

## **APPENDIX F-B**

### **Highway Interface Manual**





## **Highway Interface Manual**

**February 8, 2011**

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## 1.0 Introduction

### 1.1. Project Description

The DesertXpress project is a high speed interstate passenger railroad that will extend nearly 200 miles from Victorville, California to Las Vegas, Nevada, on new, high-quality, exclusive double track, with no at-grade crossings. DesertXpress will provide a convenient and efficient travel alternative to I-15, with trains departing from both ends of the line as frequently as every 20 minutes on Fridays and Sundays, and hourly during most of the week.

Pending the results of the Final EIS, which is evaluating both diesel/electric and Electric Multiple Unit (EMU) train technologies, this document assumes that the DesertXpress passenger trains will operate as EMUs, consisting of up to 10 cars, initially operating during peak periods at peak-hour headways of 20 minutes in both directions. These trains will travel at speeds up to 150 mph. As a result of feedback from interagency working group meetings with participation from the California Department of Transportation (Caltrans), the Nevada Department of Transportation (NDOT), the Federal Highway Administration (FHWA), and the Federal Railroad Administration (FRA), the alignment is anticipated to generally follow the north/west side of the I-15 right-of-way in a side-running configuration, although a median running alternative also has been evaluated in the EIS.. Highway crossovers are also expected for the side-running configuration.

The DesertXpress project does not require any permanent modified access to I-15: no additional access points and no new interchanges. Temporary access during construction may be requested. For safety and security reasons, access to the parallel maintenance and inspection roadway that is within the fenced and intrusion-protected trackway shall be restricted only to authorized personnel from authorized entities. Access to the trackway shall only be provided from local roadways at interchanges and overpasses along the entire route (not from I-15 directly). The final emergency response plan will identify which entities can access the trackway at those controlled access points and provide the protocol and control procedures that govern that access. The highway agencies will provide input to the emergency response plan.<sup>1</sup>

### 1.2. Purpose of this document

The purpose of this document is to provide guidance for implementing the DesertXpress Project within the CALTRANS and NDOT highway rights of way, and includes such elements as: highway design standards, barriers, emergency

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<sup>1</sup> 49CFR 239. The FRA has the lead with consultation with highway agencies

access, maintenance of traffic, etc. This document is also intended to provide guidance to the development of a right-of-way plan, in accordance with 49CFR213.361, which requires the owner of railways using Class 8 and/or Class 9 track to submit a barrier plan, termed a “right-of-way plan,” to the Federal Railroad Administration for approval. At a minimum, that plan must contain provisions in areas of demonstrated need for prevention of:

- Vandalism;
- Launching of objects from overhead bridges or structures into the path of trains; and
- Intrusion of vehicles from adjacent rights-of-way

Design parameters and specifications for the rail components of the project are contained in the Design/Construction Interface Manual, which was specifically prepared for the DesertXpress Project. Because the project is being implemented through a design/build process, this manual shall be provided to the selected design/build contractor team as a mandatory design requirement document, and the contractor’s design submittals will be reviewed to ensure consistency with the design requirements contained herein.

Rail components within the existing Interstate right-of-way or modifications to the freeway must be reviewed and approved at various stages of the design/build process by CALTRANS, NDOT, and FHWA. The process and schedule for these reviews will be as set forth in an agreement between these highway agencies and DesertXpress. Project elements within the Interstate right-of-way require approval by the highway agencies, including the following:

- Clear zone
- Barriers
- Bridges and tunnels
- Vertical clearance
- Retaining walls
- Drainage
- Median crossings for emergency vehicles
- Sight distance
- Fencing
- Visual screening
- Locked-gate access
- Temporary construction access
- Freeway interchanges or ramps
- Signing and striping
- Emergency Preparedness Plan
- Security Plans

### 1.3. Reference Projects

In completing this document, consideration was given to similar projects that have been planned and/or executed. While California has not yet fully designed or implemented a High Speed Rail line, BART has implemented several heavy rail extensions, such as the Dublin - Pleasanton Extension, which operates alongside or in the median of State Route 238 and Interstate 580. These BART trains are somewhat similar to the DesertXpress EMUs in that they also have no locomotives and can have electric propulsion on each car of the train, although they are somewhat lighter weight trains designed to operate at maximum speeds of up to 80 mph rather than 150 mph. Nevada has no comparable operating transit mode, except for the Las Vegas Monorail in place over Clark County streets.

The BART Dublin-Pleasanton Extension (DPX) is also the subject of lessons learned. Upon its completion, DPX experienced a significant number of intrusions into the rail right-of-way by cars and trucks. These incidents led to an in-depth study to determine how/why these incursions occurred, and to develop specific solutions for each problem identified.

In addition, the design engineers referenced the request for proposals (RFP) and environmental impact analysis that was completed several years ago for the planned Florida High Speed Rail Project. While this project has not yet been implemented, the RFP incorporated design parameters for operating the proposed high-speed trains within an existing highway right-of-way.

## 2.0 Codes and Regulations

### 2.1. Introduction

All highway infrastructure design shall be performed in accordance with applicable FHWA, Caltrans, or Nevada DOT Standards, while the design of railroad track and structures will comply with applicable FRA and AREMA standards.

In general, applicable regulations and codes take precedence over these standards. In the case of differing values between the governing regulations, codes and standards, the criterion followed shall be that which results in the satisfaction of all applicable requirements. Standards shall be mandated as required for securing regulatory approval.

Recognizing that the existing highway drainage system was not designed to accommodate an adjacent high speed railway, additional drainage requirements for the railroad right-of-way, and to the extent necessary, a separate drainage system and flood management plan will be designed and installed for the DesertXpress right-of-way, the design requirements of which will be documented in a separate design manual prepared during the phase of preparing the final designs. The highway agencies will have input to that effort.

### 2.2. FHWA

All modifications to the Interstate infrastructure clearance will be designed in accordance with the most current FHWA policies and standards.

In any locations where the DesertXpress infrastructure occupies land that will remain part of the Interstate right-of-way, approval by FHWA of an Interstate Access Request is required. This includes locked-gate access from the freeway or cross-roads for maintenance or emergencies and also includes temporary access for construction.

The provisions of the AASHTO *Roadside Design Guide* regarding clear zone width and barrier design should also be followed where practicable and consistent with state highway agency design standards and requirements.

- 2.2.1 Title 23 of the Code of Federal Regulations, Part 625, Part 630, and 636
- 2.2.2 *AASHTO A Policy on Design Standards Interstate System*
- 2.2.3 *AASHTO A Policy on Geometric Design of Highways and Streets*
- 2.2.4 [FHWA Policy on Access to the Interstate System](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2009_register&docid=fr27au09-110)  
([http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2009\\_register&docid=fr27au09-110](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2009_register&docid=fr27au09-110))



- 2.2.5 Interstate System Access Informational Guide  
(<http://www.fhwa.dot.gov/design/interstate/pubs/access/index.cfm>)
- 2.2.6 NCHRP Report 492, Roadside Safety Analysis Program Engineer's Manual

### 2.3. California Department of Transportation (Caltrans)

All modifications to Caltrans infrastructure or improvements within Caltrans right of way will be designed in accordance with the most current Caltrans Manuals, Standards and Specifications (<http://www.dot.ca.gov/manuals.htm>), including but not limited to:

- 2.3.1. Highway Design Manual;
- 2.3.2. Plans Preparation Manual;
- 2.3.3. Project Development Procedures Manual;
- 2.3.4. Right-of-Way Manual;
- 2.3.5. Surveys Manual;
- 2.3.6. Bridge Design Practice Manual;
- 2.3.7. Guidelines for Structures Foundations Reports; Foundation Report Preparation for Bridge Foundations; Guidelines for Preparing Geotechnical Design Reports; Soil and Rock Logging, Classification, and Presentation Manual; Foundation Manual; and Geotechnical Manual;
- 2.3.8. California Manual on Uniform Traffic Control Devices;
- 2.3.9. Highway Safety Manual
- 2.3.10. Traffic Manual, Chapter 7; and
- 2.3.11. Storm Water Quality Handbook – Project Planning and Design Guide.

Any deviations from Caltrans Manuals, Standards or Specifications will require written approval before final design.

### 2.4. Nevada Department of Transportation

All modifications to Nevada DOT infrastructure will be designed in accordance with the most current NDOT Manuals and standards, including:

- 2.4.1. Project Design Development Manual - Roadway, Traffic
- 2.4.2. Bridge Design and Procedures Manual
- 2.4.3. Hydraulic Design Manual
- 2.4.4. Geotechnical Policies and Procedures Manual
- 2.4.5. Standard Specifications for Road and Bridge Construction
- 2.4.6. Standard Plans for Road and Bridge Construction

- 2.4.7. HOV/Managed Lanes and Ramp Metering Policy Manual
  - 2.4.8. Access Management System and Standards
  - 2.4.9. Storm Water Planning and Design Manual
  - 2.4.10. Pattern and Palette of Place (landscape and aesthetics master plan)
- 2.5. Railroad Standards
- 2.5.1. Railroad track, structures, and catenary electrical clearances shall be designed in accordance with recommended practice of the American Railway Engineering and Maintenance of Way (AREMA) Manual for Railway Engineering 2010, as applicable.
  - 2.5.2. Tracks shall be designed to meet applicable requirements of Track Safety Standards, 49CFR213 Subpart G.
  - 2.5.3. Railroad signals and communication shall be designed in accordance with recommended practice of the American Engineering and Maintenance of Way (AREMA), Communications and Signal, as applicable.
  - 2.5.4. The DesertXpress will be certified through the FRA process and will comply with the Code of Federal Regulations (CFR), specifically 49 CFR Parts 200-299.

## 3.0 Protection Against Intrusion

### 3.1. Introduction

In view of the fact that the DesertXpress project is expected to operate adjacent to (or in some cases, within) a highway corridor, it is important to protect the railroad right-of-way against intrusion by unguided automotive vehicles, including motorcycles, automobiles, light trucks, and over-the-road trucks.

Studies have indicated that on high speed highways, a clear width of thirty (30) feet from the edge of the traveled way permits about 80 percent of the vehicles leaving the roadway out of control to recover. However, more recent studies of where rail corridors parallel roadway and highways, such as the one that was commissioned by BART for the Dublin-Pleasanton Extension (DPX), have concluded that:

- As the distance from the edge of the travel lane to the barrier increases, so does the angle that the out of control vehicle approaches the barrier. The greater the approach angle, the greater the impact and likelihood that an errant vehicle will penetrate the barrier.
- Uneven terrain between the edge of the traveled lane and the barrier can provide the impetus for a vehicle to “vault” over the barrier.

It is therefore considered of greatest importance to mitigate the possibility of a vehicle penetrating the DesertXpress right-of-way, by providing barriers between the railway and the roadway. Since barriers may present a risk of increased severity for run-off-the-road crashes, the barriers will be placed beyond the roadway clear zone to the maximum extent possible. At locations where the full clear zone distance cannot be achieved, the placement of the barrier needs to be determined with consideration given both the frequency of impact and the angle of impact. When the barrier is placed at the shoulder, there is a smaller angle of impact and thus a less severe crash. When the barrier is placed further away, the frequency of crashes is reduced, but the severity of crashes increases with the increase angle of impact. The Roadside Safety Analysis Program, as described in NCHRP Report 492, provides a methodology for determining the optimum placement of barrier when the barrier is within the roadway clear zone.

The width of the I-15 Corridor, and how the DesertXpress right-of-way fits within this corridor, varies according to location. Accordingly, the distance between the DesertXpress right-of-way and the highway travel lanes will vary. The final design plans for DesertXpress will delineate this spacing throughout the length of the corridor, but in no case shall the spacing be less than the minimum distances shown in the attached cross sections. The size and type of barrier will be determined by the relative proximity and geometry of the rails to that of the highway, as described in Section 3.2, below.

### 3.2. Barriers

#### 3.2.1. Railroad Alignment to the Side of I-15.

- a) Where the top of rail (TOR) is at or below the adjacent traveled lanes, permanent 72-inch high concrete barriers complying with Caltrans concrete barrier, Type 60 series, or Nevada DOT Type FA, or FD barrier, as appropriate, shall be installed between the guideway and the parallel roadway.
- b) Where the guideway is on an earthen fill structure, with the TOR more than six (6) feet above the adjacent travel lanes and with vertical walls exceeding 4 ft. in height above the roadway shoulder, no barrier is required. However, the base of the wall shall incorporate the same profile as the Type 60 series barrier, or Nevada DOT Type FB barrier, to redirect a vehicle from its errant path.

#### 3.2.2. Railroad Alignment in the Median of I-15

- a) Where the TOR is at or below the adjacent traveled lanes, permanent 72-inch high concrete barriers complying with Caltrans concrete barrier Type 60 series; or Nevada DOT Type FA, or FD barrier, as appropriate, shall be installed between the guideway and the parallel traveled lanes.
- b) Where the guideway is on an earthen fill structure with the TOR more than six (6) feet above the adjacent travel lanes and with vertical walls exceeding 4 ft. in height above the roadway shoulder, no barrier is required. However, the base of the wall should incorporate the same profile as the Type 60 series barrier, or Nevada DOT Type FB barrier, to redirect a vehicle from its errant path.

#### 3.2.3. Grade Separated Crossings:

- a) Highway/Road Overpasses:
  - i) Based on the proposed DesertXpress EMU trains, the minimum clearance between any overhead structure and the TOR is 16'09". This will allow a minimum of 1'00" clearance between the overhead contact wire and the existing structure. In circumstances where vertical clearances are less than 20'00", it is generally assumed that the overhead contact wire will be supported via insulated hangers, fixed directly to the existing overhead structure. Highway and rail agencies need to concur on clearance final designs to ensure sufficient clearance between rail electrical system and highway infrastructures.(see 23 CFR 646)
  - ii) Where overhead highway structures cross the DesertXpress right-of-way, their piers shall be protected by crash walls that are

specifically designed to withstand the impact of a derailed train, and shall be profiled to deflect a derailed train away from the supporting structure. At a minimum, crash walls shall be installed per the requirements of AREMA Manual for Railway Engineering, Chapter 8, Section 2.1.5. Their design will reflect the actual impact loads that would be generated by the DesertXpress trains, rather than the loads generally used for heavier, freight rail vehicles. The rail, highway, and Homeland Security agencies will review and concur with this new design.

- iii) Curved overhead highway structures that cross over the trackway shall be provided with Caltrans Type 60 series, or Nevada DOT Type A or B highway barriers, as appropriate.
- b) Rail Overpasses/Structures: Where the trackway is on a pier supported structure within the highway right-of-way, Caltrans Type 60 series barriers, or Nevada DOT Type FB barriers, as appropriate, shall be used to protect trackway piers and the occupants of highway vehicles. This will include the straddle bents for the highway crossovers and other locations.

Where adequate clearance is available and protection can be provided, the area beneath the trackway may be utilized for other transportation purposes, such as travel lanes and shoulders, or sidewalks.

- c) Where such highway overpasses extend over the DesertXpress trackway, DesertXpress shall provide adequate fencing on those overpasses to protect objects from being dropped onto the trackway, the design of which shall be consistent with Caltrans and NDOT design requirements.

### 3.3. Fencing

All accessible areas of the Railroad Right-of-Way shall be provided with protection against guideway and right-of-way entry by unauthorized persons, large animals and objects. Such protection shall be provided by chain link fencing at least six (6) feet high, installed longitudinally within the guideway, between any barrier structure and the track, at a distance of approximately 30 inches from the centerline of the barrier, if provided. Alternatively, the fence may be mounted on top of the barrier. The combined height of the barrier structure and fence shall be at least six (6) feet and fencing shall not be required where any barrier or retaining wall height would exceed six (6) feet in height. Overhead highway bridge structures shall include chain link fencing across the width of the guideway, plus 20 feet on either side, to aid in the prevention of acts of vandalism. Special fencing to protect the desert tortoise or other wildlife is expected as well. The highway agencies will assist as necessary in its selection.

### 3.4. Intrusion Detection System

All fenced areas of the Railroad Right-of-Way that could be accessed on foot by unauthorized persons shall incorporate an intrusion detection system, such as continuity wire loops, that is capable of detecting large objects that may strike or rupture the chain link fence. Where such fencing is not required, such as where the trackway is on an elevated structure or isolated by high retaining walls or barriers, intrusion detection is not mandatory but shall be installed wherever a comprehensive Hazards Analysis shows that unauthorized intrusion is possible. The intrusion detection system shall be tied into the train control system to allow either warning or train stop, as determined by the System Safety Plan. Traveler information systems and other ITS elements put in place by DXE, NDOT or Caltrans will be shared with the other parties in order to use the same applicable ITS national standards.

## 4.0 Emergency Access

### 4.1 Introduction

A comprehensive emergency response plan shall be submitted to the FRA, coordinated with the highway agencies, and appropriate emergency response organizations for review and approval during the final design phase.

### 4.2 Median Running Alternative

#### 4.2.1 Cross Median Emergency Access:

At the time of this final draft of the Manual, it is unlikely that there will be any at-grade median running sections in the project. However, in the event there is a segment that has an at-grade trackway within the median of I-15, except where the guideway is on a pier supported aerial structure, the right-of-way will be protected by Type 60 series or equivalent barriers and fencing that will preclude cross median access for emergency vehicles. To provide for cross median authorized emergency vehicle traffic, the DesertXpress project will provide bridges for the exclusive use of emergency vehicles to pass under the trackway. Including existing accessible highway overpasses and underpasses, these will provide cross median access every ten (10) miles, at a minimum. See Figure 4.1 for details.

#### 4.2.2 Parallel Emergency Access:

If lanes need to be reconstructed to accommodate median running in the I-15 Corridor, a minimum twelve (12) foot graded side clearance between the right-of way fencing and the Type 60 series barriers will be provided to accommodate the movement of emergency vehicles parallel to the traveled lanes.

### 4.3 Side Running

#### 4.3.1 Cross Median Emergency Access:

The side running alternative shall not impact cross-median emergency access.

#### 4.3.2 Parallel Emergency Access:

A minimum twelve (12) foot graded side clearance between the right-of way fencing and the Type 60 series barriers will be provided to accommodate the movement of emergency vehicles parallel to the traveled lanes.

### 4.4 Maintenance of Traffic

- 4.4.1 All construction that would impact the normal function of the I-15 corridor in California will be controlled by a Temporary Traffic Control Plan, in accordance with the California Manual on Uniform Traffic Control Devices, Part 6, Temporary Traffic Control
- 4.4.2 All construction that would impact the normal function of the I-15 corridor in Nevada will be controlled by a Temporary Traffic Control Plan, in accordance with the Manual on Uniform Traffic Control Devices, Part 6, Temporary Traffic Control. Coordination with NDOT and Caltrans, District 8 TMC San Bernardino, and the NDOT/RTC Freeway and Arterial System of Transportation (FAST) will be required.

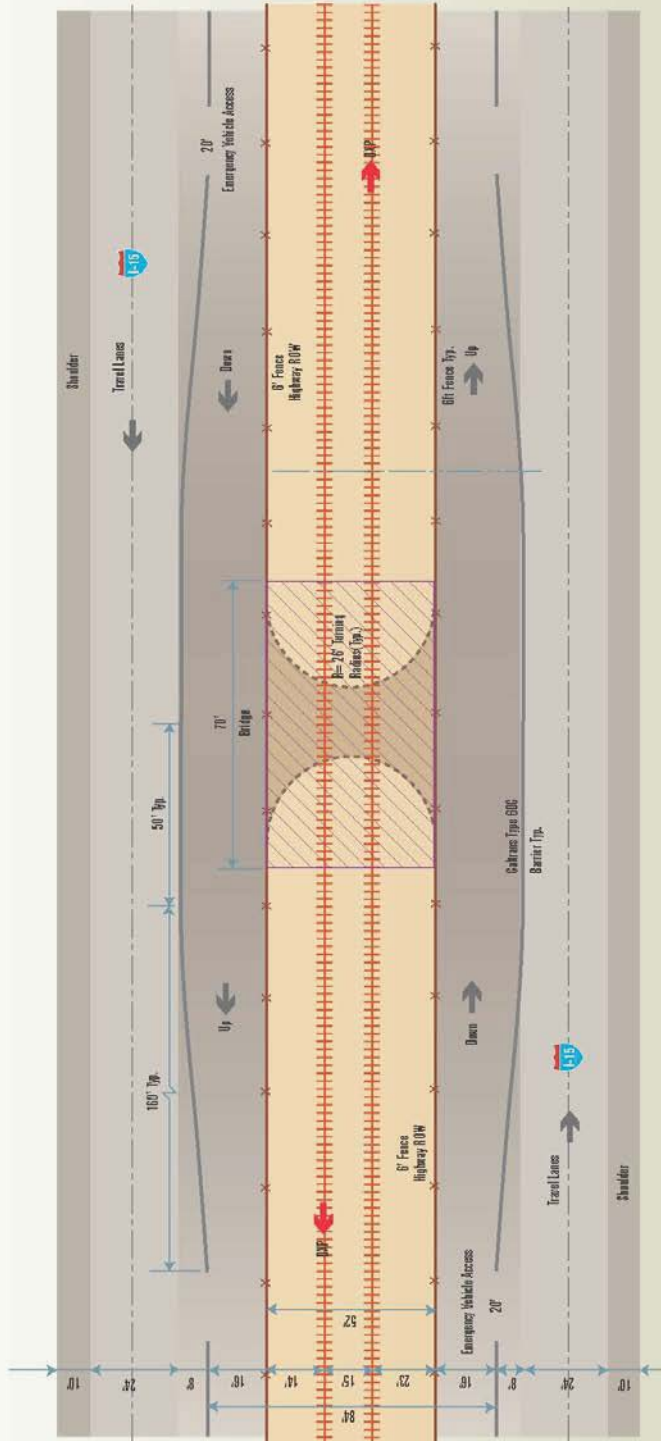
#### 4.5 Emergency Evacuation

As part of the DesertXpress System Safety Plan, an Emergency Procedure Plan to cover the emergency evacuation of passengers and staff will be developed, in accordance with NFPA 130, Chapter 9 – Emergency Procedures and 49 CFR 239 – Emergency Preparedness Plan. For almost all emergency scenarios, the Plan will require passengers to remain in the trains. The emergency responder, rail and highway agencies will review and concur with portions of that plan for segments within their ROW.

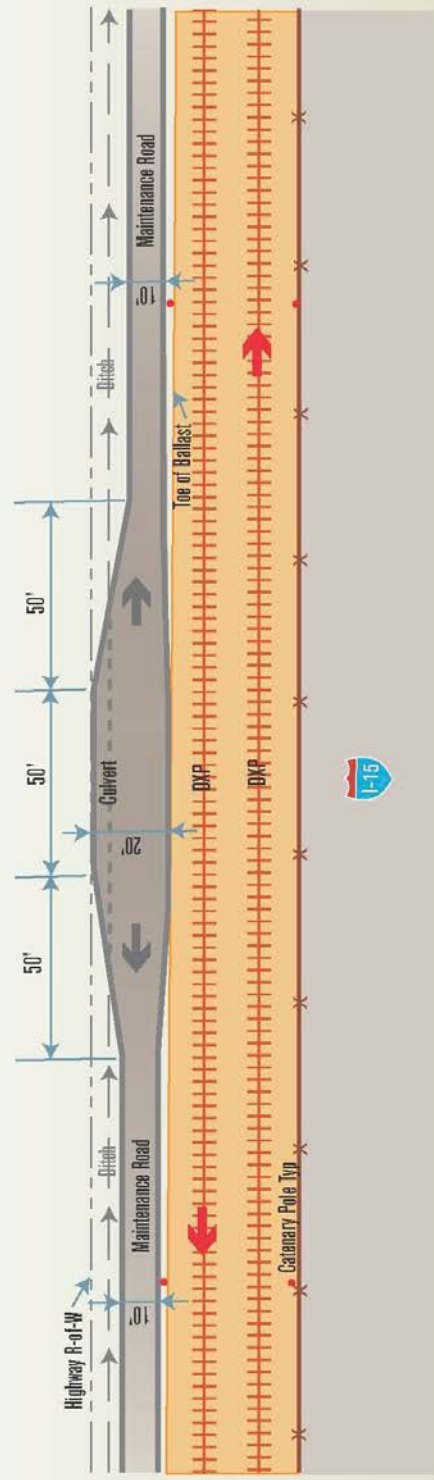
In the event of an emergency requiring immediate train evacuation, which would only occur very infrequently, train passengers will be evacuated to the 10 foot wide (minimum) maintenance road area that runs alongside the trackway. The maintenance road will be able to accommodate emergency vehicles. Passing lane “bump-outs” will be provided. See Figure 4.2 for details.

For elevated sections where no parallel maintenance roadways are provided, passengers would be evacuated to the trackway. The positive train control system will detect any stopped trains and any open doors on that train and command an automatic emergency stop of any other trains operating in that area.





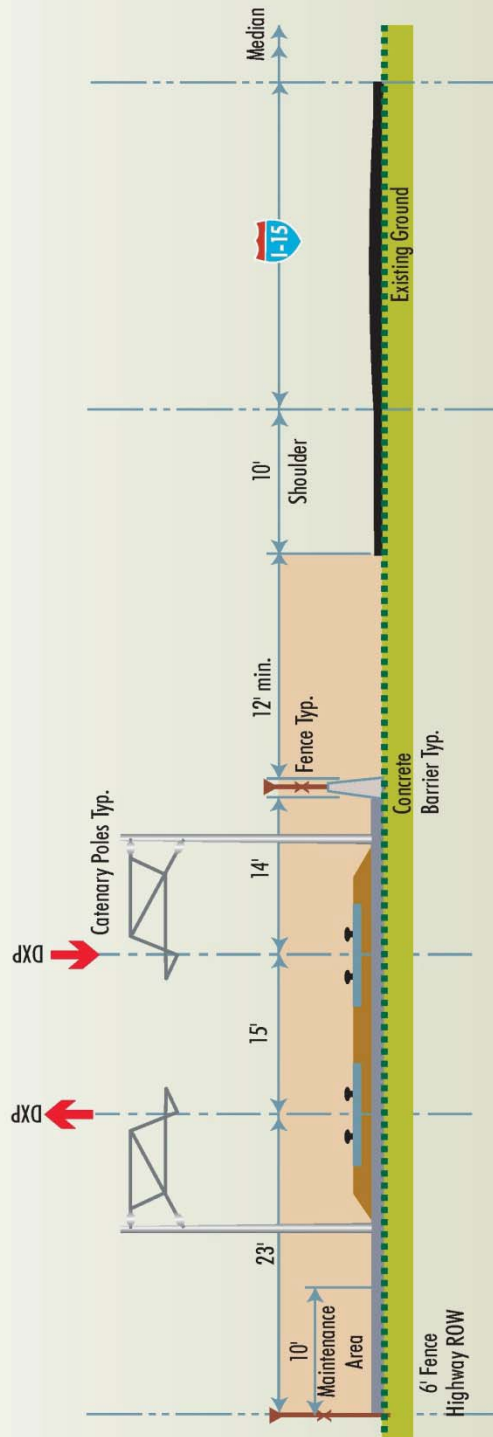
Graphic Scale  
 0' 17' 35' Feet  
**DesertXpress - figure 4.1**  
**Cross Median**  
**Emergency Access**



Graphic Scale  
0' 20' 40' Feet

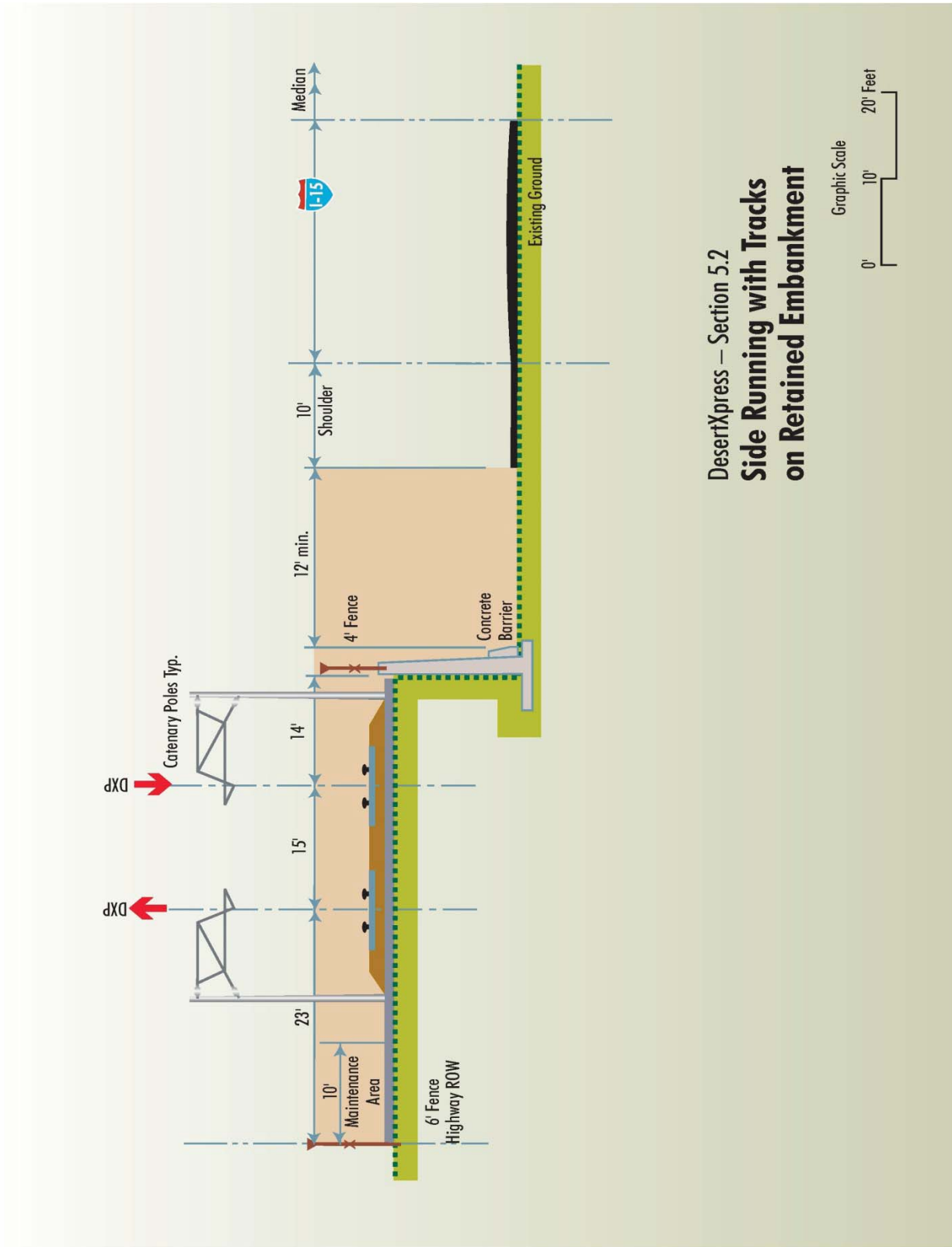
DesertXpress - figure 4.2  
**Maintenance Road  
Passing 'Bump-outs'**

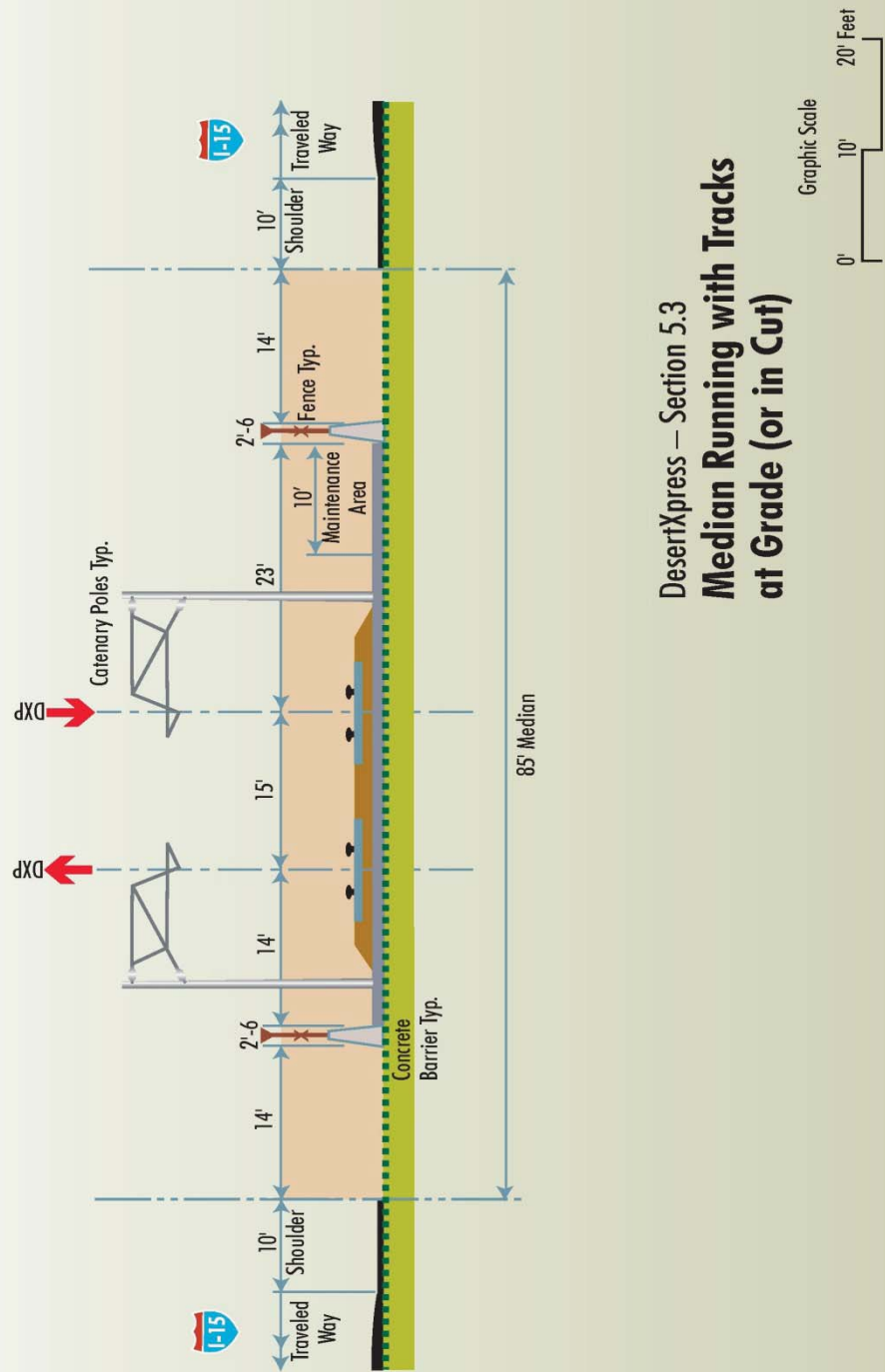
## **5.0 Typical Sections**



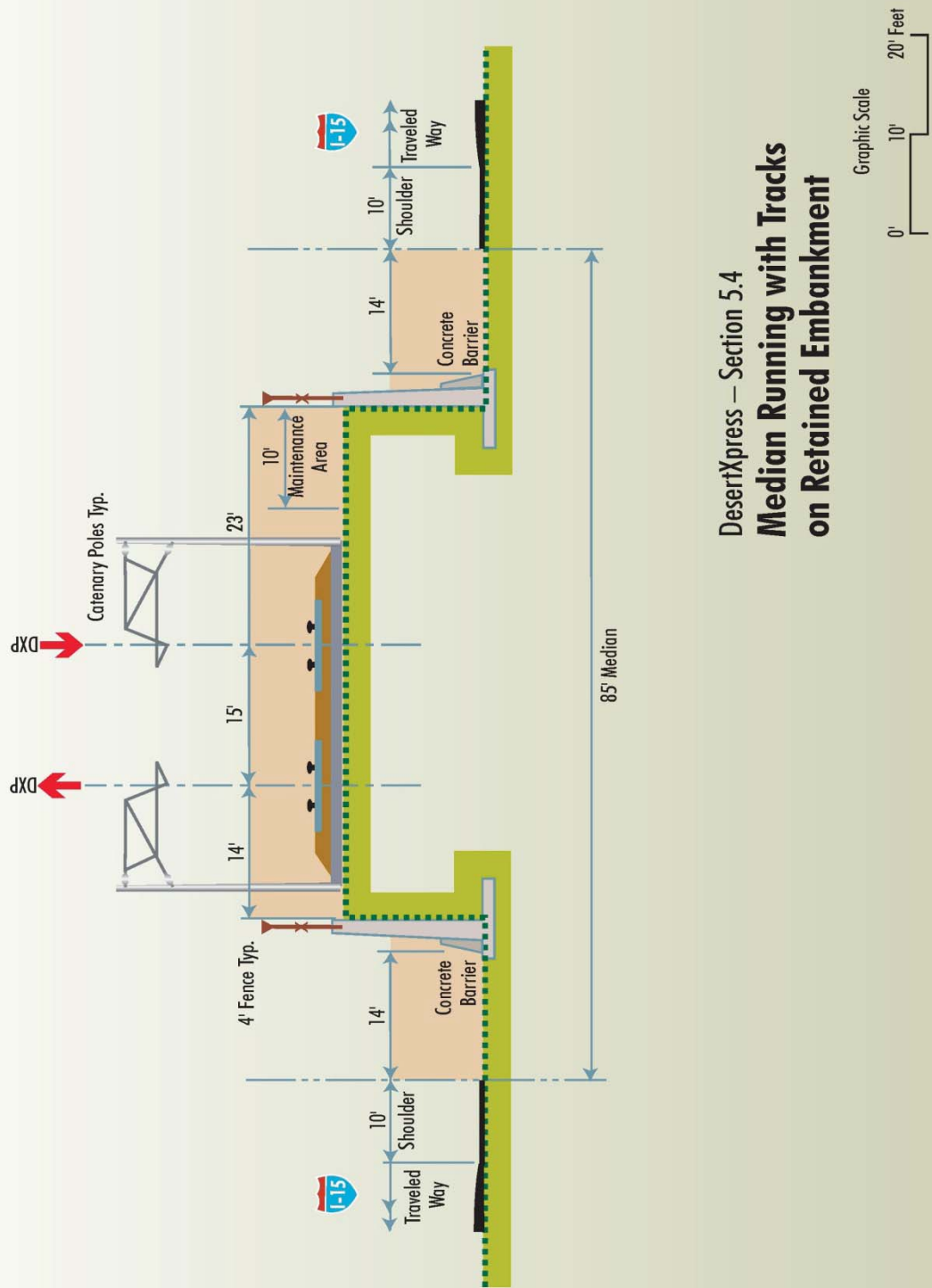
DesertXpress – Section 5.1  
**Side Running with Tracks at Grade**



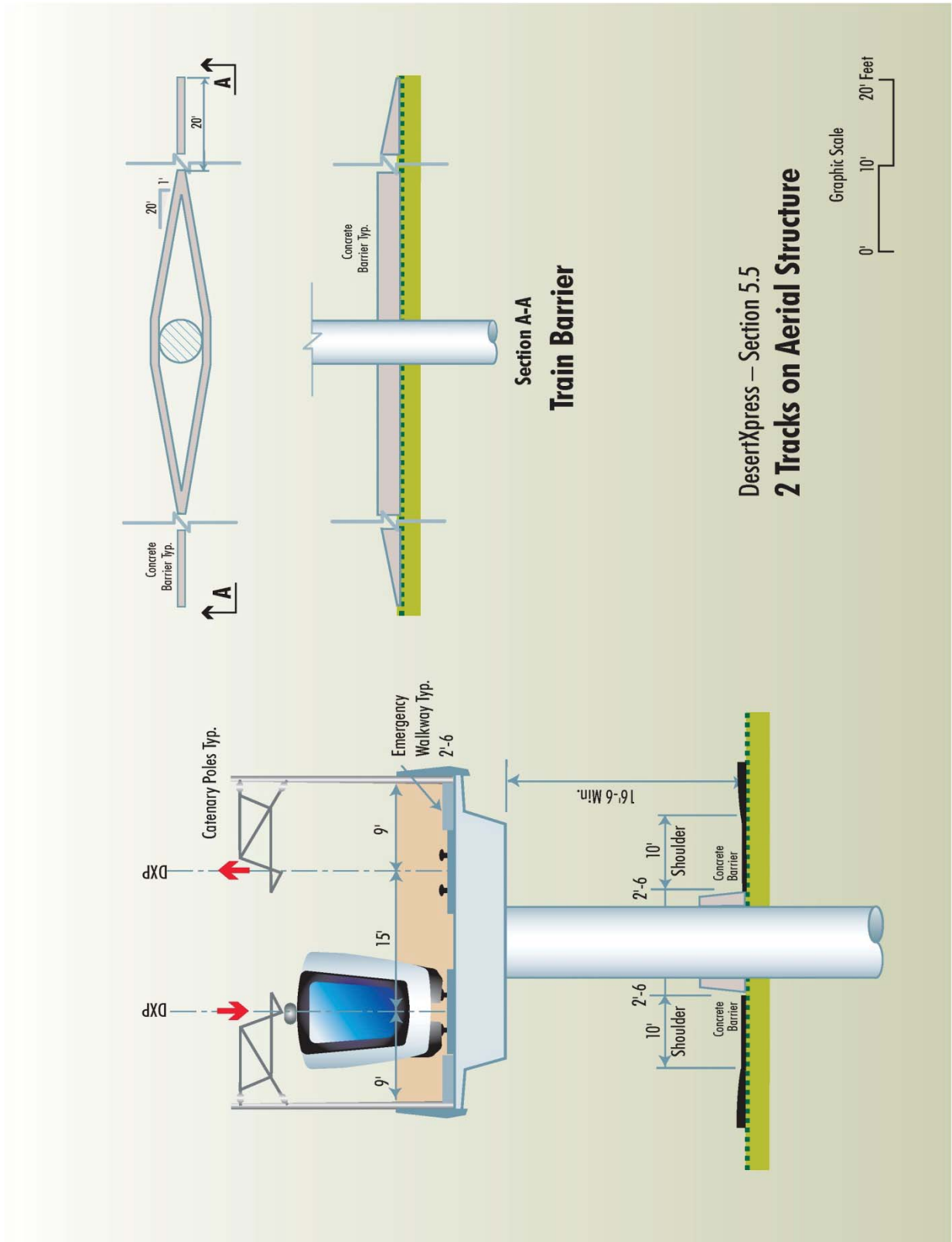




DesertXpress — Section 5.3  
**Median Running with Tracks  
 at Grade (or in Cut)**

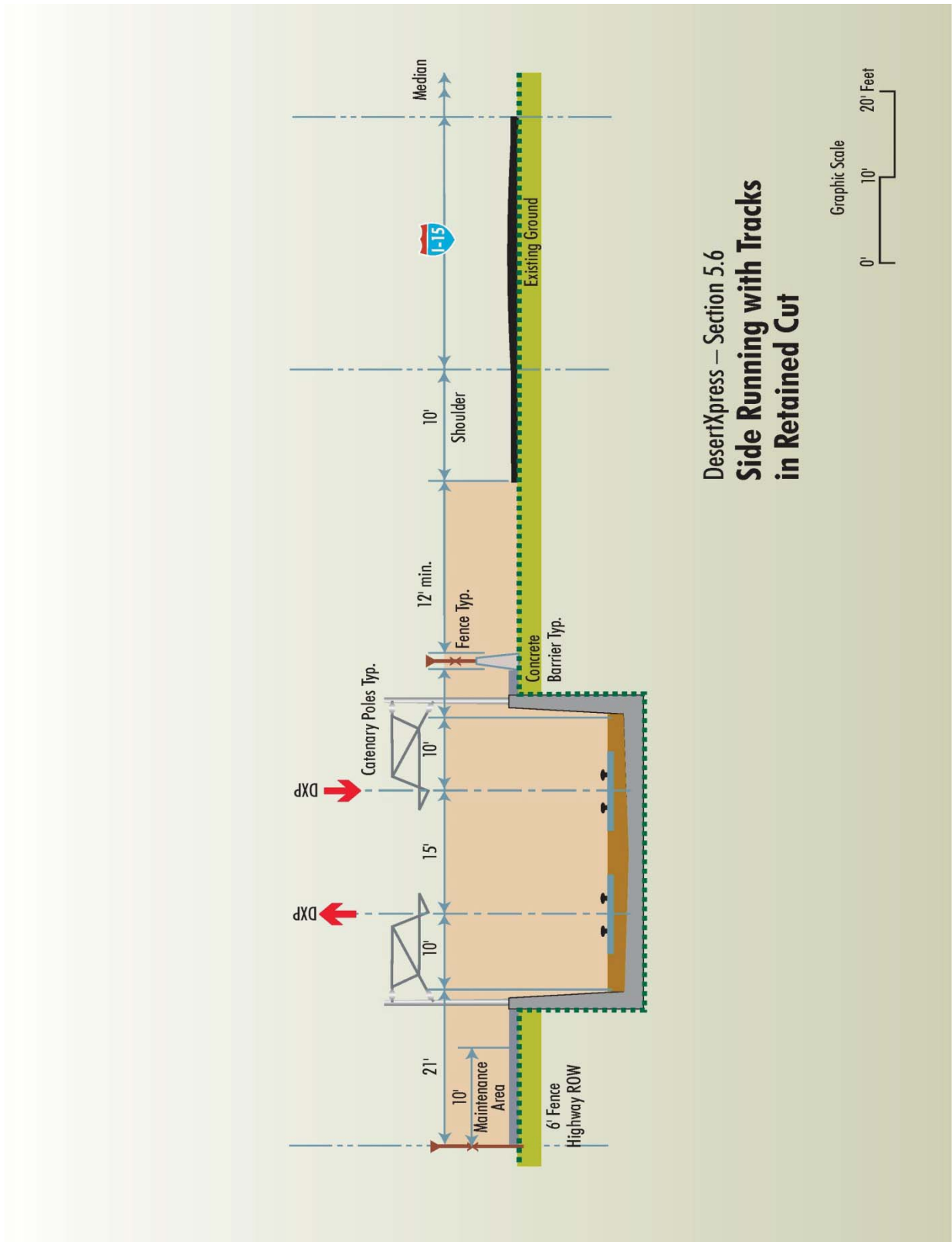


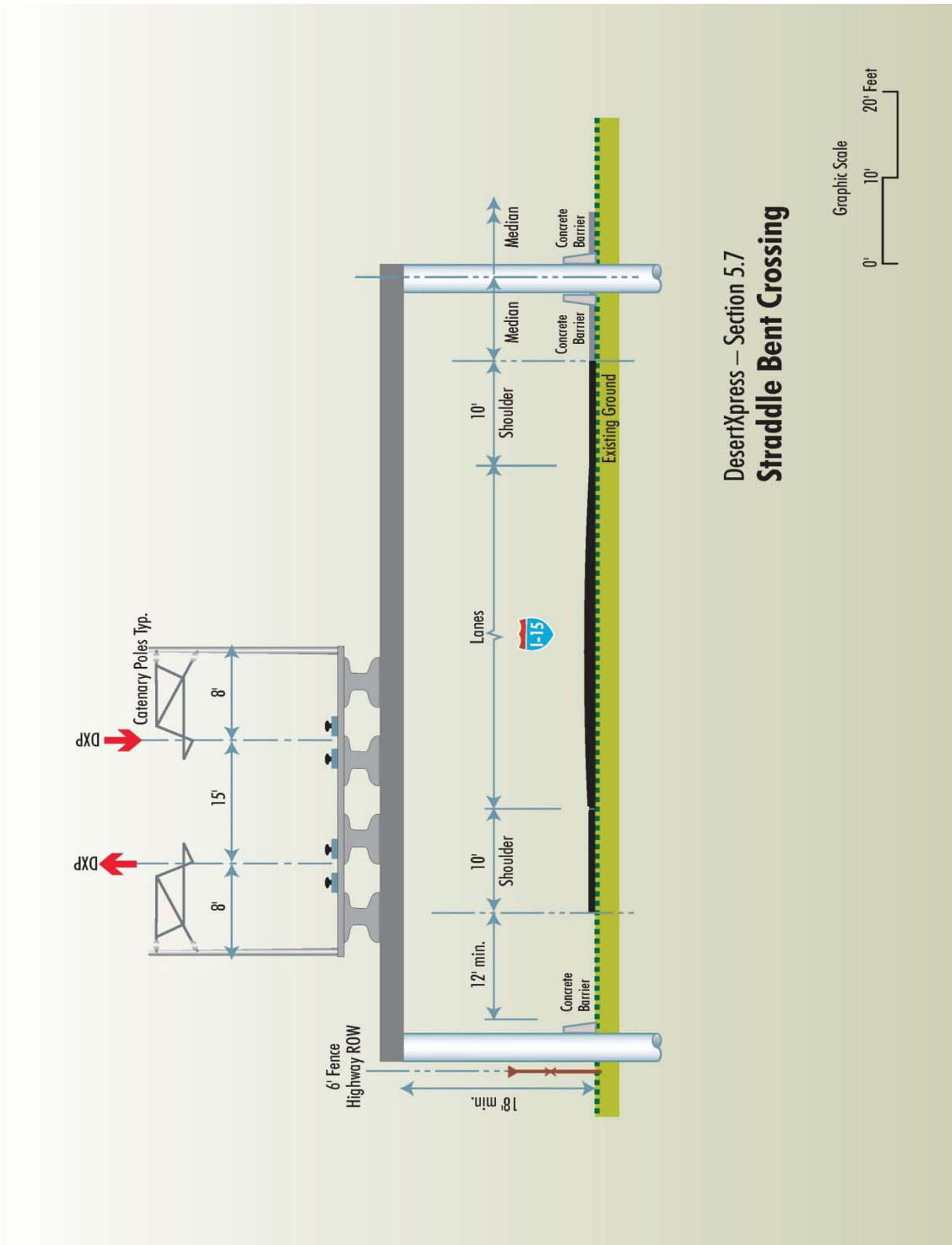
DesertXpress — Section 5.4  
**Median Running with Tracks  
on Retained Embankment**



DesertXpress – Section 5.5  
**2 Tracks on Aerial Structure**







DesertXpress – Section 5.7  
**Straddle Bent Crossing**