10-1.107 BRIDGE DECK DRAINAGE SYSTEM:

Bridge deck drainage systems shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal" of the Standard Specifications and these Special Provisions.

Self-tapping screws used for sleeve connections shall be hex-head stainless steel, installed in holes drilled to fit the self-tapping screws, conforming to the requirements of ASTM Designation: A 276, Type 304.

At the Contractor's option, fiberglass pipes and fittings with the same diameter and minimum bend radius as those shown on the plans, may be substituted for welded steel pipe in deck drain systems.

Fiberglass pipe and fittings shall conform to the requirements in ASTM Designation: D 2996, and shall have a minimum short-term rupture strength of 207 MPa. The adhesive type recommended by the manufacturer shall be used for joining pipe and fittings. Fiberglass pipe not enclosed in a box girder cell or encased in concrete shall be manufactured from ultraviolet-resistant resin pigmented with concrete-gray color, or be coated with a concrete-gray resin-rich exterior coating. Paint shall not be used. Fiberglass pipe treated with ultraviolet protection shall withstand a minimum of 2500 hours of accelerated weathering when tested in conformance with the requirements in ASTM Designation: G 154. Lamps shall be UV-B (313 nm wavelength). The resting cycle shall be 4 hours of ultraviolet exposure at 60°C, and then 4 hours of condensate exposure at 50°C. After testing, the surface of the pipe shall exhibit no fiber exposure, crazing, or checking, and only a slight chalking or color change.

Support spacing for fiberglass pipe shall be the same as shown on the plans for welded steel pipe. Pipe supports shall have a width of not less than 38-mm.

A Certificate of Compliance for fiberglass pipe and fittings shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate of Compliance shall include all laboratory test results conforming to the provisions specified herein.

For drainage piping NPS 8 or smaller, which is: (1) enclosed in a box girder cell and exposed for a length not greater than 6 m within the cell, or (2) encased in concrete, the Contractor shall have the option of substituting polyvinyl chloride (PVC) plastic pipe and fittings, with the same diameter and minimum bend radius as shown on the plans, for welded steel pipe.

The PVC plastic pipe and fittings shall be Schedule 40 conforming to the requirements of ASTM Designations: D 1785. The maximum support spacing for PVC plastic pipe shall be 2 m.

Couplings used to connect PVC plastic pipe or fiberglass pipe to steel shall be threaded or flanged. The sleeve connections shown on the plans shall not be used for either PVC plastic pipe or fiberglass pipe.

If PVC plastic pipe or fiberglass pipe is substituted for welded steel pipe, the quantity of drainage piping will be computed on the basis of the dimensions and details shown on the plans, and no change in the quantities to be paid for will be made because of the use of PVC plastic pipe or fiberglass pipe.

Payment – The contract bid price paid per kilogram for Bridge Deck Drainage System shall include full compensation for furnishing all labor, tools, materials, equipment, and incidentals, and for doing all work involved and complete in place and no additional compensation will be allowed therefor.

10-1.108 CHAIN LINK FENCE:

Chain link fence shall be Type CL-1.8 and shall conform to the provisions in Section 80, "Fences" of the Standard Specifications.

Payment - The contract bid price paid per meter for Chain Link Fence shall include full compensation for furnishing all labor, tools, materials, equipment, and incidentals, and for doing all work involved and complete in place including all necessary concrete, excavation and backfill and no additional compensation will be allowed therefor.

10-1.109 MONUMENTS:

Survey monuments shall be constructed in conformance with the provisions in Section 81, "Monuments" of the Standard Specifications and these Special Provisions.

Concrete shall be Class 3 shall be used.

The cast steel and gray cast iron frames and covers, including hardware, shall conform to the provisions in Section 55-2, "Materials" of the Standard Specifications.

Payment - The contract bid price paid per each for Survey Monument shall include full compensation for furnishing all labor, tools, materials, equipment, and incidentals, and for doing all work involved and complete in place including all necessary concrete, excavation and backfill and no additional compensation will be allowed therefor.

10-1.110 MARKERS AND DELINEATORS:

Markers and delineators shall conform to the provisions in Section 82, "Markers and Delineators" of the Standard Specifications and these Special Provisions.

Markers and delineators on flexible posts shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these Special Provisions. Flexible posts shall be made from a flexible white plastic which shall be

resistant to impact, ultraviolet light, ozone, and hydrocarbons. Flexible posts shall resist stiffening with age and shall be free of burns, discoloration, contamination, and other objectionable marks or defects which affect appearance or serviceability.

Retroreflective sheeting for metal and flexible target plates shall be the retroreflective sheeting designated for channelizers, markers, and delineators conforming to the requirements in ASTM Designation: D 4956-95 and in conformance with the provisions in "Prequalified and Tested Signing and Delineation Materials" of these Special Provisions.

Payment - The contract bid price paid per each for Delineator (Class 1) shall include full compensation for furnishing all labor, tools, materials, equipment, and incidentals, and for doing all work involved and complete in place and no additional compensation will be allowed therefor.

10-1.111 METAL BEAM GUARD RAILING:

Metal beam guard railing shall be constructed in conformance with the provisions in Section 83-1, "Railings" of the Standard Specifications and these Special Provisions.

Attention is directed to "Order of Work" of these Special Provisions.

Line posts shall be wood, steel, or plastic. Blocks shall be wood or plastic.

TERMINAL SYSTEM (TYPE CAT)

Terminal system (Type CAT) and terminal system (Type CAT) backup shall be furnished and installed as shown on the plans and in conformance with these Special Provisions.

Terminal system (Type CAT) shall be a CAT-350 Crash Cushion Attenuating Terminal as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type CAT) shown on the plans.

Terminal system (Type CAT) backup shall consist of items detailed for terminal system (Type CAT) backup shown on the plans, and shall conform to the provisions in Section 83-1.02B, "Metal Beam Guard Railing" of the Standard Specifications.

Including the terminal system (Type CAT) backup, arrangements have been made to ensure that any successful bidder can obtain the CAT-350 Crash Cushion Attenuating Terminal from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone 1-800-772-7976. The price quoted by the manufacturer for the CAT-350 Crash Cushion Attenuating Terminal, FOB Centerville, Utah is $3,500.00, not including sales tax.

The above price will be firm for orders placed on or before December 31, 2009, provided delivery is accepted within 90 days after the order is placed.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate of Compliance shall certify that the terminal system (Type CAT) conforms with the contract plans and specifications, conforms to the prequalified design and material requirements, and was manufactured in conformance with the approved quality control program.

The terminal system (Type CAT) shall be installed in conformance with the manufacturer's installation instructions and these requirements. The steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100-mm thick and each layer shall be moistened and thoroughly compacted. Wood posts shall be inserted into the steel foundation tubes by hand. Before the wood posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system (Type CAT) and backup have been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for Terminal System (Type CAT) Backup shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing terminal system (Type CAT) backup, complete in place, including excavation, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

ALTERNATIVE IN-LINE TERMINAL SYSTEM

Alternative in-line terminal system shall be furnished and installed as shown on the plans and in conformance with these Special Provisions.

The allowable alternatives for an in-line terminal system shall consist of one of the following or a Department approved equal.

(1) TERMINAL SYSTEM (TYPE SKT) - Terminal system (Type SKT) shall be a SKT 350 Sequential Kinking Terminal manufactured by Road Systems, Inc., located in Big Spring, Texas, and shall include items detailed for terminal system (Type SKT) shown on the plans. The SKT 350 Sequential Kinking Terminal can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, Telephone (801) 785–0505 or from the distributor, Gregory Highway Products, 4100 13th Street, S.W., Canton, OH 44708, Telephone (330) 477–4800.

(2) TERMINAL SYSTEM (TYPE ET) - Terminal system (Type ET) shall be an ET-2000 PLUS (4-tube system) extruder terminal as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type ET) shown on the plans. The ET-2000 PLUS (4-tube system) extruder terminal can be obtained from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone (800) 772–7976.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate of Compliance shall certify that the terminal systems furnished conform to the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

Terminal systems shall be installed in conformance with the manufacturer's installation instructions and these requirements. Each terminal system installed shall be identified by painting the type of terminal system in neat black letters and figures 60 mm high on the backside of the rail element between system posts numbers 4 and 5.

For terminal system (Type ET) the steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100-mm thick and each layer shall be moistened and thoroughly compacted. The wood terminal posts shall be inserted into the steel foundation tubes by hand and shall not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

For terminal system (Type SKT) the soil tubes shall be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100-mm thick and each layer shall be moistened and thoroughly compacted. Wood posts shall be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for Alternative In-Line Terminal System shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing

alternative in-line terminal system, complete in place, including excavation, backfill and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

ALTERNATIVE FLARED TERMINAL SYSTEM

Alternative flared terminal system shall be furnished and installed as shown on the plans and in conformance with these Special Provisions.

The allowable alternatives for a flared terminal system shall consist of one of the following or a Department approved equal.

(1) TERMINAL SYSTEM (TYPE FLEAT) - Terminal system (Type FLEAT) shall be a Flared Energy Absorbing Terminal 350 manufactured by Road Systems, Inc., located in Big Spring, Texas, and shall include items detailed for terminal system (Type FLEAT) shown on the plans. The Flared Energy Absorbing Terminal 350 can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, Telephone (801) 785–0505 or from the distributor, Gregory Highway Products, 4100 13th Street, S.W., Canton, OH 44708, Telephone (330) 477–4800.

(2) TERMINAL SYSTEM (TYPE SRT) - Terminal system (Type SRT) shall be an SRT-350 Slotted Rail Terminal (8-post system) as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type SRT) shown on the plans. The SRT-350 Slotted Rail Terminal (8-post system) can be obtained from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone (800) 772–7976.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate of Compliance shall certify that the terminal systems furnished conform to the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

Terminal systems shall be installed in conformance with the manufacturer's installation instructions and these requirements. Each terminal system installed shall be identified by painting the type of terminal system in neat black letters and figures 60-mm high on the backside of the rail element between system posts numbers 4 and 5.

For terminal system (Type SRT), the steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100-mm thick and each layer shall be moistened and thoroughly compacted. The wood terminal posts shall be inserted into the steel foundation tubes by hand and shall not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will

not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

For terminal system (Type FLEAT), the soil tubes shall be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100-mm thick and each layer shall be moistened and thoroughly compacted. Wood posts shall be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for Alternative Flared Terminal System shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing alternative flared terminal system, complete in place, including excavation, backfill and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.112 METAL RAILING:

Metal railing shall be constructed in conformance with the provisions in Section 83, "Railings" of the Standard Specifications and these Special Provisions.

The contract unit price paid per kilogram for Metal Railing shall include full compensation for furnishing all labor, materials, tools, equipment, hardware and incidentals, and for doing all the work involved in furnishing and installing metal railing, complete in place, including fabrication and protective coating, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.113 CHAIN LINK RAILING (CATHEDRAL):

Chain link railing (cathedral) shall conform to the provisions in Section 83-l, "Railings" of the Standard Specifications and these Special Provisions.

The zinc coated chain link fabric shall be 11-gage (3.05-mm), Class 2B, fused bonded vinyl coated fabric, conforming to the requirements in ASTM Designation: F 668.

The color of vinyl coated chain link fabric shall be dark violet. The final color is to be determined by the Engineer from sample coated fabric panels furnished by the Contractor. All frame metal, cables, tension wires, wire ties and other metal fittings shall be painted to match the color of the chain link fabric.

All completed steel components and hardware for chain link railing (cathedral), except the vinyl coated chain link fabric, shall be painted in conformance with the provisions in Sections 59, "Painting" and Section 91, "Paint" of the Standard Specifications and these Special Provisions.

PRECONSTRUCTION SAMPLE PANEL AND COLOR CHIP

Prior to constructing the chain link railing, the Contractor shall submit to the Engineer, 2 sample vinyl coated fabric panels at least 1.0 m x 1.0 m in size, and 2 sample color chips representing the color that will be used for painting the frame metal. Color of each sample fabric panel and color chip shall closely match the color specified in these Special Provisions. The sample panels shall be fabricated and finished with the materials, tools, equipment and methods to be used in fabricating the chain link fabric. If ordered by the Engineer, additional sample fabric panels and color chips shall be furnished until the specified finish and color are obtained, as determined by the Engineer. No construction of chain link railing (cathedral) shall be preformed until a sample vinyl coated fabric panel and a sample color chip have been approved by the Engineer.

The sample fabric panel and color chip approved by the Engineer shall be used as the standard of comparison in determining acceptability of chain link railing.

No construction of chain link railing (cathedral) shall be preformed until a sample vinyl coated fabric panel and a sample color chip have been approved by the Engineer.

PAYMENT

The contract price paid per meter for Chain Link Railing (Cathedral) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in fabricating and constructing the chain link railing (cathedral), complete in place, including coating system, furnishing and disposal of sample panels, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.114 CONCRETE BARRIER:

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers" of the Standard Specifications and these Special Provisions.

Architectural treatment with letters on raised concrete surface on the barrier recess shall be constructed to the dimensions and the font type shown on the plans. Corners at the intersection of plane surfaces shall be sharp and crisp without easing or rounding. A Class 1 surface finish shall be applied to surfaces of architectural letters.

Attention is directed to "Prepare and Stain Concrete" of these Special Provisions regarding the color of the stained concrete and test panel requirements.

Full compensation for architectural treatment on concrete barrier shall be considered as included in the contract price paid per meter for Concrete Barrier (Type 26 Modified) and no separate payment will be made therefor.

Full compensation for installation of utility conduits in concrete barrier shall be considered as included in the contract price paid per meter for Concrete Barrier (Type 26 Modified) and no separate payment will be made therefor.

Full compensation for 100-mm expanded polystyrene, footings and forming of barrier – concrete Type 60 (vertical face for side of road) shall be considered as included in the contract price paid per meter for Concrete Barrier (Type 60) and no separate payment will be made therefor.

10-1.115 TRANSITION RAILING (TYPE WB):

Transition railing (Type WB) shall be furnished and installed in conformance with details shown on the plans, the provisions in Section 83-2, "Barriers" of the Standard Specifications and these Special Provisions.

The 10-gage rail elements shall conform to the requirements of Class B, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180. End caps shall conform to the requirements of Class A, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180.

Surplus excavated material remaining after the transitional railing (Type WB) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for Transition Railing (Type WB) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing transition railing (Type WB), complete in place, including drilling holes for wood posts, driving posts, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.116 THERMOPLASTIC PAVEMENT MARKING:

Thermoplastic pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings" of the Standard Specifications and these Special Provisions.

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Retroreflectivity of the thermoplastic pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White thermoplastic pavement markings shall have a minimum initial retroreflectivity of 250 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow thermoplastic pavement markings shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

Thermoplasticpavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

Payment – Full compensation, except as otherwise provided herein, for conforming to this article shall be paid per square meter for Thermoplastic Pavement Marking and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved and no additional compensation will be allowed therefor.

10-1.117 THERMOPLASTIC TRAFFIC STRIPE (SPRAYABLE):

Sprayable thermoplastic traffic stripes (traffic lines) shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings" of the Standard Specifications and these Special Provisions.

Sprayable thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification No. PTH-02SPRAY.

Retroreflectivity of the sprayable traffic stripes shall conform to the requirements in ASTM Designation: D 6359-99. White sprayable thermoplastic traffic stripes shall have a minimum initial retroreflectivity of 250 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow sprayable thermoplastic traffic stripes shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Sprayable thermoplastic material shall be applied to the pavement at a minimum thickness of one millimeter and a minimum rate of 0.2-kg/m. The minimum application rate is based on a solid stripe of 100-mm in width.

Sprayable thermoplastic material shall be applied to the pavement at a temperature between 177°C and 205°C, unless a different temperature is recommended by the manufacturer.

Sprayable thermoplastic traffic stripes shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

Sprayable thermoplastic traffic stripes will be measured by the meter along the line of the traffic stripes, without deductions for gaps in broken traffic stripes. A double traffic stripe, consisting of two 100-mm wide yellow stripes, will be measured as one traffic stripe.

The contract price paid per meter for Thermoplastic Traffic Stripe (Sprayable) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in applying sprayable thermoplastic traffic stripes (regardless of the number, widths, and patterns of individual stripes involved in each traffic stripe) including establishing alignment for stripes, and layout work, complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.118 PAINT TRAFFIC STRIPE:

Painted traffic stripes (traffic lines) shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings" of the Standard Specifications and these Special Provisions.

Traffic stripe paint shall conform to the requirements in State Specification No. PTWB-01.

The color of the painted traffic stripes shall conform to the requirements in ASTM Designation: D 6628-01.

Retroreflectivity of the paint traffic stripes shall conform to the requirements in ASTM Designation: D 6359-99. White painted traffic stripes shall have a minimum initial retroreflectivity of 250 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow painted traffic stripes shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

The contract price paid per meter for Paint Traffic Stripe shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved (regardless of the number, widths, and patterns of individual stripes involved in each traffic stripe) including establishing alignment for stripes, and layout work, complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.119 PAVEMENT MARKERS:

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers" of the Standard Specifications and these Special Provisions.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

The contract price paid per each for Pavement Marker shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved and complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

10-1.120 DE-MOBILIZATION:

De-mobilization shall consist of the completion of all final construction and administrative work required to secure the project for termination and acceptance by the Engineer, including, but not limited to the following:

1. Satisfactory completion of Finishing Roadway in accordance with Section 22, "Finishing Roadway" of the Standard Specifications;
2. Removal of all temporary facilities, construction office, temporary utilities, plant, equipment, surplus material, construction debris and similar from project limits and adjacent property, as required and as directed by the Engineer;
3. Restoration of all temporary roads and haul routes and construction storage and office areas, etc. to original or better condition;
4. Completion of record of drawings (as-builts), to the satisfaction of the Engineer;
5. Submission of final Disadvantaged Business Enterprise report to the Engineer;
6. Submission of final certified payroll documents to the Engineer;
7. Submission of property owner releases, as required by the Engineer;
8. Completion of the requirements of permits issued by other agencies;
9. Satisfactory completion of all other contractually and legally required construction and administrative items of work.

De-Mobilization shall include the satisfactory completion of all items of work, but shall not be construed as being a separate payment for work that is paid under separate contract items. The contract item for De-Mobilization is intended for proper close-out activities.

Payment for De-Mobilization will be made on a lump sum basis in the amount of the fixed bid price after satisfactory completion of the above listed items. Payment for De-Mobilization will be included in the final pay estimate and payment. No partial payments will be made for De-Mobilization.

SECTION 10-2 HIGHWAY IRRIGATION SYSTEMS

10-2.01 GENERAL:

The work performed in connection with highway planting and irrigation systems shall conform to the provisions in Section 20, "Erosion Control and Highway Planting" of the Standard Specifications and these Special Provisions.

The Contractor shall notify the Engineer not less than 72 hours prior to requiring initial access to the existing irrigation controllers. When the Engineer determines that access to the controllers is required at other times, arrangements will be made to provide this access.

When fluctuations of water pressure and water supply are encountered during normal working hours, plants shall be watered at other times, as often, and in sufficient amounts as conditions may require to keep the soil and plant roots moist during the life of the contract.

Full compensation for watering plants outside normal working hours shall be considered as included in the contract lump sum prices paid for Highway Irrigation work and no additional compensation will be allowed therefor.

COST BREAK-DOWN

The Contractor shall furnish the Engineer a cost break-down for the contract lump sum item of irrigation system. The cost break-down table shall be submitted to the Engineer for approval within 15 working days after the contract has been approved. The cost break-down table will be approved, in writing, by the Engineer before any partial payment will be made for the item of irrigation system.

The cost break-down shall be completed and furnished in the format shown in the sample of the cost break-down included in this section. Line item descriptions of work shown in the samples are the minimum to be submitted. Additional line item descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional line item descriptions of work, the quantity, value and amount for those line items shall be completed in the same manner as for the line item descriptions shown in the samples. The line items and quantities given in the sample are to show the manner of preparing the cost break-down to be furnished by the Contractor.

The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and their values shall be included in the cost break-down submitted to the Engineer for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-down submitted for approval.

The sum of the amounts for the line items of work listed in the cost break-down table for irrigation system work shall be equal to the contract lump sum price bid for the work. Overhead and profit shall be included in each individual line item of work listed in the cost break-down table.

No adjustment in compensation will be made in the contract lump sum price paid for irrigation system due to differences between the quantities shown in the cost break-down table furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these Special Provisions.

Individual line item values in the approved cost break-down table will be used to determine partial payments during the progress of the work and as the basis for calculating an adjustment in compensation for the contract lump sum item of irrigation system due to changes in line items of work ordered by the Engineer. When the total value of ordered changes to line items of work increases or decreases the lump sum price bid for irrigation system by more than 25 percent, the adjustment in compensation will be determined in the same manner specified for increases and decreases in the total pay quantity of an item of work in Section 4-1.03B, "Increased or Decreased Quantities" of the Standard Specifications.

IRRIGATION SYSTEM COST BREAK-DOWN

Contract No. 08-455904

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
Abandon 200-mm PVC Pipe	m			
Remove 200-mm PVC Pipe	m			
200-mm PVC PR 200 Pipe	m			
300-mm Corrugated Steel Pipe	m			
Minor Concrete (Pipe Collar)	m^3			
25-mm Combination Air Relief Valve	Ea			
200-mm Butterfly Valve	Ea			
Valve Box	Ea			

TOTAL _____

10-2.02 EXISTING HIGHWAY PLANTING:

In addition to the provisions in Section 20, "Erosion Control and Highway Planting" of the Standard Specifications, work performed in connection with existing highway planting shall conform to the provisions in "Existing Highway Facilities" of these Special Provisions.

10-2.03 EXISTING HIGHWAY IRRIGATION FACILITIES:

The work performed in connection with the various existing highway irrigation system facilities shall conform to the provisions in "Existing Highway Facilities" of these Special Provisions.

Water shall be maintained in conformance with the provisions in Section 20-5.025, "Maintain Existing Water Supply" of the Standard Specifications.

CHECK AND TEST EXISTING IRRIGATION FACILITIES

Existing irrigation facilities that are to remain or to be relocated, and that are within those areas where clearing and grubbing or earthwork operations are to be performed, shall be checked for missing or damaged components and proper operation prior to performing clearing and grubbing or earthwork operations. Existing irrigation facilities outside of work areas that are affected by the construction work shall also be checked for proper operation.

A written list of existing irrigation system deficiencies shall be submitted to the Engineer within 5 working days after checking the existing facilities.

Deficiencies found during checking of the existing facilities shall be corrected as directed by the Engineer. Corrective work ordered by the Engineer will be paid for as extra work as provided in Section 4-1.03D, "Extra Work" of the Standard Specifications.

Length of watering cycles for use of potable water from water meters for checking or testing existing irrigation facilities shall be as determined by the Engineer.

REMOVE EXISTING IRRIGATION FACILITIES

Existing irrigation facilities where shown on the plans to be removed, shall be removed. Facilities that are more than 150-mm below finished grade, excluding facilities to be salvaged, may be abandoned in place.

Immediately after disconnecting an existing irrigation facility to be removed or abandoned from an existing facility to remain, the remaining facility shall be capped or plugged, or shall be connected to a new or existing irrigation facility.

Facilities to be removed shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

RELOCATE EXISTING IRRIGATION FACILITIES

Relocate existing irrigation facilities shall consist of relocating existing electric remote control valves, sprinklers, pull boxes, backflow preventers, gate valves, wye strainers, irrigation controllers, and other facilities shown on the plans or specified in these Special Provisions.

Relocate existing valves shall consist of relocating existing valves, valve boxes and valve box covers. Relocated valve boxes shall be installed with new woven wire cloth and crushed rock bedding as shown on the plans.

Existing irrigation facilities, shown on the plans to be relocated, that are, in the opinion of the Engineer, unsuitable for the purpose intended, shall be replaced in conformance with the provisions in Section 15-2.05, "Reconstruction" of the Standard Specifications.

After irrigation facilities have been relocated, the Contractor shall demonstrate that the relocated facilities function properly in the presence of the Engineer.

10-2.04 IRRIGATION SYSTEMS:

Irrigation systems shall be furnished and installed in conformance with the provisions in Section 20-5, "Irrigation Systems" of the Standard Specifications, except materials containing asbestos fibers shall not be used.

Method A pressure testing shall conform to the provisions in Section 20-5.03H(1), "Method A" of the Standard Specifications, except leaks that develop in the tested portion of the system shall be located and repaired after each test period when a drop of more than 35 kPa is indicated by the pressure gage. After the leaks have been repaired, the one hour pressure test shall be repeated and additional repairs made until the drop in pressure is 35 kPa or less.

VALVE BOXES

Valve boxes shall conform to the provisions in Section 20-2.24, "Valve Boxes" of the Standard Specifications, except as otherwise provided herein.

Valve boxes shall be identified on the top surface of the covers by stenciling with paint the appropriate abbreviations for the irrigation facilities contained in the valve boxes as shown on the plans. Valve boxes that contain remote control valves shall be identified by the appropriate letters and numbers (controller and station numbers). The letters and numbers shall be 50-mm in height. The stenciling paint shall be a commercial quality, epoxy resin base paint of a color which contrasts with the valve box covers.

BUTTERFLY VALVES

Butterfly valves shall be furnished and installed as shown on the plans and in conformance with these Special Provisions.

Butterfly valves shall have a two-piece brass or bronze body, full port opening, and shall conform to the following:

Specification	Minimum Requirement
Non-shock cold water working pressure	2760 kPa
Seats	TFE (Teflon)
O-Ring Seals	TFE (Teflon)

Butterfly valves shall be of the same size as the pipeline which the valves serve, unless otherwise noted on the plans.

Butterfly valves shall be installed in a valve box.

COMBINATION AIR RELEASE VALVES

Combination air release valves (CARV) shall be furnished and installed as shown on the plans and in conformance with these Special Provisions.

CARVs shall perform the functions of an air release valve and an air/vacuum valve in a single body unit. Valves shall be of corrosion resistant design with metal body.

CARVs shall conform to the following:

Specification	Minimum Requirement
Minimum air release valve sealing pressure	10 kPa
CARV operating pressure	1600 kPa

Full compensation for furnishing and installing CARVs, complete, in place, shall be considered as included in the contract lump sum price paid for Modify Irrigation System and no additional compensation will be allowed therefor.

PIPE

Plastic Pipe

Plastic pipe supply lines shall be polyvinyl chloride (PVC) 1120 or 1220 pressure rated pipe with the minimum pressure rating (PR) shown on the plans.

Plastic pipe (irrigation lines) shall be installed not less than 750-mm below the finished grade, measured to the top of the pipe.

Fittings for plastic pipe supply lines with a pressure rating (PR) of 315 shall be Schedule 80.

SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION:

Traffic signals, lighting, sign illumination, ramp metering systems and maintaining existing traffic management system elements during construction shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems" of the Standard Specifications and these Special Provisions.

Lighting equipment is included in the following structures:

A. Date Palm Drive Overcrossing, Br. No. 56-0560.

Communication conduit is included in the following structures:

A. Date Palm Drive Overcrossing, Br. No. 56-0560.

Traffic signal work shall be performed at the following locations:

A. Location 1: I-10 WB ramps/Date Palm Drive.
B. Location 2: I-10 EB ramps/Date Palm Drive.

Ramp metering system work shall be performed at the following locations:

A. Location 1: I-10 WB loop entrance ramp/Date Palm Drive.
B. Location 2: I-10 EB loop entrance ramp/Date Palm Drive.
C. Location 3: I-10 WB direct entrance ramp/Date Palm Drive.
D. Location 4: I-10 EB direct entrance ramp/Date Palm Drive.

10-3.02 COST BREAK-DOWN:

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down" of the Standard Specifications and these Special Provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 15 days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

The cost breakdown shall include the following items in addition to those listed in the Standard Specifications:

A. Video detection system components.
B. Wireless cellular data communications assembly.

C. General Packet radio service equipment.

10-3.03 EQUIPMENT LIST AND DRAWINGS:

The vehicle detection station 334 controller cabinet schematic wiring diagram and intersection sketch shall be combined into one drawing, so that, when the cabinet door is fully open, the drawing is oriented with the intersection.

A maintenance manual shall be furnished for all controller units, auxiliary equipment, and vehicle detector sensor units, control units, and amplifiers. The maintenance manual and operation manual may be combined into one manual. The maintenance manual or combined maintenance and operation manual shall be submitted at the time the controllers are delivered for testing or, if ordered by the Engineer, prior to purchase. The maintenance manual shall include, but need not be limited to, the following items:

A. Specifications.
B. Design characteristics.
C. General operation theory.
D. Function of all controls.
E. Trouble shooting procedure (diagnostic routine).
F. Block circuit diagram.
G. Geographical layout of components.
H. Schematic diagrams.

10-3.04 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS:

Traffic signal system shutdowns shall be limited to periods between the hours of 9 a.m. and 3 p.m.

10-3.05 MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION:

Traffic Management System (TMS) elements include, but are not limited to ramp metering (RM) system, communication system, traffic monitoring stations, video image vehicle detection system (VIVDS), microwave vehicle detection system (MVDS), loop detection system, changeable message sign (CMS) system, extinguishable message sign (EMS) system, highway advisory radio (HAR) system, closed circuit television (CCTV) camera system, roadway weather information system (RWIS), visibility sensor, and fiber optic system.

Existing TMS elements, including detection systems, identified on the plans and located within the project limits shall remain in place, and be protected from damage. If the construction activities require existing TMS elements to be nonoperational or off line, and if temporary or portable TMS elements are not shown on the plans, the Contractor shall provide for temporary or portable TMS elements. The Contractor

shall receive the Engineer's approval on the type of temporary or portable TMS elements and installation method.

Before work is performed, the Engineer, the Contractor, and the Department's Traffic Operations Electrical representatives shall jointly conduct a pre-construction operational status check of all existing TMS elements and each element's communication status with the Traffic Management Center (TMC), including existing TMS elements that are not shown on the plans and elements that may not be impacted by the Contractor's activities. The Department's Traffic Operations Electrical representatives will certify the TMS elements' location and status, and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the non-operational components.

The Contractor shall obtain written approval from the Engineer, at least 72 hours before interrupting existing TMS elements' communication with the TMC that will result in the elements being nonoperational or off line. The Contractor shall notify the Engineer at least 72 hours before starting excavation activities.

Traffic monitoring stations and their associated communication systems which were verified to be operational during the pre-construction operational status check, shall remain operational on freeway/highway mainline at all times, except:

A. For a duration of up to 15 days on any continuous segment of the freeway/highway longer than 4.8 kilometers.
B. For a duration of up to 60 days on any continuous segment of the freeway/highway shorter than 4.8 kilometers.

If the construction activities require existing detection systems to be non-operational or off line for a longer time period or the spacing between traffic monitoring stations is more than the specified criteria above, and temporary or portable detection operations are not shown on the plans, the Contractor shall provide provisions for temporary or portable detection operations. The Contractor shall receive the Engineer's approval on the type of detection and installation before installing the temporary or portable detection.

If existing TMS elements shown on the plans or identified during the pre-construction operational status check, except traffic monitoring stations, are damaged or fail due to the Contractor's activity, where the elements are not fully functional, the Engineer shall be notified immediately. If the Contractor is notified by the Engineer that existing TMS elements have been damaged, have failed or are not fully functional due to the Contractor's activity, the damaged or failed TMS elements, excluding Structure-related elements, shall be repaired or replaced, at the Contractor's expense, within 24 hours. For a Structure-related elements, the Contractor shall install temporary or portable TMS elements within 24 hours. For nonstructure-related TMS elements, the Engineer may approve temporary or portable TMS elements for use during the construction activities.

The Contractor shall demonstrate that repaired or replaced elements operate in a manner equal to or better than the replaced equipment or as directed by the Engineer. If the Contractor fails to perform required repairs or replacement work, as determined by the Engineer, the County may perform the repair or replacement work and the cost will be deducted from monies due to the Contractor.

A TMS element shall be considered non-operational or off line for the duration of time that active communications with the TMC is disrupted, resulting in messages and commands not transmitted from or to the TMS element.

The Contractor shall provide provisions for replacing existing TMS elements within the project limits, including detection systems, that were not identified on the plans or during the pre-construction operational status check that became damaged due to Contractor's activities.

If the pre-construction operational status check identified existing TMS elements, then the Contractor, the Engineer, and the Department's Traffic Operations Electrical representatives shall jointly conduct a post construction operational status check of all existing TMS elements and each element's communication status with the TMC. The Department's Traffic Operations Electrical representatives will certify the TMS elements' status and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components. TMS elements that cease to be functional between pre and post construction status checks shall be repaired at the Contractor's expense and as directed by the Engineer.

The Engineer will approve, in writing, the schedule for final replacement, the replacement methods and the replacement elements, including element types and installation methods before repair or replacement work is performed. The final TMS elements shall be new and of equal or better quality than the existing TMS elements.

Payment

The contract lump sum price paid for Maintaining Existing Traffic Management System Elements During Construction shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in maintaining existing traffic management system elements as shown on the plans, specified in the Standard specifications and these Special Provisions, and as directed by the Engineer.

If no electrical work exists on the project and no TMS elements are identified within the project limits, the pre-construction operational status check will be paid for as extra work as provided in Section 4-1.03D, "Extra Work" of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements that are not shown on the plans, but are required when an existing TMS element becomes non-operational or off line due to construction activities, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work" of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements and replacing TMS elements that are not shown on the plans nor identified during the pre-construction operational status check and were damaged by construction activities will be paid for as extra work as provided in Section 4-1.03D, "Extra Work" of the Standard Specifications.

If the Contractor is required to submit provisions for the replacement of TMS elements that were not identified, the provisions will be paid for as extra work as provided in Section 4-1.03D, "Extra Work" of the Standard Specifications.

10-3.06 CAST-IN-DRILLED-HOLE CONCRETE PILE FOUNDATIONS:

This work includes constructing cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards.

Comply with Section 86-2.03, "Foundations" of the Standard Specifications and "Piling" of these Special Provisions.

Materials

Concrete must contain not less than 350 kilograms of cementitious material per cubic meter.

Construction

For standards located in sidewalk areas, the pile foundation must be:

A. Placed to final sidewalk grade before the sidewalk is placed.
B. Square for the top 100 mm.

Use sleeve nuts on Type 1-B standards. The bottom of the base plate of Type1-B standards must be flush with finished grade.

Payment

Payment for Cast-In-Drilled-Hole Pile Foundations shall conform to the provisions in Section 86-8, "Payment" of the Standard Specifications.

10-3.07 STANDARDS, STEEL PEDESTALS, AND POSTS:

Standards, steel pedestals, and posts for traffic signal and lighting standards shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts" of the Standard Specifications, "Steel Structures" of these Special Provisions, and the following requirements.

Steel bolts not designated on the plans as high-strength (HS) or stainless steel shall be for general applications and shall conform to the requirements in ASTM Designation: A 307.

Where the plans refer to the side tenon detail at the end of the signal mast arm, the applicable tip tenon detail may be substituted.

The sign mounting hardware shall be installed at the locations shown on the plans.

Mast arm mounted street name signs shall be installed on signal mast arms at the locations shown on the plans. The mounting hardware and sign shall be assembled. The assembly shall be attached to the mast arm using a 19-mm x 0.53-mm stainless steel strap in a manner similar to the strap and saddle bracket method shown on the plans. The band shall be wrapped at least twice around the mast arm, tightened, and secured with a stainless strap seal in the same manner shown for strap and saddle bracket sign mounting. All sign and bracket materials, including straps, seals, and saddle brackets shall be furnished by the Contractor. The sign panel shall be leveled and hardware securely tightened.

Handhole reinforcement rings for standards, steel pedestals, and posts shall be continuous around the handholes.

Type 1 standards shall be assembled and set with the handhole on the downstream side of the pole in relation to traffic or as shown on the plans.

All ferrous metal parts of tubular sign structures shall be galvanized and shall not be painted.

10-3.08 SLIP BASE INSERTS:

Slip base inserts, for installation between the lighting standards and the foundations, shall conform to the details shown on the plans.

The bottom slip base plate shall be welded to the bottom anchor plate before installation. The top slip base plate shall be drilled and tapped to accept the threaded studs as shown on the plans. The studs shall not be welded to the top slip base plate. The pitch diameter of the threaded holes shall conform to the requirements in ANSI Standard: B1.1, having a Class 2B tolerance. Threaded studs installed in the top slip base plate shall match the holes in the base of the lighting standard.

The optional cast steel plate shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts" of the Standard Specifications.

Where a slip base insert is to be inserted under an existing lighting standard, the standard shall be removed without damaging the anchor bolts. The conductors may be cut, either at the base of the standard or in the adjacent pull box, where splices can be made after the inserts are in place. Existing concrete foundations shall be chipped as required to allow the bottom slip base plate to seat properly on the existing leveling

nuts. Conduit in the foundation shall be trimmed, if necessary, so that the conduit will be not less than 12-mm below the top of the bottom slip base plate. Set screw type insulated bushings may be installed on trimmed conduit in lieu of threaded bushings.

The combined bottom anchor plate and bottom slip base plate shall be bolted to the foundation. The top slip base plate, without the lighting standard attached, shall be bolted to the bottom slip base plate. Each high-strength bolt shall be torqued to 200 ± 10 N·m. After assembly of the insert, the lighting standard shall be erected and installed on the top slip base plate. During installation the lighting standard shall be properly supported to maintain proper alignment of the insert.

High strength bolts, nuts and flat washers used to connect slip base inserts shall conform to the requirements in ASTM Designation: A 325.

10-3.09 CONDUIT:

Conduit shall be Type 3, Schedule 80.

Conduit sizes shown on the plans and specified in the Standard Specifications and these Special Provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

Size Designation for Metallic Type Conduit	Equivalent Size for Rigid Non-metallic Conduit
21	20
27	25
41	40
53	50
63	65
78	75
103	100

When a standard coupling cannot be used for joining Type 3 conduit, a UL listed threaded union coupling conforming to the provisions in Section 86-2.05C, "Installation" of the Standard Specifications, or a concrete-tight split coupling, or concrete-tight set screw coupling shall be used.

When Type 3 conduit is placed in a trench (not in pavement or under Portland cement concrete sidewalk), after the bedding material is placed and the conduit is installed, the trench shall be backfilled to not less than 100-mm above the conduit with minor concrete conforming to the provisions in Section 90-10, "Minor Concrete" of the Standard Specifications. The concrete shall contain not less than 250 kg of cementitious material per cubic meter. The remaining trench shall be backfilled to finished grade with backfill material.

Conduit runs shown on the plans to be located behind curbs may be installed in the street, within 0.9 m of, and parallel with the face of the curb, by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C,

"Installation" of the Standard Specifications. Pull boxes shall be located behind the curb or at the locations shown on the plans.

After conductors have been installed, the ends of conduits terminating in pull boxes, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

At other locations where conduit is required to be installed under pavement and if a delay to vehicles will not exceed 5 minutes, conduit may be installed by the "Trenching in Pavement Method".

At the option of the Contractor, the final 0.6 m of conduit entering a pull box in a reinforced concrete structure may be Type 4.

10-3.10 CONDUCTORS AND WIRING:

Splices shall be insulated by "Method B" or, at the Contractor's option, splices of conductors shall be insulated with heat-shrink tubing of the appropriate size after thoroughly painting the spliced conductors with electrical insulating coating.

Signal Interconnect Cable (SIC) shall be the 6-pair type.

The Contractor shall perform a high-voltage series lighting test consisting of the open circuit voltage of the connected constant current transformer between conductors and ground.

The high-voltage test shall not be performed on existing circuits or equipment. Non-testing of existing circuits and equipment shall not relieve the Contractor from the responsibility for malfunctioning of existing lighting circuits due to the Contractor making splices in or connecting to the circuits and such malfunctions shall be corrected at the Contractor's expense.

10-3.11 BONDING AND GROUNDING:

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding" of the Standard Specifications and these Special Provisions.

Bonding jumpers in standards with handholes and traffic pull box lid covers shall be attached by a UL listed lug using 4.5-mm diameter or larger brass or bronze bolts and shall run to the conduit or bonding wire in the adjacent pull box. The grounding jumper shall be visible after the standard has been installed and the mortar pad and cap have been placed on the foundation.

Standards without handholes shall have bonding accomplished by jumpers attached to UL listed ground clamps on each anchor bolt.

For slip base standards or slip base inserts, bonding shall be accomplished by jumpers attached to UL listed ground clamps on each anchor bolt, or a UL listed lug attached to the bottom slip base plate with a 4.5-mm diameter or larger brass or bronze bolt.

Equipment bonding and grounding conductors are required in conduits, except when the conduits contain only combinations of loop lead-in cable, fiber optic cable, or signal interconnect cable. A No. 8 minimum, bare copper wire shall run continuously in circuits. The bonding wire size shall be increased to match the circuit breaker size in conformance with the Code, or shall be as shown on the plans. Conduits to be installed for future conductors, may omit the copper wire.

Bonding of metallic conduits in metal pull boxes shall be by means of bonding bushings and bonding jumpers connected to the bonding wire running in the conduit system.

10-3.12 SERVICE:

Continuous welding of exterior seams in service equipment enclosures is not required.

Circuit breakers shall not be the cable-in/cable-out type. All circuit breakers shall be mounted vertically with the up position of the handle being the "ON" position.

Each service shall be provided with up to 2 main circuit breakers which shall disconnect ungrounded service entrance conductors. Where the "Main" circuit breaker consists of 2 circuit breakers as shown on the plans or required in these Special Provisions, each of the circuit breakers shall have a minimum interrupting capacity of 10 000 A, rms.

Full compensation for obtaining electrical service, including fees, permits and approvals is included in the contract lump sum price paid for Signal and Lighting, and no separate payment will be made.

Full compensation for obtaining temporary electrical service, including energy costs, fees, permits and approvals is included in the contract lump sum price paid for Signal and Lighting, and no separate payment will be made.

10-3.13 MODEL 170/2070 CONTROLLER ASSEMBLY (CONTRACTOR FURNISHED, MANDATORY EQUIPMENT SOURCE):

Mandatory Equipment Source

The Contractor shall acquire the traffic signal controller assembly from the State of California Department of Transportation (Caltrans), and shall compensate the State of California for costs incurred in obtaining, testing and supplying a Traffic Signal Controller Assembly. This fee does not supersede any other fee charged by Caltrans for review, inspection or fieldwork performed by department staff as a result of the

Contractor's work. If the fee has not been paid prior to permit issuance, full payment shall be made to the district cashier prior to starting any traffic signal work authorized by the permit, and at least thirty days before the controller is needed for installation. The Contractor shall give the State's representative not less than 10 working days written advance notice prior to picking up the controller assembly, however, when the controller assembly arrives to the Caltrans warehouse located in the City of San Bernardino, The Contractor shall have three working days to pick up equipment upon notification. If the Contractor fails to pick up equipment upon notification of its arrival to the warehouse, the Contractor will be charged $50.00 a day for storing equipment. When the equipment is requested by the Contractor or upon its arrival, Caltrans will provide a time and location for picking up Model 170/2070 controller assembly. Model 170/2070 controller assemblies shall be furnished by the Contractor.

Installation

The Contractor shall construct the controller cabinet foundations (including furnishing and installing anchor bolts), and shall install the controller cabinets on said foundations, and make all field wiring connections to the terminal blocks in the controller cabinets.

The Contractor shal install the controller unit, Model 170/2070, its cabinet Model 332A and 334, or cabinet as otherwise specified, and all ancillary equipment.

The controller unit, Model 170/2070, and its cabinet, Model 332A and 334, or cabinet as otherwise specified, shall be in accordance to the provisions of Section 86-3.03, "Model 170 and Model 2070 Controller Assemblies" of the Standard Specifications.

The above referenced document is available from State of California, Bids and Documents Section in Sacramento, for a fee.

The cost of picking up and delivering each controller shall be included in the lump sum price paid for Signal And Lighting and no additional compensation will be allowed therefor.

Any State furnished traffic signal control equipment that is damaged, after the Contractor has taken possession of the item, shall be repaired to the satisfaction of the Engineer. If the damaged controller assembly is considered irreparable, it shall be replaced with a controller assembly meeting the provisions included in the County of Riverside Specifications, "TRAFFIC SIGNAL CONTROLLER ASSEMBLIES SPECIFICATIONS" available from the Engineer.

The total repair or replacement costs shall be borne by the Contractor.

The signal controller conflict monitoring unit shall be tested in the field before "Turn On".

The Contractor shall arrange to have a signal technician qualified to work on the controller and employed by the controller manufacturer or his representative, present at the time the equipment is turned on. It shall be the responsibility of the Contractor

to implement and fund any traffic signal controller assembly modifications required to achieve the traffic signal operation as shown on the construction plans.

Installing the controller assembly and foundation, including the programming and functional testing of the equipment, shall be considered as included in the lump sum price paid for Signal And Lighting and no additional compensation will be allowed therefor.

State forces will maintain controller assemblies. The Contractor's responsibility for maintaining controller assemblies shall be limited to conforming to the provisions in Section 6-1.02, "State-Furnished Materials" of the Standard Specifications.

Full compensation for the actual cost of obtaining, testing and supplying the traffic signal controller assembly shall be considered as included in the contract unit bid price paid per each for the types of the Traffic Signal Controller and no additional compensation will be allowed therefor.

10-3.14 SIGNAL ISOLATOR:

Optical isolation shall be provided to all ramp metering controller inputs through signal isolators which conform to requirements herein to remove spurious AC from the signal. Units are to conform to standard controller rack mounting requirements and provide front panel status indicators and test switches.

OPERATING REQUIREMENTS

Parameter	Units	Requirement
Output ON voltage level (min.)	Volts	80±3
Output ON voltage duration (min.)	mSec	110
Output OFF voltage level (max.)	Volts	70±3
Output OFF voltage duration (min.)	mSec	110
Output current capacity (sink, min.)	mA	50
Output configuration	NPN Open Collector	
Power consumption (per channel, max.)	Watts	1.0
Transient capability (open input)	10-µfd capacitor charged to ±1000 volts	
Transient capability (5 ohm input load)	10-µfd capacitor charged to ±2000 volts	
Power-up	Outputs must be clamped to prevent erroneous output at power-up	

Voltages passing through the hysteresis band during the timing cycle will restart timing without affecting the output state.

Full compensation for furnishing, installing, testing and providing all incidentals to insure proper operation of signal isolators will be considered as included in the contract lump sum prices paid for Ramp Metering Systems and no additional compensation will be allowed.

10-3.15 LIGHT EMITTING DIODE SIGNAL MODULE:

This work includes installing LED signal module. Comply with Section 86, "Signals, Lighting and Electrical Systems" of the Standard Specifications.

Location of LED signal module is shown on the plans. The Engineer will approve exact location.

Use LED signal module as the light source for the following traffic signal faces:

A. 300-mm section.
B. 300-mm arrow section.
C. 300-mm lane control section.

Submittals

Before shipping LED signal modules to job site, submit the following to the Transportation Laboratory:

A. Delivery form including district number, EA, and contact information.
B. List containing all LED signal module serial numbers anticipated for use.
C. LED signal modules.

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at: http://www.dot.ca.gov/hq/esc/approved_products_list

The County will test LED signal module shipments as specified in ANSI/ASQ Z1.4.. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED signal modules tested or submitted for testing must be representative of typical production units. LED and circular LED signal modules will be tested as specified in California Test 604. Arrow, U-turn, and bicycle LED signal modules will be tested as specified in California Test 3001. All parameters of the specification may be tested on the modules. LEDs must be spread evenly across the module. LED arrow indication must provide the minimum initial luminous intensity listed. Measurements will be performed at the rated operating voltage of 120 V(ac).

Delays resulting from submittal of non-compliant materials do not relieve the Contractor from executing the contract within the allotted time. Non-compliant materials will be rejected. The Contractor must resubmit new LED for retesting and pick up the failed units within 7 days of notification. The Contractor must provide new LED signal modules and allow a minimum of 30 days for the retest. The Contractor must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are the responsibility of the Contractor and no extra time will be allowed.

After testing, the Contractor must pick up the tested LED signal modules from the Transportation Laboratory and deliver to the job site.

Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED signal modules for a minimum period of 48 months after installation of LED signal modules. Replacement LED signal modules must be provided within 15 days after receipt of failed LED modules at the Contractor's expense. All warranty documentation must be submitted to the Engineer before installation. Replacement LED signal modules must be delivered to State Maintenance Electrical Shop at 175 West Cluster Street, San Bernardino, California.

MATERIALS

Minimum power consumption for LED signal module must be 5 W.

LED signal module must have an operational lifecycle rating of 48 months. During the operational lifecycle, LED signal module must meet all parameters of this specification.

LED signal module must be designed for installation in the door frame of standard traffic signal housing.

LED signal module must:

A. Be 1.8 kg maximum mass.
B. Be manufactured for 300-mm circular, arrow, and lane control section.
C. Be from the same manufacturer.
D. Be the same model for each size.
E. Be sealed units with:

    1. 2 color-coded conductors for power connection, except for lane control LED signal modules use 3 color-coded conductors.
    2. Printed circuit board and power supply contained inside and complying with Chapter 1, Section 6 of TEES published by the Department.
    3. Lens that is:

        3.1. Integral to the units.
        3.2. Convex or flat with a smooth outer surface.
        3.3. Made of UV stabilized plastic or glass, and withstands UV exposure from direct sunlight for 48 months without exhibiting evidence of deterioration.
        3.4. 1-piece EPDM gasket.

F. Include 1-meter long conductors with quick disconnect terminals attached as specified in Section 86-4.01C, "Electrical Components" of the Standard Specifications.
G. Be sealed in door frames.
H. Fit into existing traffic signal section housing and comply with ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads".

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the signal module light output. Failure of an individual LED in a string must not result in loss of entire string or other indication.

No special tools for installation are allowed.

300-mm Arrow

Comply with Section 9.01 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads" for arrow indications.

300-mm Lane Control

Combination module with a red X and green arrow. Approximate shape and size for lane control modules is shown on the plans. Conductor function and color code must be as follows:

Conductor Function and Color Code

Function	Color
Neutral	White
Red X	Red
Green Arrow	Brown

LED signal module must:

A. Be weather tight and connect directly to electrical wiring.
B. Be capable of optical unit replacement.
C. Be a single, self-contained device, ready for installation into traffic signal housing.
D. Have manufacturer's name, trademark, model number, serial number, lot number, month and year of manufacture, and required operating characteristics, including rated voltage, power consumption, and volt-ampere, permanently marked on the back of the module.
E. Have a symbol of module type and color. Symbol must be 25-mm in diameter. Color must be written out in 13-mm high letters next to the symbol.
F. Be AlInGaP technology for red and yellow indications and gallium nitride technology for green indications.
G. Be ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.
H. Have a maximum power consumption as follows:

Power Consumption Requirements

LED Signal Module Type	Power Consumption (Watts)					
	Red		Yellow		Green	
	25 °C	74 °C	25 °C	74 °C	25 °C	74 °C
300-mm circular	11	17	22	25	15	15
300-mm arrow	9	12	10	12	11	11
Lane Control (X)	9	12	--	--	--	--
Lane Control (Arrow)	--	--	--	--	11	11

Lens may be tinted, or may use transparent film or materials with similar characteristics to enhance "ON/OFF" contrasts. Tinting or other materials to enhance "ON/OFF" contrast must not affect chromaticity and must be uniform across the face of the lens.

If polymeric lens is used, surface coating or chemical surface treatment must be applied for front surface abrasion resistance.

Power supply must be integral to the module.

Internal components must be adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Lens and LED signal module material must comply with the ASTM specifications for that material.

Enclosures containing either the power supply or electronic components of LED signal module, except lenses, must be made of UL94VO flame-retardant material.

If a specific mounting orientation is required, the LED signal module must have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing. Markings must include an up arrow, or the word "UP" or "TOP."

LED signal module must meet or exceed the following values when operating at 25 °C:

Minimum Initial Intensities for Circular Indications (cd)

	200-mm			300-mm		
Angle (v,h)	Red	Yellow	Green	Red	Yellow	Green
2.5, ±2.5	157	314	314	399	798	798
2.5, ±7.5	114	228	228	295	589	589
2.5, ±12.5	67	133	133	166	333	333
2.5, ±17.5	29	57	57	90	181	181
7.5, ±2.5	119	238	238	266	532	532
7.5, ±7.5	105	209	209	238	475	475
7.5, ±12.5	76	152	152	171	342	342
7.5, ±17.5	48	95	95	105	209	209
7.5, ±22.5	21	43	43	45	90	90
7.5, ±27.5	12	24	24	19	38	38
12.5, ±2.5	43	86	86	59	119	119
12.5, ±7.5	38	76	76	57	114	114
12.5, ±12.5	33	67	67	52	105	105
12.5, ±17.5	24	48	48	40	81	81
12.5, ±22.5	14	29	29	26	52	52
12.5, ±27.5	10	19	19	19	38	38
17.5, ±2.5	19	38	38	26	52	52
17.5, ±7.5	17	33	33	26	52	52
17.5, ±12.5	12	24	24	26	52	52
17.5, ±17.5	10	19	19	26	52	52
17.5, ±22.5	7	14	14	24	48	48
17.5, ±27.5	5	10	10	19	38	38

Minimum Luminance for Arrows, U-turn, Bicycle, Lane Control, and PV Indications (cd/m2)

	Red	Yellow	Green
Arrow Indication	5,500	11,000	11,000
Lane Control Indication (X)	5,500	--	--
Lane Control Indication (Arrow)	--	--	5,500
PV Indication (cd at 2.5°±2.5°)	314	314	314

LED signal module must meet or exceed the following illumination values for 48 months when operating over a temperature range of -40 °C to + 74 °C. Yellow LED signal module must meet or exceed the following illumination values for 48 months, when operating at 25 °C:

Minimum Maintained Intensities for Circular Indications (cd)

	200-mm			300-mm		
Angle (v,h)	Red	Yellow	Green	Red	Yellow	Green
2.5, ±2.5	133	267	267	339	678	678
2.5, ±7.5	97	194	194	251	501	501
2.5, ±12.5	57	113	113	141	283	283
2.5, ±17.5	25	48	48	77	154	154
7.5, ±2.5	101	202	202	226	452	452
7.5, ±7.5	89	178	178	202	404	404
7.5, ±12.5	65	129	129	145	291	291
7.5, ±17.5	41	81	81	89	178	178
7.5, ±22.5	18	37	37	38	77	77
7.5, ±27.5	10	20	20	16	32	32
12.5, ±2.5	37	73	73	50	101	101
12.5, ±7.5	32	65	65	48	97	97
12.5, ±12.5	28	57	57	44	89	89
12.5, ±17.5	20	41	41	34	69	69
12.5, ±22.5	12	25	25	22	44	44
12.5, ±27.5	9	16	16	16	32	32
17.5, ±2.5	16	32	32	22	44	44
17.5, ±7.5	14	28	28	22	44	44
17.5, ±12.5	10	20	20	22	44	44
17.5, ±17.5	9	16	16	22	44	44
17.5, ±22.5	6	12	12	20	41	41
17.5, ±27.5	4	9	9	16	32	32

Minimum Maintained Luminance for Arrow, U-turn, Bicycle, Lane Control, and PV Indications (cd/m2)

	Red	Yellow	Green
Arrow Indication	5,500	11,000	11,000
Lane Control Indication (X)	5,500	--	--
Lane Control Indication (Arrow)	--	--	5,500
PV Indication (at 2.5°±2.5°)	314	314	314

LED signal module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 °C to +74 °C.

Chromaticity Standards (CIE Chart)

Red	Y: not greater than 0.308, or less than 0.998 -x
Yellow	Y: not less than 0.411, nor less than 0.995 - x, nor greater than 0.452
Green	Y: not less than 0.506 - 0.519x, nor less than 0.150 + 1.068x, nor more than 0.730 - x

LED signal module must operate:

A. At a frequency of 60 Hz ± 3 Hz, over a voltage range from 95 V(ac) to 135 V(ac), without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).

B. Compatible with currently used controller assemblies, including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 mA alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." Electrical connection for each Type 1 LED signal module must be 2 secured, color-coded, 1-meter long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C. Three wires must be used for lane control LED signal module.

LED signal module on-board circuitry must:

A. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.

B. Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED signal module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED signal module must not exceed 20 percent at an operating temperature of 25 °C.

When power is applied to LED signal module, light emission must occur within 90 ms.

Red and Yellow Flashing LED Signal Module

No external circuitry to flash the LED signal module is allowed. Use 12 V(dc) or 120 V(ac).

Flashing LED signal module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less for alternating current or 5 V(dc) for 12 V(dc) flasher units, is applied to the unit.

Electrical connection for each flashing LED signal module must be 4 secured, color-coded, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wire must comply with NEC, rated for service at +105 °C. Conductors for flashing LED signal module must be 1 meter in length, with quick disconnect terminals attached, and must comply with Section 86-4.01C, "Electrical Components" of the Standard Specifications. The color code is as follows:

Color Code Requirements

Function	Color
Neutral/DC common	white
Steady On	red
Flash On	brown
Flash Out	orange

Flashing LED signal module must include all necessary electronics to:

A. Operate in a "Steady On" mode.
B. Perform, in "Flash On" mode, 50 to 60 flashes per minute with a 50 percent ± 5 duty cycle.
C. Allow alternating flashing operation, wig-wag, if the "Steady On" input of another flashing LED signal module is connected.

When power is applied to the "Flash On" control conductor, the control output must allow a 12 V(dc) or 120 V(ac) signal that is switched opposite of the flash state of the module. Output must be able to source a maximum of 2.5 A for 12 V(dc), or 0.3 A for 120 V(ac).

Do not use the power consumption from "Flash Out" output of the flashing LED signal module when determining maximum power consumption.

The flashing LED Signal module must be clearly marked on the back, as "DC FLASHER" or "AC FLASHER", in 13-mm letters.

10-3.16 LIGHT EMITTING DIODE PEDESTRIAN SIGNAL FACE MODULES:

This work includes installing LED pedestrian signal face (PSF) module into standard Type A pedestrian signal housing.

Comply with Section 86, "Signals, Lighting and Electrical Systems" of the Standard Specifications.

Submittals

Before shipping LED PSF modules to job site, submit the following to the Transportation Laboratory:

A. Delivery form including district number, EA, and contact information.
B. List containing all LED PSF module serial numbers anticipated for use.
C. LED PSF modules.

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at: http://www.dot.ca.gov/hq/esc/approved_products_list

The County will test LED PSF module shipments as specified in ANSI/ASQ Z1.4. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED PSF modules tested or submitted for testing must be representative of typical production units. LED PSF modules will be tested as specified in California Test 606. All parameters of the specification may be tested on the modules.

Delays resulting from submittal of non-compliant materials do not relieve the Contractor from executing the contract within the allotted time. Non-compliant materials will be rejected. The Contractor must resubmit new LED for retesting and pick up the failed units within 7 days of notification. The Contractor must provide new LED PSF modules and allow a minimum of 30 days for the retest.

The Contractor must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are the responsibility of the Contractor and no extra time will be provided.

After successful testing. The Contractor must pick up the tested LED PSF modules from the Transportation Laboratory and deliver to the job site.

Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED PSF modules for a minimum period of 48 months after installation of LED PSF modules. Replacement LED PSF modules must be provided within 15 days after receipt of failed LED PSF modules at the Contractor's expense. The State pays for shipping the failed modules to the Contractor. All warranty documentation must be submitted to the Engineer before installation. Replacement LED PSF modules must be delivered to State Maintenance Electrical Shop at 175 Cluster Street, San Bernardino, CA. 92408.

Materials

LED PSF module must:

A. Be from the same manufacturer.
B. Be installed in standard Type A pedestrian signal housing, "UPRAISED HAND" and "WALKING PERSON". Do not include reflectors.
C. Use LED as the light source.
D. Be designed to mount behind or replace face plates of standard Type A housing as specified in ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrain Traffic Control Signal Indications" and the "California MUTCD".
E. Have a minimum power consumption of 10W.
F. Use required color and be ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.

G. Be able to replace signal lamp optical units and pedestrian signal faces with both LED and incandescent light source.
H. Fit into pedestrian signal section housings without modifications to the housing. The housing must comply with ITE publication, Equipment and Materials Standards, Chapter 3, "Pedestrian Traffic Control Signal Heads".
I. Be a single, self-contained device, not requiring on-site assembly for installation into standard Type A housing.
J. Have the following information permanently marked on the back of module:

1. Manufacturer's name.
2. Trademark.
3. Model number.
4. Serial number.
5. Lot number.
6. Month and year of manufacture.
7. Required operating characteristics, as follows:

7.1. Rated voltage.
7.2. Power consumption.
7.3. Volt-ampere (VA).
7.4. Power factor.

K. Have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing if a specific mounting orientation is required. Markings must include an up arrow, or the word "UP" or "TOP".

Marking must be a minimum of 25-mm diameter.

Circuit board and power supply must be contained inside the LED PSF modules. Circuit board must comply with Chapter 1, Section 6 of TEES published by the Department.

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the PSF module light output. Failure of an individual LED in a string must not result in the loss of entire string or other indication.

LEDs must be evenly distributed in each indication. Do not use outline forms.

No special tools for installation are allowed.

Installation of the LED PSF module into pedestrian signal face must require only removal of lenses, reflectors, lamps, and existing LED modules.

Power supply for LED PSF module must be integral to the module. Power supply for each symbol must be isolated to avoid turn-on conflict.

Assembly and manufacturing processes for LED PSF module must assure that all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Material used for LED PSF module must comply with ASTM D 3935.

Enclosures containing either the power supply or electronic components of LED PSF module, except lenses, must be made of UL94VO flame-retardant material.

Color of "UPRAISED HAND" symbol must be portland orange.

Color of "WALKING PERSON" symbol must be lunar white.

Each symbol must not be less than 250-mm high and 165-mm wide. Uniformity ratio of illuminated symbols must not exceed 4 to 1 between highest and lowest luminance areas. Symbols must comply with ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications" and the "California MUTCD".

LED PSF module must maintain an average luminance value over 48 months of continuous use in signal operation for a temperature range of -40 °C to +74 °C. In addition, LED PSF modules must meet or exceed the following luminance values upon initial testing at 25 °C.

Luminance Values

PSF module	Luminance
UPRAISED HAND	3,750 cd/m2
WALKING PERSON	5,300 cd/m2

Color output of LED PSF module must comply with chromaticity requirements in Section 5.3 of ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications".

Measured chromaticity coordinates of LED PSF module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 °C to +74 °C.

Chromaticity Standards (CIE Chart)

UPRAISED HAND (portland orange)	Not greater then 0.390, nor less than 0.331, nor less than 0.997-X
WALKING PERSON (lunar white)	X: not less than 0.280, nor greater than 0.320 Y: not less than 1.055*X - 0.0128, nor greater than 1.055*X + 0.0072

LED PSF module maximum power consumption must not exceed the following values:

Power Consumption Requirements

PSF module	Power Consumption @ 24°C	Power Consumption @ 74°C
UPRAISED HAND	10.0 W	12.0 W
WALKING PERSON	9.0 W	12.0 W

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads". The LED PSF module must be supplied with spade lugs and 3 secured, color-coded, 1 meter long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C.

LED PSF module must operate:

A. At a frequency of 60 Hz ± 3 Hz over a voltage range from 95 V(ac) to 135 V(ac) without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).

B. Compatible with currently used State controller assemblies including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 ma alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

LED PSF module on-board circuitry must:

A. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
B. Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED PSF module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED PSF module must not exceed 20 percent at an operating temperature of 25 °C.

The LED PSF module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less is applied to the unit.

When power is applied to LED PSF module, light emission must occur within 90 ms.

The "UPRAISED HAND" and "WALKING PERSON" symbol indications must be electrically isolated from each other.

Sharing a power supply or interconnect circuitry between the 2 indications is not allowed.

10-3.17 BATTERY BACKUP SYSTEM:

This work includes installing battery backup system (BBS). Comply with Section 86, "Signals, Lighting and Electrical Systems" of the Standard Specifications and TEES.

The Contractor must furnish the BBS components, external cabinet and batteries.

Submittals

Before shipping external cabinets to the jobsite, submit material list including contract number, cabinet serial numbers, and contact information to the Transportation Laboratory.

Submit a Certificate of Compliance for each external cabinet and batteries to the Engineer under Section 6-1.07, "Certificates of Compliance" of the Standard Specifications.

Quality Control and Assurance

The County may test the cabinets.

Functional Testing

After complete installation, BBS functional test must be performed. Test for 30 minutes of continuous, satisfactory operation with utility power turned off. Perform test in the presence of the Engineer.

Warranty

Batteries must be warranted by the manufacturer to operate within a temperature range of -25 °C to +60 °C for 2 years.

Batteries must have a written warranty against defects in materials and workmanship from the manufacturer prorated for a period of 60 months after installation. The Contractor must provide the Engineer with all warranty documentation before installation. Replacement batteries must be available within 5 business days after receipt of failed batteries at no cost to the State except the cost of shipping the failed batteries. Replacement batteries must be delivered to Caltrans Maintenance Electrical Shop at 175 West Cluster Street, San Bernardino, California.

Materials

Batteries must:

A. Be deep cycle, sealed prismatic, lead-calcium-based, absorbed-glass mat and valve-regulated lead acid (AGM/VRLA) type.
B. Have voltage rating of 12 V.
C. Be group size 24.
D. Be commercially available and stocked locally.
E. Have a carrying handle.
F. Be marked with date code, maximum recharge data, and recharge cycles.
G. Have 2 top-mounted, threaded, stud posts that include all washers and nuts required for attaching 9.5-mm ring lugs of a BBS battery harness.
H. Include rubber insulating protective covers for protecting the lugs, posts, and wiring - red for positive terminal and black for negative terminal.
I. Be new and fully-charged when furnished.

J. Be free from damage or deformities.

External cabinet must be one listed on the Pre-Qualified Products List at: http://www.dot.ca.gov/hq/esc/approved_products_list/

External cabinet must be capable of housing:

A. 8 batteries.
B. Inverter/charger unit.
C. Power transfer relay.
D. Manually-operated bypass switch.
E. Required control panels.
F. Wiring and harnesses

Dimensions and details for the external cabinet, for attaching the external cabinet to the Model 332A cabinet, and for wiring the equipment will be available in an information handout as described in "Project Information" of these Special Provisions.

The following details must comply with Section 86-3.04, "Controller Cabinets" of the Standard Specifications and TEES:

A. Door construction, including material, thickness, coating, and welds.
B. Frame.
C. Door seals.
D. Continuous stainless steel piano hinge or 4 leaves with 2 bolts on each side of each leaf, used to connect the door to external cabinet.
E. Padlock clasp or latch and lock mechanism.

The external cabinet must be ventilated by using louvered vents, filter, and a thermostatically controlled fan. Fan must be AC-operated from the same line output as the Model 332A cabinet. A 2-position terminal block must be provided on the fan panel, along with 3 meters of connected hookup wire.

The external cabinet surface must be anodized aluminum. Anti-graffiti paint must not be used.

The external cabinet must include all bolts, washers, nuts, and cabinet-to-cabinet coupler fittings necessary for mounting it to the Model 332A cabinet.

Fasteners for the external cabinet must include:

A. 8 cabinet mounting bolts that are 18-8 stainless steel hex head, fully-threaded, and 9.5-mm – 16 x 25.4-mm.
B. 2 washers per bolt designed for 9.5-mm bolt and are 18-8 stainless steel 25.4-mm OD round flat type.
C. K-lock nut per bolt: K-lock washer that is 18-8 stainless steel and hex-nut.

External cabinet to Model 332A cabinet couplings must include a conduit for power connections between the 2 cabinets. Couplings must include:

A. 51-mm nylon-insulated steel chase nipple, T & B 1947 or equivalent.
B. 51-mm sealing, steel locknut, T & B 146SL or equivalent.
C. 51-mm nylon-insulated steel bushing, T & B 1227 or equivalent.

Construction

Mount external cabinet to either the left or right side of Model 332A cabinet. The typical side-mounting location of external cabinet is flush with the bottom of the Model 332A cabinet and approximately equidistant from the front and rear door edges.

Payment

Full compensation for assembling and installing battery backup system is included in the contract lump sum price paid for Signal and Lighting, and no separate payment will be made therefor.

10-3.18 VIDEO IMAGE VEHICLE DETECTION SYSTEM – SIGNAL OPERATION:

GENERAL

Summary

This work includes installing video image vehicle detection system (VIVDS) for traffic signals.

Comply with Section 86, "Signals, Lighting and Electrical Systems" of the Standard Specifications.

Submittals

Submit proposed list of materials before starting work. Submit drawings and other data before the completion of the contract. Submittals include:

Submittals

Item	Description
Certificate of compliance	For VIVDS as specified in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications.
Site analysis report	Written analysis for each detection site, recommending the optimum video sensor placement approved by the manufacturer.
Lane configuration	Shop drawing showing detection zone setback, detection zone size, camera elevation, selected lens viewing angle, illustration of detection zone mapping to reporting contact output, and illustration of output connector pin or wire terminal for lane assignment.
Configuration record	Windows XP or later version of PC compatible CD containing the final zone designs and calibration settings to allow reinstallation.
Mounting and wiring information	Approved wiring and service connection diagrams wrapped in clear self-adhesive plastic, placed in a heavy duty plastic envelope, and secured to the inside of the cabinet door.
Communication protocol	Industry standard available in public domain. Document defining message structure organization, data packet length, message usability, and necessary information to operate a system from a remote Windows based personal computer.
Programming software	CD containing set up and calibration software that observes and detects the vehicular traffic, including bicycles, motorcycles, and sub-compact cars, with overlay of detection zones and allows adjustment of the detection sensitivity from a traffic signal application.
Detector performance DVD recordings and analysis	Performance analysis based on 24-hour DVD recording of contiguous activity for each approach. Include 2 contiguous hours of sunny condition, with visible shadows projected a minimum of 1.8 m into the adjacent lanes, and two 1-hour night periods with vehicle headlights present.
Preventative maintenance parts documentation	Documentation containing equipment replacement parts list for preventative maintenance, including electrical parts, mechanical parts, and assemblies.
Acceptance testing schedule	Submit schedule for approval 15 days before acceptance testing of VIVDS. Acceptance testing is separate from detector performance and analysis.
Acceptance testing documentation	Documentation for using support equipment to perform acceptance testing without assistance.
Training	Submit training material for approval 30 days before training.
Warranty	Manufacturer's written warranty against defects in material and workmanship for VIS assemblies and VDU, for 24-month period after VIVDS installation.

Quality Control and Assurance

Training

Provide a minimum of 16 hours of training by a factory authorized representative for up to 4 students. Training content must include instructions for aligning, programming, adjusting, calibrating, and maintaining VIVDS. The Contractor must provide all materials and equipment for the training. Notify the Engineer 20 days before training and agree on a training time. If agreement cannot be reached, the Engineer will determine the time. Training area will be determined by the Engineer.

Warranty

After final acceptance of VIVDS, provide replacement video image sensor assembly (VIS) and video detection unit (VDU) within 10 days after receipt of failed units at no cost to the County, except the cost of shipping failed VIS and VDU. Deliver replacement VIS and VDU to: 2033 East Ramsey Street, Banning, CA 92220.

MATERIALS

Functional Requirements

VIVDS must include a VIS and mounting hardware assembly installed on a pole or mast-arm. Use a clamping device as mounting hardware on standards. Include VDU, image processor, extension module and communication card, power supply, surge suppression, cables, connectors, and wiring for connecting to the Model 332A traffic controller cabinet.

VIS and zoom lens must be housed in an environmentally sealed enclosure, watertight and protected from dust, and must comply with NEMA 4 standards. Enclosure must include a thermostat controlled heater to prevent condensation and to ensure proper lens operation at low temperatures. Adjustable sun shield that diverts water from the camera's field of view must be included. Assembly must have waterproof connections for power, control and video signal cables, and wiring.

VIVDS must include necessary firmware, hardware, and software for designing the detection patterns or zones at the intersection or approach. Detection zones must be created with a graphic user interface designed to allow trained State/County employee to configure and calibrate a lane in less than 15 minutes. System must support normal operation of existing detection zones while a zone is being added or modified. Zone must flash or change color on a viewing monitor when vehicular traffic is detected.

Software and firmware must detect vehicular traffic presence, provide vehicle counts, set up detection zones, test VIVDS performance, and allow video scene and system operation viewing from a remote location. VIVDS must support a minimum of 2 separate detection patterns or zones that can be enacted by a remote operator.

VIVDS detection zone must detect vehicles by providing an output for presence and pulse. At least 1 detection output must be provided for each detection zone. One spare detection output must be provided for each approach. Detection performance must be achieved for each detection zone with a maximum of 8 user-defined zones for every camera's field of view.

VIVDS must detect the presence of vehicles under all types of adverse weather and environmental conditions, including snow, hail, fog, dirt, dust or contaminant buildup on the lens or faceplate, minor camera motion, and excessive vibration. If less than 95 percent detection accuracy results from low visibility conditions, the VIVDS must respond by selecting a fail-safe default pattern, placing a constant call mode for all approaches. VIVDS outputs must assume a fail-safe "on" or "call" pattern for presence detection if video signal or power failure is not available and must recover

from a power failure by restoring normal operations within 3 minutes without manual intervention. If powered off for more than 90 days, system must maintain the configuration and calibration information in memory.

Detection algorithm must be designed to accommodate naturally occurring lighting and environment changes, specifically the slow moving shadows cast by buildings, trees, and other objects. These changes must not result in a false detection or mask a true detection. VIVDS must not require manual interventions for day-night transition or for reflections from poles, vehicles or pavement during rain and weather changes. VIVDS must suppress blooming effects from vehicle headlights and bright objects at night.

Vehicle detection must call service to a phase only if a demand exists and extend green service to the phase until the demand is taken care of or until the flow rates have reduced to levels for phase termination. VIVDS must detect the presence of vehicular traffic at the detection zone positions and provide the call contact outputs to the Model 170E or Model 2070 with the following performance:

Detector Performance

Requirements	Performance during AMBER and RED interval	Performance during GREEN interval
Average response time after vehicle enters 1 m into detection zone or after departing 1 m past detection zone	≤ 1 Sec	≤ 100 ms
Maximum number of MISSED CALLS in 24-hour duration, where MISSED CALLS are greater than 5 sec. during AMBER and RED intervals and greater than 1 sec. during GREEN intervals (upon entering 1 m of detection zone or after departing 1 m past detection zone).	0	10
Maximum number of FALSE CALLS in 24-hour duration (calls greater than 500 ms without a vehicle present)	20	20

Each camera and its mounting system must be less than 4.5 kg and less than 0.1 square meter equivalent pressure area. Only 1 VIVDS camera must be mounted on a traffic signal or luminaire arm. Top of camera must not be more than 300-mm above top of arm.

VIVDS must be able to locally store, for each lane, vehicle count data in 5, 15, 30, and 60 minute intervals for a minimum period of 7 days and be remotely retrievable. VIVDS must count vehicular traffic in detection zone with a 95 percent accuracy or better over a 1-day period with a minimum range of 15 m to the limit line for each approach.

VDU front panel must have indicators for power, communication, and presence of video input for each video sensor, and a real time detector output operation. Hardware or software test switch must be included to allow the user to place either a constant or momentary call for each approach. Indicators must be visible in daylight from 1.5 m away.

A flat panel video display with a minimum 200-mm screen and that supports National Television Standards Committee (NTSC) video output must be furnished and installed in the Model 332A cabinet for viewing video detector images and for performing diagnostic testing. Display must be viewable in direct sunlight. Each VIVDS must have video system connections that support the NTSC video output format, can be seen in each camera's field of view, and has a program to allow the user to switch to any video signal at an intersection. A metal shelf or pull-out document tray with metal top capable of supporting the VDU and monitor must be furnished and placed on an EIA 483-mm rack with 10-32 "Universal Spacing" threaded holes in the Model 332A cabinet. Furnished EIA 483-mm rack must comply with EIA standard EIA-310-B. System must allow independent viewing of a scene while video recording other scenes without interfering with the operation of the system's output.

VIVDS must have a serial communication port that supports sensor unit setup, diagnostics, and operation from a local PC compatible laptop with Windows XP or later version operating system. VIVDS must have an ethernet communication environment. VIVDS must include central and field software to support remote real-time viewing and diagnostics for operational capabilities through wide area network (WAN) or wireless.

Technical Requirements

System elements must be designed to operate continuously in an outdoor traffic monitoring and control environment, all day, every day. Manufactured electronic components must support a minimum mean time between failures (MTBF) value of 10 years.

Video sensor must use a charge-coupled device (CCD) element and support NTSC and RS170 video output formats with resolution of not less than 360 horizontal lines. Video sensor must include an auto gain control (AGC) circuit, have a minimum sensitivity to scene luminance from 0.1 lux to 10,000 lux, and produce a usable video image of vehicular traffic, under all roadway lighting conditions and regardless of the time of day. Video sensor must have a motorized lens with variable focus and zoom control with an aperture of f/1.4 or better. Focal length must allow ± 50 percent adjustment of the viewed detection scene.

Enclosed VIS must operate between –37°C to +74°C and zero percent to 95 percent relative humidity.

Sensor unit mounting hardware must be powder-coated aluminum, stainless steel, or treated to withstand 250 hours of salt fog exposure as specified in ASTM B 117 without any visible corrosion damage.

VDU, image processors, extension modules, and video output assemblies must be inserted into the controller input file slots using the edge connector to obtain limited 24 V(dc) power and to provide contact closure outputs. Cabling the output file to a "D" connector on the front of the VDU is acceptable. No rewiring to the standard Model 332A cabinet is allowed. Controller cabinet resident modules must comply

with the requirements in Chapter 1 and Sections 5.2.8, 5.2.8.1, 5.2.8.2, 5.4.1, 5.4.5, 5.5.1, 5.5.5, and 5.5.6 of TEES.

VIVDS must operate between 90 to 135 V(ac) service as specified in NEMA TS-1. VIS, excluding the heater circuit, must draw less than 10 watts of power. Power supply or transformer for the VIVDS must meet the following minimum requirements:

Minimum Requirements for Power Supply and Transformers

Item	Power Supply	Transformer
Power Cord	Standard 120 V(ac), 3 prong cord, 1 m minimum length (may be added by Contractor)	Standard 120 V(ac), 3 prong cord, 1 m minimum length (may be added by Contractor)
Type	Switching mode type	Class 2
Rated Power	Two times (2x) full system load	Two times (2x) full system load
Operating Temperature	-37°C to 74°C	-37°C to 74°C
Operating Humidity Range	From 5 percent to 95 percent	From 5 percent to 95 percent
Input Voltage	From 90 V to 135 V(ac)	From 90 V to 135 V(ac)
Input Frequency	60 Hz ± 3 Hz	60 Hz ± 3 Hz
Inrush Current	Cold start, 25 A max. at 115 V	N/A
Output Voltage	As required by VIVDS	As required by VIVDS
Overload Protection	From 105 percent to 150 percent in output pulsing mode	Power limited at >150 percent
Over Voltage Protection	From 115 percent to 135 percent of rated output voltage	N/A
Setup, Rise, Hold Up	800ms, 50ms,15ms at 115 V(ac)	N/A
Withstand Voltage	I/P-0/P:3kV, I/P-FG:1.5kV, for 60 sec.	I/P-0/P:3kV, I/P-FG:1.5kV, for 60 sec
Working Temperature	Not to exceed 70°C @30% load	Not to exceed 70°C @ 30 % load
Safety Standards	UL 1012, TUV EN60950	UL 1585
EMC Standards	EN55022 Class B, EN61000-4-2, 3, 4, 5	N/A

Field terminated circuits must include transient protection as specified in IEEE Standard 587-1980, Category C. Video connections must be isolated from ground.

Wiring must be routed through end caps or existing holes. New holes for mounting or wiring must be shop-drilled.

VIVDS and support equipment required for acceptance testing must be new and as specified in the manufacturer's recommendations. Date of manufacture, as shown by date codes or serial numbers of electronic circuit assemblies, must not be older than 12 months from the scheduled installation start date. Material substitutions must not deviate from the material list approved by the Engineer.

CONSTRUCTION

For materials and installation comply with the manufacturer's recommendations. All equipment, cables, and hardware must be part of an engineered system that is designed by the manufacturer to fully inter-operate with all other system components. Mounting assemblies must be corrosion resistant. Connectors installed outside the

cabinets and enclosures must be corrosion resistant, weather proof, and watertight. Exposed cables must be sunlight and weather resistant. Label cables with permanent cable labels at each end.

Install VDU in a Model 170E or Model 2070 controller assembly. Install VIS power supply or transformer on a standard DIN rail using standard mounting hardware and power conductors wired to DIN rail mounted terminal blocks in the controller cabinet.

Wire each VIS sensor assembly to the controller cabinet with a wiring harness that includes all power, control wiring, and coaxial video cable. Attach harness with standard Mil type and rated plugs. Cable type and wire characteristics must comply with manufacturer's recommendations for the VIS to cabinet distance of the project. Wiring and cables must be continuous (without splices) between the VIS sensor and controller cabinet. Coil a minimum of 7 feet of slack in the bottom of the controller cabinet. For setup and diagnostic access, terminate serial data communication output conductors at TB-0 and continue for a minimum of 3 m to a DB9F connector. Tape ends of unused and spare conductors to prevent accidental contact to other circuits. Label conductors inside the cabinet for the functions depicted the approved detailed diagrams.

Adjust the lens to view 110 percent of the largest detection area dimension. Zones or elements must be logically combined into reporting contact outputs that are equivalent to the detection loops and with the detection accuracy required.

Verify the performance of each unit, individually, and submit the recorded average and necessary material at the conclusion of the performance test. Determine and document the accuracy of each unit, individually, so that each unit may be approved or rejected separately. Failure to submit necessary material at the conclusion of testing invalidates the test. The recorded media serves as acceptance evidence and must not be used for calibration. Calibration must have been completed before testing and verification.

Verify the detection accuracy by observing the VIVDS performance and recorded video images for a contiguous 24-hour period. The recorded video images must show the viewed detection scene, the detector call operation, the signal phase status for each approach, the vehicular traffic count, and time-stamp to 1/100 of a second, all overlaid on the recorded video. Transfer the 24-hour analysis to DVD.

VIVDS must meet the detection acceptance criterion specified in table titled "Detector Performance".

Calculate the VIVDS's vehicular traffic count accuracy as 100{1-[absolute value (TC-DC)/TC]}, where DC = detector's vehicular traffic count and TC = observed media-recorded vehicular traffic count.

The Engineer will review the data findings and accept or reject the results within 7 days. Vehicle anomalies or unusual occurrences will be decided by the Engineer. Data or counts not agreed by the Engineer will be considered errors and count against

the unit's calibration. If the Engineer determines that the VIVDS does not meet the performance requirements, the Contractor must re-calibrate and retest the unit, and resubmit new test data within 7 days. After 3 failed attempts, you must replace the VIVDS with a new unit.

Notify the Engineer 20 days before the unit is ready for acceptance testing. Acceptance testing must be scheduled to be completed before the end of a normal work shift. The Contractor must demonstrate that all VIS cameras and VDUs satisfy the functional requirements.

PAYMENT

The contract lump sum price paid for Signal and Lighting shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing video image vehicle detection system, complete in place, including testing, as shown on the plans, as specified in the Standard Specifications and these Special Provisions and as directed by the Engineer.

Repair, replacement and retesting of VIVDS components due to failure or rejection is the Contractor's expense.

10-3.19 DETECTORS:

Loop wire shall be Type 2.

Loop detector lead-in cable shall be Type B.

Slots shall be filled with hot-melt rubberized asphalt sealant.

At the Contractor's option, where a Type A or a Type B loop is designated on the plans, a Type E loop may be substituted.

For Type E detector loops, sides of the slot shall be vertical and the minimum radius of the slot entering and leaving the circular part of the loop shall be 40-mm. Slot width shall be a maximum of 16-mm. Loop wire for circular loops shall be Type 2.

The depth of loop sealant above the top of the uppermost loop wire in the sawed slots shall be 50-mm, minimum.

10-3.20 LUMINAIRES:

Ballasts shall be the lag type.

10-3.21 SIGN LIGHTING FIXTURES – INDUCTION:

Induction sign lighting fixtures shall conform to the provisions for mercury sign lighting fixtures in Section 86-6.05, "Sign Lighting Fixtures-Mercury" of the Standard Specifications and these Special Provisions.

Each fixture shall consist of a housing with door, a reflector, refractor or a lens, a lamp, a power coupler, a high frequency generator and a fuse block. Retrofit kits shall be installed as shown on the plans.

Fixtures shall have a minimum average rating of 60 000 hours. Fixtures shall be for a wattage of 87 W, 120/240 V(ac). The power factor of the fixtures shall be greater than 90 percent and the total harmonic distortion shall be less than 10 percent. Fixtures shall be Underwriter's Laboratories (UL) approved for wet locations and be Federal Communications Commission (FCC) Class A listed.

The mass of the fixture shall not exceed 20 kg. The manufacturer's brand name, trademark, model number, serial number and date of manufacture shall be located on the packaged assembly and permanently marked on the outside and inside of the housing.

MATERIALS

Mounting Assembly

The mounting assembly may be either cast aluminum, hot-dip galvanized steel plate or steel plate that has been galvanized and finished with a polymeric coating system or the same finish that is used for the housing.

Housing

Housings shall have a door designed to hold a refractor or lens. Housing doors shall be designed to be opened without the use of tools. Housings and doors shall have a powder coat or polyester paint finish of a gray color resembling unfinished fabricated aluminum.

Reflector

Reflectors shall be designed to be removed as a unit that includes the lamp and power coupler.

Refractor

Refractors or lenses shall have smooth exteriors. Lenses shall be flat or convex. Convex lenses shall be made from heat resistant, high-impact resistant, tempered glass.

Convex lenses shall be designed or shielded so that no fixture luminance is visible when the fixture is approached directly from the rear and the viewing level is the bottom of the fixture. When a shield is used it shall be an integral part of the door casting.

Lamp

Each fixture shall be furnished with a 85-W induction lamp. Interior lamp walls shall be fluorescent phosphor coated. Lamp light output shall be at least 70 percent at 60 000 hours. Lamps shall have a minimum color-rendering index of 80. Lamps shall be rated at a color temperature of 4000 K. Lamps shall be removable without the use of tools.

Power Coupler

Power couplers shall consist of a construction base with antenna, heat sink and electrical connection cable.

The power coupler shall be designed so that it can be removed with common hand tools.

High Frequency Generator

High frequency generators shall start and operate lamps at an ambient temperature of -25 °C or greater for the rated life of the lamp.

Generator output frequency shall be 2.65 MHz ± 10 percent. The generator radio frequency interference shall meet the requirements of the Federal Communications Commission Title 47, Part 18, regulations concerning harmful interference.

High frequency generators shall operate continuously at ambient air temperatures from -25 °C to +25 °C without reduction in generator life. High frequency generators shall have a design life of at least 100 000 hours at 55 °C.

High frequency generators shall be capable of being replaced with common hand tools. Conductor terminals shall be identified as to the component terminal to which they connect.

High frequency generators shall be mounted to use the fixture upon which they are mounted as a heat sink.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications, and a copy of the high frequency generator test methods and results shall be submitted by the manufacturer with each lot of fixtures. The certificate shall state that the high frequency generators meet the requirements of this section and the generator specifications of the lamp manufacturer.

Retrofit Kit

Each fixture retrofit kit shall consist of a reflector, a lamp, a power coupler and a high frequency generator. The retrofit kit components shall conform to the requirements of this section. The installation of the retrofit kit shall not require modification of existing housing and door.

10-3.22 INTERNALLY ILLUMINATED SIGNS:

The "METER ON" sign shall be a Type A pedestrian signal modified so that the reflector shall be a single chamber with 2 incandescent lamps.

The message shall be white "METER ON" as shown on the plans. White color shall be in conformance with the provisions in Section 86-4.06, "Pedestrian Signal Faces" of the Standard Specifications.

Lenses shall be 4.8-mm, minimum thickness, clear acrylic or polycarbonate plastic or 3-mm nominal thickness glass fiber reinforced plastic, with molded, one piece, neoprene gasket. Message lettering for "METER" shall be "Series C," 113-mm high, with uniform 13-mm stroke, and for "ON" shall be "Series C," 150-mm high, with uniform 25-mm stroke. Letters shall be clear, transparent or translucent, with black opaque background silk screened on to the second surface of the lens.

10-3.23 NON-ILLUMINATED STREET NAME SIGNS:

Mast arm mounted street name signs shall be installed on signal mast arms at the locations shown on the plans. The Contractor furnished hanger assembly shall be similar to that shown for internally illuminated street name signs. The mounting hardware and sign shall be assembled. The assembly shall be attached to the mast arm using a 19-mm x 0.53-mm stainless steel strap in a manner similar to the strap and saddle bracket method shown on the plans. The band shall be wrapped at least twice around the mast arm, tightened, and secured with a stainless strap seal in the same manner shown for strap and saddle bracket sign mounting. Straps, seals, and saddle brackets shall be furnished by the Contractor. The sign panel shall be leveled and hardware securely tightened.

10-3.24 PHOTOELECTRIC CONTROLS:

Contactors shall be the mechanical armature type.

Luminaires shall have Type V photoelectric control. Photoelectric units for illuminated signs shall have a "turn-on" level of between 215 lux and 323 lux (corresponds to a switching level of approximately 430 lux to 646 lux measured in the horizontal plane). "Turn-off" level shall not exceed 3 times the "turn-on" level.

10-3.25 GENERAL PACKET RADIO SERVICE EQUIPMENT:

The general packet radio service equipment shall consist of a general packet radio service (GPRS) modem, power strip, serial cable, GPRS antenna and antenna cable. These equipments shall be installed as shown in the plans and shall be capable of interacting with the Model 170 controller located inside the controller cabinet. The Contractor shall secure all components and cables to the rack or cabinet as necessary. The installed general packet radio service equipment shall be compatible with the existing Cingular GPRS/EDGE (Enhanced Data rates for Global system for mobile communications Evolution) system currently being used in the District. The Contractor shall provide software, cabling and configure the GPRS modem for connection to the existing wireless telecommunications provider's GPRS system. The Contractor shall be responsible for compatibility and demonstrating compatibility.

GENERAL PACKET RADIO SERVICE MODEM

The modem shall be Class 1, Division 2 certified, with full duplex transceiver capabilities and delivered with a power supply. The modem shall meet the following requirements:

A. Physical Characteristics:

1. Mass: Less than 0.5 kg.
2. Size: 76-mm (wide) x 25-mm (high) x 130-mm (long).
3. Status LEDs.
4. RF Antenna Connector: 50 Ω TNC male.
5. Serial Interface: RS232 DB-9F.

B. Environmental:

1. Operating Temperature Ranges: From -30°C to +74°C (10 percent duty cycle limit above 60°C).
2. Humidity: From 5 percent to 95 percent non-condensing.

C. RF features:

1. Network: 1900 MHz and 850 MHz band GPRS.
2. Transmit power range at antenna port: 1.0W for 1900 MHz band and 0.8W for 850 MHz band.
3. Transmitter can reduce output power when near a base station as per Global System for Mobile (GSM) communication specifications.
4. Receiver sensitivity: Typical level of -107 dBm, with 2.439 percent bit error rate or less.
5. Packet switched data capable of both 14,400 bps in transparent and non-transparent modes.

D. Power management features shall include but not be limited to the following:

1. Advanced power management features.
2. Low power consumption.
3. Input Voltage: From 10 V(dc) to 28 V(dc).
4. Input Current: From 40 mA to 200 mA.
5. Typical Receive: Average of 200 mA at 12 V(dc).
6. Typical Transmit: Approximately 200 mA at 12 V(dc).
7. Dormant Connection (idle for 10 s to 20 s): 40 mA at 12 V(dc).

E. Application Interfaces:

1. Attention (AT) command set.
2. Host TCP/IP stack communicates via Point to Point Protocol (PPP).
3. Windows 2000/NT/XP Dial Up Networking communicates using PPP.

POWER STRIP

The Contractor shall install a power strip at locations shown on the plans. The power strip shall meet the following requirements:

Function	Value
Mounting:	482.6 mm rack mount
No. of outlets:	6 or greater
Electrical Rating:	15 A, 125 V(ac), 60 Hz
Circuit Breaker:	12 A, 125 V(ac)
Max. Surge Current	Greater than 6500 A
Max. Energy Dissipation:	Greater than 210 J
Modes of Surge Protection:	Both Longitudinal and Transverse
Clamping Response Time	Less than one nanosecond
Modes of Noise Protection:	Transverse and Common
Noise Attenuation:	From 20 dB to 40 dB
Noise Frequency Range:	Up to 80 dB from 50 kHz to 1,000 MHz
Type of Cordset:	SJT 14/3
Indications	Line OK, Line Fault, Protection Present
Environmental Rating	From -30°C to +74°C, with humidity from 5 percent to 95 percent non-condensing
Ratings/specifications	Meets or exceeds UL 1449, UL 1283 and UL 497A
Warranty	Lifetime

SERIAL CABLE

The serial cable shall consist of six No. 22, stranded tinned copper conductors. Each conductor shall be insulated with 250 microns, minimum nominal thickness, color coded polypropylene material. Conductors shall be in twisted pairs. Each pair shall be wrapped with an aluminum polyester shield and shall have a No. 22 or larger, stranded, tinned copper drain wire inside the shielded pair.

The cable jacket shall be polyvinyl chloride, rated for a minimum of 300 V and 60°C, and shall have a minimum nominal wall thickness of 1-mm. The cable shall be at least 1 m long with a connector for termination as required. The connector at the Model 170 controller shall meet the following requirements:

The cable jacket shall be polyvinyl chloride, rated for a minimum of 300 V and 60°C, and shall have a minimum nominal wall thickness of 1 mm. The cable shall be at least 1 mlong with a connector for termination as required. The connector at the Model 170 controller shall meet the following requirements:

Amphenol or equivalent	
Part	Number
Shield	201378-2
Block	201355-1
Guide Pin	200390-4
Socket	200389-4

The cable pin configuration shall be as shown on the project plans.

GPRS ANTENNA AND ANTENNA CABLE

The antenna shall be fixed mount design and use a waterproof acrylic foam adhesive to attach to the outside surface of the controller cabinet. The adhesive should be resistant to Jet Propellant Grade 4 (JP-4), acetone, methyl ethyl ketone, motor oil and gasoline. The antenna shall come with a separate coaxial cable with appropriate connectors at each end. Connect the antenna and the GPRS modem using the cable.

The antenna shall be compatible with the modem and the existing Cingular GPRS/EDGE system. The antenna shall not be more than 28.58-mm high and 111.13-mm in diameter and it shall operate in dual bands with frequency ranges from 824 MHz to 896 MHz and from 1850 MHz to 1915 MHz.

The Contractor shall supply an antenna that meets the following requirements:

Voltage Standing Wave Ratio (VSWR) at resonant point	1.5:1 or less
Nominal Impedance	50 Ω
Gain	3 dB
Horizontal Radiation Pattern	Omni Directional
Polarization	Vertical
Maximum Power Input	125 W

DELIVERY OF THE GENERAL PACKET RADIO SERVICE EQUIPMENT

The Contractor shall deliver the GPRS modem to the Engineer 10 days before the Contractor is scheduled to pick up the Model 334 cabinet.

TESTING

Proper operation of the GPRS modem shall be demonstrated by successfully performing a loop back test at the installation site by the Contractor. The loop back test shall involve transmitting data from the Model 170 controller to the TMC computer and monitoring the resulting return data. For success, the test shall transmit 5 minutes continuously, every hour, for one full day. The Contractor shall be responsible for developing the test procedures with documentation that include required equipment, prior to testing. The Engineer will approve the test procedures and documentation before the Contractor performs the testing. The testing shall be observed by the Engineer and the final recorded results approved by the Engineer.

PAYMENT

Full compensation for general packet radio service equipment shall be considered as included in the contract lump sum price for Ramp Metering System and no separate payment will be made therefor.

10-3.26 WIRELESS CELLULAR DATA COMMUNICATIONS ASSEMBLY:

The wireless cellular data communications assembly shall consist of the Code Division Multiple Access (CDMA) modem, an external antenna, antenna cable, power supply/adapter for modem, interface cable between modem and 170E Controller, and modem mounting bracket. The wireless cellular data communications assembly shall provide wireless data transmission between the signal controller in the field and the Transportation Management Center (TMC).

CDMA Modem
The modem shall be product certified by the cellular provider.

RF Specifications:
224 mW RF output (+23.5dBm)
Full duplex transceiver
Dual band support for both 800 MHz and 1.9 GHz bands
Adheres to CDMA authentication as specified in CDMA2000

Antenna
The antenna shall meet the dual band requirements stated above.

Packet Mode Features:
The modem shall support data rates up to 150kbs and 75 kbps.

DC Power Specifications:
Advanced Power Management features
Low power consumption
Input Voltage: From 10 V(dc) to 28 V(dc)
Input Current: From 40 mA to 200 mA
Typical Receive: 200 mA at 12 V(dc)
Typical Transmit: Approximately 200 mA at 12 V(dc)
Dormant connection (idle for 10-20 seconds): 40 mA at 12 V(dc)
The above power requirements shall be provided by an AC adapter or other approved devices.

Environmental:
Operating ranges: -30 °C to +70 °C (10 percent duty cycle limit above 60 °C)
Humidity: From 5 percent to 95 percent, non-condensing

Physical Characteristics:
Mass: Shall be less than 0.5 kg.
Size: Not greater than 78-mm wide x 28-mm high x 130-mm long
Status LEDs shall provide as a minimum indications for power and received
Signal Strength Indication (RSSI), and data transmission error
RF Antenna Connector: 50 Ohm Terminal Node Controller (TNC)
Serial Interface: RS232 DB-9F
Modem Mounting Bracket shall attach and secure the modem in the proximity of the 170E Controller C2 port within the 332 Controller Cabinet

Interface Connection with 170E Controller:
Interface cable shall conform with C2P modem interconnect harness. The cable ends shall be C2P connector to the Model 170E controller and DB9 male connector to the external modem, with the following pin configurations as follow:

DB9M (to external modem)		**C2P (to Model 170 controller)**	
Function	Pin	Pin	Function
Transmit Data	3	K	Data In
Receive Data	2	L	Data Out
Signal Ground	5	N	Ground
Request to Send	7	J	Request to Send
Clear to Send	8	M	Clear to Send
Data Terminal Ready	4	H	Clear Detect

The Contractor shall provide the specified wireless cellular data communication assembly to the Engineer 20 working days before the Contractor will pick up the 332 cabinet. The Engineer will then provide the assembly to the State Electrical Operations Supervisor for activation and verification of the operational readiness of the cellular equipment prior to installation and signal turn on.

Acceptance Testing
At the time of the signal turn on the wireless cellular data communication system will be tested by State forces to perform a loop test at the installation site by transmitting via a cellular device requesting data from the 170E Controller and monitoring the resulting return data. The test will be for a period of not less then 5 days of continuous, satisfactory operation.

Warranty
The Contractor shall provide a written warranty from the manufacturer against defects in materials and workmanship for wireless cellular data communication assembly for a period of 12 months after the acceptance test has been completed.

Replacement of the wireless cellular data communication assembly shall be provided within 5 days after receipt of failed wireless cellular data communication assembly at no cost to the State, except the cost of shipping the failed parts. All warranty documentation shall be given to the Engineer at the time of delivering. Replacement parts of the wireless cellular data communication assembly shall be delivered to Caltrans Maintenance Electrical Shop at 175 Cluster Street, San Bernardino, CA. 92408.

Payment
Full compensation for wireless cellular data communication assembly shall be considered as included in the contract lump sum price for Signal And Lighting at various locations and no separate payment will be made therefore.

10-3.27 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT:

Salvaged electrical materials shall be hauled to 2033 East Ramsey Street, Banning, CA 92220 and stockpiled.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum notice of 2 business days shall be given prior to delivery.

10-3.28 DISPOSING OF ELECTRICAL EQUIPMENT:

Fluorescent light ballasts which contain polychlorinated biphenyls (PCBs) shall be disposed of in conformance with the California Department of Toxic Substances Control (DTSC) Regulations set forth in Title 22, Division 4.5, Chapter 42, of the California Code of Regulations.

Ballasts and transformers that contain polychlorinated biphenyl (PCB) are designated as extremely hazardous wastes and fluorescent tubing and mercury lamps are designated as hazardous wastes under Title 22, Division 4.5, Chapter 11, Article 4.1 and Article 5, of the California Code of Regulations.

The State assumes generator responsibility for these wastes. The Engineer will prepare the Hazardous Waste Manifest for Shipment. Ballasts shall be packaged and transported to a hazardous waste disposal facility. The Contractor shall package and transport fluorescent lights to an appropriately permitted facility.

10-3.29 PAYMENT:

The contract lump sum price or prices paid for Signal And Lighting shall include highway lighting at intersections in connection with signals only.

Other roadway lighting on the project shall be considered as included in the contract lump sum price paid for Light And Sign Illumination.

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road
Carlsbad, California 92009

In Reply Refer To:
FWS-ERIV 3282.4

Mr. Gene K. Fong
Division Administrator
U.S. Department of Transportation
Federal Highway Administration
650 Capitol Mall, Suite 4-100
Sacramento, California 95814

SEP 2 3 2004

Re: Programmatic Biological Opinion for Five Interchanges and Associated Arterial Improvement Projects along Interstate 10 and the Tiered Biological Opinion for the Palm Drive/Gene Autry Trail - Interstate 10 Interchange Improvement Project in Eastern Riverside County, California (1-6-04-F-3282.4; EA: 08-455800)

Dear Mr. Fong:

This document transmits the Fish and Wildlife Service's (Service) Programmatic Biological Opinion (Programmatic) for Five Interchanges and Associated Arterial Improvement Projects along Interstate 10 (I-10) and the Tiered Biological Opinion (Opinion) for the Palm Drive/Gene Autry Trail I-10 Interchange Improvement Project located in the Coachella Valley, eastern Riverside County, California, and the effects on the federally threatened Coachella Valley fringe-toed lizard (*Uma inornata*; fringe-toed lizard) and the federally endangered Coachella Valley milk-vetch (*Astragalus lentiginosus* var. *coachellae*; milk-vetch) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Your February 23, 2004, request for formal consultation was received at our office on February 26, 2004.

This Opinion is based on information provided in the January 2004, *Biological Assessment Palm Drive/Gene Autry Trail Interchange Improvements* (Caltrans: BA); the August 2003, *Conservation Bank Plan Addressing the Direct, Indirect, and Cumulative Effects of Interstate 10 Coachella Valley Interchange Projects* (Caltrans 2003a); a site visit on July 2, 2002; and discussions during numerous meetings to develop the Plan and the programmatic conservation strategy.

CONSULTATION HISTORY

During 2002, the Federal Highway Administration (FHWA), California Department of Transportation (Caltrans), California Department of Fish and Game (CDFG) and the Service met numerous times to develop an approach for avoiding, minimizing, and offsetting direct and indirect effects to listed species from improvements to interchanges and their associated arterial streets along I-10 in the Coachella Valley. In addition, Caltrans agreed to include 32.9 acres to the total acreage of the Conservation Bank to offset previous impacts to 30.0 acres for a Palm Drive widening project and 2.9 acres for a Ramon Road improvement project. Accompanying their December 22, 2003, letter, Caltrans issued the final version of the *Conservation Plan Addressing the Direct, Indirect, and Cumulative Effects of Interstate 10 Coachella Valley Interchange Projects* (Plan). The Plan outlines the conservation strategy developed for the Programmatic and subsequent Tiered biological opinions, including a commitment by Caltrans and FHWA to purchase 1795.4 acres of land to augment and build on existing wildlife preserves to ensure the long-term viability of sand dune habitat in the Coachella Valley.

Caltrans requested a species list for the five interchange projects discussed in the Plan in a letter dated November 20, 2003. The Service provided this species list in our December 2, 2003, letter.

In a letter dated February 23, 2004, and received by the Service on February 26, 2004, the Federal Highway Administration (FHWA) requested formal consultation on the fringe-toed lizard and milk-vetch from the direct and indirect effects of the proposed project. In a letter dated March 30, 2004, the Service responded that all information required to initiate formal consultation had been received by the Service.

During Spring 2004, the Service coordinated with CVAG to discuss purchasing the 8,881 acre Cathton Investments, Inc. property. In our letter dated June 4, 2004, we recognized using a portion of the 8,881 acre Cathton Investments, Inc. property for offsetting impacts from four of the five projects addressed by this Opinion including Palm Drive/Gene Autry Trail, Date Palm Drive, Ramon Road/Bob Hope Drive, and Jefferson Avenue interchange improvement projects. Up to 1,100.0 acres could be used for off-setting impacts of the four interchange projects and up to 362.8 acres could be used for offsetting impacts from direct effects of the associated arterial streets.

DESCRIPTION OF THE PROPOSED ACTION

The primary purpose of the proposed action is to improve traffic flow at interchanges along I-10 through the Coachella Valley (Figure 1). This consultation is programmatic because it is intended to cover interrelated projects by establishing conservation measures, including conservation banking protocol, based on avoidance and minimization measures developed to reduce both direct and indirect effects to threatened, endangered, and sensitive species in the action area for each project. At the Programmatic level, this Opinion develops the protocol for covering improvements to five I-10 interchanges and their associated arterial streets up to the

next logical termini. At the project level, this Opinion addresses the I-10 Palm Drive/Gene Autry Trail Interchange Improvement Project.

Programmatic

Caltrans, in cooperation with FHWA, proposes to improve five interchanges and their associated arterial streets along I-10 in eastern Riverside County, California. The five interchange projects include Indian Avenue, Palm Drive/Gene Autry Trail, Date Palm Drive, Ramon Road/Bob Hope Drive, and Jefferson Avenue (Figure 1). The arterial street improvements included at the Programmatic Level of this Opinion begin at the outer limits of each proposed interchange project and extend along each arterial street to the next logical termini (Table 1). For each interchange improvement project and each arterial street improvement project, a tiered biological opinion will be written to describe the project, discuss effects of the project, and provide incidental take.

The Programmatic and Tiered action areas include those areas directly and indirectly affected by the proposed project footprint, and the road effect zone along both sides of interchange improvements and adjacent arterial streets from the freeway interchange to the next logical termini (Table 1). The road effect zone for all projects covered by this Opinion is 360 feet on each side of the roadway. The existing effect distance within the road effect zone is 50% (180 feet) of the width of the road effect zone. The induced traffic increases due to interchange and arterial improvements will increase the effect distance by 50% (an additional 180 feet) resulting in reaching the threshold of the road effect zone. The development of offsetting conservation measures for the road effect zone considered species covered by the proposed Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) including the federally threatened Coachella Valley fringe-toed lizard; federally endangered Coachella Valley milk-vetch and triple-ribbed milk-vetch (*Astragalus tricarinatus*); the Federal candidate Palm Springs round-tailed ground squirrel (*Spermophilus tereticaudus chlorus*); and the sensitive flat tailed horned lizard (*Phrynosoma mcallii*), Palm Springs pocket mouse (*Perognathus longimembris bangsi*), burrowing owl (*Speotyto cunicularia*), LeConte's thrasher (*Toxostoma lecontei*), Coachella Valley giant sand-treader cricket (*Macrobaenetes valgum*), Coachella Valley Jerusalem cricket (*Stenopelmatus cahuilaensis*), and little San Bernardino Mountains linanthus (*Gilia maculata*).

Specific activities for the Programmatic action include geotechnical and archaeological surveys. These two activities may occur prior to consultation on a specific interchange project to provide information necessary for project design.

Geotechnical surveys typically entail drilling a test hole to analyze the subsurface geology and temporarily placing fill material adjacent to the boring activity. Immediately following the geotechnical study at a test pit, the borehole will be covered with the excavated material. Cross-country travel may be required for these activities.

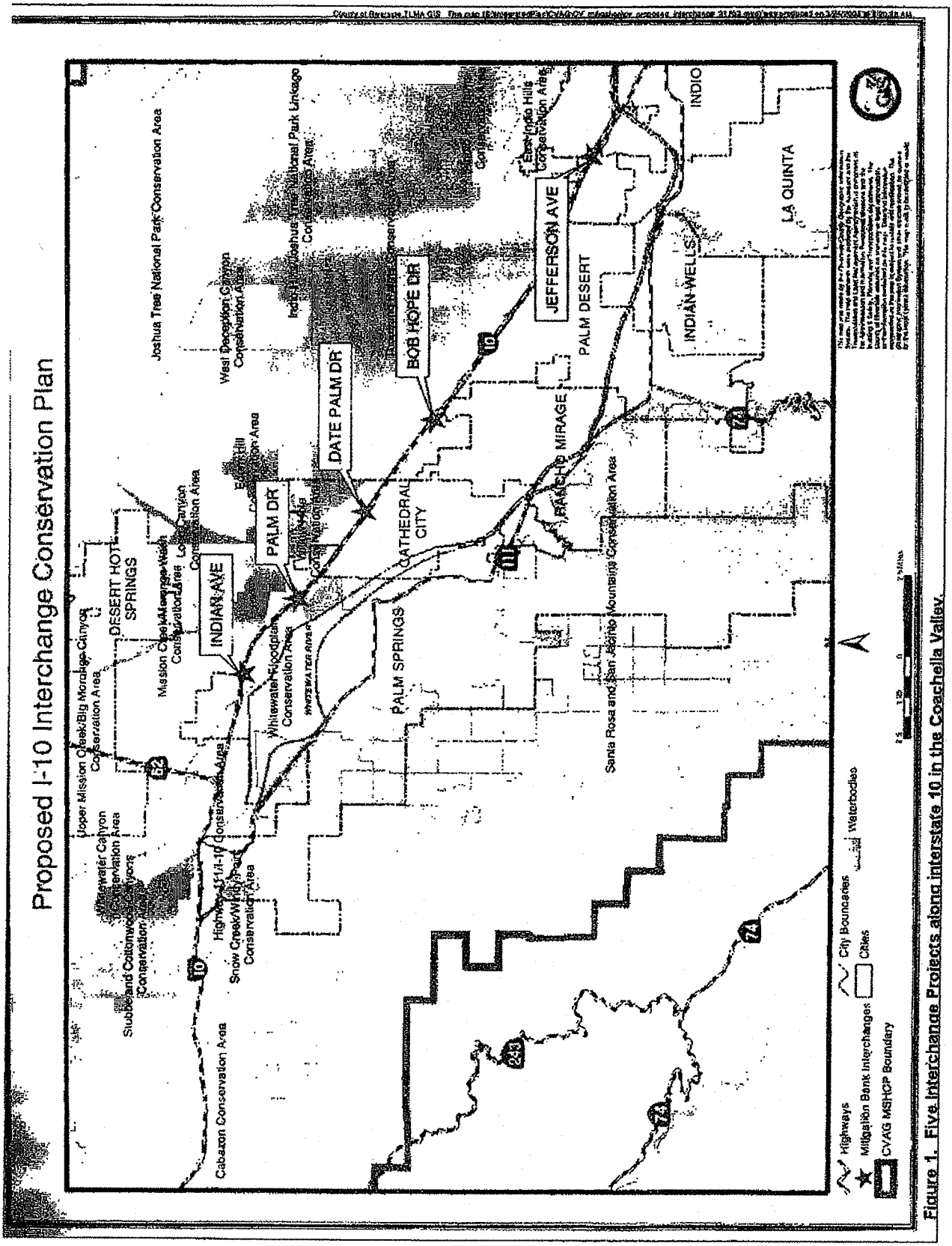

Figure 1. Five Interchange Projects along Interstate 10 in the Coachella Valley

Archaeological surveys will occur for the Jefferson Interchange Project and will likely entail manual excavation of 30x30 cm shovel probes, 1x1 m and 1.2 m test units, and perhaps some 5x5 m shovel scrapes down to 10-20 cm. Archaeological surveys may also entail mechanically excavating 3-4 trenches (24 inches wide) as deep as possible before they cave in. These surveys will include site mapping, photographs and surface collections.

I-10 Palm Drive/Gene Autry Trail Interchange Improvement Project

The project area (Figure 1) is located in the Coachella Valley, eastern Riverside County, California in the City of Palm Springs. The purpose of the proposed project is to relieve traffic congestion at the intersection of the I-10 on-and off-ramps with Palm Drive/Gene Autry Trail; accommodate planned future growth in and around the City of Palm Springs; improve access to developing residential, commercial, and industrial areas in eastern Riverside County; and improve the operational characteristics of the interchange.

Existing Average Daily Traffic (1999 ADT) volumes for this segment of I-10 in the vicinity of the Palm Drive/Gene Autry Trail interchange range between 26,152 and 32,942 vehicles in each direction. The existing peak hourly volumes range from 1,359 vehicles per hour (vph) to 2,175 vph. Projected ADT and peak hourly volumes on I-10 are expected to increase up to 78,120 and 5,430 respectively by the year 2025. Without traffic improvements, the severe congestion at the Palm Drive/Gene Autry Trail interchange will be in excess of roadway capacity, an event referred to as breakdown conditions.

The existing interchange is a diamond configuration constructed in 1968. Existing traffic controls consist of two four-way stop signs posted at the intersection of the on- and off-ramps and Palm Drive/Gene Autry Trail. Riverside County recently improved the two four-way stop signs to signalized intersections. Through the project area, I-10 is eight lanes wide, four in each direction, with no high-occupancy vehicle (HOV) lanes.

The proposed project will reconstruct the interchange at Palm Drive/Gene Autry Trail (Figure 2). The existing overcrossing will be removed and a new overcrossing (bridge) will be constructed to accommodate six lanes. A retaining wall will be required under the bridge. The six lanes will taper to connect with the existing roadway prior to reaching the existing Union Pacific Railroad overhead to the south.

The proposed project will include the following specific improvements:

- realignment of eastbound direct ramps in southeast (on-ramp) and southwest (off-ramp) quadrants,
- realignment of westbound direct ramps in northeast (off-ramp) and northwest (on-ramp) quadrants,
- addition of single-lane eastbound/westbound loop on-ramps in the northeast/southwest quadrants (with grading to accommodate a second future on-ramp lane for HOV access in the northeast/southwest quadrants),

Table 1. Interchange projects and associated arterial streets covered under the Programmatic biological opinion 1-6-03-F-3282.4. Included are approximate acreage impacted from both direct and indirect effects.

Interchange	Arterial	Logical Termini	Direct Effects (acres)	Indirect Effects (acres)
Indian Avenue			29.9	43.8
	Indian Avenue	I-10 to Dillon Road	11.27	35.48
	Indian Avenue	I-10 to San Rafael	29.56	111.76
Palm Drive/Gene Autry Trail			33.2	33.3
	Palm Drive	I-10 to 20th Avenue	7.84	62.23
	Gene Autry Trail	I-10 to Vista Chino	19.81	75.42
	Varner Road	Palm Drive to Mountain View Road	18.02	66.88
Date Palm Drive			27.4	24.2
	Date Palm Drive	I-10 to Varner Road	10.28	39.38
	Date Palm Drive	I-10 to Ramon Road	10.43	55.81
	Varner Road	Mountain View Road to Vista Chino	45.19	167.73
Ramon Road/Bob Hope Drive			71.9	97.2
	Bob Hope	Ramon Road to Dinah Shore Drive	14.35	14.6
	Ramon Road	Los Alamos to Bob Hope	9.92	14.13
	Ramon Road	I-10 to Varner	2.56	0.0
	Ramon Road	Varner to Monterey	1.29	7.89
	Varner Road	Vista Chino to ½ mile before Rio Del Sol	20.85	75.06
	Varner Road	I-10 to midpoint	2.25	3.72
Jefferson Avenue			39.3	14.7
	Jefferson Avenue	I-10 t 40th Avenue	2.2	4.21
Ramon Road *			2.9	
Palm Drive*			30.0	
Total Acreages			**440.42**	**947.5**

* Previous impacts from Caltrans projects along these arterial streets

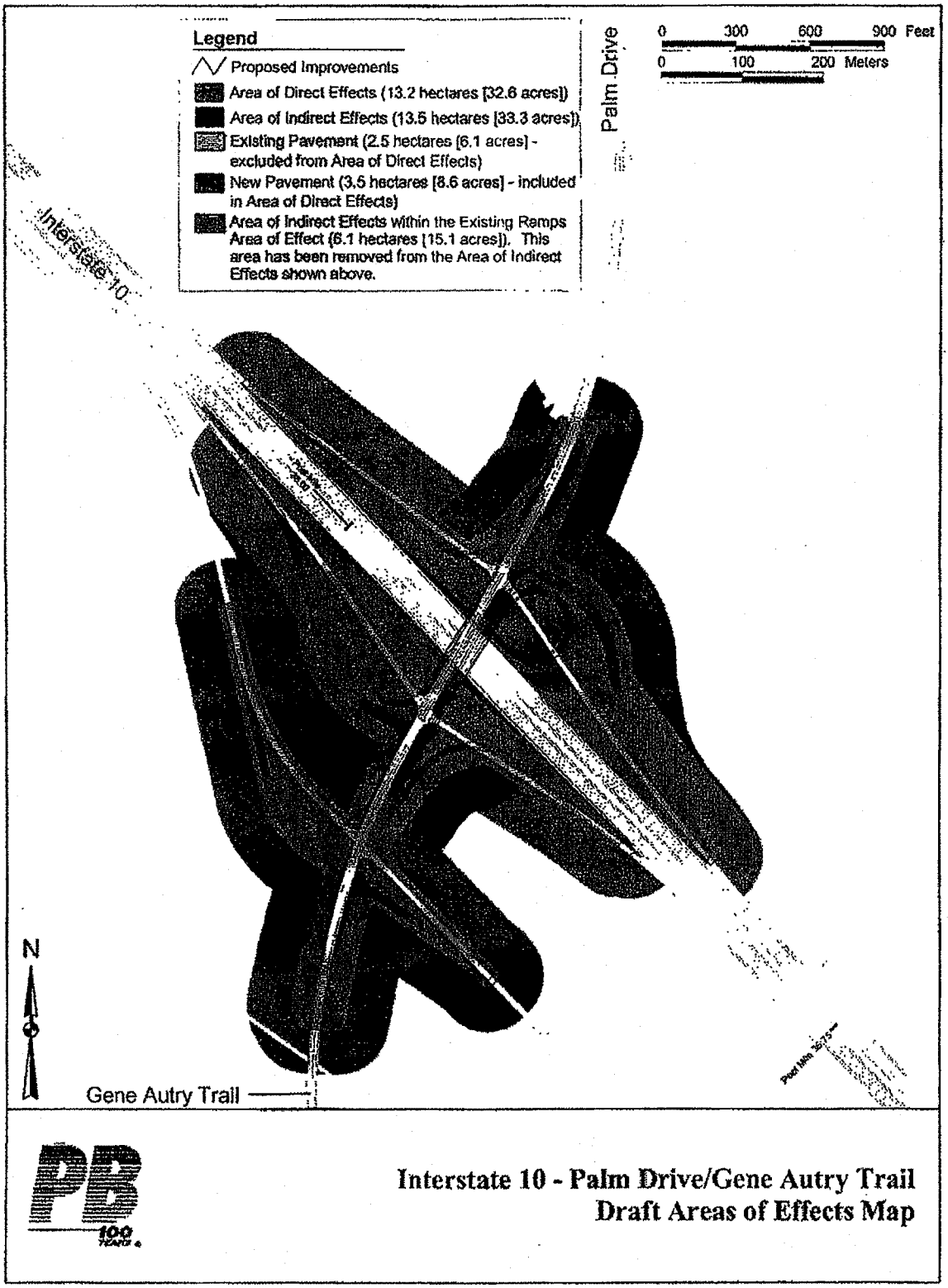

Figure 2. Tiered project within Programmatic.

- addition of pedestrian walkways and a Class II bikeway (striped, no barrier) on both sides of the bridge,
- signalized crosswalks on the eastbound and westbound on- and off-ramps, and
- realignment of the existing Micro Place/Salvia Road so that the intersection with Gene Autry Trail will be farther south.

Additional right-of-way (ROW) will need to be acquired for the improvements in all four quadrants of the interchange, totaling approximately 4.24 acres. The design of the overpass will be constructed with enough horizontal clearance to accommodate the planned widening of I-10 from eight to ten lanes.

The proposed project will directly impact 33.2 acres of desert habitat and indirectly impact 237.83 acres of desert habitat. The proposed project is scheduled for construction in fiscal year 2008 and is anticipated to take approximately 14 months.

Conservation Measures

Programmatic

The following measures will be implemented as part of all interchange and arterial street improvements covered under this Opinion:

1. All areas outside of the project footprint will be delineated as Environmentally Sensitive Areas (ESAs). All parties in conjunction with this operation will strictly avoid these areas. No construction activities, materials, or equipment will be permitted in the ESAs. These areas must be placed on the design plans and included in the construction contract.

   ESAs will be designated by erecting protective fencing delineating the project impact boundary and sensitive habitats. This barrier fencing will be constructed in such a way as to restrict the movement of reptiles into impacted areas. Fencing material can vary; however, it should consist of a cloth-like material that can withstand high winds, sun and heat. This fence should be buried 24-inches below the surface, to prevent terrestrial species from burrowing underneath, and extend above ground at least 24-inches.

2. An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will receive a training/awareness program within two weeks of working on the proposed project. They will be advised of the potential impact to the listed species and the potential penalties for taking such species. At a minimum, the program will include the following topics: occurrence of the listed and sensitive species in the area, their general ecology, sensitivity of the species to human activities, legal protection afforded these species, penalties for violations of Federal and State laws, reporting requirements, and project features designed to reduce the impacts to these species and promote continued successful occupation of the project area environs. Included in this program will be color photos of the listed species, which will be shown to the employees. Following the education program, the photos will be posted in the

contractor and resident engineer's office, where they will remain throughout the duration of the project. The contractor, Resident Engineer, and Service-approved biological monitor will be responsible for ensuring that employees are aware of the listed species.

3. The project proponent will designate a Service-approved qualified biologist who will be responsible for overseeing compliance with protective measures for the listed species. The biologist will have the authority to halt all associated project activities that may be in violation of this biological opinion. In such an event, the biologist will contact the Service within 24 hours.

4. Construction work areas will be delineated and marked clearly in the field prior to habitat removal, and the marked boundaries maintained and clearly visible to personnel on foot and by heavy equipment operators. Employees will strictly limit their activities and vehicles to the proposed project areas, staging areas, and routes of travel. The project proponent and/or the biological monitor will contact the Service to verify that the limits of construction have been properly staked and are readily identifiable.

5. A biologist will monitor construction to ensure that vegetation removal, Best Management Practices (BMPs), ESA fencing, and all avoidance and minimization measures are properly constructed and followed.

6. All equipment maintenance, staging, and dispensing of fuel, oil, or any other such activities, will occur in designated upland areas. The designated upland areas will be located in such a manner as to prevent any runoff from entering waters of the United States, including wetlands.

7. Typical erosion control measures, BMPs, in the vicinity of streams will be employed in accordance with the conditions in the 401 Water Quality Certification requirements of the Regional Water Quality Control Board.

8. Use of invasive exotic plant species in landscaped areas adjacent to or near sensitive vegetation communities will be restricted. In compliance with Executive Order 13112, impacted areas will be revegetated with plant species native to desert habitat types and the Coachella Valley, and will avoid the use of species listed in Lists A & B of the California Exotic Pest Plant Council's list of Exotic Pest Plants of Greatest Ecological Concern in California as of October 1999.

9. The seed of Coachella Valley milk-vetch will be collected off of plants from within the boundaries of permanent and temporary impacts from project construction. Seed collection will occur when the seed is past soft dough and prior to being naturally dispersed. The top four inches of soil surrounding the milk-vetch plants to be impacted will be collected and placed in plastic bags. This seed and soil will be distributed at an area consisting of aeolian habitat immediately following collection. The location where seed will be dispersed will be coordinated with the Service prior to collection.

10. All construction equipment will be inspected and cleaned prior to use in the proposed project footprint to minimize the importation of non-native plant material. All mulch, topsoil and seed mixes used during post construction landscaping activities and erosion control BMPs will be free of invasive plant species propagules. A weed abatement program will be implemented should invasive plant species colonize the area within the project footprint post-construction.

11. No off-road vehicle activity from construction personnel or other persons affiliated with the project will occur outside of the project footprint.

12. To reduce attraction of ravens and crows, which may eat fringe-toed lizards, all trash will be placed in raven-proof containers and promptly removed from the site.

13. No pets or firearms will be permitted inside the project's construction boundaries or other associated work areas.

14. All sand removal and storage activities will be restricted to the project footprint. No maintenance activities will be authorized that extend beyond the boundaries of the project footprint.

15. To the extent possible, no sand removal activities will take place from 1 November - 30 March (to avoid winter dormancy periods for the lizards) or if ambient air temperature exceeds 102 degrees Fahrenheit (the temperature at which lizard activity tends to be reduced).

16. Vehicle speeds on unpaved access roads will be restricted to a maximum of 25 MPH.

17. All culverts, bridges, and associated water passage structures will be maintained such that water and sediment may pass between upstream and downstream locations and so as not to block the passage of wildlife.

18. Impacts resulting from this project will be offset by implementing the agreements established in the *Conservation Bank Plan Addressing the Direct, Indirect, and Cumulative Effects of Interstate 10 Coachella Valley Interchange Projects* (Plan). The Plan assesses potential effects and offsetting measures for the proposed projects. The Plan establishes mitigation ratios at 2:1 for direct impacts of the interchange and associated arterial improvements covered under this Opinion and 1:1 for indirect impacts. Required offsetting measures will be provided through the acquisition of land and the final conservation bank agreement. Caltrans and/or Coachella Valley Association of Governments (CVAG) will set up an endowment fund for the purpose of managing the proposed conservation bank in perpetuity.

19. Prior to beginning construction, CVAG, Caltrans, and FHWA will purchase and establish a conservation bank (Bank), as per the Plan; finalize a conservation bank agreement with the Service and CDFG, and set up the endowment fund for managing the property in

perpetuity. Sufficient land will be purchased for the bank prior to start of construction for any given project. CVAG, Caltrans, and FHWA will coordinate with the Service and CDFG to locate and acquire Bank lands. All Bank lands will be approved by the Service and CDFG prior to purchase to ensure that these conservation lands benefit the fringe-toed lizard and milk-vetch. In addition, CVAG or its designee will be the manager of all Bank lands.

20. Geotechnical borings in areas with aeolian sand deposits will include the following measures:

    a. No cross country-travel and geotechnical borings will take place from 1 November - 30 March (to avoid winter dormancy periods for the lizards) or if ambient air temperature exceeds 102 degrees Fahrenheit (the temperature at which lizard activity tends to be reduced).

    b. When traveling cross-country, a route will be established and followed that avoids, to the maximum extent practicable, all sand hummocks and dunes.

    c. The surface area will be returned to the pre-disturbance state. If sand dunes or hummocks were impacted, then the surface sand will be placed in a separate pile and replaced as a dune or hummock.

21. Archaeological surveys in areas with aeolian sand deposits will include the following measures:

    a. The outer perimeter of all survey areas will be delineated and the area within this perimeter will be calculated and deducted from the Conservation Bank.

    b. All work including staging, depositing excavated materials, storing equipment, etc, will be conducted within the perimeter of the survey area.

I-10 Palm Drive/Gene Autry Trail Interchange Project

The proposed action contains the following measures that will be implemented as part of the proposed I-10 Palm Drive/Gene Autry Trail Interchange Improvement Project:

22. The Project proponent will ensure that conservation measures one through twenty listed above are followed.

23. Direct impacts to 33.2 acres of partially consolidated and unconsolidated blowsand habitats will be offset through the debit of 66.4 acres (a 2:1 replacement ratio) from the Bank. Indirect effects to 237.83 acres of partially consolidated and unconsolidated blowsand habitats will be offset through the debit of 237.83 acres (a 1:1 replacement

ratio) from the Bank. The 304.23 acres will be preserved in perpetuity by the Conservation Bank Manager as established in the conservation bank agreement.

24. The 304.23 acres of aeolian sand habitat will be debited from the Bank prior to the commencement of construction activities associated with the project.

STATUS OF THE SPECIES

Coachella Valley milk-vetch (*Astragalus lentiginosus* var. *coachellae*)

Listing Status

The Service listed the Coachella Valley milk-vetch as endangered on October 6, 1998 (63 FR 53596-53615). Critical habitat for the taxon has not been designated. A recovery plan has not been developed for this species.

Species Description

Astragalus lentiginosus was first described by Sir William Jackson Hooker (1831) based on a specimen collected by David Douglas in the Blue Mountains of Oregon (Kuntz 1891). Rupert C. Barneby (1964) described the Coachella Valley milk-vetch based on a specimen collected in 1913 by Alice Eastwood in Palm Springs, California. The Coachella Valley milk-vetch, a member of the pea family (Fabaceae), is an erect winter annual or short-lived perennial with ascending stems 4-12 inches tall. Short, appressed, white hairs densely cover the leaves, stems, and fruits. The plant has pink-purple flowers arranged in 13 to 25-flowered racemes and strongly inflated two-chambered fruits (Hickman 1996). The Coachella Valley milk-vetch is one of 19 varieties of *A. lentiginosus* found in California (Spellenberg 1993), none of which occur in the same region or habitat types. However, *A. aridus* and *A. crotalariae* may be found within the geographical and ecological range of *A. lentiginosus* var. *coachellae*. Both taxa, in contrast to the Coachella Valley milk-vetch, have fruits with a single chamber.

Distribution

Historical abundance of the taxon in the Coachella Valley is unknown. The California Natural Diversity Data Base (CNDDB) contains records of twenty to twenty-five occurrences within the past decade. Ninety percent of these occurrences were found within 3 miles of I-10 (Barrows 1987) from north of Indio to Cabazon. The Coachella Valley Preserve System protects approximately 20 to 25 percent of the documented plant locations. Approximately 75 to 80 percent of the known Coachella Valley milk-vetch locations are found on unprotected lands. Of these, approximately 7 percent exist on Southern California Edison lands, 7 percent occurs on lands within the Agua Caliente Indian Reservation, and the remainder is situated on other private parcels.

There are six known occurrences of this species in the Desert Center area along Highway 177 (Cornett 1994). Two of these occurrences are on the Bureau of Land Management Desert Lily Preserve, three are on private land, and one within Joshua Tree National Park. Although a recent 1998 California Department of Fish and Game survey confirmed the presence of two significant populations along the southwest border of the Desert Lily Preserve approximately 7 miles from Desert Center, most recorded Coachella Valley milk-vetch populations occur between Cabazon and Indio.

Life History

Coachella Valley milk-vetch is an annual to short lived perennial plant. As an annual, an individual plant grows from seed, blooms, produces new seed (after a flower is pollinated), and then dies all in one year's time (and typically only during the spring–summer growing season). As a short-lived perennial, an individual may bloom and produce seed for a few consecutive seasons and then die. Depending on a given year's conditions, perennial and annual plants can vary in size. Variation in growing conditions can also influence the size and extent of a population of individual standing plants.

The true population of a species of annual or short lived perennial plant generally consists of its seed bank (a reserve of dormant seeds, generally found in the soil). The entire seed bank typically does not germinate in any given year. During any given year, the visible population of standing plants rarely reflects the spatial or numerical extent of the seed bank. The number and location of standing plants in a population can vary annually due to a number of factors, including the amount and timing of rainfall, temperature, and soil conditions. Indeed, there may be no visible evidence of a population for a year or even a span of several years only to return again when local conditions are suitable for seed germination. Additionally, a seed bank may remain viable for years without input of new seeds. For example, seemingly unoccupied habitat for *Holocarpha macradenia* (Santa Cruz tarplant), was found to contain a viable seed bank where standing plants had not been seen in more than 7 years (Bainbridge, *in litt.* 1999).

Habitat Affinities

The Coachella Valley milk-vetch is found on loose wind-blown or alluvial sands on dunes/flats largely within the Coachella Valley of Riverside County, California. Holland (1986) characterized the habitat type as stabilized and partially-stabilized desert sand fields. Species often found in association with the Coachella Valley milk-vetch include, *Larrea tridentata* (creosote bush), *Ambrosia dumosa* (burro-weed), *Psorothamnus emoryi* (indigo bush), *Atriplex canescens* (fourwing saltbush), *Abronia villosa* (sand verbena), *Dicoria canescens* (dicoria), *Achnatherum hymenoides* (Indian ricegrass), *Croton californicus* (croton), *Chamaesyce polycarpa* (sandmat), *Petalonyx thurberi* (sandpaper plant), *Astragalus aridus* (annual desert rattleweed), *A. crotalariae* (Salton milk-vetch), and *Oenothera deltoides* (devil's lantern). Barneby (1964) initially described this taxon as apparently confined to the Coachella Valley.

However, he later identified specimens collected in 1973, from the valley floor near Desert Center [approximately 50 miles to the east], as *A. lentiginosus* var. *coachellae*.

Population Trend

Population sizes of the Coachella Valley milk-vetch vary widely from year to year, depending on environmental conditions, making assessments of total individual numbers difficult. At locations where botanists monitored the Coachella Valley milk-vetch in 1995, densities varied from 1 plant per acre to 24 plants per acre (Sanders and Thomas Olsen Associates 1995). One of the largest known remaining sites for this taxon occurs in the north, near Snow Creek Road. In 1995, this area supported about 24 plants per acre, the greatest densities of Coachella Valley milk-vetch found during the 1995 surveys (Barrows 1987, Sanders and Thomas Olsen Associates 1995).

Threats

The primary threat to the Coachella Valley milk-vetch is habitat destruction due to extensive development within the Coachella Valley. The elimination of habitat began with the introduction of agriculture over a century ago, but urbanization has accelerated greatly in the past 40 years. Significant dune habitats that once occurred along the southwestern edge of the Coachella Valley, along the base of the Santa Rosa Mountains, now support five cities (Barrows 1987). Increased urbanization has reduced available habitat through direct conversion of land and alterations in the sand transport system responsible for the creation/maintenance of sandy habitats (Barrows 1987). As habitat becomes increasingly fragmented by urban development, remaining populations become more vulnerable to adverse effects of vehicular activities, roadside maintenance, or subsequent paving/landscaping and accompanying weed invasions. Fragmentation increases the potential for stochastic events that detrimentally affect long-term survival probability. Similarly, fragmentation decreases the species' resilience to rebound from such events.

Coachella Valley fringe-toed lizard (*Uma inornata*)

Listing Status

In 1980, the State and Federal (45 FR 63812-63820) governments listed the Coachella Valley fringe-toed lizard as an endangered and threatened species, respectively; critical habitat also was designated (*ibid.*). The species was listed due to the destruction/degradation of suitable habitat converted for agricultural and developmental purposes (The Nature Conservancy (TNC) 1985). In 1980, the Federal government designated critical habitat for the fringe-toed lizard as part of the final rule listing the fringe-toed lizard. In 1984, the Service published a recovery plan (Service 1984) for the fringe-toed lizard. In 1986, the Service approved a Habitat Conservation Plan (HCP) for the fringe-toed lizard that was signed by the County of Riverside, the nine cities of the Coachella Valley and the Service.

Species Description

The Coachella Valley fringe-toed lizard is a medium sized lizard that averages approximately 5.9 inches to 9.4 inches in total length. Adult males range from approximately 2.8 inches to 4.8 inches in snout-vent length and adult females range from about 2.6 inches to 3.9 inches. Tails comprise between 49 and 64 percent of total length of adult lizards. Dorsal color of the fringe-toed lizard is whitish to pale gray with a pattern of ocelli (eyelike markings) formed by dark markings on the pale background. The ocelli form a pattern of longitudinal stripes over the shoulders. The ventral surface is white. One or several black dots may be present on each side of the abdomen and dusky lines are present on the throat. The fringe-toed lizard has three internasal scales and less than 29 femoral pores (Norris 1958, Stebbins 1954, Mayhew 1965, and Pough 1973).

The numerous morphological adaptations that protect the lizard's body from abrasion, exclude sand particles from body openings, and allow the lizard to move about in an unstable environment include (Stebbins 1943, 1944, and Norris 1958): (1) nostrils that exclude sand; (2) U-shaped nasal passages that trap sand particles; (3) a wedge-shaped snout that allows passage through the sand; (4) an elongated upper jaw that overlaps the lower jaw, allowing the lizard to dive into sand without filling its mouth; (5) fringed eyelids with a double seal to exclude sand; (6) flaps of skin that cover the ears when under sand; (7) smooth scales to reduce friction; and (8) elongated, fringed toes that increase foot surface area and traction for running over and swimming through sand.

The fringe-toed lizard has the ability to run across the sand at relatively high speeds and literally dive into it. Fringe-toed lizards may move short distances after burial, engaging in what has been called "sand-swimming" until the lizard is completely buried (Stebbins 1944, Norris 1958).

Distribution

A.S. England (1983) calculated that the fringe-toed lizard occupied approximately 200 square miles of aeolian habitat in the Coachella Valley prior to significant agricultural development at the beginning of this century. At the time of England's analysis, nearly all natural habitat in the southern quarter of the valley had been converted to agricultural and associated urban uses. Based on England's analysis, the historical distribution of the fringe-toed lizard included approximately 144 square miles of suitable habitat west of the Coachella Canal and 56 square miles east of the canal. Suitable habitat in both areas is rapidly declining. By August 1979, only 10 square miles of undeveloped and fragmented habitat remained east of the canal. Because of the small size, isolation, and high development potential, these fragmented habitat patches are not considered adequate for the long-term survival of fringe-toed lizard populations (Service 1984).

Undeveloped fringe-toed lizard habitat west of the Coachella Canal also has declined sharply. The original 144 square miles of habitat were reduced to 122 square miles by 1955, to 101 square

miles by August 1978, and to 94.8 miles by December 1982 (England 1983). Portions of the remaining fringe-toed lizard habitat may only support very limited populations. The 1984 estimate of occupiable habitat throughout the range of the fringe-toed lizard is 127 square miles (Coachella Valley Fringe-toed Lizard Conservation Land Steering Committee 1984).

Since listing, the major local jurisdictions in the Coachella Valley, in coordination with the Service, Bureau of Land Management, and California Department of Fish and Game, have developed and implemented the Coachella Valley Fringe-toed Lizard Habitat Conservation Plan (HCP), which established a reserve system for conservation of this species. The HCP, approved by the Service in April 1986 under section 10(a)(1)(B) of the Act, established conditions under which local jurisdictions could approve development in aeolian sand habitats outside the boundaries of the reserve system (TNC 1985). Upon payment of a mitigation fee, the HCP permitted private development. The HCP established the mitigation fee to fund acquisition and management of the reserve system.

The reserve system created by the HCP established three separate preserves that collectively protect 26 square miles (mi^2) of land containing 12.25 mi^2 of occupiable blowsand habitat. The three reserves are the Whitewater River Preserve (1.9 mi^2), Willow Hole Preserve (2.2 mi^2), and the Thousand Palms Preserve (8.1 mi^2). Some researchers believed that the Whitewater River Preserve has a sustainable aeolian sand source as long as there are periodic flood flows within the Whitewater River (Meek and Wasklewicz 1993). Griffiths *et al.* (2002) were more tentative. They believed the hydrologic effects of the percolation ponds upstream could adversely affect the sediment deposition from the Whitewater and San Gorgonio Rivers. Regardless, the biological value of this reserve requires protecting the integrity of the Whitewater River hydrologic and sediment delivery system.

The Willow Hole Preserve appears to receive sand from the Morongo and Mission Creek washes west of the Indio Hills (Weaver 1981, Meek and Wasklewicz 1993). There is no substantial evidence of recent aeolian activity northwest of the Willow Hole Preserve, and this suggests these deposits may have slowly accumulated over thousands of years (Meek and Wasklewicz 1993). The present immobility of sands, anchoring of sand by mesquite, and protection of deposits from wind within valleys suggest sands in this area could remain indefinitely (Meek and Wasklewicz 1993). Strong winds transport fluvial sediment from the Mission-Morongo depositional plain to Willow Hole and Edom Hill (Griffiths *et al. 2002).* In addition, intense summer thunderstorms recycle these aeolian deposits on Edom Hill into Willow Hole. However, lowering the groundwater table through pumping could result in the dieback of mesquite that anchor the dunes on the Preserve, which would render dunes vulnerable to erosion (Meek and Wasklewicz 1993).

The Thousand Palms Preserve is located north of I-10 and Bermuda Dunes. The Thousand Palms Preserve's primary sand source is considered to be a series of relatively small canyons in the Indio Hills west of Thousand Palms Canyon (Simons, Li and Associates 1997). The Thousand Palms Canyon Watershed was identified as a secondary sand source for the Preserve. The

Thousand Palms' dunes are moving towards the southeast and consist of largely unvegetated active dunes surrounded by a creosote bush and saltbush dune hummocks area where aeolian activity varies from year to year. This site is the driest and hottest of the three preserves and has the lowest perennial plant species richness and abundance (Center for Natural Lands Management (CLNM) 2000).

Habitat Affinities

The Coachella Valley fringe-toed lizard is endemic to fine, wind-blown sand habitat in the Coachella Valley and is restricted to sandy plains, mesquite dunes, and sand hummocks (45 FR 63818). According to Norris (1958), sandy plains are a featureless, nearly level plain covered with a variable thickness of mixed silt and sand. Deposits on sand plains typically result from the winnowing of fine sand from adjacent sand accumulation. Norris (1958) describes a variety of dune systems throughout the range of *Uma* species. The few remaining mesquite dunes in the Coachella Valley are found along and above the San Andreas Fault. The San Andreas Fault acts as a spring that channels ground water up towards the surface.

Sand hummocks or accretion dunes are an accumulation of sand in piles within and around bushes (Norris 1958). Sand hummocks typically form in the periphery to large deposits of sand. In the Coachella Valley, where the wind direction is constant, the accumulated sand deposits are oriented with regard to the wind source. The windward slope is composed of coarse sand and is usually truncated close to the base of the bush, while the leeward side, favored for basking by fringe-toed lizards, possesses a long stringer of fine sand. The greatest height of such an accumulation is usually within the bush. When sand accumulates around large bushes such as mesquites and desert willows, accretion dunes may reach heights of 30 feet or more. Sand hummocks are the most common type of blow-sand deposits in the Coachella Valley comprising about 80 percent of fringe-toed lizard habitat (England and Nelson 1976).

Critical Habitat

Critical habitat for fringe-toed lizards includes approximated 12,000 acres (18.5 square miles) of Federal, State, local, and private lands in eastern Riverside County the majority of which is in private ownership (45 FR 63812-63820). Primary constituent elements for fringe-toed lizards are those habitat components that are essential for the primary biological needs of foraging, nesting, rearing of young, intra-specific interactions, dispersal, genetic exchange, or sheltering. Primary constituent elements are provided in undeveloped areas where sandy plains, sand hummocks and mesquite dunes exist.

The approximate 12,000 acres designated as critical habitat include both the areas of highest lizard concentration and a source of blow sand (45 FR 63812-63820). Designated critical habitat encompasses suitable habitat on the Coachella Valley Preserve and unsuitable lands that are the sand source in the Thousand Palms Canyon watershed and canyons/alluvial fans along the southern flank of the western Indio Hills. These unsuitable areas generate source material blow-

sand habitats downstream and downwind. Absent an adequate sand supply, the strong, unidirectional winds erode and deplete sand accumulations. Researchers originally thought Thousand Palms Canyon and western Indio Hills contribute equally to accretion of wind-blown sand on the preserve; however, further investigation (Lancaster *et al.* 1993, Meek and Wasklewicz 1993, and Simons, Li and Assoc. 1997) found that the western Indio Hills contributed most of the sand. These studies concluded Thousand Palms Canyon was only a minor contributor of blow-sands to the Preserve.

Life History

The fringe-toed lizard is primarily insectivorous, but will take plant material (Stebbins 1944, Smith 1946, Mayhew 1965). Captive fringe-toed lizards have been observed eating insects, juveniles of their own and other lizard species, leaves, and flower parts (Carpenter 1963)

Reproductive activity starts in the spring (typically late April), shortly after adults emerge from winter dormancy, and extends through mid-August (Mayhew 1965). Location and timing of egg-laying has not been observed in the wild, but multiple clutches may be laid in one year (Mayhew 1965). Hatchling fringe-toed lizards have been observed from late August through the fall (Stebbins 1954, Mayhew 1965). A few precocial fringe-toed lizards may breed the summer after the year they hatch, but most do not reach sexual maturity until the second summer (Mayhew 1965).

The fringe-toed lizard hibernates below ground, between November and February/March, when the daytime temperatures are predominantly below its activity range of body temperature (TNC 1985). Turner *et al.* (1981) found fringe-toed lizards to be active when ambient temperatures were 22-39° C, and ground surface temperatures were 37-58°C. During the hottest times of the year, when the surface temperatures may reach or exceed the lethal limit for the species, fringe-toed lizards become increasingly crepuscular. Periods of inactivity are spent below the surface where cooler temperatures prevail.

Population Trend

The fringe-toed lizard was considered common throughout the Coachella Valley prior to major land conversions in the 1920's. Since then, the population of fringe-toed lizards has declined due loss of habitat, habitat fragmentation, lizard collecting, and many other human activities. The Coachella Valley continues to grow at rapid rate, further destroying and fragmenting the remaining areas of suitable habitat. Since 1999, drought conditions have reduced available forage for fringe-toed lizards which has affected reproductive success and population densities.

Researchers currently know little about fringe-toed lizard populations outside the reserve system described above, other than blow-sand habitats continue to decline in association with conversion to agricultural and developed lands. Early population studies suggested that population densities of fringe-toed lizards can vary widely. Important habitat features, such as sand compaction and

patch size, likely influence densities (Turner *et al.* 1981, 1984; Barrows 1997). Turner *et al.* (1981) estimated the density of fringe-toed lizards in seven study plots to range from 1.8 to 18.2 lizards per acre. Monitoring efforts have documented fluctuations in population numbers that appear related to availability of resources, such as food and loose sand (Barrows 1996).

Threats

The loss, fragmentation, and adverse modification of aeolian sand systems are the principal reasons for the fringe-toed lizard's federally threatened status (45 FR 63812-63820). In addition, numerous natural and human activities continue to threaten the lizard including (CNLM 2000): (1) the lack of protection of sand sources and sand transport corridors to any of the three preserves; (2) sand loss, due to natural down wind movement combined with the prolonged period of time between large storm events that replenish sand sources; (3) exotic plant species such as wild mustard (*Brassica tournefortii*) and Mediterranean grass (*Schizmus barbatus*) that colonize and stabilize active dune systems; (4) off road vehicle trespass on dunes; (5) tamarisk in riparian ecosystems and along windrows; and (6) increased automobile traffic along roads that are adjacent to or fragment blow-sand habitat.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress.

Programmatic

The interchange and arterial street improvement projects discussed in the project description above span the range of the species listed in the Plan. All interchanges occur within the range of the milk-vetch and the fringe-toed lizard.

Approval of the Coachella Valley fringe-toed lizard HCP by the Service anticipated incidental take of fringe-toed lizards in association with development outside the reserve system boundaries in accordance with the general plan and zoning designations of local jurisdictions. Though past and future habitat losses consistent with the HCP are appropriately considered as part of the environmental baseline for the fringe-toed lizard, they are not for the Coachella Valley milk-vetch, whose conservation needs were not addressed in the HCP. Additionally, the Coachella Valley milk-vetch occurs outside the Coachella Valley, on the Desert Lily Preserve. The designation of this Bureau of Land Management parcel as an Area of Critical Environmental Concern offers protection to this population.

Modeled habitat for the milk-vetch and fringe-toed lizard occurs throughout the aeolian sand habitat from west of the Indian Avenue Interchange through the Coachella Valley to east of the Jefferson Road Interchange. Within the modeled habitat are historic occurrences of both species. Many of the historic occurrences have been permanently displaced and/or lost to habitat destruction from the construction of windmills, aquifer recharge facilities, railroad projects, infrastructure improvements, and residential and commercial development. Some of these developments have permanently impacted the sand source areas for sand hummocks currently occupied by the milk-vetch and fringe-toed lizard. The disconnection with sand source areas could eventually lead to degradation of sand hummocks further impacting suitable occupied habitat.

The current distribution of fringe-toed lizards along the I-10 corridor through the Coachella Valley is unknown at this time. The development of a multi-species HCP for the jurisdictions comprising the CVAG and the Agua Caliente Indian Tribe includes a preserve design to protect the fringe-toed lizard. This Programmatic Opinion is part of a coordinated effort with CVAG to develop a long-term conservation strategy for the fringe-toed lizard. The aeolian sand habitat along the five interchanges and their associated arterial streets is in various states of habitat suitability, including high quality active sand dunes south of the Bob Hope Drive/Ramon Road Interchange, stabilized desert scrub, and creosote hummock communities partially stabilized by exotic plants or the lack of recent sand transport. The use of the stabilizing creosote hummock communities by fringe-toed lizards is largely unknown. The population of lizards on the stabilizing creosote hummock communities is likely to be lower than in active blowsand areas. Due to fragmentation, drought, and degradation of habitat, portions of the remaining fringe-toed lizard habitat may only support very limited populations.

At the Palm Drive/Gene Autry Trail Project, no fringe-toed lizards were detected and a few individual milk-vetch plants were found in various locations within the proposed project footprint (Caltrans 2004). During focused surveys for the Date Palm Drive Project, the Chambers Group detected small groups of milk-vetch distributed throughout the project footprint with suitable habitat existing on all unpaved areas of the proposed project site (Parsons Brinckerhoff, Quade & Douglas 2002). During the same survey season, the Chambers Group detected no fringe-toed lizards within the project area. Focused surveys at the Ramon Road/Bob Hope project detected both fringe-toed lizards and milk-vetch within and adjacent to the project area (Caltrans 2003b, Michael Brandman Associates 2001). The aeolian sand system on the north and south sides of the I-10 and west of the interchange are high quality habitat for fringe-toed lizards and milk-vetch. A small number of fringe-toed lizards likely occupy and move through the proposed project footprint. Numerous milkvetch occur within and adjacent to the proposed project footprint. Focused surveys at the Indian Avenue project did not detect milk-vetch (LSA Associates 2001). No fringe-toed lizard surveys were conducted at Indian Avenue. Fringe-toed lizards and milk-vetch are known to occur along Indian Canyon Drive, south of the interchange, and within the Whitewater River Preserve. Though no focused surveys were conducted for the fringe-toed lizard or milk-vetch at the Jefferson Avenue Project, this area may

support low numbers of few fringe-toed lizards and milk-vetch based on the presence of suitable soils with degraded habitat conditions.

Urbanization and agricultural development in the Coachella Valley have significantly impacted the blowsand ecosystem. Development has occurred directly on sand fields and in the wind corridor, thereby partially blocking the aeolian transport of sand to the area south of the I-10 corridor. Development has also led to a reduction in groundwater, which in turn has reduced the vegetative communities, such as mesquite, that causes the blowsand to settle in specific regions. As the Coachella Valley continues to urbanize, an increasing concern as to whether or not the blowsand system is adequately protected has contributed to the impetus to complete a multi-species Habitat Conservation Plan for the Valley.

Recent Caltrans projects have impacted desert scrub habitat at Ramon Road and Palm Drive. The Ramon Road project impacted 2.9 acres of aeolian sand fields and the Palm Drive project impacted 30.0 acres of desert scrub.

I-10 Palm Drive/Gene Autry Trail Interchange Project

The action area for the proposed project is dominated by Sonoran Creosote Bush Scrub and active/partially stabilized aeolian sand habitat. The action area of the proposed project includes historical and currently occupied habitat of the Coachella Valley milk-vetch. Surveys conducted during 2000, and 2001, detected Coachella Valley milk-vetch within the ROW for I-10 and Palm Drive. Specific locations include the area within the westbound onramp and the westbound freeway, along I-10 immediately east of the existing westbound offramp, in a planter in the Arco parking area along the western boundary of Palm Drive in the northernmost part of the project site, and along the western boundary of Palm Drive south of the Arco station.

The action area of the proposed project includes historically occupied habitat for the Coachella Valley fringe-toed lizard. Although Coachella Valley fringe-toed lizards were only detected during focused surveys near the Ramon Road/Bob Hope interchange in 2000 and 2001, it is likely that fringe-toed lizards utilize some of the habitat within the action area for the remaining projects. The action area for the proposed project includes partially fragmented blocks of poor to high quality habitat surrounded by roads, the railroad, and urban development. The high mobility of the fringe-toed lizard combined with low to high quality habitat suggest that the fringe-toed lizard inhabits sand hummock habitat in the action area. A small number of milk-vetch were detected within the project footprint. Drought conditions over the last five years has likely reduced the gemination rate and establishment of this species. The distribution in the seed bank in unknown.

EFFECTS OF THE ACTION

Programmatic

At the Programmatic Level, the effects of the action include the construction of road improvements at the five interchange projects and the associated arterial streets to their logical termini. These projects are all designed to reduce congestion and improve traffic flow along the I-10 corridor from the City of Palm Springs to the City of Indio. Each of these interchange and adjacent arterial street projects were grouped together during the development of the Plan. These interchange and arterial street improvement projects are to be constructed in the next three to twelve years depending on the availability of funding.

Direct Effects

Direct effects from the interchange and arterial street improvement projects include both temporary and permanent impacts (Table 1). Temporary and permanent impacts include clearing and grading sand hummocks, and constructing the road bed and overlying street surfaces. Direct effects encompass 407.52 acres of area associated with project footprints. Once graded, permanent impacts would result from the construction of the roadway. Temporary impacts will occur in a 25-foot wide area adjacent and parallel to the toe of slope of the newly constructed road-bed. The 407.52 acres of habitat varies in quality for supporting the fringe-toed lizard. The highest quality habitat encompasses a portion of the total area to be impacted. The majority of habitat to be impacted by all projects addressed by this Opinion consists of creosote hummock communities with *Schizmus* ssp. and other exotic plants partially stabilizing the sand hummocks. In the majority of the areas to be impacted, the habitat for fringe-toed lizards is sub-optimal, therefore, the expected distribution of fringe-toed lizards is likely lower than 1.8 to 18 lizards per acre predicted for high quality habitat (Turner *et al.* 1981) and probably varies from less than one to up to five lizards per acre. Based on the degraded nature of the habitat in areas to be impacted by the five interchange projects and the associated arterial streets, there is the potential that ten to one-hundred milk-vetch and between 50 and 2,400 fringe-toed lizards could be adversely affected by construction activities. Due to drought conditions and the lack of detection of fringe-toed lizards at each of the proposed project locations (except Ramon Road/Bob Hope Interchange), a small, but unknown number of fringe toed lizards could be adversely affected by project construction. To reduce impacts to less than one-hundred individual milk-vetch plants and the associated seed bank, and a small but unknown number of fringe-toed lizards, conservation measures 1 through 21 of this Opinion would be implemented. Direct effects from fugitive dust, offroad vehicle activity, and human caused disturbances to adjacent occupied habitat would be avoided by implementing conservation measures 1-21 of this Opinion.

Indirect Effects

The road effect zone (Forman *et al.* 1997, 2000) is the area from the road edge to the outer limit within which road traffic has significant ecological effects on wildlife. The width of the effect distance of the road effect zone is based on traffic intensity, whether the road is a two lane or greater roadway, the species present along the roadway, and a variety of ecological variables. Changes in traffic intensity can alter the effect distance along roads within the road effect zone. For each species, there is a threshold where the effect distance and the road effect zone are the same.

During the development of the Plan, the working group (FHWA, Caltrans, CDFG, the Service) established a threshold width for the road effect zone of 360 feet on each side of the roadway where habitat exists. The 360-foot distance is based on a home range of 418,284 square feet (Brodie *et al.* 1999) for the flat-tailed horned lizard (*Phrynosoma mcallii*). The diameter of a circular home range for the flat-tailed horned lizard is 360 feet. Since there are insufficient data on home ranges for the fringe-toed lizard and the fringe-toed is faster and has a more active habits than the flat-tailed horned lizard, the working group determined that the home range for the fringe-toed lizard would be at least as large as the home range for the flat-tailed horned lizard. Using a circular home range with a diameter of 360 feet, the working group agreed that under existing conditions, 50 percent of lizards with a home range that overlaps the adjacent roadway would be directly killed by automotive traffic. For threshold traffic intensity, the working group assumed that all lizards having a home range that overlaps the adjacent roadway will be directly killed by automotive traffic.

Since existing traffic intensity is leading to direct mortality of 50 percent of lizards inhabiting the habitat adjacent to the roadway, the effect distance for current conditions is 180 feet from the road edge. Traffic intensity resulting from construction of the five interchanges and their associated arterial streets would increase this distance to 360 feet for a change of 180 feet. This 180-foot change in the effect distance is considered the width of indirect effects to fringe-toed lizards and the other fauna listed in the Plan. Multiplying this width by the length of the road improvement projects results in indirect effects to 947.5 acres. Since habitat to be impacted varies between high quality aeolian sand habitat and stabilizing creosote hummocks, the expected distribution of fringe-toed lizards is likely lower than 1.8 to 18 lizards per acre predicted for high quality habitat (Turner *et al.* 1981) and could vary from less than one to up to five lizards per acre. Due to drought conditions and the lack of detection of fringe-toed lizards at each of the proposed project locations, a small, but unknown number of fringe toed lizards could be adversely affected by project construction. To reduce impacts to a small but unknown number of fringe-toed lizards, conservation measures 8, 10, 11, 12, and 18 through 21 of this Opinion would be implemented.

Habitat fragmentation would also occur due to the implementation of the proposed improvement projects. Constructing new roads and widening existing road corridors without installing undercrossings for sand transport and species dispersal would result in the loss of connectivity

between large expanses of habitat including sand source areas. In particular, widening of arterial streets at Indian Avenue, Gene Autry Trail, Palm Drive, and Varner Road between Palm Drive and Date Palm Drive should have underpass systems installed to allow for species dispersal between the fringe-toed lizard HCP reserves, and the proposed CVMSHCP reserve design. Accordingly, CVAG's proposed MSHCP is designed to provide wildlife movement underpasses across all of these arterial streets.

I-10 Palm Drive/Gene Autry Trail Interchange Improvement Project

Direct Effects

Direct effects to 33.2 acres of stabilizing Sonoran Creosote Bush Scrub and aeolian sand habitat occupied by the milk-vetch and fringe-toed lizard would occur from the construction of the proposed project, including temporary and permanent impacts. The loss of 33.2 acres of occupied Sonoran Creosote Bush Scrub and aeolian sand habitat would harm those fringe-toed lizards occupying the area of temporary and permanent impacts and result in the loss of all milk-vetch individuals and the associated milk-vetch seedbank. Based on the drought conditions and the lack of detection of fringe-toed lizards at the project site, the project has the potential to directly affect a small but unknown number of-toed lizards. Direct effects to milk-vetch can range from a few individuals to several hundred individuals depending on the seed bank expression during the rainy season. Direct effects to milk-vetch would be minimized by collecting seed and the underlying soil from those plants found within the project footprint and distributing this seed within preserved aeolian sand habitat. Direct effects to fringe-toed lizards and milk-vetch would be offset by implementing conservation measures 1 through 20 and 22 through 24 listed above and preserving lands necessary for maintaining aeolian sand systems, as proposed by the Plan.

Indirect Effects

Indirect effects to 237.8 acres of stabilizing Sonoran Creosote Bush Scrub and aeolian sand habitat occupied by a small but unknown number of fringe-toed lizards would occur due to habitat fragmentation and the effect of road mortality caused by increased traffic intensity from the improved interchange at I-10 and Palm Drive/Gene Autry Trail. For the proposed project, the effect distance would be 180 feet for existing roads. Indirect effects to 33.3 acres would occur within the road effect zone of the interchange project. Indirect effects would occur in the remaining 180 feet of the road effect zone along the adjacent arterial streets as follows: (1) 62.2 acres on Palm Drive from I-10 to 20th Avenue; (2) 75.4 acres on Gene Autry Trail from I-10 to Vista Chino; and (3) 66.9 acres on Varner Road from Palm Drive to Mountain View Road. Indirect effects to fringe-toed lizards and milk-vetch would be offset by implementing conservation measures 8, 10, 11, 12, 18 through 20, and 22 through 24 listed above and preserving lands necessary for maintaining aeolian sand systems, as proposed by the Plan.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Future development on private land is likely to continue along the I-10 corridor throughout the Coachella Valley. This development will result in further fragmentation and obstruction or alteration of sand transport. Furthermore, based on projections for an increasing population in the Coachella Valley, development within the sand sources and corridors in the nearby designated critical habitat and proposed CVMSHCP preserves will increase and suitable habitat will decrease. Proposed land acquisition in the Plan to offset habitat loss from the proposed projects would further efforts to protect designated critical habitat and preserves.

Cities in the Coachella Valley are working together under the guidance of the CVAG to develop the CVMSHCP. The Agua Caliente Band of Cahuilla Indians also is developing an HCP for the area around the project. Within both HCPs are conservation strategies designed to protect the milk-vetch and fringe-toed lizard.

CONCLUSION

After reviewing the current status of the Coachella Valley milk-vetch and the Coachella Valley fringe-toed lizard, environmental baseline for the action area, effects of the proposed project, and cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the Coachella Valley milk-vetch and the Coachella Valley fringe-toed lizard. Though critical habitat has been designated for the fringe-toed lizard, critical habitat has not been designated within the action area, therefore, none would be adversely affected by the proposed project.

Programmatic

This conclusion is based on the following reasons:

1. The loss of 407.5 acres of suitable habitat for hundreds of milk-vetch, a small but unknown number of fringe-toed lizards, and the other species covered by the Plan from direct effects would be offset by acquiring 815.0 acres of land in an area deemed essential for the long term sustainability of the designed preserve system in the Coachella Valley.

2. The loss of a small but unknown number of fringe-toed lizards and numerous organisms of the species covered by the Plan that occupy 947.5 acres of suitable habitat adjacent to the project footprint and associated arterial streets from indirect effects would be offset by

acquiring 947.5 acres of land in an area deemed essential for the long term sustainability of the designed preserve system in the Coachella Valley.

3. All lands acquired to offset direct and indirect effects to the milk-vetch, fringe-toed lizard, and other species covered by the Plan would be preserved in perpetuity and managed for the recovery of the milk-vetch, fringe-toed lizard and other species covered by the Plan.

I-10 Palm Drive/Gene Autry Trail Interchange Improvement Project

This conclusion is based on the following reasons:

1. The loss of a few to tens of milk-vetch and a small but unknown number of fringe-toed lizards that occupy 33.2 acres of sand hummocks would be offset by acquiring 66.4 acres of land in an area deemed essential for the long term sustainability of the designed preserve system in the Coachella Valley.

2. The loss of a small but unknown number of fringe-toed lizards occupying 237.8 acres of sand hummocks adjacent to the project footprint and associated arterial streets would be offset by acquiring 237.8 acres of land in an area deemed essential for the long term sustainability of the designed preserve system in the Coachella Valley.

3. All lands acquired to offset direct and indirect effects to the milk-vetch and fringe-toed lizard would be preserved in perpetuity and managed for the recovery of the milk-vetch and fringe-toed lizard.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The following incidental take authorization pertains to the I-10 Palm Drive/Gene Autry Trail Interchange Improvement Project only. The measures described below are non-discretionary and must be implemented by FHWA, the project proponents, and the contractors so that they become binding conditions of any grant, contract, or permit issued to the applicant, as appropriate, for the exemption of section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity that is covered by this incidental take statement. If FHWA (1) fails to require the project proponent to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

The Service anticipates the following levels of take for the Coachella Valley fringe-toed lizard could occur as a result of constructing and operating the proposed I-10 Palm Drive/Gene Autry Trail Interchange Improvement Project:

1. A small but unknown number of fringe-toed lizards that utilize the 33.2 acres of stabilizing Sonoran Creosote Bush Scrub and aeolian habitat that would be temporarily and permanently impacted by the interchange project.

2. A small but unknown number of fringe-toed lizards that utilize the 360-foot road effect zone along the interchange and adjacent arterial streets to the next logical termini as described in Table 1.

Reasonable and Prudent Measures

The Service believes the following Reasonable and Prudent Measure is necessary and appropriate to minimize take of Coachella Valley fringe-toed lizards:

Caltrans and FHWA shall ensure that construction activities, and anthropogenic disturbances to listed species and their habitats are avoided and/or minimized.

Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, FHWA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary and shall be incorporated as binding requirements into all applicable funding agreements, contracts, and permits..

Caltrans shall implement the above reasonable and prudent measure through the following terms and conditions:

1 Caltrans shall ensure that all construction activities occur within the designated project footprint and that all adjacent native habitat is left undisturbed by construction activities.

2 A biological monitor shall be present at all pre-construction and pre-grading meetings and be present onsite during all vegetation removal. The biological monitor shall be authorized to halt all associated project activities that may be in violation of any permits issued.

3 During construction, soils to be impacted shall be watered down to prevent fugitive dust from drifting into adjacent habitat.

4 Caltrans and FHWA shall acquire all lands (at least 337.1 acres) and have an approved conservation bank agreement in place prior to beginning any and all construction activities. The 337.1 acres includes the 304.2 acres to offset impacts from the I-10 Palm Drive/Gene Autry Trail Interchange Project, the 2.9 acres from impacts at Ramon Road, and 30.0 acres from impacts at Palm Drive.

The Service retains the right to access and inspect the project site for compliance with the proposed project description and with the terms and conditions of this biological opinion. Any habitat destroyed that is not in the identified project footprint should be disclosed immediately to the Service for possible reinitiation of consultation.

Reporting Requirements

To demonstrate compliance with the foregoing terms and conditions, FHWA, or its designated contact, shall submit an annual report to the Service that describes and summarizes the implementation of the proposed project and its associated conservation measures.

Disposition of Sick, Injured, or Dead Specimens

The Service's Division of Law Enforcement, San Diego, California (619) 557-5063 is to be notified within three working days should any fringe-toed lizard(s) be found sick, injured, or dead in the project area. The Service's Carlsbad Fish and Wildlife Office should be notified concurrently at (760) 431-9440. Written notification to both offices must be made within five calendar days and include the collection date and time, location of the lizard(s), and any other pertinent information. Care must be taken in handling sick or injured lizard(s) to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. The remains of intact fringe-toed lizard(s) shall be placed with educational or research institutions holding appropriate State and Federal permits.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information.

1. Currently, there are planning and implementation efforts to develop a preserve system to offset the impacts of development through the CVMSHCP. Caltrans and FHWA should assist in the planning of these efforts to ensure that all future road designs avoid adversely affecting future preserves. Caltrans and FHWA should assist in the implementation of acquisition and restoration efforts to enhance the long term viability of the preserves and their sand source areas.

2. Caltrans and FHWA should control and remove all exotic plant species along the I-10 corridor and all other State roads in the Coachella Valley. Caltrans and FHWA should follow Executive Order 13112 and only replant with native flora to reduce the need for irrigation and to prevent invasive exotic plant species from stabilizing active sand transport areas.

For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the I-10 Palm Drive/Gene Autry Trail Interchange Improvement Project outlined in the initiation request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions or concerns about this biological opinion, please contact John DiGregoria of my staff at (760) 431-9440.

Sincerely,

Therese O'Rourke
Assistant Field Supervisor

cc: Scott Quinnell, Biologist, Caltrans District 8 Office

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
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In Reply Refer To:
FWS-ERIV-3282.6

NOV 07 2005

Mr. Gene K. Fong
Division Administrator
U.S. Department of Transportation
Federal Highway Administration
650 Capitol Mall, Suite 4-100
Sacramento, California 95814

Subject: Appended Programmatic Biological Opinion for Five Interchange Improvements on Interstate 10 and Associated Arterial Improvements for the Tiered Date Palm Drive Interchange Project, the Date Palm Drive Arterial Streets Project, and the Palm Drive/Gene Autry Trail Arterial Streets Project in Eastern Riverside County, California (1-6-05-P-3282, EA08-455900, 455800)

Dear Mr. Fong:

On August 31, 2005, the draft appended biological opinion was inadvertently signed and mailed. The project proponent requested a review of the draft and the staff biologist had not fully worked out all details with the project proponent. The following document fully replaces the document (FWS-ERIV-3282.6) sent on August 31, 2005.

This letter acknowledges the U.S. Fish and Wildlife Service's (Service) receipt on October 12, 2004, of your October 8, 2004, letter requesting initiation to amend the programmatic biological opinion (Opinion) for the Five Interchange Improvements on Interstate 10 (I-10) and Associated Arterial Improvements under section 7 of the Endangered Species Act of 1973, as amended (Act) on the proposed tiered Date Palm Drive Interchange Project located in eastern Riverside County, California. On February 2, 2005, FHWA requested including the Date Palm Drive Arterial Streets Project and the Palm Drive/Gene Autry Trail Arterial Streets Project as part of the amended programmatic biological opinion. The Federal Highways Administration has determined that the proposed Project would likely adversely affect the federally endangered Coachella Valley milk vetch (*Astragalus lentiginosus* var. *coachellae*; milk-vetch) and the federally threatened Coachella Valley fringe-toed lizard (*Uma inornata*; fringe-toed lizard).

All information required of you to initiate consultation was either included with your letter or is otherwise accessible for our consideration and reference. We have assigned log number FWS-ERIV-3282 to this consultation. Please refer to that number in future correspondence on this consultation.

This appended Opinion includes a project description, baseline, effects analysis, and incidental take for the proposed actions. The programmatic sections and all other sections of the Opinion (1-6-04-F-3282.4) are included by reference.

CONSULTATION HISTORY

On September 23, 2004, the Service issued the Opinion 1-6-04-F-3282.4 establishing the umbrella for five interchange projects and their associated arterial streets out to the next logical termini. Since then, there have been discussions between FHWA, Caltrans, Riverside County, Coachella Valley Association of Governments (CVAG) and the Service regarding how to implement individual projects addressed in the Opinion. On November 17, 2004, the Service sent a letter initiating formal consultation for the Date Palm Interchange Project. On February 2, 2005, FHWA submitted a letter requesting that the six associated arterial street projects be appended with the Date Palm Drive Interchange Improvement Project. On August 26, 2005, the Service met with CVAG where we agreed that the culvert options under the Union Pacific Railroad overcrossing will continue to be explored, and all impacts within the Willow Hole Conservation Area and Whitewater Floodplain Conservation Area will be offset by purchasing lands within these two Conservation Areas. On August 31, 2005, the draft appended biological opinion was inadvertently signed and mailed. The project proponent requested a review of the draft and the staff biologist had not fully worked out all details with the project proponent. On October 31, 2005, the Service and CVAG came to final agreement on the up-front purchase of the final 431.44 acres of land for the Conservation Bank. On October 31, 2005, the Service and Caltrans finalized the language for the conservation measures within the project description. On November 7, 2005, CVAG, Palm Springs, and the Service agreed to a timeline and strategy for purchasing all outstanding lands for the Conservation Bank.

DESCRIPTION OF THE PROPOSED ACTION

The following project description and conservation measures will be appended to the Opinion (1-6-04-F-3282.4). All sections of the Opinion will remain valid with the addition of the following project description and conservation measures.

The proposed action includes improving the Date Palm Drive Interchange, and widening six arterial street projects associated with the Date Palm Drive Interchange and the Palm Drive/Gene Autry Trail Interchange. The six arterial street projects include Date Palm Drive from I-10 north to Varner Road, Date Palm Drive south to Ramon Road, Varner Road from Mountain View to Vista Chino, Palm Drive from I-10 north to 20th Avenue, Gene Autry Trail from I-10 south across the UPRR overcrossing, Gene Autry Trail from the UPRR overcrossing south to Vista Chino, and Varner Road from Mountain View to Palm Drive. The two Varner Road sections are included as a single project throughout this appended Opinion.

Date Palm Drive Interchange

The existing Date Palm Drive interchange will be improved by realigning the westbound and eastbound direct on-ramps, constructing new single-lane westbound and eastbound loop on-ramps, and expanding the Date Palm Drive bridges over I-10. The bridges will be widened on both sides to accommodate six lanes, a raised median, a sidewalk in each direction, and a Class II bike lane (striped only, no barrier) in each direction. Pedestrian crosswalks will be provided for all on- and off-ramps with signals proposed on the eastbound and westbound off-ramps with Date Palm Drive. The I-10 overcrossing will provide additional horizontal clearance to accommodate the future planned expansion of the I-10 freeway facility from eight to ten lanes with the addition of two high occupancy vehicle (HOV) lanes. The UPRR overcrossing at the south end of the proposed project is currently under construction for widening from two to six lanes.

The Date Palm Drive Interchange Improvement Project will permanently impact 27.4 acres of Sonoran creosote bush scrub, stabilized and partially stabilized desert sand fields, and stabilized and partially stabilized desert dunes. The interchange improvement project will start construction in 2007 and will take approximately 400 days to complete.

Date Palm Drive

Date Palm Drive will be widened from two and four lanes to six lanes from Varner Road southerly to Ramon Road to the ultimate cross section of 128 feet and the I-10 interchange bridges and ramps. A cross section of the widening includes four 12 to 14-foot travel lanes; an 18-foot curbed or painted median; 8-foot shoulders, curb and gutter; and 21 feet of parkway which includes landscaping if development is adjacent and sidewalk where warranted. At intersections, dual 11-foot left turns lanes will replace the median.

The widening of Date Palm Drive will permanently impact 10.28 acres of Sonoran creosote bush scrub and mixed woody and succulent scrub north of I-10, and 10.43 acres of stabilized shielded fields south of I-10. The Date Palm Drive widening project will start construction in 2007 and will take approximately 14 months to complete.

Gene Autry Trail UPRR Bridge

The existing Gene Autry Trail Bridge over the UPRR tracks (Bridge No. 56C82) will be widened from two lanes to six lanes. The widening will be constructed on the east side of the existing structure and the approaches. The project will require construction of widened embankments for the bridge approaches, extending approximately 600 feet north and 1200 feet south of the railroad centerline. North of the bridge, the roadway will be widened from the existing two lanes to a six lane section to match the adjacent project to improve the Gene Autry Trail/I-10 Interchange. South of the bridge, the roadway will taper to meet the adjacent Gene Autry Trail Project. Planning will continue regarding the construction of a passageway along the southern

end of the overcrossing and ramp to function as a sand transport/wildlife corridor connecting the west and east side habitats. Caltrans, CVAG and the City of Palm Springs will continue to work with the Service to develop a functioning passageway associated with the overcrossing including the concept of extending the bridge gap on the southern end of the overcrossing, installing culverts, or another solution that will provide for the desired wildlife crossing, and aeolian sand transport system.

The widening of the Gene Autry Trail UPRR Bridge will permanently impact 5.0 acres of Sonoran desert scrub and a small area of tamarisk windrow. The widening of the UPRR Bridge along Gene Autry Trail will start construction in 2006 and will take approximately 12 months to complete.

Gene Autry Trail

Gene Autry Trail will be widened at grade from two to four lanes from the UPRR crossing southerly to Via Escuela. The widening along this segment includes four 12-foot travel lanes and 8-foot shoulders. Gene Autry Trail will be widened from Via Escuela south to Vista Chino. The widening includes six 12 foot travel lanes, 8 foot shoulders. A traffic signal and appurtenant turn lanes will be constructed at Via Escuela and Vista Chino.

Widening Gene Autry Trail will permanently impact 14.8 acres of Sonoran desert scrub and stabilized and unstabilized desert dunes. The Gene Autry Trail widening project will start construction in 2006 and will take approximately 6 months to complete.

Varner Road

Varner Road will be widened from Palm Drive east through Mountain View Avenue to Vista Chino. The widening includes four 12 to 14-foot travel lanes, an 18-foot painted median, 8-foot shoulders, and 21 feet of parkway which includes landscaping if development is adjacent. Intersections will have dual 11-foot left turns lanes constructed in the median.

The widening of Varner Road will permanently impact 63.21 acres of Sonoran creosote bush scrub and stabilized and unstabilized desert dunes. The Varner Road widening project will start construction in 2007 and will take approximately 12 months to complete.

Palm Drive

Palm Drive will be widened from I-10 north to 20th Avenue. The widening includes four 12 to 14-foot travel lanes, an 18-foot curbed or painted median, 8-foot shoulders, curb and gutter, and 21 feet of parkway which includes landscaping if development is adjacent and sidewalk where warranted. Intersections will have dual 11-foot left turn lanes constructed in the median.

The widening of Palm Drive will permanently impact 7.84 acres of Sonoran creosote bush scrub and stabilized and unstabilized desert dunes. The Palm Drive widening project will start construction in 2008 and will take approximately 8 months to complete.

Conservation Measures

25. Conservation measures 1 through 20 of the programmatic biological opinion will be implemented for the above appended projects.

26. For projects slated to begin prior to the end of April 2006, the seed of and soil around Coachella Valley milk-vetch within project impact areas will be collected prior to construction.

27. Direct impacts to 138.97 acres of stabilized and partially stabilized shielded sand fields, active sand fields, ephemeral sand fields, Sonoran creosote bush scrub, Sonoran mixed woody and succulent scrub, and stabilized and partially stabilized desert dunes will be offset through the debit of 277.94 acres (a 2:1 replacement ratio) from the Conservation Bank. Indirect effects to 287.12 acres of stabilized and partially stabilized shielded sand fields, active sand fields, ephemeral sand fields, Sonoran creosote shrub scrub, Sonoran mixed woody and succulent scrub, and stabilized and partially stabilized desert dunes will be offset through the debit of 287.12 acres (a 1:1 replacement ratio) from the Conservation Bank. The 565.06 acres will be preserved in perpetuity by the Conservation Bank Manager as established in the conservation bank agreement.

28. Currently, 1364 acres have been purchased and preserved for the Conservation Bank. CVAG has committed to purchasing the remaining 431.44 acres within both the Willow Hole Conservation Area and the Whitewater Floodplain Conservation Area according to the following timeline: 1) CVAG will open escrow on a parcel at least 115 acres and place a cash deposit of 25 % of total purchase price prior to the start of construction on the widening of Gene Autry Trail widening south of the UPRR overcrossing; 2) 224 acres prior to the start of construction on the widening of Varner Road within the Willow Hole Conservation Area; and 3) 92.44 acres prior to the start of construction on the widening of Indian Canyon Road within the Whitewater Floodplain Conservation Area.

29. Each piece of the 565.06 (277.94 plus 287.12) acres of aeolian sand habitat will be acquired, protected, and debited from the Conservation Bank prior to the commencement of construction activities associated with each project.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all

proposed Federal projects in the action area that have undergone section 7 consultation and the impacts of State and private actions, which are contemporaneous with the consultation in progress.

Date Palm Drive Interchange

The action area for the proposed Date Palm Drive Interchange Project is dominated by Sonoran Creosote Bush Scrub with an area of Stabilized and Partially Stabilized Desert Dunes. The action area includes historical and currently occupied habitat of the milk-vetch and fringe-toed lizard. During focused surveys in 2001 (Caltrans 2004), twenty-six individual milk-vetch were detected within the survey area adjacent to the existing roadway. Surveys were not conducted during the 2004/2005, wet season. Therefore, the full distribution of milk-vetch in the action area is unknown. Fringe-toed lizards were not detected during focused surveys in 2000 and 2001. These surveys only covered a small area adjacent to the roadway. Fringe-toed lizards are difficult to survey for and detect and are highly mobile. The various sand formations in the action area are likely occupied by fringe-toed lizards, including some of the stabilized and partially stabilized hummocks associated with the Sonoran Creosote Bush Scrub community. Because fringe-toed lizards are highly mobile, difficult to detect, and population levels respond to changes in sand conditions overtime, it is difficult to estimate the number of fringe-toed lizards currently in the action area.

Arterial Streets

The action area for the proposed Date Palm Drive Project is dominated by Sonoran mixed woody and succulent scrub, and stabilized and partially stabilized desert dunes; and includes historical and currently occupied habitat of the milk-vetch and fringe-toed lizard. The action area for the proposed Gene Autry Trail UPRR Bridge Project is dominated by stabilized and partially stabilized shielded sand fields, active sand fields, and ephemeral sand fields; and includes historical and currently occupied habitat of the milk-vetch and fringe-toed lizard. The action area for the proposed Gene Autry Trail Project is dominated by active sand fields and ephemeral sand fields, and includes historical and currently occupied habitat of the milk-vetch and fringe-toed lizard. The action area for the proposed Varner Road Project is dominated by Sonoran mixed woody and succulent scrub, and ephemeral sand fields; and includes historical and currently occupied habitat of the milk-vetch and fringe-toed lizard. The action area for the proposed Palm Drive Project is dominated by Sonoran mixed woody and succulent scrub, stabilized and partially stabilized desert dunes, and stabilized and partially stabilized shielded sand fields; and includes historical and currently occupied habitat of the milk-vetch and fringe-toed lizard. Because no surveys were conducted for the arterial streets addressed in this appended biological opinion, we assume the presence of fringe-toed lizards and milk-vetch.