN. BY <i>bl haggins</i>	
CHKD. BY <i>bl haggins</i>	08/10	NO. _____		DATE _____	REVISION _____
		BY _____		CHKD. _____	APPR. _____

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OF
362

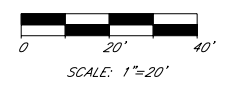


MATCHLINE STA 497+00.00
SEE SHEET RD 51

MATCHLINE STA 503+00.00
SEE SHEET RD 53

GRANT ROAD STA 99+74.95=
ORACLE ROAD STA 500+00.00

- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

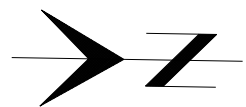


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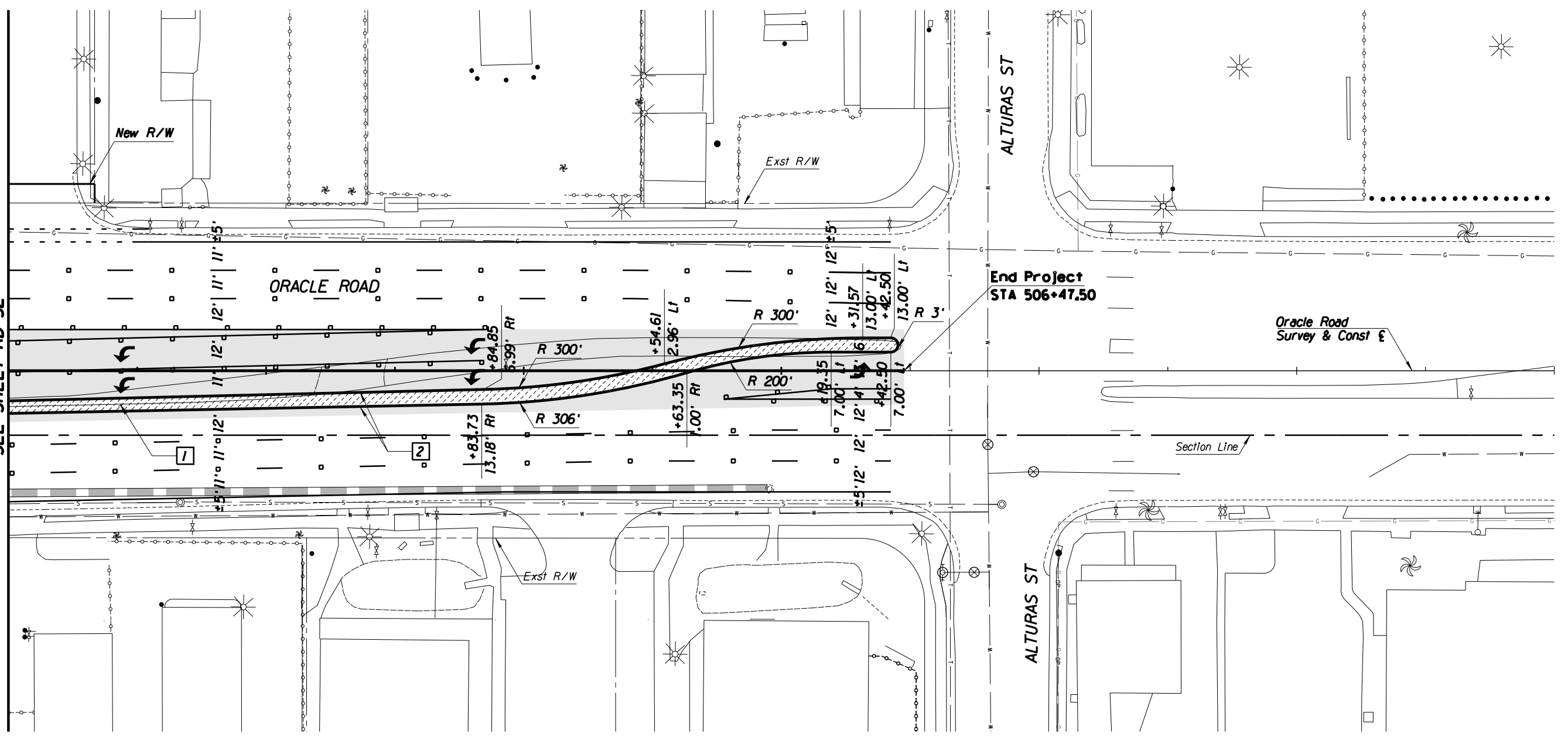
DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		ORACLE ROAD PLAN SHEET STA 497+00 TO STA 503+00		2010
CITY OF TUCSON	DSGN. BY <i>W. Huggins</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>W. Huggins</i>	08/10		OF 362
	CHKD. BY <i>R. Switz</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



503+00 504+00 505+00 506+00 507+00 508+00 509+00

MATCHLINE STA 503+00.00
SEE SHEET RD 52



Oracle Road
Survey & Const E

End Project
STA 506+47.50

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



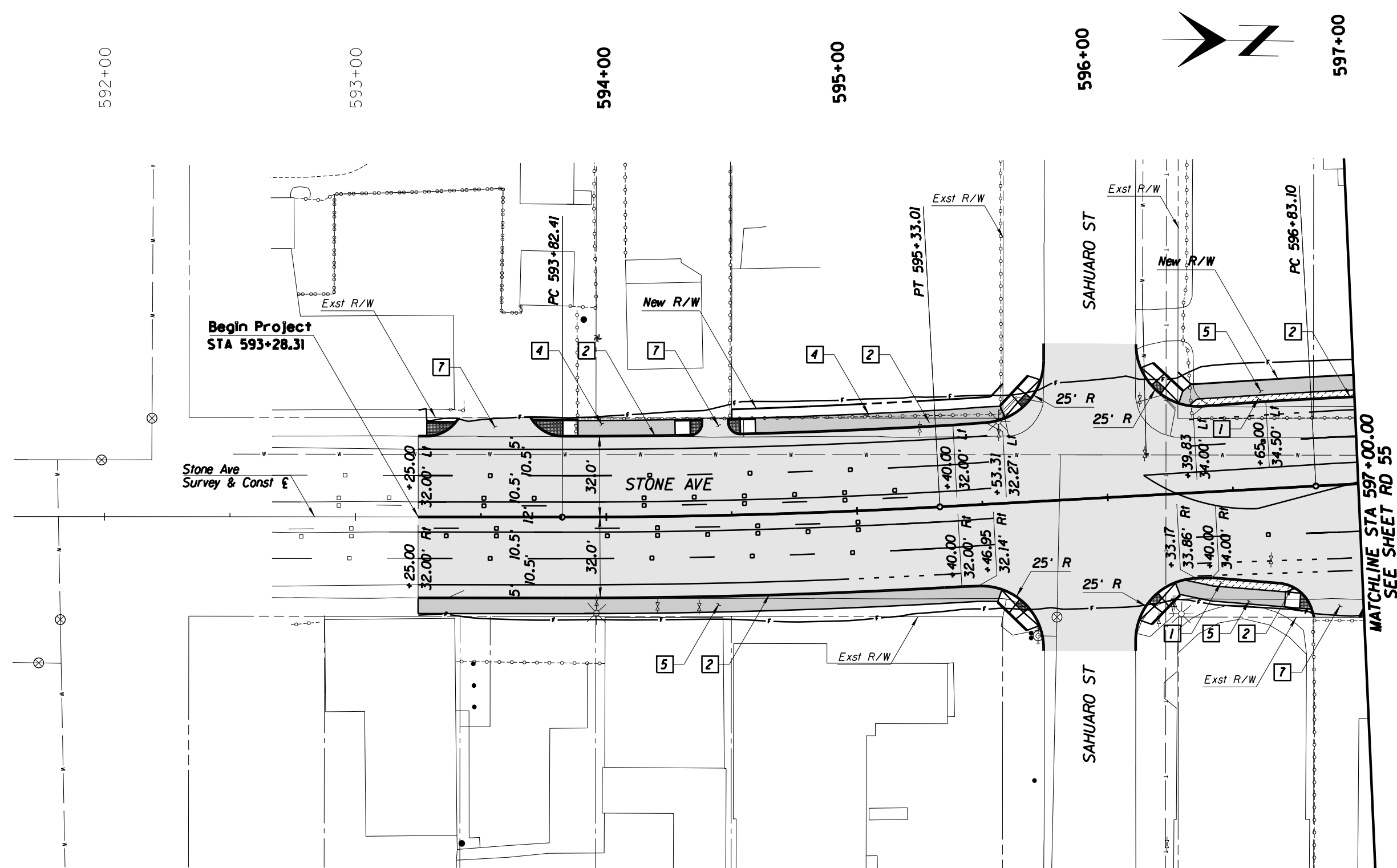
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		ORACLE ROAD PLAN SHEET STA 503+00 to STA 509+00		OF 362
	DSGN. BY <i>bl. hupperts</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>bl. hupperts</i>	08/10		
	CHKD. BY <i>bl. hupperts</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



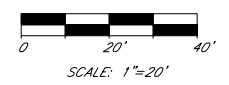
Begin Project
STA 593+28.31

Stone Ave
Survey & Const E

MATCHLINE STA 597+00.00
SEE SHEET RD 55

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		SCALE: 1"=20' H.	
STONE AVE PLAN SHEET STA 592+02 TO STA 597+00		DSGN. BY <i>R. Swick</i>	08/10
CITY OF TUCSON		DRWN. BY <i>R. Swick</i>	08/10
		CHKD. BY <i>R. Swick</i>	08/10
PLAN NO.		362	

NO.	DATE	REVISION	BY	CHKD.	APPR.

597+00

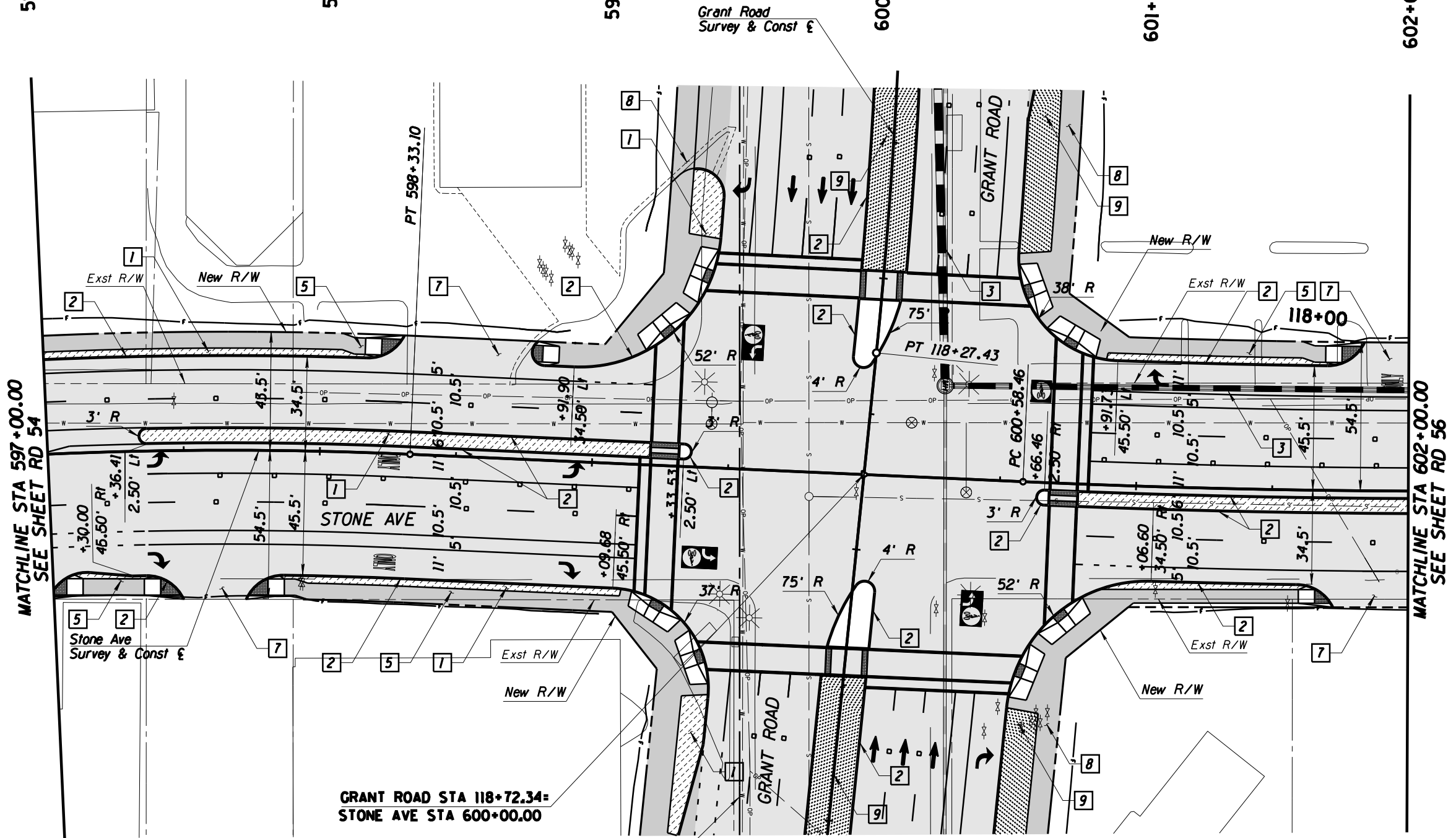
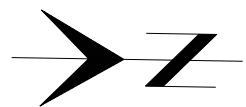
598+00

599+00

600+00

601+00

602+00



MATCHLINE STA 597+00.00
SEE SHEET RD 54

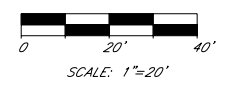
MATCHLINE STA 602+00.00
SEE SHEET RD 56

GRANT ROAD STA 118+72.34=
STONE AVE STA 600+00.00

Section Line

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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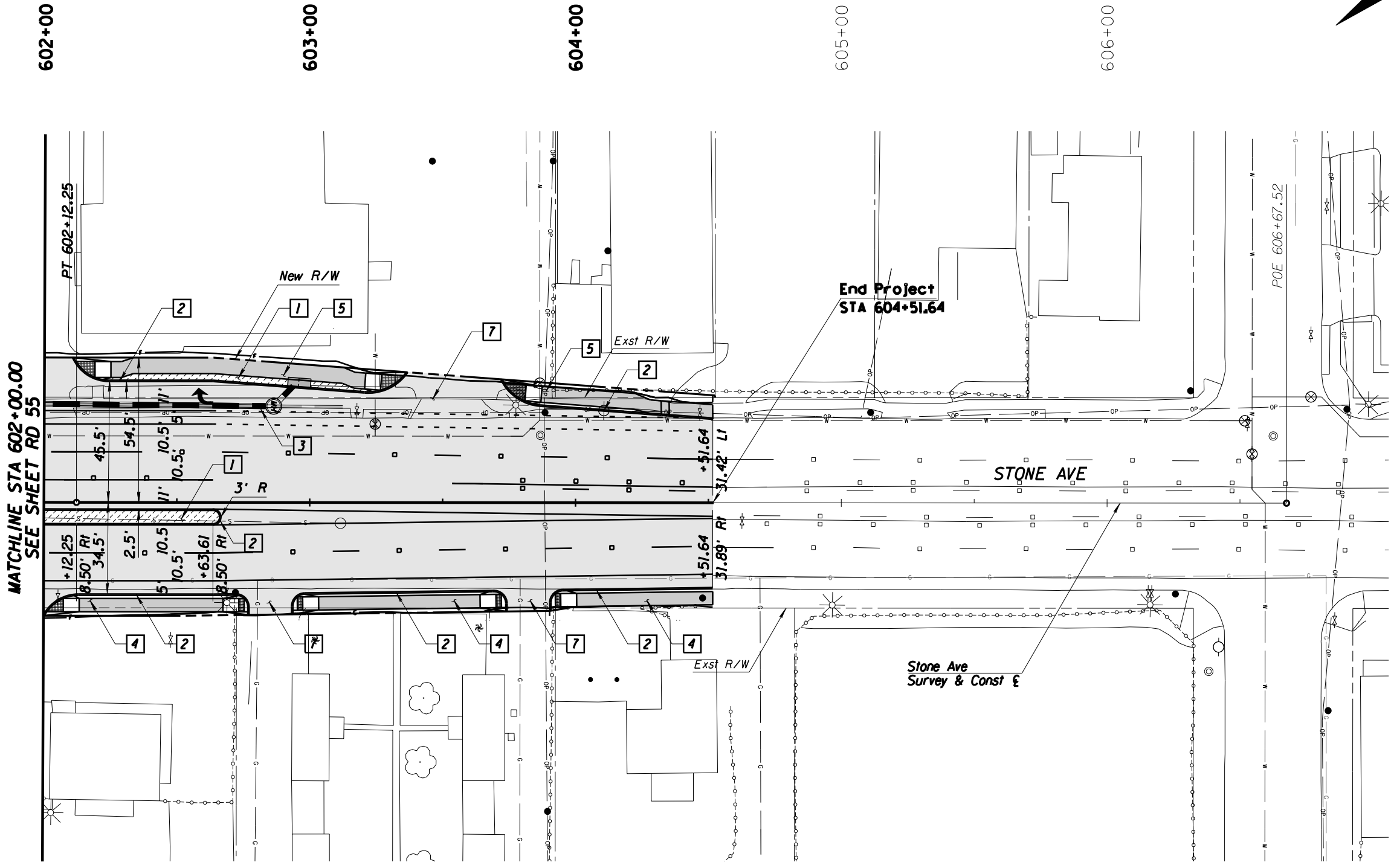
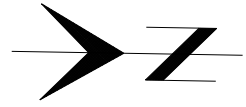
DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

STONE AVE
PLAN SHEET
STA 597+00 TO STA 602+00



DSGN. BY <i>R. Johnson</i>	08/10	REF.	SCALE: 1"=20' H.	OF 362
DRWN. BY <i>R. Swits</i>	08/10			
CHKD. BY <i>R. Swits</i>	08/10	PLAN NO.		

NO.	DATE	REVISION	BY	CHKD.	APPR.



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

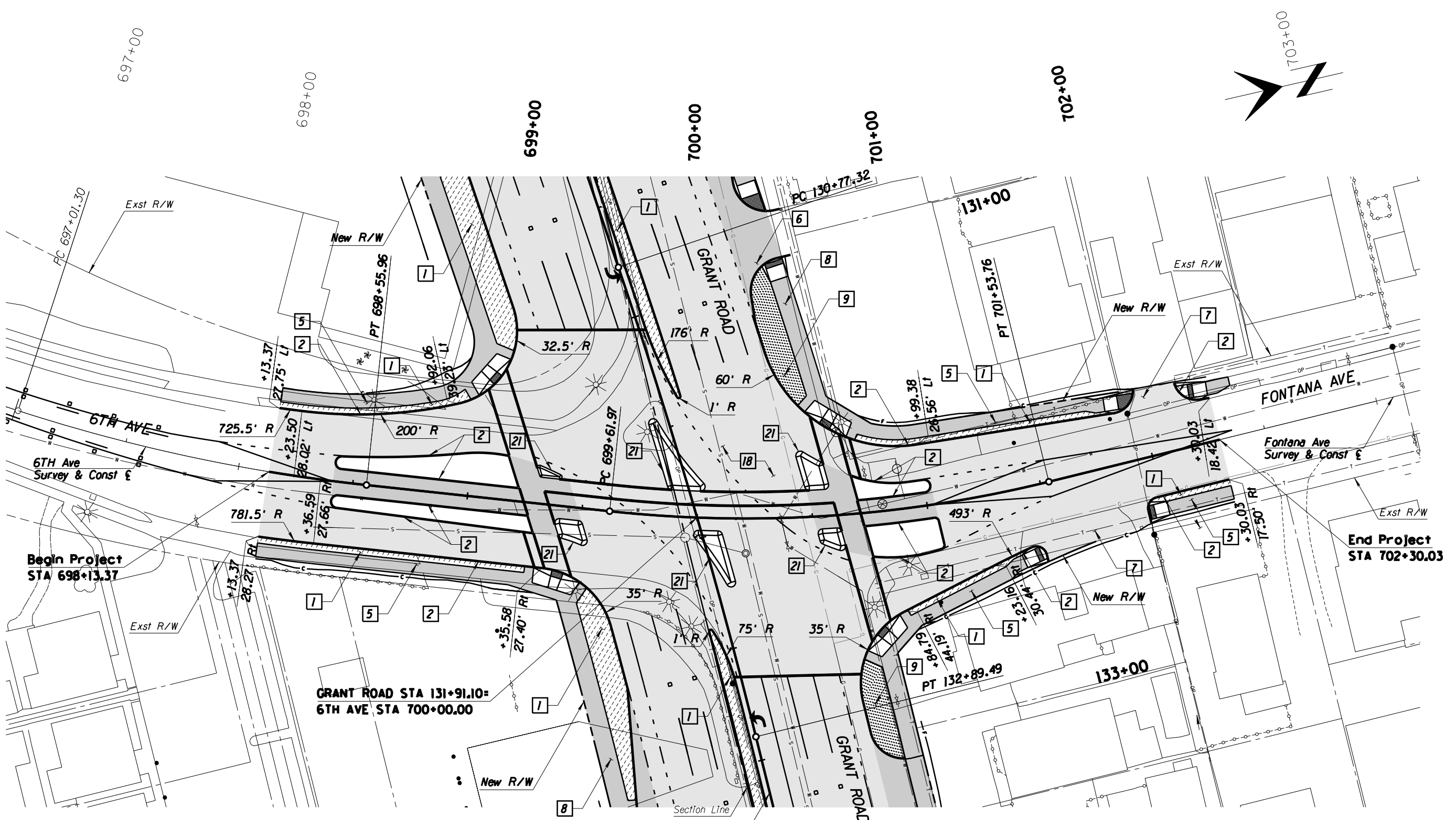


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		STONE AVE PLAN SHEET STA 602+00 TO STA 606+68		OF 362
CITY OF TUCSON	DSGN. BY <i>R. Swick</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>R. Swick</i>	08/10		
	CHKD. BY <i>R. Swick</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



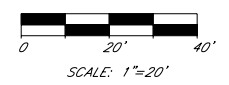
Begin Project
STA 698+13.37

GRANT ROAD STA 131+91.10=
6TH AVE STA 700+00.00

End Project
STA 702+30.03

Legend

- AC Pvmt
- PCC Pvmt/Swik
- Landscaping
- Water Harvesting



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6TH AVE-FONTANA AVE
PLAN SHEET
STA 697+00 TO STA 703+00



DSGN. BY <i>W. Hupperts</i>	08/10	REF.	SCALE: 1"=20' H.
DRWN. BY <i>W. Hupperts</i>	08/10		
CHKD. BY <i>R. Swits</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

362
OF
362

792+00

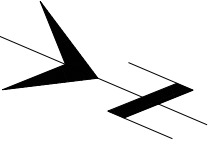
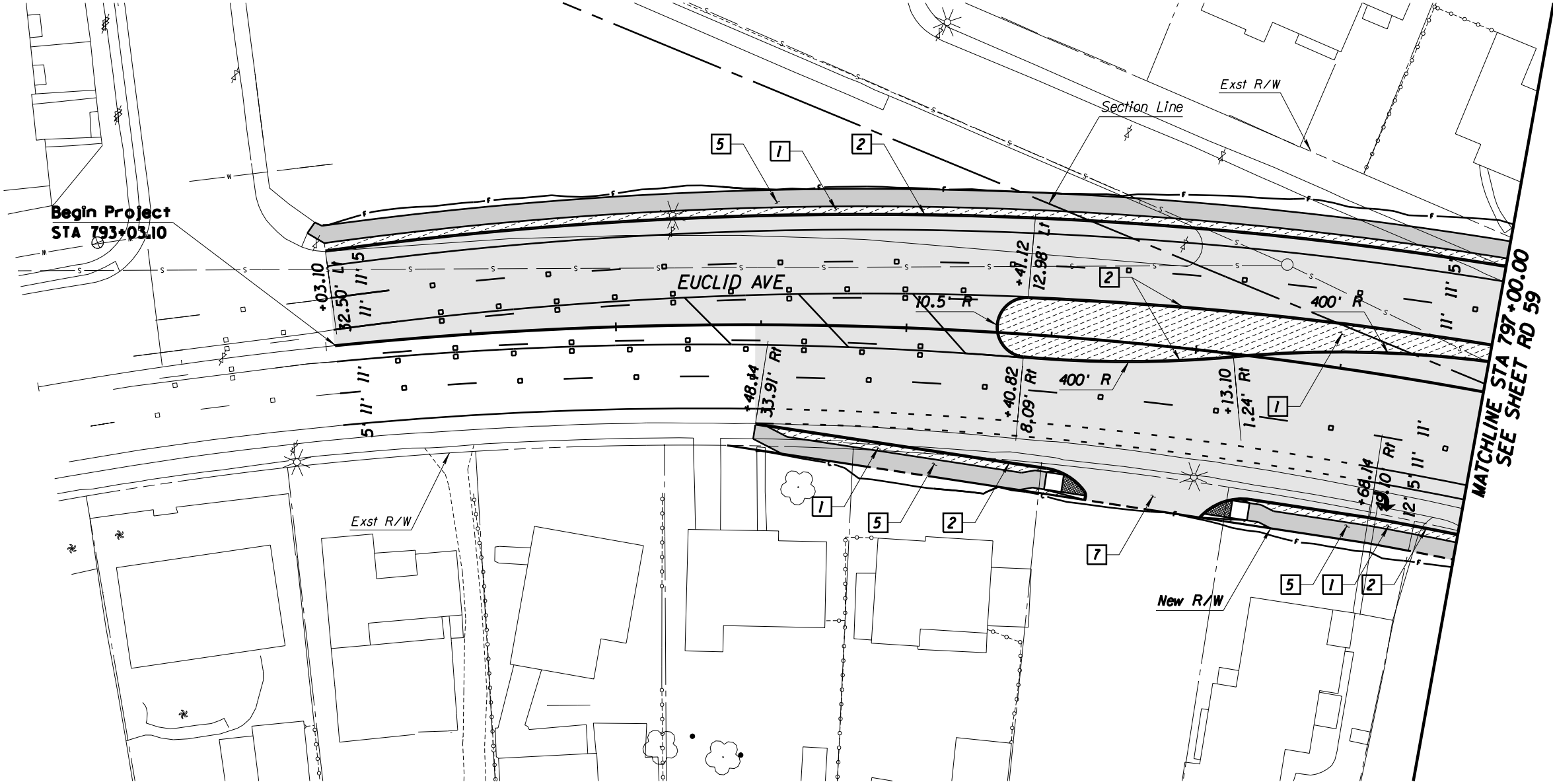
793+00

794+00

795+00

796+00

797+00



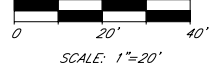
Begin Project
STA 793+03.10

EUCLID AVE

MATCHLINE STA 797+00.00
SEE SHEET RD 59

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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CITY OF TUCSON	DESIGN BY <i>[Signature]</i>	08/10	REF.	SCALE: 1"=20' H.
	DRAWN BY <i>[Signature]</i>	08/10		
	CHKD. BY <i>[Signature]</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

797+00

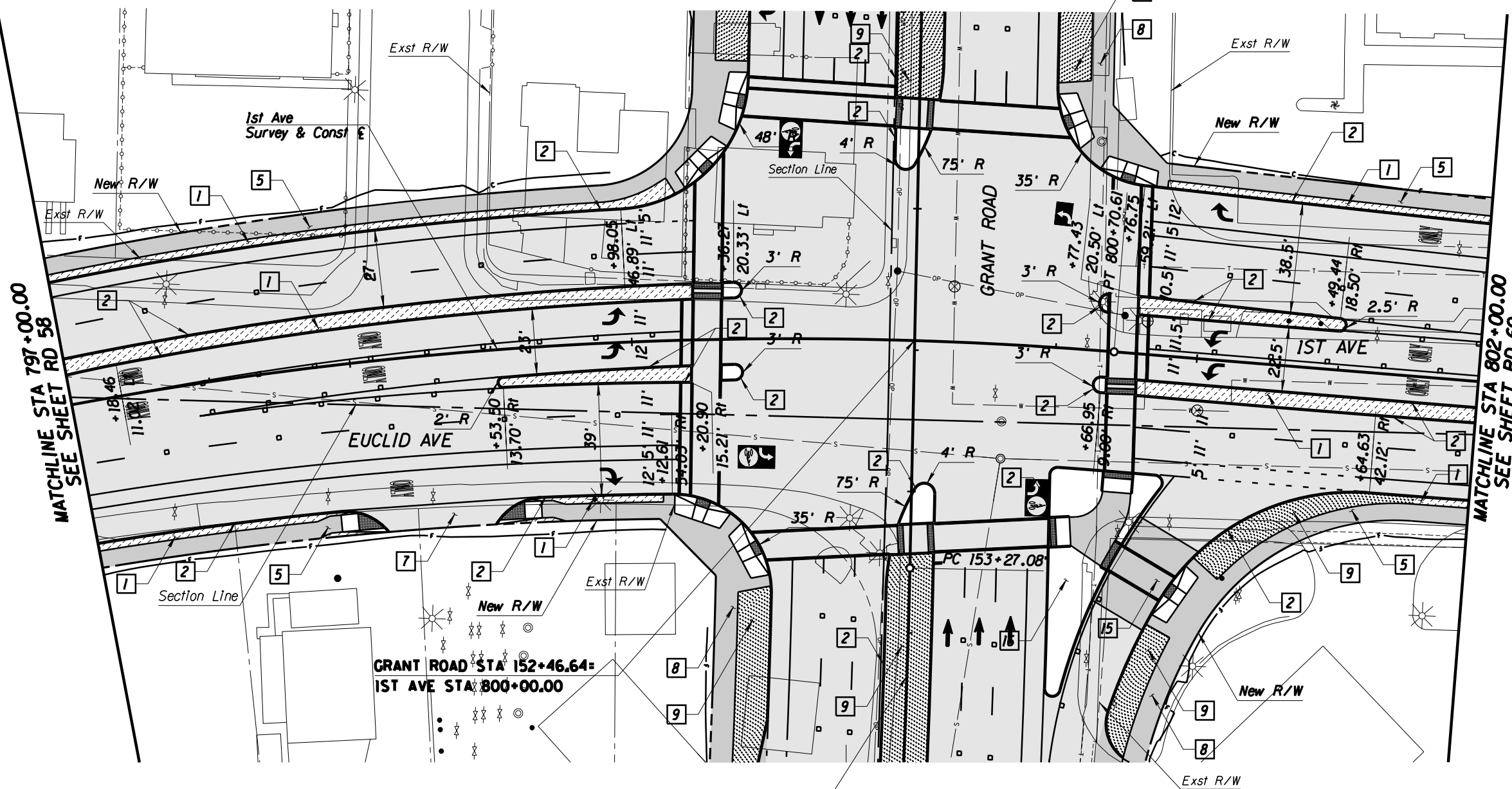
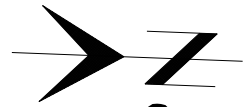
798+00

799+00

800+00

801+00

802+00



MATCHLINE STA 797+00.00
SEE SHEET RD 58

MATCHLINE STA 802+00.00
SEE SHEET RD 60

GRANT ROAD STA 152+46.64=
IST AVE STA 800+00.00

Grant Road
Survey & Const E

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



SCALE: 1"=20'

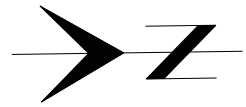


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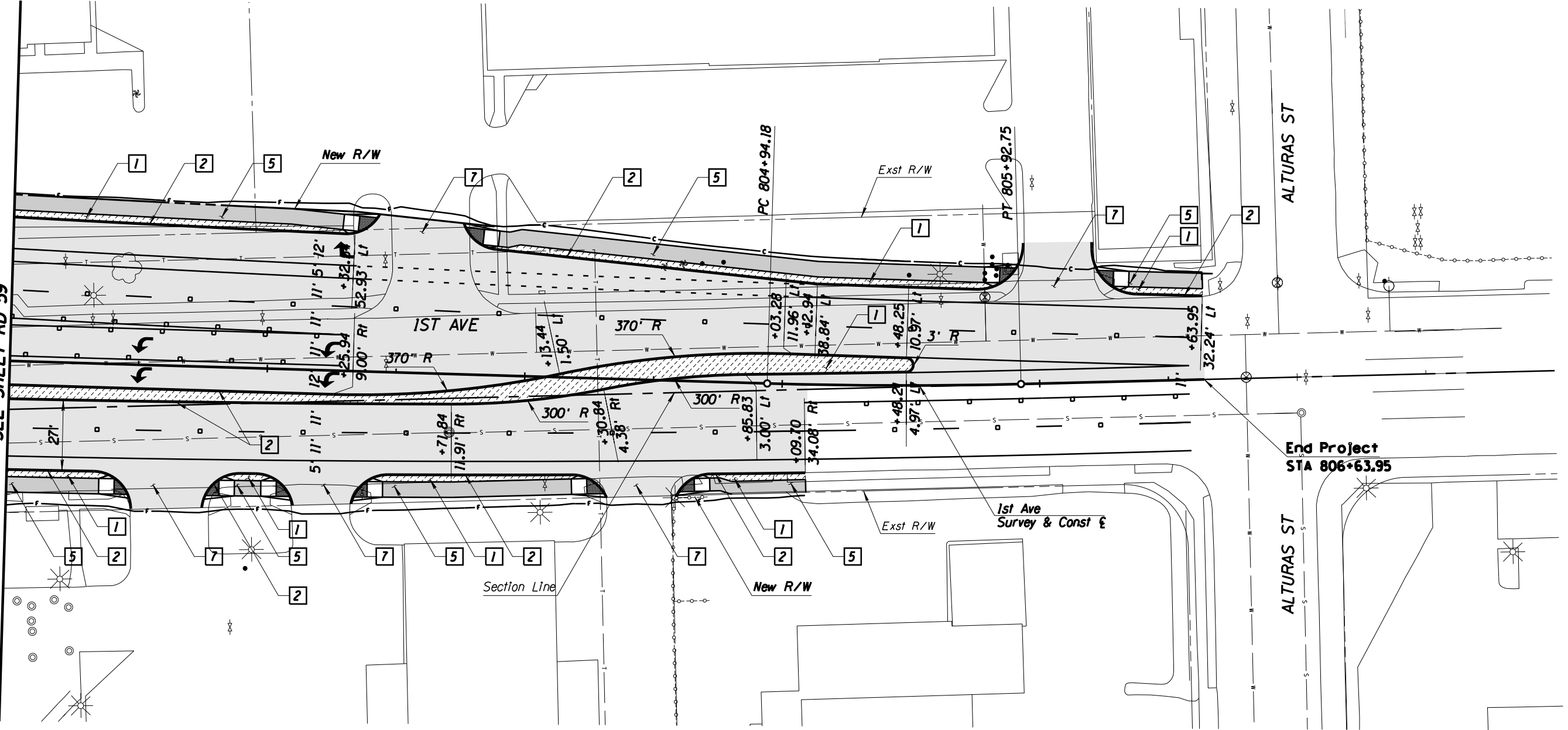
DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		EUCLID AVE/IST AVE PLAN SHEET STA 797+00 TO STA 802+00		71 OF 362
	DSGN. BY <i>[Signature]</i>	08/10	REF. _____	SCALE: 1"=20' H.
	DRWN. BY <i>[Signature]</i>	08/10	_____	_____
	CHKD. BY <i>[Signature]</i>	08/10	PLAN NO. _____	

NO.	DATE	REVISION	BY	CHKD.	APPR.



802+00 803+00 804+00 805+00 806+00 807+00 808+00

MATCHLINE STA 802+00.00
SEE SHEET RD 59



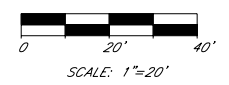
End Project
STA 806+63.95

ALTURAS ST

ALTURAS ST

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

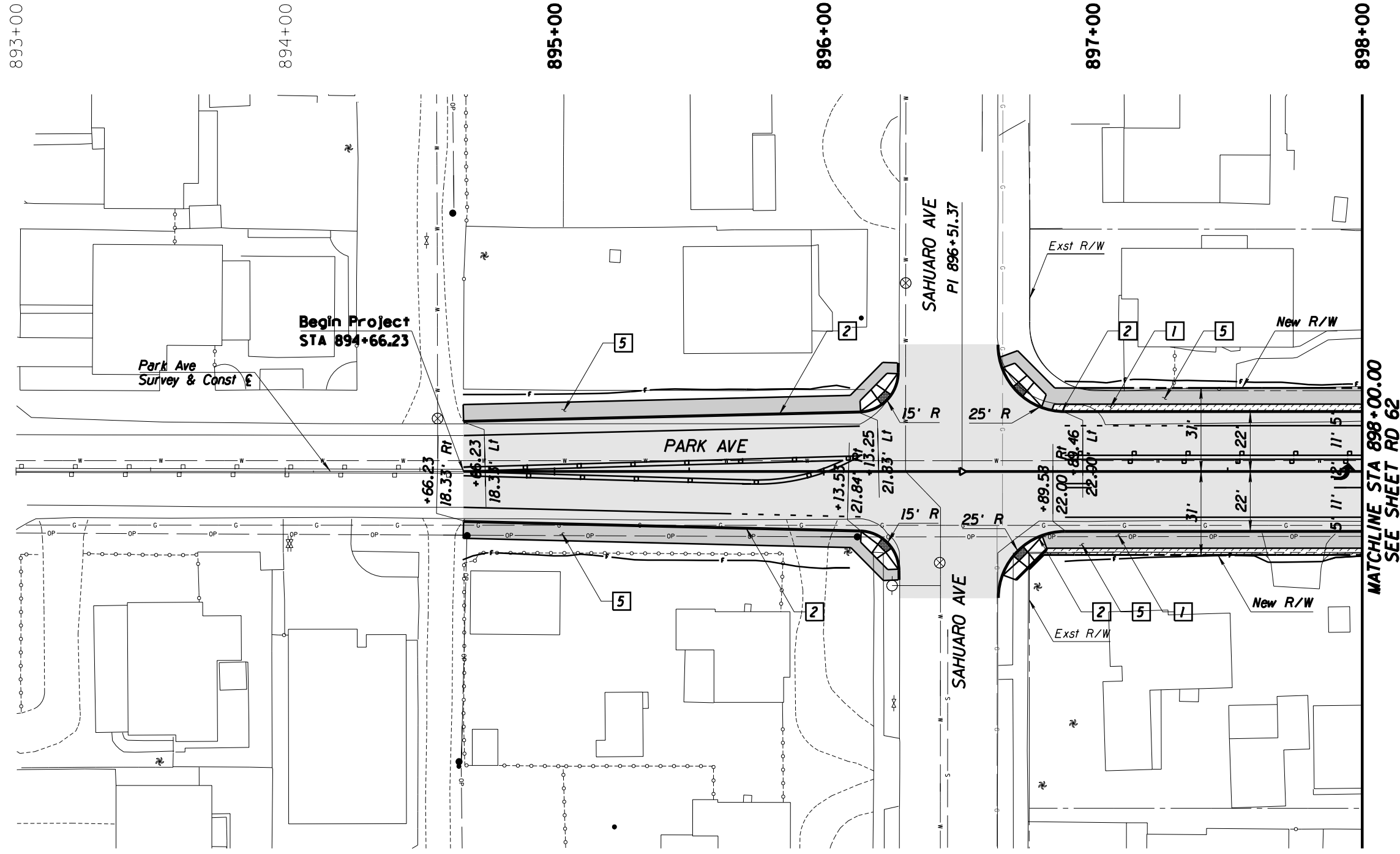
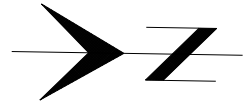


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		EUCLID AVE/1ST AVE PLAN SHEET STA 802+00 TO STA 808+00		72 OF 72
CITY OF TUCSON	DSGN. BY <i>[Signature]</i> 08/10	REF. _____	SCALE: 1"=20' H.	72 OF 362
	DRWN. BY <i>[Signature]</i> 08/10	_____	_____	
	CHKD. BY <i>[Signature]</i> 08/10	PLAN NO. _____	_____	

NO.	DATE	REVISION	BY	CHKD.	APPR.



Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

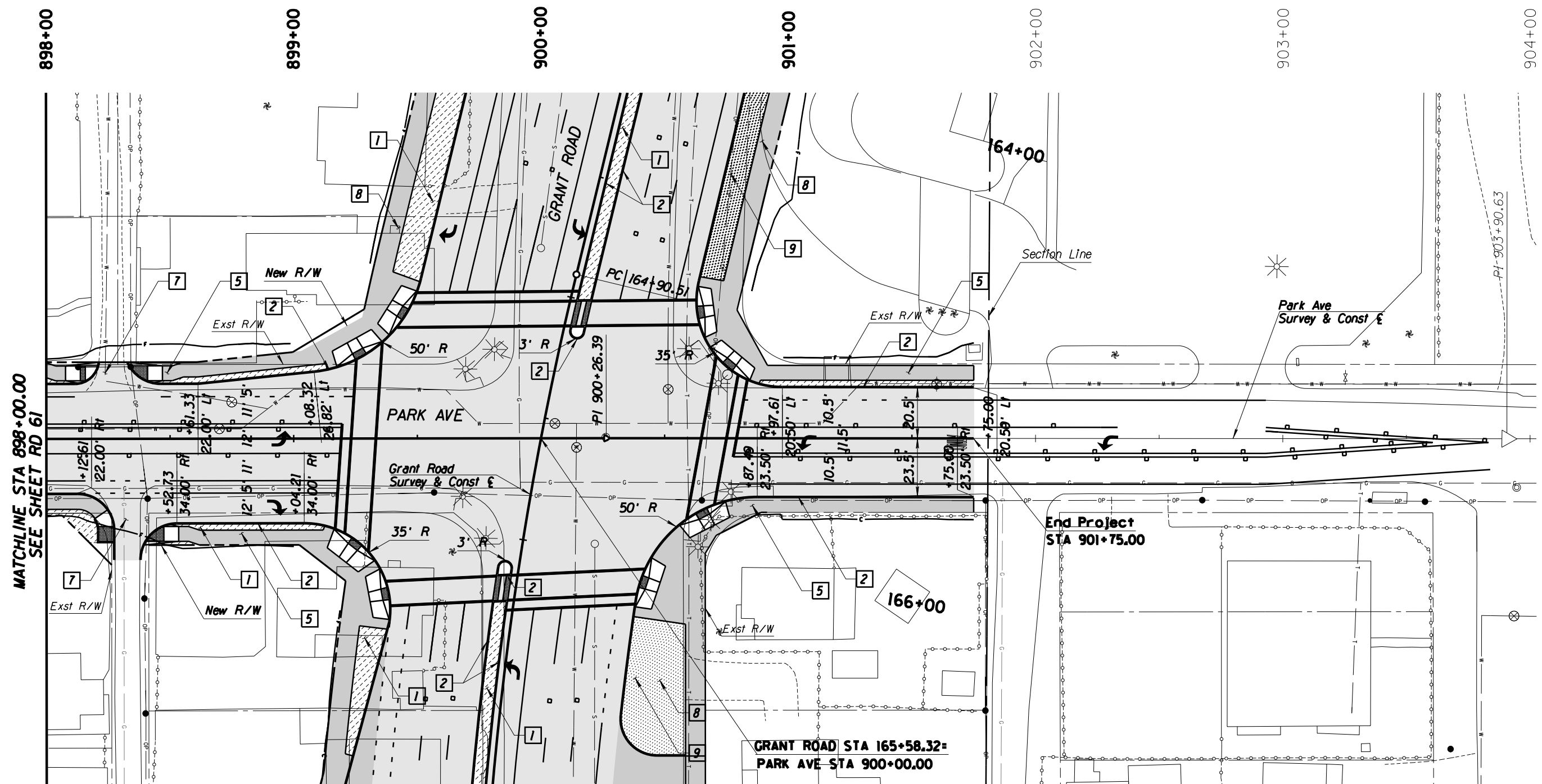
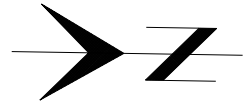


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		PARK AVE PLAN SHEET STA 893+00 TO STA 898+00		73 OF 362
CITY OF TUCSON	DSGN. BY <i>[Signature]</i> 08/10	REF.	SCALE: 1"=20' H.	73 OF 362
	DRWN. BY <i>[Signature]</i> 08/10			
	CHKD. BY <i>[Signature]</i> 08/10	PLAN NO.		

NO.	DATE	REVISION	BY	CHKD.	APPR.



MATCHLINE STA 898+00.00
SEE SHEET RD 61

End Project
STA 901+75.00

GRANT ROAD STA 165+58.32=
PARK AVE STA 900+00.00

Legend

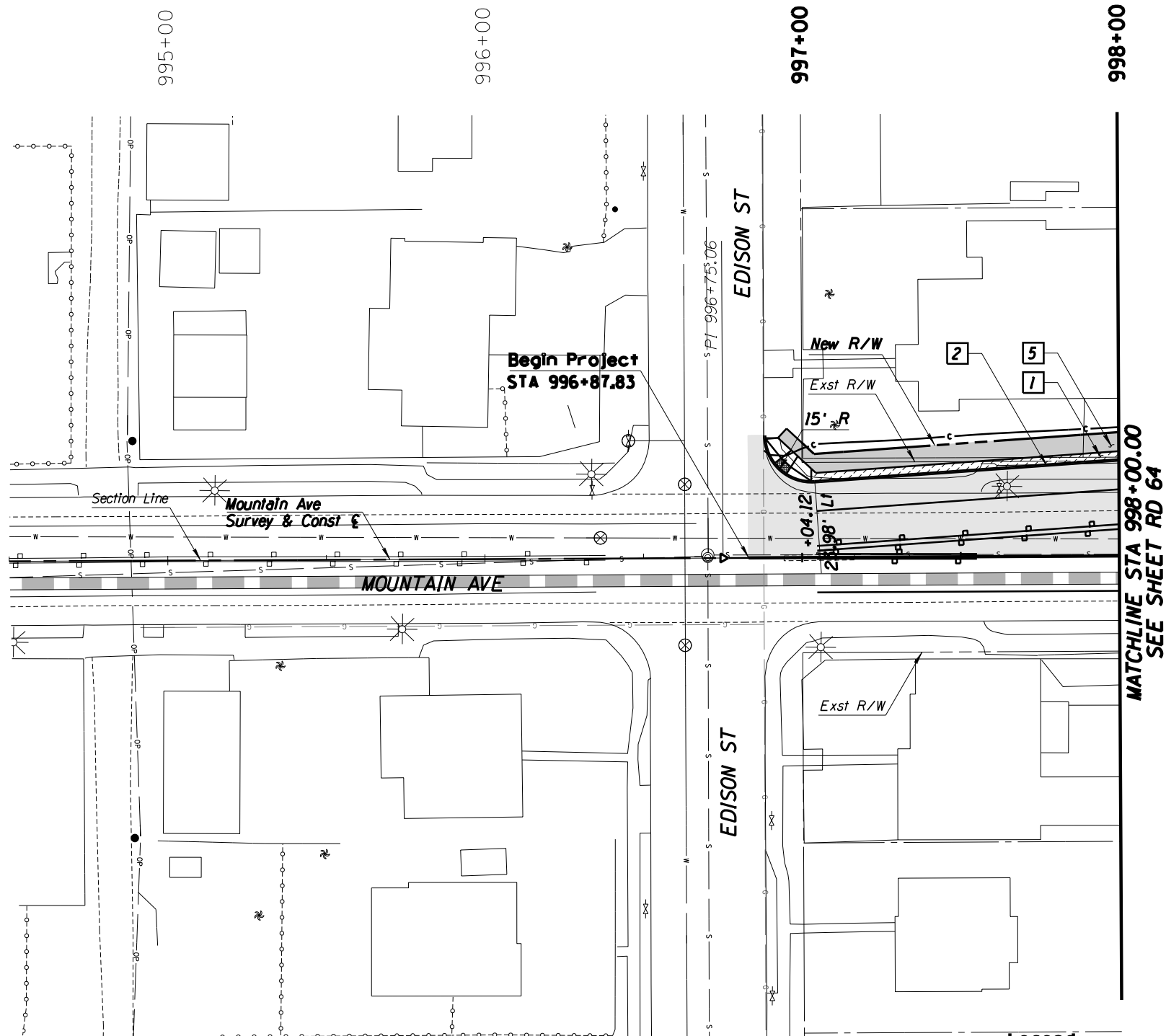
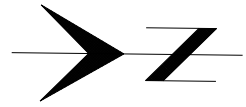
- AC Pvmt
- PCC Pvmt/Swik
- Landscaping
- Water Harvesting



PRELIMINARY
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NOT FOR
CONSTRUCTION

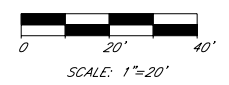
DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		PARK AVE PLAN SHEET STA 898+00 TO STA 904+00		74 OF 362
CITY OF TUCSON	DSGN. BY <i>[Signature]</i> 08/10	REF.	SCALE: 1"=20' H.	74 OF 362
	DRWN. BY <i>[Signature]</i> 08/10	PLAN NO.		
	CHKD. BY <i>[Signature]</i> 08/10			

NO.	DATE	REVISION	BY	CHKD.	APPR.



Legend

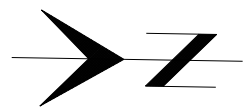
- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



PRELIMINARY
30%
NOT FOR
CONSTRUCTION

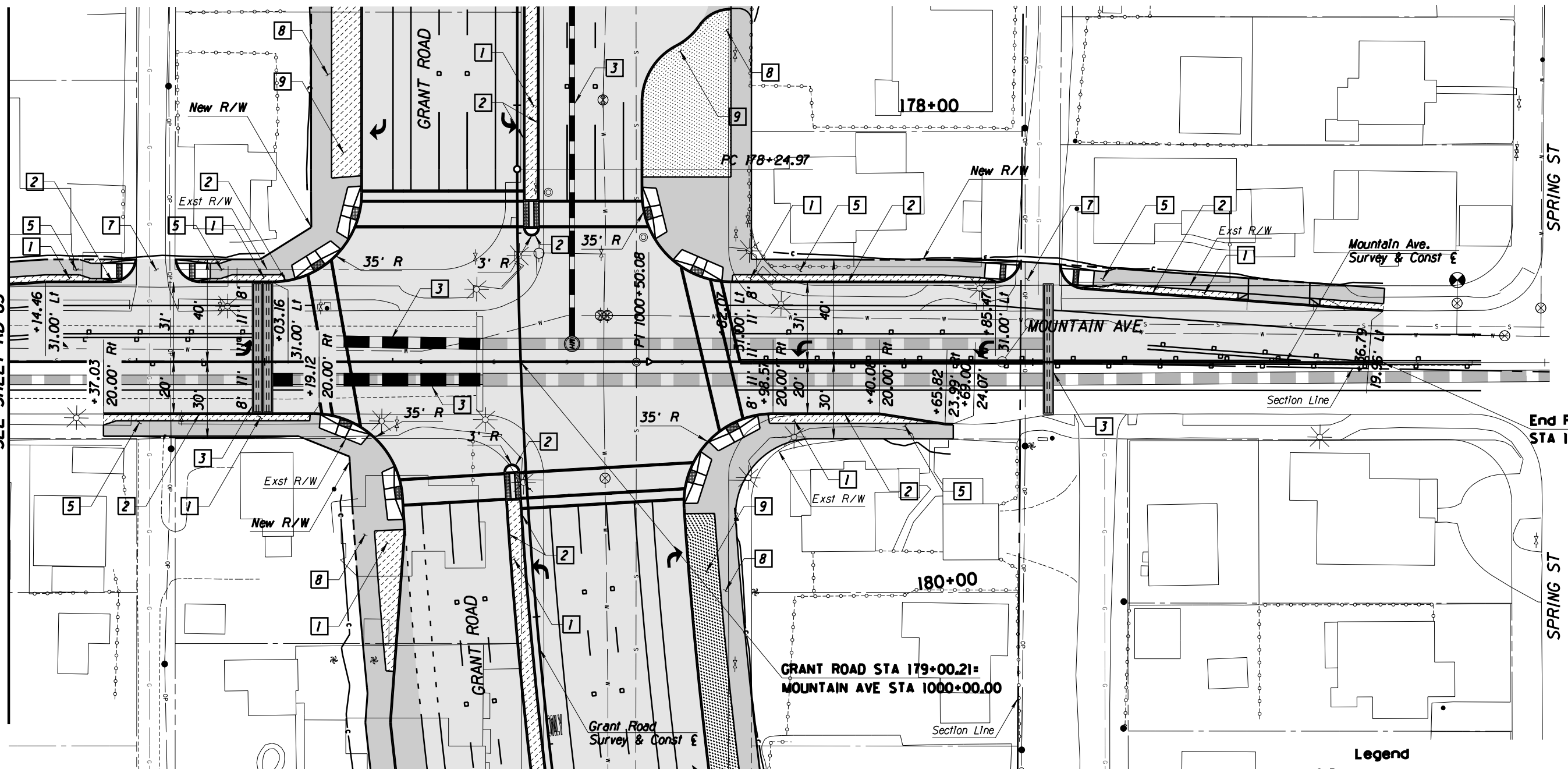
DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		MOUNTAIN AVE PLAN SHEET STA 994+50 to STA 998+00		362 OF 362
CITY OF TUCSON	DSGN. BY <i>W. Huggins</i>	08/10	REF. _____	SCALE: 1"=20' H.
	DRWN. BY <i>W. Huggins</i>	08/10	_____	_____
	CHKD. BY <i>R. Swick</i>	08/10	PLAN NO. _____	

NO.	DATE	REVISION	BY	CHKD.	APPR.



998+00 999+00 1000+00 1001+00 1002+00 1003+00 1004+00

MATCHLINE STA 998+00.00
SEE SHEET RD 63



End Project
STA 1003+36.79

- Legend**
- AC Pvmt
 - PCC Pvmt/Swik
 - Landscaping
 - Water Harvesting



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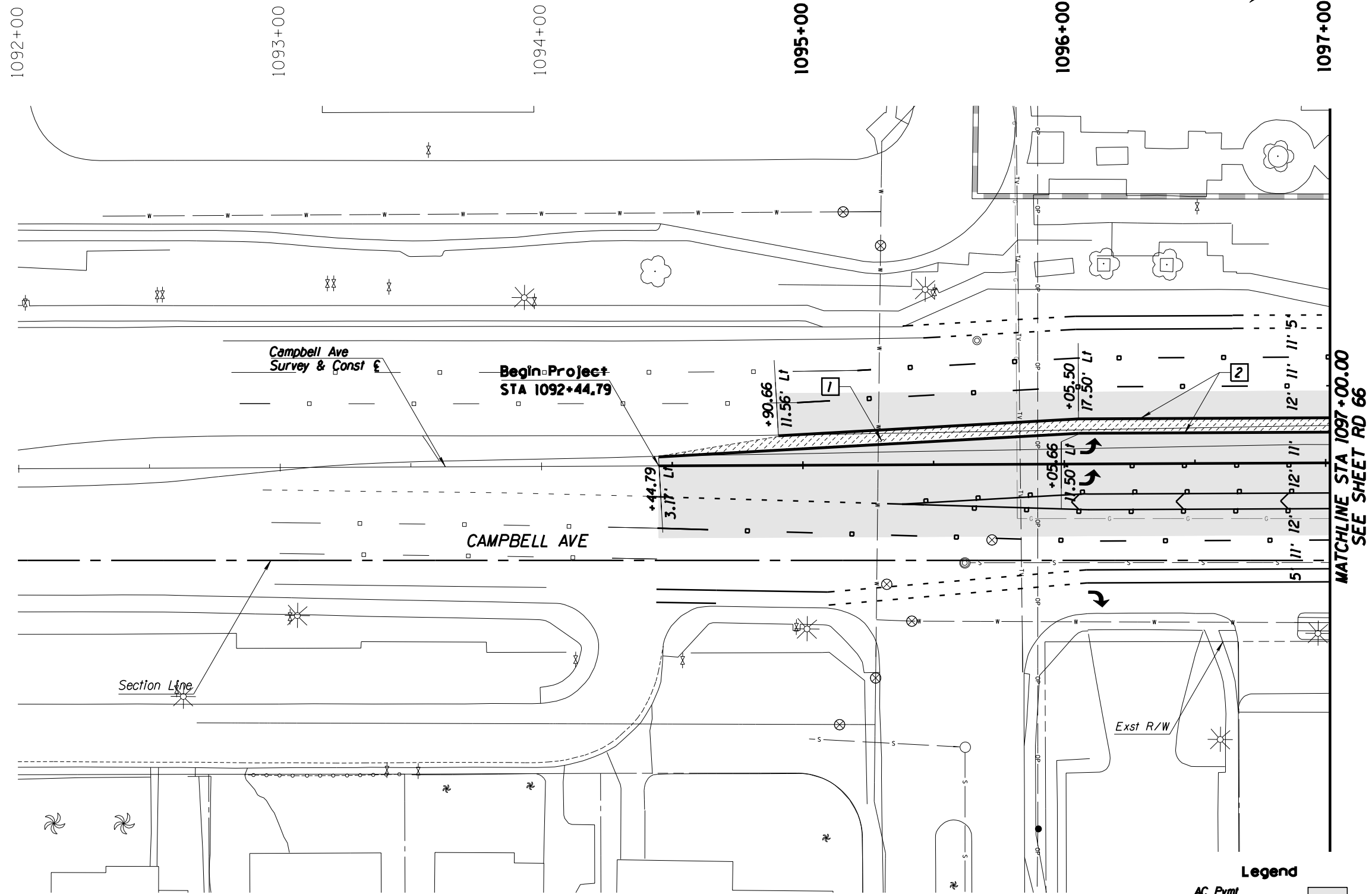
DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

MOUNTAIN AVE
PLAN SHEET
STA 998+00 TO STA 1004+00



DSGN. BY <i>W. Huggins</i>	08/10	REF.	SCALE: 1"=20' H.	24 OF 362
DRWN. BY <i>W. Huggins</i>	08/10			OF 362
CHKD. BY <i>R. Swits</i>	08/10	PLAN NO.		362

NO.	DATE	REVISION	BY	CHKD.	APPR.



MATCHLINE STA 1097+00.00
SEE SHEET RD 66

- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

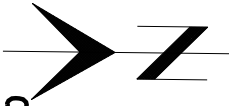
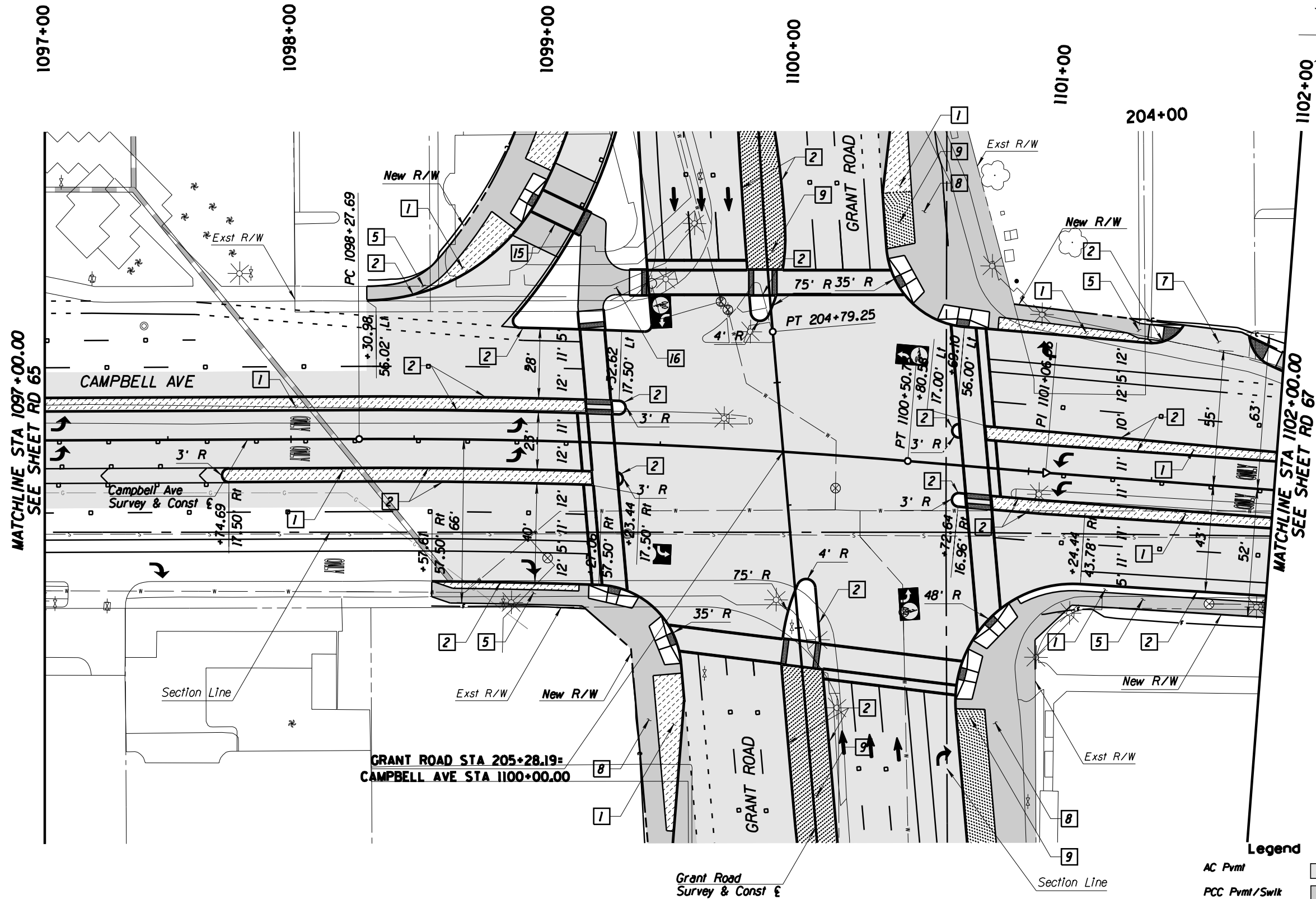


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		CAMPBELL AVE PLAN SHEET STA 1092+00 to STA 1097+00		?? OF ??
	DSGN. BY <i>W. Johnson</i>	08/10	REF. _____	SCALE: 1"=20' H.
	DRWN. BY <i>M. Huppert</i>	08/10		?? OF 362
	CHKD. BY <i>R. Switz</i>	08/10	PLAN NO. _____	

NO.	DATE	REVISION	BY	CHKD.	APPR.



- Legend**
- AC Pvmt
 - PCC Pvmt/Swik
 - Landscaping
 - Water Harvesting

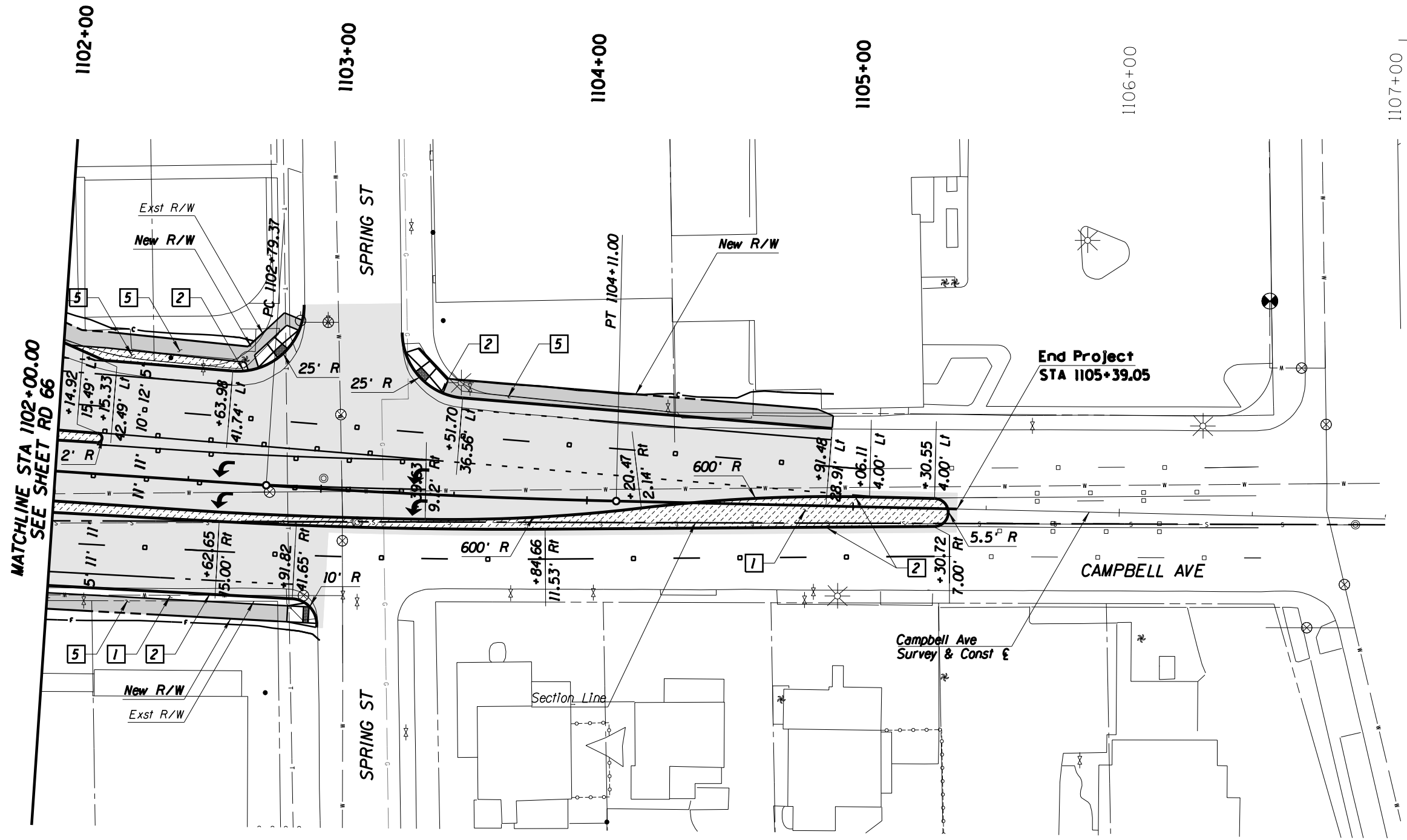


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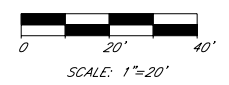
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		CAMPBELL AVE PLAN SHEET STA 1097+00 TO STA 1102+00		1 OF 362
CITY OF TUCSON	DSGN. BY <i>W. Johnson</i>	08/10	REF. _____	SCALE: 1"=20'
	DRWN. BY <i>M. Huppert</i>	08/10	PLAN NO. _____	2 OF 362
CHKD. BY <i>R. Swits</i>	08/10			362

NO.	DATE	REVISION	BY	CHKD.	APPR.



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

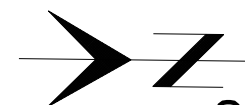


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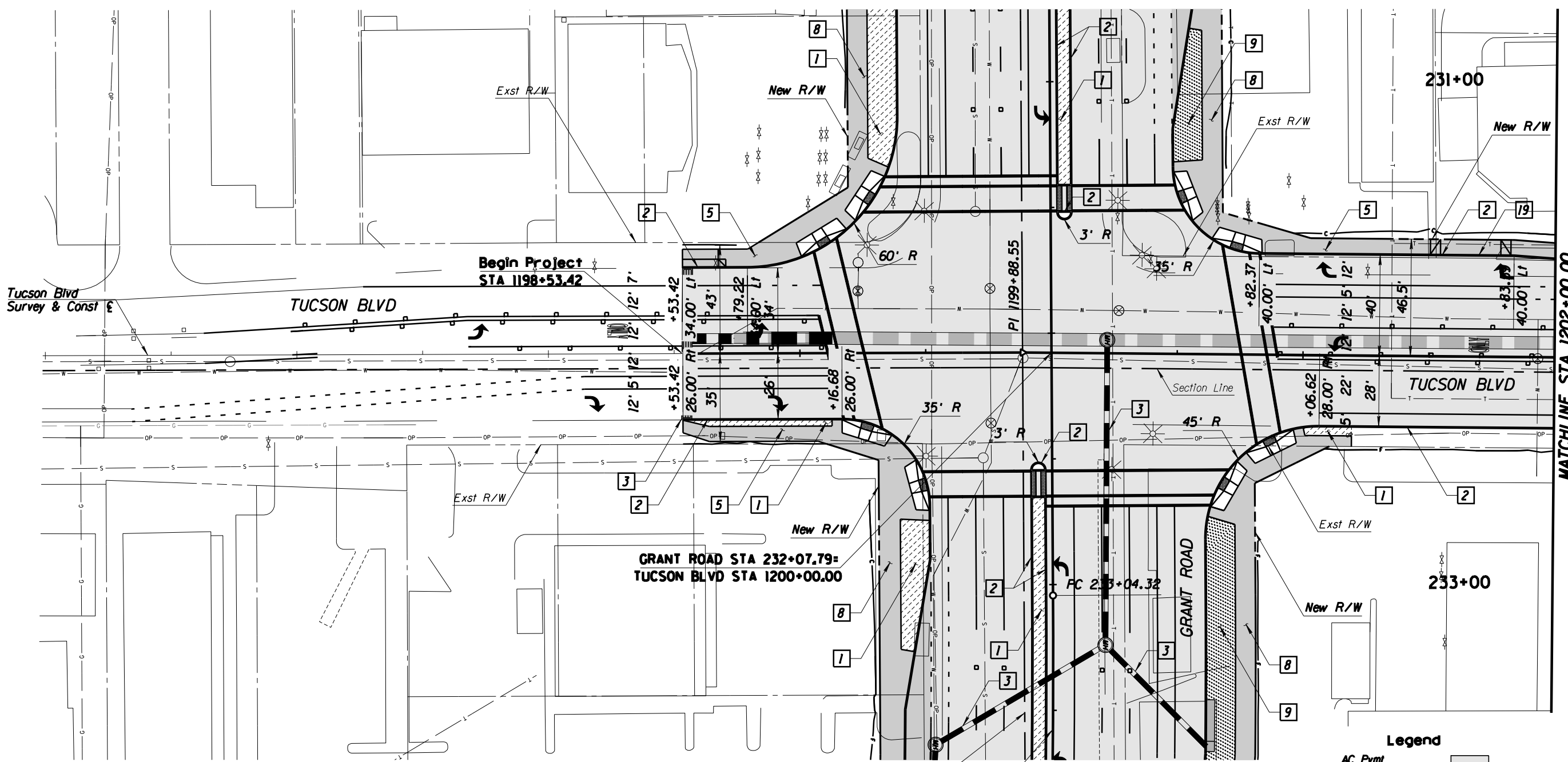
**PRELIMINARY
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		CAMPBELL AVE PLAN SHEET STA 1102+00 TO STA 1107+00		7/1 OF 7/3
CITY OF TUCSON	DSGN. BY <i>[Signature]</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>[Signature]</i>	08/10		
	CHKD. BY <i>[Signature]</i>	08/10	PLAN NO.	362

NO.	DATE	REVISION	BY	CHKD.	APPR.



1196+00 1197+00 1198+00 1199+00 1200+00 1201+00 1202+00



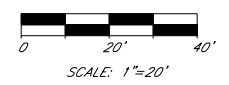
MATCHLINE STA 1202+00.00
SEE SHEET RD 69

Tucson Blvd
Survey & Const E

Grant Road
Survey & Const E

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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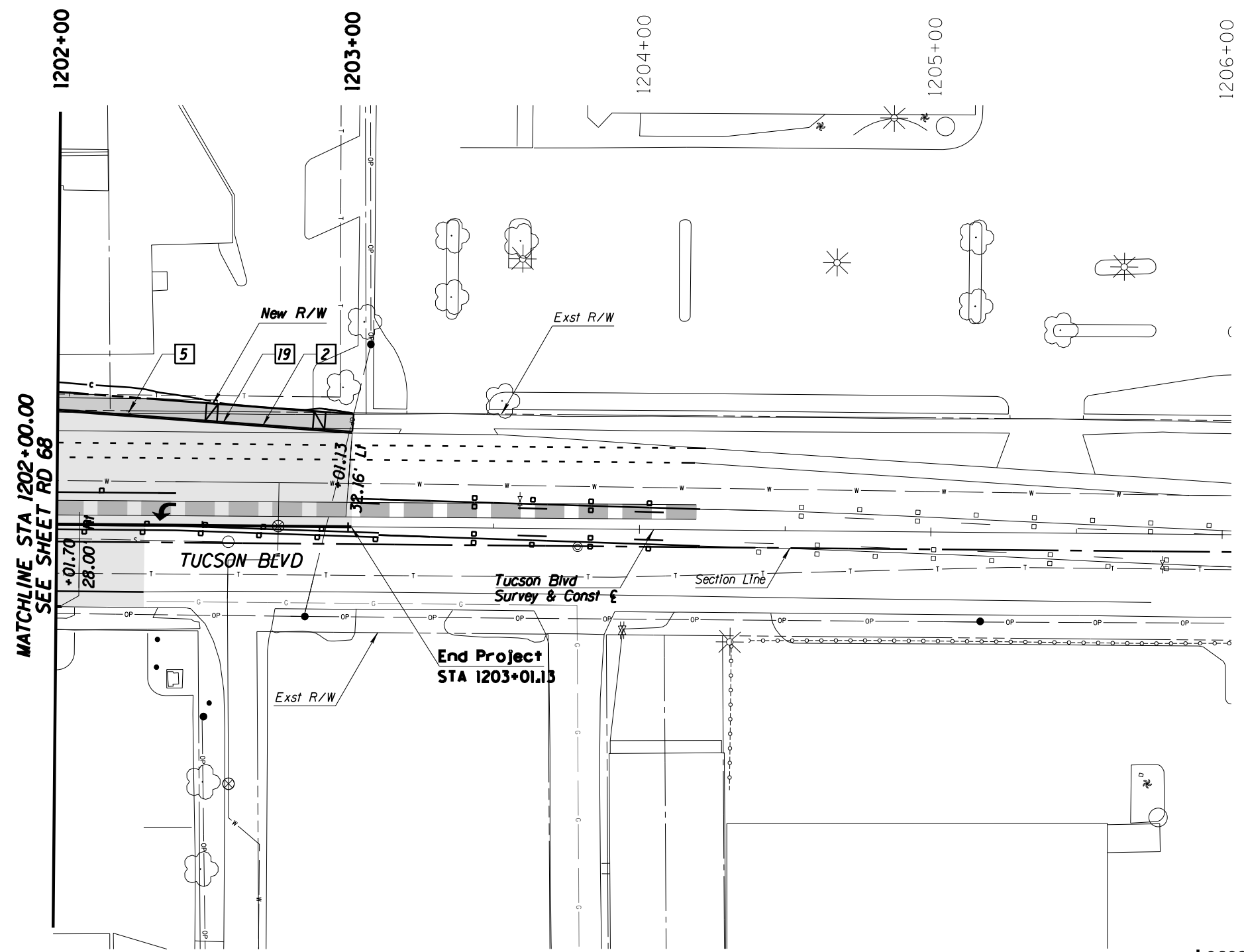
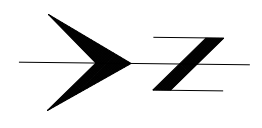
TUCSON BLVD
PLAN SHEET
STA 1196+00 to STA 1202+00



DSGN. BY <i>bl. hupperts</i>	08/10	REF.	SCALE: 1"=20' H.
DRWN. BY <i>bl. hupperts</i>	08/10		
CHKD. BY <i>bl. hupperts</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

2010
OF
362



MATCHLINE STA 1202+00.00
SEE SHEET RD 68

**End Project
STA 1203+01.15**

- Legend**
- AC Pvmt
 - PCC Pvmt/Swik
 - Landscaping
 - Water Harvesting

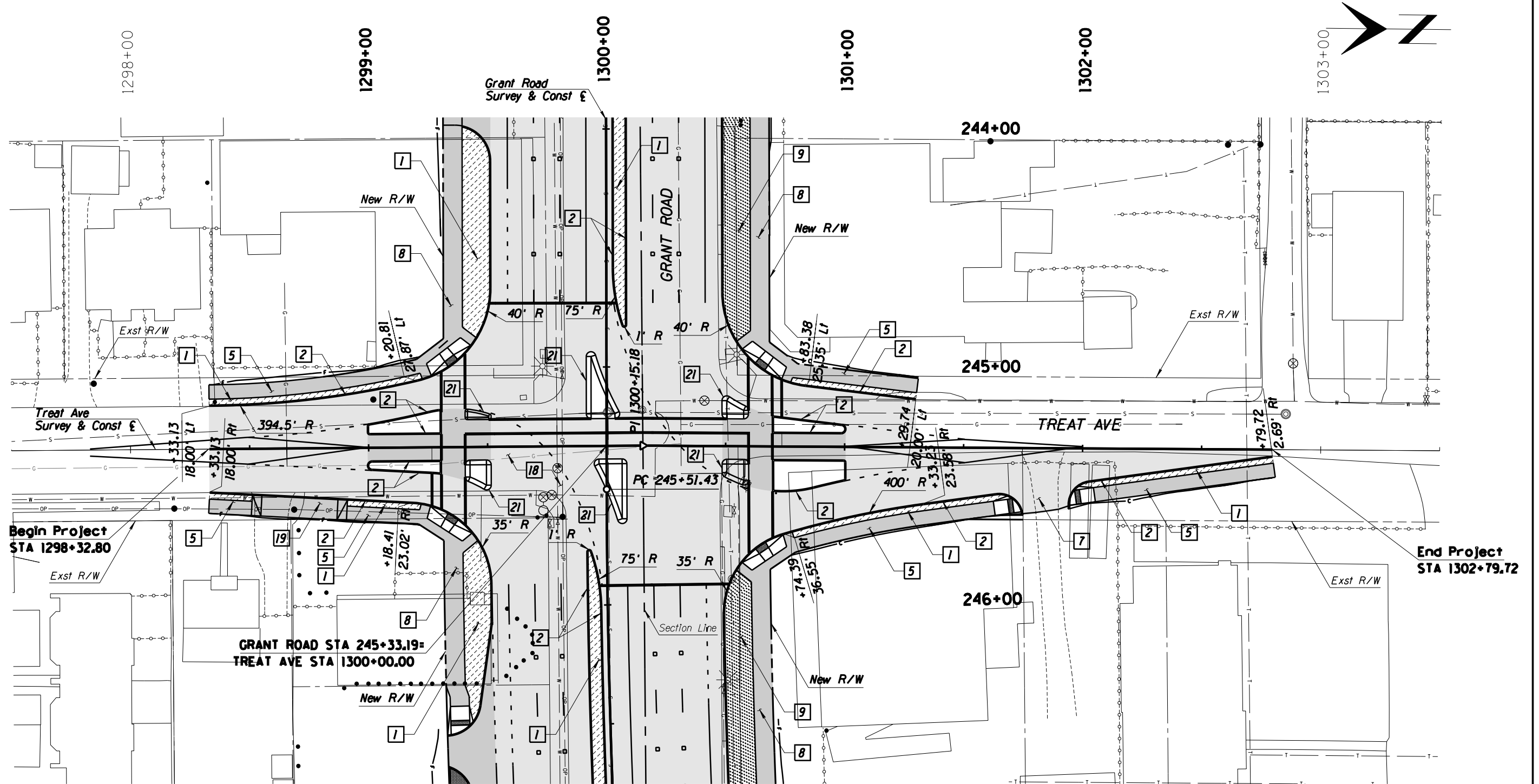


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		TUCSON BLVD PLAN SHEET STA 1202+00 to STA 1206+00		21 OF 362
CITY OF TUCSON	DSGN. BY <i>W. Haggins</i>	08/10	REF.	SCALE: 1"=20' H
	DRWN. BY <i>W. Haggins</i>	08/10		
	CHKD. BY <i>R. Swick</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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TREAT AVE
 PLAN SHEET
 STA 1297+50 TO STA 1303+50

	DSN. BY <i>W. Hupperts</i> 08/10 REF. _____ SCALE: 1"=20' H.	2017 OF 362
	DRWN. BY <i>W. Hupperts</i> 08/10	
	CHKD. BY <i>R. Swits</i> 08/10 PLAN NO. _____	

NO.	DATE	REVISION	BY	CHKD.	APPR.

1391+00

1392+00

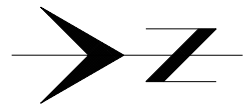
1393+00

1394+00

1395+00

1396+00

1397+00



Begin Project
STA 1394+87.22

Exst R/W

COUNTRY CLUB ROAD

Country Club Road
Survey & Const E

Section Line

+87.22
33.50' RI

+67.22
48.00' RI

MATCHLINE STA 1397+00.00
SEE SHEET RD 72

2

1

5

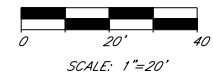
7

Exst R/W

New R/W

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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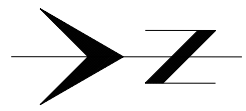
COUNTRY CLUB ROAD
PLAN SHEET
STA 1391+00 TO STA 1397+00



DSGN. BY <i>W. Johnson</i>	08/10	REF.	SCALE: 1"=20' H.
DRWN. BY <i>M. Haggins</i>	08/10		
CHKD. BY <i>R. Swits</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

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OF
362



1397+00

1398+00

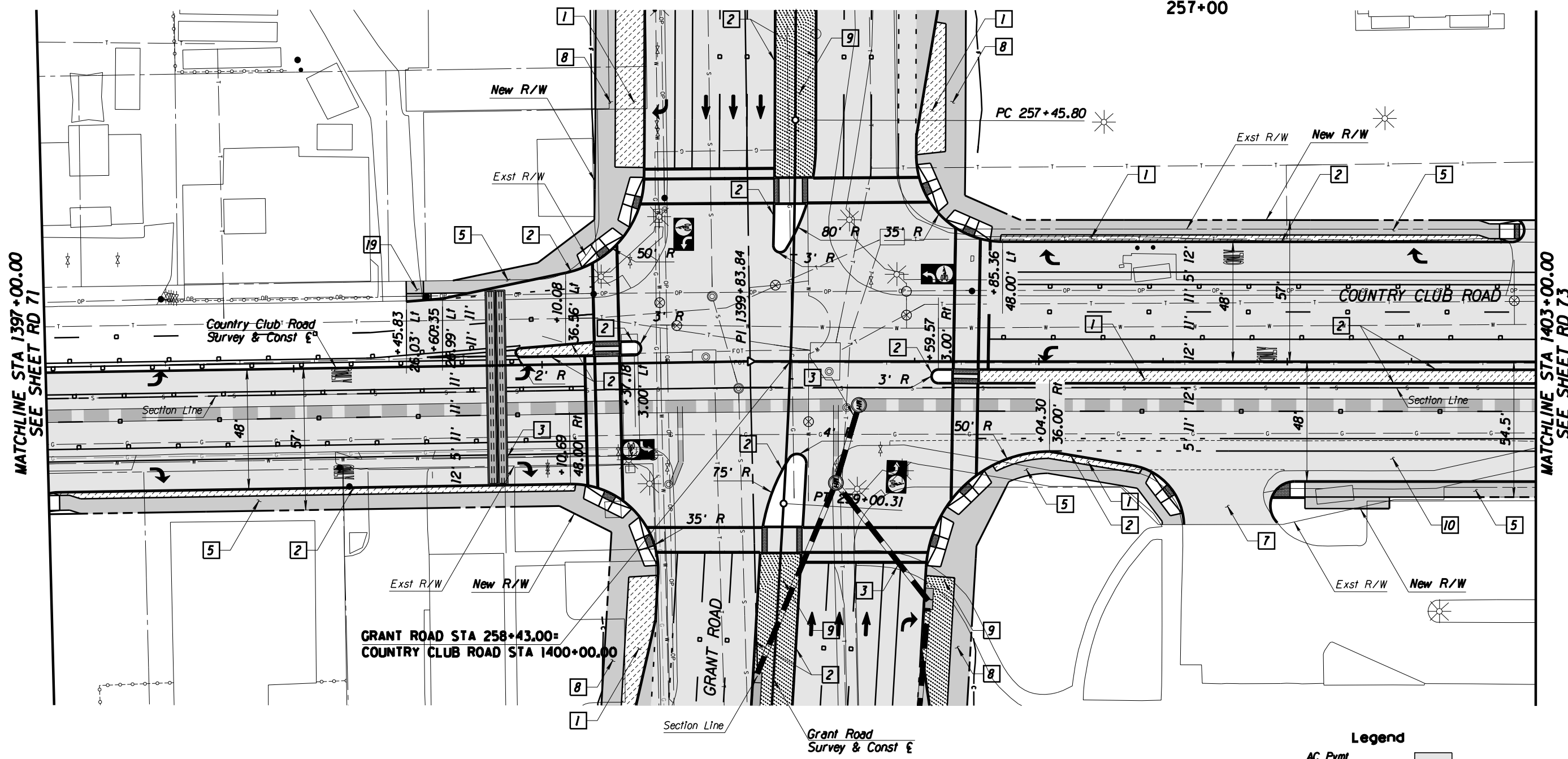
1399+00

1400+00

1401+00

1402+00

1403+00

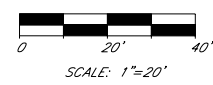


MATCHLINE STA 1397+00.00
SEE SHEET RD 71

MATCHLINE STA 1403+00.00
SEE SHEET RD 73

GRANT ROAD STA 258+43.00=
COUNTRY CLUB ROAD STA 1400+00.00

- Legend**
- AC Pvmt
 - PCC Pvmt/Swik
 - Landscaping
 - Water Harvesting

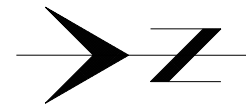


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		CITY OF TUCSON	
COUNTRY CLUB ROAD PLAN SHEET STA 1397+00 TO STA 1403+00			
DESIGN BY: <i>[Signature]</i>	08/10	REF.:	SCALE: 1"=20' H.
DRAWN BY: <i>[Signature]</i>	08/10		
CHKD. BY: <i>[Signature]</i>	08/10	PLAN NO.	

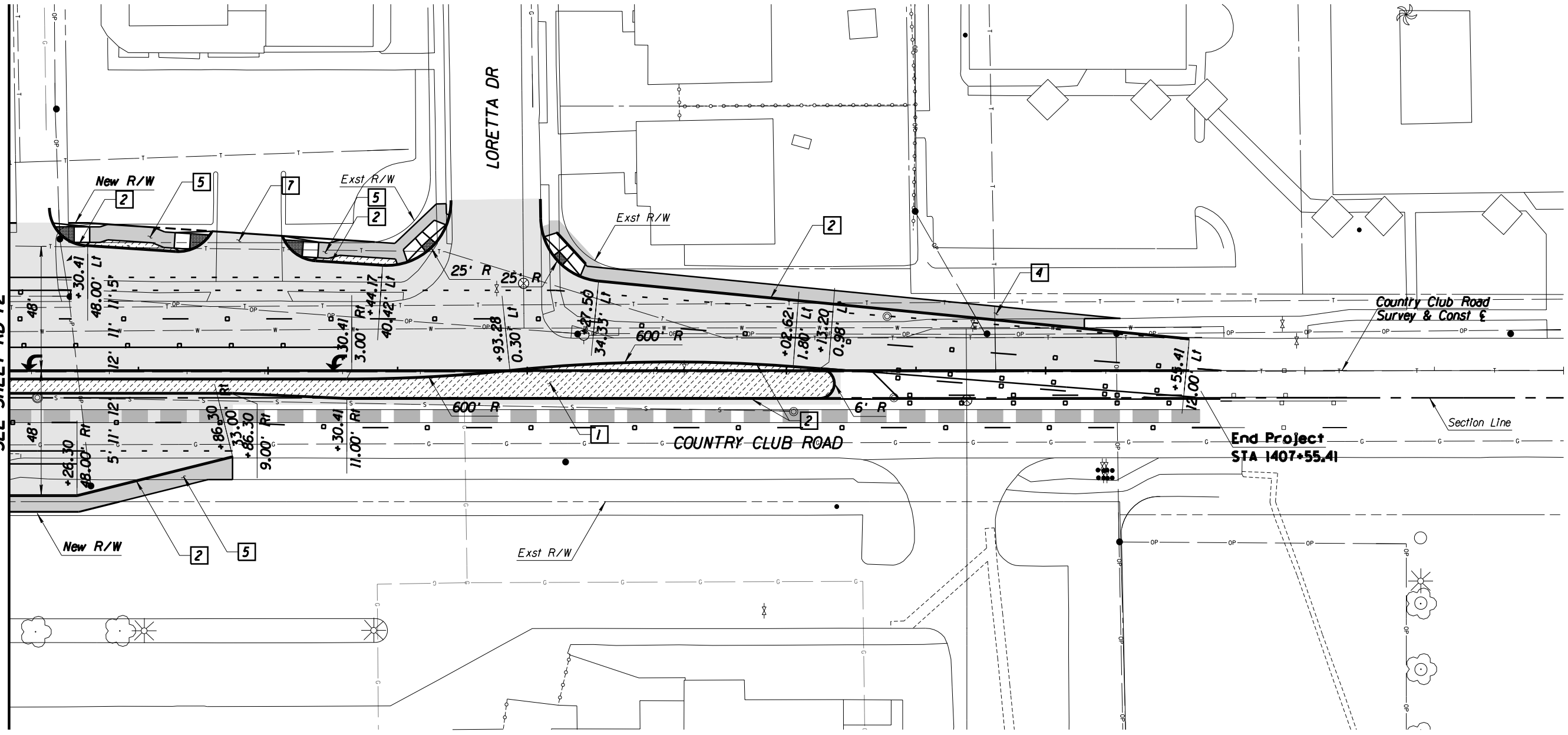
NO.	DATE	REVISION	BY	CHKD.	APPR.

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OF
362



1403+00 1404+00 1405+00 1406+00 1407+00 1408+00 1409+00

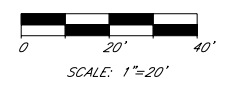
MATCHLINE STA 1403+00.00
SEE SHEET RD 72



End Project
STA 1407+55.41

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



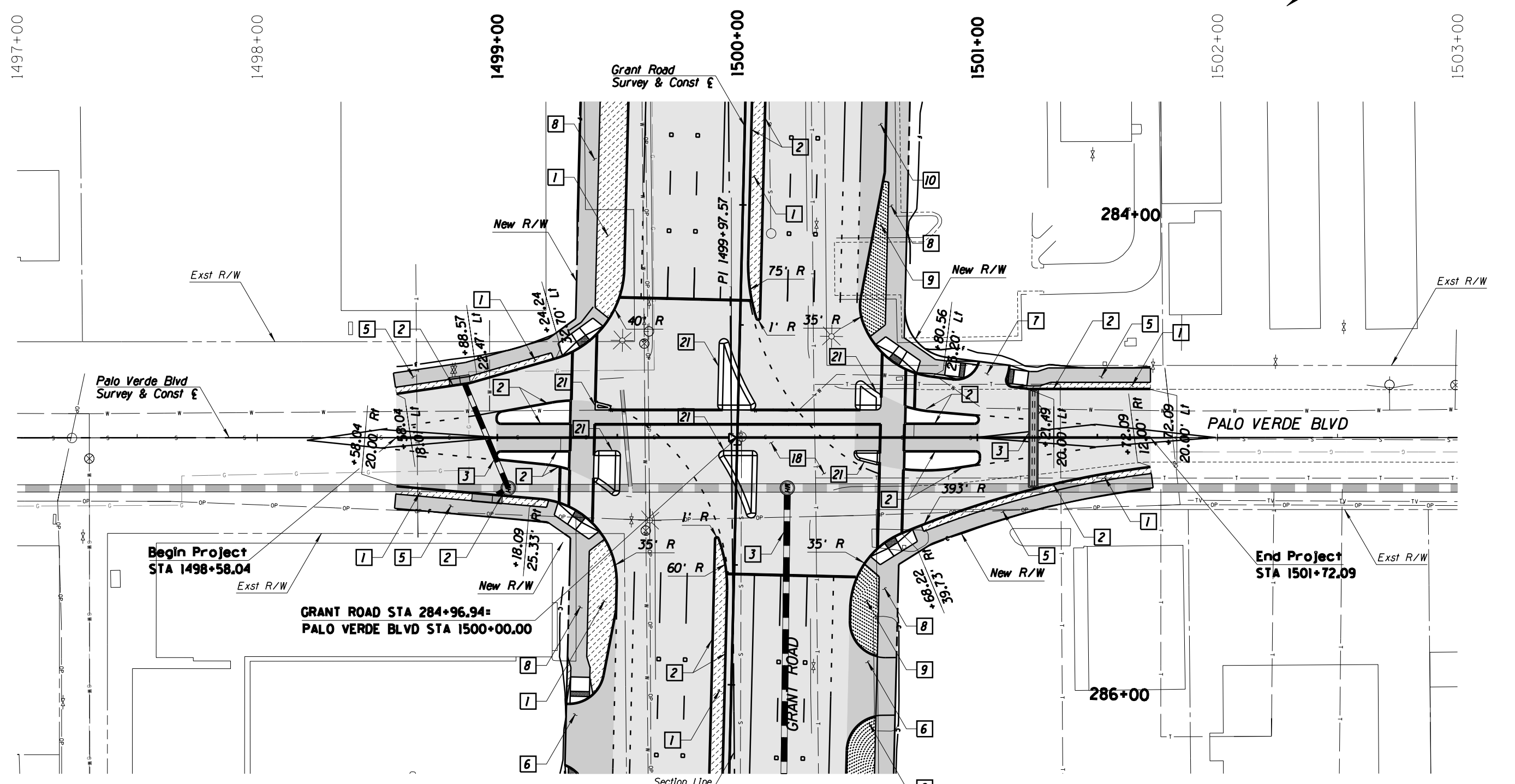
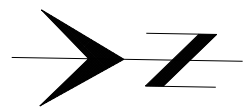
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		CITY OF TUCSON	
COUNTRY CLUB ROAD PLAN SHEET STA 1403+00 TO STA 1409+00			
DESIGN BY <i>W. Johnson</i>	08/10	REF.	SCALE: 1"=20' H.
DRAWN BY <i>M. Huppert</i>	08/10		
CHECKED BY <i>R. Switz</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

362
OF
362



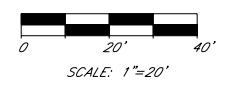
Begin Project
STA 1498+58.04

GRANT ROAD STA 284+96.94=
PALO VERDE BLVD STA 1500+00.00

End Project
STA 1501+72.09

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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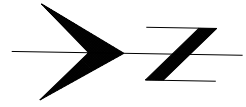
DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

**PALO VERDE BLVD
PLAN SHEET
STA 1497+00 TO STA 1503+00**

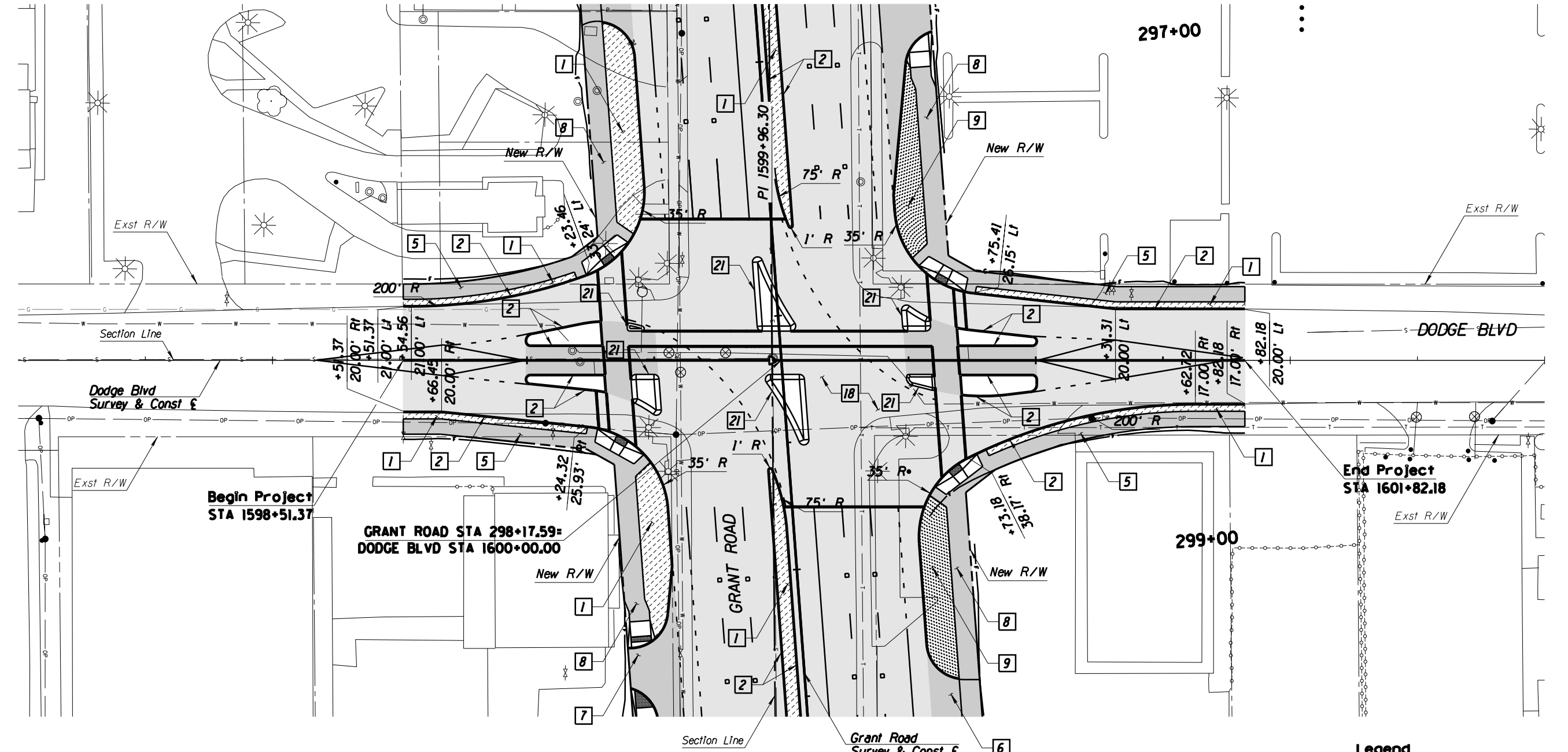


DSGN. BY <i>M. Hupperts</i>	08/10	REF.	SCALE: 1"=20' H.
DRWN. BY <i>M. Hupperts</i>	08/10		
CHKD. BY <i>R. Switz</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



1597+00 1598+00 1599+00 1600+00 1601+00 1602+00 1603+00



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting



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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		2017
DODGE BLVD PLAN SHEET STA 1597+00 to STA 1603+00		OF 2015
CITY OF TUCSON	DSGN. BY <i>bl</i> 08/10	SCALE: 1"=20' H
	DRWN. BY <i>bl</i> 08/10	27
	CHKD. BY <i>bl</i> 08/10	OF 362
	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

1692+00

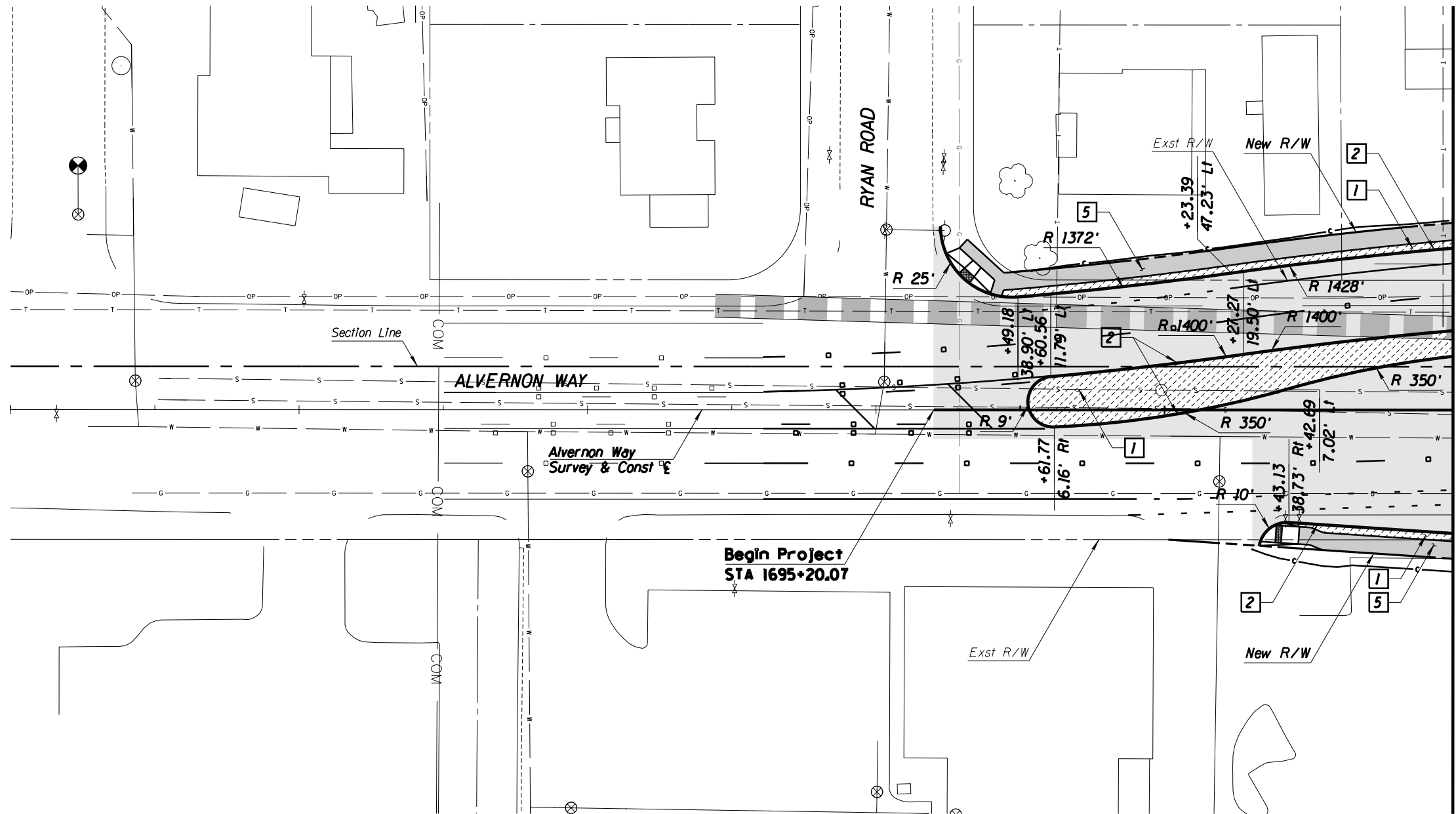
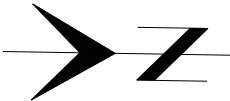
1693+00

1694+00

1695+00

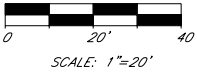
1696+00

1697+00



Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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CONSTRUCTION

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION			
ALVERNON WAY PLAN SHEET 1692+00 to 1697+00			
CITY OF TUCSON	DSGN. BY <i>W. Huggins</i>	08/10	REF. SCALE: 1"=20' H.
	DRWN. BY <i>W. Huggins</i>	08/10	
	CHKD. BY <i>R. Swick</i>	08/10	PLAN NO.

NO.	DATE	REVISION	BY	CHKD.	APPR.

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1697+00

1698+00

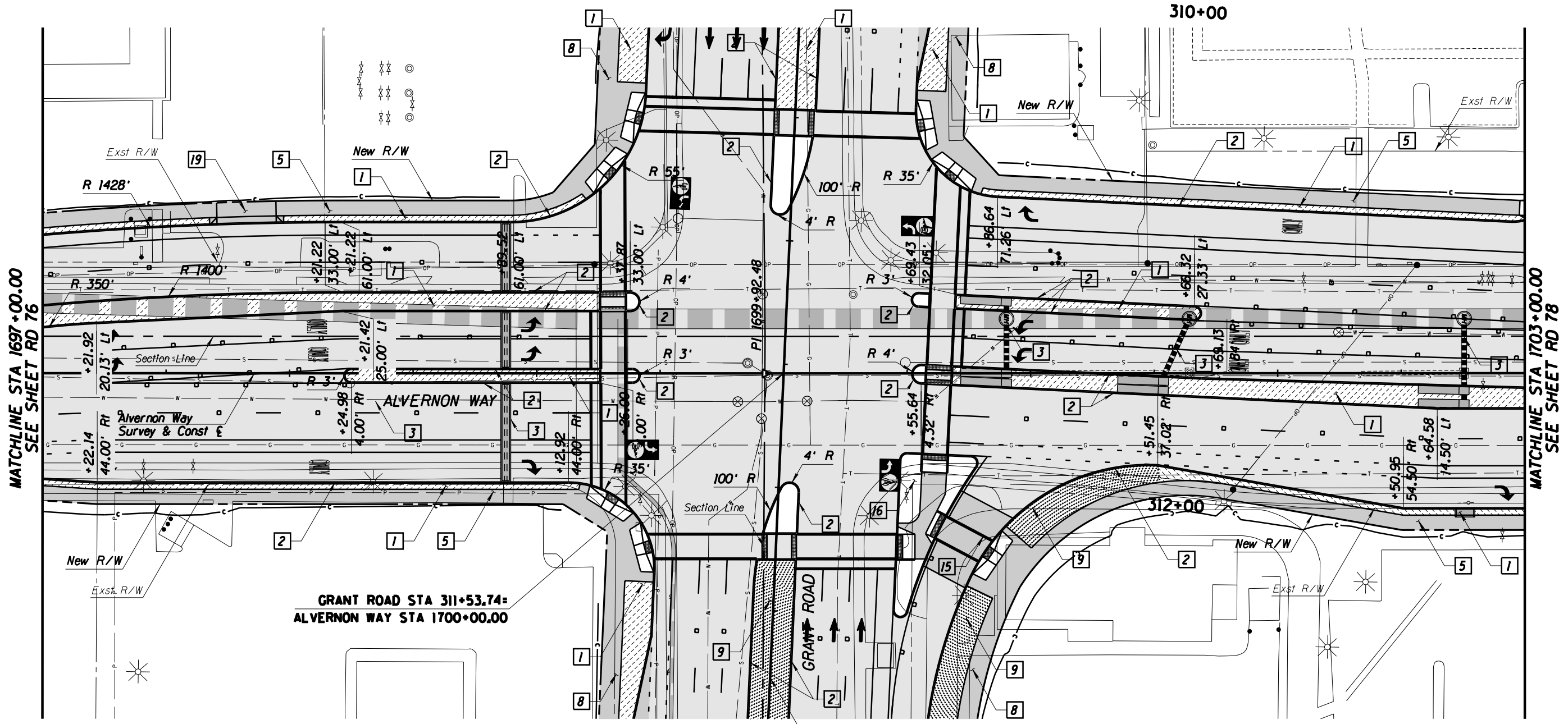
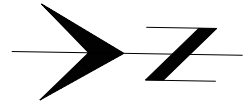
1699+00

1700+00

1701+00

1702+00

1703+00



MATCHLINE STA 1697+00.00
SEE SHEET RD 76

MATCHLINE STA 1703+00.00
SEE SHEET RD 78

GRANT ROAD STA 311+53.74=
ALVERNON WAY STA 1700+00.00

Grant Road
Survey & Const E

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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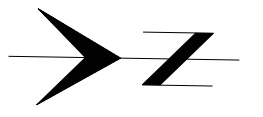
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CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

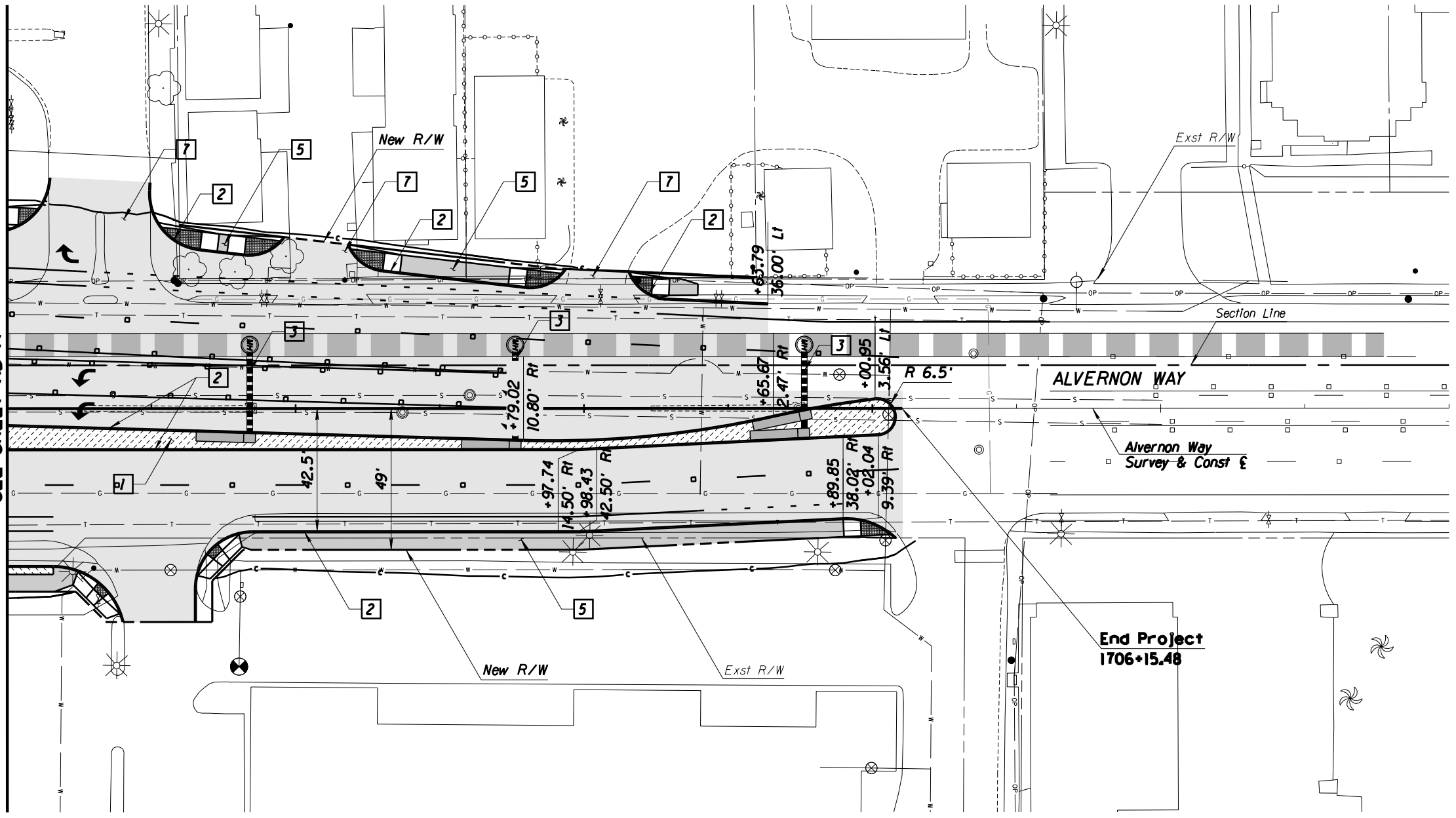
**ALVERNON WAY
PLAN SHEET
STA 1697+00 TO STA 1703+00**

	DSGN. BY <i>W. Hupperts</i>	08/10	REF.	SCALE: 1"=20' H.	22 OF 362
	DRWN. BY <i>W. Hupperts</i>	08/10			
	CHKD. BY <i>R. Swits</i>	08/10	PLAN NO.		

1703+00 1704+00 1705+00 1706+00 1707+00 1708+00



MATCHLINE STA 1703+00.00
SEE SHEET RD 77



End Project
1706+15.48

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

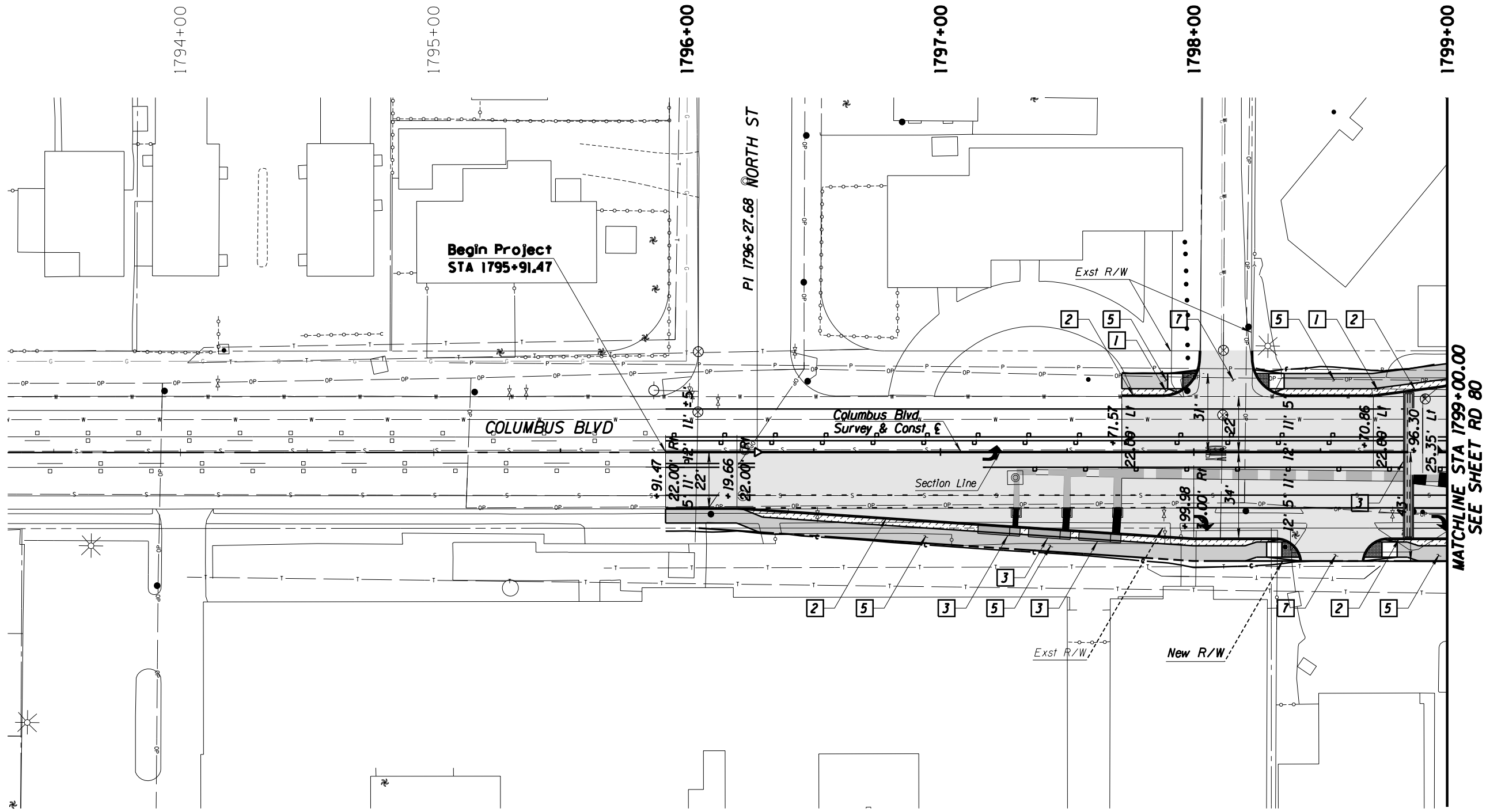
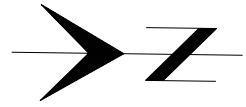
ALVERNON WAY
PLAN SHEET
STA 1703+00 TO 1708+00



DSGN. BY <i>al. hupperts</i>	08/10	REF.	SCALE: 1"=20' H.
DRWN. BY <i>al. hupperts</i>	08/10		
CHKD. BY <i>al. hupperts</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

20175
OF
20175
OF
362



- Legend**
- AC Pvmf
 - PCC Pvmf/Swik
 - Landscaping
 - Water Harvesting

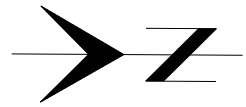


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		2017.2
COLUMBUS BLVD PLAN SHEET STA 1793+50 to STA 1799+00		OF 362
DESIGN BY <i>W. Johnson</i>	08/10	SCALE: 1"=20' H.
DRAWN BY <i>M. Huppert</i>	08/10	OF 362
CHKD. BY <i>R. Swits</i>	08/10	PLAN NO.

NO.	DATE	REVISION	BY	CHKD.	APPR.



1799+00

1800+00

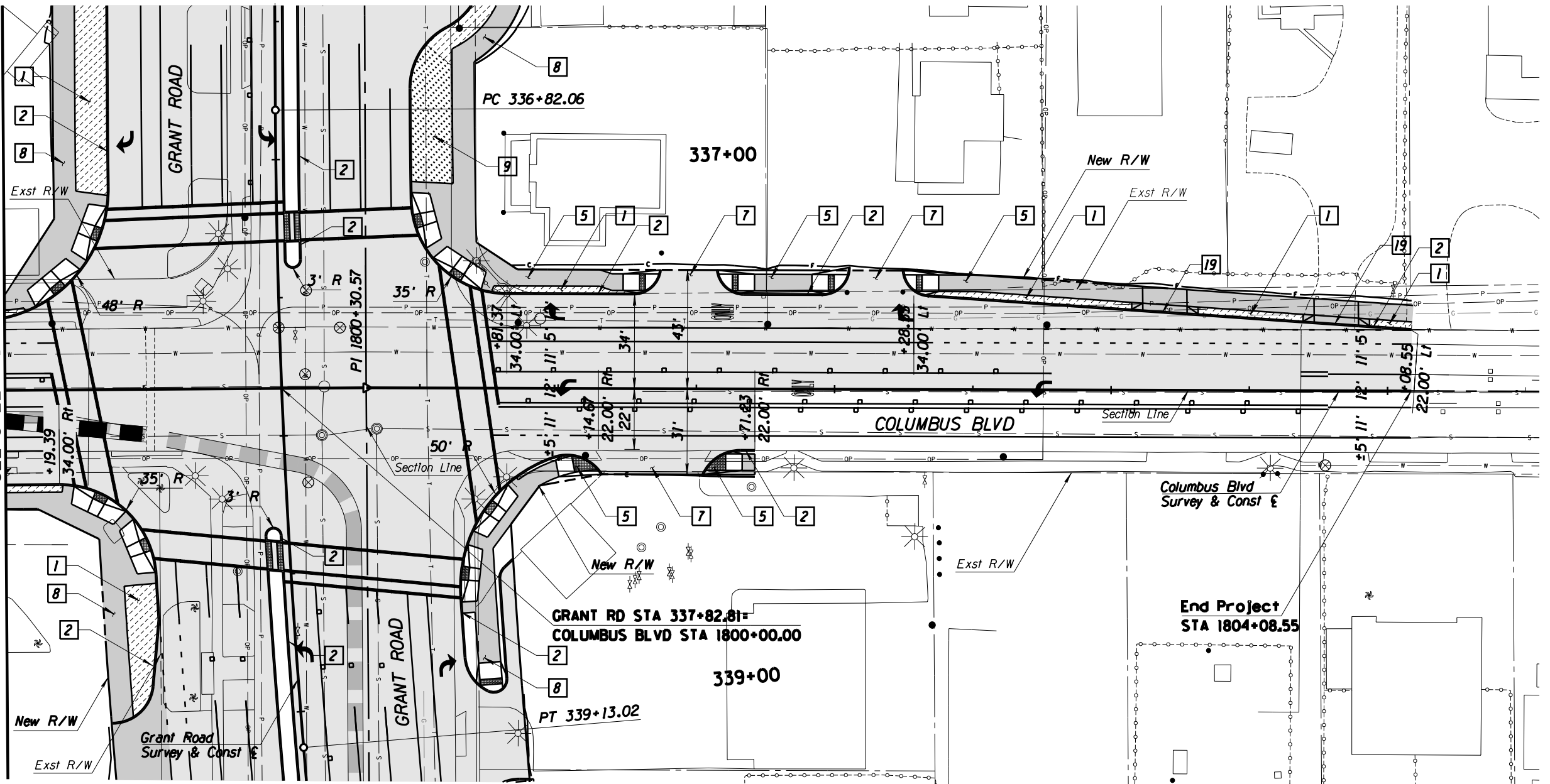
1801+00

1802+00

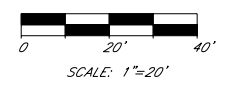
1803+00

1804+00

MATCHLINE STA 1799+00.00
SEE SHEET RD 79



- Legend**
- AC Pvmt
 - PCC Pvmt/Swik
 - Landscaping
 - Water Harvesting

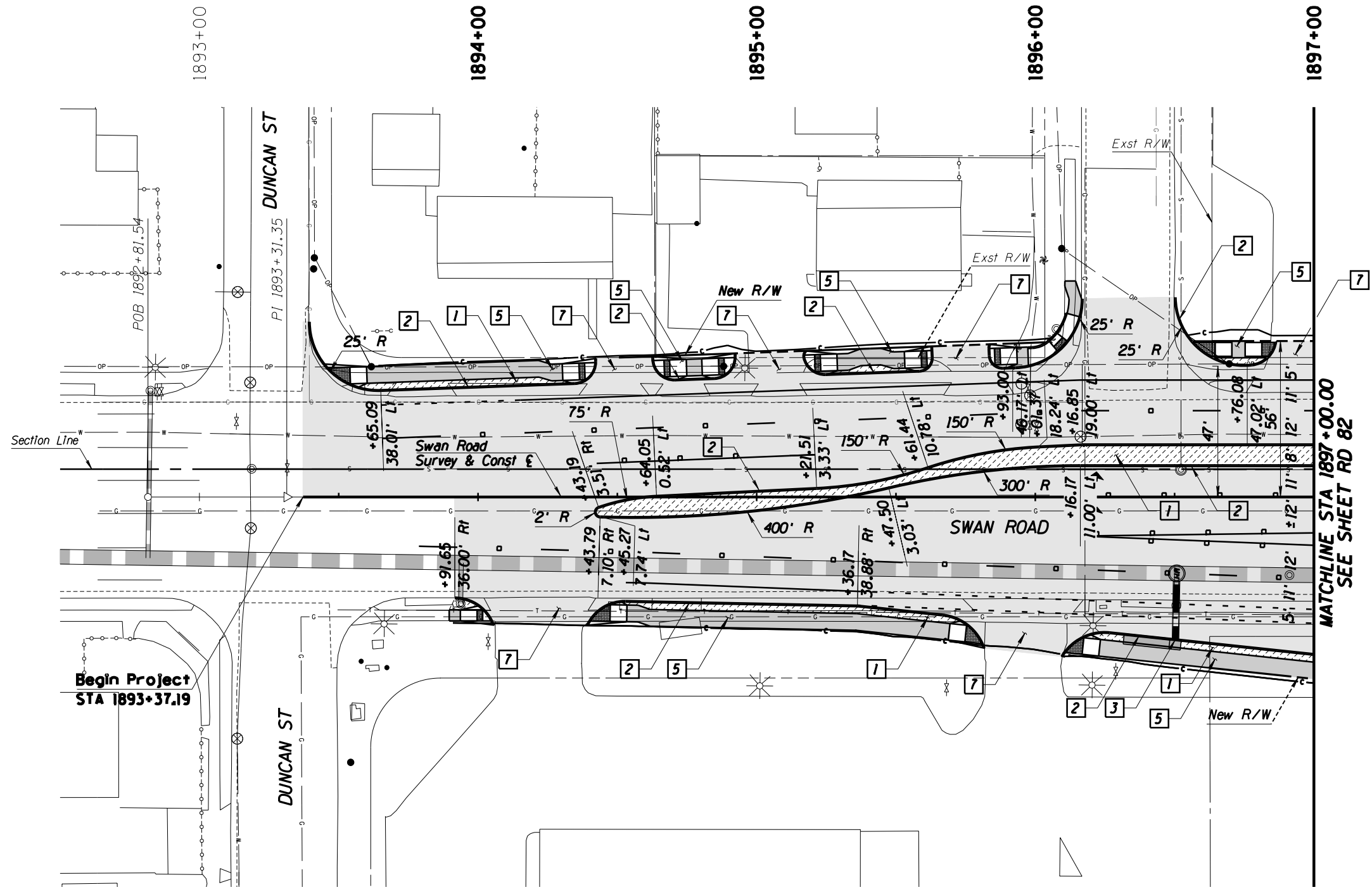
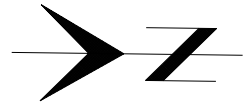


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		COLUMBUS BLVD PLAN SHEET STA 1799+00 TO STA 1804+50		OF FOUR
CITY OF TUCSON	DSGN. BY <i>W. Johnson</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>M. Haggins</i>	08/10		
	CHKD. BY <i>R. Swits</i>	08/10	PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.

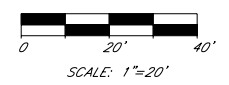


Begin Project
STA 1893+37.19

MATCHLINE STA 1897+00.00
SEE SHEET RD 82

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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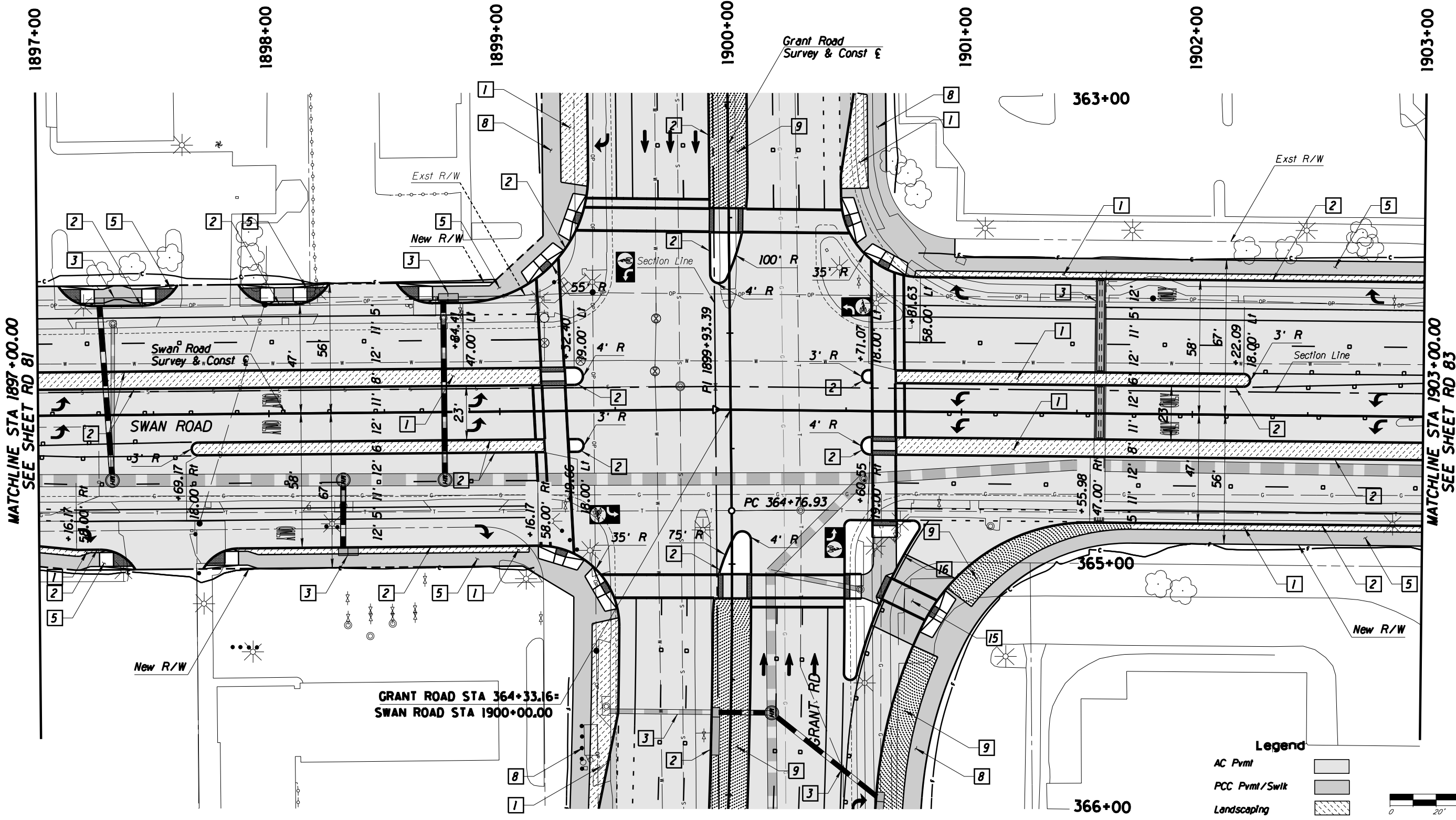
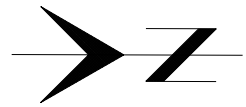
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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION

SWAN ROAD
PLAN SHEET
STA 1892+82 TO STA 1897+00

	DSN. BY <i>W. Huggins</i> 08/10 REF. SCALE: 1"=20' H.	OF 362
	DRWN. BY <i>W. Huggins</i> 08/10	
	CHKD. BY <i>R. Swick</i> 08/10 PLAN NO.	

NO.	DATE	REVISION	BY	CHKD.	APPR.



MATCHLINE STA 1897+00.00
SEE SHEET RD 81

MATCHLINE STA 1903+00.00
SEE SHEET RD 83

GRANT ROAD STA 364+33.16=
SWAN ROAD STA 1900+00.00

Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting

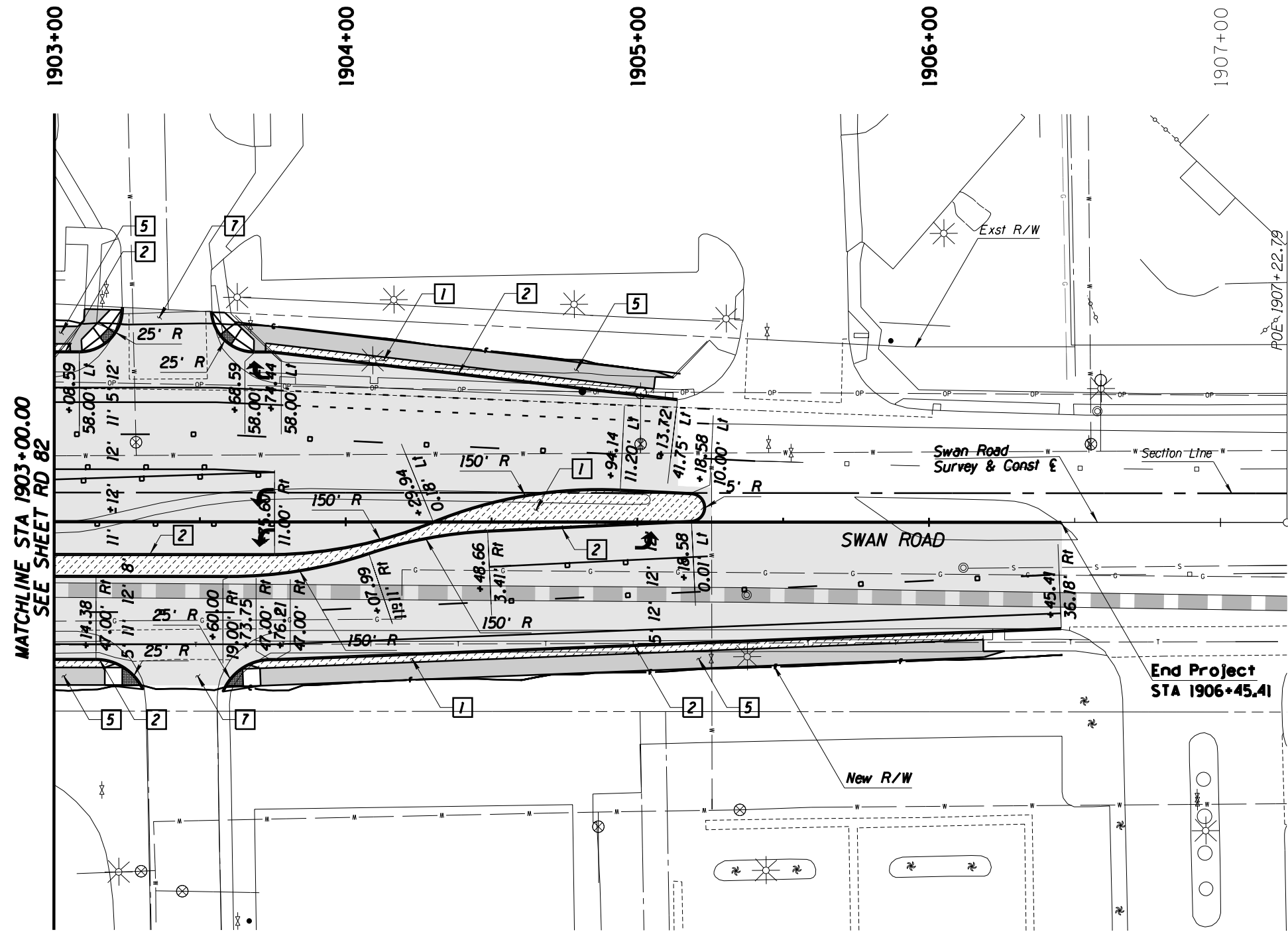
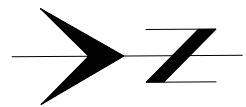


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DEPARTMENT OF TRANSPORTATION/ENGINEERING DIVISION		SWAN ROAD PLAN SHEET STA 1897+00 TO STA 1903+00		1895
CITY OF TUCSON	DSGN. BY <i>W. Hupperts</i>	08/10	REF.	SCALE: 1"=20' H.
	DRWN. BY <i>W. Hupperts</i>	08/10		14
	CHKD. BY <i>R. Swits</i>	08/10	PLAN NO.	362

NO.	DATE	REVISION	BY	CHKD.	APPR.



Legend

- AC Pvmf
- PCC Pvmf/Swik
- Landscaping
- Water Harvesting



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CITY OF TUCSON	DSGN. BY <i>W. Hupperts</i>	08/10	REF.	SCALE: 1"=20' H
	DRWN. BY <i>W. Hupperts</i>	08/10		
	CHKD. BY <i>R. Swick</i>	08/10	PLAN NO.	362

NO.	DATE	REVISION	BY	CHKD.	APPR.