

SCOPE OF WORK PROJECT SPECIFIC CONTRACT

CONTRACT TYPE - COST PLUS FIXED FEE

SOW DATE: January 14, 2020
PROJECT NUMBER: STM R200-262
PROJECT LOCATION: Region 2 Bridge Bundle – Design Build Grant Project
PROJECT CODE: 23398

THE COMPLETE SCOPE OF WORK INCLUDES THIS DOCUMENT (ATTACHED TO THE CONTRACT FOR CONSULTANT SERVICES)

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Comments regarding this scope may be directed to:

CONTRACTS AND MARKET ANALYSIS BRANCH

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INSTRUCTIONS

This Scope of Work is to serve as a template for Colorado Department of Transportation (CDOT) to develop and negotiate solid contracts with Consultant teams on projects and tasks. The Consultant shall coordinate all activities, tasks, meetings, communications and deliverables with the CDOT/ Project Manager (PM) (or his or her designee) for this project. All submittals will be through the CDOT/PM or a designee, who will make appropriate distribution. Upon notice to proceed, the Consultant shall be responsible and will account for all effort contained in the Final Scope of Work.

This Scope of Work has been reviewed by the Department and reflects a plan of approach based on the known goals. One factor determining the selection of a Consultant is the ability of that Consultant to analyze the project goals, evaluate the work elements, and formulate a work plan. This process may produce new approaches or modification to the project work elements. Because of that, all Consultants should be aware that the Final Scope of Work for a project will be produced with input from the selected Consultant.

SECTION 1

PROJECT SPECIFIC INFORMATION

1.1 PROJECT BACKGROUND

In December 2018, CDOT submitted three applications for grant funding under the U.S. Department of Transportation's Federal Highway Administration Competitive Highway Bridge Program(CHBP). The grant funds go toward highway bridge replacement or rehabilitation projects on public roads that demonstrate cost savings by bundling at least two highway bridge projects into a single contract. In August 2019, it was announced that 20 projects in 18 states were awarded grants totaling \$225M. Of those 20 projects awarded, one was the CDOT Region 2 Bundle for \$12.475M.

This design build project is funded by the grant and funds from the Colorado Bridge Enterprise. It comprises the replacement of fourteen (14) rural bridges spread across highway corridors in southern and western Colorado. These bridges are located on key corridors for rural mobility as well as intra- and interstate commerce, particularly for the movement of agricultural and access to tourist destinations. All of the bridges are well past their design life and 13 of the bridges are at least 80 years old. The condition for 13 of the bridges is categorized as 'poor', leading to increased frequency and intensity of maintenance. The project improves bridges in poor condition on key routes, US 350, US 24, and CO 9, ensuring the bridges will not require load restrictions that can negatively impact commerce.

The purpose of this contract is to prepare preliminary design of the 14 bridges and adjacent roadway, data collection and analysis, design build procurement document preparation, survey, utility location and coordination, hydrology and hydraulics, geotechnical engineering, and environmental by September 2020 to allow CDOT to be prepared to advertise the Draft Request for Proposals by October 2020. It is anticipated that the project will be constructed within the existing right of way; ROW acquisition is not anticipated. It is anticipated that the replacement of the bridges will be approved environmentally as Categorical Exclusions.

1.2 PROJECT GOALS

This project is intended to produce the following improvements:

- A. Fourteen (14) new structures
- B. Improved Safety
- C. Higher level-of-service
- D. Update facilities to current standards

This contract is intended to produce the following:

- A. Design Build preliminary design complete by September 2020
- B. Advertise Design Build Draft RFP by October 2020
- C. Complete Design Build technical requirements prior to Final RFP
- D. Advertise Design Build Final RFP December 2020/January 2021

1.3 PROJECT LOCATION

Seven structures on US 350, four on US 24, and three CO 9

1.4 PROJECT COSTS

The cost of this project is estimated at \$34.26M.

1.5 WORK DURATION

The time for the work described in this scope is approximately March 2020 to April 2021.

1.6 CONSULTANT RESPONSIBILITY AND DUTIES

The Consultant will be responsible for providing preliminary design and procurement support for Design Build Request for Proposals including:

- A. Preliminary structure design and plan development
- B. Preliminary roadway design and plan development
- C. Geotechnical engineering design and plan development
- D. Utilities
 - 1. Potholing and survey quality level B services for all utilities
 - 2. Utility mapping and pertinent information of existing utilities
 - 3. Coordination with utility owners
 - 4. Utility Relocation Agreements
 - 5. Ditch company coordination
- E. Environmental
 - 1. NEPA related clearances
 - 2. Resource review (including but not limited to)
 - a. HazMat/HazWaste (including lead based paint and asbestos testing)
 - b. Threatened and Endangered species
 - c. Wetlands
 - d. Archeology
 - e. Paleontology
 - f. History
 - g. Stormwater
 - h. Section 4(f)
- F. Survey
- G. Hydrology and Hydraulic Engineering
- H. ROW impacts
- I. Cost estimates
- J. Design Build procurement document preparation

1.7 WORK PRODUCT

The Consultant work products are:

- A. Reports
- B. Environmental Documents
- C. Project Development Plan and required documents
- D. Design Build procurement documents
- E. Project Coordination
- F. Schedules
- G. Meeting Minutes
- H. Professional Engineer stamped documents
- I. Professional Land Surveyor stamped documents
- J. Design support during project implementation

1.8 WORK PRODUCT COMPLETION

All submittals must be accepted by the CDOT Contract Administrator or designee.

1.9 ADDITIONAL PROJECT INFORMATION

Additional information regarding this project is included in the following documents:

CHBP Grant Application

- A. Bridge Inspection Reports
- B. As-built plans from past construction projects
 - Copies of these documents may be requested from CDOT. A moderate fee may be required for copies.

SECTION 2

PROJECT MANAGEMENT AND COORDINATION

2.1 CDOT CONTACT

The Contract Administrator for this project is: Jennifer Billings, Region 2 Resident Engineer.

Active day-to-day administration of the contract will be delegated to the CDOT/PM:

Name: Scott Dalton
Title: Project Director
Address: 1480 Quail Lake Loop, Suite A, Colorado Springs, CO 80906
Phone: 719-251-7820
Fax: 719-227-3298

2.2 PROJECT COORDINATION

Coordination will be required with the following:

- A. Colorado Department of Transportation
 - B. Colorado Bridge Enterprise
 - C. Federal Highway Administration (FHWA)
 - D. Colorado Parks and Wildlife
 - E. Utility Companies (Private and Public)
 - F. Ditch Companies
 - G. Railroad
 - H. Colorado Department of Public Health and Environment (CDPHE)
 - I. Otero, Las Animas, Teller, Fremont, El Paso, and Park Counties
 - J. U.S. Army – Fort Carson / Pinyon Canyon Maneuver Site
- List is not all-inclusive, there may be coordination with other agencies required.

The consultant should anticipate that a design that affects another agency has to be accepted by that agency prior to its acceptance by CDOT. Submittals to affected agencies will be coordinated with CDOT.

SECTION 3 EXISTING FEATURES

Note: This Section lists known features in the area. It should not be considered as complete, and should include, as appropriate, information from Section 2 Project Management and Coordination. The Consultant should be alert to the existence of other possible conflicts.

3.1 STRUCTURES

| Structure Number | Highway | MM | Year Built |
|------------------|---------|---------|------------|
| G-12-C | CO 9 | 71.445 | 1938 |
| J-14-C | CO 9 | 20.107 | 1934 |
| J-15-G | CO 9 | 15.970 | 1971 |
| I-13-G | US 24 | 227.095 | 1937 |
| I-15-AO | US 24 | 271.900 | 1937 |
| I-15-T | US 24 | 271.691 | 1937 |
| H-13-N | US 24 | 240.686 | 1937 |
| M-21-B | US 350 | 51.682 | 1937 |
| M-21-C | US 350 | 50.582 | 1937 |
| M-21-J | US 350 | 57.069 | 1935 |
| M-22-U | US 350 | 69.817 | 1935 |
| M-22-Y | US 350 | 57.474 | 1935 |
| N-21-C | US 350 | 47.131 | 1936 |
| N-21-F | US 350 | 48.744 | 1937 |

3.2 UTILITIES

- A. CDOT Region 2 Utility Manager
- B. CDOT Fiber
- C. Ditch Company(s)
- D. Railroad(s)
- E. Gas
- F. Electric
- G. Phone

3.3 PERMANENT WATER QUALITY CONTROL MEASURES

Project structure locations appear to be outside of MS4 mapped areas. Verification required.

SECTION 4 GENERAL INFORMATION

4.1 NOTICE TO PROCEED

Work shall not commence until the written Notice-to-Proceed is issued by CDOT. Work may be required, night or day, and/or weekends, and/or holidays, and/or split shifts. CDOT must concur in time lost reports prior to the time lost delays being subtracted from time charges. Subject to CDOT prior approval, the time charged may exclude time lost for:

- A. Reviews and Approvals
- B. Response and Direction

4.2 PROJECT COORDINATION

- A. Routine Working Contact: Routine working contact shall be between the CDOT/PM and the Consultant Project Manager (C/PM) as defined in Appendix C.
- B. Project Manager Requirements: Each Project Manager shall provide the others with the following:
 - 1. A written synopsis or copy of their respective contacts by telephone and in person with others
 - 2. Copies of pertinent written communications

4.3 ROUTINE REPORTING AND BILLING

The Consultant shall provide the following on a routine basis:

- A. Coordination of all contract activities by the C/PM
- B. Periodic reports and billings required by CDOT Procedural Directive 400.2 (Monitoring Consultant Contracts)
- C. Minutes of all Meetings: The minutes will be completed and provided to the CDOT/PM within five (5) working days after the meeting. When a definable task is discussed during a meeting, the minutes will identify the "Action Item", the agency responsible for accomplishing it, and the proposed completion date.
- C. In general, all reports and submittals must be approved by CDOT prior to their content being utilized in follow-up work effort.

4.4 PERSONNEL QUALIFICATIONS

The C/PM must be approved by the CDOT Contract Administrator. Certain tasks must be done by Licensed Professional Engineers (PE) or Professional Land Surveyors (PLS) who are registered with the Colorado State Board of Registration for Professional Engineers and Land Surveyors. National Institute for Certification in Engineering Technology (NICET) certification or other certifications may be required for project inspectors and testers.

All tasks assigned to the Consultant must be conducted by a person on the Consultant team that is qualified and has specific expertise in that task. The qualified person is a professional with the necessary education, certifications (including registrations and licenses), skills, experience, qualities, or attributes to complete a particular task. Design of any special project features must be directed, completed, and overseen by a professional engineer with significant experience in design of those special project features.

This contract requires that the prime firm or any member of its team be pre-qualified in the following disciplines for the entire length of the contract: Bridge Design, Bridge Inspection, Civil Engineering, Electrical Engineering, Environmental Engineering, Geotechnical Engineering, Highway & Street Design,

Hydrology and Hydraulics (including PWQ), Landscape Architecture, Management (Contract Admin), Management (Construction), Materials Testing Soils Engineering, Structural Engineering, Surveying, Transportation Engineering, Traffic Engineering, Tunneling, and Water Quality.

4.5 CDOT COMPUTER/SOFTWARE INFORMATION

The consultant shall utilize the most recent CDOT adopted software. The primary software used by CDOT is as follows:

| | | |
|----|-----------------------|--|
| A. | Earthwork | InRoads and/or OpenRoads |
| B. | Drafting/CADD | InRoads and/or OpenRoads & Microstation w/CDOT's formatting configurations & standards |
| C. | Survey/photogrammetry | CDOT TMOSS, InRoads and/or OpenRoads |
| D. | Bridge | Bentley Bridge Suite, AASHTOWARE, CDOT Bridge Geometry, and others |
| E. | Estimating | Transport (an AASHTO sponsored software) as used by CDOT |
| F. | Specifications | Microsoft Word |
| G. | Scheduling | Microsoft Project |
| H. | Water Quality Data | ArcView |
| I. | Document Sharing | Projectwise |
| J. | Pavement Design | AASHTOWare Pavement ME Design |

4.6 COMPUTER DATA COMPATIBILITY

The data format for submitting design computer files shall be compatible with the latest version of the adopted CDOT software as of Notice to Proceed for the contract. The Consultant shall immediately notify the CDOT/PM if the firm is unable to produce the desired format for any reason and cease work until the problem is resolved. Refer to Section 8, Table 1 - Submittals, for additional information regarding current formats and the acceptable transmittal media.

4.7 PROJECT DESIGN DATA AND STANDARDS

- A. General: Appendix A provides a comprehensive list of state and federal reference material. However, Appendix A does not contain local agency reference material that may be pertinent to some projects. The consultant is responsible for obtaining and ensuring compliance with the most recent CDOT-adopted version of the listed references including standards and specifications, manuals, and software, or as directed by the CDOT/PM. Conflicts in criteria shall be resolved by the CDOT/PM.
- B. Specific Design Criteria: Appendix B is a list of specific project criteria. The list is comprehensive and may include items that are not required for tasks defined in this scope. The Consultant shall submit any proposed changes to the pertinent criteria to the CDOT/PM at one of the periodic progress meetings prior to initiating design.
- C. Construction Materials/Methods: The materials and methods specified for construction will be selected to minimize the initial construction and long-term maintenance cost to the State of Colorado. Non-typical construction materials and methods must be approved in writing by CDOT.

4.8 CDOT'S RIGHT TO SELF PERFORM WORK

While it is anticipated that the Consultant will perform activities contained in the scope, CDOT reserves the right to self-perform any or all of these tasks, or to provide assistance to the Consultant on any or all such work.

Note: For all agreements that include final design services:

- A. For Design-Bid-Build project, if the prime or sub consultant participate in more than 30% (of design costs) in the final design portion of the contract, they shall not be able to compete for construction administration and engineering services for the owner on the same project for which they are providing final design services.
- B. For Design-Build project, if the prime or sub consultant participate in the creation of the RFQ, RFP, Books 1-5, and/or the procurement, short listing, BAFO, or award processes:
 - 1. They shall not be able to participate as one of the Design-Build teams competing for the construction award of the project.
 - 2. They may be eligible to perform construction administration and engineering services for the owner, if CDOT deems it appropriate.
 - 3. If a prime recuses itself during the RFQ, RFP, and procurement phases of a DB project then its sub consultants are automatically recused also for this contract. Sub consultants still wanting to be involved with the DB project would have to provide their services through a separate contract event.
- C. Prime or sub consultants who perform preliminary design (up-to FIR for DBB and up-to RFQ for DB) and environmental services (Phase 1 and ISA for example) may continue with, or compete for, final design services.

SECTION 5

PROJECT INITIATION AND CONTINUING REQUIREMENTS

5.1 PROJECT MEETINGS

The types and numbers of meetings shall be flexible and determined by an interactive process as approved by the CDOT/PM.

- A. Initial Project Meeting: Schedule and facilitate initial project kick-off meeting. All appropriate disciplines should be included in the scoping meeting. Create an invitation list, send notices with a draft agenda prior to the meeting, and provide meeting minutes to all those invited. Whenever possible, the kick-off meeting will include an on-site inspection to familiarize the entire project team with the character and conditions of the area. The scoping meeting will also be used to clearly identify scope elements, responsibilities and coordination necessary to complete the work.
- B. Progress meetings: CDOT and Consultant team will meet periodically as required (typically at two-week intervals). The meetings will review activities required to be complete since the last meeting, problems encountered/anticipated and potential solutions, project schedule update, action items, and coordination required with other agencies.
- C. Meeting Minutes: Project meeting minutes shall be completed by the Consultant and provided to the CDOT/PM within one week of the actual meeting. When a definable task is discussed during a meeting, the minutes will identify the "Action Item", the party responsible for accomplishing it, and the proposed completion date.
- D. Contact List: Establish and maintain a computerized list of all appropriate interested parties for the communication process.

5.2 PROJECT MANAGEMENT

At the kick-off meeting, or shortly thereafter, create and provide an approach for managing the project (i.e. involved staff, key team positions), including task orders, a schedule, document and agency reviews and other project needs. The Consultant shall coordinate all the work tasks being accomplished by all parties to ensure project work completion stages are on schedule.

5.3 DEVELOP A PROJECT SCHEDULE AND ASSIGN TASKS

The Consultant is responsible for coordinating the required work schedule for tasks accomplished by CDOT and other agencies. Prepare the initial project schedule for review by the CDOT/PM and consultant team, and refine to provide detail as requested. Modifications will be made as necessary in collaboration with CDOT and appropriate justification.

5.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Prepare and submit a QA/QC plan as part of the planning documents noted above, and commit to adhering to the QA/QC process throughout the project.

5.5 OBTAIN NECESSARY RIGHT-OF-ENTRY AND PERMITS

Some activities may require work on land not controlled by CDOT. In such cases the Consultant shall obtain the necessary written permission to enter the premises. Written permission shall be coordinated with other CDOT staff and consultants that may need right-of-entry such as geotechnical and environmental personnel. Included in this written permission will be the names and telephone numbers of persons to contact should notification prior to entry be necessary. CDOT Form 730 may be used for this purpose. Signed copies of written permission will be submitted to the CDOT/PM prior to entering private property for survey work. Some activities such as materials testing on existing pavement and structures may require a permit. Permits will be obtained and copies submitted to the CDOT/PM.

SECTION 6

ENVIRONMENTAL WORK TASK DESCRIPTIONS

Note: This Section is written specifically for projects requiring an Environmental Impact Statement (EIS), an Environmental Assessment (EA), or a Categorical Exclusion (CatEx). It includes elements that are not required for all projects requiring NEPA protocol. Region environmental personnel will determine which items in this section are necessary to address the requirements of the EIS, EA, or CatEx, or post-NEPA activities (ensuring that all of the commitments made by the NEPA document are implemented in the design package).

6.1 CONSULTANT DISCLOSURE STATEMENT

40 Code of Federal Regulations (CFR) Section 1506.5(c) specifies that a disclosure statement to avoid conflict of interest must be prepared. If an environmental document is prepared with the assistance of a consulting firm, the firm must execute a disclosure statement.

6.2 PROJECT INITIATION

- A. Environmental Scoping Task:** An early environmental coordination/scoping task will occur as directed by the CDOT/PM. An environmental scoping meeting should be held with the Regional Environmental Project Manager, the Regional Water Quality Specialist/Water Pollution Control Manager, the Regional Project Manager, appropriate members of the Environmental Programs Branch (EPB), C/PM, and staff from Right-of-Way, Maintenance, Hydraulics, Traffic, Property Management, and Utilities, as appropriate. This task will include a meeting with CDOT and the local agency representatives to discuss the initial work efforts of the project.
- B. Review Applicable Existing Documents:** Review project-specific documents or data related to the assessment of environmental, social, and economic resources and impacts in the project area that are determined relevant. Examples of relevant documents are previous studies, planning efforts, access management plans, safety assessments, and other traffic studies. These resources may be CDOT documents or may have been created by local planning agencies or municipalities.
- C. Extent of Study Required for Resources:** Determine the extent of study required for each resource area. The extent of study can be defined in four categories: 1) complete analysis required; 2) short analysis to define resources/impacts; 3) no analysis required; or 4) analysis already completed (for example, by a previous study).
- D. Preparation and Coordination of Requirements:** During the early coordination/ scoping process, determine the effort required for the preparation and coordination requirements to allocate: 1) work to be completed by CDOT Region Staff; 2) work to be completed by CDOT Headquarters Staff; 3) work to be completed by Consultant or its project partners; and 4) outside agency concurrence or approvals required.
- E. Extent of Narrative Required:** For each resource, determine during the scoping phase the extent to which documentation is required for each resource. The level of documentation can be included in several ways, such as: 1) a complete analysis/ documentation included in the text; 2) a summary of the analysis performed included in the text; 3) a statement that no impacts are expected; or 4) including information and documentation (technical memoranda, references, annotated bibliography) in an appendix of the document with reference to the appendix in the body of the text. This will be detailed to the extent possible using information available during the scoping phase.

F. Project Study Area Limits/Logical Termini: Preliminary project study area limits are established in Section 1 and 3 of the Generic Scope of Work document. Perform necessary research and data collection to propose a study area boundary for environmental resources and logical termini for use in scoping. In coordination with the CDOT/PM, prepare a recommendation to the FHWA for approval of the logical termini, if applicable.

G. Administrative Record: Maintain a NEPA Administrative Record that adheres to the established process. Make available all parts of this Administrative Record to the CDOT/PM (or his or her designee), or to the Colorado Attorney General's office (as requested) at any time during the project's duration. All materials associated with the project Administrative Record will be delivered in the format specified by the CDOT/PM when closing the project. Final project invoice payments to the Consultant are conditional upon the professional and complete delivery of these materials to CDOT's office. Given the extent of documentation collected for the NEPA process, the consultant must update the record regularly and provide information to CDOT electronically.

6.3 ENVIRONMENTAL ANALYSIS AND DOCUMENTATION: Determine the effort required to examine the transportation needs in the project area definitively and completely, to develop and evaluate transportation alternatives following the NEPA process, and to develop the appropriate NEPA documents. All environmental documentation, technical reports and technical memos will be submitted to CDOT, and may be required to be supplied to reviewers at CDOT EPB, FHWA, and for early review as appropriate and necessary.

6.4 DATA COLLECTION, FIELD INVESTIGATION, MITIGATION MEASURES

The following analyses are required for each of the bridges that pass the screening process. Each resource will be summarized concisely, focusing on the project issues of concern in the NEPA document. The scope shall define the level of documentation, project tasks, and project deliverables for each of the resource areas. Identify the required area and resources to evaluate and determine the early coordination/scoping process as discussed above, but may evolve over the life of the project as new information is discovered through analysis. Reference other projects within the study area (to make sure existing conditions are alike between both projects, understand future planned conditions within the study area, and to appropriately evaluate cumulative impacts to resources); these projects may be related to transportation, but may also be entirely unrelated to transportation (such as a new strip mall, school, park, apartment building, for example). As determined by the Consultant team, the Region, and EPB, a larger area is typically evaluated for cumulative effects. The level of detail and analysis will be determined based on the level of environmental documentation (e.g., Feasibility Study, CatEx, EA, or EIS). It is expected that the level of detail for this NEPA analysis will be multiple CatEx documents. Use of Geographic Information Systems (GIS) for environmental data is required to be in compliance with CDOT GIS standards. All GIS data shall be provided to CDOT in electronic format with the annual updates for the administrative record.

Relevant information will be incorporated in the NEPA document sections such as: Affected Environment, Environmental Consequences, and Mitigation Measures. In addition, technical reports may be prepared in support of the project and shall be reviewed and referenced as appropriate in the NEPA document. If new or unique resources are identified during scoping, this scope of work will be modified to include these, as appropriate.

A. Water Quality

1. Colorado Discharge Permit System (CDPS), and design and permitting issues per the CDOT PWQ program.
2. A mitigation plan that includes conclusions of effects, permanent best management practices (BMPs), temporary/construction BMPs, erosion control measures, and definition of maintenance responsibilities.

B. Floodplains Assessment

1. Identify location of regulatory floodplains and floodways published by FEMA and local agencies, and assess impacts of planned changes to those boundaries from CDOT activities or planned map revisions by others.
2. Add information to environmental resource mapping of existing conditions.
3. Determine the adverse impacts of each alternative with respect to the base flood elevation (BFE), floodway boundary, and local drainage. This must include the impacts of construction and other “temporary” activities.
4. Analyze impacts and develop possible actions to mitigate for the adverse impacts, then coordinate with roadway and structural designers.
5. Analyze the impacts and mitigation. Included in the analysis will be a determination of significant impacts due to:
 - a. Single community access routes.
 - b. Risk for social or economic losses due to flooding.
 - c. Alteration of beneficial floodplain values.
 - d. Recommend preparation of a local floodplain development permit for all work in floodplains and floodways, as required by state and federal law.
 - e. Recommend preparation of a no-rise certification for all work in floodways, as required by state and federal law.
 - f. Recommend preparation of Conditional Letter of Map Revision (CLOMR), Letter of Map Revision (LOMR) requirement
6. Prepare a Floodplain Information Sheet for the final approved plan set.
 - a. Show and clearly label the current effective 100-yr floodplain and floodway boundaries, and the 500-year floodplain (as applicable).
 - b. Show and clearly label all cross sections and BFE lines published on the current effective FIRM (note; all elevations must be reported in the same vertical datum identified on the current effective FIRM).
 - c. Show and clearly label any fluvial hazards, buffer zones or erosion management zones.
 - d. Show the limits of disturbance for all permanent and temporary activities, and label as such.
 - e. Show all ground survey point elevations in the same vertical datum identified on the current effective FIRM.
7. Add notes to indicate the waterway name, jurisdiction and community number, panel number, date of current effective information, a sentence describing which local code requires permits, a sentence for permitting and no-rise compliance, and a note recognizing that flooding may occur outside the mapped Special Flood Hazard Area (SFHA).
8. Prepare floodplain and drainage assessment information as outlined in the CDOT NEPA manual. If prepared, the information will be reviewed by the Region or EPB specialist and then finalized.

C. Wetlands

1. Wetlands Determination/Delineation:
 - a. Conduct a field evaluation for the presence of wetlands within the project study area. Global Positioning System (GPS) should be used for this activity.
 - b. Delineate the boundaries and size of all anticipated jurisdictional and non-jurisdictional wetlands and waters of the US within the project area. using United States Army Corps of Engineers (USACE) guidance listed in Appendix A.
 - c. Prepare wetlands maps that delineate the wetland boundaries within and adjacent to each identified project site. GPS/GIS will be used for this mapping.
 - d. Coordinate the findings with the CDOT Region and the USACE. Obtain jurisdictional determination of the wetlands from the USACE, when wetlands are impacted.
2. Wetland Finding Report: Prepare a Wetland Finding Report (using CDOT’s 2019 Wetland finding format). The Functional Assessment of Colorado Wetlands (FACWet) should be used, as appropriate according to current CDOT procedures. Conduct a wetland assessment based on the NEPA document addressing the amount of permanent and temporary wetlands impacts and mitigation. Wetland mitigation should be identified as early as possible in the NEPA process. Mitigation sites must be evaluated for availability and suitability for wetland habitat.

D. Vegetation and Noxious Weeds

Conduct necessary field surveys and identify vegetation and noxious weeds within the project area. GPS will be used for this activity. Plot major vegetation zones/ecosystems, and weed locations and densities on a map.

1. Perform an impact analysis.
2. Prepare an Integrated Noxious Weed Management Plan prior to construction

E. Fish and Wildlife

Conduct necessary field surveys and identify fish and wildlife and their habitat within the project area. As appropriate, GPS/GIS will be used to identify habitat.

1. Coordination with the Colorado Parks and Wildlife (CPW) and US Fish and Wildlife Service (USFWS) as appropriate.
2. Perform an impact analysis.
3. Develop appropriate mitigation measures
4. Prepare Biological Resources Report

F. Threatened and Endangered (T&E) Species

1. Conduct necessary desktop and field surveys and identify T&E species and/or Designated Critical Habitat.
2. Review existing planning documents to determine any existing Habitat Conservation Plans (HCP) for T&E species.
3. Identify impacts to species and recommend mitigation.
4. Based on affected environment and habitat, prepare the T&E species impact assessment.
5. Develop a Biological Assessment for the USFWS if federally listed T&E species and/or Designated Critical Habitat will be impacted and there is a federal nexus.
6. Develop a HCP with the USFWS if T&E species and/or Designated Critical Habitat will be impacted and if there is a federal nexus.
7. Identify any impacts and develop a mitigation plan to conform to requirements of the Endangered Species Act.
8. Use CDOT's SWIFT method for developing T&E clearances where appropriate.

G. Historic Properties

1. Perform and provide the survey report for review by the CDOT Region Historian or EPB Senior Staff Historian, and incorporate the information into the NEPA document
2. Collection and Evaluation of Baseline Information as defined by Section 106 of the National Historic Preservation Act of 1966, as amended

H. Historic Clearance

1. Determine the area of potential effect (APE), in coordination with CDOT and the State Historic Preservation Officer (SHPO).
2. Conduct a literature and records search for previously recorded historic resources in the APE at the OAHP.
3. Conduct an intensive architectural field survey of the APE (structure and adjacent properties, if impacted) and determine National Register of Historic Places (NRHP) eligibility for each resource 45 years or older. Potential resources include man-made structures, ditches, railroads, etc.
4. Identify and coordinate with consulting parties (e.g., public, historic preservation groups, local historical societies, museums) regarding historic properties in the project area.
5. Write a comprehensive Historic Resources Survey Report according to guidelines established by the OAHP to submit for review by the CDOT Region and/or EPB Senior Staff Historian.
6. Determine potential impacts, both direct and indirect, to historic resources and recommend mitigation strategies to avoid, minimize, or mitigate impacts.
7. Prepare correspondence as necessary for the CDOT Region and/or EPB Senior Staff Historian to submit to the SHPO.

8. Collaborate with the CDOT Region Historian or EPB Senior Staff Historian to develop a Memorandum of Agreement, if necessary, with recommended mitigation strategies for adverse effects for agency review and execution.
9. Prepare Section 4(f) documents as required.
10. Work with the CDOT Region historian or EPB Staff Historian to obtain any necessary approvals.

I. Historic Bridge Clearance

1. Research the Statewide Historic Bridge Inventory to determine the eligible or non-eligible status of bridges that may be in the project area.
2. Prepare correspondence as necessary for the CDOT Region and/or EPB Senior Staff Historian to submit to the SHPO.
3. If bridges that have been determined to be eligible or listed on the NRHP are present, develop alternatives to bridge replacement, including: No-Action, rehabilitation, build a companion structure, build a new bridge in a different location, and others dictated by the project circumstances.
4. Collaborate with the CDOT Region and/or EPB Senior Staff Historian to develop a Memorandum of Agreement, if necessary, to mitigate adverse impacts to historic bridges for agency review and execution.
5. Prepare an archival documentation or other creative mitigation of the bridge to mitigate adverse effects according to standards established by the OAHP.
6. When applicable, prepare information for CDOT Adopt-a-Bridge program to mitigate adverse effects.
7. Work with the CDOT Region and/or the EPB Senior Staff Historian to obtain any necessary approvals.
8. Prepare Section 4(f) documents as required.

J. Archaeology

1. A review of historic Sanborn Fire Insurance maps and other appropriate archival sources will be completed to determine if the area may contain significant archaeological sites or features.
2. Conduct an intensive field survey of the project corridor(s) and undertake site-specific test excavations, as necessary and appropriate, to determine NRHP eligibility. The Consultant shall not undertake test excavations before consulting with CDOT.
3. Complete laboratory analyses of all collected artifacts and ancillary specimens.
4. Write a comprehensive survey report according to guidelines established by the OAHP.
5. Develop a data recovery plan to mitigate potential adverse effects to significant archaeological localities, as appropriate and necessary.
6. Coordinate the mitigation plan with the EPB Senior Staff Archaeologist, SHPO, and other required agencies.
7. Conduct data recovery excavations at any significant archaeological site that cannot be avoided during construction.
8. Analyze artifacts.
9. Prepare and submit a data recovery excavation report which describes, in a thorough and comprehensive fashion, the project results and the nature of the site in the context of the regional archaeological database. The report must also include site management recommendations in the context of the NRHP.
10. Coordinate Tribal consultation and support EPB Senior Staff Archaeologist as needed.
11. Prepare Section 4(f) documents as required.

K. Paleontological Resources

1. Perform a literature and museum fossil database search and field assessment.
2. Determine the presence or absence of paleontological resources.
3. Conduct analysis to determine the scientific significance (research and/or educational value) of the resource.
4. Write the paleontological technical report, including mitigation proposals, if necessary. The assessment report will be reviewed by the EPB Staff Paleontologist for adequacy.

5. Coordinate the mitigation plan with the EPB Staff Paleontologist.

L. Section 4(f) and Section 6(f) Evaluation

1. Inventory and map project area for Section 4(f) and/or 6(f) facilities.
2. Determine if any potential impacts or ROW acquisitions include Section 4(f) properties (e.g., publicly owned parks, recreational facilities, nationally significant historic sites, wildlife refuges) or Section 6(f) properties (those that have received Land and Water Conservation Funds).
3. Determine and evaluate project impacts on Section 4(f) and/or 6(f) properties using preliminary design information, and the necessary commitments for mitigation measures. Determine whether impacts qualify under the “de minimis” 4(f) use. Prepare an analysis that includes avoidance alternatives, discussion of prudent and feasible, least harm (if necessary), minimization, and mitigation related to Section 4(f) properties. This may include the development of a new alternative(s) as an avoidance alternative(s)
4. Determine if the Section 4(f) use could be evaluated as a De Minimis Finding. If so, prepare that documentation in consultation with CDOT Region or EPB Staff.
5. Prepare the Draft and Final documentation for Section 4(f) and/or 6(f) evaluation. This will go through the Region Planning and Environmental Manager (RPEM) to the EPB for review.
6. Prepare evaluation and coordinate reviews with RPEM and EPB staff for review by FHWA.

M. Farmlands

In coordination with the Natural Resource Conservation Service (NRCS), investigate and quantify the effect of the project alternatives on farmlands—determining whether farmlands in question are classified as “prime” or “unique,” as well as the extent to which impacts may affect local communities. The US Department of Agriculture Farmland Conversion Form (Form AD 1006) will be completed as necessary. Develop mitigation measures, if applicable, for impacts.

N. Hazardous Materials

Perform and document the following Initial Site Assessment (ISA) and/or Modified Environmental Site Assessment (MESA) activities:

1. Conduct regulatory research that includes the collection, mapping and Evaluation of data from the following resources:
 - a. Hazardous Waste Lists compiled by U.S. EPA or CDPHE which identify, utilizing a database provider if appropriate.
 - b. Records kept by U.S. EPA or CDPHE on hazardous waste regulation violations or citations
 - c. Lists kept by the appropriate fire department
 - d. Available historic tax records which indicate past land use (coordinate with property ownership and land use data research), such as Sanborn Fire Insurance Maps
 - e. Available historic aerial photos of the corridor (e.g., United States Geological Survey, public libraries, etc.)
 - f. Historic topographic maps
 - g. Any pertinent records maintained by CDOT
 - h. Documented personal interviews, if approved by CDOT/PM
 - i. Agency file reviews
2. Analyze results of regulatory research and records review and identify potential impacts construction activities may have on existing hazardous waste sites. Assess potential liability issues and hazards to the public and construction workers and develop potential mitigation options. Prepare the ISA/MESA Document to include the following:
 - a. Prepare the draft and subsequent final ISAs to address comments provided by CDOT.
 - b. ISAs will conform to American Society for Testing and Materials (ASTM) standards for Phase I reports (with limitations), and make a determination of the necessity of a Phase II report.

- c. Identify how the presence of hazardous waste locations may impact each alternative, including the no-action alternative. GIS mapping will be desired.
- 3. Conduct In-Situ Tests via performing the following and providing a survey report, as determined on a project-specific basis:
 - a. Select locations for soil boring/monitoring wells based on information obtained above, geologic review, and alignment considerations.
 - b. Install monitoring wells and obtain soil and water samples for chemical analysis as well as geotechnical and geologic data.
 - c. Perform asbestos and lead based paint testing as determined appropriate.
- 4. Phase II site assessment if deemed to be important for the alternatives screening process.

SECTION 7

PRECONSTRUCTION WORK TASK DESCRIPTIONS

Note: The following activities of communication, consensus building, project team reviews, conceptual design, data gathering, documentation, and formal public notice shall be planned by the Consultant and coordinated with the CDOT/PM. The time of their accomplishment will overlap and parallel paths of activity should be planned to finish the development phase in accordance with the shortest possible schedule. A project plan shall be developed by the Consultant that satisfies the requirements of the project development. This plan must be approved by the Contract Administrator before starting the work.

7.1 PROJECT INITIATION AND CONTINUING REQUIREMENTS

- A. Environmental Mitigation and Requirements: Ensure that any mitigation commitments within the NEPA documentation are incorporated into the project.
- B. Independent Design Review: An independent design review shall be performed on any design accomplished by others that will be used in this project. A report identifying the results of these reviews shall be submitted to the CDOT/PM within one week of the review.
- C. Identify Design Criteria: Submit a copy of Appendix B - Specific Design Criteria with the appropriate items completed.
- D. Initiate Survey: Arrange Preliminary Field Survey and/or Aerial Survey. CDOT Form 1217a is an outline of a complete survey request and may be used as a guide for completing the survey plan.
- E. Traffic Control: Consultant field activities that interfere with traffic operations within existing roadways will require control of traffic. The Consultant shall plan and provide any required traffic control for the survey, testing, or the design process. Traffic control operations will be in accordance with the MUTCD. The proposed Method for Handling Traffic (MHT) must be submitted to the CDOT/PM. Also, certification of the Traffic Control Supervisor as a Worksite Traffic Supervisor by the American Traffic Safety Services Association (ATSSA) or as a TCS (Traffic Control Supervisor) by the Colorado Contractors Association (CCA) shall be required.

7.2 PROJECT DEVELOPMENT

- A. **Survey:** Surveys will be conducted in accordance with the CDOT Survey Manual, the latest addendum thereof, and applicable state statutes. The completed survey shall be reviewed by the Region survey unit. Two weeks should be provided in the schedule to complete the review and sufficient time should be provided to address all comments provided by this review. Design shall not proceed until all comments resulting from this review have been satisfactorily addressed.
 - 1. Pre-survey Conference: A pre-survey conference shall be held. The consultant shall attend the Pre-survey conference prior to any right of way or survey work
 - 2. Survey Data Research: Research shall be done as per current CDOT manuals
 - 3. Project Control Survey:
 - a. Locate or Establish HARN Stations: Project control shall be tied to the nearest Colorado High Accuracy Reference Network Station (HARN). In the event there are no HARN stations within 3 miles of the project (Order B, 1:1,000,000 accuracy), or HARN Densification (Order B-2, 1:500,000 accuracy), additional HARN Densification stations shall be set. NGS Blue Book procedures shall be followed for all HARN Densification stations. This will include proper spacing using proper monumentation, equipment, observation procedures, coordination through the Colorado State Geodetic Advisor and submission to NGS for inclusion in the National Database.
 - b. Monumentation: Materials will be supplied by CDOT. Care is to be taken to install said monumentation in locations that are readily usable for the project and in a safe location so that they can be utilized throughout construction (no monumentation shall be set on or near the centerline of the proposed roadway).
 - c. Local Project Control: Survey the required project control (centerline/baselines and elevation reference) as required. Prepare a control survey diagram showing graphical

- representation of all monuments used for control. Tabulate coordinates and physical descriptions of all found monuments and other physical evidence.
4. Land Survey/Boundary Survey: Tie aliquot, property and other land monuments to the control survey. Prepare a Land Survey Control Diagram showing graphical representation of all found aliquot, property and land monuments and their relationship to the project control. Tabulate the coordinates and physical description of all found monuments and other physical evidence.
 5. TMOSS (Topographic) Survey: Collect the data required to produce a planimetric map and submit in TMOSS format. Features located will include, but not be limited to signs, mailboxes, fences, driveways, curb cuts, curbs, sidewalks, and edges of pavements. Horizontal accuracy shall be as specified for a CDOT class C or D TMOSS survey.
 6. Terrain (Relief or Elevation) Survey: Collect elevation data and submit in TMOSS format. Natural ground elevations shall be as specified.
 7. Utility Survey: Locate utility poles, manholes, valves, pedestals, guy wires, and other visible utility features. Survey underground utilities as marked by the utility companies. Determine invert elevations of manholes and vaults and survey the locations of utilities exposed by "potholing".
 8. Hydraulic Survey: Locate existing culverts, storm sewers, inlets, vaults, manholes, PWQ structures, and determine invert and rim elevations and sizes and materials. Accomplish existing drainage site surveys for designated culverts and bridges in accordance with the Drainage Design Manual.
 9. Material Sources: Survey designated material sources as specified.
 10. Supplemental Surveying: As required and specifically requested.
 11. Survey Report: Prepare a Survey Report as required in the Survey Manual.
 12. Photogrammetry:
 - a. Camera Calibration Report
 - b. Flight Plan
 - c. Flight
 - d. Contact Prints
 - e. Negatives
 - f. Enlargements
 - g. Photo Index
 - h. Supplemental Survey (wing points)
 - i. Data Reduction
 - i. Topographic Contours
 - ii. Planimetric (Topography)
 - j. Map Compilation
 - i. Index Maps
 - ii. Finished Maps
 - k. Accuracy Tests: Tests are to be performed on a regular basis throughout the project by the consultant.
 13. Review by Professional Land Surveyor: The accuracy tests are to be reviewed by the PLS in responsible charge for the project, and submitted to the project engineer and made part of the project records. Further review of all aspects of the field and office work shall also be the responsibility of the PLS in responsible charge.

7.3 PRELIMINARY DESIGN

A. Traffic Engineering

1. Review locations with "potential for accident reduction map" and or traffic operations analysis and or the safety assessment report as provided by CDOT to determine which safety improvements will be incorporated into the project.
2. Analyze the proposed project design with the traffic projection data
3. Recommend the appropriate geometry (i.e., number of lanes, auxiliary lanes, storage lengths, weaving distances, etc.) in accordance with the current version of Highway Capacity Manual.
4. The proposed design shall be reviewed to ensure compatibility with existing signing procedures throughout the preliminary roadway design process

5. Use traffic data appropriate to the anticipated construction timing in developing detour alternatives.
6. Develop the total ESAL for the design life and submit to the CDOT/PM for the pavement design.
7. Submit the traffic data and recommendations to the CDOT/PM for review.

B. Materials Engineering: A preliminary soil investigation should be conducted.

1. Determine test hole locations (horizontal and vertical) and coordinate with the CDOT/PM.
2. Collect soil samples and test for:
 - a. Classification
 - b. Moisture – Density Relationship
 - c. Resistance Value
 - d. Corrosiveness – Note locations of high corrosiveness with recommendations; see CDOT pipe material selection policy.
 - e. Bearing Capacity
3. Prepare and submit a soils investigation report.
4. Prepare and submit pipe material selection report.

C. Pavement

1. New Pavement Structure: The feasible alternatives of new pavement structure shall be designed utilizing procedures outlined in the 2020 M-E Pavement Design Manual. New pavement designs for widening shall be compatible with adjacent rehabilitated existing pavement. Tie-ins for structure approaches shall include a minimum 100' mill and overlay beyond the new pavement.
 - a. Perform a distress survey
 - i. Determine the types of distress present in the pavement
 - ii. Determine the extent of each distress type
 - iii. Develop a distress map for the existing pavement
 - iv. Determine the causes of the existing distress utilizing tests and required analyses.
 - v. Determine the drainage conditions of the existing surface and subsurface
 - b. Investigate the existing pavement structure
 - i. Subgrade: soil classifications, moisture/density relationship, resistance value and corrosiveness
 - ii. Base: thickness, gradation, plasticity index, liquid limit, resistance value, strength coefficient
 - iii. Pavement: thickness, strength coefficient
2. Pavement Design Report: Include all the above tests, investigations, analyses, and calculations performed. Submit to the CDOT/PM for acceptance.

D. Existing Structures and Foundation

1. Existing bridge condition investigation: Determine condition of existing bridge deck, superstructure and substructure material as required.
2. Foundation Investigation Report
 - a. Prepare a Foundation Investigation Request showing requested test hole locations.
 - b. Formulate drilling pattern, perform the necessary subsurface investigation and collect samples as required.
 - c. Perform the appropriate laboratory tests and analyze the data. Determine strength, allowable bearing capacity and corrosiveness of foundation material.
 - d. Perform lateral analyses (deformation, moment, and shear) for the caissons and/or piles which are subjected to lateral loadings if appropriate. This may be a computer analysis which will consider the group effect and selection of the soil parameters.
 - e. If appropriate, a pile driving analysis using a wave equation will be accomplished.
 - f. Submit the Foundation Investigation Report to the CDOT/PM for approval.
 - g. Prepare engineering geology plan sheet and copies of the Foundation Investigation Report foundation report with recommendations for bearing capacities or type, size, and tip (bottom) elevation of the required foundation. Specify if pre-drilling, pile tip, casing, dewatering, etc., are needed for foundation construction.

E. Hydrology/Hydraulic Engineering

1. Data Collection and Hydrology

- a. Establish drainage basin data: delineate and determine size, waterway geometrics, vegetation cover, and land use.
- b. Collect historical data: research flood history and previous designs in the project proximity; obtain data from other sources (e.g., UDFCD, CWCB, CDOT Maintenance, and local residents).
- c. Complete a project site visit to evaluate channel/overbank roughness coefficients, channel stability, vegetation, condition/adequacy of existing structures, Ordinary High Water, allowable high water, etc. Document the site visit(s) with photos.
- d. Select a design storm frequency based on the established criteria.
- e. Complete a hydrological analysis using existing studies or approved methods.
- f. Perform a risk analysis.

2. Hydraulics

- a. Complete preliminary design of minor drainage structures:
 - i. Determine locations, sizes, and alignment based on preliminary hydraulic design. Identify locations by highway station or coordinates, as appropriate.
 - ii. Determine the allowable headwater.
 - iii. Assess the degree of sediment and debris problems to be encountered
 - iv. Assess abrasion and corrosion levels based on CDOT Pipe Material Selection Policy.
 - v. Prepare preliminary structure cross-sections and determine elevations, flow lines, slopes and lengths of the structures.
- b. Complete preliminary design of major drainage structures:
 - i. Complete hydraulic analysis and water surface profiles.
 - ii. Determine required hydraulic size/skew of major structures/channels
 - iii. Determine minimum low chord elevation per CDOT criteria
 - iv. Determine design storm and 500-year water surface elevations.
 - v. Determine scour for design storm and 500-year event
 - vi. Assess channel erosion protection for structures.
- c. Complete preliminary design for PWQ CMs and outlet structures with details as needed. Adequate detail should be included in the FIR construction plan set if FIR-level decisions are required with respect to right-of-way, easements, maintenance, etc. to move to final design.
- d. If required, identify and assist CDOT in coordinating potential funding participation of local municipalities or agencies.

3. Prepare preliminary construction plans that include:

- a. Drainage Plan Sheets
- b. Drainage Detail Sheets as needed

4. Prepare preliminary Hydraulic Design Report in accordance with the CDOT Drainage Design Manual

- a. Introduction, Hydrology, Existing Structures and Design Discussion sections should be close to final at this level. Design Discussion should include CDOT and local criteria the project intends to meet.
- b. Recommended design should be preliminary at this level and progress through final design.
- c. All design assumptions and related design decisions shall be documented.
- d. The Appendix shall contain:
 - i. Drainage basin maps
 - ii. Hydrology/hydraulic worksheets
 - iii. Drainage construction plan sheets.
 - iv. CDOT pipe material selection documentation
 - v. Water Quality report and PWQ worksheets

5. Perform internal QA/QC prior to submittal to CDOT.

6. Perform in person and virtual, Hydrology and Hydraulic Engineering, On-the-Job (OJT) training to CDOT Engineer(s) in Training.

F. Environmental – Water Quality

1. Storm Water Management Plan: Initiate a Storm Water Management Plan in accordance with:
 - a. Municipal Separate Storm Sewer Systems (MS4)
 - b. CDPHE’s Construction Discharge Permit System requirements
 - c. CDOT’s Erosion Control and Storm Water Quality Guide
 - d. Local agency SWMP/GESC/EC requirements
 - e. CDOT’s Standard Specifications
 - f. CDOT Standard Plans
 - g. Other appropriate documents
2. Prepare preliminary Permanent Water Quality (PWQ) plans in conjunction with Section 7.C.5.b.iii of this document.
 - a. Determine PWQ requirements (local agency MS4 requirements, CDOT requirements, etc.)
 - b. Develop PWQ alternatives that will meet CDOT and local agency MS4 requirements
 - c. Identify right-of-way requirements and utility impacts for alternatives
 - d. Identify all entities and
 - e. Other appropriate documents
3. Prepare preliminary water quality report as an appendix to the Hydraulic Design Report to include PWQ Evaluation and Tracking Forms, cost estimate for PWQ CMs, etc.
4. Conduct a PWQ meeting just prior to FIR to discuss alternatives with CDOT PWQ Specialist/Water Pollution Control Manager, Hydraulics Engineer, and Project manager.
5. Perform internal QA/QC prior to submittal to CDOT.

G. Utility Coordination

1. Location Maps: Obtain utility location maps from the Utility Companies which identify utility features in the project area. Requests and receipt of maps will be coordinated with the Region Utility Manager via copies of request and transmittal letters.
- 2.. Reviews and Investigations: Conduct field reviews and utility investigations with the Region Utility Manager and Utility companies, as required, to ensure correct horizontal and vertical utility data. When possible this will be done utilizing non-destructive investigative techniques. Potholing may be necessary to identify utilities in conflict with design or construction (SUE Quality Level A). All other utility survey to SUE Quality Level B. The horizontal and vertical locations will be shown in the plans and cross sections. When “potholing” is required, the Consultant shall be responsible for all necessary excavations.
3. Incorporate utility locations in plans from utility survey
4. Relocation Recommendations: Submit necessary information for the relocation or adjustments of affected utilities to the Region Utility Manager. Work with the Region Utility Manager to process the required agreements. Including but not limited to Utility Relocation Agreements (URA).
5. Ditch Company Coordination: Contact ditch companies through the Region Utility Engineer to coordinate ditch requirements and restrictions. Develop the plans for the necessary irrigation structures and submit to the Region Utility Engineer for Ditch Company review.

H. Roadway Design and Roadside Development: Coordinate all design activities with required CDOT specialty units and other outside entities.

1. Roadway Design
 - a. Input, check, and plot survey data
 - b. Verify that a project specific coordinate system approved by CDOT is used to identify the horizontal locations of key points. The coordinate systems used for roadway design and ROW shall be compatible.

- c. Input and check horizontal and vertical alignments against all design criteria. Necessary variances and/or design decisions will be identified with justification and concurrence by CDOT & FHWA.
- d. Provide alignments, toes of slope and pertinent design features, including permanent and temporary impacts, to the ROW, Utility and Environmental Managers.
- e. Plot/develop all required information on the plans in accordance with all applicable CDOT policies and procedures.
- f. Using current approved CDOT software, generate a 3 dimensional design model and produce preliminary quantities.

I. Right-of-Way: The following work shall be done by, or under the immediate supervision of, a Professional Land Surveyor (PLS). The following work may be included as part of a Surveying contract or part of a Right-of-Way plans preparation contract.

1. Research
 - a. Identify affected ownership from preliminary design plans
 - b. Obtain assessor's maps for the project
 - c. Locate documents which transfer title
 - d. Prepare chain of title as described in the manual or as directed by the CDOT Project Manager
 - e. Look for encumbrances, liens, releases, etc.
 - f. Make physical inspection of property. Note any physical evidence of apparent easements, wells, ditches, ingress, and egress
 - g. Check with local entities such as the County Road Department or County Engineer for location of existing roads or easements
 - h. Check for and obtain latest subdivision plats and vacations of streets

2. Ownership Map: For additional detail on required drafting software, see Section 8 Submittals. Project coordinate system ownership map shall be submitted along with a "Project Narrative".
 - a. Review preliminary design and survey report.
 - b. Review project coordinate system and basis of bearing from Control Survey prior to calculations
 - c. Compute alignment of ROW centerline and store coordinates of all found monuments within the first tier of properties left and right of Centerline
 - d. Review ownership documents (Memoranda of Ownership and/or title commitments, deeds and supporting plats)
 - e. Calculate coordinates of lost or obliterated aliquot corners using guidelines established by the Bureau of Land Management. (To be used in resetting corners according to Colorado Revised Statutes)
 - f. Establish subdivisions of sections using Bureau of Land Management Guidelines. Show all section lines and 1/4 section lines on the ownership map and ROW plans
 - g. Determine existing Right-of-Way limits from deeds of record, CDOT plans and found ROW markers. Previous Right-of-Way plans, if available, will be provided by CDOT as an aid
 - h. Determine ownerships and their property boundary locations. Locate the intersection of these property boundary lines with the existing CDOT Right-of-Way. Determine location and ownership of existing easements of record.
 - i. Secure additional property ties and additional topography where the highway improvement may affect improvements adjacent to the Right-of-Way. This additional topography should include:
 - i. Proximate buildings, sheds, etc.
 - ii. Underground cables and conduits
 - iii. Wells
 - iv. Irrigation ditches and systems
 - v. Septic tanks, cesspools, and leaching fields
 - vi. Landscaping
 - vii. Other

- viii. Reconcile overlaps and gaps in ownerships as required by CDOT, documenting method used (may require additional field work). Include reasons for decisions in the “Project Narrative”.
- j. Plot OWNERSHIP MAP. If entire ownership will not fit on the sheet at this scale, an additional abbreviated OWNERSHIP MAP may be used at a scale of 1”=1 mile, or other suitable scale, to show the configuration of large ownerships. Metric equivalents may be required.
- k. Label all monuments found with description of monument and project coordinates (from Control Survey Diagram)
- l. Show improvements and topography within the ownerships and existing access to the street/county road system.
- m. Number ownerships alternately as they occur along the centerline from south to north or west to east in the same direction as the stationing. Show current names of owners and lessees
- n. Calculate the total area of all ownerships affected, including coordinates of all property corners. Deduct areas for existing road Rights-of-Way. Bearings and distances do not need to be shown on 1” = 1 mile abbreviated OWNERSHIP MAPS
- o. Different land uses within a property should be cross-hatched or shaded.
- p. In the lower right corner of the OWNERSHIP MAP, show seal, number and name of Professional Land Surveyor supervising the work
- q. Transmit finished reproducible OWNERSHIP MAP, electronic drawing files, and Memoranda of Ownership to CDOT along with all calculations, field notes, and supporting data. The OWNERSHIP MAP will include a copy of the control and monumentation sheet

J. Major/Minor Structural Design: Major structures are bridges and culverts with a total length greater than twenty feet or retaining walls with a total length greater than one hundred feet and a maximum exposed height at any section of over five feet. This length is measured along centerline of roadway for bridges and culverts, and along the top of wall for retaining walls. Overhead sign structures (sign bridges, cantilevers, and butterflies extending over traffic) are also major structures, but are exempt from the structure preliminary design activity defined here. The CDOT Structure Reviewer will participate in coordinating this activity.

- 1. Structural Data Collection
 - a. Obtain the structure site data. The following data, as applicable, shall be collected: (Typical roadway section, roadway plan and profile sheets showing all alignment data, topography, utilities, preliminary design plan) Right-of-Way restrictions, preliminary hydraulics and geology information, environmental constraints, lighting requirements, guardrail types, recommendations for structure type, and architectural recommendations.
 - b. Obtain data on existing structures. When applicable, collect items such as existing plans, inspection reports, structure ratings, foundation information, and shop drawings. A field investigation of existing structures will be made with notification to the Resident Engineer.
- 2. Structure Selection and Layout
 - a. Review the structure site data to determine the requirements that will control the structure size, layout, type, and rehabilitation alternatives. On a continuing basis, provide support data and recommendations as necessary to finalize the structure site data.
 - b. Determine the structure layout alternatives. For bridges, determine the structure length, width, and span configurations that satisfy all horizontal and vertical clearance criteria. For walls, determine the necessary top and bottom of wall profiles.
 - c. Determine the structure type alternatives. For bridges, consider precast and cast-in-place concrete and steel superstructures and determine the spans and depths for each. For walls, determine the feasible wall types.
 - d. Determine the foundation alternatives. Consider piles, drilled caissons, spread footings, and mechanically stabilized earth foundations based on geology information from existing structures and early estimates from the project geologist. To obtain supporting

- information, initiate the foundation investigation as early as possible during the preliminary design phase.
- e. Determine the rehabilitation alternatives. Continued use of all or parts of existing structures shall be considered as applicable. The condition of existing structures shall be investigated and reported. Determine the modifications and rehabilitation necessary to use all or parts of existing structures and the associated costs.
 - f. Develop the staged construction phasing plan, as necessary for traffic control and detours, in conjunction with the parties performing the roadway design and traffic control plan. The impact of staged construction on the structure alternatives shall be considered and reported on.
 - g. Compute preliminary quantities and preliminary cost estimates as necessary to evaluate and compare the structure layout, type, and rehabilitation alternatives.
 - h. Evaluate the structure alternatives. Establish the criteria for evaluating and comparing the structure alternatives that, in addition to cost, encompass all aspects of the project's objectives. Based on these criteria, select the optimum structure layout, type, and rehabilitation alternative, as applicable, for recommendation to CDOT.
 - i. Prepare preliminary general layout for the recommended structure. Prepare structure layouts in accordance with current standards. Special detail drawings and a detailed preliminary cost estimate shall accompany the general layout. The special detail drawings shall include the architectural treatment. Perform an independent design and detail check of the general layout.
3. Structure Selection Report: Prepare a structure selection report to document, and obtain approval for, the structure preliminary design. By means of the structure general layout, with supporting drawings, tables, and discussion, provide for the following:
 - a. Summarize the structure site data used to select and layout the structures. Include the following:
 - i. Existing structure data, including sufficiency rating and whether or not the structure is on the "select list".
 - ii. Project site plan
 - iii. Roadway vertical and horizontal alignments and cross sections at the structure
 - iv. Construction phasing
 - v. Utilities on, below, and adjacent to the structure
 - vi. Hydraulics:
 - vii. Channel size and skew, design year frequency, minimum low girder elevation, design year and 500-year high water elevations, estimated design year and 500-year scour profiles, and channel erosion protection
 - viii. Preliminary geology information for structure foundation
 - ix. Architectural requirements
 - b. Report on the structure selection and layout process. Include the following:
 - i. Discuss the structure layout, type, and rehabilitation alternatives considered
 - ii. Define the criteria used to evaluate the structure alternatives and how the recommended structure was selected
 - iii. Provide a detailed preliminary cost estimate and general layout of the recommended structure
 - c. Obtain acceptance by CDOT on the recommended structure and its layout. Allow approximately two weeks for review of the structure selection report. The associated general layout, with the revisions required by the CDOT review, will be included in the RFP plans. The structure selection report, with the associated general layout, must be accepted in writing by CDOT prior to the commencement of further design activities.
 4. Foundation Investigation Request: Initiate the foundation investigation as early in the preliminary design phase as is practical. On plan sheets showing the project control line, its stations and coordinates, utilities, identify the test holes needed and submit them to the project geologist. The available general layout information for the new structure shall be included in the investigation request.

K. Construction Phasing Plan: A construction phasing plan shall be developed for all projects which integrates the construction of all the project work elements into a practical and feasible sequence. This plan shall accommodate the existing traffic movements during construction (detours). A preliminary traffic control plan will also be developed which will be compatible with the phasing plan.

7.4 PROJECT MANAGEMENT SUPPORT

A. Design Control

1. Provide the required staff, communication equipment and computer systems with appropriate software for tracking and monitoring the planning efforts.
2. Conduct periodic corridor progress meetings at an interval acceptable to the CDOT/PM. The following shall be reviewed:
 - a. Activities complete since the last meeting
 - b. Problems encountered
 - c. Late activities
 - d. Activities required by the next progress meeting
 - e. Solutions for unresolved and anticipated problems
 - f. Information or items required from other agencies
3. Develop a quality assurance program that ensures correct error-free plans are produced by the project designers.
4. The consultant shall coordinate the technical aspects of the planning efforts such as:
 - a. Ensuring that the separate projects all utilize the same reference and data base for horizontal and vertical control.
 - b. Bearings, coordinates, grades and elevations are identical for common control lines on separate projects.
 - c. Earthwork balance is accomplished where appropriate

B. Information Services

1. Provide a management information system to monitor and report progress. This System will include a computer terminal and/or software for the CDOT/PM that the consultant shall furnish and maintain. This system will:
 - a. Provide access to current project data and status (e.g., progress versus schedules and cost estimates versus budgeted funds)
 - b. Include the project schedules for submittals and key events
 - c. Identify progress with respect to the schedules
 - d. Identify critical path activities
 - e. Provide upon demand the scheduled submittals/key events for designated time periods
2. Produce and periodically update a strip map which outlines the entire corridor. The Information Shown on this Map will Include the following:
 - a. Preliminary engineering project limits
 - b. Construction project limits
 - c. Construction project estimated costs
 - e. Other information that is considered appropriate

C. Budget Planning Support

1. Maintain a current file of project cost estimates. The date and type of each estimate will be identified.
2. Maintain a current file of existing and proposed funding for projects. Types of funding sources will be identified.
3. Develop a proposed ad schedule based on the estimated costs and the existing and anticipated future funding. The proposed ad schedule will be compared to the design schedule. Adjustments to the design and ad schedules may be made with CDOT concurrence.
4. A continuing evaluation of cash flow requirements and drawdown schedules administrative, preliminary engineering, right-of-way, utility, and construction costs will be accomplished. The funding requirements will be compared with the budget, also on a continuing basis. CDOT will be notified immediately of changes in funding requirements. (this will be completed when needed)

SECTION 8

CONTRACT CONCLUSION (CHECKLIST)

8.1 SUPPLEMENTAL WORK

This contract may be supplemented for:

- A. Preliminary Design
- B. Procurement Document Preparation

8.2 CONTRACT COMPLETION

This Contract will be satisfied upon acceptance of the following items if applicable:

- A. Project Schedule
- B. Project Progress Meeting Minutes
- C. Traffic Control Plan(s)
- D. All documents found in research
- Q. Completion of review of contract submittals
- R. Design Plans, Specifications, and Estimates
- T. Utility Clearances, Relocation Agreements, and Subsurface Utility Engineering (SUE)
Quality Level B
- U. Hydraulic Design Report (signed and sealed)
- W. Structural Report (signed and sealed)
- X. Geotechnical Report (signed and sealed)
- Y. Materials Report, including Pavement Selection Report (signed and sealed)

APPENDIX A REFERENCES

1. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) PUBLICATIONS (using latest approved versions):

- A. A Policy on Design Standards-Interstate System
- B. A Policy on Geometric Design of Highways and Streets
- C. Guide for Design of Pavement Structures
- D. Standard Specifications for Highway Bridges
- E. Guide for the Design of High Occupancy Vehicle and Public Transfer Facilities
- F. Guide for the Development of Bicycle Facilities
- G. Standard Specifications for Transportation Materials and Methods of Sampling and Testing – Part I, Specifications and Part II, Tests
- H. Highway Design and Operational Practices Related to Highway Safety
- I. Roadside Design Guide
- J. Load Resistance Factor Design (LRFD) Specifications

2. COLORADO DEPARTMENT OF TRANSPORTATION PUBLICATIONS (using latest approved versions):

- A. CDOT Design Build Manual
- B. Design Guide (all volumes)
- C. Bridge Design Manual
- D. Bridge Detailing Manual
- E. Lighting Design Guide
- F. Bridge Rating Manual
- G. Project Development Manual
- H. Erosion Control and Stormwater Quality Guide
- I. Field Log of Structures
- J. Cost Data Book
- K. Drainage Design Manual
- L. NEPA Manual
- M. Environmental Stewardship Guide
- N. Quality Manual
- O. Survey Manual
- P. Field Materials Manual
- Q. Standard Plans, M & S Standards
- R. Standard Specifications for Road and Bridge Construction and Supplemental Specifications

- S. Item Description and Abbreviations (with code number) compiled by Engineering Estimates and Market Analysis Unit (“Item Book”)
- T. Right-of-Way Manual
- U. The State Highway Access Code
- V. Utility Manual
- W. TMOSS Generic Format
- X. Field TMOSS Topography Coding
- Y. Topography Modeling Survey System User Manual
- Z. Interactive Graphics System Symbol Table

3. CDOT PROCEDURAL DIRECTIVES (using latest approved versions):

- A. No. 27.1 Social Marketing – Use of Web 2.0 and Similar Applications
- B. No. 31.1 Web Site Development
- C. No. 400.2 Monitoring Consultant Contracts
- D. No. 501.2 Cooperative Storm Drainage System
- E. No. 514.1 Field Inspection Review (FIR)
- F. No. 516.1 Final Office Review (FOR)
- G. No. 1217a Survey Request
- H. No. 1304.1 Right-of-Way Plan Revisions
- I. No. 1305.1 Land Surveys
- J. No. 1502.1 Traffic Control for Planned and Unplanned Work
- K. No. 1502.2 Temporary Reduction in Speed Limits
- L. No. 1601 Interchange Approval Process
- M. No. 1700.1 Certification Acceptance (CA) Procedures for Location and Design Approval
- N. No. 1700.3 Plans, Specifications and Estimates (PS&E) and Authorization to Advertise for Bids under Certifications Acceptance (CA)
- O. No. 1700.5 Local Entity/State Contracts and Local Entity/Consultant Contracts and Local Entity/R.R. Contracts under C.A
- P. No. 1700.6 Railroad/Highway Contracts (Under Certification Acceptance)
- Q. No. 1905.1 Preparation of Plans and Specifications for Structures prepared by Staff Bridge Branch

4. FEDERAL PUBLICATIONS (using latest approved versions):

- A. Manual on Uniform Traffic Control Devices
- B. Highway Capacity Manual
- C. Urban Transportation Operations Training – Design of Urban Streets, Student Workbook
- D. Reference Guide Outline – Specifications for Aerial Surveys and Mapping by Photogrammetric Methods for Highways

- E. Executive Order 12898
- F. Executive Order 11988 & 13690 FHWA Federal-Aid Policy Guide
- G. FHWA NHI Hydraulic Circular (HEC) and Hydraulic Design Series (HDS) Reports
- H. Technical Advisory T6640.8A
- I. U.S. Department of Transportation Order 5610.1E
- J. Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques
- K. ADAAG Americans with Disabilities Act Accessibility Guidelines
- L. 23 CFR 771, the FHWA Technical Advisory T6640.8A
- M. 44 CFR 59-72, standards of the National Flood Insurance Program (NFIP)

5. AREA:

- A. Manual for Railway Engineering
- B. Urban Storm Drainage Criteria Manual (UDFCD)
- C. Any appropriate local agencies references as appropriate

APPENDIX B SPECIFIC DESIGN CRITERIA

Note: The following criteria will be developed by the consultant and coordinated with the CDOT/PM prior to starting the design. The Consultant shall develop the CDOT Form 463 and insert a copy upon completion.

1. ROADWAY

A. BASIC DESIGN

The basis for design will be the data in CDOT Form 463, Design Data. A copy of the latest applicable design Data form will be furnished to the consultant.

B. GEOMETRIC AND STRUCTURE STANDARDS:

- a Design Speed, horizontal alignment, curvature, vertical alignment, sight distance and superelevation is specified in Form 463.
- b Use of Spirals –
- c Passing Sight Distance -
- d Decision Sight Distance -
- e Frontage Roads, Separation Width -
- f CDOT Access Code -
- g Airway – Highway Clearances Design Guide -
- h Bridges and Grade Separation Structures, Clearances to Structures and Obstructions, CDOT Design Guide -
- i Curb and Gutters, Type -

C. GEOMETRIC CROSS SECTION are as specified in Form 463

D. INTERSECTIONS AT GRADE:

- a. Type -
- b. Special Considerations –

E. TRAFFIC INTERCHANGES:

- a. Type –
- b. Ramp Type –
- c. Special Considerations –

F. DESIGN OF PAVEMENT STRUCTURE:

- a. Pavement Type & Percent Trucks are as specified in Form 463-
- b. Economic Analysis Period –
- c. Design Life –

G. MISCELLANEOUS DESIGN CONSIDERATIONS:

- a. Fence Type -
- b. FEMA Flood Zone –
- c. Design Flood Frequency -

H. ROADSIDE DEVELOPMENT

- a. Bike and Pedestrian facilities -
- b. Specifications for Revegetating Disturbed Areas to be provided by CDOT
- c. Noise Control -
- d. Type -
- e. Guardrail and End Treatments -

I. LIGHTING:

APPENDIX C DEFINITIONS

Note: For other definitions and terms, refer to Section 101 of the CDOT Standard Specifications for Road and Bridge Construction and the CDOT Design Guide.

| | | |
|----|----------|---|
| 1 | AASHTO | American Association of State Highway & Transportation Officials |
| 2 | ADT | Average two-way 24-hour Traffic in Number of Vehicles |
| 3 | AREA | American Railway Engineering Association |
| 4 | ASTM | American Society for Testing and Materials |
| 5 | ATSSA | American Traffic Safety Services Association |
| 6 | ADAAG | Americans with Disabilities Accessibility Act Guidelines |
| 7 | BAFO | Best and Final Offer |
| 8 | BAMS | Bid Analysis and Management Systems |
| 9 | BFE | Base Flood Elevation |
| 10 | BLM | Bureau of Land Management |
| 11 | BNSF | Burlington Northern Santa Fe Railroad |
| 12 | CA | Contract Administrator – The CDOT Manager responsible for the satisfactory completion of the contract by the consultant. |
| 13 | CAP | CDOT’s Action Plan |
| 14 | CatEx | Categorical Exclusion |
| 15 | CBC | Concrete Box Culvert |
| 16 | CBE | Colorado Bridge Enterprise |
| 17 | CCA | Colorado Contractors Association |
| 18 | CDOT | Colorado Department of Transportation |
| 19 | CDOT/PM | Colorado Department of Transportation Project Manager – The CDOT Engineer responsible for the day to day direction and CDOT Consultant coordination of the design effort (as defined in Section 2 of this document) |
| 20 | CDOT/STR | Colorado Department of Transportation Structure Reviewer – The CDOT Engineer responsible for reviewing and coordinating major structural design |
| 21 | CDPHE | Colorado Department of Public Health and Environment |
| 22 | CEQ | Council on Environmental Quality |
| 23 | CLOMR | Conditional Letter of Map Revision |

| | | |
|----|------------------------|--|
| 24 | COG | Council of Governments |
| 25 | COGO | Coordinate Geometry Output |
| 26 | CONSULTANT | Consultant for the project |
| 27 | CONTRACT ADMINISTRATOR | Typically a Region Engineer or Branch Head. The CDOT employee directly responsible for the satisfactory completion of the contract by the Consultant. The contract administration is usually delegated to a CDOT Project Manager (as defined in Section 2 of this document). |
| 28 | C/PM | Consultant Project Manager – The Consultant Engineer responsible for combining the various inputs in the process of completing the project plans and managing the Consultant design effort. |
| 29 | CWCB | Colorado Water Conservation Board |
| 30 | DB | Design Build |
| 31 | DBB | Design Bid Build |
| 32 | DEIS | Draft Environmental Impact Statement |
| 33 | DHV | Future Design Hourly Volume (two-way unless specified otherwise) |
| 34 | EA | Environmental Assessment |
| 35 | EIS | Environmental Impact Statement |
| 36 | EPB | Environmental Programs Branch |
| 37 | ESAL | Equivalent Single Axle Load |
| 38 | ESE | Economic, Social and Environmental |
| 39 | FEIS | Final Environmental Impact Statement |
| 40 | FEMA | Federal Emergency Management Agency |
| 41 | FHPG | Federal Aid Highway Policy Guide |
| 42 | FHWA | Federal Highway Administration |
| 43 | FIPI | Finding In Public Interest |
| 44 | FIR | Field Inspection Review |
| 45 | FONSI | Finding of No Significant Impact |
| 46 | FOR | Final Office Review |
| 47 | GPS | Global Positioning System |
| 48 | ITP | Instructions to Proposers |
| 49 | LOMR | Letter of Map Revision |

| | | |
|----|---------------------|---|
| 50 | MAJOR STRUCTURES | Bridges and culverts with a total clear span length greater than twenty feet. This length is measured along the centerline of roadway for bridges and culverts, from abutment face to abutment face, retaining structures are measured along the horizontal distance along the top of the wall. Structures with exposed heights at any section over five feet and total lengths greater than a hundred feet as well as overhead structures including (bridge signs, cantilevers and butterflies extending over traffic) are also considered major structures. |
| 51 | MPO | Metropolitan Planning Organization (i.e. Denver Regional Council of Governments, Pikes Peak Area Council of Governments, Grand Junction MPO, Pueblo MPO, and North Front Range Council of Governments). |
| 52 | MS4 | Municipal Separate Storm Sewer System |
| 53 | NEPA | National Environmental Policy Act |
| 54 | NFIP | National Flood Insurance Program |
| 55 | NGS | National Geodetic Survey |
| 56 | NICET | National Institute for Certification in Technology |
| 57 | NOAA | National Oceanic and Atmospheric Administration |
| 58 | PAPER SIZES | See Computer-Aided Drafting Manual (CDOT); Table 6-13 and Table 8-1 |
| 59 | PE | Professional Engineer registered in Colorado |
| 60 | PM | Program Manager |
| 61 | PLS | Professional Land Surveyor registered in Colorado |
| 62 | PRT | Project Review Team |
| 63 | PS&E | Plans, Specifications and Estimate |
| 64 | PROJECT | The work defined by this scope |
| 65 | PWQ CM | Permanent Water Quality Control Measure |
| 66 | RFP | Request for Proposals |
| 67 | RFQ | Request for Qualifications |
| 68 | ROR | Region Office Review |
| 69 | ROW | Right-of-Way: A general term denoting land, property, or interest therein, usually in a strip acquired for or devoted to a highway |
| 70 | ROWPR | Right-of-Way Plan Review |
| 71 | RTD | Regional Transportation Director |
| 72 | T/E | Threatened and/or Endangered Species |
| 73 | SFHA | Special Flood Hazard Area |
| 74 | SH | State Highway Numbers |
| 75 | SUE | Subsurface Utility Engineering |

| | | |
|----|------------|---|
| 76 | SWMP | Stormwater Management Plan |
| 77 | TMOSS | Terrain Modeling Survey System |
| 78 | TOPOGRAPHY | In the context of CDOT plans, topography normally refers to existing cultural or manmade details. |
| 79 | UDFCD | Urban Drainage and Flood Control District |
| 80 | UP | Union Pacific Railroad |
| 81 | URA | Utility Relocation Agreement |
| 82 | USCOE | United States Army Corp of Engineers |