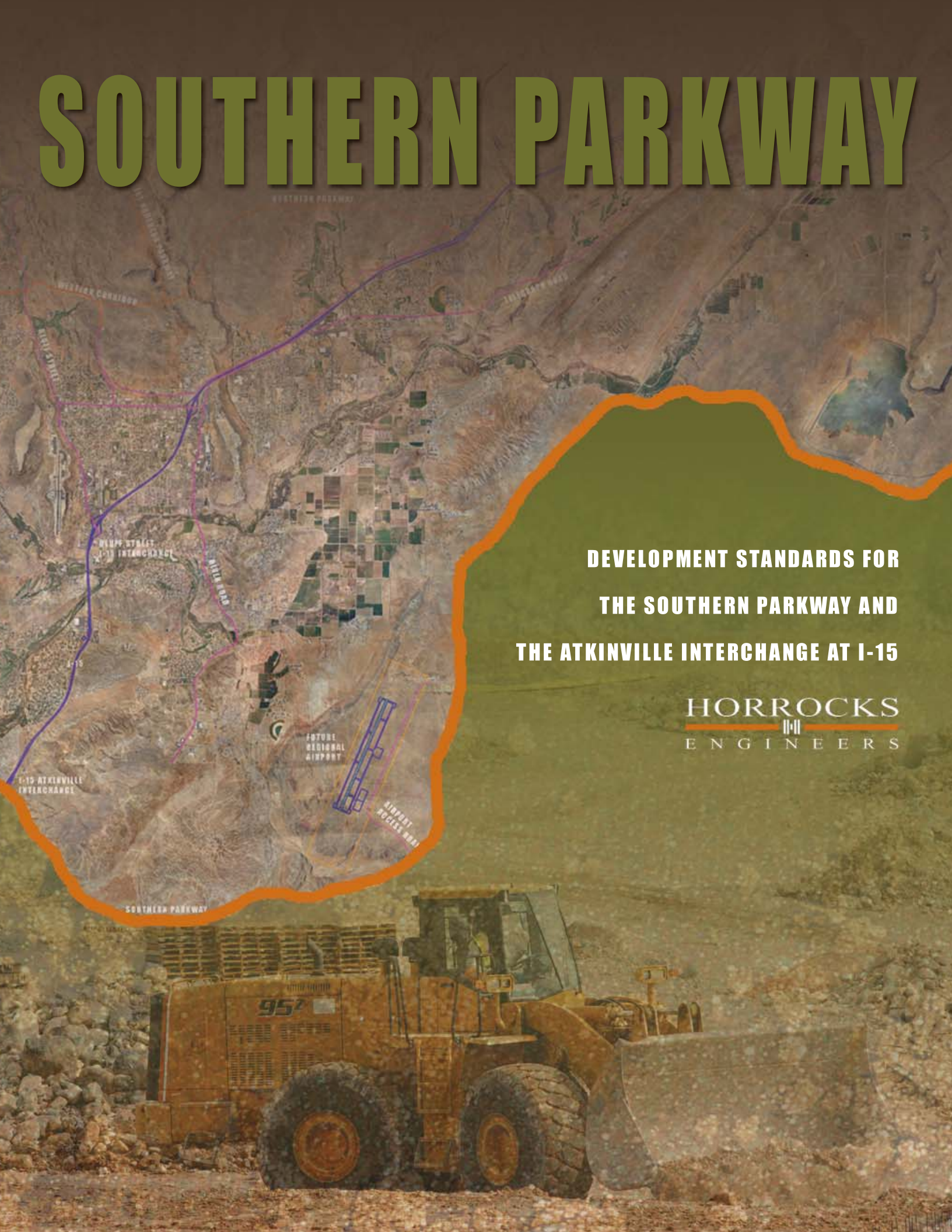
SOUTHERN PARKWAY



DEVELOPMENT STANDARDS FOR THE SOUTHERN PARKWAY AND THE ATKINVILLE INTERCHANGE AT I-15

HORROCKS ENGINEERS

DEVELOPMENT STANDARDS FOR

THE SOUTHERN PARKWAY AND

THE ATKINVILLE INTERCHANGE AT I-15

PREPARED FOR:

UDOT CONNECTING COMMUNITIES

PREPARED BY:

HORROCKS ENGINEERS

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SECTION 1.0 - INTRODUCTION

1.1 PURPOSE

The Atkinville Interchange at I-15 and the Southern Parkway will provide access to land that, up to this point has had very limited access. This manual will set standards for the design and construction of the Southern Parkway, interchanges along the Southern Parkway, frontage roads, and local streets. It will also, set the standards for access management along the Southern Parkway. Ultimately the Southern Parkway will act as a belt route beginning at I-15, MP 2 in St. George and connecting into State Route 9 in Hurricane. It is classified as a high speed arterial with intersecting roads ultimately to be grade separated.

A Final Environmental Impact Statement (FEIS) Report for the Southern Parkway has been completed and was approved by the Federal Highway Administration (FHWA). Therefore, there are environmental commitments that have been made by the Utah Department of Transportation (UDOT) that will have to be performed prior to, during, and/or after construction. Some of the design standards may be the result of the way that the Southern Parkway was defined in the FEIS.

This manual is not intended to supersede any published Standards, Policies, or Guidance Documents currently available. The criteria to be used on this project have been divided into four categories; Access Management, Operations, Geometrics, and Other Factors.

1.2 PROJECT LIMITS

The project is located in St. George, Utah (Washington County). The proposed location of the Atkinville interchange with I-15 is located at approximately MP 2.1, between the Atkinville Wash and the Visitor's Center. The crossroad is the Southern Parkway a 26 mile facility connecting St. George and Hurricane. Pioneer Road exists on the west side of I-15, which serves the Sun River Community. A frontage road is proposed on the east side of I-15 as part of the School and Institutional Trust Lands Administration (SITLA) Development.

The Southern Parkway will be constructed in phases. The first phase will include the Atkinville Interchange at I-15, connect to Sun River Parkway on the west side of the interstate, and connect to River Road, which is 2.5 miles east of the interstate. The Southern Parkway will be situated in a 300 foot right-of-way corridor.

SECTION 2.0 - APPLICABLE STANDARDS

The following documents contain standards that will be used in preparation of the design:

2.1 DESIGN STANDARDS

Utah Department of Transportation

- Standard Drawings
- Standard Specifications for Road and Bridge Construction
- Manual of Instruction, Roadway Drainage (January 2004)
- Manual of Instruction, Roadway Design
- Manual of Instruction, Right-of-Way (July 1996)

2.2 PUBLICATIONS & POLICIES

Utah Department of Transportation

- Engineering Technology Systems Manual (May 2003)
- Design Process Manual (September 2003)
- Accommodation of Utilities and the Control and Protection of State Highway Rights-of-Way (2003 Edition) – or Current Edition

American Association of State Highway and Transportation Officials (AASHTO)

- A Policy on Geometric Design of Highways and Streets (2004 Edition)
- Roadside Design Guide (2002 Edition)
- A Guide for Achieving Flexibility in Highway Design (May 2004)

Transportation Research Board (TRB)

- TRP Research Report 345 – Single Point Urban Interchange Design and Operations Analysis
- TRB - Highway Capacity Manual, HCM 2000

Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways

SECTION 3.0 – ACCESS MANGEMENT CRITERIA

The following section describes some of the access management standards set forth by UDOT in the Accommodation of Utilities and the Control and Protection of State Highway Rights-of-Way (2003 Edition) manual. UDOT has established these standards in order to protect the State Highway system in terms of safety, capacity, and operating speed.

3.1 State Highway Access Management Categories

Table 7.4-1 from the Highway Access Management Standards (shown in the Appendix) shows the access spacing standards for the following categories.

Roadway	Category	
I-15	Category 1	Freeway/Interstate
Southern Parkway	Category 3	System Priority Urban
Sun River Parkway (Western Corridor)	Category 5	Regional Priority Urban
Frontage Roads	Category 8	Community – Urban Importance
Local Roads	Category 8	Community – Urban Importance

3.2 Access Spacing

Roadway	Recommended Spacing
I-15	Per FHWA Interstate Requirements
Southern Parkway Westside	I-15 Interchange to existing Pioneer Road: 1,000 feet (Accepted by FHWA)
Southern Parkway Eastside	I-15 Interchange to Frontage Road access spacing: 1,320 feet min.
Interchanges along the Southern Parkway	From intersecting road to intersecting road: 4800' or with an Auxilliary lane 4500'
Frontage Roads/Local Roads	Signal spacing: 1,320 feet Street spacing: 500 feet Access spacing: 250 feet
Distance to First Access from Ramp	Access spacing: 500 feet

Spacing listed here are the recommended minimum distances center to center between intersections. All properties will be given the opportunity to have reasonable access after considering topography and other unique physical limitations of the site. These minimum distances may be modified to meet these criteria.

Signal spacing is measured from the centerline of the existing or future signalized intersection cross street to the center of the next existing or future signalized intersection cross street. Street and access spacing is measured from the centerline of the first street/access to the centerline of the next street/access.

3.3 Access Type

The Southern Parkway is classified as a high speed arterial with intersecting roads ultimately to be grade separated. However, the Southern Parkway will initially be a two-lane (one-lane in each direction) facility with at-grade intersections. At-grade Intersections will be where future grade separated interchanges are located. When an access to the Southern Parkway is approved construct acceleration and deceleration lanes along the mainline of the Southern Parkway, as shown in the appendix.

Grade separate all at-grade intersections when the Southern Parkway becomes a four-lane (two lanes in each direction) facility.

Determine the type of access on the Southern Parkway by using the traffic operations analysis at each location. Identify access points along the Southern Parkway as a potential traffic signal location and meet the spacing requirements for a traffic signal and grade separation. Refer to FEIS that has determined preliminary locations for grade separated accesses along the Southern Parkway. Meet the requirements specified in Section 4 for the use of signalized intersections on the Southern Parkway. Grade separate the Southern Parkway at I-15 with ramp connections for all movements.

Control access at intersecting streets based on the spacing requirements in the above table. Once access spacing requirements are met for the Southern Parkway, beyond this the local jurisdiction is responsible for granting access to adjacent streets and property.

SECTION 4.0 – OPERATIONAL CRITERIA

The following section is used to describe the operational criteria used to evaluate performance of project elements. These include functional classifications, number of lanes, and measures of performance.

4.1 Functional Classification

Roadway	Functional Classification
I-15	Freeway
Southern Parkway	Grade Separated Arterial
Sun River Parkway (Western Corridor)	Principal Arterial – Urban
Frontage Roads	Local – Urban
Local Roads	Varies

4.2 Regional Modeling & Travel Demand Forecasts (Design Years)

Traffic Modeling and Analysis will be evaluated at four critical time periods:
2005 – Initial interchange opening and limited land development
2015/2025 – Used to verify the implementation of phased roadway improvements
2035 – Planning horizon for interchange and connecting roadways

4.3 Basic Number of Lanes (Lane Requirements)

Roadway	Basic Lane Configuration
I-15	Southern Parkway Structure will accommodate for 6-lanes on I-15
Ramps	Per traffic analysis
Southern Parkway	4 General Purpose Lanes
Sun River Parkway (Western Corridor)	4 General Purpose Lanes + Center Lane
Frontage Roads/Local Roads	Per Traffic Analysis / local Master Plans

Auxiliary and/or turn lanes at intersections will be determined by a detailed traffic analysis. At a minimum, signalized intersections will require a dedicated left turn lane.

4.4 Measures of Performance

4.4.1 Level of Service (LOS)

The level of service for proposed elements of the project will be determined using procedures in the Highway Capacity Manual with methods relating to the type of feature (i.e. Multilane highway, signalized intersections, ramp termini, weave area, etc…). Acceptable LOS will be D or better. Phased roadway improvements will be evaluated at intermediate design years. Elements proposed in the initial construction will be required to be at LOS D or better in 2015 and LOS E in 2025. The ultimate build alternative will remove all elements performing below these limits.

4.4.2 System Delay

Proposed configurations of different interchange types and crossroad spacing will be evaluated using Highway Capacity analysis procedures for the specific design elements as well as the overall system delay of the proposed improvements. This will be done in order to compare various interchange to crossroad spacing designs.

SECTION 5.0 – GEOMETRIC DESIGN CRITERIA

5.1 General Design

The following section contains design criteria used for development of the roadway elements. Not all elements of a complete design are included; UDOT and AASHTO Standards will govern in all cases.

The ultimate build alternative will be developed for the year 2030. Intermediate design years will be used only to develop phasing alternatives for the interchange and connecting roadways.

The design vehicle is the Utah Department of Transportation interstate semi-trailer (WB-62) for I-15 and the Southern Parkway. Frontage and Local Roads may utilize a smaller design vehicle based upon proposed land use in the area.

Tables 5.1, 5.2, 5.3 show the design standards for the Southern Parkway, Interchanges, frontage and local streets respectively. The standards that have been given reference the AASHTO "A Policy on Geometric Design of Highways and Streets 2004" (Green Book), The UDOT Standard Drawings, and the AASHTO Roadside Design Guide 2002. The three main categories for the geometric design standards are Design Controls, Cross Section Elements, and Alignment Elements.

5.2 Alignments

5.2.1 Horizontal

Use AASHTO criteria for the appropriate design speed to establish horizontal curvature. Include adequate superelevation transition length for all curves. A maximum superelevation rate of 6.0% is to be used on all high-speed roadways. Low-speed roadways will utilize a maximum superelevation rate of 4.0%. Apply superelevation and side friction in accordance with AASHTO criteria (i.e Method 5 for high-speed roadways and Method 2 for low-speed urban roadways). Include adequate tangent between all reverse curves.

5.2.2 Vertical

Use AASHTO criteria for the selected design speed to establish vertical curvature. Minimum longitudinal grades for streets with curb and gutter or roadside barrier is 0.50%. Maximum longitudinal grades for each roadway are as follows:

5.3 Gore Area

Full depth pavement will be provided to a point where the edge of pavement of the ramp is 12 feet outside of the mainline edge of pavement. Independent alignment control begins/ends at this point. This is the same as the 40 feet from outside shoulder to outside shoulder lines shown in table 5.2.

5.4 Interchanges and Ramp Termini

5.4.1 Entrance Ramps

Use parallel type ramps capable of handling the proposed design speed at the ramp gore. Multiple lane entrance ramps will utilize a downstream auxiliary lane per AASHTO criteria.

5.4.2 Exit Ramps

Use taper type ramps per UDOT guidelines (20:1 preferable, 15:1 minimum). Multiple lane exit ramps require the addition of an auxiliary lane upstream of the exit gore per AASHTO criteria.

5.4.3 Ramp Terminal Spacing

Successive ramp terminals (exit – exit and entrance – entrance) will be separated by 1000 feet between common points.

Table 5.1 Southern Parkway Mainline Geometrics				
ITEM	AASHTO	UDOT	Southern Parkway	Comments
Design Controls				
Classification	Arterial	See AASHTO	Arterial	Major Arterial with grade separated intersections
Reference	GB P. 443	-		
Design Speed (mph)	65	See AASHTO	65	
Reference	GB P. 444	-		
Cross Section Elements				
Lane Widths (ft)	12	12	12	
Reference	GB P. 448	SD DD 11,12		
Left Shoulders (ft)	4-8	4-10	6	4' Paved + 2' Graded
Reference	GB P. 455	SD DD 11,12		
Right Shoulders (ft)	8	-	10	8' Paved + 2' Graded
Reference	GB P. 455	SD DD 11,12		
Barrier Offset (ft)	2	2	2	
Reference	GB P. 315	SD BA 1D, 1E, 4E		
Cross Slope (%)	1.5-2	2	2	
Reference	GB P. 446	SD DD 12		
Open Median Width (ft)	50	50 Min.	60 min.	Not including shoulder
Reference	RDG P. 62	SD DD 4		
Min. Clear Zone 6:1 Fore slope (ft)	30-32	See AASHTO	30	
Reference	Table 3.1 (RDG)			
Min. Clear Zone 6:1 Back slope (ft)	26-28	See AASHTO	26	
Reference	Table 3.1 (RDG)	-		
Min. Horizontal Underpass Clearances (ft)	Clear Zone	Clear Zone	Clear Zone	If clear zone cannot be met barrier will be used
Reference	GB P. 507	SD DD 11,12		
Alignment Elements				
Stopping Sight Distance (ft)	645	See AASHTO	645	
Reference	GB P. 445	-		
Min. Radius Normal Crown (ft)	9130	See AASHTO	9130	
Reference	GB P. 168	-		
Min. Radius Max Superelevation (ft)	1660	See AASHTO	1660	
Reference	GB P. 168	-		
Max. Superelevation (%)	6.0	See AASHTO	6.0	AASHTO Method 5
Reference	GB P. 144	-		

Table 5.1 Southern Parkway Mainline Geometrics				
ITEM	AASHTO	UDOT	Southern Parkway	Comments
Tangent Runout at Max. Superelevation (ft) Reference	Eq. 331 GB P. 191	See AASHTO -	Eq. 331	
Max. Grade (%) Reference	4.0 GB P. 446	See AASHTO -	4.0 Preferred 6.0 Max.	
Min. Grade (%) Reference	0.5 GB P. 236	See AASHTO -	0.5	
Min. Vertical Curve K-Crest Reference	193 GB P. 271	See AASHTO -	193	
Min. Vertical Curve K-Sag Reference	157 GB P. 275	See AASHTO -	157	
Min. Length of Vertical Curve (ft) Reference	210 GB P. 276	See AASHTO -	210	
Min. Bridge Vertical Clearance (ft) Reference	16 GB P. 506	16.5 SD DD 8	16.5	Bridges over drainage channels refer to the UDOT Drainage Manual
Min. Overhead Vertical Clearance (ft) Reference	17 GB P. 507	17.5 SD DD 8	17.5	Examples: Overhead Signs, Overhead Utilities

Notes:

GB = AASHTO "A Policy On Geometric Design of Highways and Streets 2004"

SD = 2005 UDOT Standard Drawings

RDG = AASHTO "Roadside Design Guide 2002"

Table 5.2 Interchange Ramp Geometrics				
ITEM	AASHTO	UDOT	Interchange Ramps	Comments
Design Controls				
Classification	Freeway/Arterial	See AASHTO	Freeway/Arterial	
Reference	GB P. 443, 503	-		
Ramp Design Speed (mph)	40	See AASHTO	40	Ramps speed varies, however 40 mph is the assumed speed at the gore.
Reference	GB P. 825	-		
Cross Section Elements Multilane Ramps				
Lane Widths (ft)	12-14	12-14	12-14	12' lanes will be used with multilane ramps and 14' lane when the ramp is a single lane.
Reference	GB P. 839	SD DD 4		
Paved Left Shoulders (ft)	4	4	4	
Reference	GB P. 838	SD DD 4		
Paved Right Shoulders (ft)	6-8	6-8	6-8	Shoulder width will be determined by lane width.
Reference	GB P. 839	SD DD 4		
Gore Area (ft)	-	40	40	From Mainline outside shoulder to outside shoulder of ramp.
Reference	GB P. 833	SD DD 6		
General Cross Section Elements				
Barrier Offset (ft)	2	2	2	
Reference	GB P. 315	SD BA 1D, 1E, 4E		
Cross Slope (%)	1.5-2	2	2	
Reference	GB P. 829	SD DD 12		
Min. Clear Zone 6:1 Fore slope (ft)	20	See AASHTO	20	
Reference	Table 3.1 (RDG)			
Min. Clear Zone 6:1 Back slope (ft)	20	See AASHTO	20	
Reference	Table 3.1 (RDG)	-		
Alignment Elements				
Stopping Sight Distance (ft)	305	See AASHTO	305	
Reference	GB P. 112	-		
Min. Radius Normal Crown (ft)	3770	See AASHTO	3770	
Reference	GB P. 168	-		
Min. Radius Max Superelevation (ft)	485	See AASHTO	485	
Reference	GB P. 168	-		
Max. Superelevation (%)	6.0	See AASHTO	6.0	AASHTO Method 5
Reference	GB P. 144	-		

Table 5.2 Interchange Ramp Geometrics				
ITEM	AASHTO	UDOT	Interchange Ramps	Comments
Tangent Runout at Max. Superelevation (ft) Reference	Eq. 331 GB P. 191	See AASHTO -	Eq. 331	
Max. Grade (%) Reference	6.0 GB P. 446	See AASHTO -	6.0	
Min. Grade (%) Reference	0.5 GB P. 236	See AASHTO -	0.5	
Min. Vertical Curve K-Crest Reference	44 GB P. 271	See AASHTO -	44	
Min. Vertical Curve K-Sag Reference	64 GB P. 275	See AASHTO -	64	
Min. Length of Vertical Curve (ft) Reference	120 GB P. 276	See AASHTO -	120	
Min. Bridge Vertical Clearance (ft) Reference	16 GB P. 506	16.5-17 SD DD 8	16.5-17.0	Bridges over drainage channels refer to the UDOT Drainage Manual
Min. Overhead Vertical Clearance (ft) Reference	17 GB P. 507	17.5 SD DD 8	17.5	

Notes:

GB = AASHTO "A Policy On Geometric Design of Highways and Streets 2004"

SD = 2005 UDOT Standard Drawings

RDG = AASHTO "Roadside Design Guide 2002"

Table 5.3 Frontage and Local Roads Geometrics				
ITEM	AASHTO	UDOT	Frontage/Local	Comments
Design Controls				
Classification	Local	See AASHTO	Local	
Reference	GB P. 379	-		
Design Speed (mph)	30-40	See AASHTO	30-40	
Reference	GB P. 381	-		
Cross Section Elements Multilane Ramps				
Lane Widths (ft)	11-12	-	11-12	
Reference	GB P. 393	-		
Two way left turn lanes	12	12	12	
Reference	GB P. 393	SD DD 4		
Paved Right Shoulders (ft)	4-6	4-6	4-6	
Reference	GB P. 384	SD DD 4		
General Cross Section Elements				
Barrier Offset (ft)	2	2	2	At least 4' from the traveled way
Reference	GB P. 383	SD BA 1D, 1E, 4E		
Cross Slope (%)	1.5-2	2-3	2	
Reference	GB P. 383	SD DD 12		
Min. Clear Zone 6:1 Foreslope (ft)	14	See AASHTO	14	
Reference	Table 3.1 (RDG)			
Min. Clear Zone 6:1 Backslope (ft)	14	See AASHTO	14	
Reference	Table 3.1 (RDG)	-		
Curb and Gutter (ft)	-	2.5w X 0.5h	2.5w X 0.5h	UDOT Type B1 Curb and Gutter
Reference	-	SD GW 2		
Alignment Elements				
Stopping Sight Distance (ft)	200-305	See AASHTO	200-305	
Reference	GB P. 381	-		
Min. Radius Normal Crown (ft)	3220	See AASHTO	3220	
Reference	GB P. 167	-		
Min. Radius Max Superelevation (ft)	533	See AASHTO	533	
Reference	GB P. 167	-		
Max. Superelevation (%)	4.0	See AASHTO	4.0	AASHTO Method 2 (Low Speed Urban)
Reference	GB P. 144	-		
Tangent Runout at Max. Superelevation (ft)	Eq. 331	See AASHTO	Eq. 331	
Reference	GB P. 191	-		

Table 5.3 Frontage and Local Roads Geometrics				
ITEM	AASHTO	UDOT	Frontage/Local	Comments
Max. Grade (%) Reference	7.0 GB P. 382	See AASHTO -	7.0	
Min. Grade (%) Reference	0.5 GB P. 236	See AASHTO -	0.5	
Min. Vertical Curve K-Crest Reference	19-44 GB P. 381	See AASHTO -	19-44	
Min. Vertical Curve K-Sag Reference	37-64 GB P. 381	See AASHTO -	37-64	
Min. Length of Vertical Curve (ft) Reference	120 GB P. 276	See AASHTO -	120	
Min. Bridge Vertical Clearance (ft) Reference	16 GB P. 506	16.5-17 SD DD 8	16.5-17.0	Bridges over drainage channels refer to the UDOT Drainage Manual
Min. Overhead Vertical Clearance (ft) Reference	17 GB P. 507	17.5 SD DD 8	17.5	

Notes:

GB = AASHTO "A Policy On Geometric Design of Highways and Streets 2004"

SD = 2005 UDOT Standard Drawings

RDG = AASHTO "Roadside Design Guide 2002"

SECTION 6.0 – TRAILS

6.1 Trail Commitments

A bike/pedestrian trail has been planned to run parallel along the Southern Parkway alignment. This would be a 10 foot paved trail.

6.2 Trail Planning

Along with the trail that will run along the Southern Parkway there are also trails that are being planned in commercial or residential developments that will be going in next to the Southern Parkway. If trails that are being planned through development areas can make logical connections in and out of the development and tie into the Southern Parkway trail it would not be necessary for the trail to run parallel to the Southern Parkway.

6.3 Bicyclists

Bicyclists will be able to travel along the corridor by using the trail system and will share the roadway with vehicles in accordance with the law.

SECTION 7.0 – UTILITIES

7.1 Southern Parkway Mainline

Prohibit utilities from being placed parallel to the Southern Parkway that are not for the purpose of the Parkway. Examples of acceptable utilities would include ATMS, storm drain pipe, electrical conduit for roadway lighting and other similar utilities that are for the function of the Southern Parkway. All necessary utilities that need to cross the Southern Parkway will be accommodated. Bore all utility crossings once the Southern Parkway is constructed. Allow no trenches across the Southern Parkway road surface.

APPENDIX

7.4.3 State Highway Access Management Standards

Table 7.4-1 summarizes State Highway Access Management Standards regarding minimum desired signal spacing, street, access spacing, and interchange crossroads access spacing.

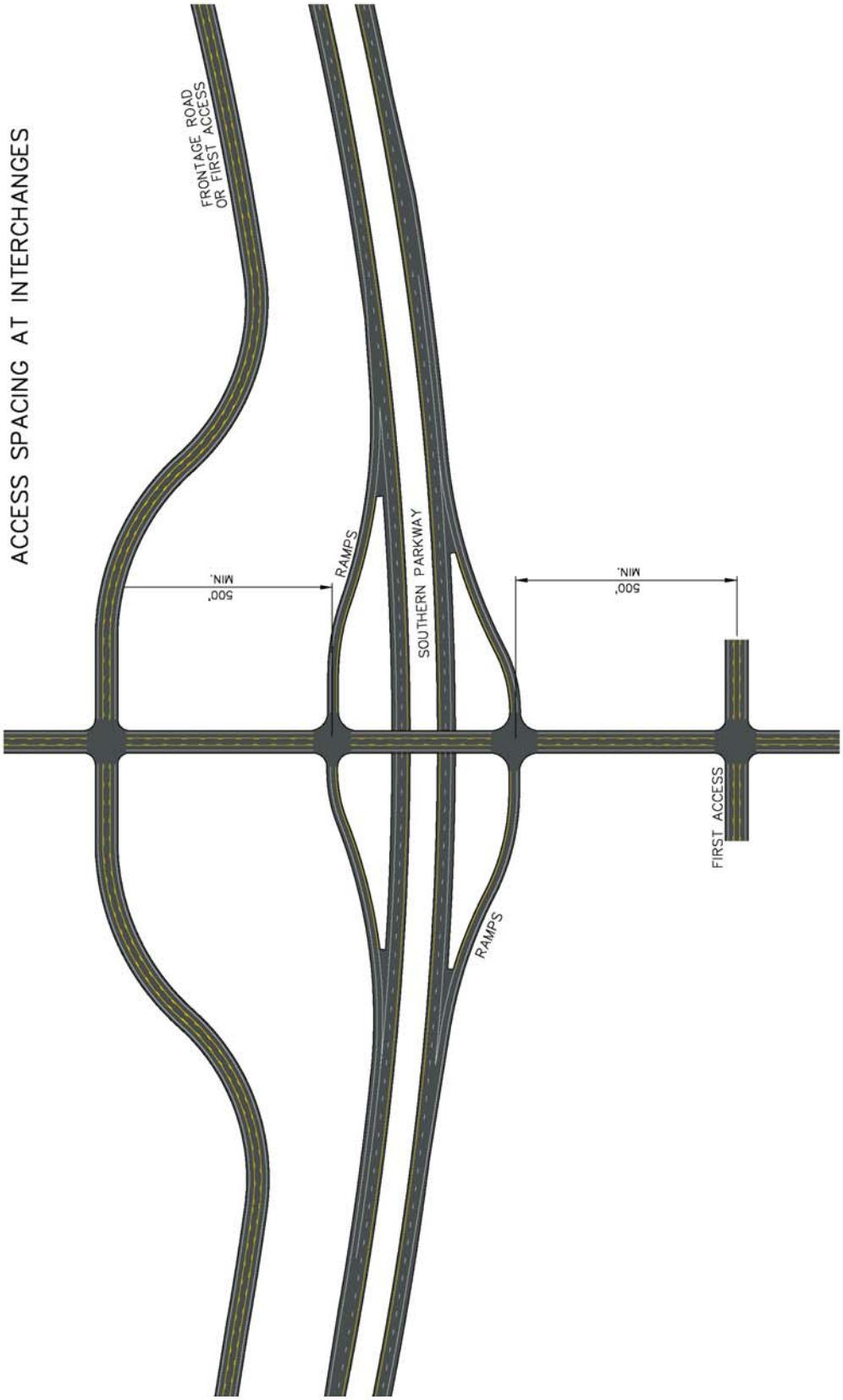
Table 7.4-1: State Highway Access Management Standards

Category	Minimum Signal Spacing (feet)	Mimimum Street and Full Access Spacing (feet)	Mimimum Rt In Rt Out Access Spacing (feet)	Mimimum Access Spacing Near at Grade Interchanges (feet)		
				to 1st R-in R-out A	to 1st Intersection B	from last R-in R-out C
1	Interstate/Freeway Standards Apply					
2	5,280	No Unsignalized Access Permitted		2,640	2,640	2,640
3	2,640			1,320	2,640	2,640
4	1,320			1,320	1,320	1,320
5	2,640	800	400	660	1,320	500
6	2,640	660	330	660	1,320	500
7	1,320	660	330	660	1,320	500
8	1,320	500	250	Not Applicable		
9	1,320	300	150			

Minimum interchange crossroads access spacing standards A, B, and C are defined as follows:

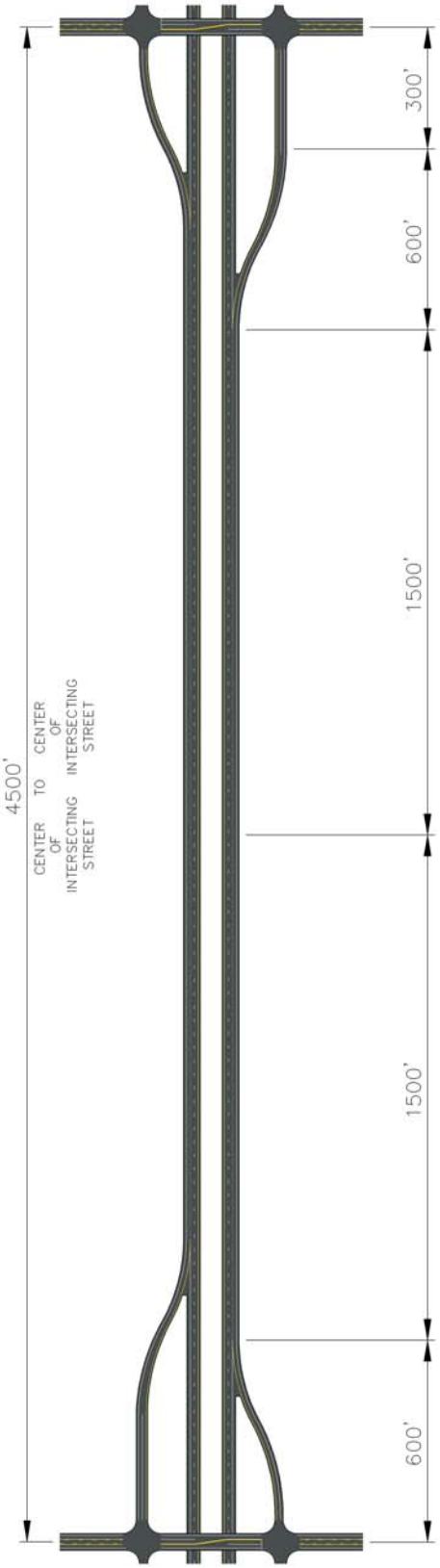
1. Standard “A” refers to the distance from the interchange off-ramp gore area (point of widening) to the first right-in/out driveway intersection
2. Standard “B” refers to the distance from the interchange off-ramp gore area (point of widening) to the first major intersection
3. Standard “C” refers to the distance from the last right-in/out driveway intersection to the interchange on-ramp gore area (point of widening).

*Note: A grant of access does not guarantee a right or interest of full movement access.


ACCESS SPACING AT INTERCHANGES
FRONTAGE ROAD OR FIRST ACCESS
RAMPS
SOUTHERN PARKWAY
500' MIN.
500' MIN.
FIRST ACCESS
RAMPS

MINIMUM INTERCHANGE SPACING

WITH AUXILIARY LANE

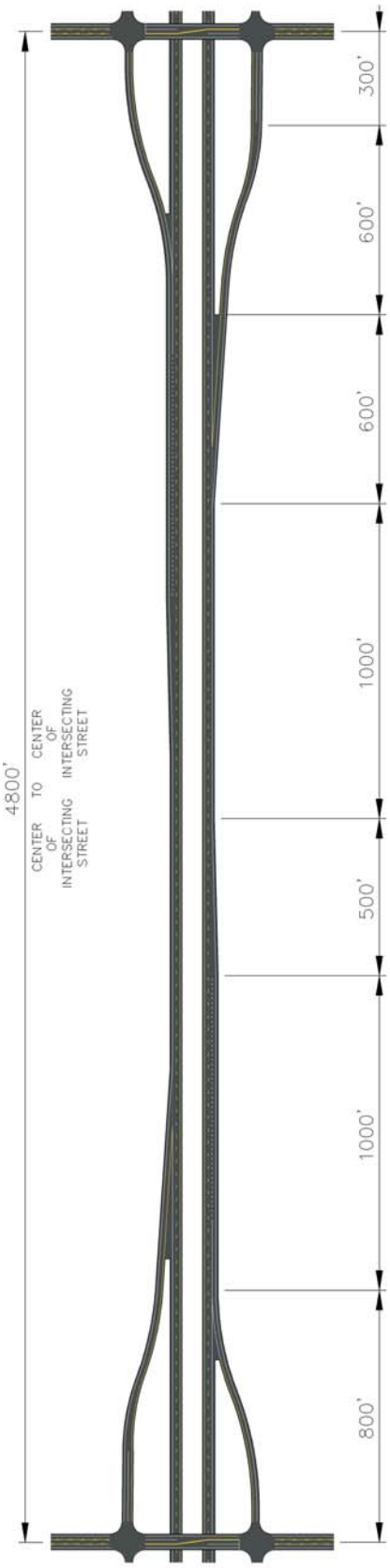


*600' ACCELL TO 40 mph
1500' ON RAMP INFLUENCE AREA
1500' OFF RAMP INFLUENCE AREA
*600' DECELERATION
*300' STORAGE

4500' TOTAL

* CHECK HORIZONTAL AND VERTICAL GEOMETRY

MINIMUM INTERCHANGE SPACING

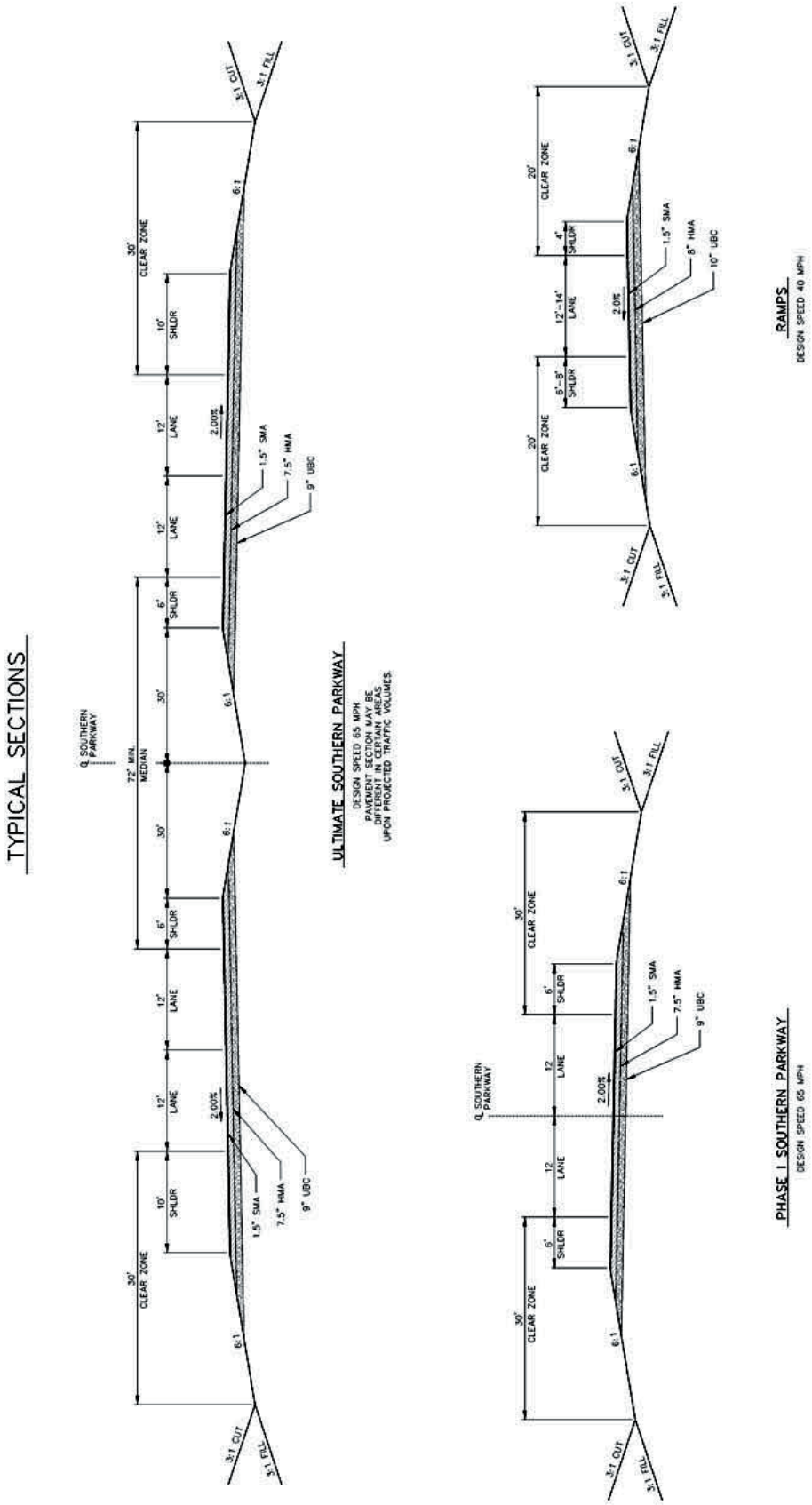


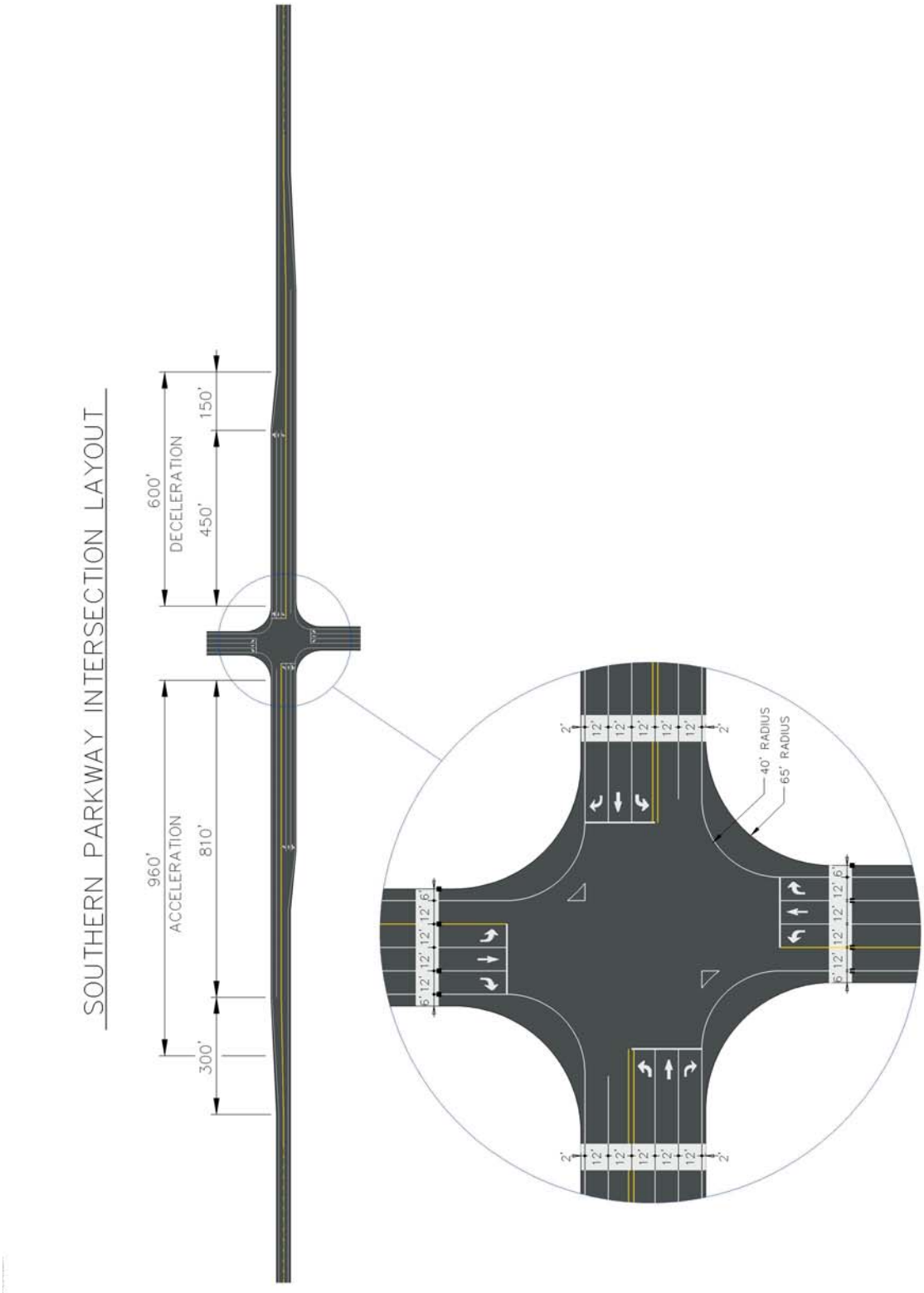
*800' ACCELL TO 40 mph
1000' MIN. PARALLEL
500' TAPER
1000' NORMAL
600' TAPER OFF
*600' DECELL
*300' STORAGE

4800' TOTAL

* CHECK HORIZONTAL AND VERTICAL GEOMETRY

TYPICAL SECTIONS




SOUTHERN PARKWAY INTERSECTION LAYOUT
600'
DECELERATION
150'
450'
960'
ACCELERATION
810'
300'
40' RADIUS
65' RADIUS
2'
12'
6'