# Technical Memorandum

**To:** Kathy Arnold  
**From:** Seri Park  
**Company:** Rosemont Copper  
**Date:** June 15, 2009  
**Re:** Wide Load Truck Turnouts for State Route 83  
**Doc #:** 111/09-320842-5.3  
**CC:** Jamie Sturgess (Rosemont)  
David Krizek and Jamie Joggerst (Tt)

## 1.0 Introduction

This Technical Memorandum was prepared by Tetra Tech and presents two (2) potential locations for wide load truck turnouts along State Route 83 (AZ-83). This memorandum also discusses the design criteria used for the turnouts as well as their advantages and disadvantages.

The two (2) proposed wide load truck turnouts are shown on Figure 1 and located at Milepost (MP) 55.4 near Sahuarita Road and MP 47.2 just north of the proposed Primary Access Road to the Rosemont Copper Project site. The proposed locations of the two (2) wide load truck turnouts were identified during a meeting with Rosemont Copper Company on April 28, 2009.

In the American Association of State Highway and Transportation Officials (AASHTO) Roadway and Street Design Guidelines, a turnout is defined as:

> “a widened, unobstructed shoulder area that allows slow-moving vehicles to pull out of the through lane to give passing opportunities to following vehicles”.

In other words, a turnout provides an area for emergency stops and also allows slower moving vehicles to pull out of the through lane so that vehicles can pass. AASHTO suggests using turnouts when a low Average Daily Traffic (ADT) roadway does not have a high amount of trailing vehicles behind slower moving vehicles and when the topography within the area creates steep grades where the construction of an additional lane or passing lane may not be cost effective. Often such conditions are found in mountainous, coastal, and scenic areas where more than 10% of the total traffic volume is large trucks and recreational vehicles. It should be noted that AZ-83 between Interstate I-10 and Greaterville Road generally fits this condition.
2.0 Design Vehicle

In order to propose a wide load truck turnout, the design vehicle must first be established. Based on Table 407.2 in the Arizona Department of Transportation (ADOT) Roadway Design Guidelines, a WB-62 type, Interstate Semi Trailer is recommended as the design vehicle for intersections along a State Route. In AASHTO's Geometric Design of Highways and Streets, a WB-65 type is recommended as the minimum sized design vehicle for intersections on state highways that carry high volumes of traffic and/or provide local access for large trucks. Therefore, in this Technical Memorandum, a WB-65 type was chosen as the design vehicle since a safe truck turning with WB-65 type will also satisfy a safe truck turning for a WB-62 type.

3.0 Wide Load Truck Turnout Design Criteria

Geometric Design Elements

The basic design guidelines for defining the proposed wide load truck turnouts presented herein followed Exhibit 3-64 in the AASHTO Roadway and Street Design Guidelines (Attachment A) and AASHTO Chapter 3 Elements of Design. Under these guidelines, the minimum turnout width is 12 feet. However, Tetra Tech recommends a turnout width of 16 feet and no larger. Also stated in the above mentioned guidelines, turnout designs should consider the following three (3) elements: 1) turnout length, including entry and exit tapers, 2) turnout width, and 3) the location of the turnout with respect to horizontal and vertical curves. Turnouts should not be located on or adjacent to a horizontal or vertical curve that limits the sight distance in either direction. Turnouts should be located so that approaching drivers have a clear view of the entire turnout in order to determine whether the turnout is available for use.

For both of the proposed wide load truck turnouts, clearing and grubbing will need to conform to the guidelines specified in the Landscape and Irrigation Design Guidelines for Arizona Department of Transportation Encroachment Permit Applications as presented in Attachment B.

The following paragraphs provide detailed information regarding the proposed wide load truck turnout for each location.

Wide Load Truck Turnout near Sahuarita Road (MP 55.4)

The wide load truck turnout near Sahuarita Road is proposed to be just south of the intersection along the west side so that it can be utilized by southbound truck traffic. There is a guardrail along the east side of AZ-83 at the intersection with Sahuarita Road. There is an additional guardrail on the west side of AZ-83 which starts approximately 600 feet south of the Sahuarita Road intersection. The proposed wide load truck turnout is located between the Sahuarita Road intersection and the west side guardrail.

Based on the existing speed limit on AZ-83 of 55 miles per hour (MPH) and AASHTO Exhibit 3-64, the turnout will need to be 550 feet long. This distance includes 100-foot long entry and exit tapers. As indicated in the AASHTO Exhibit 3-64, the maximum length of a turnout, including entry and exit tapers, should not exceed 600 feet. This maximum length is recommended in
order to prevent vehicles from using the turnout as a passing lane. The proposed truck turnout should also be 16 feet wide, be paved with asphalt, and have edge markings such as directional arrows for entry and exit traffic. Figure 2 provides a detailed design illustration of the truck turnout. The proposed location of this wide load truck turnout does not have horizontal or vertical curves and therefore has sufficient sight distance for ingress and egress. In Attachment C, a before and after photo comparison is provided to illustrate the visual changes with regards to adding a wide load truck turnout near Sahuarita Road.

**Wide Load Truck Turnout near Project Primary Access Road (MP 47.2)**

The proposed wide truck turnout near the Primary Access Road also has a relatively flat roadway geometry with regards to the horizontal and vertical alignment. As stated in Mine Plan of Operation (MPO) (WestLand, 2007), the location of the Primary Access Road provides a clear sight distance of up to 2,500 feet in both directions. The existing speed limit on AZ-83 is also 55 MPH at this proposed turnout location. Therefore the truck turnout will also be 550 feet long which includes 100-foot long entry and exit tapers. Similar to the turnout near Sahuarita Road, the turnout near the Primary Access Road should be 16 feet wide, be paved, and have edge markings. Figure 2 provides a detailed design illustration of the truck turnout.

**Sign Installation**

AASHTO Roadway and Street Design Guidelines recommend proper signing and pavement markings in order to maximize turnout usages and to assure safe operation. No specific signing guidelines pertaining to truck turnout is provided in the Manual on Uniform traffic Control Devices (MUTCD) 2003 or ADOT Roadway Design Guidelines. Therefore, guidelines from the California (CA) MUTCD were utilized. Exhibit 3B-108 in the CA MUTCD (Attachment D) shows an example diagram for a truck turnout with proper signage. Tetra Tech recommends installing signs to alert drivers of the wide load truck turnout following the CA MUTCD guidelines. However, the final sign type and location should be coordinated with ADOT prior to installation.

Should signs be installed for the truck turnout, installation should follow ADOT’s Roadway Design Guidelines, Section 303.2, which states:

“Roadside obstacles, non-traversable hazards and fixed objects, should be removed, made ‘breakaway’, relocated or shielded by a barrier if they are within the minimum recovery area width”.

In addition, roadside clearing of large trees will need to conform to the guidelines specified in Landscape and Irrigation Design Guidelines.

**3.1 Wide Load Truck Turnout Advantage and Disadvantage**

Advantages:

- Having an area for wide load trucks to turnout and let traffic pass will improve traffic flow and maximize the roadway capacity
- Adding a turnout provides a safe parking area for large vehicle to inspect loads and conduct other miscellaneous safety activities
- Improves roadway safety by reducing potential accidents associated with vehicles passing wide load trucks
- Improves traffic safety by providing better and enhanced sight distance for through vehicles

Disadvantages:

- Ingress and egress points should be well maintained
- Grading work will be required
REFERENCES


Arizona Department of Transportation (2007) Roadway Design Guidelines


Proposed 16' Truck Turnout  Existing 12' Lane  Existing 12' Lane

8' Truck  Hot Mix Asphalt

Aggregate Base

**SECTION A-A**

Wide Load Truck Turnout Designed Per:

Legend:
- ROW - Right of Way

Location:
- Mile Post 55.4
- Intersection of State Route 83 and East Sahurita Road

**WB-65**
- Tractor Width: 8.00 feet
- Tractor Track: 8.00 feet
- Articulating Angle: 70.00°
- Lock to Lock Time: 6.00
- Steering Angle: 28.40°
Proposed 16' Truck Turnout	Existing 12' Lane	Existing 12' Lane

8' Truck

Hot Mix Asphalt

Aggregate Base

SECTION A-A

15.00

53.00

3.00

43.50

4.00

19.50

8' Truck

Legend:
ROW - Right of Way

Proposed 16' Truck Turnout Designed Per:

Legend:
- ROW - Right of Way

Location: Mile Post 47.2

Wide Load Truck Turnout Designed Per:

Legend:
- ROW - Right of Way

Location: Mile Post 47.2

Hot Mix Asphalt

Aggregate Base

STATE ROUTE 83

100' Taper

350' Turnout

100' Taper

WB-65

<table>
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<th>Lock to Lock Time</th>
<th>Steering Angle</th>
<th>Articulating Angle</th>
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[Diagram details not transcribed]
ATTACHMENT A
AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
EXHIBIT 3-64
The recommended lengths for turnouts include entry and exit tapers. Typical entry and exit taper lengths range from 15 to 30 m [50 to 100 ft] (42, 43).

<table>
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<th>Metric</th>
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<th>Minimum length (ft)a</th>
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</table>

a Maximum length should be 185 m (600 ft) to avoid use of the turnout as a passing lane.

Exhibit 3-64. Recommended Lengths of Turnouts Including Taper

The minimum width of the turnout is 3.6 m [12 ft] with widths of 5 m [16 ft] considered desirable. Turnouts wider than 5 m [16 ft] are not recommended.

A turnout should not be located on or adjacent to a horizontal or vertical curve that limits sight distance in either direction. The available sight distance should be at least 300 m [1,000 ft] on the approach to the turnout.

Proper signing and pavement marking are also needed both to maximize turnout usage and assure safe operation. An edge line marking on the right side of the turnout is desirable to guide drivers, especially in wider turnouts.

Shoulder Driving

In parts of the United States, a long-standing custom has been established for slow-moving vehicles to move to the shoulder when another vehicle approaches from the rear and return to the traveled way after that following vehicle has passed. The practice generally occurs where adequate paved shoulders exist and, in effect, these shoulders function as continuous turnouts. This custom is regarded as a courtesy to other drivers requiring little or no sacrifice in speed by either driver. While highway agencies may want to permit such use as a means of improving passing opportunities without a major capital investment, they should recognize that in many states shoulder driving is currently prohibited by law. Thus, a highway agency considering shoulder driving as a passing aid may need to propose legislation to authorize such use as well as develop a public education campaign to familiarize drivers with the new law.

Highway agencies should evaluate the mileage of two-lane highways with paved shoulders as well as their structural quality before deciding whether to allow their use as a passing aid. It should be recognized that, where shoulder driving becomes common, it will not be limited to selected sites but rather will occur anywhere on the system where paved shoulders are provided.
ATTACHMENT B
LANDSCAPE AND IRRIGATION DESIGN GUIDELINES
FOR ARIZONA DEPARTMENT OF TRANSPORTATION
ENCROACHMENT PERMIT APPLICATIONS
LANDSCAPE AND IRRIGATION
DESIGN GUIDELINES
ARIZONA DEPARTMENT OF TRANSPORTATION
ENCROACHMENT PERMIT APPLICATIONS

PREPARED BY:
ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
ROADSIDE DEVELOPMENT SERVICES

0967r
INTRODUCTION

The Arizona Department of Transportation, Highways Division, encourages the landscaping of its rights of way through the cooperative efforts with local governments and adjacent property owners. Because the right of way is a public area, of prime importance with relation to landscaping is the protection of the public and its safe access to the facilities as well as the improvement of aesthetic considerations.

Landscaping, being composed of living plant material, is in a constant state of change and must consider the ultimate growth of plants. Additionally, other considerations are the use of low water requirement plant materials and any other local jurisdictional requirements, such as sidewalks, signing setbacks and other requirements in relation to each specific roadway. After all of these factors have been considered the completion of the landscaping can greatly enhance the beauty of the roadway and the community.
LANDSCAPING

I. GENERAL

An approved Encroachment Permit is required before any landscape improvements may be incorporated within the ADOT Highway right-of-way. This applies to work performed under nationwide programs such as Global Releaf as well as individual efforts. Landscaping by local governments may be constructed and maintained within the control of access on the crossroads of major highways under a fully executed Intergovernmental Landscape Maintenance Agreement prepared by the State and an approved Encroachment Permit.

The highway roadside is an integral unit of a total highway facility. The term "roadside" generally refers to the area between the outer edge of the roadway and the right-of-way boundary. These include all unpaved areas within the right-of-way.

Permit applicants are encouraged to employ competent design professionals such as Registered Landscape Architects, Architects or Engineers, and to direct their work toward securing a product that fully represents the owner's needs and desires and meets the Arizona Department of Transportation (ADOT) standards, before submitting such plans for review and approval. Permit applicants and design professionals are encouraged
to discuss landscape needs and proposals with District Permits Supervisors and Roadside Development Services Landscape Architects before commencing work on final construction plans.

All plans and specifications shall be sufficiently complete and detailed for easy analysis and compliance inspection. Plans shall be designed to select plant materials appropriate for the intended use and location, to arrange plants for optimum effect of color, texture, form and to ensure reasonable maintenance within the capability of the proposed permittee. Permit applications will be reviewed for consideration of the following factors which can affect the safe and efficient operation of the highway facility.

II. DRAWINGS

A. PLANS:

Drawings must be legible, accurate and drawn to scale. They shall include a north arrow, name of development, designer and design firm with appropriate phone numbers and location of project.

B. PLANT MATERIALS:

Plants proposed for use must be clearly located, showing mature sizes, and identified as to botanical name (genus species, variety), planting size, quantity and spacing used.
Areas within an Arizona Department of Water Resources Active Management Areas must adhere to the plant list provided for that area. (See attached Plant Lists.)

C. EXISTING FEATURES:

Existing features such as curbs, sidewalks, pipe culverts, drainage structures, retention basins, driveways, highway and non-highway signs, overhead lines, underground utilities, irrigation lines, manholes, service cabinets, etc, shall be shown. In addition, the posted speed limit for the highway shall be indicated. Existing trees and shrubs shall be incorporated into the design wherever feasible. Clearing of trees and shrubs will not be permitted unless approved through the permit process. When planters are cut out of existing sidewalk areas, sufficient space must remain for compliance with ARS statutes relating to accessibility by the physically handicapped. The use of steel tree grates is recommended to maximize usable sidewalk space and to maintain a safe walking surface.

D. SLOPES:

Existing or proposed slopes shall be identified with respect to elevation differences between top and bottom and rate of slope between.
III. DESIGN

A. EROSION CONTROL:

Erosion control measures must be employed to prevent surface drainage from eroding soil surfaces and carrying the resultant silt into natural or man made drainage systems, highways or private properties.

B. SAFETY SETBACKS FOR FIXED OBJECTS:

Minimum setbacks from the travel way for newly planted trees with an ultimate trunk diameter of more than 4 inches or other hazardous fixed objects should be as follows:

1. 50 MPH or Greater Design Speed:

   a. Minimum setback from the edge of the traffic lane should be 35 feet unless one of the following reasons will allow for a lesser distance.

      1) Cuts of 3 to 1 or steeper - obstacles are allowed 10 feet behind the point of vertical intersection (P.V.I.) at the toe of the slope. (See illustration 'A'.)

      2) Where concrete barriers, walls, abutments, or other rigid obstructions are used - fixed objects may be placed 4' behind the obstructions. (See illustration 'B')
3) Where flexible guardrail (box-beam, w-beam, or cable) is used - 6 to 20 feet behind the face of the guardrail, depending upon the type. (See illustration 'C'.)

4) Where there are barrier curbs (5" or more vertical face) near a traveled lane 6 feet behind the face of the curb (see illustration 'D'); adjacent to a parking lane - no definite setback distance.

b. Where limited right-of-way or the necessity for planting would result in less clearance, all factors in the particular problem area should be weighed to decide if a special exception is warranted.

2. **50 MPH or less design speed:**

   a. Minimum setback of a fixed object from the edge of the traffic lane may be 30 feet unless one of the reasons set forth under (1) will allow for a lesser distance.

   b. On curves, adequate sight distance for the design speed of the highway must be maintained.

C. **REQUIREMENTS FOR SIGHT DISTANCE:**

A clear line of sight must be maintained at all highway intersections and entrances. Generally, shrubs, plantings or other obstructions in
this zone must be limited to an ultimate height of 18" or less to allow a clear line of sight down the highway in either direction for at least 400' from the front of the vehicle located 10' behind the edge of the highway to be entered. (See illustration 'E'.)

D. CULTURAL REQUIREMENTS FOR PLANTS:

Use plants that require minimal maintenance and are hardy to the area. Avoid plants that are messy, brittle, short lived or subject to infestations of insects or disease. Plants used in areas where sight distance must be maintained shall have a mature height of 18" or less.

E. VISIBILITY OF HIGHWAY FEATURES:

The visibility of highway signs, delineators, edges of sidewalks, curbs, roadway or guardrail must be maintained at all times. Therefore, provide sufficient plant setbacks and plants with mature sizes that will not outgrow spaces to avoid costly trimming as plants mature.

IV. DETAILS

A. Plans shall include, as appropriate, planting details for trees, shrubs, ground cover, vines, and cacti showing size of planting pit in relation to size of plant ball. (See planting details.)
B. Plans should include staking or guying details as required by the size and species of plant proposed. (See planting/staking details.)

C. Plans should identify problem soils and propose appropriate measures to overcome them.

D. If a mineral surface treatment is proposed, details should be included to indicate the depth, gradation, color and the vertical relationship to the roadway curb or sidewalk. A pre-emergent herbicide should be specified to preclude weeds in these areas. (See Granite and Rock Mulch details.)

E. Details for headers, signs, walls, sidewalks, planters, etc., should be included whenever proposed.

V. MAINTENANCE

A. Problems in maintenance shall be anticipated during the design phase. Changes in environmental conditions should be anticipated.

B. It shall be the responsibility of the permittee to assure that all landscaping and irrigation can be maintained to the satisfaction of ADOT.
ILLUSTRATION 'A'
ILLUSTRATION 'C'
TREE or OTHER FIXED OBJECT

6' Min.

ROADWAY

5"+ HIGH CURB

ILLUSTRATION 'D'
ATTACHMENT C
PHOTOS FOR WIDE LOAD TRUCK TURNOUT
(AZ-83/SAHUARITA ROAD NEAR MILEPOST 55.4)
Existing conditions at AZ-83 and Sahuarita Road Intersection (looking south)
Figure 3B-108 (CA). Examples of Signing and Marking Turnouts

LEGEND

▲ Sign Location      ➡️ Direction of Travel

NOT TO SCALE

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