Preliminary Bridge Selection Report

Beardsley Road Connector
SR 101L

Prepared For:

City of Peoria
Engineering Department

In association with:

Arizona Department of Transportation

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1.0 BACKGROUND

The Maricopa County Department of Transportation (MCDOT) completed the Northwest Valley Transportation Study in 2000 in response to the rapid growth the area has been experiencing over the past decade. This study evaluated the transportation demands of the area which extended into portions of Maricopa County and the Cities of Peoria and Glendale.

While this study was being conducted, the Cities of Peoria and Glendale were in the process of completing the General Plan for their respective cities. During the development of their plans, the City of Peoria identified a number of transportation issues and locations that required further study. This need initiated the development of the North Central Peoria/Northwest Glendale Circulation Study, which built upon the MCDOT study. The Circulation Study identified potential short-term and long-term improvements needs between 67th Avenue to 91st Avenue and Bell Road to Happy Valley Road.

The results of the study confirmed the need for a Beardsley Road connection to SR 101L (101L). The interchanges at Union Hills Drive and 75th Avenue experience high traffic volumes and congestion during peak hours. The connector would improve traffic operational characteristics and safety for this region, and would relieve congestion at these two locations.

The purpose of the project is to develop long-term improvements to traffic operations and safety for the existing connections to 101L at Union Hills Drive and 75th Avenue by providing an additional connection from Beardsley Road. The proposed connector consists of the extension of Beardsley Road east of 81st Avenue to a proposed 101L frontage road, including a crossing of the New River, to provide direct access to the 75th Avenue interchange or to the Union Hills Drive interchange. The connector also includes a U-Turn Ramp Underpass structure just north of Union Hills Drive that for access to northbound 101L from Beardsley Road. This project will be funded jointly between the City of Peoria and through the ½ cent sales tax and is currently programmed for construction in the 2010 fiscal year.

1.1 PROJECT LOCATION

Project Vicinity and Location Maps are provided as Figures 1 and 2 respectively.

The project area is located in the north central portion of the City of Peoria and the northwest portion of the City of Glendale, in Maricopa County, Arizona. The boundary between Peoria and Glendale roughly follows New River, typically a dry riverbed that traverses diagonally through the project area from north-northeast to south-southwest. The project area is in the southeast portion of a large residential section of Peoria. This residential area encompasses 13 square-miles and is bounded by the Agua Fria River on the west, Sun City and Union Hills Drive on the south, New River on the east, and Pinnacle Peak Road on the north. The existing infrastructure typically funnels commuter traffic to the southeast towards two access points to 101L – one at 75th Avenue and the other at Union Hills Drive.

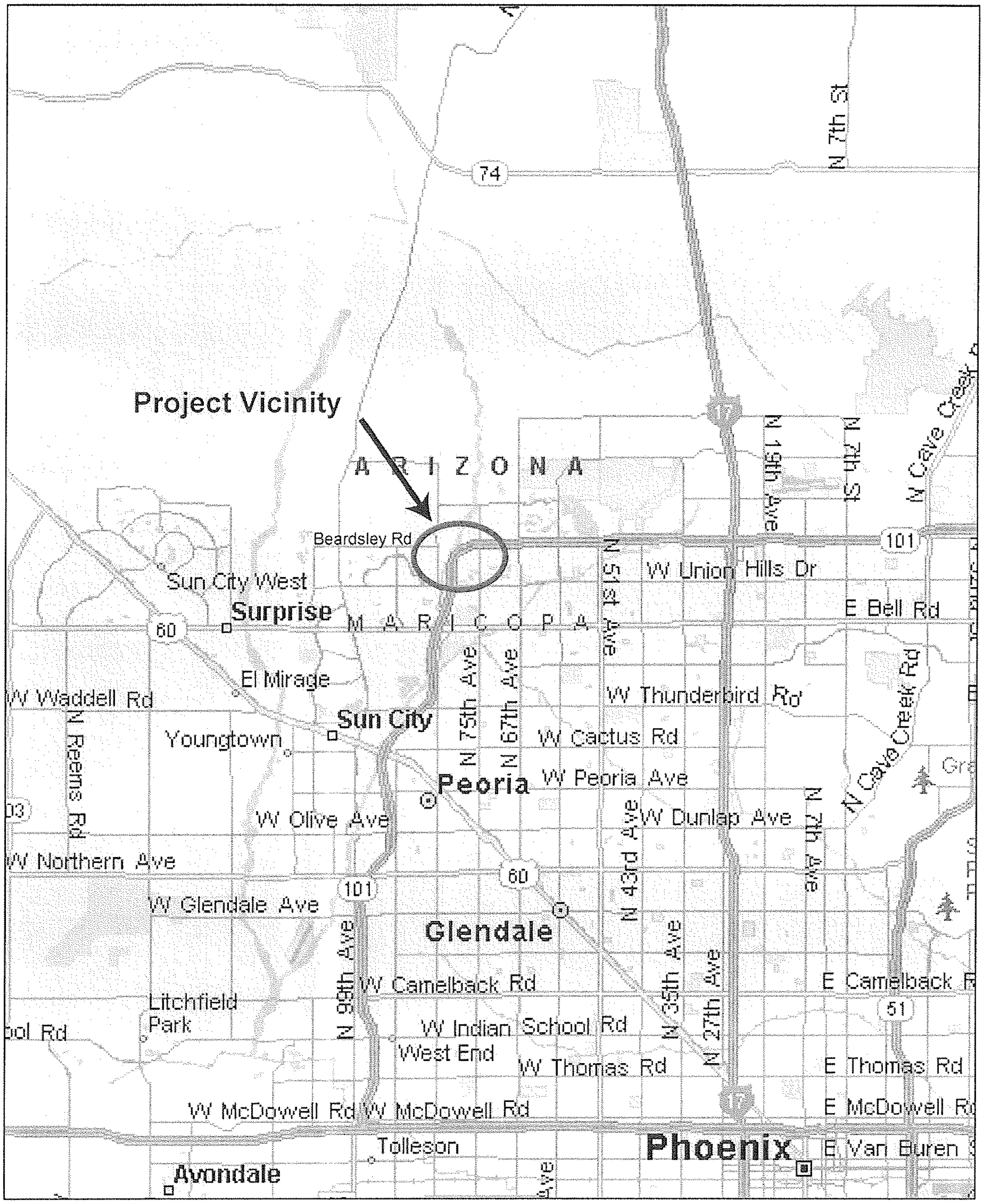


Figure 1 – Project Vicinity Map

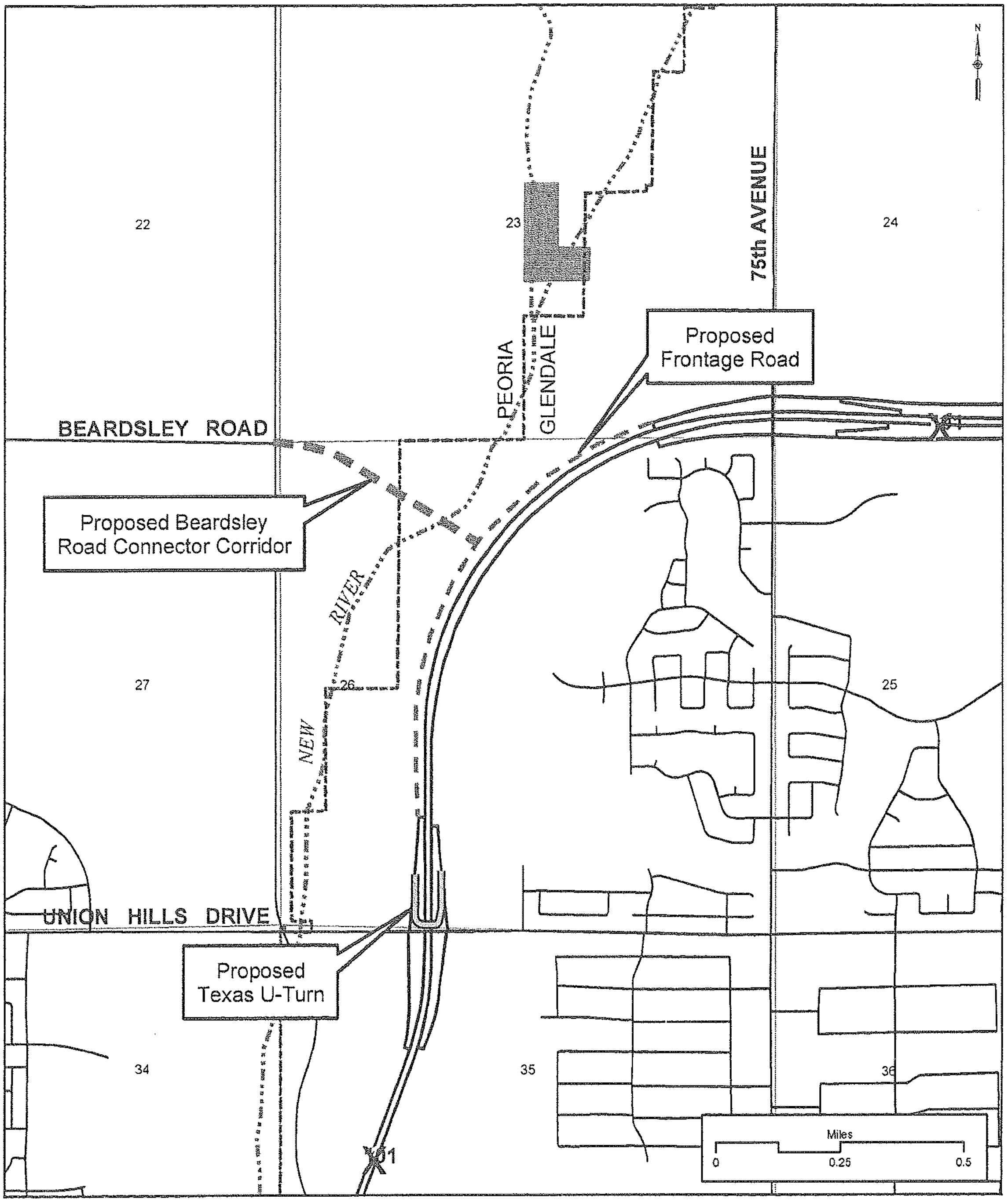


Figure 2 – Project Location Map

The project area contains one component of the Regional Freeway System: 101L (Agua Fria Freeway) and several major urban arterials.

The project is predominately on a new alignment, which will provide access from the arterial roadways to an urban freeway. Providing an additional access onto 101L will relieve congestion at the existing 75th Avenue and Union Hills Drive interchanges.

1.2 DESCRIPTION

This report addresses the selection of bridge structure types and configurations for the Beardsley Road Connector project. The bridge structures included in this project are:

1. U-Turn Ramp Underpass (101L)
2. Beardsley Road Bridge at New River

The purpose of this Preliminary Bridge Selection Report is to establish the preliminary design for the bridge structures – factoring cost, aesthetics, safety, and overall function; and to make a recommendation on structure type. A Final Bridge Selection Report, based on confirmed and updated information, will be included with the Stage III (60%) submittal.

1.3 STRUCTURE TYPE SELECTION AND CRITERIA

The structure type selection process is an evaluation of the functional requirements of a bridge with respect to the practical and economical constraints imposed by roadway geometrics, construction sequencing, traffic control requirements, site conditions, and the physical limitations of bridge structural systems. Bridge configurations evaluated in detail are those meeting the functional requirements that are known to be economical, constructable, serviceable and aesthetically acceptable for the proposed site and application. The conditions for the selection of a bridge configuration for a specific site may place greater or controlling significance on one or more of these parameters. The bridge configuration recommended for final design is that which best satisfies all the constraints relative to their degree of importance for each particular site.

The technical design criteria used in developing the structural alternatives are the *LRFD Bridge Design Specifications,* AASHTO, 3rd Edition – 2004 and the 2005 and 2006 *Interim Specifications* (superstructure), *Standard Specifications for Highway Bridges,* American Association of State Highway and Transportation Officials (AASHTO), 17th Edition – 2002 (substructure) and the latest edition of the ADOT *Bridge Practice Guidelines.*

General Plan and Elevation, and Typical Section Sheets have been completed for the U-Turn Ramp Underpass and Beardsley Road Bridge at New River and are included in Appendix A.

2.0 U-TURN RAMP UNDERPASS

2.1 GENERAL

The proposed U-Turn Ramp Underpass structure provides a one-lane route over 101L for southbound frontage road traffic wishing to access northbound 101L without entering the Union Hills Drive intersection. This type of grade separated configuration, in which vehicles traveling on one side of a one-way frontage road are allowed to U-turn onto the opposite frontage road without being stopped by traffic signalization, is called a "Texas U-Turn"; named after the state of its origin. In 2002, the North Central Peoria/Northwest Glendale Circulation Study concluded that a "Texas U-Turn" style interchange would be the preferable configuration to provide alternative freeway access to the area west of 101L and north of Union Hills Drive.

The concept of an east to north fly-over ramp aligned with Beardsley Road was initially investigated during the Design Concept phase but not pursued further due to insufficient intersection spacing between 75th Avenue and Union Hills Drive.

2.2 ROADWAY AND BRIDGE GEOMETRY

The design speed for the U-Turn Ramp is 20 mph. The U-Turn roadway section provides curb and gutter or barrier on each side of the roadway and accommodates one 12'-0" through traffic lane and variable width shoulders. The roadway section at the bridge is variable due to the sharp radii approach and departure curves on the bridge which has chorded edges. At the outside edge of each shoulder, the ADOT standard 42" F-shape bridge concrete barrier is recommended due to the tight radii and unique turning movement. The horizontal alignment at the bridge consists of an entrance curve which ends in Span 1, a tangent section in portions of Spans 1 and 2, and an exit curve which begins in Span 2. The profile has been set to provide 16'-6" vertical clearance to the ultimate 101L. The minimum vertical clearance is controlled by the future 101L mainline HOV widening and is located adjacent to the median barrier.

The bridge profile grade and pivot point is along a reference chord which is an extension of the tangent section of the horizontal alignment to the bridge ends. The bridge profile is level (0%) with variable resultant grades along the splayed north barrier face. The bridge is superelevated at a constant 4%.

2.3 CONSTRUCTION ISSUES / TRAFFIC CONTROL

A major concern when constructing a bridge over an existing freeway is maintenance of traffic of the freeway below. The use of falsework to support forms during construction, creates difficulty in establishing safe clearance and creates traffic opening restrictions. Therefore, when a precast concrete option is feasible, it is the preferred structure type over an existing freeway.

Since the proposed U-Turn Ramp is on a new alignment, traffic impacts will be primarily limited to 101L. Temporary closures of 101L will be required for girder placement.

Temporary barrier and shoulder closures on 101L will be required to construct the median pier and to protect construction activities at the abutments. It is anticipated that girder setting operations will occur during a weekend or overnight closure to minimize commuter impacts. It is anticipated that stay-in-place metal deck forms will be used to limit the traffic restrictions during the placement of the deck concrete.

2.4 DRAINAGE

Although the reference chord grade is level, due to the flared deck coupled with a 4% cross slope, there is an approximately 1% resultant grade along the north barrier face for drainage of the bridge deck. The deck runoff will drain into the project on-site storm drain system. Existing freeway drainage elements shall be protected-in-place.

2.5 RIGHT-OF-WAY

New right-of-way is not required in the vicinity of the U-Turn Ramp Underpass. Bridge construction can occur within the existing right-of-way.

2.6 UTILITIES

At the time of this report, no new utilities were identified in the vicinity of the bridge and no utilities are planned to cross the bridge structure. An existing roadway sign will need to be relocated to the bridge. Conduits for street lighting and sign lighting will be located within the bridge. During final design, further coordination will be necessary to determine the type, size of locations of these conduits.

2.7 AESTHETICS

The front faces of abutments, wing walls, and adjoining retaining walls will have vertical rustication to match the theme of the existing Agua Fria Freeway corridor. The exposed abutment faces, piers, and the outer faces and soffit of the superstructure will be painted in a color matching other structures within the corridor to provide continuity and further enhance the structure appearances at minimal cost.

The proposed overpass structures will use columns which match the 3'-6" thick by approximately 20-foot wide, vertically tapered, non-prismatic columns at the existing Union Hills Drive Traffic Interchange Underpass (TIUP). The column has an aesthetically pleasing appearance with an approximately 5'-6" band of vertical rustication. The thin rectangular shape is flexible and comparatively less sensitive to the effects of longitudinal bending moments and superstructure shortening. About the major axis, they are comparatively stiff making them effective in resisting transverse forces. They also have the advantage of being narrower than a comparable round column, reducing the amount of encroachment into the median shoulder or spreading of the mainline median in underpass situations.

2.8 BRIDGE CONFIGURATION - GENERAL

In recent history, the design and construction of bridges for the Maricopa County Regional Freeway System has produced a knowledge base of economical and constructible bridge configurations for typical underpass structures. The two superstructure types commonly used for typical underpass configurations are cast-in-place post-tensioned concrete box girders and standard precast-prestressed concrete AASHTO girders composite with a cast-in-place concrete deck. Post-tensioned box girders can accommodate relatively long spans and variable geometrics when compared to precast concrete girders. The post-tensioned box girder structures work well on curved alignments for which the concrete box's flexibility in geometrics and high torsional stiffness is ideally suited. Precast systems have a construction advantage when working over traffic due to the lack of falsework. Composite steel girder bridges have not been found to be cost competitive for typical underpass applications and are therefore not evaluated in detail. The historical service performance of post-tensioned box girder and standard AASHTO girder superstructures has generally been good.

During the design concept phase, three general bridge concepts were evaluated: 1) Widen existing Union Hills Drive TIUP, 2) Construct a new structure with a lower design speed and smaller radii, 3) Construct a new structure with a higher design speed and larger radii. The first concept does not allow for future widening and created clearance issues on 101L. This concept was disregarded. The second concept was parallel to Union Hills Drive with sharp radii on each approach with a design speed of 20 mph. The third concept included a sweeping curve over the entire structure with a maximum design speed of 30 mph. To facilitate the geometry of the larger radii and resulting larger spans, precast-prestressed girders are not viable for this concept. Therefore, the second concept is recommended for further evaluation in this report.

The U-Turn Ramp Underpass will be separated from the existing Union Hills Drive TIUP by 39 feet to provide sufficient horizontal clearance for the future widening of the Union Hills Drive roadway and bridge.

With the rising 101L profile north of Union Hills Drive, the profile of a separate structure is required to be above that of Union Hills Drive to provide sufficient clearance to 101L below. Therefore, the deck surface of the U-Turn Ramp Underpass will be approximately 1 foot higher than the deck surface of the Union Hills Drive TIUP.

Determination of span configurations are based on assessment of the existing two-span Union Hills Drive TIUP structure located immediately south of the proposed U-Turn Ramp. The abutments and pier are aligned with the existing Union Hills Drive TIUP abutments and pier for consideration of future general purpose and HOV lanes along 101L.

Abutments used for underpass structures can range from stub abutments to full-depth wall abutments. Stub abutments are typically supported by a single row of drilled shafts when the abutment is situated in embankment fills or when loads or soil conditions are not conducive to the use of spread footings. Full-depth abutments are usually cantilevered from spread footings or shaft caps to resist lateral earth pressures and maintain stability. The shaft caps are supported by multiple rows of small diameter drilled shafts or a single row of larger diameter drilled shafts.

Piers for underpass structures are usually single or multi-column bents with integral cap beams for post-tensioned box girder superstructures and exposed cap beams for AASHTO girder superstructures. The columns are supported on isolated or continuous footings, or transition caps supported by a single or group of drilled shafts or piles.

2.9 BRIDGE CONFIGURATION – ALTERNATIVE 1

Superstructure

The recommended superstructure type is a precast-prestressed AASHTO girder superstructure with a composite cast-in-place deck using stay-in-place forms. The precast-prestressed girder superstructure is recommended for this bridge to eliminate falsework thus minimizing traffic control and impacts as well as overall constructability.

Due to the sharp radii of the roadway alignment, any configuration with straight AASHTO girders results in an unused portion of bridge deck, or "wasted deck". The bridge deck will be flared and the layout of the girders splayed to accommodate the off-tracking of commercial truck turning movements while minimizing the area of wasted bridge deck.

The bridge flares from its narrowest point at the center pier to each end to accommodate the tracking of commercial trucks. The width of the bridge structure varies from 28'-10 ½" at the center pier to 62'-0 ½" at Abutment 1 measured out-to-out of bridge deck.

The superstructure depth is 7'-0". The span configuration results in two, 125' spans (up to 127'-9" along the exterior splayed girder) with a total structure length of 255'-0" along the bridge reference chord parallel to Union Hills Drive from end to end of bridge. The structure has six girder lines in Span 1 and five in Span 2. The girder spacing varies from a minimum of 4'-4" at the pier to a maximum of 10'-11" measured along centerline bearing. Deck overhangs are constant at 3'-8".

Substructure and Foundations

For the foundations, the bridge will be supported on walled piers and abutments with spread footings similar to the existing Union Hills TIUP, which are approximately 5' below existing finish grade.

The geotechnical investigation has not yet been completed at the time of this report. Substructure recommendations are based on the recommendations from the *Preliminary Geotechnical Evaluation Beardsley Road Connection 83rd Avenue to Loop 101 Peoria and Glendale, Arizona*, Ninyo & Moore, February 2004. Ninyo and Moore reviewed as-built drawings for the existing Union Hills Drive and 75th Avenue Traffic

Interchange Underpasses over 101L. The existing Union Hills Drive bridge abutments are supported on shallow spread footings using a design bearing pressure of 2.5 ksf at elevation 1221.0 and the pier is supported on spread footings with a design bearing pressure of 6 ksf at elevation 1205.5. The existing 75th Avenue bridge abutments and pier are also founded on spread footings with design bearing pressure of 5 ksf and 6 ksf respectively. Based on this information, the Preliminary Geotechnical Evaluation recommends spread footings for support of the U-Turn Ramp Underpass. Due to the limited median work zone and the potential depth of excavation required for spread footings at the pier, it is recommended that shallower footings and drilled shafts be investigated further and a comparative cost analysis be performed during final design.

Abutments 1 and 2 are partial depth founded on shallow spread footings. Permanent retaining walls oriented normal to 101L will be constructed to retain abutment fills on the south edge. Retaining walls aligned parallel to the U-Turn Ramp centerline will be constructed along the left edge of the roadway width turning parallel to 101L.

The pier will be located at the intersection of the 101L median centerline and the U-Turn Ramp construction centerline. The pier consists of a single wall type column 3'-6" thick with a tapered width (20 foot average) to match the existing Union Hills Drive TIUP columns. The column will be supported spread footing. The thickness of the top of the pier will be increased to 5'-6" to provide adequate girder seats.

2.10 BRIDGE CONFIGURATION – ALTERNATIVE 2

An alternative to the recommended bridge configuration would the same two-span AASHTO Type VI Modified girder bridge with a reconfigured rectangular or near rectangular bridge deck. Although this alternative results in a greater wasted deck area, it was evaluated to for improved constructability by eliminating or reducing the flaring of the deck and girders.

For a rectangular structure with parallel edges of deck, the width is controlled by the west abutment and is 63'-8". This alternative would require eight girder lines spaced at 8'-0".

The amount of wasted deck area would be approximately 5000 square feet (SF). The wasted deck area could be reduced to 3500 SF with a deck width which varies linearly from 63'-8" at the west abutment to 51'-3" at the east abutment.

The abutments and pier would be similar to Alternative 1, except for the addition of one pier column.

The rectangular deck alternative will require that the U-Turn ramp profile be increased by approximately 1.5 feet to account for the 4% cross slope coupled with the 0.25% profile of 101L. The profile increase could be reduced with warping of the bridge deck within the limits of the wasted deck area; however, deck forming challenges would arise.

2.11 COST ESTIMATES

Estimated costs for each structure alternative have been developed by multiplying approximate quantities by estimated unit costs, and summing for the structure totals. These are separated into bridge specific items and other items included in the overall bridge cost. Recent ADOT bid history is utilized as the basis for deriving estimated unit costs of specific items; however, changes in the construction market may impact actual bid costs at the time design is finalized. Itemized costs and totals for the structure alternatives evaluated are included in Appendix B.

The estimated cost of these alternatives, including a 10% contingency is as follows:

Alternative 1 – Two-span precast-prestressed AASHTO Type VI Modified girder bridge (flared deck)

Structure total cost for alternatives comparison $ 1,120,640
Structure total cost per square foot $102.18

Alternative 2 – Two-span precast-prestressed AASHTO Type VI Modified girder bridge (rectangular deck)

Structure total cost for alternatives comparison $1,552,405
Structure total cost per square foot $97.21

2.12 RECOMMENDATION

Alternative 1, a precast-prestressed girder structure with partial depth abutments and a center pier founded on spread footings is recommended for this site. Although the construction of splayed girders creates challenges in deck forming, the cost savings over a wasted deck or partially wasted deck alternative are significant enough to warrant this alternative selection.

3.0 BEARDSLEY ROAD BRIDGE AT NEW RIVER

3.1 GENERAL

The Beardsley Road Bridge at New River is necessary as part of the extension of the existing Beardsley Road alignment from 81st Avenue to the proposed connection with the 101L. The structure will carry two-lanes of traffic in each direction with a center turning lane. Bridge location and width is controlled by the proposed channelization of New River. A new multi-use path will pass under the bridge parallel to the west abutment.

3.2 ROADWAY AND BRIDGE GEOMETRY

The design speed for Beardsley Road is 50 mph. The Beardsley Road roadway section provides curb and gutter on each side of the roadway and accommodates two 12'-0" through traffic lanes each direction and a 13'-0" turn lane resulting in a clear width of 65 feet measured from face of curb to face of curb. The roadway section at the bridge has been adjusted to provide a 4'-0" outside shoulders, two 12'-0" traffic lanes, and a 13'-0" turn lane resulting in a clear width of 69 feet measured from face of barrier to face of barrier. At the outside edge of the south shoulder is the ADOT standard 32" F-shape bridge concrete barrier which is typical for a river crossing. At the outside of the north shoulder is the ADOT Standard 42" F-shape bridge concrete barrier which is used to mitigate headlight glare on residences north of the bridge. The horizontal alignment at the bridge is in a tangent section. The profile has been kept as low as possible to reduce both noise and visual impacts to Fletcher Heights residents just north of the project while providing a minimum of 10-foot clearance for the multi-use path. Channel grading will be required to achieve this clearance. The profile is on a crest vertical curve which provides adequate freeboard (three feet minimum) to the ultimate channelization of New River.

3.3 CONSTRUCTION ISSUES / TRAFFIC CONTROL

A major concern when constructing a bridge over a normally dry desert wash or river is the potential for fast moving flood waters during a storm event. Superstructure types such as cast-in-place concrete, which require falsework in the riverbed to support forms during construction, are at a significant risk of being washed away during an event. While temporary falsework can be designed to resist certain flows, costs increase significantly and the risk remains. Superstructures consisting of precast concrete or steel girders, which can be fabricated off-site and placed without falsework, have a significant advantage for bridges over waterways. When using girder superstructures, consideration must be given to transportation of the girders from the fabrication facility to the project site. Girders lengths of over approximately 150 feet in length become unfeasible to transport over local streets.

Since the proposed Beardsley Road is on a new alignment, traffic control is not a critical issue with respect to bridge construction.

Construction access in the New River will be coordinated with the Flood Control District of Maricopa County. However, access for pier construction and girder placement should be straight forward with little or no special requirements.

3.4 DRAINAGE AND HYDRAULICS

Drainage issues specific for this project are addressed in the *Preliminary Drainage Report (30% Submittal) for the Beardsley Road Connector*, J2 Engineering and Environmental Design, June 2006. Drainage of the bridge decks will be towards the abutments along the barrier faces. There will be no open deck drains on the bridge. Bridge hydraulics are based on a HEC-RAS analysis performed by the Corps of Engineers (COE) for ultimate New River conditions as outlined in the Middle New River Watercourse Master Plan. The COE 100-year high water surface elevation was calculated at 1247.24 with a flow rate of 13,400 cfs and a velocity of 7.1 fps. Scour is anticipated at abutments and piers. Preliminary scour calculations indicate 34 feet of scour at the piers. This scour depth is used for preliminary estimates of both the abutments and piers.

The Middle New River Watercourse Master Plan recommends bank protection consisting of gabion mattress and channel 2:1 slopes.

3.5 RIGHT-OF-WAY

Right-of-way will be acquired for the extension of Beardsley Road. The preliminary right-of-way requirements for this project are delineated in the project plans. The construction of the bridge can occur within the proposed right-of-way. However, temporary construction easements will likely be required for access to the river bed to construct piers and place girders. Access requirements will be investigated further during final design.

3.6 UTILITIES

A large high voltage APS power pole will be in conflict with the proposed alignment of Beardsley Road and will be relocated. There will be new utilities crossing with the bridge. Conduits for street lighting, telephone and cable utilities will be located within the bridge. During final design, further coordination will be necessary to determine the type, size of locations of these conduits as well as with other utilities that may request to cross the bridge.

3.7 AESTHETICS

The two primary factors considered in the appearance of bridge structures are the superstructure type and the interrelated abutment and span length configuration. Uniform and simple lines of the cast-in-place alternatives give the structure a pleasing appearance superior to most other types. Precast-prestreseed girder superstructures, while acceptable in their appearance, have more complex surfaces in elevation, and a greater superstructure depth for a given span length. The exposed pier cap beam below the superstructure also detracts from the overall appearance. The aesthetic preference is normally for the use of longer spans and stub abutments that provide for an open view when economically feasible.

Round pier columns are recommended at the proposed structure to improve hydraulics.

The front faces of abutments, columns, wing walls, and adjoining retaining walls could be cast with rustication. The exposed abutment faces, piers, and the outer faces and soffit of the superstructures could be painted or stained in color to enhance the structure appearances at minimal cost.

Architectural enhancements that are additions to the basic bridge elements have not yet been developed at the time of this report and will be developed during final design.

3.8 BRIDGE CONFIGURATION - GENERAL

The determination of span configurations and suitable span lengths is the result of evaluating an often complex interrelationship between the geometrics of the roadways, slopes of embankment fills and cuts, practical span arrangements and structure behavior, site constraints, constructability, economics, and aesthetics. Some aspects of this evaluation are quantified calculations of geometrics and cost; others are qualitative application of experience, knowledge of local historical practice, and engineering judgment.

The superstructure types commonly constructed over rivers and natural ravines typically consist of structural steel girders, cast-in-place concrete girder bridges, side-by-side precast-prestressed concrete box beams, and standard precast-prestressed AASHTO I-girders composite with a cast-in-place deck. Reinforced concrete box culverts and concrete closed frame bridges supported on mat foundations are frequently used for smaller crossings. Structural steel girder bridges are not typically used in Arizona due to their higher cost of construction. A few bridges with post-tensioned cast-in-place box girder superstructures have been constructed over rivers and natural ravines. However, the cost of and risk associated with falsework in these situations typically outweighs the benefits of this type of system. Precast systems have a construction advantage in that construction does not require falsework; however, adequate access for construction equipment must be provided for setting the girders. The selection of one of these superstructure types is usually determined by a combination of the required freeboard, bridge span lengths, approach roadway vertical profile, and the constructability of the structure when river flows and scour are a consideration. The historical service performance for all of these structure types has provided generally good performance.

Abutments used for river crossing structures can range from stub abutments to full-depth wall abutments with stub type being more common. Stub abutments are typically supported by a single row of drilled shafts when the abutment is situated in embankment fills or when loads or soil conditions are not conducive to the use of spread footings. Full-depth abutments are usually cantilevered from spread footings or shaft caps to resist lateral earth pressures and maintain stability. The shaft caps are supported by multiple rows of drilled shafts.

Piers are usually multi-column bents with integral cap beams for slab or box girder superstructure bridges, and exposed cap beams for precast superstructures. The columns on river crossings are usually round concrete columns to improve the hydraulic capacity. The columns are supported on individual large-diameter drilled shafts, isolated or continuous footings, or transition caps. The transition caps are supported by a single or group of drilled shafts or piles.

3.9 BRIDGE CONFIGURATION – ALTERNATIVE 1

Superstructure

The recommended superstructure type is the precast-prestressed AASHTO girder with a composite cast-in-place deck. The precast-prestressed girder superstructure is recommended for this bridge to eliminate falsework construction and improve constructability. Two-span and three-span configurations were investigated. The two-span configuration results in two, 142' spans with AASHTO Type VI girders. With a superstructure depth of seven feet, this configuration would require raising the proposed profile of Beardsley Road to achieve adequate freeboard for the 100-year event and was eliminated. The recommended configuration is a three-span precast-prestressed concrete AASHTO Type IV girder bridge. The superstructure depth is 5'-5". The spans are 95'-2", 96'-8", and 95'-2" with a total structure length of 292'-6". The structure has nine girder lines spaced at 8'-1" with 3'-8" deck overhangs.

Substructure and Foundations

The geotechnical investigation has not been completed at the time of this report. Substructure recommendations are based on the recommendations from the *Preliminary Geotechnical Evaluation Beardsley Road Connection 83rd Avenue to Loop 101 Peoria and Glendale, Arizona*, Ninyo & Moore, February 2004. Ninyo and Moore reviewed two available geotechnical engineering reports for the existing the Union Hills Drive Bridge over New River to the south and Deer Valley Road Bridge over the New River to the north. Based on results of deep borings, these reports recommended drilled shaft foundations embedded in subsurface profiles consisting of sand, gravel and cobbles (SGC) and/or sand and gravel.

Drilled shaft construction can be completed with minimum disruption to the embankments since large excavations would not be required. Drilled shaft foundations also can provide the deep foundations necessary to resist the effects of scour. For these reasons, the Preliminary Geotechnical Evaluation also recommends the use of drilled shaft supports that extend into the underlying very dense SGC at both the abutments and piers.

Abutments 1 and 2 are stub abutments. Permanent retaining walls oriented parallel to the roadway centerline will be constructed outside of the roadway width to retain the roadway fills.

Piers will consist of round columns as an extension of the recommended drilled shaft foundations. Drilled shafts will be embedded to depths necessary to satisfy loading and scour requirements. The round pier configuration satisfies the structural and hydraulic requirements and will simplify forming.

A geotechnical investigation and Final Geotechnical Report will be completed prior to the Stage III (60%) submittal. The Final Bridge Selection Report will include substructure recommendations based on the Final Geotechnical Report and Final Drainage Report.

3.10 BRIDGE CONFIGURATION – ALTERNATIVE 2

An alternative to the recommended bridge configuration would be a two-span structural steel plate girder bridge with a total structure length of 292'-6". This alternative was evaluated to eliminate the construction of one pier with only a slightly increased structure depth.

This alternative would require nine girder lines spaced at 8'-1". The superstructure depth for the bridge would be 5'-9". The girders would likely be fabricated to incorporate continuity over the single pier and would be field spliced at moment inflection points to allow for reasonable transportation lengths. The material for the steel girders could be weathering steel to eliminate the need for painting.

The cost of steel has increased dramatically in the last few years. The cost of this alternative is not comparable with Alternative 1 and will not be considered further. Additionally, steel structures usually require additional maintenance costs and in-depth bridge inspections.

3.11 COST ESTIMATES

Estimated costs for each structure alternative have been developed by multiplying approximate quantities by estimated unit costs, and summing for the structure totals. These are separated into bridge specific items and other items included in the overall bridge cost. Recent ADOT bid history is utilized as the basis for deriving estimated unit costs of specific items; however, changes in the construction market may impact actual bid costs at the time design is finalized. Itemized costs and totals for the structure alternatives evaluated are included in Appendix B.

The estimated cost of these alternatives, including a 10% contingency is as follows:

Alternative 1 – Three-span precast-prestressed AASHTO Type IV girder bridge

Structure total cost for alternatives comparison	$1,796,509
Structure total cost per square foot	$85.30

Alternative 2 – Two-span structural steel plate girder bridge

Structure total cost for alternatives comparison	$2,819,916
Structure total cost per square foot	$133.90

3.12 RECOMMENDATION

Alternative 1, a precast-prestressed girder structure with stub abutments founded on drilled shafts and pier columns supported on drilled shafts is recommended for this site. Alternative 1 is preferred over Alternative 2 since it requires shorter girders that facilitate the transportation and delivery of girders and provides the most cost effective solution.

4.0 REFERENCES

LRFD Bridge Design Specifications, American Association of State Highway and Transportation Officials (AASHTO), 3rd Edition – 2004 and the 2005 and 2006 *Interim Specifications.*

Standard Specifications for Highway Bridges, American Association of State Highway and Transportation Officials (AASHTO), 17th Edition – 2002.

Bridge Practice Guidelines, Arizona Department of Transportation (ADOT), Latest Edition.

Preliminary Geotechnical Evaluation Beardsley Road Connection 83rd Avenue to Loop 101 Peoria and Glendale, Arizona, Ninyo & Moore, February 2004.

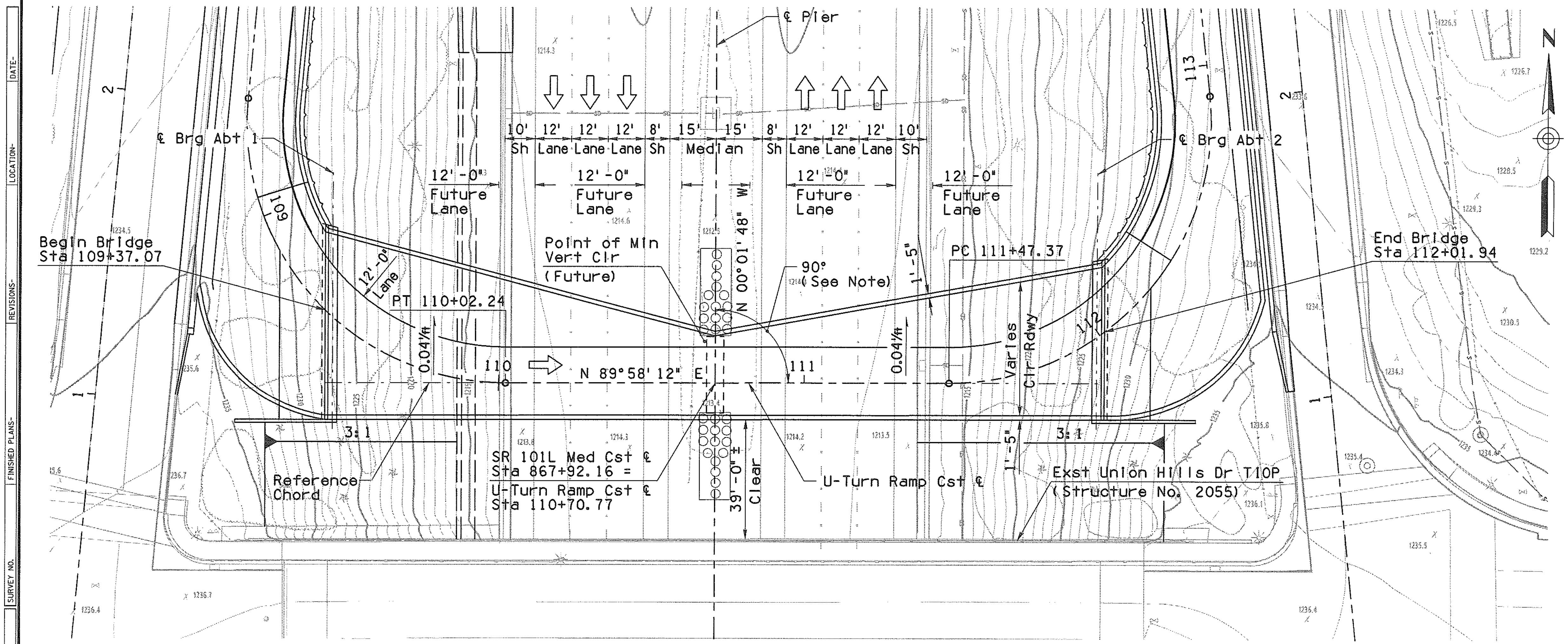
Final Design Concept Report, Beardsley Road Connector, Carter & Burgess, May 2006

Preliminary Drainage Report (30% Submittal) for the Beardsley Road Connector, J2 Engineering and Environmental Design, June 2006.

APPENDIX A

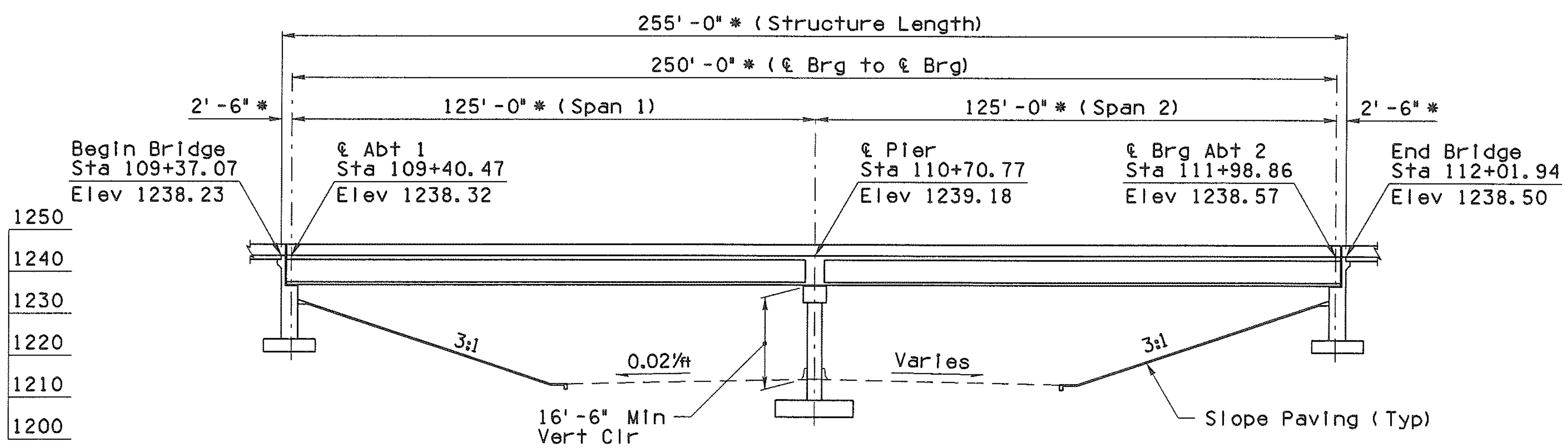
Bridge Plans and Typical Sections

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	-			



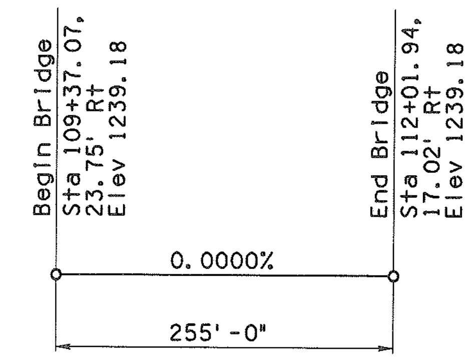
LOCATION PLAN

New Two Span AASHTO Type VI Modified Precast Concrete Girder Bridge
Contour Interval = 1'-0"
Skew = 0°
Scale: 1" = 20'-0"



ELEVATION

Scale: 1" = 20'-0"



REFERENCE CHORD PROFILE

NTS

NOTES:

1. Reference Chord is a straight line projection of the U-Turn Ramp alignment tangent to the ends of the bridge. Bearing of Reference Chord is N 89°58'12" E.

2. ℄ Bearing Abutments & ℄ Pier are normal to Reference Chord.

* Measured along Reference Chord.

	NAME	DATE
DESIGN	CRB	06/06
DRAWN	TST	06/06
CHECKED	CAL	06/06

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA 867+
U-TURN RAMP UNDERPASS
GENERAL PLAN & ELEVATION

ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
101L	15.82	-	BEARDSLEY ROAD CONNECTOR

TRACS NO. -

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO. S-1.01

6/28/2006 N:\60003917\Prod\str\U-Turn Bridge\BRutgp01.dgn

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	-			

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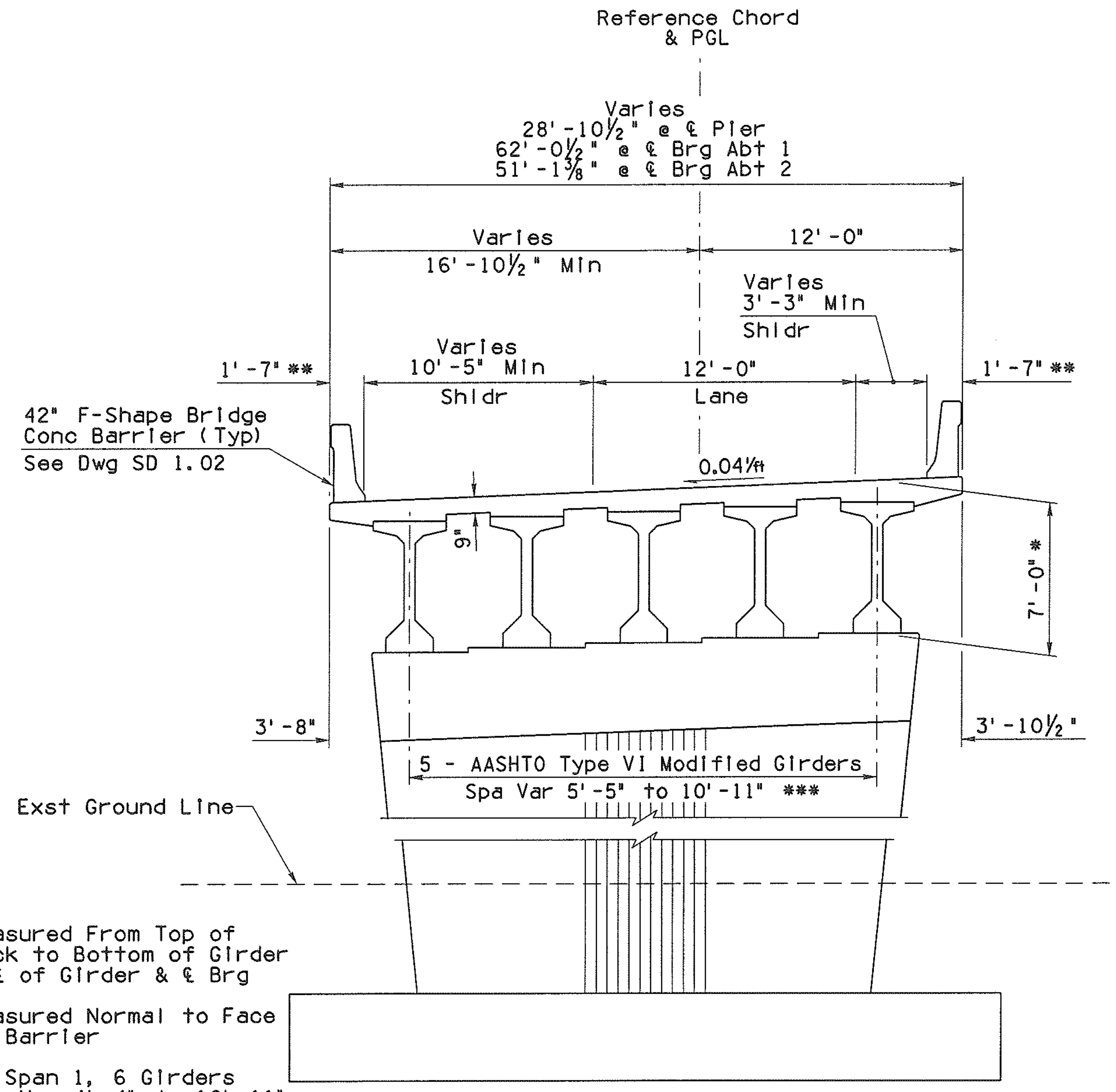

* Measured From Top of Deck to Bottom of Girder @ ℄ of Girder & ℄ Brg

** Measured Normal to Face of Barrier

*** At Span 1, 6 Girders Spa Var 4'-4" to 10'-11"

TYPICAL SECTION

Span 2 Shown, Looking East (Ahead On Station)
Scale: ¼" = 1'-0"

GENERAL NOTES:

Construction Specification - Arizona Department of Transportation Standard Specifications for Road and Bridge Construction, Edition of 2000.

Design Specifications - AASHTO LRFD Bridge Design Specifications, 3rd Edition 2004 and the 2005 and 2006 Interim Specifications (Superstructure), AASHTO Standard Specifications for Highway Bridges, 17th Edition, 2002 (Substructure)

Dead Load - Dead Load includes allowance of 25 pounds per square foot for future wearing surface.

Loading Class - HL93 design truck or tandem and design lane load.

Composite Design - Dead load carried by girders only.

Seismic Performance category A (Acc=0.03g).

All concrete shall be Class "S" unless noted otherwise.

Reinforcing steel shall conform to ASTM Specification A615. All reinforcing shall be furnished as Grade 60.

All bends and hooks shall meet the requirements of AASHTO Article 8.23. All bend dimensions for reinforcing steel shall be out-to-out of bars. All placement dimensions for reinforcing steel shall be to center of bars unless noted otherwise.

All reinforcing steel shall have 2 inch clear cover unless noted otherwise.

All mechanical splices shall conform to the requirements for mechanical connections in Section 605-3.02 of the Standard Specifications.

Stresses:
- Superstructure .... f'_c= 4500 psi
- Barriers & barrier footings .... f'_c= 4000 psi
- All other Class "S" concrete .... f'_c= 3500 psi
- Grade 60 transverse deck reinf .... f_s= 20000 psi
- All other Grade 60 .... f_s= 24000 psi
- Prestressing steel .... f'_s= 270000 psi (1/2" dia. 7-wire Low Relaxation Strand)

Barriers shall be constructed after spans have taken dead load deflection. Barriers shall not be slip formed.

Chamfer all exposed corners ¾" unless noted otherwise.

Dimensions shall not be scaled from drawings.

Exposed concrete surfaces shall be painted in accordance with the Standard Specifications and Special Provisions.

ADOT STANDARD DRAWING LIST

ADOT Structures Section Details; SD 1.01, SD 1.03, SD 2.01, SD 3.01.

APPROXIMATE QUANTITIES

ITEM	STR EX CY	STR BACKFILL CY	CLASS "S" CONCRETE f'c=3500 PSI CY	CLASS "S" CONCRETE f'c=4500 PSI CY	REINFORCING STEEL LBS	AASHTO TYPE VI MODIFIED GIRDERS LF	RETAINING WALL SF
Abt 1	-	-	-	-	-	-	-
Pier	-	-	-	-	-	-	-
Abt 2	-	-	-	-	-	-	-
Superstructure	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-
As-Built Total							

Approach Slab: .... XXXX ft^2
42" F-Shape Bridge Conc Barrier & Transition: .... XXX LF
Restrainers, Fixed: .... XX Ea
Restrainers, Expansion: .... XX Ea
Deck Joint Assembly (3 x 3 Compression Seal) .... XX LF
Slope Paving .... XXX SY

		DATE
DESIGN	CRB	06/06
DRAWN	TST	06/06
CHECKED	CAL	06/06

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA 867+
U-TURN RAMP UNDERPASS
GENERAL NOTES, SECTION & QUANTITIES

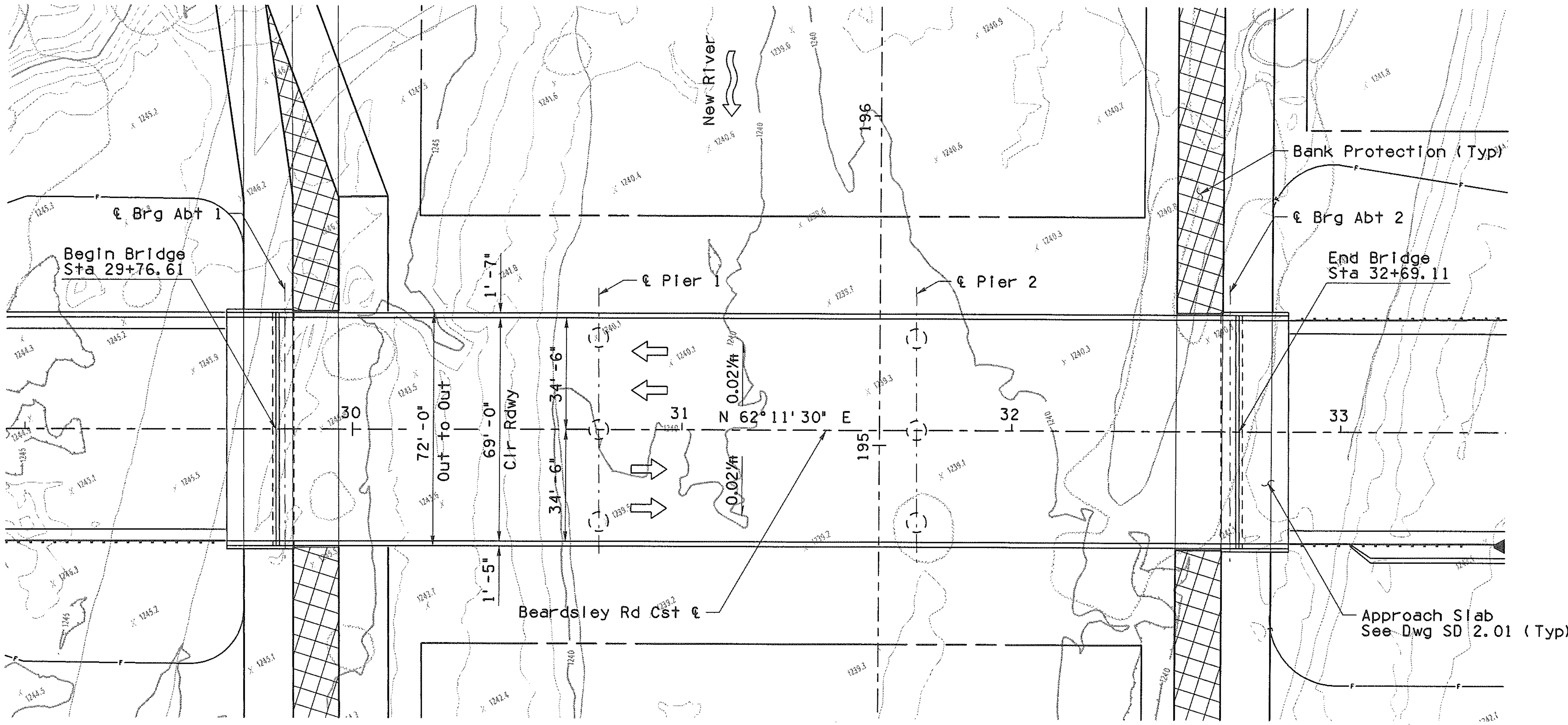
ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
101L	15.82	-	BEARDSLEY ROAD CONNECTOR

TRACS NO. - | -

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING
DWG NO. S-1.02
____ OF ____

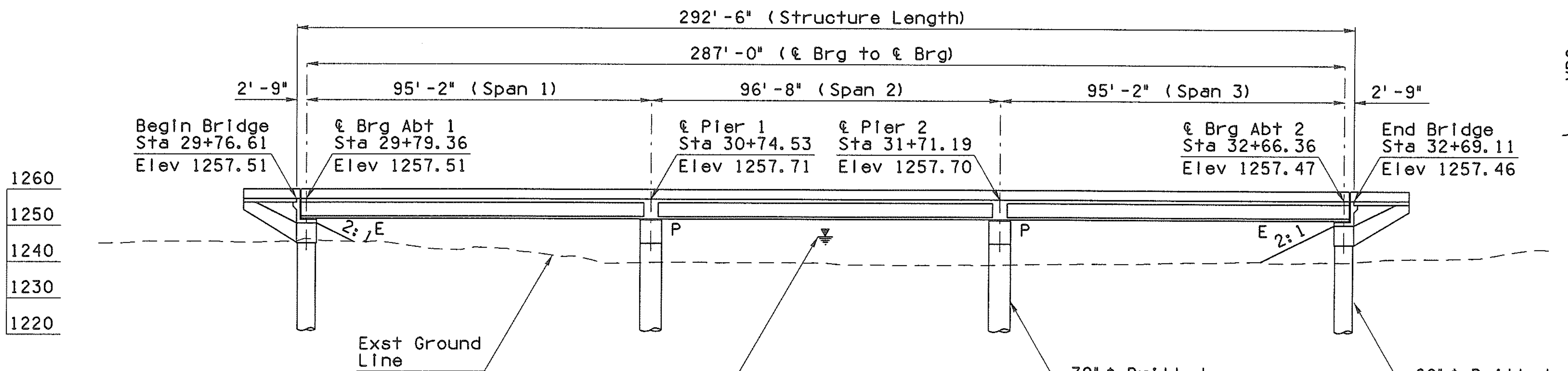
NO.1	DESCRIPTION OF REVISION	MADE BY	DATE
NO.2	DESCRIPTION OF REVISION	MADE BY	DATE

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	-			
		-			



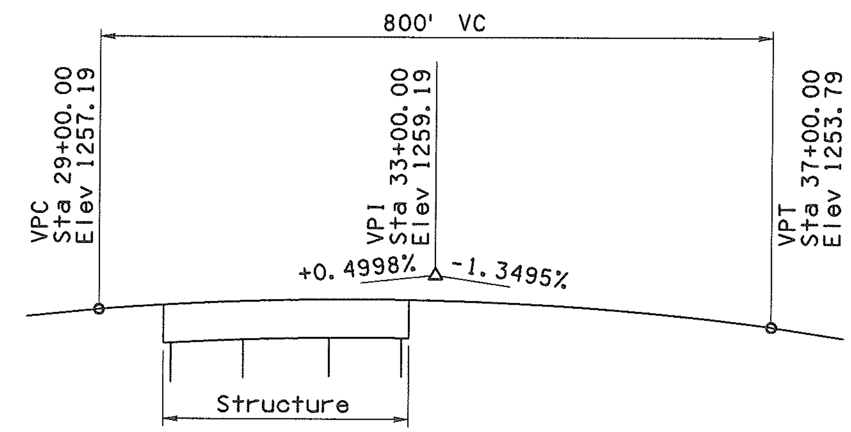
LOCATION PLAN

New Three Span AASHTO Type IV Precast Concrete Girder Bridge
Contour Interval = 1'-0"
Skew = 0°
Scale: 1" = 20'-0"



ELEVATION

Scale: 1" = 20'-0"



BEARDSLEY ROAD PROFILE

NTS

NOTE:
Stations & elevations are measured along Beardsley Road Cst ℄.

	NAME	DATE
DESIGN	CRB	06/06
DRAWN	TST	06/06
CHECKED	CAL	06/06

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA 29+
BEARDSLEY RD BRIDGE AT NEW RIVER
GENERAL PLAN & ELEVATION

ROUTE	MILEPOST	STRUCTURE NO.	LOCATION
101L	16.72	-	BEARDSLEY ROAD CONNECTOR

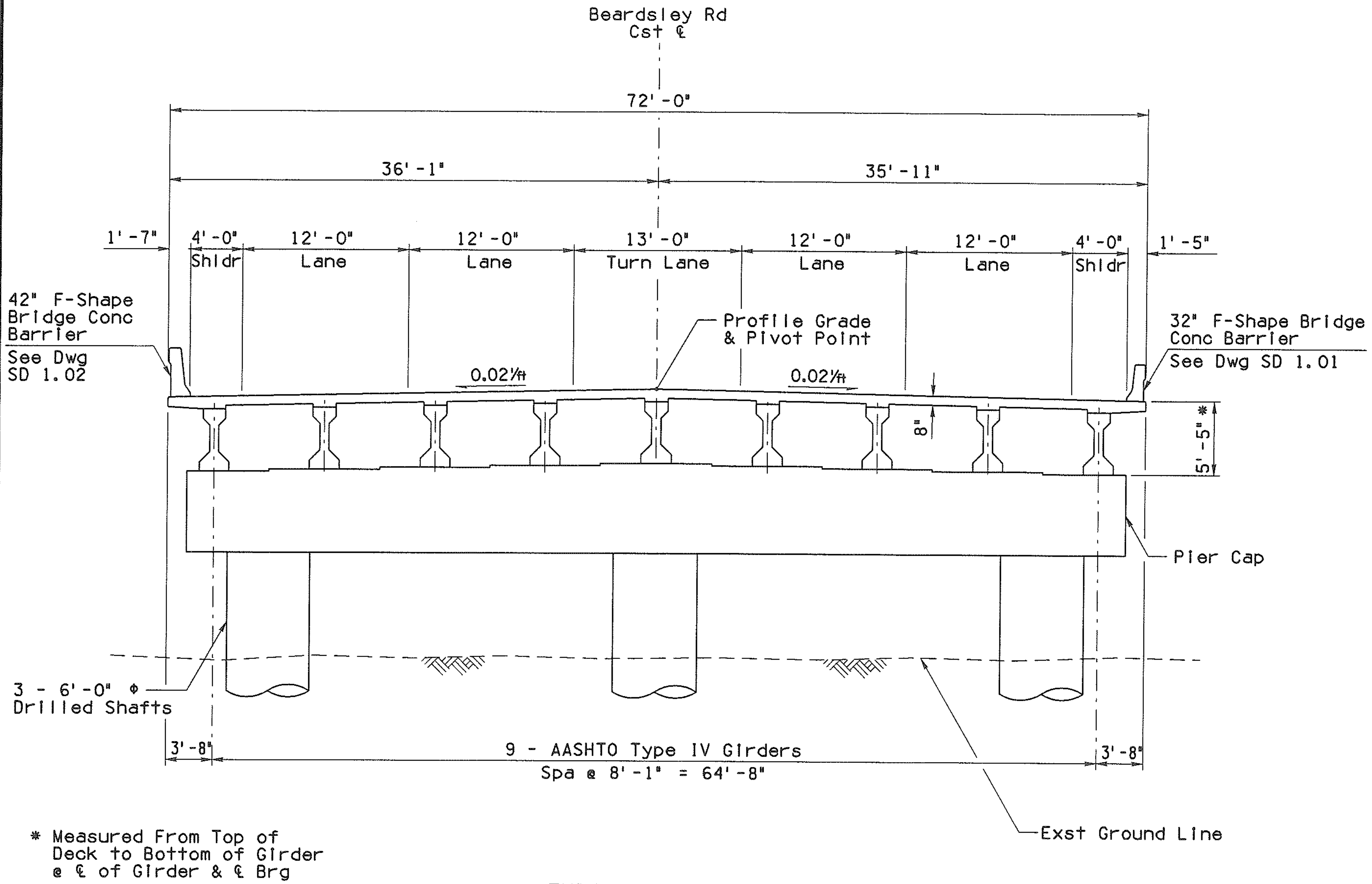
PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO. S-2.01

TRACS NO. - | -

DATE- LOCATION- REVISIONS- FINISHED PLANS- SURVEY NO. DATE- LOCATION- REVISIONS- FINISHED PLANS- SURVEY NO.

6/28/2006 N:\60003917\Prod\str\Bearsdley Bridge\BRbbgp01.dgn



TYPICAL SECTION
Shown Looking Ahead On Station
Scale: 3/16" = 1'-0"

GENERAL NOTES:

Construction Specification - Arizona Department of Transportation Standard Specifications for Road and Bridge Construction, Edition of 2000.

Design Specifications - AASHTO LRFD Bridge Design Specifications, 3rd Edition 2004 and the 2005 and 2006 Interim Specifications (Superstructure, AASHTO Standard Specifications for Highway Bridges, 17th Edition, 2002 (Substructure).

Dead Load - Dead Load includes allowance of 25 pounds per square foot for future wearing surface.

Loading Class - HL93 design truck or tandem and design lane load.

Composite Design - Dead load carried by girders only.

Seismic Performance category A (Acc=0.03g).

All concrete shall be Class "S" unless noted otherwise.

Reinforcing steel shall conform to ASTM Specification A615. All reinforcing shall be furnished as Grade 60.

All bends and hooks shall meet the requirements of AASHTO Article 8.23. All bend dimensions for reinforcing steel shall be out-to-out of bars. All placement dimensions for reinforcing steel shall be to center of bars unless noted otherwise.

All reinforcing steel shall have 2 inch clear cover unless noted otherwise.

All mechanical splices shall conform to the requirements for mechanical connections in Section 605-3.02 of the Standard Specifications.

Stresses:
- Superstructure .... f'_c= 4500 psi
- Barriers & barrier footings .... f'_c= 4000 psi
- All other Class "S" concrete .... f'_c= 3500 psi
- Grade 60 transverse deck reinf .... f_s= 20000 psi
- All other Grade 60 .... f_s= 24000 psi
- Prestressing steel .... f'_s= 270000 psi
  (1/2" dia. 7-wire Low Relaxation Strand)

Barriers shall be constructed after spans have taken dead load deflection. Barriers shall not be slip formed.

Chamfer all exposed corners 3/4" unless noted otherwise.

Dimensions shall not be scaled from drawings.

Exposed concrete surfaces shall be painted in accordance with the Standard Specifications and Special Provisions.

ADOT STANDARD DRAWING LIST

ADOT Structures Section Details; SD 1.01, SD 1.03, SD 2.01, SD 3.01.

APPROXIMATE QUANTITIES

ITEM	STR EX CY	STR BACKFILL CY	CLASS "S" CONCRETE f'c=3500 PSI CY	CLASS "S" CONCRETE f'c=4500 PSI CY	REINFORCING STEEL LBS	AASHTO TYPE IV GIRDERS LF	60" Φ DRILLED SHAFTS LF	72" Φ DRILLED SHAFTS LF
Abt 1 & Wingwalls	-	-	-	-	-	-	-	-
Piers 1 & 2	-	-	-	-	-	-	-	-
Abt 2 & Wingwalls	-	-	-	-	-	-	-	-
Superstructure	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-
As-Built Total								

Approach Slab: .... XXXX ft²
32" F-Shape Bridge Conc Barrier & Transition: .... XXX LF
42" F-Shape Bridge Conc Barrier & Transition: .... XXX LF
Restrainers, Fixed: .... XX Ea
Restrainers, Expansion: .... XX Ea
Thrie Beam Guardrail Transition System: .... X Ea
Deck Joint Assembly (3 x 3 Compression Seal): .... XX LF

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	-			

		DATE
DESIGN	CRB	06/06
DRAWN	TST	06/06
CHECKED	CAL	06/06

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA 29+
BEARDSLEY RD BRIDGE AT NEW RIVER
GENERAL NOTES, SECTION & QUANTITIES

101L ROUTE | 16.72 MILEPOST | - STRUCTURE NO.

LOCATION BEARDSLEY ROAD CONNECTOR

TRACS NO. - | -

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING
DWG NO. S-2.02
____ OF ____

6/28/2006 N:\60003917\Prod\str\Bearsdley Bridge\BRbbgsq.dgn

APPENDIX B

Quantities and Cost Estimates

LUMP SUM STRUCTURE ITEMS					
ITEM NUMBER	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
2030501	STRUCTURAL EXCAVATION	CU.YD.	$20.00	778	$15,569
2030506	STRUCTURE BACKFILL	CU.YD.	$30.00	272	$8,161
6010003	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,500)	CU.YD.	$400.00	589	$235,525
6010005	STRUCTURAL CONCRETE (CLASS S) (F'C = 4,500)	CU.YD.	$450.00	451	$202,786
6011131	F-SHAPE BRIDGE CONCRETE BARRIER AND TRANSITION (42 INCH)	L.FT.	$100.00	575	$57,500
6011347	DECK JOINT ASSEMBLY (3X3 COMPRESSION SEAL)	L.FT.	$120.00	113	$13,560
6011371	APPROACH SLAB (SD 2.01)	SQ.FT.	$12.00	2,200	$26,400
6014956	PRECAST, P/S MEMBER (AASHTO TYPE 6 MOD. GR.)	L.FT.	$180.00	1,390	$250,121
6015101	RESTRAINERS, VERTICAL EARTHQUAKE (FIXED)	EACH	$110.00	11	$1,210
6015102	RESTRAINERS, VERTICAL EARTHQUAKE (EXPANSION)	EACH	$110.00	11	$1,210
6050002	REINFORCING STEEL	LB.	$1.00	147,183	$147,183
9210001	SLOPE PAVING	SQ.YD.	$50.00	651	$32,539
			SUBTOTAL:		$991,764
			CONTINGENCY:	10.00%	$99,176
			TOTAL COST:		$1,090,940
			TOTAL COST/SF:		$99.47

OTHER ITEMS					
ITEM NUMBER	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
9140153	RETAINING WALL (	SQ.FT.	$45.00	600	$27,000
			SUBTOTAL:		$27,000
			CONTINGENCY:	10.00%	$2,700
			TOTAL COST:		$29,700
			TOTAL COST/SF:		$2.71

TOTAL FOR STRUCTURE ALTERNATIVE COST COMPARISON	
SUBTOTAL:	**$1,018,764**
CONTINGENCY:	**$101,876**
TOTAL COST:	**$1,120,640**
TOTAL COST/SF:	**$102.18**

Structure Name:	**U-Turn Ramp Underpass, Alternative 1**		
Superstructure Type:	**Precast AASHTO Type VI Modified Girder**		
Substructure Type:	**Partial Depth Abutments**		
Foundation Type:	**Spread Footings**		
No. of Spans:	**2**	Total Length (ft):	**255**
Span Lengths (ft):	**125-125**	Width (Out to Out) (ft):	**Varies, 28.88 to 62.04**
Skew (deg):	**0**	Area (sq ft):	**10,967**

LUMP SUM STRUCTURE ITEMS					
ITEM NUMBER	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
2030501	STRUCTURAL EXCAVATION	CU.YD.	$20.00	854	$17,084
2030506	STRUCTURE BACKFILL	CU.YD.	$30.00	299	$8,956
6010003	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,500)	CU.YD.	$400.00	856	$342,524
6010005	STRUCTURAL CONCRETE (CLASS S) (F'C = 4,500)	CU.YD.	$450.00	601	$270,424
6011131	F-SHAPE BRIDGE CONCRETE BARRIER AND TRANSITION (42 INCH)	L.FT.	$100.00	570	$57,000
6011347	DECK JOINT ASSEMBLY (3X3 COMPRESSION SEAL)	L.FT.	$120.00	124	$14,880
6011371	APPROACH SLAB (SD 2.01)	SQ.FT.	$12.00	2,420	$29,040
6014956	PRECAST, P/S MEMBER (AASHTO TYPE 6 MOD. GR.)	L.FT.	$180.00	2,000	$360,000
6015101	RESTRAINERS, VERTICAL EARTHQUAKE (FIXED)	EACH	$110.00	16	$1,760
6015102	RESTRAINERS, VERTICAL EARTHQUAKE (EXPANSION)	EACH	$110.00	16	$1,760
6050002	REINFORCING STEEL	LB.	$1.00	245,071	$245,071
9210001	SLOPE PAVING	SQ.YD.	$50.00	716	$35,778
			SUBTOTAL:		$1,384,277
			CONTINGENCY:	10.00%	$138,428
			TOTAL COST:		$1,522,705
			TOTAL COST/SF:		$95.35

OTHER ITEMS					
ITEM NUMBER	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
9140153	RETAINING WALL (	SQ.FT.	$45.00	600	$27,000
			SUBTOTAL:		$27,000
			CONTINGENCY:	10.00%	$2,700
			TOTAL COST:		$29,700
			TOTAL COST/SF:		$1.86

TOTAL FOR STRUCTURE ALTERNATIVE COST COMPARISON	
SUBTOTAL:	**$1,411,277**
CONTINGENCY:	**$141,128**
TOTAL COST:	**$1,552,405**
TOTAL COST/SF:	**$97.21**

Structure Name:	**U-Turn Ramp Underpass, Alternative 2**		
Superstructure Type:	**Precast AASHTO Type VI Modified Girder**		
Substructure Type:	**Partial Depth Abutments**		
Foundation Type:	**Spread Footings**		
No. of Spans:	**2**	Total Length (ft):	**255**
Span Lengths (ft):	**125-125**	Width (Out to Out) (ft):	**62.04**
Skew (deg):	**0**	Area (sq ft):	**15,969**

LUMP SUM STRUCTURE ITEMS					
ITEM NUMBER	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
2030501	STRUCTURAL EXCAVATION	CU.YD.	$20.00	135	$2,700
2030506	STRUCTURE BACKFILL	CU.YD.	$30.00	270	$8,100
6010003	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,500)	CU.YD.	$400.00	471	$188,400
6010005	STRUCTURAL CONCRETE (CLASS S) (F'C = 4,500)	CU.YD.	$450.00	726	$326,700
6011130	F-SHAPE BRIDGE CONCRETE BARRIER AND TRANSITION (32 INCH)	L.FT.	$100.00	323	$32,300
6011131	F-SHAPE BRIDGE CONCRETE BARRIER AND TRANSITION (42 INCH)	L.FT.	$110.00	323	$35,530
6011347	DECK JOINT ASSEMBLY (3X3 COMPRESSION SEAL)	L.FT.	$120.00	138	$16,560
6011371	APPROACH SLAB (SD 2.01)	SQ.FT.	$12.00	2,160	$25,920
6014952	PRECAST, P/S MEMBER (AASHTO TYPE 4 GIRDER)	L.FT.	$150.00	2,570	$385,500
6015101	RESTRAINERS, VERTICAL EARTHQUAKE (FIXED)	EACH	$110.00	32	$3,520
6015102	RESTRAINERS, VERTICAL EARTHQUAKE (EXPANSION)	EACH	$110.00	16	$1,760
6050002	REINFORCING STEEL	LB.	$1.00	222,500	$222,500
9050430	THRIE-BEAM GUARD RAIL TRANSITION SYSTEM	EACH	$1,600.00	3	$4,800
			SUBTOTAL:		$1,254,290
			CONTINGENCY:	10.00%	$125,429
			TOTAL COST:		$1,379,719
			TOTAL COST/SF:		$65.51

OTHER ITEMS					
ITEM NUMBER	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
6090060	DRILLED SHAFT FOUNDATION (60")	L.FT.	$450.00	318	$143,100
6090072	DRILLED SHAFT FOUNDATION (72")	L.FT.	$600.00	393	$235,800
			SUBTOTAL:		$378,900
			CONTINGENCY:	10.00%	$37,890
			TOTAL COST:		$416,790
			TOTAL COST/SF:		$19.79

TOTAL FOR STRUCTURE ALTERNATIVE COST COMPARISON	
SUBTOTAL:	**$1,633,190**
CONTINGENCY:	**$163,319**
TOTAL COST:	**$1,796,509**
TOTAL COST/SF:	**$85.30**

Structure Name:	**Beardsley Road Bridge at New River, Alternative 1**		
Superstructure Type:	**Precast AASHTO Type IV Girder**		
Substructure Type:	**Stub Abutments**		
Foundation Type:	**Drilled Shafts**		
No. of Spans:	**3**	Total Length (ft):	**292.5**
Span Lengths (ft):	**95.17-96.67-95.17**	Width (Out to Out) (ft):	**72.00**
Skew (deg):	**0**	Area (sq ft):	**21,060**

LUMP SUM STRUCTURE ITEMS					
ITEM NUMBER	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
2030501	STRUCTURAL EXCAVATION	CU.YD.	$20.00	135	$2,700
2030506	STRUCTURE BACKFILL	CU.YD.	$30.00	270	$8,100
6010003	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,500)	CU.YD.	$400.00	340	$136,000
6010005	STRUCTURAL CONCRETE (CLASS S) (F'C = 4,500)	CU.YD.	$450.00	575	$258,750
6011130	F-SHAPE BRIDGE CONCRETE BARRIER AND TRANSITION (32 INCH)	L.FT.	$100.00	323	$32,300
6011131	F-SHAPE BRIDGE CONCRETE BARRIER AND TRANSITION (42 INCH)	L.FT.	$110.00	323	$35,530
6011347	DECK JOINT ASSEMBLY (3X3 COMPRESSION SEAL)	L.FT.	$120.00	138	$16,560
6011371	APPROACH SLAB (SD 2.01)	SQ.FT.	$12.00	2,160	$25,920
6040001	STRUCTURAL STEEL	LB.	$2.00	774,000	$1,548,000
6050002	REINFORCING STEEL	LB.	$1.00	170,600	$170,600
9050430	THRIE-BEAM GUARD RAIL TRANSITION SYSTEM	EACH	$1,600.00	3	$4,800
			SUBTOTAL:		$2,239,260
			CONTINGENCY:	10.00%	$223,926
			TOTAL COST:		$2,463,186
			TOTAL COST/SF:		$116.96

OTHER ITEMS					
ITEM NUMBER	DESCRIPTION	UNIT	UNIT COST	QUANTITY	COST
6090060	DRILLED SHAFT FOUNDATION (60")	L.FT.	$450.00	378	$170,100
6090072	DRILLED SHAFT FOUNDATION (72")	L.FT.	$600.00	257	$154,200
			SUBTOTAL:		$324,300
			CONTINGENCY:	10.00%	$32,430
			TOTAL COST:		$356,730
			TOTAL COST/SF:		$16.94

TOTAL FOR STRUCTURE ALTERNATIVE COST COMPARISON	
SUBTOTAL:	**$2,563,560**
CONTINGENCY:	**$256,356**
TOTAL COST:	**$2,819,916**
TOTAL COST/SF:	**$133.90**

Structure Name: **Beardsley Road Bridge at New River, Alternative 2**
Superstructure Type: **Structural Steel Plate Girder**
Substructure Type: **Stub Abutments**
Foundation Type: **Drilled Shafts**
No. of Spans: **2**
Span Lengths (ft): **143.5-143.5**
Skew (deg): **0**

Total Length (ft): **292.5**
Width (Out to Out) (ft): **72.00**
Area (sq ft): **21,060**