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BASIS OF DESIGN REPORT

ISSUE DATE: SEPT.20.2023

VERSION: 0

Kiewit | Massman | Traylor
a joint venture

VERSION HISTORY

VERSION NUMBER	PURPOSE DESCRIPTIONS	DATE
0	DRAFT Basis of Design Report	09/20/2023

Contents

0.0 GENERAL

0.1 INTRODUCTION

This Basis of Design Report (BOD) is a reference document developed by the design team for use by the design team. The purpose of the document is threefold:

1) To facilitate up-front planning prior to initiating a new design by identifying applicable standards and establishing high-level design philosophies.
2) To clearly, and thoroughly, document design decisions, analysis of alternatives including rationale for rejection of any alternative concepts, project-specific standards and specifications, supplemental sketches, details, and assumptions used during preconstruction.
3) As a living document throughout design development to reflect decisions and changes necessary to capture the scope and basis of the final design through the life of the project.

The BOD will serve as a single tool to capture relevant design information for the lifecycle the project. It is intended that each discipline reads or refers to the BOD for information pertaining to other disciplines to enhance coordination and design compatibility.

Pertinent information that is not native to the BOD are included as Appendices.

The audience of the BOD is engineering and design staff and leadership, but it may also be used as a reference by other non-engineering staff such as estimators and operating district project leadership.

The BOD is organized into three parts as described below:

Part 1 – Design Criteria, includes major sections that align with the technical sections of the project Technical Provisions (TP). Each technical section includes:

- Discipline Design Approach
- Design Constraints & Interfaces
- Design Criteria

Part 2 – Basis of Design, includes major sections that align with the technical sections of the project Technical Provisions (TP). Each technical section includes:

- General – Design Summary
- Design Optimization Strategy
- Design Exceptions
- Design Assumptions and Decisions
- Design Risks and Opportunities
- Design Quantities
- Deliverables Summary

Part 3 – Appendices, includes documents related to the development of Parts 1 and 2.

0.2 DESIGN TEAM

POSITION	NAME	INITIALS
Design Manager	John Kalvelage	
Deputy Design Manager	Matthew Reuer	
Deputy Design Manager	Nicholas Roberts	
Roadway Design Lead	Drew Davis	
Drainage Design Lead	Andrew James	
Landside Structures Design Lead	Lloyd Pitts	
Main Span & HLA Design Lead	Wally Jordan	
Geotech Design Lead	Michael Owens	
Utilities Design Lead	Marcus Stacey	
Environmental Design Lead	Paige Felts	
ITS Design Lead	James Schoen	
Landscape Architecture Lead	Oliver Boehm	
MOT Design Lead	Sylvie Gervais	
Bridge Architecture Lead	Donald MacDonald	
Traffic & Traffic Modeling Lead	James Thomas	
Security Lead	Daniel Renfroe	
Wind Analysis Lead	Ben Riley	

0.3 PROJECT GOALS

ALDOT's goals for the Project are identified below:

- Realize the benefits of progressive design-build project delivery, such as risk mitigation through early contractor involvement, collaborative project development, and reduction of the overall schedule for delivery of the Project;
- Add additional capacity along I-10 between Virginia Street in Mobile and the Mobile/Baldwin County line to alleviate traffic congestion and facilitate economic growth by constructing an aesthetically-pleasing cable-stay bridge with a minimum 100-year

service life and minimum 215-foot vertical clearance over the 600–foot wide Mobile River ship channel;

- Provide hazardous materials vehicles a path along I-10 so they are no longer required to detour through the Mobile Central Business District and Africatown community, minimize impacts to the maritime industry, and meet all commitments laid out in the environmental documentation and permitting;
- Coordinate with the design-builder of the Bayway Project;
- Uphold the trust of Stakeholders and the public in delivering the Project;
- Deliver the Project within ALDOT's budget; and
- Complete the Project within five years from the date of the execution of the Design-Build Agreement.

0.4 SCOPE OF WORK

0.4.1 Project Description

The improvements to be completed by the Design-Builder, Kiewit | Massman | Traylor, a Joint Venture (KMT), will include improvements on I-10 from Broad Street in Mobile to the Project Station 582+17.00, by providing a minimum of three continuous and unobstructed lanes per direction across the approaches and main span across the Mobile River, plus required operational, merge, acceleration, and deceleration lanes identified and provided in the Reference Information Documents (RIDs). In addition, the existing I-10 between Broad Street and the Wallace Tunnels and all required overpasses/underpasses, the Broad Street, Virginia Street, Texas Street, Canal/Water Street (at the West Tunnel Portal), and US-90/98 (at the East Tunnel Portal) interchanges. Interchange bridges at the East Tunnel Portal will be design and constructed under a rehabilitation scheme to meet a 40-year service life. As part of the Project, the Design-Builder will also be responsible for developing, designing, and constructing or demolishing, as applicable, the following improvements:

- Crossings for railroads owned by CSX and Canadian National/Illinois Central (CN/IC).
- Identified on and off ramps as depicted in the Reference Information Documents and modified interchanges. These on and off ramps will include all approaches and departures of the connectors to ensure existing connectors are preserved.
- Other potential related facilities necessary for connectivity, mobility, and safety, including drainage and utility coordination.
- Demolition of those existing corridor elements which are replaced as part of the Project.
- Such elements include bridges, ramps, portions of roadways, and roadway appurtenances.

ALDOT intends to procure a single Design-Builder, KMT, under a Design-Build Agreement (DBA) with two separately authorized phases as follows:

1. Preconstruction Phase; and
2. Construction Phase.

The Preconstruction Phase will be preceded by a limited-scope Early Design Works Agreement and will fully commence once the DBA is executed. The Preconstruction Phase is anticipated to commence in the fourth quarter of 2023 and conclude concurrently with the Construction Phase. The Construction Phase, if authorized, would follow based on schedules to be developed during the Project. Although the phases are generally consecutive, ALDOT may authorize certain elements of the work to proceed early to optimize the overall schedule.

0.4.2 Project Information

0.4.2.1 Environmental Status

KMT will be responsible for (i) obtaining permits and approvals needed for design and construction of the Project, except for those that the contract documents expressly make the responsibility of ALDOT; (ii) complying with mitigation requirements and other requirements or general conditions of permits or approvals; and (iii) except as otherwise provided in the contract documents, designing and constructing, and/or paying for required approval and permit modifications/mitigation after the initial approvals and permits are acquired.

FHWA approved the Combined Final Environmental Impact Statement/Record of Decision ("FEIS/ROD") for the proposed I-10 bridge over the Mobile River and new I-10 Bayway on August 15, 2019. ALDOT completed a Supplemental Draft Environmental Impact Statement ("SDEIS") to document changes made since the DEIS was signed in 2014. The SDEIS was signed by FHWA on March 26, 2019. A re-evaluation of the FEIS/ROD for changes made between the approval of the FEIS/ROD and issuance of the DBA will be completed by ALDOT. ALDOT intends to incorporate design changes proposed by the Design-Builder and approved by ALDOT in the re-evaluation of the FEIS/ROD, provided that incorporating such changes does not alter the timing of issuing the Amendment/NTP for construction. It is anticipated that additional Governmental Authorities, including, but not limited to, the USACE, USCG, the Federal Aviation Administration, United States Fish and Wildlife Service, National Marine Fisheries Service, Alabama Department of Environmental Management, and Alabama Department of Conservation and Natural Resources, will need to issue environmental permits and/or approvals for the Project. As identified in the FEIS/ROD, mitigation will be required to obtain permits and satisfy environmental commitments of the FEIS/ROD.

If KMT chooses to modify the data on which any permits or approvals are based or a permit or approval itself, a re-evaluation of the FEIS/ROD and modification of the mitigation requirements may be required.

The EIS required Phase III archeological investigations prior to ground disturbing activities. The field work for these investigations was completed by ALDOT, and KMT was given notice by email on 6/30/2023 that there are no restrictions on ground-disturbing activities due to archeological resources.

0.4.2.2 Right of Way (ROW) Acquisition

The Project ROW consists of the following; Planned Project ROW, Additional Project ROW, and Additional Non-ROW Properties. ALDOT has already acquired the majority of Planned Project ROW parcels necessary and has stated they will perform any remaining acquisitions after execution of the DBA. The terms governing these ROW acquisitions will be detailed as the project progresses.

If KMT determines it needs Additional Project ROW for its design solution, KMT will be responsible for such necessary ROW acquisition services per federal requirements included in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. Chapter 61), in 23 C.F.R. Part 710, and the Code of Alabama (1975). If additional parcel acquisition is necessary, KMT will engage a qualified consultant or consultants, including a ROW Manager, and will coordinate additional acquisition activities with ALDOT.

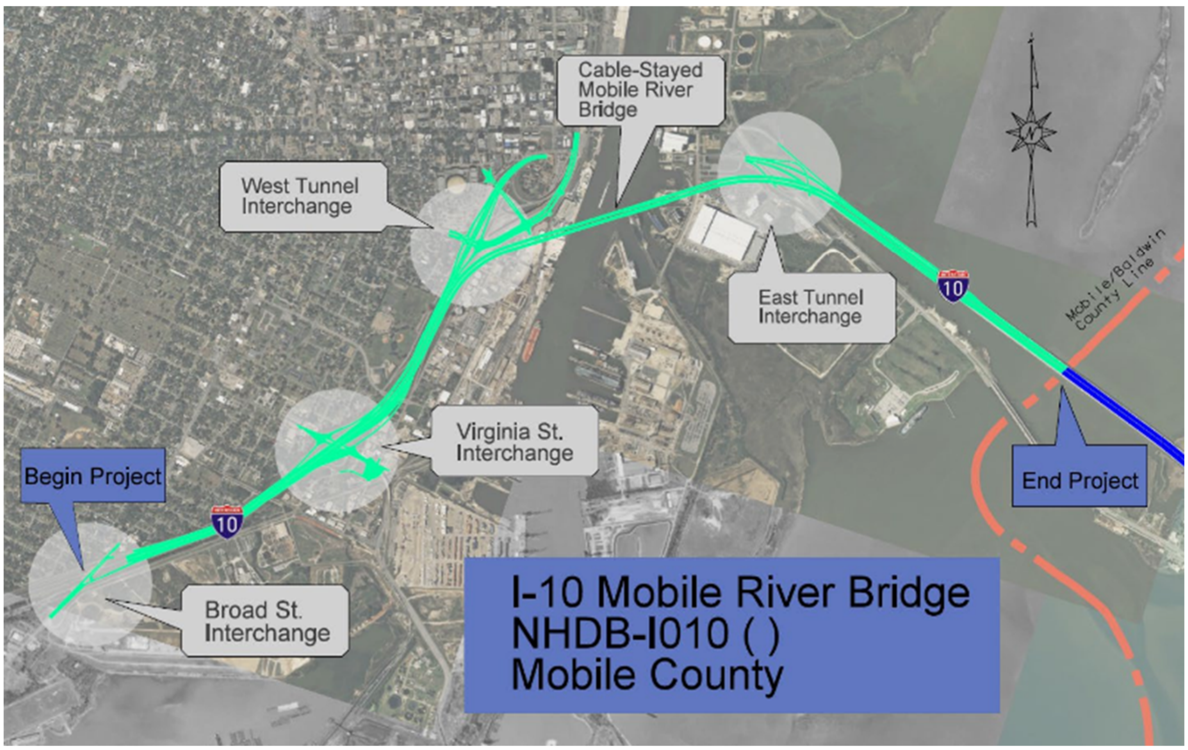

Figure 0-1. Mobile River Bridge Project

0.4.2.3 Geotechnical Exploration Program

KMT will be responsible for determining geotechnical data and testing, performing geotechnical investigations, and performing tests, analyses, and calculations. ALDOT has performed certain geotechnical exploration work regarding the Project. KMT will rely upon the ALDOT provided data and supplement with their own to complete the Geotechnical Exploration Plan.

0.4.2.4 Utility Investigation and Relocation

KMT will be responsible for coordinating utility relocation for the Project. The Utility Agreements will either specify that the Utility Owner will perform its own design and construction, or that KMT will perform design and construction. The agreements will be executed between KMT and each Utility Owner and will govern legal terms and conditions, design requirements and scope, cost, and schedule requirements. ALDOT has undertaken early utility coordination efforts, including: (i) creating a list of public and private utilities located along the corridor; (ii) creating a utility location map; and (iii) meeting with select major utilities that are anticipated to be impacted by the Project. ALDOT has obtained Subsurface Utility Engineering information for likely potential conflict areas, including pier locations and drainage outfalls along Madison Street, Canal Street, and Elmira Street. KMT is required through the Technical Provisions to perform SUE services in accordance ASCE 38-22 requirements, which will be performed during the Early Works and Preconstruction Phase.

0.4.2.5 Aesthetic Requirements

KMT will comply with the aesthetic guidelines established by the Aesthetic Steering Committee, which have been developed through coordination with ALDOT to establish attractive, yet functional and economical, aesthetic requirements for the Project. KMT will cooperate with ALDOT in continued coordination with the Aesthetics Steering Committee during the design phase to ensure designs are following the previously established requirements.

Parts of the Project, including the cable-stay Mobile River Bridge, will be constructed within the viewshed of existing historic resources as defined in 36 CFR Part 800. Reference Information Documents include aesthetic guidelines for the bridge to mitigate the Project’s visual impact on the historic areas.

The FEIS/ROD found that no city ordinance controls future development on the grounds of historic preservation, but Proposers must conduct their own assessment of any possible impacts of existing city ordinances. Consistent with applicable law, the City of Mobile may enact ordinances that would promote consideration of the aesthetic appearance of structures within the viewshed of historic districts.

0.4.3 Railroad Construction

KMT will be required to coordinate with the railroads, design railroad crossings and drainage outfalls in accordance with railroad design criteria and obtain railroad approvals and permits as required for any railroad-related work. The Project crosses the CSX and CN/IC railroads.

0.5 DESIGN EXCEPTION & VARIANCE PROCESS

0.5.1 Design Exceptions

Through the Project environmental approval process, FHWA has approved certain Design Exceptions for the preliminary design on the Reference Plans, which are included as final Design Exceptions in the Reference Information Documents (RIDs). KMT does not have to obtain approval for such Design Exceptions if the Design Exception is for the same criteria, Element, and location for the preliminary design and KMT’s design. FHWA has given its concurrence on conceptual Design Exceptions for the preliminary design on the Reference Plans.

These conceptual Design Exceptions will require FHWA approval if the exception is used for KMT’s design. The Design Exception Final Concurrence document located in the RIDs describes the final and conceptual Design Exceptions. KMT must apply for a Design Exception for all Elements that do not meet minimum design criteria. The following 10 criteria are considered controlling for the design of projects on the National Highway System (NHS): (i) design speed, (ii) lane width, (iii) shoulder width, (iv) horizontal curve radius, (v) superelevation rate, (vi) stopping sight distance, (vii) maximum grade, (viii) cross slope, (ix) vertical clearance, and (x) design loading structural capacity. Stopping sight distance applies to horizontal alignments and vertical alignments except for sag vertical curves. Of the 10 controlling criteria, only design loading structural capacity and design speed apply to all NHS facility types. The remaining criteria are applicable only to high-speed NHS roadways, defined as interstate highways, other freeways and roadways with a design speed greater than or equal to 50 mph and their ramps.

If KMT's design creates additional or requires revisions to Design Exceptions or KMT intends to use the conceptual Design Exceptions, KMT shall obtain the Design Exceptions. KMT shall prepare Requests for Design Exceptions or Request for Conceptual Design Exceptions that document the factors that justify each exception. Each Request for Design Exception or Request for Conceptual Design Exceptions must include an analysis of the following:

A. Specific design criteria that will not be met.
B. Existing roadway characteristics.
C. Alternatives considered.
D. Comparison of the safety and operational performance of the roadway.
E. Impacts such as right of way, community, environmental, cost and usability by all modes of transportation related to obtaining the minimum criteria.
F. Proposed mitigation measures.
G. Compatibility with adjacent sections of roadway.

For each Request for Design Exception or each Request for Conceptual Design Exceptions, KMT shall prepare all documentation in accordance with the FHWA Mitigation Strategies for Design Exceptions. KMT shall submit the Request for Design Exception to ALDOT according to TP Table 18-2. KMT shall submit the Request for Conceptual Design Exception to ALDOT according to TP Table 18-2. Following ALDOT's review of any Request for Design Exception, ALDOT will submit the Request for Design Exception to FHWA for review and approval. All Design Exceptions must be reviewed by ALDOT and reviewed and approved by FHWA according to the Contract Documents. KMT should submit Requests for Design Exceptions early in the design process so that options providing the minimum design value can be fully considered.

0.5.2 Design Variances

Each deviation from the design criteria set forth in the Technical Provisions that does not require a Design Exception, will require a "Design Variance." KMT shall prepare a Request for Design Variance for each such deviation in accordance with the FHWA Mitigation Strategies for Design

Exceptions. KMT shall submit the Request for Design Variance to ALDOT according to TP Table 18-2. All Design Variances must be approved by ALDOT. Design Variances are not required for elements identified in approved Design Exceptions.

1.0 PART 1 – DESIGN CRITERIA

1.1 DESIGN CRITERIA – ENVIRONMENTAL/PERMITTING

Standards listed in the Technical Provisions (TP) Table 5-1 include:

1. The Combined FEIS/ROD

The project environmental clearance is provided by the I-10 Mobile River Bridge and Bayway Record of Decision (ROD) signed by FHWA on 8/15/2019. The ROD contains a table with the Final Environmental Commitments for the project. TP Attachment 5-1 contains a version of this table that indicates which of these commitments will be retained by ALDOT. The remaining commitments are the responsibility of KMT.

2. ALDOT Highway Traffic Noise Analysis and Abatement Policy and Guidance
3. ALDOT Public Involvement Plan for the Environmental Process, July 2015
4. FHWA Technical Advisory 6640.8A, Guidance for Preparing and Processing Environmental and Section 4(f) Documents, October 30, 1987
5. Guidelines for Operation (GFO) 3-44

1.1.1 Discipline Design Approach

The Project Request for Proposals (RFP) specifies a number of environmental permits that will be provided by ALDOT. The remainder of the permits required to complete the work will be obtained by KMT. A permit matrix that includes all required permits will be a design deliverable and will specify who is responsible for obtaining each permit. This matrix can be viewed on the project SharePoint site here. The design will be continually evaluated for compliance with environmental requirements. An environmental design review checklist has been created to complete Inter-Disciplinary Reviews (IDRs) of design packages, and a bi-weekly environmental task force serves as formal coordination with the owner.

Periodic meetings to clarify permitting requirements are held with regulators. Meeting minutes are stored in OneNote and distributed via InEight software.

1.1.2 Design Constraints & Interfaces

The FEIS/ROD and contract contain design constraints. The FEIS/ROD will be reevaluated by ALDOT. KMT will provide support for this re-evaluation but it will be an ALDOT responsibility. The reevaluation will include changes to the design, including alignment shifts and lane configuration changes.

1.1.3 Design Criteria

Design criteria is based on TP Section 5, the FEIS/ROD, and anticipated constraints in permits, especially the United States Army Corp of Engineers (USACE) and United States Coast Guard (USCG) permits.

1.2 DESIGN CRITERIA – UTILITY RELOCATIONS

1.2.1 Discipline Design Approach

Under the Progressive Design Build approach, ALDOT and KMT will perform or cause to be performed all Utility Relocations necessary to accommodate the project. ALDOT's standard utility process is governed by the ALDOT Utility Manual (revised Nov 2022), and it stipulates the agreement form(s) and processes to be followed. ALDOT and KMT will meet with each affected Utility Owner to introduce the project and ask whether the Utility Owner elects to utilize ALDOT's SAHD-No 02 or No-03 (Utility Owner managed design & construction, or Design-Builder managed Design & Construction of Utility Relocations, respectively).

During these initial meetings KMT will obtain as much information as possible from each Utility Owner regarding their existing facilities and request copies of records, as-builts, permits, or verbal recollections of utility locations. KMT will also utilize subsurface utility engineering (SUE) to gather more precise information about existing utilities. This SUE work will be performed by a contractor, T2 Utility Engineers. At locations where a utility crossing could create a conflict with the proposed work, the existing utility may be exposed in order to get a more precise elevationand confirmation of other utility facility characteristics, such as material type, diameter, casing, etc.

KMT will lead a jobwide effort to perform conflict analysis of existing utilities versus proposed roadway improvements, this effort will also take into consideration the condition of existing facilities and their ability to withstand loading or vibration from adjacent non-utility construction operations as well as violations of a required standard such as the ALDOT Utility Manual regarding casing, depth of cover, or other criteria. A Utility Conflict Matrix will be utilized to inventory each existing utility and assess the disposition of each utility as no-conflict, protect-in-place, or relocate. If applicable, corrosion control measures such as pipe coating should be taken into consideration when designing and constructing the relocated facilities. If the KMT is doing the design and construction of the relocated facilities, KMT will be responsible for corrosion protection. If the Utility Owner is doing the design and construction of the relocated facility, the Utility Owner will be responsible for corrosion protection. Once a utility is determined to require a relocation or protect-in-place treatment (collectively referred to as "Utility Relocation"), each utility will be depicted graphically in a Conceptual Relocation Plan.

The Conceptual Relocation Plan will be provided to Utility Owners in a collaborative environment to obtain their buy-in of planned relocation alignments and will be provided to Utility Owners as the basis of their designs or will be utilized for any Design-Builder led designs.

KMT intends to use Volkert to perform all Water/Wastewater relocation designs for Mobile Area Water & Sewer Service (MAWSS). KMT will encourage each utility owner to utilize the SAHD-No 03 agreement where KMT would perform design & construction services. Below is a table of the likely scope responsibilities, which will be updated as decisions are made.

Utility Type	Utility Owner	Design Entity	Construction Entity	Comments
Water/Wastewater	MAWSS	KMT	KMT	
Gas	Spire	Utility Owner	Utility Owner	
Electric Transmission & Distribution	Alabama Power Company (APCO) (a Southern Company)	Utility Owner	Utility Owner	APCO may utilize a consultant
Telecom	AT&T (Local and Corp), Lumen, Uniti, Comcast, City of Mobile, Windstream, MCI/Verizon, Level 3	KMT – Civil Utility Owner – Cable	KMT – Civil Utility Owner – Cabling and splicing	Not confirmed

The file arrangement will be as follows:

File Name	Owner	Purpose	Location
EUTI_Prelim.dgn	KMT SUE Lead	Master composite file for existing utilities	Projectwise
PUTI.dgn	KMT Utility Design Coordinator	Master composite file for conceptual relocation design alignments for all utilities regardless of engineer of record	ProjectWise
Testholes.dgn	KMT SUE Lead	This file will contain callouts containing information obtained through QL-A testholes	ProjectWise
SUE Data.dgn	KMT SUE Lead	Contains raw SUE survey data which is the basis of creating linework in the EUTI file	ProjectWise
Water/Sewer Detailed Design	Volkert Design Lead	Detailed design files for MAWSS relocations	ProjectWise

Telecom Civil Design	TBD	TBD	TBD
Utility Owner Designs	Utility Owner design lead or consultant	Source of detailed design/relocation alignments. Each design will be incorporated into KMT's PUTI file to ensure jobwide alignment/assignment coordination of all utilities	Utility Owner's own native copies. CAD copies are sent to KMT Utility Design Lead periodically and stored on ProjectWise.

1.2.2 Design Constraints & Interfaces

Below is a list of major known constraints which will need to be resolved:

- Alabama Power Company (APCO) 115kV Overhead Transmission near east tunnel
- MAWSS 48"-54" Gravity Sewer along Conception & Virginia. The portion of this large pipeline north of Texas St. was CIPP lined within the last 5 years, but portions further south of that, such as at Virginia St. and along Conception near and south of Texas were not re-lined making them less stable.
- Several old MAWSS Vitrified Clay Pipe gravity sewer lines and Cast-Iron water lines (jobwide)
- Long-Haul fiber optic cables along Hwy98 (Causeway) and Addsco Road near east tunnel area.

Key Interfaces for the utility design team include:

- Utilities and ***Geotechnical***
  - Identify locations for ground improvements and potential unsuitable materials
  - Utilize geotechnical boring results info for utility design, as applicable
  - Obtain differential settlement models for locations with cuts, fills, and SOE
- Utilities and ***Environmental***
  - Identify any trees and shrubs that may be impacted by utility relocations that otherwise would not have been impacted by the roadway improvements and attempt to mitigate, if feasible
  - Identify any impacted trees or shrubs on the Utility Plans, per the ALDOT Utility Manual
- Utilities and ***Roadway/Civil***
  - Understand horizontal and vertical alignments and their impacts to utilities
  - Understand pavement sections and impact to shallow or fragile utilities, including manhole adjustments for overlay areas
  - Understand ADA requirements and the impacts existing and proposed utility facilities may have on sidewalks and shared use path

    - Utilities are listed as a required component in Technical Provisions (TP) Section 17.2.1.1 Settlement Monitoring Plan. A requirement of this plan, listed in TP Section 17.3.4 Settlement Monitoring, is that settlements must be less than ¼" unless they're allowed by a site-specific threshold. Our approach is to evaluate existing utilities which are susceptible to these types of settlements, which mainly includes water and sewer lines. We will identify each location of existing water/sewer which is not required to be relocated due to a physical conflict with the project and discuss on a case-by-case basis. It is generally assumed that small diameter polyvinyl chloride (PVC) or high-density polyethylene (HDPE) conduits for telecom and electric, as well as steel or HDPE gas lines, will not be adversely affected by moderate settlements.
- Utilities and ***MOT***
    - Evaluate temporary detour impacts to utilities, particularly detours build outside the permanent footprint.
    - Identify temporary detour and other Maintenance of Traffic (MOT) needs to facilitate utility construction, such as short-term and long-term closures.
- Utilities and ***Walls***
    - Identify locations of walls including footing detail and impacts related to utilities
    - Walls are generally used in widening scenarios, understand each crossing utility and whether it requires casing
    - Identify any temporary wall impacts to utility facilities and analyze potential mitigation options
- Utilities and ***Right of Way***
    - Ensure that appropriate utility accommodation rules are applied based on property ownership and maintenance jurisdiction (such as City of Mobile standards governing utility placement on local cross streets, and ALDOT Utility Manual governing utility interfaces with the interstate)
- Utilities and ***Drainage***
    - Identify new drainage facilities and conflicts with existing utilities
    - Ensure utility relocation designs are compatible with new and existing drainage
- Utilities and ***Structures***
    - Evaluate each deep foundation type against existing utilities in the area. Physical impacts due to pile driving or shaft drilling, and also indirect impacts due to support of excavation (SOE) for a footing and vibrations caused by pile driving.
    - Evaluate crane access roads and applied loads on underground utilities
    - Evaluate overhead utilities against permanent bridge structures as well as constructability constraints including crane boom working radius and access
- Utilities and ***Lighting/ITS/Signals***

- Coordinate locations of electric service to ensure service is available
  - Evaluate location of Lighting/ITS/Signal Poles with regard to potential impacts to both existing and proposed utilities
- Utilities and ***Construction***
  - Identify areas where open cut vs. bore may be required
  - Understand bypass pumping plan for sewer cut overs
  - Understand valving plans for water cut overs
  - Identify any moratoriums regarding outages / cut overs for electric, gas and telecommunication facilities based on loads and / or special events
- Utilities and ***Aesthetics/Landscaping***
  - Confirm required utility services are coordinated and available at locations for irrigation, lighting for aesthetics, etc. (if required)
  - Ensure that proposed overhead powerlines do not interfere with aesthetics plan
- Utilities and **Corrosion Control**
  - Coordination will be required with adjacent existing utilities to understand the existing corrosion control systems and provide appropriate offsets if necessary
- Utilities and **Railroads**
  - Impact to utilities within the RR ROW are not anticipated.
  - Relocation of overhead utilities over RR ROW may be required.
  - Utilities that must cross the RR ROW due to a relocation will be coordinated to ensure the proper permits are acquired

1.2.3 Design Criteria

The Technical Provisions identify the design criteria for utilities.

9.2.1 Standards

Design-Builder shall perform all Utility Adjustment Work according to the Standards listed in TP Table 9-1, and with applicable Utility Owners' standards.

TP Table 9-1: Standards

No.	Organization	Name
1	ALDOT	Utilities Manual
2	ALDOT	Construction Manual
3	ALDOT	Guidelines for Operation (GFO) 3-14
4	AASHTO	A Guide for Accommodating Utilities Within Highway Right-of-Way
5	AASHTO	Policy on the Accommodation of Utilities Within Freeway Right-of-Way
6	ASCE	C-1 38-02 Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data

Utility Accommodation Jurisdiction

The following list provides guidance from ALDOT through Task Force conversations about which standards to apply to existing and proposed utilities in various areas throughout the job.

- Utilities crossing the interstate itself, not along cross streets, will be fully subject to design criteria listed in the ALDOT Utilities Manual and other references in the Table 9-1 Standards. Underground utilities within cross-streets will be evaluated against city standards for policy compliance and not the ALDOT Utility Manual.
- Clarifications to utility accommodation jurisdiction for adjacent city streets will be as follows
    - Texas Street will be handed over to the City of Mobile after the project is complete so should follow City requirements
    - Conception Street and Claiborne Street should follow City requirements
    - Virginia Street maintenance will be transferred to ALDOT up to the denial of access (DA) limits as shown on the ROW Plans
    - Water Street running west from the new Claiborne St. extension will be ALDOT and Water Street running east from the new Claiborne St. extension will be City.
    - At west tunnel interchange under the HLA, all Project ROW will be ALDOT maintenance and City streets will continue to be City maintained.
- Denial of Access clarifications
    - Existing fence will take precedent

- Denied Access limits will need to be extended to the intersection of new Claiborne St. extension from what is shown on the ROW Plans

Water & Sewer

The water & sewer utilities throughout the project are owned by Mobile Area Water & Sewer System (or MAWSS). The table below identifies criteria from the ALDOT Permit Manual and ALDOT Utility Manual unique to water & sewer. In addition to this table the MAWSS Design & Construction standards will be observed. It is anticipated that the Design-Builder will perform the design services for MAWSS.

		Underground Utilities						
		Depth of Cover	Skew Angle & Alignment	Casing Requirements	Separation from Other Roadway Features	Separation from Other Utilities	Appurtenance Placement	Other Requirements
Water	Crossing	36" Below ditch or 48" below bottom of pavement (ALDOT Permit Manual)	Near perpendicular as possible (ALDOT Permit Manual)	Encased if >2" (ALDOT Permit Manual) Interstate crossing casing must extend beyond ADL (ALDOT Permit Manual) Encasement variance allowed per API1102 & PRCI PR227-144507-R01 If DIP is used, casing may not be required under road prism for w/ww (UM 2.19.4) Corrosion protection measures for carrier pipe and required casings will be implemented per MAWSS and ALDOT specifications, if required.	See Note #23 (TP 9.3.2)	Required clearance between water and sewer mains shall be a minimum of **18 inches** vertical distance (with water line crossing over sewer line), pipe joints not within **5 feet** of sewer main on either side of crossing, and **10 feet** horizontal distance. At locations where these clearance conditions cannot be satisfied, encasement pipe, as directed by the Engineer, shall be required. If practical, no joints should be allowed within 6 feet of sewer mains or storm drains on either side of crossings (MAWSS Water Construction Spec 11.1.10.F)	35mph curbed >6' from FOC 35mph non-curb use RDG >35mph use RDG Place within 1' of ROW line preferably, do not effect pedestrian traffic (UM 2.19.5)	Markers required for crossings within 1' of ROW line (UM 2.19.5) Isolate crossings with valves (UM 2.19.5)
	Longitudinal	36" Below ditch or 48" below bottom of pavement (ALDOT Permit Manual)			See Note #23 (TP 9.3.2)		Place within 1' of ROW line preferably, do not effect pedestrian traffic (UM 2.19.5)	
Sewer	Crossing	36" Below ditch or 48" below bottom of pavement (ALDOT Permit Manual)	Near perpendicular as possible (ALDOT Permit Manual)	Encased if >2" (ALDOT Permit Manual) Interstate crossing casing must extend beyond ADL (ALDOT Permit Manual) Encasement variance allowed per API1102 & PRCI PR227-144507-R01 If DIP is used, casing may not be required under road prism for w/ww (UM 2.19.4) Corrosion protection measures for carrier pipe and required casings will be implemented per MAWSS and ALDOT specifications, if required.	See Note #23 (TP 9.3.2)		Place within 1' of ROW line preferably, do not effect pedestrian traffic (UM 2.19.5)	Markers required for crossings within 1' of ROW line (UM 2.19.5) Low-pressure air test is required for new installations within ROW per ADEM (UM 2.22.2)
	Longitudinal	36" Below ditch or 48" below bottom of pavement (ALDOT Permit Manual)			See Note #23 (TP 9.3.2)		Place within 1' of ROW line preferably, do not effect pedestrian traffic (UM 2.19.5)	Low-pressure air test is required for new installations within ROW per ADEM (UM 2.22.2)

Gas

The only owner of gas utilities on the project is Spire Inc. (formerly known as Mobile Gas Co.). It is anticipated that they will perform their own design, for which they will follow their design standards and other required industry standards. Their designs will be reviewed by KMT for compliance with the ALDOT Utility Manual, which is summarized in the table below.

		Underground Utilities						
		Depth of Cover	Skew Angle & Alignment	Casing Requirements	Separation from Other Roadway Features	Separation from Other Utilities	Appurtenance Placement	Other Requirements
Gas	Crossing	36" Below ditch or 48" below bottom of pavement (ALDOT Permit Manual, UM 2.19.2) If min bury depth not possible, protect pipe with other means such as slab or casing acceptable to ALDOT. Variance is required (UM 2.19.2) Unencased gas pipelines must be 5' under ditches and 6' under pavement (UM 2.19.4) **Depth of unencased crossing under interstate is 10ft (UM 2.19.4)**	Near perpendicular as possible (ALDOT Permit Manual)	Gas Mains >2" must be encased in coated steel (ALDOT Permit Mnaul) Interstate crossing casing must extend beyond ADL (ALDOT Permit Manual) Encasement variance allowed per API1102 & PRCI PR227-144507-R01 If unencased, use 2 sizes greater wall thickness. Must be epoxy coated outside. No jack & bore install. Cathodic protection req'd. Must be welded steel pipe. Xray test all welds. Pressure test req'd (UM 2.19.4) Casing must be vented (UM 2.19.4)	See Note #23 (TP 9.3.2)		Place within 1' of ROW line preferably, do not effect pedestrian traffic (UM 2.19.5)	Markers required for crossings within 1' of ROW line (UM 2.19.5) Isolate crossings with valves (UM 2.19.5)
	Longitudinal	36" Below ditch or 48" below bottom of pavement (ALDOT Permit Manual, UM 2.19.2) If min bury depth not possible, protect pipe with other means such as slab or casing acceptable to ALDOT. Variance is required (UM 2.19.2)			Maintenance clearances between pipeline and other facilities are established on project by project basis (UM 2.19.1) Pipeline crossing of stream or river 25' min horizontal clearance from any footing (UM 2.19.1) See Note #23 (TP 9.3.2)		Place within 1' of ROW line preferably, do not effect pedestrian traffic (UM 2.19.5)	Preferable to place longitudinal gas lines parallel to pavement or ROW (UM 2.19.1) Normally place within 5' of ROW (UM 2.19.1) Do not place in shoulder or median (UM 2.19.1) Spire will self perform the design and construction of their relocated faciliites. They will be responsible for implementing any corrosion control measures.

Telecom

There are several different telecom utility owners on the project, both aerial and underground with coaxial cable, copper cable, and fiber optic cable. Most of the telecom utility owners have expressed interest in performing their own design, if that is the case then KMT's review criteria will be limited to the ALDOT Utility Manual items listed in the tables below for underground and aerial.

		Underground Utilities						
		Depth of Cover	Skew Angle & Alignment	Casing Requirements	Separation from Other Roadway	Separation from Other Utilities	Appurtenance Placement	Other Requirements
Telecom	Crossing	36" Below ditch or 48" below bottom of pavement (ALDOT Permit Manual and UM 2.26.1)	Near perpendicular as possible (ALDOT Permit Manual and UM 2.26.2)	Interstate crossing casing must extend beyond ADL (ALDOT Permit Manual) Underground comm lines are allowed to be unencased if UO agrees not to open cut to maintain lines except in emergencies (UM 2.26.1) Casing for telecom shall extend 6' behind back of curb, if used (UM 2.26.3) PVC or HDPE class 200 is ok for telecom (UM 2.26.3)			Place within 1' of ROW line preferably, do not effect pedestrian traffic (UM 2.19.5, UM 2.26.1)	Markers required for crossings within 1' of ROW line (UM 2.19.5) Installing spare conduits is ok (UM 2.26.1)
	Longitudinal	36" Below ditch or 48" below bottom of pavement (ALDOT Permit Manual and UM 2.26.1)	Parallel installation to pavement or ROW line is preferred (UM 2.26.2)	Underground comm lines are allowed to be unencased if UO agrees not to open cut to maintain lines except in emergencies (UM 2.26.1)			Place within 1' of ROW line preferably, do not effect pedestrian traffic (UM 2.19.5, UM 2.26.1)	Installing spare conduits is ok (UM 2.26.1)

		Overhead Utilities			
		Vertical Clearance to Road	Horizontal Clearance	Pole Location	Other Requirements
Telecom	Crossing	18' low wire to deck (ALDOT Permit Manual) 25' low wire to top of barrier (ALDOT Permit Manual, UM 2.18) 18' min low wire to road (UM 2.18.2)		Crossings near perpendicular (ALDOT Permit Manual) Poles placed outside clear zone and ADL for interstate (ALDOT Permit Manual) Use AASHTO Roadside Design Guide for clear zones (UM Sec. 2.7.3)	Avoid guy wires inside highway ROW where feasible (ALDOT Permit Manual)
	Longitudinal		25' horizontal clearance from "neat lines of structure" (ALDOT Permit Manual)	Pole alignments for relocation should match existing line (ALDOT Permit Manual) Poles placed outside clear zone and ADL for interstate (ALDOT Permit Manual) Align as close to ROW as possible (UM 2.13.1)	Avoid guy wires inside highway ROW where feasible (ALDOT Permit Manual)

Electric

Electric facilities consist of overhead Transmission, overhead Distribution, and underground Distribution. All non-ALDOT electric is owned by Alabama Power Company (a division of Southern Company), referred to as APCO. APCO has indicated a desire to perform their own designs, KMT will review their plans against ALDOT Utility Manual requirements listed below both for overhead and underground facilities.

		Underground Utilities						
		Depth of Cover	Skew Angle & Alignment	Casing Requirements	Separation from Other Roadway	Separation from Other Utilities	Appurtenance Placement	Other Requirements
Electric	Transmission	UG electric power will have 4' min cover under ditches and pavement (UM 2.26.1)	Near perpendicular as possible (ALDOT Permit Manual)	Underground electric power installations under highway prism will be encased (UM 2.26.1)			Place within 1' of ROW line preferably, do not effect pedestrian traffic (UM 2.19.5)	
	Distribution	36" Below ditch or 48" below bottom of pavement (ALDOT Permit Manual) UG electric power will have 4' min cover under ditches and pavement (UM 2.26.1)		Interstate crossing casing must extend beyond ADL (ALDOT Permit Manual) Underground electric power installations under highway prism will be encased (UM 2.26.1)			Place within 1' of ROW line preferably, do not effect pedestrian traffic (UM 2.19.5)	

		Overhead Utilities			
		Vertical Clearance to Road	Horizontal Clearance	Pole Location	Other Requirements
Electric	Transmission	115kV is 20.1ft (APCO Email 4/20/23 citing NESC) 18' low wire to deck (ALDOT Permit Manual) 25' low wire to top of barrier (ALDOT Permit Manual, UM 2.18) 18' min low wire to road (UM 2.18.2)	25' horizontal clearance from "neat lines of structure" (ALDOT Permit Manual, UM 2.18)	Crossings near perpendicular (ALDOT Permit Manual) Poles placed outside clear zone and ADL for interstate (ALDOT Permit Manual) Align longitudinal as close to ROW as possible (UM 2.13.1) Avoid crossing over bridges or abutments when practical (UM 2.13.1, UM 2.18) No longitudinal poles in median, crossing poles in median ok if median >80' with approval (UM 2.18)	Avoid guy wires inside highway ROW where feasible (ALDOT Permit Manual) Single Pole only (no frames) (UM 2.18.1)
	Distribution	18ft (APCO Email 4/20/23) 18' low wire to deck (ALDOT Permit Manual) 25' low wire to top of barrier (ALDOT Permit Manual, UM 2.18) 18' min low wire to road (UM 2.18.2)	25' horizontal clearance from "neat lines of structure" (ALDOT Permit Manual, UM 2.18)	Crossings near perpendicular (ALDOT Permit Manual) Poles placed outside clear zone and ADL for interstate (ALDOT Permit Manual) Align longitudinal as close to ROW as possible (UM 2.13.1) Avoid crossing over bridges or abutments when practical (UM 2.13.1, UM 2.18) No longitudinal poles in median, crossing poles in median ok if median >80' with approval (UM 2.18)	Avoid guy wires inside highway ROW where feasible (ALDOT Permit Manual) Single Pole only (no frames) (UM 2.18.1)

A general list of additional criteria, including a citation of where the criteria came from, is listed below.

- 25' minimum horizontal distance from bridge footings or drainage structures when crossing stream or river (ALDOT Permit Manual 13.3)
- Bore pits must be located outside denied access fence on interstate crossings (ALDOT Permit Manual 13.3)
- Abandoned lines >= 4" shall be grout filled or removed (ALDOT Permit Manual 13.3)
- Gas and electric power lines cannot be attached to structures, communications and water can with special approval (ALDOT Utility Manual ("UM") Section 2.4)
- AASHTO Roadside Design Guide and AASHTO Geometric Design of Highways and Streets govern Clear Zone compliance (UM Section 2.7.1)
- Electric power and Communication facilities will follow NESC (UM 2.9.1)
- Water lines will conform with AWWA (UM 2.9.1)
- Pressure pipelines will conform with ANSI pressure piping and 49CFR 192,193,195 and other applicable industry codes (UM 2.9.1)
- Liquid Petroleum pipelines conform with API 1102 (UM 2.9.1)

- No new utilities will be permitted longitudinally within control of access / ADL (UM 2.13.2)
- All utility facilities placed under the highway, unless exempted within the manual, will require encasement unless a variance is obtained (UM 2.19.3)
- Encasement must extend past toe of slope or ditch, and less than 6' from the face of curb, preferably past ADL (UM 2.19.3)
- Vents & casing related appurtenances must be located at the ROW line (UM 2.19.3)
- Casing not required if <2" (UM 2.19.4)
- Suitable bridging, concrete slabs, etc. must be used to protect uncased pipelines to protect from construction or maint. Ops (UM 2.19.4)
- Telephone junction-boxes and similar appurtenances outside pavement shall be HS-20 (UM 2.19.5)
- Trench bedding must be 6" in depth or half the diameter of pipe whichever smaller. Bedding requirement may be waived by Region Engineer under certain circumstances (UM 2.19.7)
- Side roads & private drives: <500 ADT should be bored w/out casing. >500 ADT bored w/ casing (UM 2.19.7)
- Annular void between casing and bore diameter should be grouted (UM 2.19.7)
- Variances to ALDOT Utility Manual allowed: Identify the specific variance, explain why its warranted, identify potential risks (UM 2.27)
- Utility construction within ROW will conform to ALDOT Standard Specifications (UM 6.1.2)
- Utility will warrant their work for 1yr following Department's acceptance (UM 6.1.2)
- New underground utilities not allowed within 10' clear from column or pile footing unless approved by ALDOT (Technical Provision ("TP") 9.3.2)
- MSE leveling pad & strap zone are considered spread footing and subject to 10' clear spacing for utilities (TP 9.3.2)
- No utilities 3' horizontal from base of spread footing (or MSE wall) or 2:1 down and away from it (TP 9.3.2)
- Do not install buried utilities producing stray current within 300' of anode bed or MSE wall unless addressed in Corrosion Protection Plan (TP 9.3.2)

1.3 DESIGN CRITERIA – GEOTECHNICAL

The TPs for the project present a comprehensive list of the standards to be used to design the project. Table 1 presents a listing of these standards. Additional design standards may be needed based on the geotechnical exploration findings. Should conditions be encountered that require design methods/procedures beyond those listed, we will work with ALDOT to obtain approval before advancing the design.

Table 1 – Project Design Standards

No.	Organization	Name
1	AASHTO	LRFD Bridge Design Specifications, 9th Edition
2	FHWA	Geotechnical Engineering Circulars
3	ALDOT	Standard Specifications for Highway Construction
4	ALDOT	General Application Special Provisions
6	ALDOT	Special Provisions for Highway Construction
7	ALDOT	Structural Design Manual
8	AASHTO	Guide for Design of Pavement Structures, 1993 Edition
9	AASHTO	LRFD Bridge Construction Specifications
10	AASHTO	Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th edition, Appendix C
11	AASHTO	Guide Design Specifications for Bridge Temporary Works
12	AASHTO	R-13 (Standard Practice for Conducting Geotechnical Subsurface Investigations)

1.3.1 Discipline Design Approach

Our design approach is based on a review of the Technical Provisions (TP's) and the Reference Information Documents (RIDs).

- The RID's did not meet the recommendations of AASHTO LRFD Bridge Design Specifications, 9th Edition, Table 10.4.2-1 which provides for the minimum drilling criteria for bridges and walls.
- A Geotechnical Exploration Plan was developed to bridge the data gap between the RID's and what is required by the TP's.
- The geotechnical exploration has been designed to collect boring, cone penetration test (CPT), geophysical and laboratory test data necessary to design the different project elements.
- Geotechnical exploration is planned to commence fall 2023 and be completed in February 2023.
- The exploration consists of about 180 borings and CPT soundings to depths ranging from 10 to 415 feet with most exploration points being extended to a depth of about 150 feet.
- A total of 21 piezometers are currently planned.
- CPT soundings comprise about 35 percent or more of the exploration.

- About 15 percent of the exploration points are located over water.
- The depth of exploration points was based on AASHTO LRFD Table 10.4.2-1.
- Preliminary project submittals for both bridges, walls and embankments will be based on the RID's. The RID data will be evaluated, and project specific parameters developed for each of the structures based on our experience and project understanding.
- As geotechnical drilling and laboratory test data become available for specific structures, the foundation design assumptions and parameters used to develop the preliminary design memorandum will be reviewed and compared with the structure specific geotechnical data and the foundation loading. Should the data vary from the RID provided data, additional analyses will be performed, and the draft report amended accordingly.

A foundation load testing program is currently being developed in accordance with the TPs.

- The load test program will include static and dynamic load testing on driven piles and static testing (O-cell testing) on drilled shafts.
- The results of the load testing will be used to evaluate construction means and methods, as well as the ultimate capacity and resistance distribution along the foundation element.
- The type and frequency of the load testing will be used to determine the geotechnical resistance factor for the foundation in accordance with AASHTO.
- The type, location, and nature of the load testing will be determined based on a cost and schedule analysis of the number and length of the foundation elements versus the geotechnical resistance factor for an assumed level of load testing.
- The load testing data provided in the RID's will be used to support preliminary foundation analyses.

Assuming the project starts as scheduled, the geotechnical design submittals should be complete by the last week of April 2024.

1.3.2 Design Constraints & Interfaces

The primary design constraint is the exploration schedule. To achieve the schedule, 6 drill rigs with 3 pieces of equipment over water will be required. Primary schedule constraints include:

- Work will be performed during the hurricane season. We expect at least 2 named storms within the Gulf of Mexico which could impact project schedule.
- Drilling on the interstate will have to be performed at night with time limitations during the busy summer vacation season.
- Utility avoidance and potholing for land-based borings.
- Staffing for field work including field loggers, safety personnel, and field coordination.
- The ability to achieve the required exploration depths using CPT equipment. If we cannot achieve the necessary exploration depths, additional standard penetration test (SPT) equipment will be needed.

- Understanding of what environmental measures will be required other than drumming cuttings and drilling fluids for over-water work.

Interface between KMT, local utilities, private utility location, potholing contractor, traffic control and environmental staff will be the most important communication interface necessary to complete the project successfully. Design constraints include:

- Locked horizontal and vertical alignment for the project.
- Environmental constraints associated with Nationwide 6 Permit. Critical path for structures and roadway.
- Foundation loading for bridges.
- Location and depth of underground utilities that may be impacted by construction.
- United States Coast Guard Permits.
- Vibration requirements/limitations in the FEIS/Section 106 of the MOA and the related project RFI's related to pile driving near the existing sanitary sewer(s).

1.4 DESIGN CRITERIA – EROSION CONTROL

Erosion Control design, also referred to as Construction Stormwater Management, emphasizes measures to prevent erosion and sediment issues from happening in the first place. This is achieved by employing various best management practices (BMPs) using approved products and construction techniques followed up with frequent and documented inspection during construction.

1.4.1 Discipline Design Approach

The Erosion Control design approach includes the following:

- General Conformance to Technical Provisions (TP) Section 11
- Apply for and obtain an Alabama Department of Environmental Management (ADEM) Construction Permit (ALR100000).

1.4.2 Design Constraints & Interfaces

- Compliance with the ADEM Construction General Permit (CGP).
- BMP's to be consistent with TP Section 11.3.2

1.4.3 Design Criteria

- General Conformance to TP Table 11-1
- ASWCC - The Alabama Handbook for Erosion Control, Sediment Control, and Stormwater Management on Construction Sites and Urban Areas, ("Alabama Handbook")
- ADEM - Admin. Code r. 335-6-x-.xx
- ADEM - Construction General Permit, ALR100000, April 1, 2021
- ALDOT - Construction Best Management Practices Plan (CBMPP) Template
- ALDOT - Construction Manual, Section 2.5
- AASHTO - Highway Drainage Guidelines, Volume III, Guidelines for Erosion and Sediment Control in Highway Construction (1992)

1.5 DESIGN CRITERIA – STRUCTURES

1.5.1 Discipline Design Approach

Our design approach is based on a review of the Technical Provisions (TP's) and the Reference Information Documents (RIDs). The design is based on the limited ALDOT-provided geotechnical data and is considered conservative at this stage. The design makes extensive use of the Florida I-Beam (FIB) girders. Where span length and/or curvature preclude the use of FIBs, steel plate girders have been used.

The superstructure of the High-Level Approach and Main Span is a combined cross-section for both eastbound and westbound traffic. The Main Span is a 5-span cable-stayed bridge with a 1395' main span and 590' back spans, with a tie-down pier located approximately 485' from each tower. The superstructure is comprised of steel plate girders with composite, precast concrete panels and CIP stitch pours plus longitudinal post-tensioning.

Typical HLA piers are solid, conventionally reinforced, cast-in-place concrete columns with a common cap supporting both the eastbound and westbound roadway on cast-in-place footings supported on 24" square precast prestressed concrete piles. Drilled shafts are used at select locations to reduce the potential impacts to underlying utilities. The interchange bridges feature either columns on footings supported by piles or drilled shafts, columns on monoshafts, or pile bents using piles or drilled shafts. The Main span Tower is a cast-in-place concrete diamond founded on steel pipe piles with concrete infill.

The reconstruction of Bridges 19 through 25 in the East Interchange has been removed from the project scope in favor of performing rehabilitation of the existing bridges

1.5.2 Design Constraints & Interfaces

The primary design constraint is the limited amount of geotechnical data. The RID data does not provide the recommended coverage specified in the AASHTO LRFD Bridge Design. A Geotechnical Exploration Plan has been developed to bridge the data gap between the RID's and what is required by the TPs but exploration results that may be used for design will not be available until much later in the design process.

There are several critical utilities that are constraints on the bridge design, one of which is a 48-inch diameter sanitary gravity sewer traversing the west alignment. Any bridge foundations within 100 feet of the sewer will be constructed using drilled shafts with means and methods to reduce the potential for settlement near the pipe. The fiber optic duct bank located within the East Interchange Bridges footprint has also been avoided using special piers and straddle bents.

1.5.3 Design Criteria – Landside Bridges

The design criteria for this section are covered under Section 1.5.4 Design Criteria (Main Span & High-Level Approaches) with the following exceptions:

- Design Life for the West Tunnel Interchange Bridges are to meet 75-year design life as a minimum. The West Tunnel Interchange Bridges can be designed in accordance with Section 1.6 and/or ALDOT Bridge Bureau Structural Design Manual latest edition and subsequent approved modifications by the ALDOT State Bridge Engineer.
- The exterior barrier rail of all interchange bridges is the ALDOT Standard BBR-1.

1.5.4 Design Criteria – Main Span & High-Level Approaches

Criteria	References
1. Specifications	
A. General Specifications	
1. Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, 2022.	"ALDOT Spec"
B. Design Specifications	
1. ALDOT I-10 Mobile River Bridge Project - Technical Provisions, Industry Draft (December 15, 2022)	"TP"
2. ALDOT Structural Design Manual, January 2023. Exceptions to the requirements of the manual are allowed only if ALDOT approves a specific request (RFI) submitted by the Design Builder to the Bridge Engineer.	"SDM"
3. ALDOT Guidelines for Operation, September 2017	"GFP"
4. ALDOT Quality Control Manual for Bridge Plan Detailing, January 2021	"QCMBPD"
5. ALDOT Bridge Inspection Manual, October 2021	"BIM"
6. American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications, 9th Edition, 2020.	"AASHTO"
7. Comite Euro-International De Beton - Federation Internationale De La Preconstrainte (CEB-FIP) Model Code 1990, Chapter 2 Material Properties (for concrete creep and shrinkage effects only).	"CEB-FIP"
8. Post-Tensioning Institute DC45.1 Recommendations for Stay Cable Design, Testing, and Installation, 2012	"PTI"
9. FHWA TS-80-205 Design Specifications for Steel Box Girders	"FHWA TS-80"
10. AISC Steel Construction Manual, 15th Edition, 2017	"AISC"
11. American Concrete Institute Building Code Requirements for Structural Concrete and Commentary 318-19(22)	"ACI"
12. AASHTO / AWS D1.5M / D1.5-2015, Bridge Welding Code, 2015	"BWC"
13. AWS D1.1, Structural Welding Code Steel, 2010	"SWC"
14. AASHTO Manual for Bridge Evaluation, 2nd Edition, 2011	"MBE"
15. AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, 2nd Edition, with 2015 Interim Revisions.	"Ped Gd Spec"
16. AASHTO Guide Specification and Commentary for Vessel Collision Design of Highway Bridges, 2nd Edition, with 2010 Interim Revisions.	"Vessel Gd Spec"
17. AASHTO LRFD Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals	"SIGNS"
18. Guide Specifications for Bridges Vulnerable to Coastal Storms, First Edition, 2008 with March 2010 Errata; and 2023 Interim Revisions.	"Storm Gd Spec"
19. AASHTO Guide Specifications for Wind Loads on Bridges During Construction, 1st Edition, 2017	"WIND"
20. Post-Tensioning Institute Specification for Grouting of Post-Tensioned Structures M55.1-19	"PTI GROUT"
21. PTI / ASBI Guide Specification for Grouted Post-tensioning M50.3-19	"PTI MULTI"

22. ASCE / SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures 23. AASHTO Guide Design Specifications for Bridge Temporary Works 24. AASHTO M 251 Standard Specification for Plain and Laminated Elastomeric Bridge Bearings	"ASCE 7" "TEMP" "M251"
2. General *A. Units & Dimensions* 1. Units for structure shall be designed and detailed using the customary English units of feet, pounds/kips, degrees Fahrenheit, etc. 2. Dimensions shown on plans are measured at a normal temperature of 70°F. 3. Elevations are based on North American Vertical Datum (NAVD) 88. *B. Clearances* All Main Span Bridge and HLA structures must provide minimum geometric clearances as identified in TP Attachment 18 1 1. Minimum roadway clearance: a. Horizontal – 30' from edge of travel lane of adjacent roadway (with no barrier protection) b. Vertical – 17'-0" above roadway c. Vertical – 18'-0" above roadway at overhead sign structures 2. Mobile River Bridge Navigational Clearance a. Horizontal – 600 feet normal to the channel b. Vertical – established against the Mean High Water Elevation plus Sea Level Rise, as specified in the Coastal and Hydraulic Design Report i. During construction – 195 feet ii. Final – 215 feet 3. Design and construction of the High-Level Approaches over water from Station 565+00 to end station of the I-10 Mobile River Bridge Project 1 shall withstand the 100-year storm surge and achieve a minimum of one foot of clearance above the 100-year storm surge wave crest elevation, including sea-level rise at the end of the Service Life, as defined in the approved Coastal and Hydraulic Design Report per TP Section 14.3.3, at a "service immediate." 4. Minimum railroad clearance a. Horizontal – clear span railroad right-of-way Vertical – 23 feet above top of rail	 TP 2.3.1 SDM 3.3 TP 7.3.1 GFP 3-76 TP Attachment 18.1 TP 12.3.1.2 GFP 3-25 TP 18.3.2.1 TP 12.3.1.6.1 TP 12.3.1.2 TP 14.3.3
3. Design and Analysis Method All structural components shall be designed in accordance with requirements in the AASHTO LRFD Bridge Design Specifications at all appropriate service, fatigue, strength, and extreme event limit states.	

A. *Reinforced Concrete* – Designed at strength and extreme limit states. Verified for compliance with crack control criteria at service limit state and for compliance with specified stress range in reinforcing at fatigue limit state. In check of crack control criteria, exposure factor γ_e shall be Class 1 for all members.	AASHTO 5.5.4 AASHTO 5.5.5 AASHTO 5.6.7 AASHTO 5.5.3.2
B. *Prestressed Concrete* – Designed at service limit state and verified for compliance with criteria at strength and extreme limit states. 1. Provisions for prestressing construction per AASHTO 5.9 shall be considered. 2. Effective flange width for service limit state stress calculations shall be in accordance with AASHTO 4.6.2.6. Full compression flange width shall be considered effective in determination of section capacity at the strength limit state.	AASHTO 5.5.4 AASHTO 5.5.5 AASHTO 5.9 AASHTO 2.5.2.6.2 AASHTO 4.6.2.6
3. Camber & Deflection a. Beam camber for computing the build-up must be based on 120-day old beam concrete. b. A minimum one inch haunch shall be provided at girder mid-span, calculated at the critical edge of the girder flange. c. Criteria for deflection is presented in AASHTO LRFD, Article 2.5.2.6.2. Live load deflection shall be checked for both loading options as given in AASHTO LRFD, Article 3.6.1.3.2	SDM 5.2.9 SDM 2.2 AASHTO 2.5.2.6.2 AASHTO 3.6.1.3.2
C. *Partially Prestressed Concrete* - Designed at strength and extreme limit states reflecting the presence or absence of prestressing (i.e. supplemental compression provided by the stay cables and post-tensioning tendons). Verified for compliance with crack control criteria and compression limitations under service limit state. Crack control criteria shall be based on the crack width limitations specified in Service Life Design Report. Resulting strains are related to the crack width allowable values through the formulae given in AASHTO LRFD Section 5.6.7 Compression service limits shall be in accordance with AASHTO LRFD 5.9.2.3	AASHTO 5.6.7 AASHTO 5.9.2.3
D. Steel Structures 1. HLA Plate Girders shall be designed as a composite section in the region where the concrete slab is in compression under dead load. For continuous girders, the regions where the slab is in tension shall be designed as non-composite.	SDM 6
2. Main Span Edge Girders a. The steel edge girders for the cable-stayed main span shall satisfy the requirements of the AASHTO LRFD. This includes loads, load factors, reduction factors, proportional limits, stiffener design and detailing requirements. However, in recognition of the effects of axial compression that will be present in the edge girders the interaction effects between axial, shear and bending will be considered. In the absence of a guidance for this interaction in the LRFD, the provisions of FHWA TS-80-205 shall be adopted. Specifically, the edge girders shall	FHWA TS-80

satisfy the interaction equation in section 1.7.211 (4) of FHWA TS-80-205 b. Edge girders shall be designed to be either System Redundant or Internally Redundant Members. Demonstration of redundancy shall conform to the methodology in the approved Redundancy Report. 3. Camber Ordinates for Steel Girders a. The following two sets of camber ordinates shall be calculated and shown: i. Camber due to dead load of steel only. ii. Total non-composite dead load camber (dead load of both steel and concrete). b. Camber ordinates shall be calculated and shown at the same points required for incremental deck finished grade elevations, as follows: i. Camber ordinates at 10th points shall be provided for all spans up to 99' in length. ii. Camber ordinates at 20th points shall be provided for spans from 100' to 199' in length. iii. Camber ordinates at 40th points shall be provided for spans 200' and greater in length.	
E. *Bearings* All bearings shall be designed and detailed to be replaceable. No uplift is allowed in the bearings for any service load combination. 1. Pot & Disc Bearings – Designed at the service limit state. Pot or disk elements are designed at the service limit state. All other components, i.e. sole plates, masonry plates, and bearing anchorages designed at the strength limit state. 2. Elastomeric bearings shall be designed using "Method A", as described in AASHTO LRFD, Article 14.7.6, with a durometer hardness of 50 for laminated pads and 60 for plain pads.	TP 13.3.1.7.4 AASHTO 3.4.3.1 AASHTO 14.7.4 AASHTO 14.7.8 AASHTO 14.7.5 SDM 14.2 AASHTO 14.7.6
F. *Foundation Elements* 1. Axial capacity of foundation elements shall be evaluated at the strength limit state. Resistance factor (ø) to determine ultimate capacity shall be calculated per AASHTO Tables 10.5.5.2.3-1 & 10.5.5.2.4-1. 2. Structural design of foundation elements shall be for strength and extreme limit state. Design Steel Pipe Piles and precast concrete piles in accordance with AASHTO 10.7.3.13. 3. Uplift in piling is allowed and resistance factor (ø) to determine ultimate capacity shall be calculated per AASHTO Tables 10.5.5.2.3-2 & 10.5.5.2.4-1.). 4. Design for Scour- a. Loss of lateral and vertical support due to scour calculated in accordance with Coastal and Hydraulic Design Report shall be considered at strength and extreme event limit states. b. Bridge foundations are evaluated for the following three scour conditions:	AASHTO 10.5.5 SDM 10.2 AASHTO 10.7.3.13 AASHTO 10.5.5.2.3-2 AASHTO 10.5.5.2.4-1 AASHTO 10.7.3.13 TP 13.3.1.4-1

i. 100-year scour: the streambed material in the scour prism above the total scour line shall be assumed to have been removed for design conditions. The new top of soil elevation after scour is used for all Strength and Service limit states design. (i) Per TP 13.3.1.4.1, Design-Builder shall include the following load combinations in the design of the Main Span Bridge at the Extreme Event limit state: • γp DC + γp DW + 1.75(LL+IM) + 1.0FR at 180% of the 100-year computed scour • γp DC + γp DW + 1.0WA + 1.0FR + 1.00 WS at 70% of the 100-year computed scour • γp DC + γp DW + 1.0WA + 1.0FR + 1.00 CV at 60% of the 100-year computed scour ii. 500-year scour: the stability of the bridge foundation shall be investigated for this scour condition. This is treated as an extreme event limit state with live load factor of 0.5. iii. Long-term scour: Scour is treated as an extreme event in the AASHTO Specifications. Typically, two extreme events are not considered simultaneously. However, since the timing of a vessel collision is not predictable, the effect of long-term scour should be considered. One-half of the 500-year scour will be considered as long-term scour in combination with extreme events.	AASHTO 3.4.1 Commentary for Extreme Events
5. Design for lateral loads in accordance with AASHTO 6.15.3.2. Shear resistance of the concrete-filled pipe piles will be determined as noted in AASHTO 6.12.3.2.2	AASHTO 6.15.3.2 AASHTO 6.12.3.2.2
G. *Stay Cables* 1. Stay-cables shall be designed in accordance with the Strength, Extreme, Service and Fatigue limit states stipulated in Section 5.3 of the PTI Recommendations for Stay Cable Design, Testing, and Installation.	TP 13.3.2.3.1 PTI 5.3
2. The static design of cables shall be made for axial loads and the bending stresses near the anchorages that result from angle changes caused by cable sag changes, geometry changes from joint displacement and change of angle due to rotation of girder and tower.	
3. The bridge shall be designed so that the stay cables can be replaced one at a time while maintaining two lanes of traffic in each direction per PTI Section 5.4. The active lanes shall be away from the cable being replaced. Fatigue stress consideration shall not be applied for this condition. The bridge shall be designed so that the accidental loss of a cable shall not result in failure of the bridge per PTI Section 5.5.	PTI 5.4 PTI 5.5
4. All stays shall include two reference strands that can be removed and replaced for inspection purposes for each cable stay. The reference strands shall not be included in the stay capacity but shall be considered during construction.	
5. The stay cable systems shall accommodate, without cable or anchorage replacement, additional capacity through future strand installation. Any	

group of three adjacent cables shall have the ability to add 5% capacity globally.

H. *Main Span Deck Design*

1. In the transverse direction, the Main Span Deck will be designed as reinforced concrete. In the longitudinal direction, the Main Span Deck will be designed as partially prestressed. In both cases the deck will be designed for a value of gamma of XXXX. This value will be updated with the value or values in the approved Service Life Report as applicable.
2. The longitudinal design of the deck will consider the effects of global and local demand and capacity in both the strength and service limit states. Global demand consists of the tension and compression applied to the concrete deck by the global effects of the loads placed on the structure. This includes the built-in distribution of dead load, live loading, wind and other effects as defined by the LRFD. The global effects will be applied in a model that accounts for the transverse spread of loads across the width of the deck resulting from the application of stay forces and shear lag. Local demands primarily include effects that induce bending in the concrete deck, including self weight, superimposed dead loads and live loads as defined by the LRFD. Global and local demands will be combined in accordance with the Load Combinations defined in these criteria. When effects cannot be shown to be concomitant, they will be combined to produce the worst effects.
3. Longitudinal post-tensioning will be present in some but not all locations along the main span deck. The post tensioning will be included in the global models to capture the effects of placement and stressing sequence. At the service limit state, the effects of post-tension will be considered as demand, adding to the net axial loads present in the concrete deck. The net loads will then be used to calculate stresses in the deck reinforcement and evaluated against the requirements of AASHTO LRFD Section 5.6.7. No beneficial increase in the post-tensioning strain will be considered at the Service Limit State. At the strength limit state, the post-tensioning will be included in the demand calculation with the strain limits defined in the LRFD applied.

I. *Main Span Bearings and Tie-downs*

TP 13.3.2.2.2

1. At the attachment points of the main span superstructure to the backspan transition piers (transition from Main Span to High Level Approach), the connection shall remain in compression under the application of all load cases. This shall be achieved through the combined use of dead loads and supplemental ballast only.
2. At the attachment points of the main span superstructure to the intermediate backspan tie-down piers, the connection shall remain in compression under the application of the AASHTO LRFD Service I load case. This shall be achieved through the combined use of dead loads and supplemental ballast only. Ballast shall be considered as self weight (DC) for the purposes of load combinations and load factors; however it shall be

assigned a value of 0.9 that maximizes load effects without consideration of the value of 1.25 applied to other components of DC. 3. All remaining uplift demand at the attachment point of the main span superstructure to the backspan piers shall be resisted by permanent cable tie-downs. Tie-downs shall be designed as a stay cable, including cable loss and replacement cases. Tie-downs shall be installed with adequate tension such that the adjacent bearings remain in compression under all load cases and limit states. At each support, no one anchorage shall contain more than 50% of the designed strands, and each anchorage shall have an additional capacity of no less than 10% of the initial tie-down capacity through future strand installation. The reference strands may be considered as contributing to the 10% additional capacity.	
J. *Main Span Pylon Design Methodology* Non-linear analysis methods shall be used to account for the large changes in initial geometry of the Main Span towers and backspan piers. However, the large number of load cases (e.g. wind) in LRFD method in combination with the fact that superposition and/or factoring of load effects is no longer valid when behavior is nonlinear makes the nonlinear analysis not the best tool for design. As an alternative, several representative nonlinear analyses will be performed, ratioed to their linear counterparts and then enveloped to determine an appropriate design amplification factor to be used for all design load cases.	AASHTO 4.5.3.2
Non-linear analysis is utilized to determine the maximum elastic buckling load, which is set as the Euler buckling load, or the elastic critical buckling resistance, Pe, of the member and substituted into the column equations in AASHTO LRFD to compute the member capacities. The resultant critical buckling load is also used to determine the effective slenderness ratio (KL/r) (or effective length, KL) from AASHTO LRFD Pe equation. The slenderness ratio is then utilized in the approximate single step moment magnification equations in the AASHTO LRFD 4.5.3.2.2b to determine second order effects. The resulting amplification factor can then be used to increase the design moments determined from linear analyses accordingly.	AASHTO 4.5.3.2.2b
The stiffness of the concrete members is determined considering variability in cracking, reinforcement, and creep along the length of concrete compression members. ACI 318-19 Eq. 6.6.4.4.4c is used to calculate effective stiffness of the concrete members. ACI equation is chosen over AASHTO LRFD 5.6.4.3 equations as it is considered more accurate by accounting for section reinforcement, size, external loads, and section resistance.	ACI 6.6.4.4.4c AASHTO 5.6.4.3
Initial geometric imperfections are accounted by considering transverse sinusoidal deviation out-of-straightness with ± L/1500 at mid-height in refined analysis. Time dependent effects (i.e. creep in concrete) are considered in non-linear time-dependent staged construction analysis. Actual end-member restraints at foundations are considered by using equivalent foundation springs in the global model that are generated in nonlinear FB-MultiPier analysis at mid-depth of the pile caps.	

K. *HLA Column Design Methodology* 1. Kℓu /r for columns may exceed 100. Therefore, the column design for all HLA bents does not use the approximate procedure specified in AASHTO Article 5.6.4.3. Instead, a large deflection non-linear analysis (P-Δ analysis) is performed to account for second order effects resulting from the applied loads and deformations. In the P-Δ analysis, $0.4I_g$ from the AASHTO expressions for effective moment of inertia in 5.6.4.3 is used as cracked section properties for entire column length. 2. Footing springs are generated using the FB-Multipier software at bottom of column (top of footing) including the contribution of the footing, pile group and soil. 3. For long straddle bents utilizing post-tensioning, the effects of concrete shrinkage, uniform temperature changes and concrete creep are included in loads for the bent cap design. 4. Initial imperfections are also taken into accounted in the design process. If the moment is zero or less than the calculated value due to minimum eccentricity, the axial load will be multiplied by the minimum eccentricity (0.6 + 0.03h) to obtain the applied moment, where h is the dimension of column in the direction of bending. 5. The moments from the P-Δ analysis are used for both the column and footing design. 6. For tall columns, the stability during construction under wind loads is also evaluated.	ACI 6.6.4.5.4
4. Design Loadings *A. Operational Importance Factor* Design-Builder shall design the Main Span Bridge and High-Level Approaches with an operational importance factor of 1.05. Design-Builder shall apply the operational importance factor to the entirety of the Main Span Bridge and High-Level Approaches. B. *Redundancy Factor* Redundancy factor = 1.0 under strength limit state. All primary steel members fully or partially in tension shall be classified as a System Redundant Member (SRM) or Internal Redundant Member (IRM) such that no member is considered a Nonredundant Steel Tension Member. C. Dead Loads (DC & DW) 1. Unit Weight of Reinforced Concrete: AASHTO LRFD 3.5.1 2. Unit Weight of Prestressed Concrete: 155 lbs/ft^3 3. Unit Weight of Structural Steel: 490 lbs/ft^3 4. Stay-in-place forms: 15 lbs/ft^2 5. Wearing surfaces and future overlays (1.5” PPC @ 140-pcf): 17.5 lbs/ft^2 6. Traffic Barrier (each): The barrier rail dead load shall be considered equally distributed across all girders. However, the dead load for girder design shall not be less than 25% of a single barrier rail weight.	TP 13.3.1.4.1 FHWA TS-80 SDM 3.1

a. PennDOT BD-610M: 500 lbs/ft b. BBR-M(54): 1027 lbs/ft c. BBR-1: 375 lbs/ft d. TX (54): 1115 lbs/ft 7. Lock-up Device: xx lbs each 8. Fence: xx lbs/ft 9. Maintenance Catwalk: xx lbs/ft 10. Utility Allowance (future conduit): no allowance is required. 11. Design-Builder shall apply an additional superimposed dead load allowance of 200 lbs./ft. as a line load along the centerline of the eastbound and westbound lanes of the Main Span Bridge and High-Level Approaches.	TP 13.3.1.4.2
D. Live Loads (LL) 1. Design Live Load – bridges are designed to accommodate an HL-93 truck or a tandem truck plus lane load as defined in AASHTO 3.6. 2. Dynamic Live Load Allowance (IM) – Not applicable to the design of foundations.	AASHTO 3.6 TP 13.3.1.4.3
3. Load ratings shall be performed using HL-93 and ALDOT posting loads. The operating level of all ALDOT posting vehicles described in ALDOT Bridge Inspection Manual and the FAST Act Emergency Vehicles EV2 and EV3 shall be analyzed at the operating level.	TP 12.3.3.6
E. Longitudinal Forces (LF) 1. For non-integral bents, the Braking Force (BR) shall be 8.75% of the weight of the design truck or design tandem. The force shall be assumed to act horizontally at the top of the cap in either longitudinal direction to cause extreme force effects. It shall be distributed equally to all bearings. For the widest deck section, the section can accommodate up to 5 lanes. For tributary length less than 450-ft, the ratio between ALDOT requirement and AASHTO 3.6.4 is 0.35. The SDM provision will only apply to piers/bents supporting precast concrete beam superstructures only. Also, this provision does not apply to straddle bents.	SDM 3.4
(table below)	AASHTO 3.6.4

Lane number	Multiple Presence Factors, m	BR value per pier (kip)	AASHTO 3.6.4 (kip)	Ratio
1	1.20	7.560	21.6	0.35
2	1.00	12.600	36.0	0.35
3	0.85	16.065	45.9	0.35
4	0.65	16.380	46.8	0.35
5	0.65	20.475	58.5	0.35
6	0.65	24.570	70.2	0.35
7	0.65	28.665	81.9	0.35
8	0.65	32.760	93.6	0.35
9	0.65	36.855	105.3	0.35

2. All other provisions of AASHTO 3.6.4 shall apply unless refined methods are used for the analysis.

F. Centrifugal forces (CE) — AASHTO 3.6.3
   1. Highway design speed (v): 65-mph or 95.33-ft/s

G. Wind Loads
   1. Wind on Structure (WS) – Calculate and apply per AASHTO 3.8. — TP 13.3.1.5
      a. Design 3-Second Gust Wind Speed for Different Load Combinations, V — SDM 3.2

Load Combination	3-Second Gust Wind Speed (mph), V
Strength III	160
Strength V	80
Service I	70
Service IV	120

      b. Wind Exposure Category D
      c. Design will be in accordance with the project-specific Wind & Climatology Report for the High-Level Approaches and Mains Span.
   2. Wind on Live Load (WL): AASHTO LRFD 3.8.1.3
   3. The design wind load for chain link or metal fabric fence shall be taken as 0.015 ksf acting normal to the entire surface. The wind load need not be applied simultaneously with live load. — AASHTO 13.8.2

H. Water Loads
   1. Criteria for Water Loads (WA) is given in AASHTO 3.7. — SDM 3.2
   2. Bridges exposed to coastal influences shall be designed in accordance with the project-specific Coastal & Hydraulic Design Report.

I. Creep and Shrinkage (CR & SH) – Calculate strains per CEB-FIP Model Code 1990, Chapter 2. Mean annual relative humidity for design: 75%. Time from release of strands to pouring of the bridge deck is 120 days. — SDM 5.2.8, SDM 5.2.9

J. Thermal Effects — SDM 3.3, AASHTO 3.12.2.2
   1. Uniform Temperature (TU) – Calculate per Procedure B in accordance with AASHTO 3.12.2.2. Normal base temperature is 70°F.
      a. Superstructure & Substructure – Designed for uniform temperature rise or fall. Apply load factor for uniform temperature, γ_{TU}, when calculating force effects at the strength and event limit states in accordance with AASHTO 3.4.1 (γ_{TU} = 0.5 if gross section properties of the piers are considered, and γ_{TU} = 1.0 if cracked section properties are considered).
         i. Thermal Coefficient: 0.000006 in/in per °F for concrete
            0.0000065 in/in per °F for steel members
         ii. For concrete girder bridges with concrete decks
            (i) $TU_{MaxDesign}$: 105 °F (temperature rise 35 °F)
            (ii) $TU_{MinDesign}$: 30 °F (temperature fall 40 °F)

iii. For steel girder bridges with concrete decks (i) $TU_{MaxDesign}$: 110 °F (temperature rise 40 °F) (ii) $TU_{MinDesign}$: 25 °F (temperature fall 45 °F)	PTI
iv. Cable Stays – Non-uniform temperature variations affecting the design or assembly of the girder may include: (i) Temperature differential between stay cables and deck or between stay cables and pylon shall be assumed -10ºF and a +20ºF..	TP 13.3.1.4.4
(ii) Temperature differential between stays left and right of the pylon, longitudinally, shall be assumed ±10ºF. (iii) Thermal gradient through deck, as specified in AASHTO LRFD.	TP 13.3.1.4.4 TP 12.3.3.1 TP13.3.1.4.4
b. Bearings and Deck Joints i. Temperature movements, including the additional combined movements due to creep, shrinkage, and elastic shortening, must be considered as follows: (i) A. 1.2 x (Temperature fall + creep + shrinkage + elastic shortening) (ii) B. 1.2 x (Temperature rise) The Main Span bridge is not restrained against thermal expansion in the transverse directions and forces due to thermal expansion will not develop.	AASHTO 14.7.2.5
ii. Friction shall be X% (of the applied vertical force for dimpled lubricated PTFE bearing pressure greater than 3.0 ksi. iii. Joints shall be set for a 1½'' opening (perpendicular to joint) at 70°F. When using the "open armored joint" type expansion joint, the maximum joint opening size is limited to 3". When using a sealed expansion joint, a maximum joint opening size of 4" is allowed. The sealed joint shall be taken from the ALDOT list of Qualified Materials for Bridge Expansion Joint Systems. When evaluating acceptable joint sizes, the minimum joint opening size during bridge expansion shall be the maximum of either the manufacturer's requirements for the joint system selected or 0.50 inches. When the calculated maximum joint opening exceeds 4", a modularjoint shall be used.	SDM 14.1 TP 12.3.3.1 TP 13.3.1.4.4 AASHTO 3.12.3
2. Temperature Gradient (TG) – Calculate per AASHTO 3.12.3, temperature zone 3. Apply load factor for temperature gradient, γ_{TG}, in accordance with AASHTO 3.4.1 (γ_{TG} = 0.0 at the strength and event limit states, 1.0 at the service limit state when live load is not considered, and 0.5 at the service limit state when live load is considered).	AASHTO 3.11
K. Earth Pressure (EH & EV) – Calculate and apply per AASHTO 3.11.	

1. Horizontal Earth Pressure (EH) – Include actual calculated surcharge loads from adjacent structures, but not less than equivalent horizontal earth pressure for live load surcharge (LS) applied per AASHTO 3.11.6.4. 2. Vertical Earth Pressure (EV) – Unit weight of earth fill: 120 lbs/ft^3.	
L. Earthquake Effects – Seismic Design Category (SDC) A1; Site Class Definition: D 1. Horizontal response spectral acceleration coefficient at 1.0 second period modified by long-period site factor (S_{D1}): 0.072 i. Horizontal response spectral acceleration coefficient at 1.0 second period (S_1): 0.03 ii. Site Factor for long-period range of acceleration spectrum (F_V): 2.4 2. Peak seismic ground acceleration coefficient modified by short-period site factor (A_S): 0.048 i. Horizontal peak ground acceleration coefficient (PGA): 0.03 ii. Site Factor at zero-period on acceleration spectrum (F_{PGA}): 1.6 3. Minimum support length per AASHTO 4.7.4.4.	SDM 3.5 AASHTO 3.10 AASHTO 4.7.4.4
M. Vehicular Collision Force (CT) – Bridge piers to be protected by barrier or crash wall if located within minimum clearance restriction for roadway or railroad, respectively. Vehicular collision force shall not be applied if bridge is protected by barrier.	AASHTO 3.6.5
N. Vessel Collision Force (CV) Design-Builder shall design and construct Structures to withstand vessel collisions according to the approved Vessel Collision Report per TP Section 14.3.5. Design-Builder shall design Project Structures to withstand storm impacts in accordance with the AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms, First Edition 2008 with March 2018 Errata.	TP 13.3.1.4.5 TP 13.3.1.3 TP 14.3.5
O. Construction Loads – Construction loading values are summarized below according to the loads defined in AASHTO LRFD 5.12.5.3.2:	TP 13.4.1.1 AASHTO 5.12.5.3.2

Load Name	Load Value
DC	Self-weight
DIFF	Will not be considered; however, it is assumed detailed control of geometry, weights and cable stayed forces will occur to prevent any out-of-balance effects.
DW	Assumed Zero during construction
CLL	Refer to Erection Manual
CEQ	Refer to Erection Manual
IE	Refer to Erection Manual
CLE	Refer to Erection Manual
U	All stages of Main span erection included as DC.
WS	Refer to Wind and Climatology Report
WE	Refer to Wind and Climatology Report
WUO	Included in WS

A	Weight of element being handled
AI	100% of load A acting upward or downward for strength limit states. 10% of load A acting upward or downward for service limit states.
CR&SH	Section 4.H
T	Section 4.I

1. Dynamic equipment load (IE), longitudinal equipment load (CLE), and wind on equipment (WE) not included for design of the Landside Bridges or High-Level Approaches.

2. Flexural tension and principal tension stresses shall be determined at service limit states as specified in the following table. The distribution and application of the individual erection loads appropriate to a construction phase shall be selected to produce the most unfavorable effects. The construction load compressive stress in concrete shall not exceed 0.50 f’c, where f’c is the design concrete compressive strength at the time of load application

AASHTO 3.4.1

Load Combination	LOAD FACTORS														
	Dead Load			Live Load			Wind Load			Other Loads					Earth Loads
	DC DW	DIFF	U	CEQ CLL	IE	CLE	WS	WUP	WE	CR	SH	TU	TG	A AI WA	EH EV ES
a	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	γ_{TG}	1.0	1.0
b	1.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	γ_{TG}	1.0	1.0
c	1.0	1.0	0.0	0.0	0.0	0.0	1.0	0.7	0.0	1.0	1.0	1.0	γ_{TG}	1.0	1.0
d	1.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.7	1.0	1.0	1.0	γ_{TG}	1.0	1.0
e	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	0.3	1.0	1.0	1.0	γ_{TG}	1.0	1.0
f	1.0	0.0	0.0	1.0	1.0	1.0	1.0	0.0	0.3	1.0	1.0	1.0	γ_{TG}	1.0	1.0

3. Construction load combinations at strength limit state:
   For superstructure and substructure:

   1.1(DC + DIFF) + 1.3(CEQ + CLL) + A + AI

   DC + CEQ + A + AI

   For substructure only:

   The Strength I, III, and V load combinations from AASHTO Table 3.4.1-1 shall apply. The loads DIFF and CEQ shall be included and factored with γDC. The load WUP shall be included and factored with γWS. The loads CLL and WE shall be included and used in place of LL and WL, respectively. Load factors for DC, DW, and WS shall be taken as specified in AASHTO 3.4.2. The dynamic response or dynamic allowance

(AI) shall be applied to substructure elements above the drilled shaft or footing including the column to foundation connection.	
P. Load combinations at the appropriate service, fatigue, strength, and extreme event limit states per AASHTO Table 3.4.1-1.	
1. Load factor for prestressing effects (PS) shall be 1.0 per AASHTO Table 3.4.1-3.	
2. Load factors for creep & shrinkage effects per AASHTO 3.4.1-3.	
Q. Pedestrian Overlook Loading	
1. Pedestrian bridges shall be designed for a uniform pedestrian loading of 85 psf in combination with a load factor of 1.75. This loading shall be patterned to produce the maximum load effects. Consideration of dynamic load allowance is not required with this loading.	
R. Downdrag	
1. Possible development of pile downdrag forces, also known as negative skin friction, shall be evaluated in accordance with AASHTO 3.11.8 and applied per AASHTO Table 3.4.1-2.	
5. Materials	
A. Concrete	SDM 5.1
1. 28-day compressive strength (f'c) for design:	TP 13.3.1.9
a. Precast superstructure: 9,500 psi	RFITOCLI-00009
b. Prestressed concrete pile: 6,000 psi	RFITOCLI-00030
c. Superstructure (including barrier rails and deck): 4,000 psi	
d. Substructure (including footings and walls): 4,000 psi	
e. Main Span Towers (56-Day Strength): 8,000 psi	
f. Drilled Shafts: 4,000 psi	SDM 5.2.7
g. Seal Concrete: 3,000 psi	
2. Modulus of Elasticity – Calculate per AASHTO 5.4.2.4 with the correction factor for aggregate source (K_1) = 1.16 if regional dolomitic limestone aggregate is used (adjust K1 as appropriate for other aggregates) and the unit weight of concrete (w_C) = 150 lbs/ft^3 (for all suppliers, both precast and CIP).	SDM 5.6
3. Mass Concrete	
a. Concrete elements that have a least dimension exceeding 5' shall generally be considered as mass concrete excluding drilled shafts. Mass concrete elements shall be constructed in conformance with requirements in Section 510.03(d) of the ALDOT Standard Specifications for Highway Construction, and the Thermal Control Plan as described in TP 13.4.4.1.	TP 13.4.4.1
b. Elements that shall be considered as mass concrete are identified in Thermal Control Plan.	TP 13.3.1.9.2
i. To be determined as design progresses.	
ii. To be determined as design progresses.	

4. All exposed edges of concrete shall be chamfered a minimum of ¾".	TP 13.3.1.2
B. Reinforcing Steel 1. All deformed reinforcing shall be in conformance with AASHTO M31 (ASTM A615), Grade 60 or Grade 75/80. All reinforcing shall be plain except for the reinforcing identified in Service Life Design Report, and Corrosion Protection Plan per TP 13.3.1.2. 2. Concrete cover requirements: a. Superstructure i. Deck slabs: 2.5" clear top, 1 ¼" clear bottom, 2'' clear sides, 3'' clear ends ii. Barriers: 2" b. Substructure i. Cap: 3'' clear end, 2'' clear bottom, 2'' clear top and sides. ii. Column: Water crossings, 3'' clear; grade separations, 2'' clear. iii. Footing: 4'' clear bottom, 3'' clear sides and top, 4'' clear top of pile to bottom mat of reinforcing iv. Drilled Shafts: (i) in soil, 6'' clear sides, 6'' clear bottom to main reinforcing, 1'-0'' to first hoop. (ii) in rock, 4'' clear min. sides, 6'' clear bottom to main reinforcing, 1'-0'' to first hoop. v. Struts: 2'' clear typical transverse, 3'' minimum end (clearance may be greater dependent on the embedment of the main reinforcing as stipulated by the designer). c. Crack Control – Class 1 Exposure Condition	TP 13.3.1.9.1 TP 12.3.3.1.3 QCMBPD 3.3.3 AASHTO 5.10.1
C. Prestressing Steel 1. Strands – AASHTO M203 (ASTM A416), Seven Wire, Grade 270, Low Relaxation a. Modulus of Elasticity: 28,500 ksi b. Maximum Jacking Stress: 0.80 f_{py} Pre-tensioning 0.9 f_{py} Post-tensioning c. Maximum Anchoring Stress i. At End of Seating Zone: 0.74 f_{pu} ii. At Anchor: 0.7 f_{pu} d. Anchor Set: 3/8" e. Friction Coefficient: 0.25 f. Wobble Coefficient i. External Tendons: 0.0 ii. Internal Tendons: 0.0002 per ft. g. Strand Diameter: 0.5 for prestressing of piles 0.6 for prestressing in girders 0.62 for stay cables and tie-downs 2. Bars – AASHTO M275 (ASTM A722), Grade 150 (Type II) a. Apparent Modulus: 30,000 ksi b. Maximum Jacking Stress: 0.72 f_{pu} (0.9 f_{py})	AASHTO 5.6.7 AASHTO 5.4.4 AASHTO 5.9.3 AASHTO 5.4.4

c. Maximum Anchoring Stress i. At End of Seating Zone: 0.7 f_{pu} ii. At Anchor: 0.7 f_{pu} d. Anchor Set: 1/16" e. Wobble Coefficient: 0.0002 per ft. 3. Tendon Ducts a. Transverse Deck Tendons – corrugated high-density polypropylene flat duct b. Longitudinal External Tendons – high-density polyethylene c. Longitudinal Internal Tendons – corrugated high-density polypropylene round duct d. Longitudinal External Tendon Deviator – rigid steel (schedule 40) (galvanized) e. Bars – corrugated high-density polypropylene	AASHTO 5.9.3
D. Structural Steel 1. Main members (e.g., girders, rolled beams, lateral bracing, diaphragms, stiffeners, and vertical connection plates) shall be AASHTO M270 Grade 50, unless otherwise noted. Where Grade 70 material is specified, steel shall be HPS 70. 2. Miscellaneous members (such as armor plates, ladders, catwalks, and clip angles) shall be AASHTO M 270 Grade 36 or Grade 50.	
E. Pot & Disc Bearings – AASHTO M270 (ASTM A709), Grade 50	
F. Elastomeric Bearings – Steel-laminated in conformance with AASHTO M251, Durometer 50, and 60 for plain pads	
G. Anchor Bolts – AASHTO M314, Grade 55	
H. Stay Cables and Tie-Down Strand 1. AASHTO M203 (ASTM 415) Seven Wire, Grade 270 Low Relaxation 2. Strand metallic area of 0.2325 in^2 3. Strands will be individually greased and sheathed	
I. Bolted Connections All field connections shall be made with high strength ASTM F3125 Grade A325 (Type 1) min 7/8" diameter bolts designated as a slip critical (Class ”B" Contact Surface) connections unless noted otherwise. All bolt holes shall standard size unless noted otherwise. Grade A490 bolts may be selected if considered beneficial. A490 bolts shall not be galvanized but shall be coated per ASTM 3393. Class B faying surfaces and threads excluded will be required. Field drilling of bolt holes are permitted only as detailed in the plans.	TP 12.3.3.1 SDM 6.5
J. Lock-Up Devices The lock-up devices (LUDs) shall be designed to engage, acting as an effectively fixed connection longitudinally, between the superstructure and the Main Span Towers due to wind, braking, and/or seismic loading. Effectively un-restrained	

movement in the LUD shall be accommodated under the slow displacements of temperature, creep, and shrinkage.	
6. Allowable Stresses A. Reinforced Concrete – Designed at strength limit state and verified for compliance with serviceability and fatigue criteria per AASHTO 5.7.3.4 and 5.5.3.2. B. Prestressed Concrete Girder 1. Girders shall be designed so that in no case shall the tension in the bottom of the girder after losses under the Service III load combination limit state exceed $0.0948\sqrt{f'_c}$ (ksi). 2. Anchorage zones in prestressed girders: ~~A~~ Splitting resistance relative to the anchorage zone shall be no less than 4% of the total prestressing forces at transfer as specified in AASHTO 5.9.4.4.1. The force at transfer shall be the stress inducing force in the girder end release per SDM 5.2.12. Confinement steel reinforcement shall be #3's spaced at 4" o.c. minimum and shall extend from the end of the girder for a distance equal to 1.5 times the beam depth. C. Prestressed Concrete 1. Stresses at service limit state in accordance with AASHTO 5.9.4. Also limit principal web tension for SERVICE III load combination to $3.5\sqrt{f'_c}$ (psi), $0.110\sqrt{f'_c}$ (ksi). No tension allowed in precompressed tensile zones after all losses have occurred. 2. Stresses for construction load combinations in accordance with AASHTO 5.14.2.3.3. Also limit principal web tension for construction load combinations to the following: a. Principal web tension excluding "Other Loads": $3.5\sqrt{f'c}$ (psi), $0.110\sqrt{f'c}$ (ksi) b. Principal web tension including "Other Loads": $4\sqrt{f'c}$ (psi), $0.126\sqrt{f'c}$ (ksi) 3. Casting and Erection a. Minimum concrete strength prior to lifting segments or lowering forms: 2,500 psi b. Minimum concrete strength prior to stressing vertical and transverse post-tensioning: 4,000 psi c. Minimum age of segments at time of erection: 28 days d. Minimum concrete strength prior to stressing longitudinal post-tensioning: 6,500 psi for precast segments and 2,500 psi for CIP closure joints D. Bearings 1. Pot Bearings – Stresses at service limit state in accordance with AASHTO 14.7.4.	 AASHTO 5.7.3.4 AASHTO 5.5.3.2 SDM 5.2.3 TP 12.3.1.4 SDM 5.2.6 SDM 5.2.12 AASHTO 5.9.4.4 AASHTO 5.9.4 AASHTO 5.9.2.3 AASHTO 5.14.2.3.3 AASHTO 14.7.4

2. Disc Bearings - Stresses at service limit state in accordance with AASHTO 14.7.8. 3. All other bearing elements are designed for strength.	AASHTO 14.7.8
7. Retaining Wall A. The Department's Special and Standard Drawings book has retaining wall details to address fill heights of up to 34'. These details are provided on Bridge Standard Drawing RW 10-4. For fill heights greater than 34' requiring special design, the engineer shall be responsible for providing a design that satisfies the latest AASHTO design requirements. B. Responsibility for design and details of retaining walls shall be as follows: 1. Temporary retaining walls – The contractor shall be responsible for providing the design and details for all temporary retaining walls. 2. Permanent conventional walls – The Bridge Bureau shall be responsible for providing the design and details for all permanent conventional retaining walls unless a consultant has been contracted to provide such items as part of a complete set of plans. 3. Permanent proprietary walls – The contractor shall be responsible for providing the design and details for all permanent proprietary retaining walls.	SDM 11.3
8. Load Rating A. Bridge superstructures shall be analytically load rated in accordance with the requirements of the ALDOT Maintenance Bureau Bridge Inspection Manual Appendix I. B. All load ratings shall be in accordance with the latest edition of the AASHTO Manual for Bridge Evaluation. C. All structures that meet the NBI definition of a bridge shall be load rated using the latest version of AASHTOWare Bridge Rating unless the structure type is not supported by the software. D. The load rater shall provide a rating manual for any bridge type that is not compatible with AASHTOWare Bridge Rating. The rating manual shall consist of an ALDOT approved software to load rate the bridge for future permit vehicles. For the Main Span, the manual shall include a spreadsheet suitable for the application and rating of additional trucks to the rated members of the Main Span. E. ALDOT Posting Vehicles are shown in BIM Appendix I.	TP 12.3.3.6 SDM 16 BIM Appendix I

1.6 DESIGN CRITERIA – PORTS AND COASTS

1.6.1 Discipline Design Approach

To be developed as design progresses.

1.6.2 Design Constraints & Interfaces

To be developed as design progresses.

1.6.3 Design Criteria

To be developed as design progresses.

1.7 DESIGN CRITERIA – SETTLEMENT & VIBRATION MONITORING

Technical Provisions (TP) Section 17 specifies the requirements that are intended to limit the impact of construction on surrounding properties. These requirements include maximum permissible vibrations and maximum permissible settlements at various distances from our construction activities. In our design process, the means and methods that will be required to construct a given feature (e.g., a pier foundation, a culvert, etc.) must be considered with respect to these limits specified in TP Section 17.

1.7.1 Discipline Design Approach

Our design approach considers the vibration and settlement limits specified in TP Section 17 and summarized in Tables 1 and 2.

Table 1 – Vibration Monitoring Limits Summary

Condition	Distance Limit	Required Monitoring	Comments
Historic Structure	Vibration-causing activity within 250 ft	• Vibrations • Pre-construction survey • Post-construction survey	Max vibration of 0.1 ips at historic structures; Historic structures defined in Appendix J of Environmental Impact Statement
Modern Structure	Vibration-causing activity within 150 ft	• Vibrations • Pre-construction survey • Post-construction survey	Max vibration of 0.5 ips

Table 2 – Settlement Monitoring Limits

Condition	Distance Limit	Required Monitoring	Comments
Historic Structures	Within 250 ft of construction work potentially causing settlement, heave, or groundwater lowering	• Settlement • Groundwater level when dewatering performed	Max settlement ≤ ¼ inch Notify ALDOT if groundwater drops > 12 inches.
Modern Structures	Within 150 ft of construction work potentially causing settlement, heave, or groundwater lowering	• Settlement • Groundwater level when dewatering performed	Max settlement ≤ ¼ inch Notify ALDOT if groundwater drops > 12 inches.

Existing or new structures that may be affected by ground loss, ground heave, or dewatering	Same as above	• Settlement • Groundwater level when dewatering performed	Max settlement ≤ ¼ inch Notify ALDOT if groundwater drops > 12 inches.
Area near drilled shaft excavations	Maximum horizontal distance of shaft length or 10 x shaft diameter	• Settlement • Groundwater level when dewatering performed	Max settlement ≤ ¼ inch Notify ALDOT if groundwater drops > 12 inches.
Area near other excavations	5 x excavation depth	• Settlement • Groundwater level when dewatering performed	Max settlement ≤ ¼ inch Notify ALDOT if groundwater drops > 12 inches.

Additionally, the Section 106 Memorandum of Agreement (MOA), requires vibration monitoring at the following "Special Structures", regardless of where construction activities are occurring:

1. Christ Church Cathedral
2. Old City Hall (History Museum of Mobile)
3. Conde-Charlotte Museum House
4. Phoenix Fire Museum
5. Austal
6. The Wallace Tunnel
7. The Bankhead Tunnel

In consideration of the above limits, our design approach is as follows:

- Identify the locations of activities that may create vibrations (e.g., pile driving, demolition, etc.) and/or settlement (e.g., large fills, excavations, dewatering, construction-induced vibrations, etc.).
- Use rational analyses, the results of the University of South Alabama Vibration Study, and other technical literature to estimate the impact of the potential construction activity at the relevant distances from the site of the activity.
- Preclude designs that require means and methods that are deemed likely to exceed the limits in Tables 1 and 2.
- Develop a monitoring plan that confirms the impacts are within the specified limits.

1.7.2 Design Constraints & Interfaces

The design constraints are the limits in Tables 1 and 2. These limits preclude the following:

- Driven piles or vibratory installation of drilled shaft casing in many locations.

- Large fill placement near existing structures or utilities
- Uncontrolled dewatering near existing structures or utilities

1.7.3 Design Criteria

See Tables 1 and 2 in Section 1.7.1.

1.8 DESIGN CRITERIA – ROADWAYS

Roadway design for the Project includes design of interstate highways, service interchanges, highway ramps, local roadway connections and the removal of a service interchange.

ALDOT uses a Performance-Based, Practical Design approach to roadway design. Roadway design for the project has been designed to comply with Section 18.0 of the Technical Provisions (TP's) and TP Attachment 18-1. TP Attachment 18-1 has been modified to update references to the 2018 AASHTO Green Book.

1.8.1 Discipline Design Approach

The Roadway design approach included the following:

- Revise Traffic Interchange (TI) at Virginia Street from a Diverging Diamond Interchange (DDI) to a Standard Diamond Interchange (SDI). Based on the traffic data from the original Interchange Modification Report (IMR), there were not a significant number of left turning vehicles to warrant the full reconstruction required for a DDI. Since a DDI was not necessary, it was felt that a standard diamond interchange would cause less reconstruction of Virginia Street. This would simplify construction and reduce delays into and out of the Port. An IMR update will be required once updated traffic is received.
- Options were presented to minimize the Design Exception (DE) that exists for the Horizontal Stopping Sight Distance (HSSD) along the West High Level Approach (HLA). FHWA directed the team to utilize what is known as "Option 3" which places the HLA between the Eastbound (EB) and Westbound (WB) I-10 Business, similar to the Reference Information Document (RID) design. This did not eliminate the need for a DE but did reduce it from the RID design. This option was chosen because it drastically reduces if not eliminates the need for straddle bents along the West HLA. This will in turn cause less traffic disruption during construction.
- Optimize alignments to improve:
    - Maintenance of Traffic (MOT) operations and Constructability to reduce construction schedule.
        - Alignments at the East Tunnel were moved off-line of the existing alignments for constructability.
    - Reduce structure length and height through horizontal and vertical geometry.
- Optimize alignments to minimize or eliminate design exceptions.
    - The East Tunnel Ramp B alignment was revised to eliminate a DE.
    - The West HLA alignment was modified to reduce the required DE. In addition to an alignment revision, the WB inside shoulder was widened to 12' to improve the HSSD DE.
    - It was discovered during design that the EB outside shoulder along the East HLA was deficient of HSSD although a DE was not conceptually approved for this deficiency. This was presented in the March 21, 2023 Task Force Meeting and it was shown that it would take a 16' shoulder width to eliminate this DE. FHWA

stated that this shoulder should be widened to 16'. The design was modified to provide this 16' shoulder width and several weeks later ALDOT stated that they did not want to widen this shoulder and that a 12' shoulder should be used and a DE should be submitted.

1.8.2 Design Constraints & Interfaces

The Roadway design constraints include the following:

- Roadway design near the Wallace Tunnel cannot affect the structural integrity of the Tunnel and Tunnel portals.
- Roadway profiles going into and out of the Wallace Tunnel have approved design exceptions for final design. If the roadway profiles change, new design exceptions will be needed.
- I-10 alignments in the Bayway section need to interface with the Bayway Project.
- I-10 alignment at east end of the project to tie into existing I-10
- Major urban reconstruction in a tight corridor
- Interface with local streets.
- ADA design.
- Right of Way – project design to remain within identified right of way limits.
- Railroad Right of Way
- Environmental; Wetland and SAV impacts
- Aged storm drainage infrastructure.
- Utility Constraints

1.8.3 Design Criteria

Design Criteria for Roadways is based on the following sections and attachments of the RFP.:

- TP Section 7.0 Land Surveying
- TP Section 8.0 Right of Way
- TP Section 13.0 Main Span Bridge and High-Level Approaches
- TP Section 18.0 Roadways
- TP Attachment Table 18-1 (Modified, See Note)
- TP Section 21.0 Bicycle and Pedestrian Facilities
- TP Section 22.0 Aesthetics and Landscape
- TP Section 27.0 Tunnels and Tunnel Ancillary Facilities

Additional Roadway design criteria are provided in:

- ALDOT Performance-Based Practical Design Guide

- ALDOT Access Management Manual, September 2022 https://www.dot.state.al.us/publications/Maintenance/pdf/Permits/AccessManagementManual.pdf
- ALDOT Guidelines for Operations (GFO) 3-10, 3-16, 3-40, 3-42, 3-50, 3-63, 3-75 and 3-76, https://www.dot.state.al.us/publications/Design/pdf/AldotGFO1.pdf
- ALDOT US Customary Design Detail Library and Special Project Details, https://www.dot.state.al.us/publications/Design/DesignDetailLibrary.html
- ALDOT Standard and Special Drawings for Highway Construction, 2023 https://alletting.dot.state.al.us/Docs/Standard_Drawings/StdDrawingSelect.html
- AASHTO A Policy on Geometric Design of Highways and Streets, 2018, 7th edition (Green Book)
- AASHTO Roadside Design Guide 2011, 4th edition
- AASHTO A Policy on Design Standards Interstate Systems, May 2016
- FHWA Diverging Diamond Interchange Information Guide 2021, 2nd edition
- US Access Board Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way 2011
- NCHRP National Cooperative Highway Research Program (NCHRP) Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features
- AASHTO Manual for Assessing Safety Hardware (MASH), 2016, 2nd edition
- City of Mobile, AL ROW Standard Drawings
- RFI 004 modified the Design Speeds of the following to coincide with the posted speed limit:
    - Broad Street
    - Claiborne Street
    - Claiborne Street Extension
    - Canal Street
    - Water Street
    - Dunlap Drive
    - Addsco Road
    - I-10 Business

The TPs identified four Design Exceptions (Des) in the preliminary design of the Reference Plans. They are the following:

1. Wallace Tunnel DE- FHWA Approved for Final Design. DE incorporated into final design.
2. West High-Level Approach DE- Conceptual DE requires FHWA Approval. DE reduced and incorporated into final design.

3. ~~East Tunnel Interchange (Ramp B) – Conceptual DE, requires FHWA Approval.~~ DE eliminated through ramp design optimization.
4. ~~Bayway Bridge DE – Conceptual DE, requires FHWA Approval~~. DE eliminated by ALDOT. Shoulder width changed from four feet to six feet. RFI 022 is asking for ALDOT concurrence that DE not needed.

Refer to Section 2.8.3 for additional design exception discussion.

Currently there are no Design Variances in the design.

54” median barrier is being used along the roadway median sections as a continuation of the structures and HLA median requirements to reduce headlight glare.

1.9 DESIGN CRITERIA – DRAINAGE

All drainage work is to be in accordance with Technical Provisions (TP) Section 19 and shall account for all sources of runoff that may reach the Project, whether originating within or outside the Project Right-of-Way (ROW), in the design of the drainage facilities. Bridge Deck Drainage is to be in accordance with TP Section 12.3.1.9 including subsections 12.3.1.9.1, 12.3.1.9.2, and 12.3.1.9.3.

1.9.1 Discipline Design Approach

All elements of the project's drainage system shall be designed to provide a complete and functional drainage system that complies with the requirements of TP Section 19. All drainage improvements shall be designed in a manner that accounts for all existing and proposed tributary areas within or outside the planned project ROW. Tributary areas will incorporate future land-use plans within 150 ft of ROW and potential uses from governmental entities zoning at a minimum, for drainage areas discharging into ROW.

1.9.2 Design Constraints & Interfaces

Standards: All drainage work shall be performed according to Technical Provisions Table 19-1: standards

Data Collection: Collect available data for the following:

- Data collection will be in conformance with TP19.2.2 for water resources issues, wetlands, Federal Emergency Management Agency (FEMA) floodplains, and other data required to establish a drainage system in the Project limits.
- Municipal drainage plans, watershed management plans, pertinent existing storm drain plans, survey data within the Project limits will be collected in conformance with TP 19.2.2.
- If documentation is not available for elements and those elements are to remain in place, investigation and data collection of those elements will conform with TP 19.2.2.

Coordination with other Governmental Entities

- Coordinate and obtain all data, drainage, designs, approvals, and permits with affected interests, governmental entities, utility owners, and railroads, as applicable.
- FEMA map revisions
    - If a map revision is found to be warranted documentation shall be prepared including risk assessments, risk analysis, and design.
    - Map revision documentation is to be provided to the local floodplain administrator to file conditional letter of map revision and letter of map revision (LOMR) with FEMA

Software

- Approved drainage software shall be in accordance with ALDOT memorandum regarding *Departmental Approved Hydrological Hydraulic Software*, dated August 6, 2018.
- The use of Bentley's Open Roads Designer shall be allowed instead of Bentley's STORMCAD.

Design-Builder may utilize Elements of the existing drainage system, not maintained by ALDOT, if thorough investigation and design has determined such systems are suitable for conveyance of Post-project flows to the end of the Service Life. Design-builder shall show that use of existing systems does not detrimentally affect upstream or downstream features under Post-Project conditions.

1.9.3 Design Criteria

- FHWA, Hydraulic Design of Highway Culverts, Hydraulic Design Series No. 5
- FHWA, Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22
- ALDOT, Hydraulic Manual
- ALDOT, Guidelines for Operation (GFO) 3-17, 3-18, 3-19, 3-20, 3-21, 3-22, 3-24, 3-39, 3-45,3-46, 3-47, 3-48, 3-52, 3-72, and 3-73
- ALDOT, Memorandum regarding Departmental Hydrological/Hydraulic Software Programs
- OpenRoads Designer Drainage & Utilities
- AASHTO, 2005 Model Drainage Manual

1.10 DESIGN CRITERIA – RAIL

No track design work is anticipated in this project, only freight railroad coordination. All railroad coordination is to be in accordance with Technical Provisions (TP) Section 20. The Mobile River Bridge and the proposed pedestrian bridge will interface with CSX Railroad. The I-10 Bridge over Tennessee Street and Canadian National Railway (CN) will interface with CN.

1.10.1 Discipline Design Approach

No track design work is anticipated in this project, only freight railroad coordination. With freight railroad coordination, communication is key to a successful project. Meetings will be held to discuss any potential issues, such as clearance, so the railroad is aware of what is being designed.

Any structure over or under the railroads will have to be submitted to the railroad. Typically, preliminary plans (30%) are submitted and once approved final plans are submitted. Each submittal will have a railroad comment resolution meeting to make sure the designer understands the railroad comment and the railroad is generally agreeable to the designer's solution. Once final plans are approved by the railroad, a Construction Agreement can be executed. No construction can take place over or under the railroad's property without a Construction Agreement.

1.10.2 Design Constraints & Interfaces

Several disciplines will interface with the freight railroads. As a result, these disciplines will need to adhere to each railroad's design requirements. Typically for freight railroads, bridge must clear span their right of way and no drainage is allowed to be directed onto their right of way. For more specific design requirements either speak with the project's railroad coordinator or see the next section, 11.11.3.

1.10.3 Design Criteria

The design criteria for design will need to adhere to each railroad's requirements and the following standards as shown in TP Table 20-1:

- CSX Railroad – CSX Public Project Manual
- CN Railway – TBD
- AREMA Manual for Railway Engineering
- ALDOT Guidelines for Operation (GFO) 4-6 and 5-6.

1.11 DESIGN CRITERIA – BICYCLE AND PEDESTRIAN FACILITIES

1.11.1 Discipline Design Approach

Bicycle and pedestrian facilities will be constructed and maintained according with Technical Provisions (TP) Section 21. Provide bicycle and pedestrian facilities that are compatible with existing trails and do not hinder or interfere with the planned trails and other facilities for pedestrians and cyclists identified in the following documents:

- Alabama Department of Transportation *Bicycle and Pedestrian Plan*, 2010.
- Mobile Metropolitan Planning Organization *Long Range Transportation Plan*.
- Eastern Shore Metropolitan Planning Organization *Long Range Transportation Plan*.
- Mobile County *Bicentennial Bicycle and Pedestrian Master Plan*, October 21, 2011.
- Eastern Shore Metropolitan Planning Organization Bicycle and Pedestrian Transportation Concept, February 2015.
- Mobile Metropolitan Planning Organization Bicycle and Pedestrian Comprehensive Plan, March 4, 7 2015.
- City of Spanish Fort Causeway Master Plan.
- City of Mobile Map for Mobile.

1.11.2 Design Constraints & Interfaces

- Design-Builder shall be responsible for accommodating any new or updated plans from the above reference agencies issued up to the Setting Date.

1.11.3 Design Criteria

- AASHTO, Guide for the Development of Bicycle Facilities
- AASHTO, Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO, Manual for Assessing Safety Hardware (MASH)
- FHWA, Manual of Uniform Traffic Control Devices
- US Access Board, Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- US Access Board, Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of- Way (PROWAG)
- ALDOT, Access Manual

1.12 DESIGN CRITERIA – AESTHETICS AND LANDSCAPE

1.12.1 Discipline Design Approach

Design Development Process:

The landscape design development process involved a collaborative approach, bringing together a multidisciplinary team of landscape architects and engineers. Initial consultations were conducted to understand the project's goals, site conditions, and client preferences. The team evaluated factors such as climate, topography, soil quality, and drainage patterns, as well as the context of the immediate surroundings, to inform design decisions. Below is an outline of steps taken during design development.

Conceptual Design:

- **Develop Conceptual Landscape Design Ideas and Themes:** The process of developing conceptual landscape design ideas and themes begins with a comprehensive understanding of the linear infrastructure, encompassing roads, highways, and transportation corridors. The landscape architects take into account the functional requirements and constraints of these linear elements while also considering the aesthetic aspects that contribute to the overall visual harmony. The project's context provides inspiration with the surrounding environment, cultural heritage, and local characteristics. Evaluating these factors creates themes that resonate with the community and reflect the project's identity. These themes are conceptual frameworks that guide the subsequent design process, ensuring that every element of the landscape complements and enhances the linear infrastructure in a cohesive and meaningful manner.

- **Explore Various Design Options and Address Site-Specific Challenges:** In the pursuit of crafting a well-balanced and sustainable landscape, the landscape architects engage in a thorough exploration of design options tailored to address site-specific challenges. These challenges may include rugged topography, limited space, drainage issues, or the need to accommodate diverse transportation modes. By conducting in-depth site analysis, they gain insights into the unique attributes and constraints of the area, enabling them to devise innovative solutions. The design options they develop aim to optimize the use of available space, seamlessly integrate green spaces, and promote safe and efficient pedestrian movement. The result is a landscape design that not only overcomes site-specific challenges but also enhances the overall visual quality and user experience, fostering a sense of place and connection with the environment.

- **Integrate Sustainable Landscape Practices:** Sustainability lies at the core of the landscape architects' design philosophy, and integrating sustainable landscape practices is a fundamental aspect of their work. Through thoughtful planning and consideration of environmental impacts, they incorporate various sustainable strategies into the landscape design. Stormwater management, a key aspect, involves the implementation of features such as detention and retention facilities to mitigate stormwater runoff, improve water quality, and replenish groundwater resources. Additionally, the landscape architects carefully curate plant selections based on their suitability to the local climate, tolerance to hydraulic conditions, ensuring low-maintenance requirements and reduced water consumption. These sustainable landscape practices not only minimize the project's ecological footprint but also promote resilience, longevity, and environmental stewardship, leaving a positive and lasting impact on the community and surrounding ecosystems.

Design Development:

- Refine the Final Conceptual Design: After developing the conceptual landscape design ideas and themes, the next critical step is to refine the selected concept into a comprehensive and detailed plan. This process involves translating the broad conceptual framework into specific and tangible elements that will compose the final landscape. Landscape architects meticulously consider every aspect of the design, including plant selections, hardscape elements such as pathways, seating areas, and identify locations for public art. structures, and landscape features like water features, sculptures, or recreational spaces. Each element is carefully evaluated for its functional and aesthetic value, ensuring that they align harmoniously with the overall design concept and the linear infrastructure. The refined plan serves as a blueprint, guiding the implementation phase and providing a clear vision for the project's realization.

- Prepare Detailed Drawings, Specifications, and Cost Estimates: With the refined landscape plan in hand, the landscape architects proceed to create detailed drawings, specifications, and cost estimates for the proposed landscape elements. These drawings are highly technical and provide precise measurements, dimensions, and specifications for each element, including the layout of plants, materials, and construction details for hardscape features. The specifications outline the quality standards for materials, installation methods, and performance expectations, ensuring consistency and adherence to the design intent during construction. Additionally, the landscape architects estimate the costs associated with each element, considering material prices, labor expenses, and any special requirements. These detailed documents are essential for accurately communicating the design to contractors and stakeholders, facilitating the procurement process, and maintaining project budgets.

- Consider Accessibility and Pedestrian Safety: In linear design development, promoting accessibility and ensuring pedestrian safety are vital considerations. Landscape architects carefully analyze the project's alignment and surrounding areas to identify opportunities for integrating walkways, pedestrian crossings, and green spaces that enhance the user experience. By strategically placing walkways and crossings, they create a seamless pedestrian network that encourages active mobility and connectivity within the linear infrastructure. Green spaces, such as parks or plazas, provide inviting areas for relaxation and recreation along the linear corridor. Moreover, the landscape architects prioritize safety by designing pedestrian-friendly crossings, traffic calming measures, and appropriate lighting to ensure a secure environment for all users. This thoughtful integration of accessibility and pedestrian safety elements enriches the overall functionality and inclusivity of the linear design, fostering a vibrant and user-centric landscape.

1.12.2 Design Constraints & Interfaces

Assumptions Made:

Several key assumptions were made during the design development process. These include:

Planting Strategy and Landscape Integration:
During the design development phase, planting areas were carefully considered, taking into account the existing landscaping on the site and assuming that the current plantings would remain in place or will need to be properly permitted for replacement through the City of Mobile.. The goal was to create a cohesive and harmonious landscape by strategically placing new plantings to complement and enhance the existing vegetation. Each specific character area was analyzed to determine the appropriate selection of plants that would seamlessly integrate with the surroundings. By doing so, the new plantings were intended to fill out the designated spaces, ensuring a cohesive and visually appealing composition that works in harmony with the established landscape choices. The result is a thoughtfully planned landscape that respects the existing environment while adding new elements to enhance its overall beauty and functionality.

Plant Suitability:
All plant selections were based on their adaptability to the local climate and site-specific conditions in Mobile, Alabama, as recommended by authoritative manuals such as the AASHTO Roadside Design Guide, ALDOT A Manual for Roadside Vegetation Management, City of Mobile Landscape Ordinance, and USDA Guide to Native Trees for Landscaping on the Eastern Shore of Mobile Bay. We are assuming these plants are readily available in the sizes we have specified and in good health.

Planting Soils: All planting soil will meet planting soil requirements with adequate soil amendments to optimize soil structure, fertility, and drainage, thereby resulting in healthy plant growth. The specific soil amendments required are outlined in the technical provisions. We will follow ALDOT's guidelines and assume that they have detailed appropriate soil amendment practices for permitting purposes.

Risks and Mitigation Strategies:
To mitigate risks, the following strategies have been employed:

Plant Health and Survival: Rigorous plant health inspections will be conducted by trained professionals to ensure that all trees, shrubs, seedlings, and vines are in a healthy condition before and after planting. Any non-viable plants will be promptly replaced.

Soil Quality and Amendments: Continuous monitoring of soil health will be carried out, and any deficiencies will be addressed promptly through appropriate soil amendments to support optimal plant growth.

Compliance and Quality Control: Regular inspections will be performed throughout the project duration to ensure compliance with design specifications, approved guidelines, and industry best practices.

Unforeseen Environmental Factors: Contingency plans will be established to address potential environmental changes or unforeseen circumstances that may affect the landscape's integrity and longevity.

1.12.3 Design Criteria

- AASHTO, A Guide for Transportation Landscape and Environmental Design
- AASHTO, Roadside Design Guide
- ALDOT, Standard Specifications for Highway Construction
- ALDOT, Standard and Special Drawings
- ALDOT, Manual for Roadside Vegetation Management
- American Association of Nurserymen, American Standard for Nursery Stock
- American Joint Committee on Horticultural Nomenclature, Standardized Plant Names
- ANSI, Z60.1 American Standard for Nursery Stock
- City of Mobile, Landscape Ordinance
- I-10 Mobile Rover Bridge Project - Technical Provisions, Section 22.0 - Aesthetics and Landscape
- I-10 Mobile Rover Bridge Project - Technical Provisions, Section 22.0 - Aesthetics and Landscape (Attachment 22.1)
- USDA, Guide to Native Trees for Landscaping on the Eastern Shore of Mobile Bay

1.13 DESIGN CRITERIA – SIGNING, PAVEMENT MARKING, AND SIGNALS

1.13.1 Discipline Design Approach

Perform all Work pertaining to signing, pavement marking, and signalization according to Technical Provisions (TP) Section 23. For the Project, design all components of the signing system, pavement marking system, and traffic signal system to provide a complete and functional highway system that meets the requirements of the TP and design criteria.

1.13.2 Design Constraints & Interfaces

- Until such time that the permanent signs are in place, relocate existing signs or provide temporary signs.
- Remove conflicting signs and sign Structures.
- Permanent signs and support Structures must be new, unless otherwise authorized by ALDOT.
- Third Party signs or sign support structures.
- See 23.3.1.2 Signs Outside of the Project Right-of-Way (ROW).
- See 23.3.1.3 Advance Toll Information Signs
- See 23.3.1.4 USS Alabama Battleship Signs

1.13.3 Design Criteria

Design-Builder shall perform all signing, pavement marking, and signal Work in accordance with the Standards listed in TP Table 23-1, summarized as follows:

- AASHTO, Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 1996 Version
- ALDOT, Miscellaneous Guide Sign Policy
- ALDOT, Roundabout Manual
- ALDOT, Signal Design and Timing Manual
- ALDOT, Signing Plan Design Guide
- ALDOT, Specific Service Sign Policy
- ALDOT, Guidelines for Operation (GFO) 3-32, 3-33, 3-37, 3-56, 3-57, and 5-1
- ALDOT, ALDOT Standard and Special Drawings for Highway Construction,
- FHWA, Manual of Uniform Traffic Control Devices (MUTCD)
- NESC, National Electrical Safety Code
- NFPA, National Electrical Code NFPA-70
- All interstate signs must use "Major" Category A or B or Overhead letter heights according to Tables 2E-4 and 2E-5 of the FHWA MUTCD.

1.14 DESIGN CRITERIA – INTELLIGENT TRANSPORTATION SYSTEM (ITS)

1.14.1 Discipline Design Approach

A new ITS shall be designed and constructed for the Project. The new ITS shall be constructed to accommodate ALDOT's operation of a tolling system in accordance with TP Section 1 (General). The ITS is designed to comply with ALDOT Statewide Transportation Plan (SWTP) and Section 24 of the Technical Provisions (TP). All ITS work shall be performed according to the standards listed in the TP Table 24-1. The design includes the following system: traffic detection, toll specific DMS, Communications Network, Traffic management Camera Coverage (CCTV), Force Off Detectors, Dynamic Message Signs (DMS), Automated Incident Detection System (AIDS), Low Visibility Fog Warning System, Connected Vehicle Devices, electrical power systems, and all Conduit infrastructure to support identified systems per TP Section 24.

The ITS design for the Mobile River Bridge will include developing an inventory of existing ITS elements and identifying new ITS elements for the MRB as well as the future Bayway Bridge project due to the proximity of the two projects. Existing and new/future equipment will have to be identified and evaluated in the ALDOT Control Room facility to accommodate the newly identified ITS elements for the two projects. ALDOT will be responsible for the integration between the two projects, and with all other governmental entities.

1.14.2 Design Constraints & Interfaces

- Newly designed ITS to function with existing ITS System components adjacent to the project. All existing ITS within the project limits will be removed.
- Communications System must be compatible with ALDOT ITS and business network
- Design of tolling system infrastructure needs to be coordinated with ALDOT's separately procured Tolling Contractor.

1.14.3 Design Criteria

Design-Builder shall perform all ITS Work according to the Standards listed below. In cases where ALDOT ITS General Application requirements conflict with NEMA TS4 requirements, the ALDOT ITS General Application will govern.

- ALDOT Standard Specifications for Highway Construction
- ALDOT Testing Manual
- ALDOT Standard and SPecial Drawings for Highway Construction
- ALDOT General Application Special Provisions
- ALDOT Materials, Source and Devices with Special Acceptance Requirements Manual (Qualified Products List)
- Alabama Statewide ITS Architecture; Final Report
- ALDOT Intelligent Transportation Systems (ITS) General Application
- NFPA 70; National Electrical Code (NEC)
- NFPA 70E; Standard for Electrical Safety in the Work Place

- ANSI/IEEE Standard C2; National Electrical Safety Code (NESC)
- FHWA Manual on Uniform Traffic Control Devices (MUTCD); 2009 Edition
- AASHTO Roadside Design Guide, 4th Edition; 2011 and July 2015 Errata.
- AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2009 Edition.
- NEMA TS 2-2016; Traffic Controller Assemblies with NTCIP Requirements – Version 07.07.
- NEMA TS 4-2016; Hardware Standards for Dynamic Message Signs (DMS) with NTCIP Requirements; February, 2017
- ONVIF Open Network Video Interface Forum (ONVIF) Standards for IP based security products. Profile S March 2016 v1.1.1.
- ANSI Z535.4: Product Safety Signs and Labels
- FCC Rule 15, Part B: Rules and Regulations for Unintentional Radiators
- NEMA Standards Publication 250; Enclosures for Electrical Equipment (1000V Maximum)
- UL 48; Standard for Electric Signs
- UL 50; Enclosures for Electrical Equipment
- UL 1449; Surge Protection Devices, Third Edition
- SAE J2540 – Advanced Traveler Information Systems (ATIS) Family of Standards for Coding of Messages and Phrase Lists
- IEEE 802 – Family of Standards related to Local Area Networks, including 802.11p - Wireless access in vehicular environments (WAVE)
- IEEE 1609 – Family of Standards for Wireless Access in Vehicular Environments (WAVE) – Security Services for Applications and management Messages
- US Department of Homeland Security Industrial Control Systems Cyber Emergency Response Team (ICS-CERT) Recommended Practices
- National Institute of Standards and Technology (NIST) SP 800-37, Guide for the Security Certification and Accreditation of Federal Information Systems
- National Institute of Standards and Technology (NIST) 800-53, Recommended Security Controls for Federal Information Systems
- FHWA 23 CFR Part 511 – Real-Time System Management Information Program
- FHWA 23 CFR Part 940 – Intelligent Transportation System Architecture and Standards
- ALDOT Guidelines for Operation (GFO) 5-27 and 5-28
- NTCIP 1203 Object Definitions for Dynamic Message Signs (DMS)

1.15 DESIGN CRITERIA – TRAFFIC CONTROL

1.15.1 Discipline Design Approach

The Traffic Control is designed to comply with Technical Provisions (TP) Section 18 (Roadways), Section 19 (Drainage) and Section 25 (Traffic Control). All Traffic Control work shall be performed according to the standards associated listed in TP Table 25-1. The Traffic Control scope of work includes the development of the traffic management configurations that simultaneously preserve road users' mobility and security and facilitates construction of temporary detours and new permanent alignments. The Traffic Control configurations will cover all work that may interact with traffic.

Traffic Control design approach includes the following for each stage:

- Installation of concrete roadside barriers to protect work zones and/or channelized traffic.
- Installation of temporary signage.
- Construction of temporary roadway and structures and alignments allowing to establish safe and convenient work zones.
- Provide a drainage design to address live traffic and construction area.
- Removal of the existing pavement markings and installation of temporary pavement markings.
- Provision of access to work sites.
- Accommodation of pedestrians, cyclists, light and heavy vehicles, construction equipment, and all other road and site users' mobility.
- Implementation of planned short-term and long-term lane or road closures and associated detours.

1.15.2 Design Constraints & Interfaces

Traffic Control design constraints are listed in this section.

1.15.2.1 Phasing

Traffic Control should be designed in a way that eases meeting scheduled deadlines while respecting the constraints listed in TP Section 25. The general objective is to achieve the best compromise between construction process efficiency on the one hand, and fluidity and safety of travel on impacted and neighboring roads on the other hand. The phasing should thus be established considering multiple factors such as:

- The need to optimize the work sequence so that construction is complete within the agreed 5-year schedule.
- Adjacent interchanges' impacts, including, but not limited to closures constraints related to the connection of East and Mid-Bay interchanges.
- Adjacent project impacts, including but not limited to Bayway project and its related closure constraints.
- Temporary structures to minimize construction impacts on road users.

- Lane closures restrictions according to TP Section 25.3.2, TP Attachment 25-1 (Eligibility for Approved Lane Closures), TP Attachment 25-2 (Permitted Ramp and Side-Street Lane Closures), TP Attachment 25-3 (Concurrent EB Ramp Lane Closure Restrictions) and TP 25-4 (Concurrent WB Ramp Lane Closure Restrictions).

1.15.2.2 Temporary Geometry

The principal factor that drives the temporary geometric design is the space available for the implementation of temporary structures. The main constraints that the temporary geometry designer should be aware of are the following:

- Temporary structures design shall remain within the identified right of way limits.
- Temporary structures design shall not encroach on the railroad right of way.
- Temporary structures design near the Wallace Tunnel shall not affect the structural integrity of the Tunnel and Tunnel portals.
- The maximum allowable differential between the posted speed limit and the reduced speed limit during construction is 10 mph
- Design criteria such as minimum lane width, minimum shoulder width, minimum clearance to new abutments, minimum clearance between temporary and new structures barriers shall be respected. These criteria are detailed in section 1.15.3 below.

1.15.2.3 Traffic Operations

When required, traffic analyses of temporary traffic operations are run using the peak volumes from 2016 provided. The following constraints apply to temporary traffic operations design:

Detours

- All streets, intersections, truck routes and detours shall remain open to traffic throughout construction duration unless closure is approved by ALDOT, Governmental Entities with jurisdiction, utilities, railroads, and public services where applicable.
- Detour plans must ensure that all detoured vehicle types can negotiate the detoured path.
- Suitable pavement transitions shall be provided for all detour interfaces.
- The impacts on traffic operations on adjacent roads should be minimized when detours are implemented. Traffic analyses shall be conducted when required.
- LOS degradation should be minimized and kept within the limits stated in TP Section 25.3.1.3.1 for detours having a proposed duration of more than 30 days. Appropriate mitigation measures shall be analyzed and implemented when required.
- Particular attention should be paid to traffic operations on Palmetto Street, S. Conception Street, Dunlap Drive, Addsco Road, Water Street, Canal Street, Old Water Street and Royal Street as per TP Section 25.3.1.4 to maintain continuous access to Austal USA, Mobile County Metro Jail, and Cruise Terminal.

Transit and active mobility

- Access to existing transit stops shall be maintained when possible. If access cannot be maintained, reasonable alternatives shall be provided and coordinated with the transit authority.

- Existing bicycle and pedestrian access to transit stops shall be maintained when possible. If access cannot be maintained, reasonable alternatives shall be provided and coordinated with the transit authority.

Heavy Vehicles

- Truck route information shall be considered when defining detours for a closure that impacts heavy vehicle flows. Particular attention shall be given to heavy vehicles coming from and heading to the port.

Speed Limit

- The maximum allowable differential between the posted speed limit and the reduced speed limit during Construction is 10 mph. Any other change to the posted speed limits is not allowed unless otherwise approved by ALDOT.

1.16.2.4 Local Communities Access

Safety devices and signs will be installed to ensure safe travel through and around the work areas. The temporary configuration will accommodate the following:

- Access to public and private properties.
- Local access for impacted roads.
- School bus pick up and drop off.
- Emergency services.
- Delivery access.
- Solid waste collections access.

Details of the community's transportation need including, but not limited to the following shall be confirmed following consultations with the local communities. Particular attention will be paid to the following:

- Maintaining continuous access to Palmetto Street and S. Conception Street to accommodate the Mobile County Metro Jail facility.
- Maintaining continuous access to Dunlap Drive and Addsco Road from US 90/98 to accommodate Austal USA transportation needs.
- Maintaining access to the Cruise Terminal during cruise departure days.

1.15.2.5 Other Temporary Considerations

- Lighting: temporary lighting will be provided in consideration of the temporary configuration and based on lighting analysis.
- Drainage: The temporary drainage also has some constraints that shall be included in the traffic management design.
    - Existing drainage structures capacity will be checked as they will be incorporated into the temporary drainage design. Culverts, Ditches, catch basins, slotted barrier will be added and connect to existing systems when needed. Further survey information might be needed to address this constraint.

    - Thorough coordination and collaboration between design and construction team is required.
- ITS: Temporary relocation of field devices, communications facilities, and power to provide a fully operational ITS throughout construction.
- Traffic Signals: Modification of existing signals to maintain appropriate signal operations and installation of temporary traffic signals base on traffic analysis may be required.
- Utility constraints: additional lane reconfiguration may be required for specific utility work.

1.15.3 Design Criteria

DB contractor must perform all temporary road works in compliance with TP section 25 Traffic Control and adhere to the standards listed in TP table 25-1. These standards can be summarized as follows:

- FHWA, Manual of Uniform Traffic Control Devices (MUTCD)
- AASHTO, Policy on Geometric Design of Highways and Streets
- AASHTO, A Policy on Design Standards Interstate System
- TRB, Alternative Intersections/Interchanges: Informational Report
- FHWA, 2011 Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of Way
- ALDOT, Guidelines for Operation (GFO) 3-39, 3-49, 3-61, 3-65, 4-8, and 4-9
- ALDOT, Construction Manual
- ALDOT, Standard Specifications for Highway Construction
- ALDOT, Traffic Signal Design Guide and Timing Manual
- ALDOT, ALDOT Traffic Control Detail Library
- ALDOT, ALDOT Standard and Special Drawings for Highway Construction, Latest Edition
- NCHRP, National Cooperative Highway Research Program (NCHRP) Report 581, Design of Construction Work Zones on High-Speed Highways

TP Attachment 18-1 provides a comprehensive set of design criteria that are desirable for the development of permanent geometric elements. These criteria are intended to be applicable to both permanent and temporary geometry. However, there may be instances where meeting all the criteria specified in TP Table 18-1 becomes impractical or unattainable. To address this situation, the table next page provides alternative recommendations in accordance with NCHRP Report 581, Design of Construction Work Zones on High-Speed Highways,

Table of Temporary Roadway Standards																
Temporary Roadway Classification		Design Speed / Temporary Posted Speed (mph)	Posted Speed (mph)	Design Vehicle	Minimum Stopping Sight Distance (ft)	Max Super-elevation Rate NC=2.2%	Min Curve Radius Method 2 (ft)	Min Curve Radius Method 5 (ft)	Max Grade (%)	Min Grade (%)	Minimum Crest K-Factor PERM / TEMP	Minimum Sag K-Factor PERM / TEMP	Accel. Lane Length (min)	Decel. Lane Length (min)	Cut / Fill Slope
Mainline I-10	Begin Project - Milepost 25.800	55	65	WB67	300*	8%	960	960	3%	0.5% (Desirable) 0.3% (Min)	114 / 42	115 / 65	—	—	2H:1V (w barrier) 4H:1V (w/o barrier)
	Milepost 27.834 - Milepost 29.352	55	65	WB67	300*		960	960	3%		114 / 42	115 / 65	—	—	
I-10 Business	Milepost 26.7 - Milepost 27.834	40	Posted speed 55 Advisory speed 40	WB67	300*	8%	444	444	3%		44 / 42	64 / 34	—	—	
	Milepost 25.800 - Milepost 26.7	45	55	WB67	300*	8%	587	587	3%		61 / 42	79 / 44	—	—	
Ramps	Conventional and Slip Ramps	30	VAR.	WB67	200	8%	214	214	4% (5% max) /- 5% (6% max) Refer to AASHTO page 10-93 for ramps on grades	0.5% (Desirable) 0.3% (Min)	19	37 / 20	Desirable : - Application of Green Book Tables 10-3, 10-4, & 10-5 Minimum : The larger of : - 70% of the desirable value - 300 ft Taper : 300 ft	Desirable : - Application of Green Book Tables 10-3, 10-4, & 10-5. Minimum : - 200 to 300 ft Taper: 200 ft	2H:1V (w barrier) 4H:1V (w/o barrier)
		35			250		314	314			29	49 / 27			
		40			300*		444	444			44 / 42	64 / 35			
		45			300*		587	587			61 / 42	79 / 44			
	Loop	15	VAR.	WB67	80		38	38			3	10 / 5			
		20			115		76	76			7	17 / 9			
		25			155		134	134			12	26 / 14			
Frontage Roads	FR	35	VAR.	WB67	250	6%	340	713	4%	0.5% (Desirable) 0.3% (Min)	29	49 / 27	—	—	2H:1V (w barrier) 4H:1V (w/o barrier)
State & US Routes	SR-16/US-90/SR-42/US-98	45	VAR.	WB67	300*	8%	587	587	4%	0.5% (Desirable) 0.3% (Min)	61 / 42	79 / 62	—	—	2H:1V (w barrier) 4H:1V (w/o barrier)
City/County Roads	VAR.	35	45	WB40/WB67	250	4%	371	1370	4%	0.5% (Desirable) 0.3% (Min)	29	49 / 27	—	—	2H:1V (w barrier) 4H:1V (w/o barrier)
		30	40	WB40/WB66	200		214	214			19	37 / 20	—	—	
		25	35	WB40/WB67	155		154	729			12	26 / 14	—	—	
		20	30	WB40/WB67	115		86	490			7	17 / 9	—	—	
		15	15 or 25	WB40	80		42	277			3	10 / 5	—	—	
REFERENCES	—	—	—	—	AASHTO Table 3-1 and 3-2 (on grades) *Minimum allowed 300ft as per NCHRP 581 Section 4.3.2.1	—	NCHRP 581 & AASHTO Table 3-13	AASHTO Table 3-10	—	—	PERM refer to AASHTO Table 3-35 TEMP refer to AASHTO Formula 3-44 (S^2/2158)	PERM refer to AASHTO Table 3-37 TEMP refer to AASHTO Formula 3-52 (V^2/46.5)	—	—	—

The design of temporary measures for traffic control does not always need to meet the standards of the proposed design. The previous table outlines the minimum design standards necessary to ensure a safe and adequate temporary design solution. In such circumstances, opting for less restrictive criteria presents a significant cost advantage for the project. The flexibility provided by this supplementary table allows for practical adjustments while maintaining a balance between meeting essential safety requirements and optimizing cost-effectiveness.

Additional Maintenance of Traffic (MOT) temporary design criteria that are not included in the previous are listed below.

Table Additional MOT design criteria

Minimum lane width	11 ft
Minimum shoulder width	2 ft. This is a minimum. It may be necessary to maintain larger shoulders for spread on the roadway and structures to mitigate the potential for hydroplaning and to facilitate temporary drainage.
Temporary sidewalks	5 ft
Temporary walls	Face of temporary wall offset 4 ft from edge of new pavement.
Temporary pavement	(TBD)
Temporary barriers	Mainline barrier, 2 ft slide, paved surface under barrier, including temporary pavement. Frontage road and cross streets will use low profile barrier. Barrier can be placed on edge of pavement. No slide risk as long as there is no drop off.
Minimum bridge underclearance	14’ unless existing is less – if less need to be posted and validated for rerouting trucks and oversize load
Lane configuration	2 lanes per direction on I-10
Hazardous materials	Alternate route should be identified for hazardous material trucks when closing an existing route for hazardous materials.
Design life	In accordance with the duration each temporary detour is in use. If traffic is placed on proposed pavement prior to placement of the final lift, the permanent pavement design shall be modified, as necessary, to mitigate the load impact and premature failure in the future.

In addition, The DB contractor shall perform all temporary drainage work in compliance with TP section 19.3.7 Temporary Drainage Facilities. These standards can be summarized as follows:

- Convey a storm return frequency of 10 years on interstates and five years on cross streets.

- Comply with the same design requirements, except for storm return frequency, and construction requirements as that of the permanent drainage systems. *(Listed in the table below)*
- Provide safe operation during construction.
- Accommodate both existing and construction area runoff water.
- Comply with Good Industry Practice.

Moreover, the temporary drainage designer shall comply to other criteria pertaining to the permanent drainage listed in the following design manual.

No.	Organization	Name
1	FHWA	Hydraulic Design of Highway Culverts, Hydraulic Design Series No. 5
2	FHWA	Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22
3	ALDOT	Hydraulic Manual
4	ALDOT	Guidelines for Operation (GFO) 3-17, 3-18, 3-19, 3-20, 3-21, 3-22, 3-24, 3-39, 3-45, 3-46, 3-47, 3-48, 3-52, 3-72, and 3-73
5	ALDOT	Memorandum regarding Departmental Hydrological/Hydraulic Software Programs
6	AASHTO	2005 Model Drainage Manual

1.16 DESIGN CRITERIA – TOLLING

To be provided once Tolling criteria are defined by ALDOT's separate Tolling Project solicitation.

1.16.1 Discipline Design Approach

To be provided once Tolling criteria are defined by ALDOT's separate Tolling Project solicitation.

1.16.2 Design Constraints & Interfaces

To be provided once Tolling criteria are defined by ALDOT's separate Tolling Project solicitation.

1.16.3 Design Criteria

To be provided once Tolling criteria are defined by ALDOT's separate Tolling Project solicitation.

1.17 DESIGN CRITERIA – TUNNEL AND TUNNEL ANCILLARY FACILITIES

1.17.1 Discipline Design Approach

The design of the project shall provide for the protection of the existing Wallace Tunnel portals, including median and outside curbing and barrier rails, concrete slabs and counterweight, and retaining walls. The project design may remove and construct new median curbing and barrier in the existing Wallace Tunnel to facilitate construction of new project elements and shall ensure that such removal and construction of new median curbing and barrier does not affect the structural integrity of the Tunnel and Tunnel portals.

1.17.2 Design Constraints & Interfaces

There is an “anchor system” on either side of the tunnel that consists of integral retaining walls and slab several hundred feet beyond the entrances of the tunnel. Work will not extend beyond the tunnel anchor system into the tunnel “portal”. It has been noted in Task Force Meetings that the anchor system helps secure the tunnel in place and should not be disturbed.

1.17.3 Design Criteria

Tunnel and Tunnel Ancillary structures will be protected. Where median barrier and curbing are to be removed and replaced, refer to Roadway Design Criteria.

1.18 DESIGN CRITERIA – ELECTRICAL AND LIGHTING

The Electrical and Lighting design includes the Electrical Power Supply for all components of the project, all lighting within the project limits, including permanent and temporary roadway lighting of the bridge, under deck lighting, maintenance lighting, navigation lighting, aviation lighting, lighting of local streets, and replacement of existing lighting in the project right-of-way (ROW) as well as the lighting associated with the newly constructed Pedestrian and bike facilities. Backup power to be provided to all power systems with the following exceptions: aesthetic lighting, and roadway lighting on the Bayway portion of the project. The Electrical and Lighting design shall comply with the standards as listed in Technical Provisions (TP) Table 28-1 and with applicable utility owner standards.

1.18.1 Discipline Design Approach

The Electrical and Lighting design will provide appropriate/adequate electrical/lighting for Interstate sections, interchanges, underpasses, pedestrian areas, navigational lighting, and aesthetic lighting. The lighting design will be achieved by performing a lighting analysis of all lighted areas within the project limits with the appropriate codes and standards as a basis for analysis along with the requirements defined in the Technical Provisions. The electrical design will be based on load calculations for each lighting control center, reviewing voltage drop calculations for roadway lighting circuits, and compliance with the requirements as defined in the Technical Provisions.

1.18.2 Design Constraints & Interfaces

The Electrical and Lighting Systems constraints/interfaces include the following:

- Electrical systems to tie into existing utility feeds
- Electrical supply must be maintained to existing street lighting and ITS equipment throughout construction
- Discontinuing electrical supply to any facility requires approval from ALDOT prior to commencement of work
- Lighting Circuits to be segregated dependent upon governmental entities having jurisdiction
- No work to be performed in existing junction boxes
- Continuous lighting to be provided in all locations along all roads prior to the project and for the new alignment of I-10
- Existing lighting levels shall be maintained during construction where existing lighting exists. Roadway, high–mast, and underpass luminaires must be in accordance with the ALDOT List of Qualified Material, Sources, and Devices, List IV-6.
- Existing lighting serving ALDOT operations must remain in operation unless temporary lighting is provided

1.18.3 Design Criteria

Design-Builder shall perform all electrical Work according to the Standards listed in TP Table 28-1, and with applicable Utility standards related to certain Utility Owners.

Chapters 6 and 10 of the NFPA-502 Standard for Road Tunnels, Bridges, and Other Limited Access Highways do not apply to this Project.

1.19 DESIGN CRITERIA – SECURITY

To be provided at a later date.

1.19.1 Discipline Design Approach

To be provided at a later date.

1.19.2 Design Constraints & Interfaces

To be provided at a later date.

1.19.3 Design Criteria

To be provided at a later date.

1.20 DESIGN CRITERIA – DIGITAL DELIVERY

1.20.1 Discipline Design Approach

The Digital Delivery of the project will utilize OpenRoads Designer and MicroStation Connect Edition for all drawing production and various 2D and 3D modeling activities per the Technical Provisions (TP) requirements. Additionally, the ALDOT OpenRoads Designer Workspace and the Kiewit Modeling Features will be utilized for the project. All CAD-based data will be stored and actively developed within the Bentley hosted ProjectWise environment. All file federation and organization will be developed per the Kiewit Infrastructure Engineers Design Content Management Standards (DCM) and per Bentley Systems recommended workflows.

1.20.2 Design Constraints & Interfaces

The Digital Delivery constraints/interfaces include the following:

- Bentley Systems OpenRoads Designer software updates to fix known technical software issues.
- 3D Modeling Level of Development per the TP requirements and construction activity requirements.

1.20.3 Design Criteria

The Digital Delivery design criteria include the following:

- Kiewit Infrastructure Engineers Design Content Management Standards
- ALDOT OpenRoads Designer Workspace
- Bentley Systems recommended workflows for OpenRoads Designer
- Technical Provisions (TP) requirements and Attachments provides a comprehensive set of modeling requirements for the project.

1.21 DESIGN CRITERIA – CES/TSDC **(ADD POST GMP)**

To be provided at later date once project scope is defined at GMP.

1.21.1 Discipline Design Approach

To be provided at later date once project scope is defined at GMP.

1.21.2 Design Constraints & Interfaces

To be provided at later date once project scope is defined at GMP.

1.21.3 Design Criteria

To be provided at later date once project scope is defined at GMP.

2.0 PART 2 – BASIS OF DESIGN

2.1 BASIS OF DESIGN – ENVIRONMENTAL/PERMITTING

The environmental design component of this Project to identify and obtain environmental permits requried to complete the work. As discussed, these permits are organized in a permit matrix that is stored on the project SharePoint site.

2.1.1 General – Design Summary

All design components must be in compliance with the TPs and the environmental clearance documents provided by ALDOT. Design or construction methods that differ from these documents must be included in the environmental reevaluation that will be submitted to FHWA by ALDOT.

2.1.2 Design Optimization Strategy

The environmental group will support the project design optimizations by reviewing the changes against the requirements in the TPs and environmental clearance documents. Changes will be discussed with ALDOT during task force meetings, and where appropriate, optimizations may be discussed with regulatory agencies. Optimizations that are agreed to by ALDOT will be included in the environmental reevaluation.

2.1.3 Design Exceptions

- None developed at this stage.

2.1.4 Design Assumptions and Decisions

To be developed as design progresses.

2.1.5 Design Risks and Opportunities

Final environmental commitments will not be known until FHWA approves the ALDOT reevaluation. There is a risk that a new commitment could be included that is not currently understood by the project team

A second environmental design risk is the permitting schedule. ALDOT will provide the individual 404 permit required to complete the work, but this permit includes the new Bayway, which is much farther behind in design that the MRB.

There is also a risk that the ALDOT reevaluation could be delayed, which would also delay the USCG permit. This permit is critical and must be approved prior to beginning work on the main bridge pylons.

2.1.6 Design Quantities

- None developed at this stage.

2.1.7 Deliverables Summary

- Environmental Permit Matrix
- Environmentally Senstive Map and Memo

2.2 BASIS OF DESIGN – UTILITY RELOCATIONS

2.2.1 General – Design Summary

- ALDOT provided utility base data in the Reference Information Documents (RIDs) that were used to create our base map for existing utilities
- The project's Technical Provisions (TPs) Section 9 detail the procedures the KMT will follow
- A subsurface Utility Engineering (SUE) firm has been retained (T2 Utility Engineers) to confirm and map the existing utility data in accordance with ASCE 38-22
- Preliminary utility conflicts have been identified based on the HLA and roadway geometry designs and will continue as the design progresses
- A Master Utility Agreement will be executed with each utility owner to define project Terms and Conditions, subsequent Task Order Packages will be used to define relocation scopes, costs, and schedules
- Water and Wastewater relocations will be designed and constructed by KMT (Volkert as part of the team will provide design)
- Dry utilities (power, gas and telecommunications) intend to self-perform their design and construction, unless otherwise requested

2.2.2 Design Optimization Strategy

Conflict avoidance has been the optimized design strategy, where possible and practical

2.2.3 Design Exceptions

None expected at this time

2.2.4 Design Assumptions and Decisions

To be developed as design progresses.

- HLA footers have been modified to avoid direct conflict with the MAWSS 48" gravity sewer line on Conception St.

2.2.5 Design Risks and Opportunities

Design Risks include:

- Un-encased utility facilities crossing the interstate. Utility owners do not have records of older facilities. Will utilize SUE to help determine encasements (if possible)
- Settlement areas around old and possibly fragile lines
- Protection of large diameter (48 inch) sanitary sewer line along Conception St. And continuation north of Canal St (within Character 4 area)
- APCO Transmission at east HLA crossing. Challenge to acquire adequate clearance over the new bridge and cross perpendicular to avoid physical conflicts at the pile sites

Design Opportunities:

- Use of SUE Quality Level A data to determine utility facility elevations and work with design disciplines to acquire adequate clearances from the existing utility facilities that are planned to remain
- Use of SUE Quality Level B information to determine facilities within the project limits that may not have been identified in original project documents. Having this data prior to construction allows potential design around options prior to construction
- Once horizontal and vertical clearances are determined, work with the utility owners to attain agreeable design clearances and any protect in place measures that need to be taken

2.2.6 Design Quantities

- None developed at this stage.

2.2.7 Deliverables Summary

The following is a deliverables summary for Utility Relocations:

- Utility Relocation Concept Plans
- Master Utility Agreement
- Phase 1 Task Order Packages (for individual utility owners)
- Phase 2 Task Order Packages (for individual utility owners)
- Sealed Task Order Packages (for individual utility owners)
- Utility Conflict Matrix
- Utility Work Acceptance Requests
- Cost Records and Reports
- Utility Record Drawings

2.3 BASIS OF DESIGN – GEOTECHNICAL

2.3.1 General – Design Summary

- ALDOT provided Reference Information Documents (RIDs) that included a Geotechnical Baseline Report, a Load Testing Report, corrosivity studies and historical data performed for existing or proposed structures within the project boundaries.
- The RIDs included a conceptual 30 percent corridor design for I-10. Kiewit intends to design the I-10 corridor in general accordance with the 30 percent drawings.
- The project Technical Provisions (TPs) require the geotechnical design to be performed in accordance with AASHTO LRFD Bridge Design Specifications, 9th Edition.
- The boring locations and depths are based on AASHTO Table 10.4.2-1.
- The TPs require a Pile Load Test program that will be performed while the geotechnical exploration is being performed.
- Subsurface soil conditions on land generally consist of an interval of sandy silt fill underlain by similar soil with occasional clay seems in the 1- to 5-foot-thick range. A thick fat clay layer was encountered around a depth of 100 feet and typically extended below a depth of 150 feet.
- Preliminary analysis indicates the Mobile River Bridge will be supported on driven concrete piles or driven steel piles. Most of the bridges will be supported on pre-cast concrete piles ranging from 18- to 36-inches square. However, drilled shafts will be required for a few bridges on the west interchanges and the west high-level approach due to vibration constraints associated with existing structures and utilities.
- Preliminary wall analyses indicate walls can be constructed using mechanically stabilized earth walls. Ground improvement will be required to construct Wall 1 due to stability and settlement related issues.

2.3.2 Design Optimization Strategy

In order to refine and optimize the design, additional tests will be carried out on the site. The additional program will include:

- A boring program developed to meet the AASHTO boring spacing and depth criteria as well as the TPs boring spacing criteria for previously drilled borings. The boring program will include:
    - 120 SPT boring of a depth varying between 10’ to 415’.
    - 56 CPT boring of a depth varying between 40’ and 150’.
    - Installation of 21 piezometers to a depth of 30 feet.
- A laboratory testing program in conjunction with the geotechnical exploration performed on selected soil samples from the SPT borings. The laboratory testing program will include:

o Moisture Content	o Consolidation
o Atterberg Limits	o Unconsolidated Undrained (UU)
o Grain Size	o CU w/PP
o Hydrometer	o Direct Shear
o Wash 200	o pH
o Proctor	o Electrical Resistivity
o Resilient Modulus	o Chloride

o Specific Gravity	o Sulphate

- A load testing program to confirm foundation capacities and to allow the use of a higher resistance factor for the design and installation of foundations, in general accordance with AASHTO requirements. The load testing program is based on the TP requirements as well as statistical analysis performed by KMT with the available existing data provided in the RID. The load testing program will include:
  - TPs requirements:
    - 1% of the total number of drilled shafts installed for the project.
    - One load test at each main span bridge tower foundation.
    - One load test at each main span anchors pier foundation
  - Proposed additional load tests according to the statistical analysis results:
    - 3 load tests on 24-in PSCP

2.3.3 Design Exceptions

- None noted.

2.3.4 Design Assumptions and Decisions

The preliminary design assumptions were based on the data provided in the RID, including subsurface data collected from borings and laboratory tests, as well as load tests carried out by ALDOT. The design will be amended as necessary with the new information gathered during the additional tests that will be perform on the site as described in TP Section 2.3.2.

2.3.5 Design Risks and Opportunities

Design risks include the following:

- Pile driving vibrations may be greater than anticipated, possibly precluding piles at some locations or requiring changes in means and methods that could require additional load testing.
- Higher cost to complete the load test program than the cost saved by the optimization of the deep foundation lengths.
- Stratigraphic and groundwater conditions different from those derived from the data provided in the RID.

Different stratigraphic and groundwater conditions can generate:

- Increase in deep foundation lengths.
- Increase in anticipated settlement that could have a direct impact on:
  - The roadway grading costs associated with additional settlement over the pavement overlay life.
  - The wall type and foundation system
  - The deep foundations lengths
  - The integrity of the existing structures and utilities

Design opportunities include the following:

- Better stratigraphic and groundwater conditions than those estimated from the RID.

  Better stratigraphic and groundwater conditions can generate:

  - Reduction of the deep foundation lengths.
  - Reduction of estimated settlement reducing site preparation costs.

2.3.6 Design Quantities

- None developed at this stage.

2.3.7 Deliverables Summary

The following is a summary of the geotechnical deliverables:

- Geotechnical Subsurface Data Report
- Geotechnical Work Plan
- Geotechnical Exploration Plan
- Drilled Shaft Load Test Program
- Drilled Shaft Load Test Report
- Driven Pile Load Test Program
- Driven Pile Load Test Report
- West High Level Approach Geotechnical Report
- Main Span Bridge Geotechnical Report
- East High Level Approach Geotechnical Report
- West Segment Bridges Geotechnical Report
- West Segment Walls Geotechnical Report
- Project Wide Miscellaneous Foundations Geotechnical Report (signs, signals, ITS, etc.)

2.4 BASIS OF DESIGN – EROSION CONTROL

2.4.1 General – Design Summary

The Erosion Control design component consists of three main sections: Project Information, Environmental Concerns and Commitments, and Environmental Best Management Practices (BMPs).

The Project Information section compiles the Alabama Department of Environmental Management (ADEM) Notice of Intent (NOI) and project quadrangle map; properties of the soil expected to be encountered; and hydraulic information including the anticipated rainfall conditions and the minimum design storm for temporary BMPs.

The Environmental Concerns and Commitments section compiles information regarding construction stormwater along with other environmental issues such as wetlands, priority waters, threatened and endangered species, historical and archaeological sites, and hazardous materials.

The Environmental BMPs section compiles standard information from the ALDOT Construction Manual, ALDOT Specifications, ALDOT Standard and Special Drawings, and project specific information.

Prepare the phased Erosion and Sediment Control Plan, including devices and designs for structural controls that (i) conform to applicable ADEM regulations regarding the selection and implementation of BMPs; and (ii) conform to Alabama Soil and Water Conservation Committee Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas, 2018. Design Builder to ensure BMP's and Erosion and Sediment Control Plans comply with requirements listed in TP 11.3.2 and 11.3.3. Design Builder to ensure construction and maintenance requirements per TP 11.4 and 11.4.1 are met.

2.4.2 Design Optimization Strategy

- Permanent BMP’s will be used as needed as design progresses to ensure the post-Project flows are similar to the pre-Project flow conditions.

2.4.3 Design Exceptions

- None noted.

2.4.4 Design Assumptions and Decisions

- None noted.

2.4.5 Design Risks and Opportunities

- Prepare a Stormwater Treatment Facility Plan for each stormwater treatment facility required by ALDOT and the applicable Governmental Entities MS4 permits as noted on TP 11.3.4.

2.4.6 Design Quantities

- None developed as of this stage.

2.4.7 Deliverables Summary

- ADEM Construction General Permit Application
- Construction Best Management Practices Plan
- Stormwater Treatment Facility Plan
- Erosion and Sediment Control Plan

2.5 BASIS OF DESIGN – STRUCTURES

2.5.1 General – Design Summary

Refer to Section 1.5.1.

2.5.2 Design Optimization Strategy

For Landside (Interchange) Bridges:

- 75-year service life
- FDOT Standards FIB Girders, Bearings, & Details (longer spans, less girders for design/cost optimization, & reduced girder depth for vertical clearance considerations)
- Use of ALDOT Standards for concrete deck thickness, reinforcement, & SIP metal forms
- Use of most efficient foundation type
  - Bents with mono-shafts (48” diameter drilled shafts)
  - Abutments with drilled shafts (36” diameter shafts)
  - Abutments with PPC piles (16” SQ)
  - Bents with PPC piles (24” SQ)
- Fixed bents with full depth diaphragm with dowels (no anchor bolts)
- Expansion bents with shear blocks (no anchor bolts)
- Bents located outside RR ROW and greater than 25’ from centerline of track(s)
- Barriers utilized to protect bents in the clear zone (no vehicular impact design)
- Optimization of spans layout to avoid existing foundations and utilities
- Elimination of closed drainage system (open deck drainage system except over streets & RR ROW)

For HLA:

- Use only one type of concrete girder FIB-78
- Use steel plate girder where span lengths preclude the use of prestressed concrete girders
- Maximize use of 24” PPC piles.
- Limit column dimensions to 3 sizes.
- Fixed bents with full depth diaphragm with dowels (no anchor bolts)
- Expansion bents with shear blocks (no anchor bolts)
- Use drilled shafts and integral footings adjacent to the 48” diameter sanitary sewer line.

- Introduce 175-ft spans to reduce the lengths of straddle bents for the East HLA in the East Interchange area.
- Optimize East HLA footing sizes to accommodate use of a construction trestle.

2.5.3 Design Exceptions

Refer to Section 2.8.3 for High-Level Approach Design Exceptions.

2.5.4 Design Assumptions and Decisions

The HLA alignment at the Mobile Jail and surrounding streets, together with the 48" diameter sanitary sewer line and adjacent concrete box culvert set strict constraints on the foundation locations. The most economical and efficient solution is a 4-span continuous steel plate girder unit 1000-ft in length.

At the intersection of I-10 BUS East and I-10 BUS WB ON Ramp, two 175-ft FIB-78 girder spans are used to minimize the lengths of straddle bents over the underlying infrastructure. This optimization reduces the maximum straddle bent length from 146' to 119'.

2.5.5 Design Risks and Opportunities

See Section 1.5.2 for design constraints. The risk and opportunities matrix will be developed as design progresses.

2.5.6 Design Quantities

A summary of the quantities will be provided once they have been verified by Estimating.

2.5.7 Deliverables Summary

For the Landside (Interchange) Bridges & High-Level Approaches the following deliverables have been provided to the estimating team.

ALDOT Standards for:

- Barrier Rail
- Approach End Slabs
- End Wall (prestressed girder end diaphragm)
- Bridge deck reinforcement chart (Figure 9.1)
- Armored Joints
- Deck Drains
- FDOT Composite Elastomeric Bearing Pads
- Prestressed Pile
- General Notes

Conceptual (30%) Bridge Plans

- Concrete dimensions for footings, columns, and pier caps
- Typical sections

Other deliverables provided in tables:

- Foundation Matrix including:
  - Footing dimensions & concrete quantity
  - Pile / drilled shaft size & spacing
  - Pile / drilled shaft lengths
  - Bent cap dimensions & concrete quantity
  - Column sizes, heights and concrete quantity
- Reinforcement ratios for:
  - Footings
  - Drilled shafts
  - Pier Columns
  - Pier Caps
  - Deck
- Steel Units
  - Total weight of steel plate girder (18% included for diaphragms, lateral bracing, etc.)
  - No. of bolts in steel unit

For the Main Span Bridge the following deliverables have been provided as part of the 30% Plans set:

- Main steel girders provided in tables
- Stay cables quantities provided in tables
- Concrete dimensions provided for deck panels, stitch pours, and ballast
- PT quantity for deck panels
- Concrete dimensions provided for pylon, piers, and footings
- Pile type, size, and length
- Connections and bolts for Primary Members
- Barrier Rail

Other deliverables provided in tables:

- Secondary steel members and connections
- Stay anchors (top and bottom)
- Deck rebar ratio (LBS/CY)
- Pylon, pier, and foundation rebar densities (LBS/CY)
- Pile rebar (LBS/CY)
- Miscellaneous
  - Number of bolts – stay anchorages
  - Lock-Up restraint
  - Wind farings
  - Access walkways and related components
  - Fencing
  - Drainage

2.6 BASIS OF DESIGN – PORTS AND COASTS

2.6.1 General – Design Summary

To be developed as design progresses.

2.6.2 Design Optimization Strategy

To be developed as design progresses.

2.6.3 Design Exceptions

To be developed as design progresses.

2.6.4 Design Assumptions and Decisions

To be developed as design progresses.

2.6.5 Design Risks and Opportunities

To be developed as design progresses.

2.6.6 Design Quantities

To be developed as design progresses.

2.6.7 Deliverables Summary

To be developed as design progresses.

2.7 BASIS OF DESIGN – SETTLEMENT AND VIBRATION

2.7.1 General – Design Summary

- Anticipated vibration magnitudes will be estimated using the results presented in the University of South Alabama Vibration Report. Other technical literature combined with the subsurface data provided in the RIDs will be used as necessary. Additional vibration data will be collected when driven pile load tests are performed at the start of construction, and our estimates will be updated if appropriate.
- Regardless of the estimated magnitude, the evaluation will consider the response to the RFI regarding pile driving activities near the large sanitary sewer line, which prohibits vibratory sheet pile driving within 40 ft of the sewer line and impact pile driving within 100 ft of the sewer line.
- The vibration estimates will be used to establish the limits of vibration-inducing activities. The efficacy of the limits will be confirmed via settlement and vibration monitoring during construction.
- Anticipated settlement magnitudes at various distances from fill loads and/or dewatering will be estimated using basic soil mechanics by modeling in Settle3 software. The subsurface data included in the Reference Information Documents (RIDs) will serve as the basis of the initial analyses. As additional subsurface data are obtained, the models will be updated to reflect the new data as appropriate.
- The settlement estimates will be used to establish the limits of settlement-inducing activities. The efficacy of the limits will be confirmed via settlement and vibration monitoring during construction.

2.7.2 Design Optimization Strategy

Not anticipated at this stage.

2.7.3 Design Exceptions

None noted.

2.7.4 Design Assumptions and Decisions

- We assume the results of the University of South Alabama (USA) Vibration Report are applicable to the entire alignment and that similar values will be obtained for our selected pile sizes, means and methods, and installation equipment. Monitoring during the driven pile load test program will help determine the validity of this assumption.
- We assume the subsurface conditions indicated by the RIDs are reliable.

2.7.5 Design Risks and Opportunities

- The primary design risk is that our analyses may underestimate vibrations and/or settlements leading to measurements that exceed the specified thresholds.

- A possible opportunity is that the new subsurface data may justify better than expected performance in terms of estimated settlement magnitudes.

2.7.6 Design Quantities

Not applicable.

2.7.7 Deliverables Summary

- Settlement and Vibration Monitoring Plan.

2.8 BASIS OF DESIGN – ROADWAYS

2.8.1 General – Design Summary

The project is approximately four and a half miles in length and begins on the west side at Broad Street on I-10 and terminates at the east end at the Mobile County line on the Bayway. The project is broken out into two civil packages, west and east, and consists of an urban corridor with three new interchanges crossing I-10 and Business I-10 at Virginia Street, Water/Canal Street, and US90/US98 Streets. There are several constraints: the existing Wallace Tunnel, Local crossroads, existing interstate, and many structures.

Several key decisions that came out of Task Force meetings that drove the cost and schedule included:

- Diverging Diamond Interchange (DDI) vs Diamond Interchange. See Section 2.8.2 for more discussion.
- Eastbound (EB) Business I-10 Realignment. See Section 2.8.2 for more discussion.
- Vertical Clearance at the Main Span. See Section 2.8.2 for more discussion.
- Design speed vs Posted speed. See Section 2.8.2 for more discussion.

2.8.2 Design Optimization Strategy

The design strategy focused on the RID design and how to optimize it for construction and reduce costs. The following concepts were incorporated into the design.

- Diverging Diamond Interchange (DDI) vs Diamond Interchange at Virginia Street. The Reference Information Document (RID) design incorporated a DDI that required a bigger footprint to build at Virginia Street. This bigger footprint impacted traffic operations and constructability. Through traffic analysis a Tight Diamond interchange showed equal performance with less impact to Virginia Street and improved constructability. This alternative was approved at the Task Force meeting.
- EB Business I-10 Realignment. With the decision to change to a Tight Diamond interchange at Virginia Street, there was an opportunity to realign EB Business I-10 to the north sooner than the RID design to allow for more of I-10 to be constructed to improve constructability. This option was referred to as Option 3. There was also another option (Option 4) which kept the I-10 Business alignments along the outside of the High Level Approach (HLA) until it approached Water St./Canal St. where it cut across to the north. FHWA ultimately decided that Option 3 was the preferred alignment.
- The Vertical Clearance at the Main Span was determined to be deficient using the current design structure depth. The requirement of 215' clearance over the ship channel plus the 100yr Sea Level Rise was clarified through an RFI that was submitted and concurred with by ALDOT. Therefore, we raised the profile of the main span bridge to meet 215' clearance over the ship channel + 100yrSLR + design and construction tolerances by adjusting the curve length of the crest curve over the river. The K value was well above the minimum required, therefore we were able to provide more vertical

clearance by adjusting the curve length and not necessarily raising the profile grade line (PGL).

- Design speed matches the Posted speed. To standardize some of the design criteria, it was decided at Task Force Meetings and with an RFI to match Design Speed to Posted Speed. There were roads in the project where design speed and posted speed differed by 5-10 mph. If this was not changed some roads would have required 9% superelevation which was above ALDOT's 8% max. The realignment of Claiborne Street benefited from the lower speed which did not require superelevation, thus keeping an optimized alignment for construction. Claiborne Street was also realigned from the RID design because the RID design did not provide the required vertical clearance.

2.8.3 Design Exceptions

The project requires design exceptions from ALDOT and FHWA. Design Exceptions will be in accordance with the FHWA Mitigation Strategies for Design Exceptions and will be submitted to ALDOT for approval. After approval, ALDOT will submit to FHWA.

Four Design Exceptions were identified in the RFP, however, through design optimization and project RFI's, two Design Exceptions were eliminated. However, it was discovered there was an additional Design Exception needed for the EB East HLA outside shoulder width that wasn't identified in the RID design. Two of the RFP identified Design Exceptions and the third additional Design Exception required for the project and are listed below:

1. **Wallace Tunnel Design Exception –** a request for Project elements that are constrained by the tunnel. Project elements include:
    - Longitudinal Grade:
    - Shoulder Width:
    - Horizontal Stopping Sight Distance
    - Minimum Horizontal Curve Radii
    - Superelevation

Refer to Figures 4 and 5 of the original DE Request for project elements constrained by the Wallace Tunnel.

2. **West High Level Approach Design Exception –** request for Horizontal Stopping Sight Distance for the WB bridge inside lane and EB outside lane of the I-10 West High-Level Approach.

Refer to Technical Memorandum TM 2017-0817 of the original DE.

3. ***EB East HLA Outside Shoulder Width –*** the RID design did not have the required HSSD, therefore a DE will be prepared for the deficiency in HSSD. There was an option discussed in the Roadway Task Force Meetings to widen the shoulder to 16' to mitigate the need for a DE, but ultimately it was decided to proceed with a DE.

There are no Design Variances requested for the project.

2.8.4 Design Assumptions and Decisions

Design Decisions include the following:

- Diverging Diamond Interchange (DDI) vs Diamond Interchange. See Section 2.9.2 for more discussion.
- EB Business I-10 Realignment. See Section 2.9.2 for more discussion.
- Vertical Clearance at the Main Span. See Section 2.9.2 for more discussion.
- Design speed vs Posted speed. See Section 2.9.2 for more discussion.

No Design Assumptions currently in design.

2.8.5 Design Risks and Opportunities

Design Opportunities include the following:

- Introduce Option 4 (see Section 2.8.2) back into design. ALDOT liked this option however FHWA was not in favor of this option.

Design Risks include the following:

- Drainage masterplan not prepared or approved which can influence the roadway design.
- Geotechnical investigations are not complete which could impact roadway/bridge limits.
- Pavement design could impact roadway profiles.
- Maintenance of Traffic (MOT) is in its early stages and could revise the roadway design as it progresses.
- Intelligent Transportation System (ITS) cabinets and access locations.
- Tolling Gantry locations and details.
- Utility relocations.
- Required Design Vehicles per TPs on surface streets vs. ML & ML ramps are ambiguous. List of assumptions used by Design Team:
    - WB-67 assumed for all turning movements off Canal/Water Street Ramps except U-Turn movement where a WB-40 was assumed.
    - WB-40 assumed for all turning movements off Canal/Water to other surface streets.

2.8.6 Design Quantities

Refer to Project Wise and SharePoint for roll plots, matrices, earthwork reports.

2.8.7 Deliverables Summary

The following is a summary of roadway deliverables for the Conceptual plan submission:

- Typical Sections (sheets)
- Plan Roll plots

- Geometric layout roll plots
- Paving layout Roll plots (showing dimensions and pavement transition widths and lengths)
- Profile Roll plots
- Striping Roll plots
- Utility Roll plots (showing existing utils)
- Drainage Schematic Roll plots (typical routing plan)
- Cross Section Roll plots
- Demo roll plots
- Roadway Models (30% model)

2.9 BASIS OF DESIGN – DRAINAGE

All drainage work is to be in accordance with Technical Provisions (TP) Section 19 and shall account for all sources of runoff that may reach the Project, whether originating within or outside the Project Right-of-Way (ROW), in the design of the drainage facilities. Bridge Deck Drainage is to be in accordance with TP Section 12.3.1.9 including subsection 1-3.

2.9.1 General – Design Summary

- Drainage Master Plan (DMP) - Submit concurrently with 60% Design Submittal.
    - Design-Builder shall prepare a plan depicting existing/proposed drainage system as an overall schematic of analysis for the project drainage system and shall be the basis for roadway drainage design. The drainage masterplan will be updated as the project progresses.
    - DMP shall include:
        - Cover sheet & Table of Contents,
        - Discussion of the purpose, description of watershed, methodology and summary,
        - Hydrology Calculations and Maps
        - Evaluation of Existing conditions – existing conditions within the Project Right-of-Way (ROW) as well as downstream of the project outside of Project ROW
        - Documentation used to size drainage improvements (including future land-use)
        - A comparison of Pre/Post flow conditions

- Drainage Design Report - Submit with 60% Design Submittal
    - Design-Builder shall prepare a Design Report that includes complete documentation of all components of the Project's drainage system. Including the following:
        - Cover Sheet & Table of Contents
        - Record set of all drainage computations (Hydrologic and Hydraulic, and supporting data)
        - Hydraulic notes, models, and tabulations
        - Bridge and Culvert hydraulic reports for basins greater than ¾ square mile or part of a detailed FEMA study
        - Pond Designs, including graphic display of treatment areas and maintenance guidelines for operation (if applicable)
        - Drainage related correspondence file
        - Drainage system data (Location, type, material, size, and other pertinent information) in electronic format
        - Storm Sewer Drainage Reports
        - Major Stream Crossing Drainage Report

60% Drainage Design - Submit grading and drainage plans, drainage profiles, drainage details and drainage specifications necessary to convey design intent to ALDOT and KMT Estimators.

Design detail should be to a level that allows all parties to estimate drainage design in support of the Guaranteed Maximum Price (GMP).

2.9.2 Design Optimization Strategy

Design optimization for the drainage system will be performed on each element of the drainage system and will include:

- Review of existing data sources
  - Data from Reference Information Documents (RID) documentation, State and Local As-builts, and Geographical Information Systems (GIS) databases will be reviewed to develop a more comprehensive understanding of the drainage network within the project limits.
  - Use of existing drainage systems, existing drainage outfalls will be utilized. Project seeks to maintain existing flow patterns and outfall locations.
- Hydrologic and Hydraulic Analysis
  - Review of offsite drainage influences into the system including existing out falls will be performed. This will include review of pre construction run-off and flow rates as well as post-development rates.
- Drainage system Selection:
  - The components utilized include size, shape, and material type of pipes and drainage structures will be considered. Consideration will be given to retention of structurally sound components and potential for lining of structures and box culvert systems.
- Modeling and visualization:
  - The drainage system components will be modeled in hydraulic software as well as Bentley's Open Roads Designer (ORD) drainage to improve coordination and layout of the system.
- Sensitivity Analysis:
  - The drainage system will be analyzed considering differing slopes, pipe systems, and detention basins where appropriate.
- Integration with other Disciplines:
  - Collaborate with other project disciplines such as roadway design, utility design, geotechnical, and environmental to align drainage design goals with the overall project goals and reduce potential relocations.
- Construction and Maintenance Considerations
  - Review of drainage system components to minimize disruption during construction to the traveling public, review construction feasibility, and consider maintenance of system.

2.9.3 Design Exceptions

At this stage of design the following design exceptions are still being coordinated:

- Technical Provisions (TP) Section 8.3.2.1 does not allow drainage or stormwater management within Character Area 4. An existing storm drainage system captures flows from this area as well as conveys other runoff through this area. A Request For Information (RFI) has been submitted to confirm if the existing storm drain system is to be removed, if proposed storm drain pipes could connect to the existing storm drain system and if necessary, proposed pipes follow existing storm drain alignments.
- TP Section 19.2.2 requires investigation and videotape or photograph of the existing drainage system and scheduled to remain in place, if documentation is not available. Limited documentation of the existing storm drain system has been provided and is not available. Investigation of the existing storm drain system is on-going at this stage of design.
- TP Section 19.3.8 requires sections along the roadway centerline that includes existing drainage facilities. Location, elevation and material information is not available for all existing drainage facilities. As additional information is received, existing drainage feature information can be provided in roadway centerline sections.

2.9.4 Design Assumptions and Decisions

- Existing storm drain systems have been mapped using available RIDs, as-builts, GIS data and limited field survey. The accuracy of this data is undefined.
- .Investigation of existing storm drain systems outside the project ROW has not been included in the 60% design efforts. Assumption made that if post-project design flows are equal to or less than pre-project flows, the project will create no adverse impacts to the existing drainage system.
- Investigation of the existing storm drain system within the project area has not been included in the 60% design efforts. Assumption made that existing storm drain systems meet the service life requirements.

2.9.5 Design Risks and Opportunities

Design Opportunities include the following:

Utilization of existing storm drain systems within the project area

Utilization of existing storm drain outfalls and existing discharges downstream of the project area, including existing outfalls to Mobile River

Design Risks include the following:

- Accuracy of existing storm drain system location, elevation, material and condition shown in available RIDs.
- Condition and capacity of existing storm drain system downstream of the project area
- Relief pipes or additional drainage piping required to improve the capacity of existing systems to remain which do not meet design capacity requirements in the TP could result in additional utility conflicts.

- Modification of roadway profiles that would affect low points, pipe routings, runoff spread, inlet placement and post-project peak flows.
- Design preferences of third-party and local stakeholders that exceed design requirements listed in the TP.
- Maintenance Of Traffic (MOT) is in its early stages and could affect the drainage layout as it progresses.
- Location of existing utilities and accuracy of available utility information.
- Utility relocations that create cost and schedule risks may require future drainage designs to provide drainage solutions that avoid utility relocations.
- Floodplain compliance with local floodplain manager requirements related to coastal surge flooding. Preliminary coordination with the City of Mobile included consideration of the preconstruction volume versus post-construction volume of material to be placed or removed from the floodplain. General concurrence with this approach was noted by the City of Mobile.

2.9.6 Design Quantities

Design quantities will be provided per GMP Deliverables list, as listed below in

2.9.7 Deliverables Summary

Deliverables for ALDOT review will be in accordance with TP Table 19-2:

- Drainage Master Plan
- Updated Drainage Master Plan
- Drainage Design Report

Deliverables for estimating will be in accordance with the GMP Deliverables List

- Standard Drawings
- CAD Base File
- Master Container File
- Proposed Model(s)
- Existing Plan
- Proposed Plan
- Profiles
- Temp Drainage
- Bridge Scour Mitigation: not included with Drainage, See 2.7 Ports and Coasts
- Special Drainage Features
- Quantity Spreadsheet
- Quantity Takeoff

- Design Basis Manual

2.10 BASIS OF DESIGN – RAIL

2.10.1 General – Design Summary

All work around the freight railroads is to be in accordance with Technical Provisions (TP) Section 20 and shall be reviewed and coordinated with the project railroad coordinator.

Any structure over or under the railroads will have to be submitted to the railroad. Typically, preliminary plans (30%) are submitted and once approved final plans are submitted. Each submittal will have a railroad comment resolution meeting to make sure the designer understands the railroad comment and the railroad is generally agreeable to the designer's solution.

2.10.2 Design Optimization Strategy

Since no track design is anticipated on this project, the only design optimization opportunities are making sure we adhere to the railroad's requirements during design of our bridges, roadways, drainage and utilities. The bridges over CSX and CN are a requirement, but avoidance of any other interactions with these railroads is beneficial to the project schedule.

2.10.3 Design Exceptions

No exceptions shall be required for design around the existing railroads.

2.10.4 Design Assumptions and Decisions

To be developed as design progresses.

2.10.5 Design Risks and Opportunities

- The current pedestrian bridge location is in conflict, visually, with a CSX cantilever signal. An opportunity may exist to move the pedestrian bridge north and/or high enough to avoid the CSX signal relocations or replace the cantilever signal structure with two wayside signals.

2.10.6 Design Quantities

- None developed as of this stage.

2.10.7 Deliverables Summary

The only deliverable on this project are the railroad permits, agreements and submittals to ALDOT as described in TP Table 20-2. Not all permits, agreements and submittals were identified in the table, but it is understood that all should be provided to ALDOT.

2.11 BASIS OF DESIGN – BICYCLE AND PEDESTRIAN FACILITIES

Design the Project to be compliant with the Americans with Disabilities Act (ADA) and to provide pedestrian facilities at areas under the west High-Level Approach spans, Water Street/Canal Street, and the New Connector Road shown in the Reference Plans at the West Tunnel Interchange. There was a requirement to provide a shared use path along US 90/98 within the Project limits. This requirement was removed in Task Force Meetings and followed up with an approved RFI. All pedestrian facilities must comply with the U.S. Access Board *Americans with Disabilities Act Accessibility Guidelines* (ADAAG) or the U.S. Access Board *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way* (PROWAG), as specified below. Design-Builder shall evaluate all existing pedestrian facilities within the Project ROW for conformance with ADAAG requirements. If Design-Builder's Work includes any portion of an intersection, Design-Builder shall ensure that the entire intersection is ADA compliant.

Existing pedestrian facilities that comply with ADAAG requirements may remain in place. Existing pedestrian facilities that do not comply with ADAAG must be replaced with facilities that comply with PROWAG requirements. All new pedestrian facilities must comply with PROWAG requirements.

Existing pedestrian facility locations include:

- Broad Street.
- Tennessee Street.
- Pillans Street.
- Virginia Street.
- South Lawrence Street.
- South Franklin Street.
- North Carolina Street.
- South Conception Street.
- Texas Street.
- Claiborne Street.
- South Claiborne Street.
- Canal Street.
- Palmetto Street.
- Saint Emmanuel Street.
- Royal Street.
- Water Street.
- Dunlap Drive.

Design Virginia Street, Water/Canal Street, and the New Connector Road located at the

West Tunnel Interchange with bicycle lanes and/or a nearby shared-use path. Maintain all existing bicycle lanes.

Design bicycle and pedestrian access to the belvedere access area around the west pylon.

2.11.1 General – Design Summary

Design and build shared-use paths, bicycle lanes, and pedestrian facilities that include the following:

- Alignment, profile, cross-section, and materials.
- Points of connection to existing and proposed multi-modal facilities.
- Crosswalk and pedestrian ramp locations and details.
- Signing, signalization, and pavement markings.
- Separation between multi-modal facilities and the nearest travel lane.
- Methods of separation, including barrier and/or fence type and height.
- Methods of illumination, where applicable, indicating light fixture locations and types.

2.11.2 Design Optimization Strategy

- None noted as of this stage

2.11.3 Design Exceptions

- None noted as of this stage.

2.11.4 Design Assumptions and Decisions

2.11.5 Design Risks and Opportunities

- Bicycle and pedestrian accommodations need to be maintained throughout construction and work zones and/or detoured accordingly.

2.11.6 Design Quantities

- None developed as of this stage.

2.11.7 Deliverables Summary

- Initial ADA Compliance and Feasibility Report
- Final ADA Compliance and Feasibility Report
- Bicycle and Pedestrian Study and Report

2.12 BASIS OF DESIGN – AESTHETICS AND LANDSCAPING

2.12.1 General – Design Summary

A detailed explanation of the aesthetics and landscape design can be found within the Aesthetic and Landscape Plan developed to explain the design principles. The Aesthetics and Landscape design component of the Mobile River Bridge Project encompasses a multi-faceted approach that strives to harmoniously merge architectural and natural elements with the urban fabric of Mobile, Alabama. This design centers conceptually around five differing character areas which together comprise the Mobile River Bridge design. This design approach is structured around several key principles that guide the development of this distinctive landscape:

Contextual Sensitivity: Our design approach commences with a comprehensive analysis of Mobile's historical, cultural, and environmental context. We aim to understand the unique characteristics of the region, such as its architectural heritage, cultural significance, and natural attributes. This in-depth analysis serves as the foundation for our design process, ensuring the project seamlessly integrates with its surroundings, respects local context, and contributes to the sense of place.

Design with Nature: We envision a design that establishes a seamless connection between the Mobile River Bridge and the natural environment. This involves the strategic placement of native plantings around pathways and pedestrian areas to create urban green spacesused for recreation or visual interest. . The landscape design will complement the proposed infrastructure and provide visual interest for motorists and enhancements for pedestrians and cyclists at a human scale.The design aims to enhance the overall scenic quality, provide opportunities for ecological restoration, and promote unity between nature and the project.

Enhanced Pedestrian Experience: The creation of a pedestrian-friendly environment is a priority for our design. We meticulously plan and design pedestrian pathways and walkways to ensure safe and accessible connections throughout the site. Scenic viewpoints and overlooks will be thoughtfully placed to offer captivating vistas of the river and surrounding landscape. Lighting installations will not only improve visibility during evening hours but also create a visually engaging and secure atmosphere. Comfortable seating areas, sheltered spaces, and amenities will invite visitors to pause, relax, and fully appreciate the grandeur of the bridge and its surroundings.

f Identify Locations for Public Art: Our design approach embraces the integration of public art installations and sculptures as integral elements of the park's aesthetic expression. These artistic features will be strategically placed to celebrate the architectural significance of the Mobile River Bridge. The selection and placement of artworks will consider the scale, materiality, and theme of the bridge, as well as the overall design intent. These art installations will engage visitors, evoke a sense of wonder and curiosity, and contribute to the overall artistic narrative of the park, enhancing its visual appeal and cultural vibrancy.

Timeless and Enduring Design: Our design approach seeks to create a landscape that transcends time, providing an enduring and cherished space for generations to come. This will be achieved through the implementation of sustainable design principles, carefully selecting durable materials, and employing construction techniques that ensure long-term durability and minimal maintenance. The site's design will consider the evolving needs and preferences of future users, allowing for flexibility and adaptability. By incorporating timeless design elements, the landscape will stand the test of time, remaining a significant and inviting space that continues to resonate with visitors and maintains its relevance within the ever-changing urban fabric of Mobile, Alabama.

Unified Character Areas: The Mobile River Bridge Project encompasses five distinct character areas, each with its own unique theme, scale, graphic patterns, and landscape treatments. To ensure the project's overall aesthetic goals and themes remain unified, we will seamlessly integrate planting elements, shade structures, signage, and artistic features within each character area. These elements will play a pivotal role in defining the identity and character of each space, creating a cohesive urban design that blends seamlessly with the surrounding context.

The Mobile River Bridge Project is a complex endeavor, and our design approach takes a multidisciplinary perspective to create an inclusive and dynamic urban environment. By adhering to these principles, we aim to celebrate the region's heritage, foster ecological resilience, and elevate the quality of life for all residents, visitors, and commuters. Our commitment to a unified urban design ensures that the project's landscape and aesthetics will serve as a lasting testament to the rich cultural and natural tapestry of Mobile, Alabama.

2.12.2 Design Optimization Strategy

None identified at this stage of design.

2.12.3 Design Exceptions

None identified at this stage of design.

2.12.4 Design Assumptions and Decisions

2.12.5 Design Risks and Opportunities

Risks and Mitigation Strategies:

To mitigate risks, the following strategies have been employed:

Plant Health and Survival: Rigorous plant health inspections will be conducted by trained professionals to ensure that all trees, shrubs, seedlings, and vines are in a healthy condition before and after planting. Any non-viable plants will be promptly replaced.

Soil Quality and Amendments: Continuous monitoring of soil health will be carried out, and any deficiencies will be addressed promptly through appropriate soil amendments to support optimal plant growth.

Compliance and Quality Control: Regular inspections will be performed throughout the project duration to ensure compliance with design specifications, approved guidelines, and industry best practices.

Unforeseen Environmental Factors: Contingency plans will be established to address potential environmental changes or unforeseen circumstances that may affect the landscape's integrity and longevity.

2.12.6 Design Quantities

Landscape quantities are determined following the requirements laid out in the Technical Provision Appendix 22.1, meeting the minimum plants required per the character are size and density required. Urban design elements have not been designed our quantified as of this point in the design process.

2.12.7 Deliverables Summary

- Aesthetics and Landscape Plans
- Aesthetics and Landscape Master Plan

2.13 BASIS OF DESIGN – SIGNAGE, PAVEMENT MARKING, AND SIGNALS

2.13.1 General – Design Summary

Signing Concept Plan

- Prepare a Signing Concept Plan showing all existing and proposed signs, including static, dynamic, tolling, and ITS signs and their disposition for the Project. Incorporate signing concepts included in the Reference Plans, including those for the West Tunnel Interchange as part of the Signing Concept Plan. The Signing Concept Plan must also include all existing and proposed pavement markings. Submit the Signing Concept Plan to ALDOT according to Technical Provisions (TP) Table 23-3.

Signing Layout Plan

- Prepare one or more Signing Layout Plans for the Project identifying final locations and signing details for each proposed sign and identifying existing signs to remain. Each Signing Layout Plan will implement signing concepts from the approved Signing Concept Plan and comply with the ALDOT Signing Plan Design Guide. Each item listed below is subject to ALDOT's review and approval.

  Each Signing Layout Plan must identify all:
  - Permanent signs.
  - Delineation.
  - Advance toll warning signs.
  - Third-party signs.
  - Nonstandard sign Structures.

  Submit the Signing Layout Plans to ALDOT according to TP Table 23-3.

Pavement Marking Plans

- Prepare Pavement Marking Plans identifying edge and lane line striping, stop lines, crosswalks, arrows, gore areas, symbols, elongated route markings and legends, raised pavement markers, object markers, delineation, or other required markings in accordance with the FHWA *MUTCD*. Pavement Marking Plans must include all temporary pavement marking locations and types, as well as existing pavement marking to remain during staged construction. Design-Builder shall submit the Pavement Marking Plans to ALDOT according to TP Table 23-3.

Traffic Signal Plans

- Prepare one or more Traffic Signal Plans for the Project, including:
  - A traffic signal layout.
  - Signal details.
  - Power service, signal wiring, and conduit layout.
  - Support Structure details, if applicable.

- Design-Builder shall submit each Traffic Signal Plan to ALDOT according to TP Table 23-3.

Traffic Signal Timing Plans

- Prepare Signal Timing Plans that optimize traffic flows according to the ALDOT *Signal Design Guide and Timing Manual* and provide signal coordination with adjacent intersections and arterials for all existing and new traffic signals, modified signals, and interconnected signals. Design-Builder shall update signal timing plans to maintain optimized flow until Project completion. Design-Builder shall submit each Signal Timing Plan to ALDOT according to TP Table 23-3.

Traffic Signal Warrant Studies

- Prepare Traffic Signal Warrant Studies for each new signal installation in the project as well as existing signals that will be modified or remain in place at the conclusion of the project. Signal warrant studies will be prepared and submitted per the requirements of TP Table 23-3. The general guidelines for traffic signal warrants presented in the Manual on Uniform Traffic Control Devices will be followed.

Traffic Sign Inventory Update Forms

- ALDOT standard Traffic Sign Inventory Update Forms will be prepared for each new sign and submitted to ALDOT per the requirements of TP Table 23-3.

2.13.2 Design Optimization Strategy

- None noted.

2.13.3 Design Exceptions

- None noted.

2.13.4 Design Assumptions and Decisions

- None noted.

2.13.5 Design Risks and Opportunities

- None noted.

2.13.6 Design Quantities

- None developed as of this stage.

2.13.7 Deliverables Summary

- Signing Concept Plan
- Signing Layout Plan
- Pavement Marking Plan
- Traffic Signal Plans
- Traffic Signal Timing Plans

- Traffic Signal Warrant Studies
- Traffic Sign Inventory Update Forms

2.14 BASIS OF DESIGN – INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

2.14.1 General – Design Summary

To provide an Intelligent Transportation System compatible with the ALDOT Advanced Traffic Management System (ATMS)and adhering to the ALDOT standards provided in TP Section 1.3.1 and the ALDOT ITS design standards provided in TP Table 24.1 The design will provide a system capable of the following functionality:

- Collect real-time traffic data.
- Monitor traffic flow and performance
- Accurately detects traffic and traffic operational conditions, including automated incident protection throughout the project limits
- Monitors and warns of low visibility
- Clearly communicates useful travel information to users
- Allows for integration into the existing ALDOT system
- Provide a physically redundant communications network and emergency power backup systems
- Accommodate ALDOT's operation of new toll systems

Prepare a detailed inventory of existing field elements including fiber, power, and devices throughout the extended project limits,including the future Bayway Bridge project, and within the Traffic Control Facility. Provide a layout identifying and locating new devices along with preexisting field elements within the Wallace Tunnel and on adjacent I-10 segments, as identified in the inventory that are to remain, to allow for a fully functional ITS with future expansion capabilities.

2.14.2 Design Optimization Strategy

- None noted.

2.14.3 Design Exceptions

- None noted.

2.14.4 Design Assumptions and Decisions

- None noted.

2.14.5 Design Risks and Opportunities

- ITS equipment and structures may have long lead times.

2.14.6 Design Quantities

- None developed at this stage.

2.14.7 Deliverables Summary

- ITS Inventory (Description, Size, Type)
- ITS Master Plan identifying existing and proposed device layout for MRB and Bayway Bridge Projects
- Coordinated and Multi-layered Testing Plan
- Electrical Load Calculations for feeder and branch circuits
- Size Calculations for service and back-up power systems

2.15 BASIS OF DESIGN – TRAFFIC CONTROL

2.15.1 General – Design Summary

There are 4 main critical components in developing the MOT scheme:

- Safety for workers and road users
- Impact on traffic
- Pedestrians/cyclists
- Constructability

2.15.2 Design Optimization Strategy

Various strategies were used to optimize the proposed design. These strategies are categorized according to the design component tackled and listed in this section.

2.15.2.1 Maintenance of Traffic

The following strategies were used to optimize the Maintenance of Traffic (MOT) design:

- First start building everything that is easily accessible or outside the existing corridor.
- The phasing plan has the flexibility for construction to adjust phases/areas around within the construction schedule as needed if there are delays.
- Provide proper work sequence and work area for better constructability efficiency, optimized schedule.
  - Minimized the number of steps for bridge construction for better construction quality and efficiency.
  - Free up the space for the High Level Approach (HLA) construction
- Inter-disciplinary optimization (e.g., phasing optimization for more efficient drainage work, etc.)
- Permanent alignment constructed early on which traffic is diverted for other construction work.
- Build temporary widening to shift traffic and accommodate minimum number of lanes.

A 6-stage phasing is conceived to complete construction work that impacts traffic.

- Phase 1 is primarily offline construction and has minimal impacts on existing traffic.
- Lane reconfigurations with traffic on temporary alignments are planned to start in Phase 2 and 3. The design utilizes lane closures to complete the construction.
- Phases 4 and 5 are primarily used to complete the HLA and new signature bridge
- Phase 6 : opening of the new bridge

2.15.2.2 Temporary Roadway

As described in the previous section, the use of temporary roadways is helpful to reroute the traffic to maximize the work zone construction and minimize closures. Therefore, in the staging development, more than 35 temporary roadways are required.

	N umber of temporary roadways under construction and to be used in the next phase
Phase 1	12
Phase 2	14
Phase 3	11
Phase 4, 5 and 6	-

Those temporary roadways are designed and used for:

- Existing shoulder reconstruction in order to shift the traffic
- Crossovers
- Widening
- Temporary ramps
- Temporary tie-in to connect existing and proposed roadways that are not at the same grade.

The following strategies were used to optimize the MOT design and prepare the design of the temporary roadways:

- Optimize temporary pavement alignment locations to avoid unnecessary widening.
- Optimization of the vertical profiles (slopes, curves, junctions) and horizontal alignments to minimize the impacts of temporary roadwork on existing pavements.
- Design speeds are reduced by 10 mph from posted speeds.
- Temporary wall optimization (WA-3, ML-5, WA-2)
- Light pole protection and other obstacle protection

2.15.2.3 Temporary Drainage

When realigning traffic onto an existing roadway or onto a temporary one, drainage needs to be validated and adapted to the new temporary condition.

The following strategies were used to optimize the temporary drainage design:

- Utilizing existing drainage structures as much as possible to make the project cost effective while holding a standard of care and welfare to the public.
- Analyze spread through slotted barrier placed for traffic control.
- Grade roadside ditches as needed to convey runoffs.
- Working closely with our construction partners to determine and design a constructible temporary design.

2.15.3 Design Exceptions

- None at this stage. MOT design includes other disciplines exceptions as needed.

2.15.4 Design Assumptions and Decisions

The MOT design criteria are summarized in Section 1.16. In addition to these criteria, the following assumptions were used in the development of the MOT plans and/or for estimation purposes:

- Follow the Technical Provision (TP) requirements for the minimum number of lanes.
    - Minimum 2 lanes on I-10
    - Minimum 2 lanes on US 98
    - Utilize temporary ramps when possible, to avoid long term closures.
- All Access roads maintained.
- Slope for temporary widening 2 :1 and will need to be protected
- Maintain ramp in parallel. Only go with taper when absolutely needed.
- Portable barrier - clear zone or sliding zone behind a barrier is under investigation.

Table below provides a detailed breakdown of the decisions and design assumptions related to temporary alignments made during the preparation of the Traffic Control Plan (TCP)drawings.

Table 2.15-1 - Temporary roadway design assumptions and decisions

OPERATION PHASE	TEMP RDW NAME	DESCRIPTION	CONSTRUCTION PHASE	DESIGN LEVEL DELIVRABLE	MARKING ALIGNMENT	CLASSIFICATION	DESIGN SPEED (MPH)	PAVEMENT STRUCTURE TYPE	DURATION OF USE (yr)	AADT	AADTT (%of truck)
1D	WA-1	Water St Ramp B reconfiguration	1B	60%	PH2A WATER RAMP	Slip Ramp	30	Ramp 1	1	3113	13
2A	E-7	US 98 WB widening	1	60%	PH2 US-98 EB	State/US Routes	45	Crossroad 3	1	26709	4
	E-8	US 98 WB widening	1	60%	PH2 US-98 WB	State/US Routes	45	Crossroad 3	1	26709	4
	E-9	Addsco Rd widening	1	60%	PH2 ADDSCO	City/County Roads	25	Crossroad 2	1	TBD	TBD
	ML-1	Crossover I-10 Broad WB	1	60%	PH2A I-10 WB BROAD	I-10 Mainline	55	Mainline I-10	2	39725	16.48
	ML-2	Lane shifted on existing shoulder EB	1	60%	PH2A BROAD RAMP D	I-10 Mainline	55	Mainline I-10	2-3	39725	16.48
	ML-3	Broad Ramp C reconfiguration	1	60%	PH2A BROAD RAMP C	Slip Ramp	45	Ramp 1	2-3	3113	13
	ML-4	I-10 BUS WB crossover Texas	1	60%	PH2A I-10 BUS WB	I-10 Business	45	Mainline I-10	1	39725	16.48
	ML-14	Lane shifted on existing shoulder EB	1	60%	PH2A I-10 MAINLINE	I-10 Mainline	55	TBD	2-3	39725	16.48
	ML-15	Lane shifted on existing shoulder EB	1	60%	PH2 1-10 MAINLINE PH2 VIRGINIA RAMP D	I-10 Mainline	45	Mainline I-10	2-3	39725	16.48
	ML-16	Existing Mainline EB widening	1	60%	PH2 I-10 MAINLINE	I-10 Mainline	55	Mainline I-10	2-3	39725	16.48
	VI-1	Virginia Ramp C reconfiguration	1	60%	PH2A VIRGINIA RAMP C	Slip Ramp	30	Ramp 1	2-3	3113	28.61
	VI-2	Virginia Ramp D loop widening	1	60%	PH2A VIRGINIA RAMP D	Loop	20	Ramp 1	2-3	3113	28.61
	VI-5	Virginia ramp A shoulder reconstruction	1	60%	PH2A VRIGINIA RAMP A	Slip Ramp	45	Ramp 1	2-3	3113	28.61
	WA-2	Water St Ramp C reconfiguration	1	60%	PH2A WATER RAMP C	Slip Ramp	30	Ramp 2	1-2	9276	13
	WA-3	Water St Ramp A U-Turn	1D	60%	PH2B WATER RAMP A UT	U-turn (Loop)	15	Ramp 1	3-4	3113	13
	WA-10	Water Ramp B profile transition at Canal St	1D	60%	PH2 WATER RAMP B	Slip Ramp	30	Ramp 1	3	TBD	TBD
	WA-18	Water Ramp B profile transition on existing I-10 WB	1	60%	PH2 WATER RAMP B	Slip Ramp	35	Ramp 1	1	TBD	TBD
2B	VI-3	Virginia Ramp C	2A	60%	PH2B VIRGINIA RAMP C	Slip Ramp	30	Ramp 1	1	3113	TBD
2C	ML-5	I-10 BUS WB widening	2A	60%	PH2C WATER ST RAMP B	I-10 Business	45	Mainline I-10	2	39725	16.48
	ML-7	I-10 BUS widening (Virginia Crossover)	2B	30%	PH2C I-10 BUS	I-10 Business	55	Mainline I-10	1-2	39725	16.48
	ML-8	I-10 BUS WB widening	2B	30%	PH2C I-10 BUS WB	I-10 Business	45	Mainline I-10	1-2	39725	16.48
	WA-4	Water Street Ramp A reconfiguration	2B	30%	PH2C WATER ST RAMP A	Slip Ramp	30	Ramp 1	1	3113	13
	WA-5	Claiborne widening/reconfiguration	2B	30%	PH2A WATER RAMP C	FR	30	Ramp 2	1	10125	12.08
3A	ML-1	I-10 Broad EB Crossover	1	30%	PH3A I-10 EB BROAD	I-10 Mainline	55	Mainline I-10	2	39725	16.48
	VI-4	Virginia Ramp A reconfiguration	2B	30%	PH3A VIRGINIA RAMP A	Loop	20	Ramp 1	1	3113	28.61
	WA-6	Cross over Canal west end	2C	30%	PH3A CANAL NB	City/County Roads	25	Crossroad 2	0.5-1	4328	4
	WA-7	Water St NB direction widening	2C	30%	PH3A WATER NB	City/County Roads	25	Crossroad 2	0.5-1	4857	4
	BR-1	Broad Ramp D reconfiguration	3A	30%	PH3A BROAD RAMP D	Slip Ramp	30	Ramp 1	1	3113	13
3B	WA-6	Cross over Canal west end	2B	30%	PH3B CANAL SB	City/County Roads	25	Crossroad 2	0.5	4328	4
	WA-8	Water St intersection Stage 3B	3A	30%	TBD	City/County Roads	25	Crossroad 2	0.5	4857	4
3C	ML-11	Connection of I-10 BUS WB to existing	3B	30%	PH3C I-10 BUS WB	I-10 Business	45	Mainline I-10	1	39725	16.48

	WA-11	Water ramp A deviation/reconfiguration	3B	30%	PH3C WATER RAMP A	Slip Ramp	30	Ramp 1	0.5-1	3113	13
	WA-12	Water St SB widening	3B	30%	PH3C WATER SB	City/County Roads	35	Crossroad 2	0.5-1	4857	4
	WA-9	Water St Intersection stage 3C	3B	30%	TBD	City/County Roads	25	Crossroad 2	0.5	4857	4
3D	ML-13	Connection of I-10 BUS EB to existing	3C	30%	PH3D I-10 BUS EB	I-10 Business	45	Mainline I-10	0.5	39725	16.48
	ML-12	Connection of I-10 BUS EB to permanent	3C	30%				Mainline I-10	0.5	39725	16.48
	WA-15	Water St NB direction reconfiguration/deviation	4A	30%	PH3D WATER SB	City/County Roads	35	Crossroad 2	0.5	30769	4
4A	WA-14	Water St Ramp A deviation to Water SB direction	3D	30%	PH4A WATER RAMP A	Slip Ramp	30	Ramp 1	0.5	3113	13
	WA-13	Water St SB direction reconfiguration	3D	30%	PH4A WATER NB	City/County Roads	30	Crossroad 2	0.5	30769	4

2.15.5 Design Risks and Opportunities

- Limited number or extent of closures allowed.
- Removal of some auxiliary lanes could reduce deceleration lane / storage length.
- Critical construction items that would have major impact on the work progress?
- Some temporary roadway tie-ins could require specific night or weekend closures.
- Considerable increased of lane density because of the reduction to 2 lanes on the main line and could potentially cause degradation of the existing level of service.
- For several detours required for ramp closure, including WB Virgina Street on-ramp and EB Texas Street on-ramp, the primary detour route is intended to be on I-10. However, it is expected that local traffic will also detour using local roadways. This added traffic may impact traffic operation on the local street at specific intersection such as Broad St / Virgina, Virginia / Washington, and Washington/ Texas. This impact may require additional mitigation measures such as traffic signal timing reprogramming.

2.15.6 Design Quantities

- None developed at this stage.

2.15.7 Deliverables Summary

The Maintenance of traffic deliverable will follow a right on time delivery. This mean the final TCP will be submitted as construction proceeds instead of submitting final designs up front similar to other disciplines. The deliverables will be broken down into the following packages:

- MOT schematic: These schematics illustrate the work zones and traffic at a high level for each phase. Give an understanding of the traffic (number of lanes opens, ramp close) and what is under construction.
- Phase 1 and 2 Design (60% Design, 90% Design IFC)
- Phase 3 Design (60% Design, 90% Design IFC)
- Phase 4 Design (60% Design, 90% Design IFC)
- Phase 5 Design (60% Design, 90% Design IFC)
- Phase 6 Design (60% Design, 90% Design IFC)

Below is a description of what is included in the 60% Design

Design deliverables (60%)

	Description	Format
TCP 60% design (22x34) - all • Work zone • Barrier • Striping • Impact attenuator	TCP drawing presenting the phasing for ML and crossroad.	22x 34 scale 1:50

• Cross section at typical area • Overhead sign (location of temporary or existing Guide signs) • Traffic control Signs	60% include note but not all callouts.	
Temporary roadway (22x34) • Geometry plan view • Profile when applicable • Drainage • Wall • Typical cross section for pavement& foundation thickness	60% include note but not all callouts.	22x 34 scale 1:50
• Detour Long term closure only		22x 34 scale varies
• Temporary Traffic signal drawing		22x 34
• Overhead signs details- GuidSign		22x 34 scale varies according to GuidSign

2.16 BASIS OF DESIGN – TOLLING

2.16.1 General – Design Summary

To be provided once Tolling criteria are defined by ALDOT's separate Tolling Project solicitation.

2.16.2 Design Optimization Strategy

To be provided once Tolling criteria are defined by ALDOT's separate Tolling Project solicitation.

2.16.3 Design Exceptions

To be provided once Tolling criteria are defined by ALDOT's separate Tolling Project solicitation.

2.16.4 Design Assumptions and Decisions

To be provided once Tolling criteria are defined by ALDOT's separate Tolling Project solicitation.

2.16.5 Design Risks and Opportunities

To be provided once Tolling criteria are defined by ALDOT's separate Tolling Project solicitation.

2.16.6 Design Quantities

- None developed at this stage.

2.16.7 Deliverables Summary

To be provided once Tolling criteria are defined by ALDOT's separate Tolling Project solicitation.

2.17 BASIS OF DESIGN – TUNNEL AND ANCILLARY STRUCTURES

2.17.1 General – Design Summary

- None noted.

2.17.2 Design Optimization Strategy

- None noted.

2.17.3 Design Exceptions

- None noted.

2.17.4 Design Assumptions and Decisions

- Non noted.

2.17.5 Design Risks and Opportunities

- Non noted.

2.17.6 Design Quantities

- None developed at this stage.

2.17.7 Deliverables Summary

- None noted.

2.18 BASIS OF DESIGN – ELECTRICAL AND LIGHTING

2.18.1 General – Design Summary

Design a fully functional system incorporating the following

- Provide an electrical power supply system for all components of the project
- Backup power as identified in the Technical Provisions
- Continuous power by use of UPS backup to the low visibility fog warning system and ITS system
- Provide lighting and associated infrastructure for the following identified areas:
    - Temporary and Permanent transportation related lighting of the bridge
    - Under deck lighting
    - Maintenance lighting
    - Navigation and Aviation lighting
    - Aesthetic lighting
    - Lighting of identified local streets
    - Replacement of identified existing lighting
    - Installation of new lighting within the new bike and pedestrian facilities

Perform a Lighting and Electrical analysis to identify the quantity and placement of new and existing features. Prepare a plan that will include details such as pole schedules, circuit schedules, conductors, and distribution schedules for each identified service. The design will incorporate all applicable codes and standards as defined in Section 28 of the Technical Provisions.

2.18.2 Design Optimization Strategy

- None noted.

2.18.3 Design Exceptions

- None noted.

2.18.4 Design Assumptions and Decisions

- None noted.

2.18.5 Design Risks and Opportunities

- Possible use of LED Roadway Luminaires in place of traditional High Mast Lighting.

2.18.6 Design Quantities

- None developed at this stage.

2.18.7 Deliverables Summary

- Lighting Analysis Report
- Lighting System Plans

2.19 BASIS OF DESIGN – SECURITY

2.19.1 General – Design Summary

To be developed as design progresses.

2.19.2 Design Optimization Strategy

To be developed as design progresses.

2.19.3 Design Exceptions

To be developed as design progresses.

2.19.4 Design Assumptions and Decisions

To be developed as design progresses.

2.19.5 Design Risks and Opportunities

To be developed as design progresses.

2.19.6 Design Quantities

To be developed as design progresses.

2.19.7 Deliverables Summary

To be developed as design progresses.

2.20 BASIS OF DESIGN – DIGITAL DELIVERY

2.20.1 General – Design Summary

All Digital Delivery work is to be in accordance with Technical Provisions (TP) and the Kiewit Infrastructure Engineers Design Content Management Standards

2.20.2 Design Optimization Strategy

Utilize File Federation per Bentley Systems recommended workflows for OpenRoads Designer and the Kiewit Infrastructure Engineers Design Content Management Standards

2.20.3 Design Exceptions

None noted at this stage.

2.20.4 Design Assumptions and Decisions

None noted at this stage.

2.20.5 Design Risks and Opportunities

None noted at this stage.

2.20.6 Design Quantities

To be developed as design progresses.

2.20.7 Deliverables Summary

3D Drawings per TP Table 2-5 and Section 2.3.2.4 as noted below:

- At each interim Submittal, but may be limited to those that, in the opinion of Design-Builder, will facilitate the review. The 3D drawings may lag by three weeks or the next monthly progress update, whichever is greater.
- With the Final Design Documents Submittal

2.21 BASIS OF DESIGN – CES/TSDC (ADD POST GMP)

2.21.1 General – Design Summary

To be provided at later date once project scope is defined at GMP.

2.21.2 Design Optimization Strategy

To be provided at later date once project scope is defined at GMP.

2.21.3 Design Exceptions

To be provided at later date once project scope is defined at GMP.

2.21.4 Design Assumptions and Decisions

To be provided at later date once project scope is defined at GMP.

2.21.5 Design Risks and Opportunities

To be provided at later date once project scope is defined at GMP.

2.21.6 Design Quantities

To be provided at later date once project scope is defined at GMP.

2.21.7 Deliverables Summary

To be provided at later date once project scope is defined at GMP.

2.22 BASIS OF DESIGN – ESDC SCOPE AND REQUIREMENTS (ADD POST GMP)

2.22.1 General – Design Summary

To be provided at later date once project scope is defined at GMP.

2.22.2 Design Optimization Strategy

To be provided at later date once project scope is defined at GMP.

2.22.3 Design Exceptions

To be provided at later date once project scope is defined at GMP.

2.22.4 Design Assumptions and Decisions

To be provided at later date once project scope is defined at GMP.

2.22.5 Design Risks and Opportunities

To be provided at later date once project scope is defined at GMP.

2.22.6 Design Quantities

To be provided at later date once project scope is defined at GMP.

2.22.7 Deliverables Summary

To be provided at later date once project scope is defined at GMP.

3.0 PART 3 – APPENDIX

3.1 APPENDICES TO BDM PART 1 – DESIGN CRITERIA

3.1.1 RFP Review Matrix

See link below:

https://app.smartsheet.com/sheets/PvQqQwQJmV3FVH338rxC6XXcPpQv37MmqpHqvQ81?view=grid

3.1.2 Design Deliverables List

See link below to Design Package Matrix:

https://portal.kiewit.com/:x:/r/sites/gw20040474-75/_layouts/15/Doc.aspx?sourcedoc=%7B05AAA76A-8E02-47B4-85D9-F0D101AD9113%7D&file=I-10%20MRB%20-%20Design%20Deliverable%20Matrix.xlsm&action=default&mobileredirect=true

See link below to Estimating Deliverables List:

https://app.smartsheet.com/sheets/wwrQ35fW2x8qqhWw8J4ggCwqfJhmgvj4mRjwmGC1?view=grid

3.2 APPENDICES TO BDM PART 2 – BASIS OF DESIGN

3.2.1 Quantity Summary Tabulations

To be provided at later date.

3.2.2 Detailed Design Schedule

See link below to Design Deliverable Matrix:

https://portal.kiewit.com/:x:/r/sites/gw20040474-75/_layouts/15/Doc.aspx?sourcedoc=%7B7FDD48C4-8676-4223-9CE9-D1D1CBD1A230%7D&file=I-10%20MRB%20-%20Design%20Deliverable%20Matrix.xlsm&action=default&mobileredirect=true

3.2.3 Task Force Minutes

See link below to Task Force Meeting Minutes:

https://portal.kiewit.com/sites/gw20040474-75/_layouts/15/Doc.aspx?sourcedoc={9d797514-4cbd-402e-a205-e990d4679ff4}&action=edit&wd=target%2800_Management%2FDesign%20Mgmt%20Weekly.one%7Cfd3f632a-1866-453c-bd5d-be127c22868f%2FDesign%20Manager%20Weekly%20%E2%80%93%204%5C%2F24%5C%2F2023%7C226da39e-f001-4da0-849a-42ed3e3bffd3%2F%29&wdorigin=NavigationUrl

3.2.4 Summary of Design Packages

See link below to Design Deliverable Matrix:

https://portal.kiewit.com/:x:/r/sites/gw20040474-75/_layouts/15/Doc.aspx?sourcedoc=%7B7FDD48C4-8676-4223-9CE9-D1D1CBD1A230%7D&file=I-10%20MRB%20-%20Design%20Deliverable%20Matrix.xlsm&action=default&mobileredirect=true

3.2.5 Design Risk & Opportunities

To be provided at later date.

3.2.6 Design Innovations

See link below to Innovation Tracking Log:

https://app.smartsheet.com/sheets/Q8cgfJc68hFC8Rj9m6c4QwRHQQ2PpHWWhq4Mxjj1?view=gantt&filterId=8782760810336132

3.2.7 Design Confidence Matrix

To be provided at later date.

3.2.8 Technical Risk Assessment (TRA)

To be provided at later date.

3.2.9 Digital Design Execution Plan

To be provided at later date.