September 20, 2018

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Technical Proposal

MD 32

South of Linden Church Road to I-70

FAP NO. AC-NHPP-G-118-1(69)N

CONTRACT NO. HO7565370
Howard County

Delivered to:
Director, Office of Procurement and Contract Management
Fourth Floor, C-405
707 N. Calvert Street
Baltimore, Maryland 21202

Prepared for:

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Submitted by:

LANE

Dewberry

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4.2 SAFETY AND MOBILITY

4.2. Safety and Mobility

A. Project Description

The Lane/Dewberry Team (Team) will dualize MD 32 from a two-lane undivided arterial to a four-lane divided rural principal arterial from the limits of the MD 32 Phase 1 Project at Sta. 217+50 (southern limit) and extend north to Sta. 456+00 providing 4.52 miles of continuous four-lane dualized roadway. See "Lane/Dewberry Team Concept Plan" on pages 13-15. The roadway will taper with pavement markings from Sta. 456+00 to Sta. 467+50 (1,150 linear feet) to tie to the existing two-lane undivided section, just south of the existing bridge over the Middle Patuxent River; though the ultimate pavement width of the dualization will be constructed up to Sta. 467+00. The extent of the dualization was achieved through the use of 19 ATCs. The Team submitted 47 ATCs, 29 were approved and 2 were deemed not an ATC and can be included in the proposal. These ATCs allowed our Team to provide stream mitigation, culverts S-1, S-3, S-5, and S-8 and the full replacement of the Triadelphia Road Bridge (S-4).

Project Elements

Roadway: The dualized typical section consists of four 12' lanes, 8' to 10' outside usable shoulders (6' to 10'paved and 0' to 2' graded), 4' minimum inside paved shoulders and a grass median except where left-turn lanes are proposed. (ATC-42 and 54)

The Team has changed the typical section with respect to normal section cross slopes. This change provides a crown for both Northbound (NB) and Southbound (SB) MD 32 instead of creating a single slope for all the travel lanes towards the outside as shown on the RFP Concept. *Figure 4.2.i* below depicts the proposed typical section. This change allows for a **reduction in wedge and level pavement along NB MD 32** and **reduces the amount of SWM facilities along the outside of NB MD 32** by treating more impervious in the median.

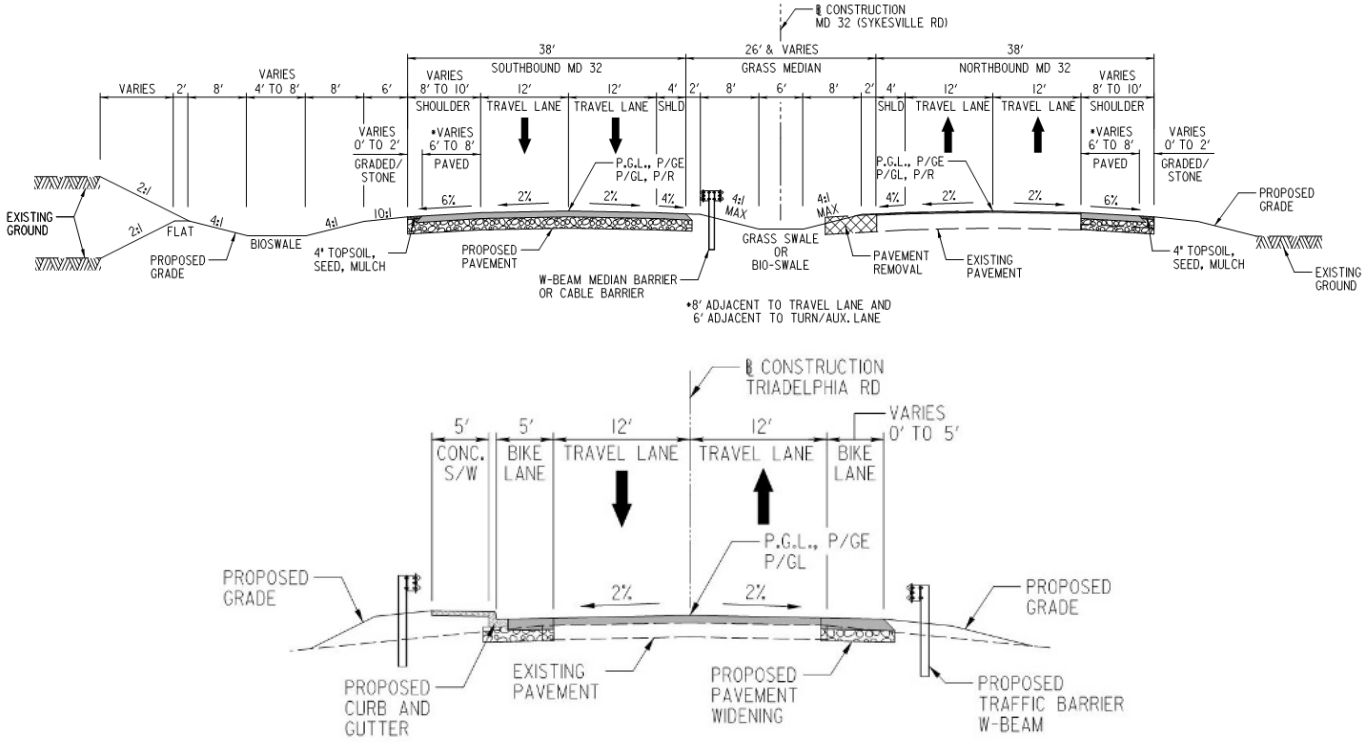


Figure 4.2.i: MD 32 and Triadelphia Road Proposed Typical Sections

This typical section is consistent throughout the project except in the following location where concrete median barrier will be utilized due to the application of approved ATC-27:

- MD 32 from approximately Sta. 331+00 to approximately Sta. 338+00, in the area of the Triadelphia Road Bridge (S-4).

Median widening will occur within the existing separated portion of MD 32 at the Burntwoods Road Interchange to provide the full dualized typical section and the existing MD 32 ramps will be modified to tie-in to the new roadway. Acceleration and deceleration lanes will be provided at all at-grade intersections with public roads and left-turn lanes will be provided within the median at all unsignalized intersections. All roadway components will be constructed within the defined right-of-way and easements and will be compatible with the planned full build-out of the MD 32 corridor.

Roadway ATCs

ATC-2: Use of Cable Barrier

ATC-12 Rev 1: Eliminate horizontal shift of NB MD 32 from STA 405+00 to STA 455+00

ATC-27: Eliminated grass median to facilitate Bridge S-4 Single Span

ATC-42: 8' Outside Paved Shoulders

ATC-54: Reduced Outside Paved Shoulders

ATC-60: Revised Typical Section for Bridge S-4

Intersections/Crossovers: The Team will design and construct improvements to six intersections/crossovers within the project corridor. These locations include: (1) MD 32 at SHA Dayton Shop – Full access with channelized median turn lanes; (2) Emergency turnaround at STA 321+50 – Median crossover with widened outside shoulders along NB and SB MD 32 to accommodate emergency U-turn movements; (3) MD 32 at Parliament Place – Right-in/right-out movements with a decel lane to the south and the beginning of a continuous turn lane to the north for NB MD 32 and a channelized median left turn lane with a decel lane for SB MD 32; (4) MD 32 at River Valley Chase – Right-in/right-out movements with accel/decel lanes for SB MD 32 and mountable channelization in the median and at the intersection to allow NB MD 32 access for emergency vehicles; (5) NB MD 32 at Stiles Way – Right-in/right-out movements with a continuous turn lane for accel/decel for NB MD 32; and (6) MD 32 at Rosemary Lane – Right-in/right-out movements with a continuous turn lane to the south and accel lane to the north for NB MD 32, and a channelized median left turn movement with a decel lane for SB MD 32.

All J-turns that were proposed with the RFP concept were eliminated by the use of ATC-12 and the reduced limits of dualization.

Other Access Roads and Access Points: The Team will design and construct four other driveway access points at the following locations: (1) Driveway at Sta. 440+00, Right – New access from Stiles Way; (2) Driveway at Sta. 458+00, Left – New access road constructed parallel to SB MD 32 with new access point at reconstructed access road at Sta. 443+00; (3) Driveway at Sta. 459+50, Right – Reconstruct existing entrance; and (4) Driveway at Sta. 465+00, Right - Reconstruct existing entrance. SWM access roads will be constructed from the new roadway shoulder at various locations.

Compatibility of Planned Corridor Improvements: The Team's project will be compatible with the planned improvements for the future Dayton Shop and Rosemary Lane Interchanges. The channelized intersection proposed in the RFP concept at the Dayton Shop will not preclude the construction of the future ramps and bridge. The new SB MD 32 pavement will be constructed in its ultimate alignment with this project while the future ramps and T-intersection located to the west will replace the median channelization proposed with this project to complete the interchange. In a similar manner, the new SB MD 32 pavement will be constructed in its ultimate alignment at Rosemary Lane while the existing NB MD 32 pavement will be maintained with a wide median as approved with ATC-12 Rev 1. In the future, the ultimate NB MD 32 pavement can be constructed in the wide median while the existing NB MD 32 pavement can be repurposed

as part of the future access road to tie to the future interchange ramps and access driveways. Some benefits of this sequencing include **less pavement will need to be reconstructed in the future** and less pavement will need to be treated as part of this project. Where Team's dualization and taper ends at Sta. 467+50, the ultimate dualized pavement width will be constructed up to Sta. 467+00 to accommodate future dualization and provide a cross over for the future construction of Bridge S-6.

Pavement: The Team has incorporated three optimization strategies into the design of the pavement section. The first strategy is the use of ATC-21 Rev 1 which uses Foamed Asphalt Stabilized Base (FASB) Course in lieu of 25.0mm Superpave Asphalt Mix as the base pavement. The second strategy is the use of modified pavement subgrade soils with cement to provide a subgrade resilient modulus of 10,500 psi and an alternative pavement section based on the improved subgrade support conditions. The third strategy is the elimination of milling/grinding of the existing MD 32 pavement and only providing overlay where rehabilitation is required. These three optimization strategies will **shorten the construction duration** by eliminating the need to mill/grind prior to overlay placement and reducing the full-depth pavement section thicknesses required (including possible reductions of multiple lift placements) and **provides significant cost savings** to maximize the project's dualization. The Team understands that laboratory testing will be performed to determine the amount of cement that would be needed to meet the design requirements. A Special Provision will be developed for approval to address the minimum standards for design, testing, and construction methods for the cement modified subgrade. Falling Weight Deflectometer (FWD) testing will be performed to verify the design subgrade modulus. Existing pavement within the project limits will be evaluated and rehabilitated, as required.

A preliminary pavement condition index (PCI) survey was conducted on existing pavements, including mainline and shoulders, to obtain a preliminary indication of the areas that will require patching prior to rehabilitation. The areas of distress delineated were then evaluated in accordance to the SHA OMT's "Pavement Design Guide" (May 2006) to determine the type of patching required for each distress and each distress severity. Based on these preliminary results, the Team has estimated that approximately 1,200 tons of full –depth patching and 1,650 tons of partial-depth patching will be required for the project.

Structures: The Team will design and construct the following five structures:

1. S-1, Clydes Branch Tributary Culvert at Sta. 255+00. The Team will construct a 7' x 10' box culvert with 1.5' of backfill replacing the proposed 7' wide x 8' high culvert at that location. **The wildlife crossing originally proposed in the RFP will be shifted from S-3 to S-1 which allows for a smaller culvert to be constructed at S-3. In addition, the Team will provide deer (wildlife) fencing between S-3 and S-1 (approximately Sta. 217+50 to Sta. 256+00) on both sides of MD 32 to improve safety by reducing deer strikes in the corridor** (ATC-44). Finally, pre-cast wing walls will be used in lieu of cast-in-place (ATC-13).
2. S-3, Clydes Branch Culvert. The Team will construct a pre-cast 96" RCP with 1' depression and weirs every 40' for fish passage and a second precast 108" RCP to replace the RFP concept of a 12'x7' box culvert and an additional 60" RCP (ATC-45). S-3 will be shifted approximately 27' centerline to centerline north of the

Structures ATCs

ATC-4: Shifted Box Culverts

ATC-13: Use of Pre-cast Wing Walls

ATC-27: Bridge S-4 Single Span

ATC-44: Shift Wildlife Crossing to Culvert S-1

ATC-45: Use of Pre-cast Culvert S-3

ATC-50: Use of Pre-cast Culvert S-5

ATC-59: Extend Existing Culvert S-5 and Add 60" Parallel Culvert

ATC-60: Use of alternative typical section for Bridge S-4

existing culvert to allow for excavation around the existing culvert and for stream maintenance during construction (ATC-4). Pre-cast culvert sections and wing walls will be used in lieu of cast-in-place (ATC-13).

3. S-4, Full Replacement of Triadelphia Road Bridge over MD 32. The Team will construct a 145' single span bridge with a narrowed typical section. (ATC-27 and 60)
4. S-5, Middle Patuxent Tributary, Rosemary Culvert. The existing double cell 6' x 10' box culvert will be maintained and extended by approximately 90' using a four-sided precast box culvert of the same dimensions instead of total removal and replacement. In addition, a 60" diameter RCP will be installed adjacent and parallel to the culvert to provide for aquatic organism passage (AOP) (ATC-50 and 59). Pre-cast wing walls will be used in lieu of cast-in-place (ATC-13). **The Team will provide deer (wildlife) fencing between S-5 and the end of paving (approximately Sta. 450+00 to Sta. 467+00) on both sides of MD 32 to improve safety by reducing deer strikes in the corridor.**
5. S-8, Clydes Branch Tributary Culvert at Sta. 250+00. The Team will construct a single 6'x 7' box culvert. The proposed culvert alignment will be shifted approximately 19' centerline to centerline north of the existing culvert to allow for excavation around the existing culvert and for stream maintenance during construction (ATC-4). Pre-cast wing walls will be used in lieu of cast-in-place (ATC-13).

Drainage/SWM/ESC: The Team has reviewed the provided Hydrologic and Hydraulic (H&H) models, concept drainage, concept SWM report and soil boring logs and has **optimized the RFP concept design for drainage, Stormwater Management (SWM) and Erosion and Sediment Control (ESC)** which has **significantly reduced the construction limits of disturbance by 84.57 acres (41.20%).** The Team understands that we will be responsible for completing the three-step process (concept, site development, and final approvals) and obtaining SWM approvals directly from SHA-PRD. The Team will construct dry pond, bioretension, and surface sand filter facilities along the west side of MD 32 and construct bioswales, grass swales, intermittent grass swales, and submerged gravel wetlands along both sides of the roadway and in the median. Along MD 32, 6' of the existing SB shoulder pavement will be removed along the future median for the majority of the length of the dualization to help offset the new impervious area.

The proposed modifications to structures S3 and S5 required a conditional letter of map revision (CLOMR) approval during the concept design phase because of their locations within the 100-year FEMA floodplain limits. The structure configuration proposed in the concept design will result in extended construction times and will cause additional delays to the travelling public. We are proposing revised culvert configurations in order to further optimize the structures' efficiency and meet the project goal to minimize disruptions to the travelling public. The revised culvert configuration will require updating the hydraulic model. There are no changes anticipated to the SHA and MDE approved hydrology for these structures provided during the RFP stage. We will revise the hydraulics model and submit it to Howard County for a preliminary review. Upon receiving acceptance from Howard County, we will submit the model to SHA, FEMA and MDE for concurrence. Upon receiving concurrence for the revised model, we will prepare a hydraulics report, all applicable forms, and CLOMR application and submit to MDE and FEMA for approval. We will coordinate with SHA throughout the process and send copies of all the documents and correspondence. Upon completion of the construction of structures S3 and S5 and all other structures that have approved CLOMR within the project limits, we will submit a letter of map revision (LOMR) to FEMA based on the as-built conditions.

The Team will maintain existing storm drain pipes throughout the project limits and, per ATC-26, will rehabilitate existing corrugated metal pipes (CMPs) less than 60" in diameter though the use of pipe lining systems in lieu of replacement with reinforced concrete pipes (RCPs). **By implementing this ATC, the Team will reduce impacts to the traveling public during construction**.

The Team will prepare ESC plans and obtain permits through Plan Review Division (PRD).

Stream Relocation: The Team will design, permit, and construct a stream relocation at Clydes Branch (approximately 500 LF) to facilitate the construction of Culvert S-3, which will be shifted to the north as approved in ATC-4 and ATC-45. The relocation will provide stable plan, profile, and cross-section that achieves lateral/bank stability and balances sediment transport and supply through these and adjacent reaches. The relocation will be designed and constructed to **avoid downstream scour, channel degradation, and fish blockages**.

Wetland/Stream Mitigation: The Team has reviewed the Phase I Rosemary Lane Tributary Stream Restoration Mitigation and Phase I Wetland Mitigation Plan approvals and will develop Phase II Mitigation Plans for both and submit Joint Permit Application (JPA) modifications. We will also develop and submit Final Phase I and II Wetland Creation and Stream Restoration Reports that will include project description and background, watershed characteristics, existing stream conditions, stream morphology, mitigation design approach, hydrologic and hydraulics analysis, design discharge analysis, rock sizing, in-stream structure placement, and FEMA requirements. We will develop typical cross section and details, geometry sheets, grading plans, profile sheets, ESC Plans, landscape plans and details for the wetland and stream, as applicable. The Team will endeavor to restore the palustrine emergent (PEM) wetland W-H as part of the restoration design of Rosemary Lane Tributary. During construction, Lane will coordinate with the Stream Restoration Design and Permitting Specialist who will have full authority to manage stream restoration-related work.

The Team will not be performing any stream mitigation for Total Maximum Daily Load (TMDL) credits to the Terrapin Branch as part of this project.

Traffic Signals: The Team will design and construct traffic signals at one intersection; MD 32 at SHA Dayton Shop. This signal will be an on-demand traffic control signal for vehicles entering and leaving the Dayton Shop. The new signal and auxiliary lanes will **reduce the delay at the intersection.**

Signing and Pavement Marking: The Team will design and install signs, pavement markings, and recessed snow plowable raised pavement markers according to MD MUTCD, MUTCD, MDOT SHA standards, OOTS directives and RFP performance requirements all to provide Positive Guidance.

Lighting: The Team will design and construct lighting at the following locations: (1) Modifications of existing lighting at the Burntwoods Road Interchange; and (2) New intersection lighting at the Dayton Shop, emergency turn-around at Sta. 321+50, Parliament Place, River Valley Chase, and Rosemary Lane. The new lighting will **increase the safety at the interchange and intersections at critical decision points.**

Landscape and Reforestation: The landscape and reforestation design will be according to MD Reforestation Law, Roadside Tree Law, MDOT SHA Landscape Design Guide (LDG), MDOT SHA Preferred Plant List, and RFP performance requirements. The landscape design will be developed to provide seasonal aesthetic interest with native, hardy, low maintenance, drought and salt tolerant plant material selected from the RFP plant list with substitutions as approved by MDOT SHA. Plantings will be in diverse groupings to present a natural appearance and common planting theme throughout the corridor. The Team will design and construct the project to minimize the number of trees removed. Tree protection fence and root pruning will be employed to minimize impacts and protection of specimen and champion trees will be addressed. Where reforestation is required, the reforestation planting densities will be reduced within Planting Zone 4 as outlined in ATC-57 Rev 1; however, although reduced the densities are in accordance with the LDG and DNR requirements. The reduction in planting density will provide appropriate tree spacing

to ensure sustainable reforestation where plant material does not compete for the limited amount of soil nutrients, moisture, and sunlight and will ensure that the reforestation areas will thrive.

Geotechnical: The Team will perform a complete geotechnical program including supplemental subsurface exploration, laboratory testing, analyses and design to complete the roadway, embankment, structural, drainage and SWM design, and construction. Items to be explored during various design phases include settlements, bearing, slope stability, retaining wall, and ground improvements as appropriate and required for each element being designed. The Team has reviewed the geotechnical data provided in the RFP, conducted a field review and does not anticipate any rock removal.

Noise Barriers: Noise barriers are not required per the RFP, but additional analysis and documentation will be required as a condition to the acceptance of ATC-12 Rev 1 into the design. The Team will re-analyze the length of MD 32 within the area of ATC-12 Rev 1 where the NB lanes are placed on the existing alignment and provide an amendment to the current noise analysis report. The Team does not anticipate that the revised alignment will require the need for noise barriers.

Earthwork: The current roadway proposed grade line generates excess soils as a result of the dualization. Further design development will strive for balanced earthwork by incorporating this excess into proposed embankments, berms, and available waste areas within the limits of our dualization. Material that cannot be incorporated within the dualization will be placed as fill to the north of our limits to aid the remaining dualization. The LOD and ESC Plans will be adjusted during final grading to allow for these fills.

Incorporated Alternative Technical Concepts (ATCs)

The Team developed and obtained approvals (or conditional approvals) for the use of 29 ATCs during the bid phase to meet the project goals including:

- **Goal 1**: Provide a project that maximizes the project elements to improve corridor traffic operations and safety while being compatible with the future planned corridor improvements;
- **Goal 2**: Provide a project that minimizes inconvenience to the community and the traveling public;
- **Goal 3**: Provide a project that minimizes overall impacts and provides proactive coordination.

In addition to meeting the project goals, the ATC's generate cost savings that were applied to the construction of the project and to provide maximum dualization. The following is a summary of the 19 ATCs that are incorporated into the Team's project:

SUMMARY OF ATCs INCORPORATED INTO PROJECT			
No.	**Title**	**Location**	**Description**
2	Use of cable barrier	Corridor-wide	Utilizes cable median barrier in lieu of W-Beam Median Barrier where there is significant continuous and consistent 34' wide median. **Benefits: Construction cost and time savings for materials and installation. Applies to Goals 1 and 2**
4	Shift S-3 and S-8 box culverts and utilize existing culverts for bypass	Culverts S-3 & S-8	Shifts the location of proposed culvert structures S-3 and S-8 from existing location and constructs them adjacent to the existing structure. Existing pipe will be used for maintenance of stream flow while the new culvert is constructed. Existing pipe culverts will be filled with flowable concrete. **Benefits: Minimizes the stream disturbance during construction and facilitate the new construction in the dry. Reduced construction cost and time savings by elimination of pumping of full stream flow and treatment of discharge and provides fish passage during construction. Applies to Goals 1, 2 and 3**
12 Rev 1	Eliminate horizontal shift of NB MD 32 from Sta. 405+00 to Sta. 455+00	MD 32, Sta. 405+00 to Sta. 455+00	Shifts NB MD 32 to the existing pavement as part of the proposed roadway improvements. SB MD 32 remains at the same location as the RFP Concept. The shift results in a wider median and eliminates the J-turn proposed in the RFP Concept. The future Rosemary Interchange can still be accommodated. **Benefits: (1) Reduces construction time and material costs due to the overlay versus full depth pavement construction of NB MD 32; (2) Simplifies MOT due to reduced number of stages and less crossovers; (3) Provides a wider median which allows for safer left turn movements, eliminates the J-Turn, reduces median barrier and allows for additional area for SWM; (4) Reduces the impervious area treatment required; and (5) Reduces the amount of utility relocations. Applies to Goals 1, 2 and 3**
13	Use pre-cast wingwalls for all culverts	Culverts S-1, S-3, S-5 & S-8	Allows the use of precast sections for the end section of new reinforced concrete box culvert and precast wingwalls at all four corners. The headwalls will be cast in place concrete. The joint between the wingwall and end section of the box culverts will be detailed to prevent leakage from the joint. A mud slab will be placed under the wingwall footing and end precast section to prevent differential settlement at the ends of the boxes. **Benefits: (1) Construction cost and time savings for installation; and (2) Reduced temporary stream impacts. Applies to Goals 1, 2 and 3**

SUMMARY OF ATCs INCORPORATED INTO PROJECT			
No.	**Title**	**Location**	**Description**
20	Use of enhanced grass swales	Corridor-wide	Provides enhanced grass swales instead of grass swales in areas where groundwater is anticipated between 0.1' to 4' below the bottom of the swale. In numerous locations along the project corridor, bioswales are proposed near existing streams, wetlands, and/or floodplains of major waterways. **Benefits: Construction cost and time savings for materials and installation. Applies to Goals 1 and 2**
21 Rev 1	Use of Foamed Asphalt Sub-Base (FASB)	Corridor-wide	Provides an alternate pavement section using Foamed Asphalt Stabilized Base Course in lieu of 25.0mm Superpave Asphalt Mix as the base pavement. **Benefits: (1) Construction cost and time savings for materials and installation and (2) More environmentally friendly using reclaimed materials. Applies to Goals 1 and 2**
26	Line existing culverts to remain	Corridor-wide	Rehabilitates existing corrugated metal pipes (CMPs) less than 60" in diameter through the use of pipe lining systems in lieu of replacement with reinforced concrete pipes (RCPs) as determined by the engineer of record. Spin-cast cementitious linings will be used for diameters greater than 36" and cured-in-place pipe (CIPP) linings will be used for diameters less than or equal to 36". **Benefits: Construction cost and time savings with simplified phasing, eliminates lane closures, quicker construction. Applies to Goals 1 and 2**

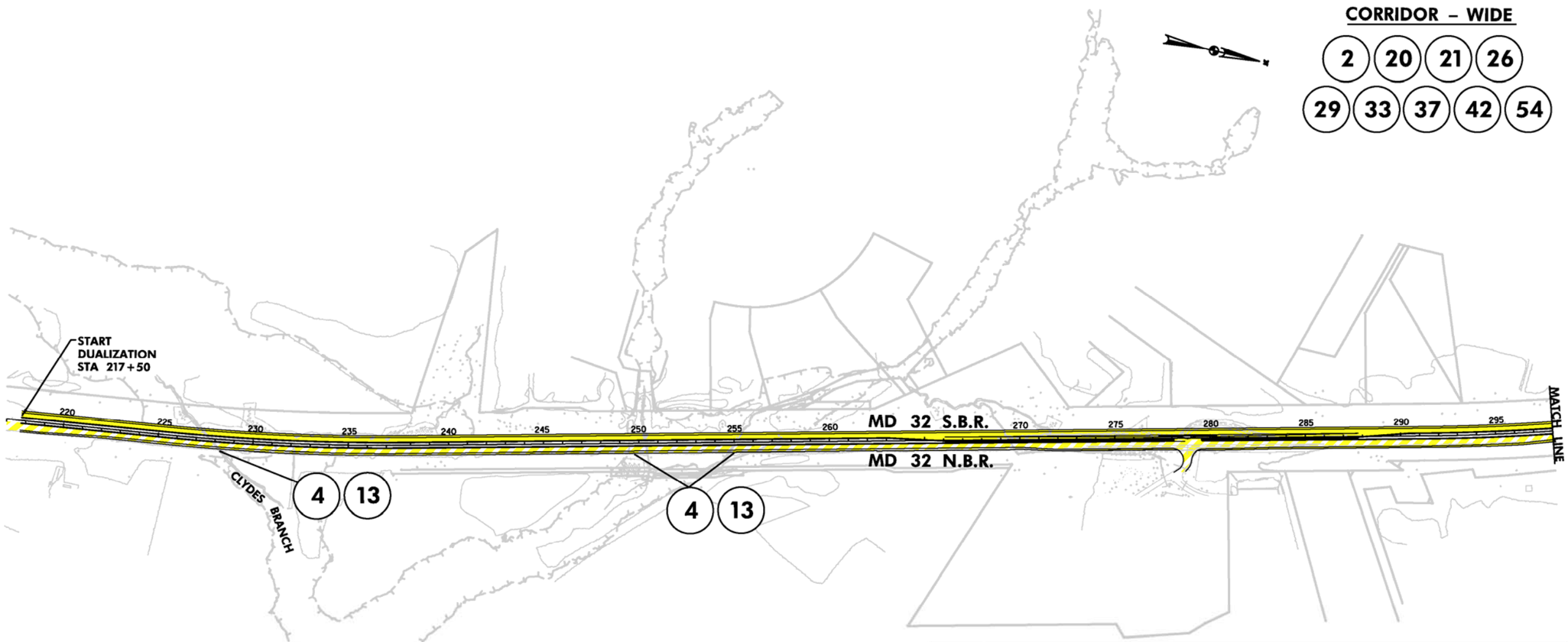
SUMMARY OF ATCs INCORPORATED INTO PROJECT			
No.	**Title**	**Location**	**Description**
27	Use of single span for Bridge S-4	Bridge S-4, Triadelphia Rd	Changes the RFP concept 2-span bridge with haunch steel girders and pier in the median of proposed MD 32 to a single span steel girder bridge that eliminates the need for a center pier. The change to a single span will have a longer span compared to the individual spans of the 2-span concept and will necessitate the following change in roadway elements: (1) Profile of Triadelphia Road will need to be raised by 1' to accommodate a deeper girder while providing a 16'-9" clearance above MD 32; and (2) SB MD 32 horizontal alignment will need to be shifted to the east. This shift will result in the elimination of the grassed median on MD 32 and will introduce standard concrete median barrier and single-face barrier along the outside shoulder. **Benefits: (1) Smaller bridge to construct and less components to maintain; (2) Shorter design and construction time due to the elimination of the center pier; (3) Simpler and quicker steel fabrication without the haunch; and (4) Construction cost and time savings for materials and installation. (5) Reduce impact on MD 32 traffic by eliminating the heavy construction work in the median; (6) Accommodates MDOT SHA's aggressive detour schedule. Applies to Goals 1 and 2**
29 Rev 1	Use of CPP-S outside of roadway	Corridor-wide	Utilizes smooth interior corrugated plastic pipe (CPP-S) outside of the roadway travel lanes instead of the reinforced concrete pipes (RCP) as shown on the RFP Concept Plans. **Benefits: Construction cost and time savings for materials and installation. Applies to Goals 1 and 2**
33	Removal of grinding and only overlay existing MD 32	Corridor-wide	Allows the overlaying of existing MD 32 without grinding or milling. Mainline pavement distresses will be repaired as needed as required by the RFP based on the results of the patching survey. The existing pavement would be cleaned and would have a suitable tack coat applied prior to the placement of the overlay. By removing the need to grind or mill prior to the placement of the overlay, the resulting post-construction pavement thickness would be thicker than had the grinding or milling been performed. **Benefits: Construction cost and time savings for reduced grinding/milling and overlay preparation. Thicker pavement section provides longer service life. Applies to Goals 1 and 2**

SUMMARY OF ATCs INCORPORATED INTO PROJECT			
No.	**Title**	**Location**	**Description**
37	Maintaining existing shoulder widths less than 10’	Corridor-wide	Maintains existing shoulder widths that are less than 10’ during construction, as opposed to providing temporary pavement widening to existing shoulders to achieve 10’ in width as required in the RFP. **Benefits: (1) Construction cost and time savings by eliminating temporary pavement and grading for crossovers; and (2) Eliminates MOT shift to facilitate construction.** **Applies to Goals 1 and 2**
42	Use of 8’ outside paved shoulders along MD 32	Corridor-wide	Utilizes 8’ wide paved shoulders along portions of MD 32 where new 10’ paved shoulders are shown on the RFP Concept Typical Sections and Plans. A full 10’ usable shoulder will be provided where the outside 2’ will be stone graded at the same cross-slope as the 8’ paved portion of the shoulder. **Benefits: (1) Construction cost and time savings for reduced full-depth pavement; (2) Reduced pavement to be maintained; (3) Reduced impervious area; and (4) Reduces owner risk in liquid asphalt allowances.** **Applies to Goals 1 and 2**
44	Shift wildlife crossing to Culvert S-1	Culvert S-1 & S-3	This ATC proposes to construct a 7' x 10' box culvert with 1.5’ of backfill for Culvert S-1 in lieu of the 7' x 8' box culvert proposed in the RFP concept. Wildlife fence will be added to both sides of the roadway from Station 217+50 to Station 256+00 to encourage wildlife use the crossing at Culvert S-1 instead of crossing the roadway within this habitat corridor. Reference ATC-45. **Benefits: (1) Construction cost and time savings for constructing a smaller/simpler structure at Culvert S-3.; (2) The larger Culvert S-1 will provide a wildlife passage in addition to Culvert S-3 and (3) Provides second crossing and fencing to direct wildlife away from traffic.** **Applies to Goals 1 and 2**

SUMMARY OF ATCs INCORPORATED INTO PROJECT			
No.	**Title**	**Location**	**Description**
45	Use of precast Culvert S-3 (96" and 108" RCP)	Culvert S-3	Proposes open cut installation of one precast 96" RCP with 1' depression, weirs every 40' for fish passage and a second precast 108" RCP for mammal passage to replace the RFP concept 12'x7' box culvert with additional 60" RCP at shifted Culvert S-3 location per approved ATC-04. **Benefits: (1) MDE Dam Safety permitting not required; (2) Design and construction cost and time savings for material fabrication and installation; (3) Eliminates in-stream activities during construction; and (4) Provides fish and aquatic organism passage, and additional amphibian and animal crossing as required by agencies. Applies to Goals 1, 2 and 3**
50	Use of precast double box for Culvert S-5	Culvert S-5	Uses a precast double cell box culvert for Structure S-5 in lieu of a 3-sided precast double cell box culvert on a cast-in-place footing. The individual culvert sections will be connected as currently proposed in the RFP concept. Additionally, the culvert will be placed on a full width by full length 1' thick mud slab and 1' of compacted aggregate. **Benefits: Construction cost and time savings for installation. Applies to Goals 1 and 2**
54	Use of reduced paved shoulder width	Corridor-wide	Reduces the paved portion of all new/reconstructed shoulders by 2' in locations not covered by the approved ATC-42. Areas where new 10' paved shoulders are proposed in the RFP Concept Typical Sections and Plans, an 8' wide minimum paved shoulder will be constructed with a 2' wide graded strip to provide a 10' total usable shoulder. In areas where new 8' paved shoulders are proposed, a 6' wide minimum paved shoulder will be constructed with a 2' wide graded strip to provide an 8' usable shoulder. In both scenarios the graded strip will have the same cross-slope as the paved portion of the shoulder. **Benefits: (1) Construction cost and time savings for reduced full-depth pavement; (2) Reduced pavement to be maintained; (3) Reduced impervious area; and (4) Reduces owner risk in liquid asphalt allowances. Applies to Goals 1 and 2**

SUMMARY OF ATCs INCORPORATED INTO PROJECT			
No.	**Title**	**Location**	**Description**
57 Rev 1	Use of reduced planting density	Corridor-wide	Reduces the planting densities and plant material in the Reforestation Areas (Zone 4) based on reduced LOD and planting limits identified by the Team. **Benefits: (1) Construction cost and time savings for reduced planting quantities; and (2) Better survival rate for the plant material.** **Applies to Goals 1 and 2**
59	Extension of existing Culvert S-5 with parallel 60-Inch culvert	Culvert S-5	Extends the existing double cell 6' x 10' reinforced concrete box culvert S-5 instead of total removal and replacement. The proposed extension is approximately 90' ±. In addition, a 60" diameter reinforced concrete pipe [RCP] will be bored & jacked adjacent and parallel to the culvert with lower invert to provide for aquatic passage. The proposed extension is not expected to significantly change the scour computations, so maintenance will be routine. **Benefits: (1) Construction cost and time savings with simplified MOT and construction phasing and installation; (2) Eliminates the need for a crossover; and (3) Safer construction.** **Applies to Goals 1 and 2**
60	Use of alternative typical section for Bridge S-4	Bridge S-4, Triadelphia Rd	Narrows the typical section for Triadelphia Road at Bridge S-4. The new typical section includes two 12' lanes, 5' bike lanes, and a 5' sidewalk on the north side of Bridge S-4. This ATC will be used in conjunction with approved ATC-27 due to sight distance constraints. **Benefits: (1) Construction cost and time savings for smaller structure; (2) Reduced maintenance.** **Applies to Goals 1 and 2**

LANE /DEWBERRY TEAM CONCEPT PLAN



NO	ATC Description
2	Use cable barrier instead of traffic barrier w-beam.
4	Shift box culverts to eliminate in-stream construction at Culvert Structures S3 and S8 while utilizing the existing culverts for maintenance of stream flow.
13	Use pre-cast wing walls instead of cast-in-place for all culverts.
20	Enhanced Wet Swales
21	Foamed Asphalt Sub Base (FASB)
26	Line existing culverts to remain
29	Use of CPP-S outside of roadway
33	Remove Grinding and Only Overlay Existing MD 32
37	Maintain existing shoulder widths less than 10'
42	8-Foot Outside Paved Shoulders along MD 32
54	Reduction of Paved Shoulder

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

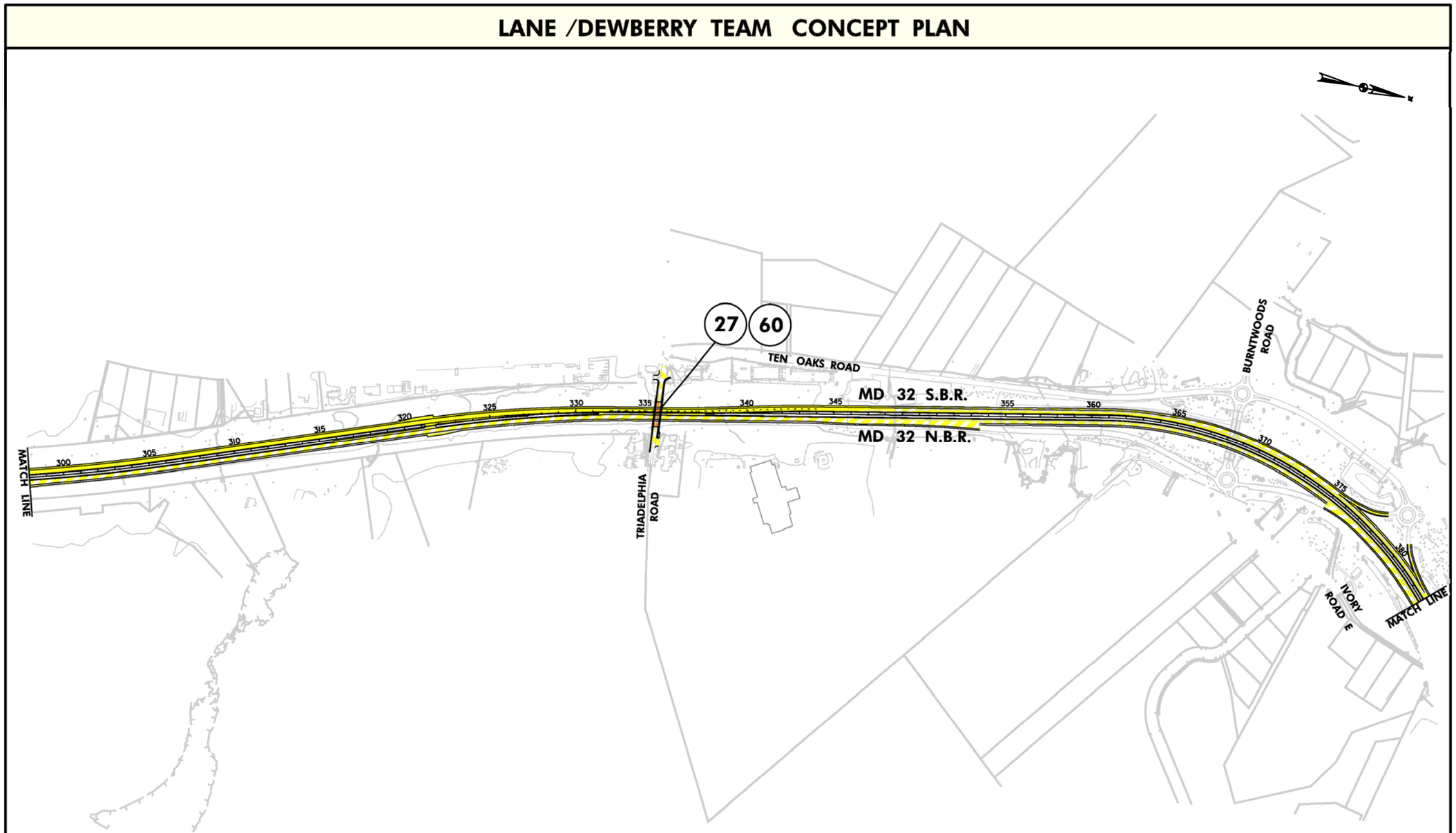
HIGHWAY DESIGN DIVISION
MD 32 DESIGN BUILD
FROM LINDEN CHURCH ROAD
TO I-70, HOWARD COUNTY

SCALE: 1" = 500' | DATE: SEPTEMBER 2018 | SHEET NO: 1 OF 3

Dewberry
Dewberry Engineers Inc.
10461 MILL RUN CIRCLE
SUITE #900
OWINGS MILLS, MARYLAND 21117
PHONE: 410.2850.9500
FAX: 410.2850.8875
www.dewberry.com

LEGEND:
(X) ATC. NO.

LANE /DEWBERRY TEAM CONCEPT PLAN



MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

HIGHWAY DESIGN DIVISION
MD 32 DESIGN BUILD FROM LINDEN CHURCH ROAD TO I-70, HOWARD COUNTY

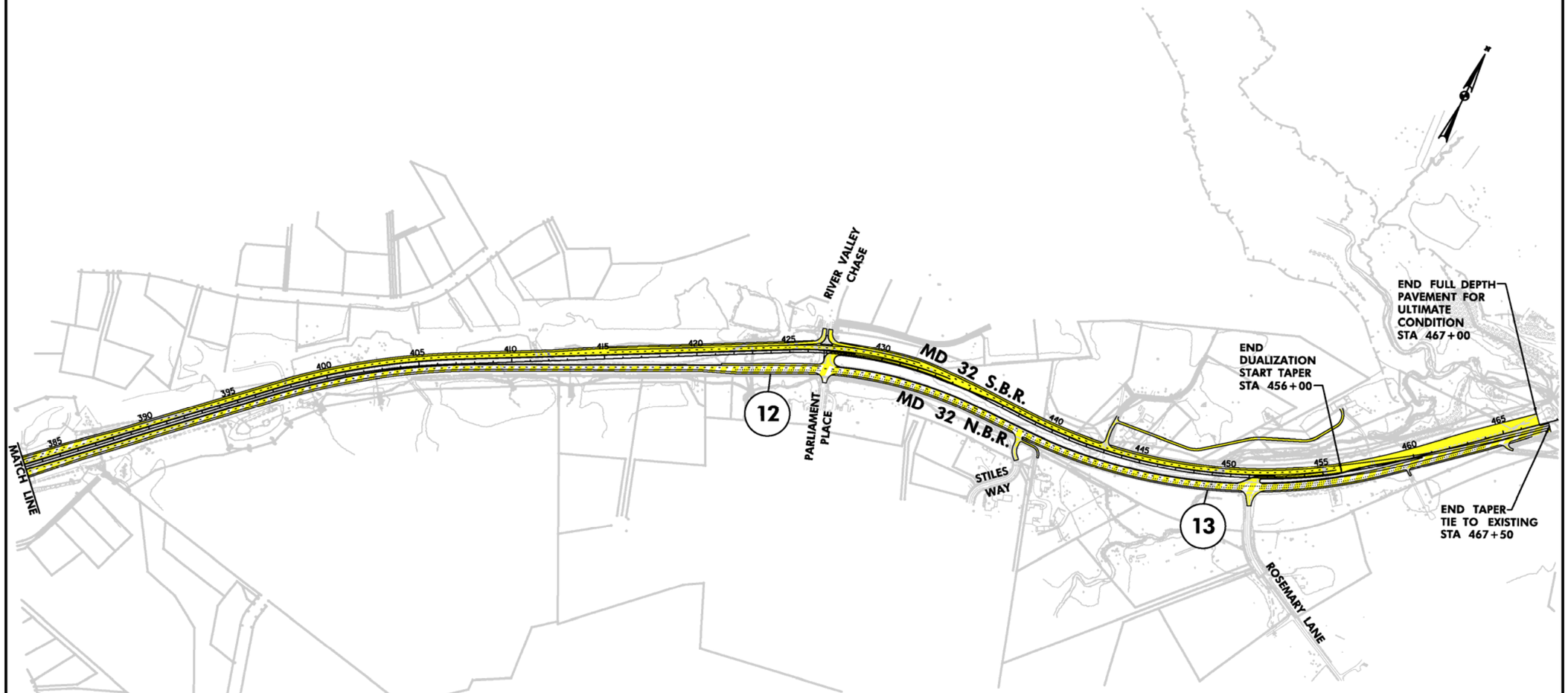
SCALE: 1" = 500' | DATE: SEPTEMBER 2018 | SHEET NO: 2 OF 3

Dewberry
Dewberry Engineers Inc.
10461 MILL RUN CIRCLE
SUITE #300
OWINGS MILLS, MARYLAND 21117
PHONE: 410.265.8600
FAX: 410.265.8875
www.dewberry.com

LEGEND:
(X) ATC. NO.

NO	ATC Description
27	*Bridge S4 (Triadelphia Road) single span bridge*
60	Alternative Typical Section of Bridge S4 (Old ATC #34)

LANE /DEWBERRY TEAM CONCEPT PLAN



MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

HIGHWAY DESIGN DIVISION
MD 32 DESIGN BUILD
FROM LINDEN CHURCH ROAD
TO I-70, HOWARD COUNTY

SCALE: 1" = 500' | DATE: SEPTEMBER 2018 | SHEET NO: 3 OF 3

Dewberry
Dewberry Engineers Inc.
10461 MILL RUN CIRCLE
SUITE #300
OWINGS MILLS, MARYLAND 21117
PHONE: 410.265.8600
FAX: 410.265.8875
www.dewberry.com

LEGEND:
(X) ATC. NO.

NO	ATC Description
12	Eliminate horizontal alignment shift from Sta. 405+00 to Sta. 455+00
13	Use pre-cast wing walls instead of cast-in-place for all culverts.

4.2.B. Improve Network Traffic Operations and Reduce Crashes

The primary goal is to provide a design that reduces travel delays in the AM and PM peak periods, ensures adequate operation of traffic signals, reduces crash rates and is compatible with planned future improvements. To accomplish these goals, our design efforts will focus on providing appropriate roadway elements and the effective use of traffic control devices. We have developed a plan that minimizes travel delay and maximizes safety for traveling public. Strategies to be implemented as part of the roadway design to achieve this include:

- Developed, submitted and received approval for 29 ATCs (19 will be incorporated) to drive significant amounts of innovation; improved traffic operations; and cost savings into the project in order to maximize the number of continuous four-lane dualized roadway.
- Increasing capacity of the roadway by adding 4.52 miles of continuous four-lane dualized roadway thus reducing delays.
- The dualization of MD 32 includes the full replacement of the Triadelphia Road Bridge.
- Reducing conflict points present in the existing condition at intersections and adjacent access roads by eliminating crossover movements and developing channelized left turn lanes and by implementing a Maryland-T turn at the Dayton Shop. The left turn and through movements are converted to right turn and U-turn movements thus reducing conflict points at intersections.
- Providing turn lane storage requirements based on projected traffic volumes to ensure adequate storage capacity is provided and eliminate the potential for spill-back into through travel lanes.
- Providing acceleration lanes exiting the intersections and deceleration lanes entering intersections.
- Providing functional outside shoulders of sufficient width for vehicle breakdown and law enforcement.

In addition to the strategies outlined as part of the roadway design elements, we will incorporate the following to minimize delays and promote safety:

- Identify areas where additional signing may be necessary for Positive Guidance in negotiating the intersections.
- Increase safety by separating turning movements from intersection areas with multiple decision points.
- Utilize warning signs to alert roadway users of special traffic conditions that are unusual or may present confusion.
- Provide enhanced traffic control devices such as larger sign panels, wider pavement markings, channelization reflectors, recessed raised pavement markers, etc., especially in areas of the channelized intersections and J-turns.

With respect to safety improvements, our Team understands the importance of this outcome at the completion of the project as well as during all phases of construction. The Team has extensive infrastructure project experience in urban, suburban, and rural areas with similar safety goals. Our prior experience prepares us to immediately recognize safety issues during the integrated design-build process so that we may mitigate problems quickly and efficiently. The design team's initial review of the RFP conceptual design acknowledged several effective methods and strategies for reducing crashes and providing safe access. To accommodate the needs of adjacent property users by maintaining safe and efficient access during and post construction activities, the project scope focuses on the following strategies:

- Eliminates dangerous head-on crashes by providing median separation;

- Allows for safe and easy access for property owners and the traveling public by reducing turn movement conflicts; and
- Assures design standards are achieved in the intermediate and final stages of construction, especially as conditions may become challenging when traffic patterns may need to transition to allow needed construction activities to occur.

For a quantitative assessment of safety, an *AASHTO Highway Safety Manual* safety analysis has been proactively developed by our Team to show the difference in the expected number of total crashes with the project. As detailed below, the number of annual crashes is predicted to reduce by 9% with this project as compared to the existing conditions (from 77 to 70 crashes per year within the project limits). In addition, the number of high severity head-on crashes are anticipated to be reduced with the implementation of median separation, and angled crashes are anticipated to be reduced with the planned access management improvements. Below are the results of our AASHTO *Highway Safety Manual* Analysis:

- Rural Two-Lane, Two-Way with 12' lanes and 8' (or wider shoulders): 11.8 crashes per mile pear year x 6.5 miles = 77 crashes

In addition, the Team will employ the following strategies for maintaining access while promoting safety measures, identified as effective, for similar type projects when implemented properly:

- Minimize impacts to existing infrastructure or access points; keep driveways and adjacent roadways open;
- Keep all movement types open during construction including turn lanes;
- Use flagging operations to help guide motorists and roadway users, and barrier, where necessary, to keep workers and the traveling public safe;
- Include barrier setbacks along lanes of traffic (with barrier breaks for adjacent property and roadway access) to maintain sight distance by including sight line analysis at all intersections and driveways during construction;
- Use temporary crossovers at intersection and driveway locations to maintain access;
- Use Auto-Turn to simulate turning movements for trucks to maintain available maneuverability during and post construction;
- Enhance work zone intersection safety by including special intersection warning signs to alert traffic of upcoming potential hazards; and
- Use work zone impact management strategies such as speed display trailers, marked police vehicles, reduced channelizing device spacing and wide lane and edge line pavement markings.

Overall, the Team's solution will decrease travel times through the corridor by adding capacity and improve safety for motorists by providing a wide median that will reduce head-on collisions and facilitates safer left-turn movements and provides additional auxiliary lanes for safer access to intersecting public roads and facilities. Other enhancements such as signing, pavement marking, lighting and traffic signalization will also create a safer corridor.

4.2.C. Design Exceptions

According to FHWA's May 5, 2016 memorandum titled "Revisions to the Controlling Criteria for Design and Documentation for Design Exceptions", the following 10 criteria are considered controlling for the design of projects on the National Highway System (NHS):

1. Design Speed
2. Lane Width
3. Shoulder Width
4. Horizontal Curve Radius
5. Superelevation Rate
6. Stopping Sight Distance
7. Maximum Grade
8. Cross Slope
9. Vertical Clearance
10. Design Loading Structural Capacity

Any design elements that fall below the design standards in the RFP Performance Requirements regarding these controlling criteria will require a design exception or design waiver to be submitted to FHWA through MDOT SHA for approval prior to being implemented into the design.

Conditions That Require Design Exception: For this project our Team has identified two conditions that do not meet the 10 AASHTO Controlling Criteria. The two conditions were identified in the RFP and will be carried through with our Team's proposed design. These two conditions include the following:

1. Existing grade of 6% on MD 32 near Rosemary Lane from Sta. 436+70 to Sta. 444+00. Being acquired by MDOT SHA.
2. Adverse superelevation on MD 32 through the intersection with MD 144 along the horizontal curve. Being acquired by MDOT SHA.

Mitigation Strategies: The Team will implement the following mitigation:

1. As stated in the Request for Design Exception document, the dualization of MD 32 and continuous auxiliary lane for right turning traffic from south of Parliament Place to north of Rosemary Lane along NB MD 32 will be implemented to address the existing 6% grade.
2. The traffic signal at MD 144 will remain and along with enhanced signing and pavement marking will encourage reduced travel speeds through the MD 144 intersection.
3. Inlaid high retro-reflectivity pavement marking tape is proposed on MD 32. These markings, in combination with street lighting, will be highly visible to motorist in different weather conditions and will clearly define the travel lane and path to safely guide motorists through the intersection and through areas with reduced travel lanes.

4.3 PROJECT SCHEDULE & PROJECT MANAGEMENT

4.3. Project Schedule & Project Management

A. Timely Completion of Project

Project Schedule: The Team has collaborated to produce a comprehensive project schedule that provides a **Final Completion Date** of October 16, 2021, for a total duration of 1,124 calendar days after the anticipated **Notice To Proceed** of December 17, 2018 (RFP Addendum No.3). Review of the summarized Critical Path Method (CPM) Project Schedule included later in this section reveals an integrated, well thought out project plan that links all right-of-way, design, permitting, submittals, milestones, material fabrication, utility design and relocation with the sequenced construction activities. The full CPM Project Schedule is provided in the Appendix allowing review in greater detail. By developing and later implementing this well-conceived plan, our Team will effectively execute the project and minimize inconvenience to the community and traveling public.

Strategies to Minimizing Inconvenience: The Team has incorporated multiple innovations into our project design that minimize inconvenience to the community and traveling public. These range from development of Traffic Control Plans and Traffic Management Plans that **reduce traffic shifts** and **improve safety** to Alternative Technical Concepts (ATC's) that **improve conditions during and post construction**. Highlights of our design include:

ATC-5 – Changes proposed crown location to retain the existing roadway cross-slope. This modification results in **reduced drainage** to the outside (eastern) shoulder **eliminating a complete MOT phase**, extensive grading, and multiple lane closures that would have been needed for wedge and level operations.

ATC-12 Rev 1 – Eliminates the horizontal alignment shift from Sta. 405+00 to Sta. 455+00 and avoids full depth pavement reconstruction and associated temporary cross-overs. Travelers realize a **construction time savings estimated at more than two months and reduced MOT**.

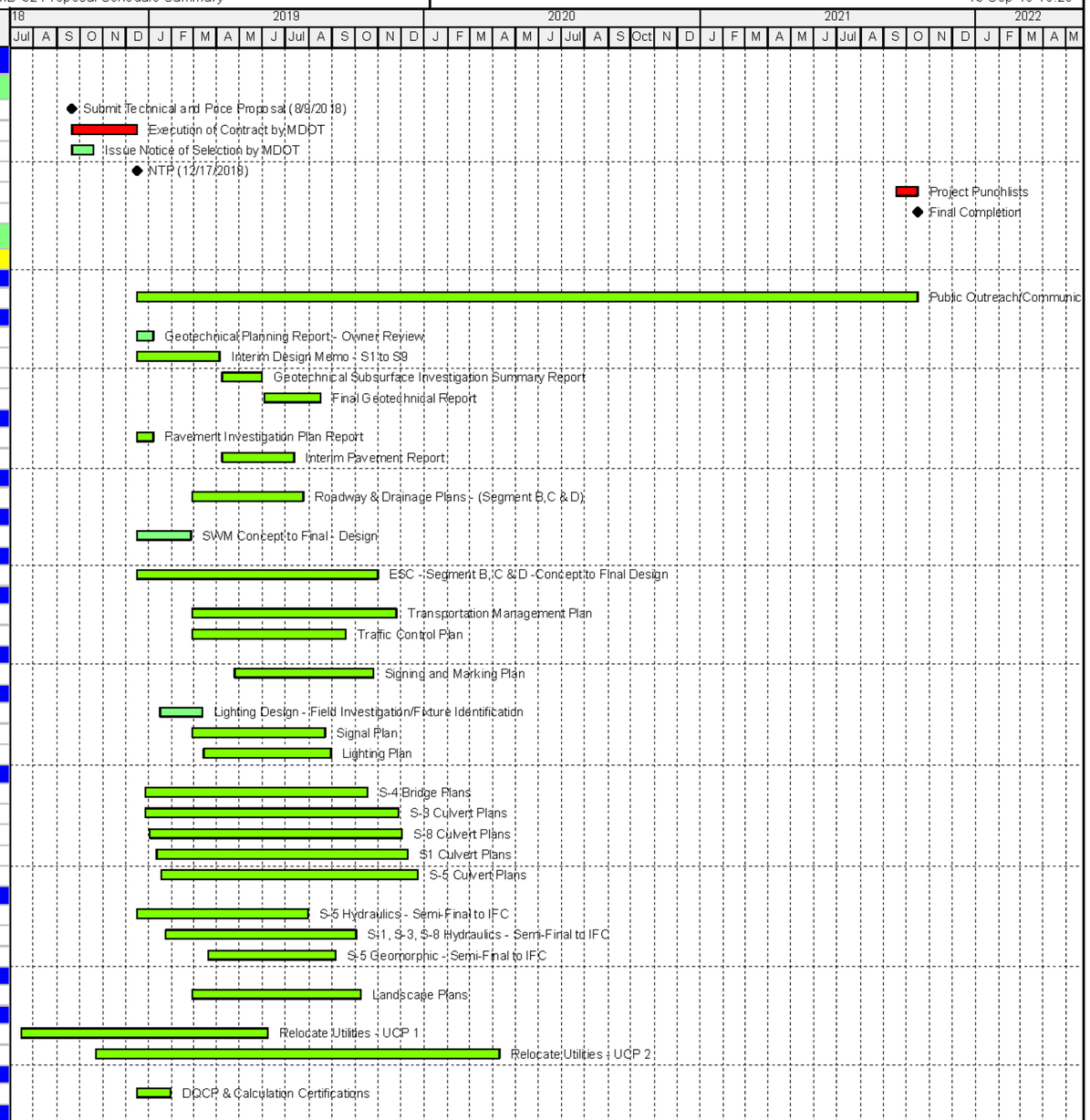
ATC-27 – Shortens span of Triadelphia Road Bridge (S-4) and eliminates pier. Provides economical structure with a **shorter construction time**. The accelerated design is needed for meet projects aggressive detour schedule requirements. Additionally, the final product will **reduce maintenance** because of the fewer supports, splices and bearings.

ATC-59 – Reuses the existing S-5 box culvert at Sta. 449+50 and extends it under the new southbound roadway. This modification **minimizes inconvenience by eliminating the traffic cross-overs** needed for the construction of a box culvert in the exiting travel lanes. Traffic can be maintained on the existing roadway while the box extension is constructed.

Critical Path: starts with Notice to Proceed (NTP), then follows the development of design plans for culverts S-3, and S-8. From design, the Critical Path follows the fabrication of culvert S-5 into the construction of S-8 in Phase 1 of Segment A. The Critical Path then follows the Box Culvert S-8, S-1 pavement construction in Phase 1 to the start of Phase 2 of Segment A. During Phase 2, the critical path follows the construction of Box Culvert S-3 S-8 and S-1, the reconstruction of roadway over the box culvert S-1, and the mill-and-overly of existing pavement. The Critical Path then follows the Phase 3 and 4 construction sequence in Segment A, and ends with project final punch lists.

MD-32 from Linden Church to I-70 (Fast Track Tridaphia Bridge) to Sta 467+50 | MD-32 Proposal Schedule Summary | 13-Sep-18 15:28

Activity ID	Activity Name	Original Duration	Start	Finish
MD-32 from Linden Church to I-70 (Fast Track Tridaphia Bridge) to Sta 4		664	16-Jul-18	16-Oct-21
Admin		1123	20-Sep-18	16-Oct-21
A00-1000	Submit Technical and Price Proposal (8/9/2018)	0	20-Sep-18*	
A00-1010	Execution of Contract by MDOT	88	20-Sep-18	16-Dec-18
A00-1050	Issue Notice of Selection by MDOT	30	20-Sep-18	19-Oct-18
A00-1030	NTP (12/17/2018)	0	17-Dec-18	
C00-1020	Project Punchlists	30	17-Sep-21	16-Oct-21
A00-1040	Final Completion	0		16-Oct-21*
Summary		664	16-Jul-18	16-Oct-21
Design		664	16-Jul-18	16-Oct-21
Public Outreach		1035	17-Dec-18	16-Oct-21
D00-5000	Public Outreach/Communications	1035	17-Dec-18	16-Oct-21
Geotechnical		130	17-Dec-18	16-Aug-19
D00-5010	Geotechnical Planning Report - Owner Review	21	17-Dec-18	08-Jan-19
D00-5020	Interim Design Memo - S1 to S9	62	17-Dec-18	05-Apr-19
D00-5030	Geotechnical Subsurface Investigation Summary Report	39	08-Apr-19	31-May-19
D00-5040	Final Geotechnical Report	54	03-Jun-19	16-Aug-19
Pavement		110	17-Dec-18	12-Jul-19
D00-5050	Pavement Investigation Plan Report	21	17-Dec-18	08-Jan-19
D00-5060	Interim Pavement Report	68	08-Apr-19	12-Jul-19
Roadway and Drainage		104	27-Feb-19	24-Jul-19
D00-5090	Roadway & Drainage Plans - (Segment B,C & D)	104	27-Feb-19	24-Jul-19
Stormwater Management		50	17-Dec-18	26-Feb-19
D00-5100	SWM Concept to Final - Design	50	17-Dec-18	26-Feb-19
Erosion and Sediment Control		224	17-Dec-18	31-Oct-19
D00-5120	ESC - Segment B, C & D - Concept to Final Design	224	17-Dec-18	31-Oct-19
Maintenance of Traffic		191	27-Feb-19	25-Nov-19
D00-5130	Transportation Management Plan	191	27-Feb-19	25-Nov-19
D00-5140	Traffic Control Plan	143	27-Feb-19	18-Sep-19
Signing and Marking		130	24-Apr-19	25-Oct-19
D00-5150	Signing and Marking Plan	130	24-Apr-19	25-Oct-19
Signals, Lighting & ITS		161	16-Jan-19	30-Aug-19
D00-5170	Lighting Design - Field Investigation/Fixture Identification	41	16-Jan-19	13-Mar-19
D00-5160	Signal Plan	125	27-Feb-19	22-Aug-19
D00-5180	Lighting Plan	120	14-Mar-19	30-Aug-19
Structures		194	27-Dec-18	23-Dec-19
D00-5220	S-4 Bridge Plans	295	27-Dec-18	17-Oct-19
D00-5210	S-3 Culvert Plans	337	27-Dec-18	28-Nov-19
D00-5260	S-8 Culvert Plans	235	02-Jan-19	02-Dec-19
D00-5200	S1 Culvert Plans	333	11-Jan-19	09-Dec-19
D00-5230	S-5 Culvert Plans	340	18-Jan-19	23-Dec-19
Hydraulics		203	17-Dec-18	02-Oct-19
D00-5270	S-5 Hydraulics - Semi-Final to IFC	159	17-Dec-18	31-Jul-19
D00-5280	S-1, S-3, S-8 Hydraulics - Semi-Final to IFC	178	23-Jan-19	02-Oct-19
D00-5300	S-5 Geomorphic - Semi-Final to IFC	119	20-Mar-19	05-Sep-19
Landscaping		158	27-Feb-19	09-Oct-19
D00-5320	Landscape Plans	158	27-Feb-19	09-Oct-19
Utilities		445	16-Jul-18	10-Apr-20
D00-5570	Relocate Utilities - UCP 1	230	16-Jul-18	07-Jun-19
D00-5580	Relocate Utilities - UCP 2	376	22-Oct-18	10-Apr-20
Quality		30	17-Dec-18	29-Jan-19
D00-5330	DQCP & Calculation Certifications	30	17-Dec-18	29-Jan-19
Environmental		537	17-Dec-18	16-Sep-21



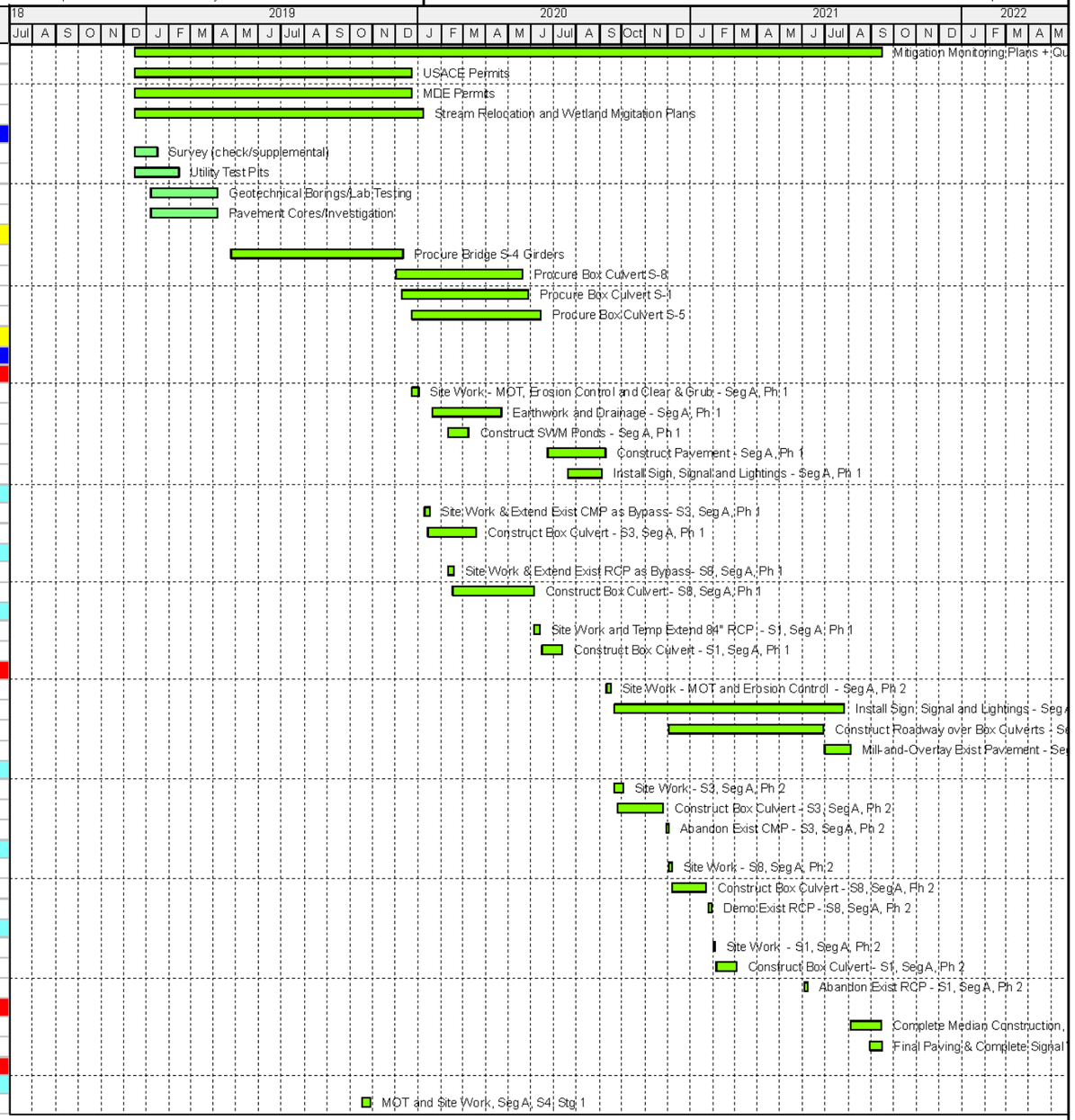
Remaining Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work

Page 1 of 3

LANE

MD-32 from Linden Church to I-70 (Fast Track Tridaphia Bridge) to Sta 467+50 | MD-32 Proposal Schedule Summary | 13-Sep-18 15:28

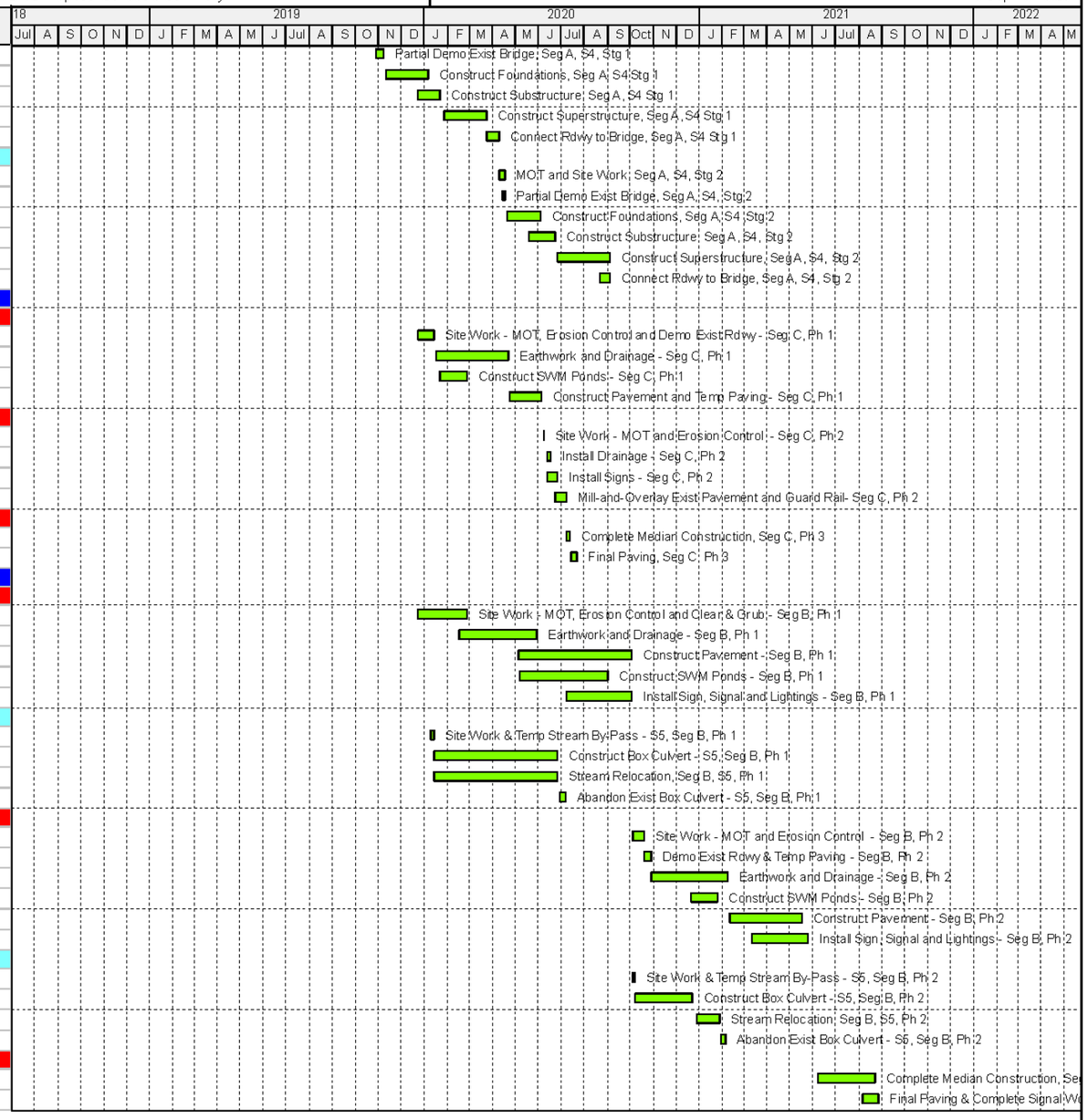
Activity ID	Activity Name	Original Duration	Start	Finish
D00-5380	Mitigation Monitoring Plans + Quarterly Compliance Reports	702	17-Dec-18	16-Sep-21
D00-5390	USACE Permits	201	17-Dec-18	23-Dec-19
D00-5400	MDE Permits	201	17-Dec-18	23-Dec-19
D00-5410	Stream Relocation and Wetland Migitation Plans	209	17-Dec-18	08-Jan-20
Start Up Field Activities		111	17-Dec-18	06-Apr-19
D00-5340	Survey (check/supplemental)	30	17-Dec-18	15-Jan-19
D00-5350	Utility Test Pits	60	17-Dec-18	14-Feb-19
D00-5360	Geotechnical Borings/Lab Testing	90	07-Jan-19	06-Apr-19
D00-5370	Pavement Cores/Investigation	90	07-Jan-19	06-Apr-19
Procurement		417	25-Apr-19	14-Jun-20
S01-1120	Procure Bridge S-4 Girders	231	25-Apr-19	11-Dec-19
S01-1170	Procure Box Culvert S-8	171	03-Dec-19	21-May-20
S01-1150	Procure Box Culvert S-1	171	10-Dec-19	28-May-20
S01-1160	Procure Box Culvert S-5	174	24-Dec-19	14-Jun-20
Construction		371	18-Oct-19	16-Sep-21
Segment A - Sta 220+00 to 345+00		371	18-Oct-19	16-Sep-21
Phase 1		138	24-Dec-19	09-Sep-20
S01-1000	Site Work - MOT, Erosion Control and Clear & Grub - Seg A, Ph 1	5	24-Dec-19	02-Jan-20
S01-1020	Earthwork and Drainage - Seg A, Ph 1	51	20-Jan-20	21-Apr-20
S01-1030	Construct SWM Ponds - Seg A, Ph 1	15	10-Feb-20	09-Mar-20
S01-1040	Construct Pavement - Seg A, Ph 1	43	23-Jun-20	09-Sep-20
S01-1050	Install Sign, Signal and Lightings - Seg A, Ph 1	25	21-Jul-20	03-Sep-20
Structure S3 (Sta 227+45) (ATC 4)		38	09-Jan-20	19-Mar-20
S01-1060	Site Work & Extend Exist CMP as Bypass- S3, Seg A, Ph 1	5	09-Jan-20	17-Jan-20
S01-1070	Construct Box Culvert - S3, Seg A, Ph 1	35	14-Jan-20	19-Mar-20
Structure S8 (Sta 250+00) (ATC 4)		62	10-Feb-20	04-Jun-20
S01-1080	Site Work & Extend Exist RCP as Bypass- S8, Seg A, Ph 1	5	10-Feb-20	18-Feb-20
S01-1090	Construct Box Culvert - S8, Seg A, Ph 1	59	17-Feb-20	04-Jun-20
Structure S1 (Sta. 255+00)		19	05-Jun-20	13-Jul-20
S01-1100	Site Work and Temp Extend 84" RCP - S1, Seg A, Ph 1	4	05-Jun-20	12-Jun-20
S01-1110	Construct Box Culvert - S1, Seg A, Ph 1	15	15-Jun-20	13-Jul-20
Phase 2		173	10-Sep-20	04-Aug-21
S02-1190	Site Work - MOT and Erosion Control - Seg A, Ph 2	5	10-Sep-20	16-Sep-20
S02-1220	Install Sign, Signal and Lightings - Seg A, Ph 2	162	21-Sep-20	26-Jul-21
S02-1210	Construct Roadway over Box Culverts - Seg A, Ph 2	108	03-Dec-20	28-Jun-21
S02-1230	Mill-and-Overlay Exist Pavement - Seg A, Ph 2	17	01-Jul-21	04-Aug-21
Structure S3 (Sta 227+45) (ATC 4)		42	21-Sep-20	02-Dec-20
S02-1240	Site Work - S3, Seg A, Ph 2	8	21-Sep-20	02-Oct-20
S02-1250	Construct Box Culvert - S3, Seg A, Ph 2	36	25-Sep-20	25-Nov-20
S02-1300	Abandon Exist CMP - S3, Seg A, Ph 2	3	30-Nov-20	02-Dec-20
Structure S8 (Sta 250+00) (ATC 4)		29	03-Dec-20	29-Jan-21
S02-1260	Site Work - S8, Seg A, Ph 2	3	03-Dec-20	07-Dec-20
S02-1270	Construct Box Culvert - S8, Seg A, Ph 2	21	08-Dec-20	22-Jan-21
S02-1310	Demo Exist RCP - S8, Seg A, Ph 2	5	25-Jan-21	29-Jan-21
Structure S1 (Sta. 255+00)		68	01-Feb-21	07-Jun-21
S02-1280	Site Work - S1, Seg A, Ph 2	3	01-Feb-21	03-Feb-21
S02-1290	Construct Box Culvert - S1, Seg A, Ph 2	16	04-Feb-21	04-Mar-21
S02-1320	Abandon Exist RCP - S1, Seg A, Ph 2	3	03-Jun-21	07-Jun-21
Phase 3 - 4		25	05-Aug-21	16-Sep-21
S03-1330	Complete Median Construction, Seg A, Ph 3	23	05-Aug-21	14-Sep-21
S03-1340	Final Paving & Complete Signal Work, Seg A, Ph 4	11	30-Aug-21	16-Sep-21
Bridge S4 - Triadelphia (ATC 27)		170	18-Oct-19	03-Sep-20
Stage 1		92	18-Oct-19	09-Apr-20
S01-1190	MOT and Site Work, Seg A, S4, Stg 1	5	18-Oct-19	28-Oct-19



Remaining Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work

MD-32 from Linden Church to I-70 (Fast Track Tridaphia Bridge) to Sta 467+50 | MD-32 Proposal Schedule Summary | 13-Sep-18 15:28

Activity ID	Activity Name	Original Duration	Start	Finish
S01-1240	Partial Demo Exist Bridge, Seg A, S4, Stg 1	8	29-Oct-19	08-Nov-19
S01-1200	Construct Foundations, Seg A, S4 Stg 1	29	11-Nov-19	06-Jan-20
S01-1210	Construct Substructure, Seg A, S4 Stg 1	17	23-Dec-19	22-Jan-20
S01-1220	Construct Superstructure, Seg A, S4 Stg 1	31	27-Jan-20	23-Mar-20
S01-1230	Connect Rdwy to Bridge, Seg A, S4 Stg 1	9	24-Mar-20	09-Apr-20
Stage 2		78	10-Apr-20	03-Sep-20
S02-1330	MOT and Site Work, Seg A, S4, Stg 2	5	10-Apr-20	17-Apr-20
S02-1340	Partial Demo Exist Bridge, Seg A, S4, Stg 2	3	14-Apr-20	17-Apr-20
S02-1350	Construct Foundations, Seg A, S4 ,Stg 2	24	20-Apr-20	03-Jun-20
S02-1360	Construct Substructure, Seg A, S4, Stg 2	18	19-May-20	23-Jun-20
S02-1370	Construct Superstructure, Seg A, S4, Stg 2	39	26-Jun-20	03-Sep-20
S02-1380	Connect Rdwy to Bridge, Seg A, S4, Stg 2	9	21-Aug-20	03-Sep-20
Segment C - Sta 345+00 to 380+00		112	24-Dec-19	22-Jul-20
Phase 1		88	24-Dec-19	05-Jun-20
S01-1250	Site Work - MOT, Erosion Control and Demo Exist Rdwy - Seg C, Ph	12	24-Dec-19	14-Jan-20
S01-1260	Earthwork and Drainage - Seg C, Ph 1	52	17-Jan-20	21-Apr-20
S01-1270	Construct SWM Ponds - Seg C, Ph 1	20	22-Jan-20	27-Feb-20
S01-1280	Construct Pavement and Temp Paving - Seg C, Ph 1	24	23-Apr-20	05-Jun-20
Phase 2		15	08-Jun-20	08-Jul-20
S02-1390	Site Work - MOT and Erosion Control - Seg C, Ph 2	0	08-Jun-20	08-Jun-20
S02-1400	Install Drainage - Seg C, Ph 2	3	12-Jun-20	16-Jun-20
S02-1420	Install Signs - Seg C, Ph 2	7	12-Jun-20	26-Jun-20
S02-1410	Mill-and-Overlay Exist Pavement and Guard Rail- Seg C, Ph 2	8	23-Jun-20	08-Jul-20
Phase 3 - 4		9	09-Jul-20	22-Jul-20
S03-1350	Complete Median Construction, Seg C, Ph 3	3	09-Jul-20	13-Jul-20
S03-1360	Final Paving, Seg C, Ph 3	6	14-Jul-20	22-Jul-20
Segment B - Sta 380+00 to 467+50 (ATC 10)		325	24-Dec-19	27-Aug-21
Phase 1		152	24-Dec-19	02-Oct-20
S01-1290	Site Work - MOT, Erosion Control and Clear & Grub - Seg B, Ph 1	35	24-Dec-19	27-Feb-20
S01-1300	Earthwork and Drainage - Seg B, Ph 1	55	17-Feb-20	29-May-20
S01-1320	Construct Pavement - Seg B, Ph 1	80	06-May-20	02-Oct-20
S01-1310	Construct SWM Ponds - Seg B, Ph 1	60	07-May-20	01-Sep-20
S01-1330	Install Sign, Signal and Lightings - Seg B, Ph 1	50	08-Jul-20	02-Oct-20
Structure S5		94	09-Jan-20	06-Jul-20
S01-1460	Site Work & Temp Stream By-Pass - S5, Seg B, Ph 1	3	09-Jan-20	13-Jan-20
S01-1470	Construct Box Culvert - S5, Seg B, Ph 1	86	14-Jan-20	26-Jun-20
S01-1480	Stream Relocation, Seg B, S5, Ph 1	86	14-Jan-20	26-Jun-20
S01-1490	Abandon Exist Box Culvert - S5, Seg B, Ph 1	5	29-Jun-20	06-Jul-20
Phase 2		122	05-Oct-20	24-May-21
S02-1430	Site Work - MOT and Erosion Control - Seg B, Ph 2	8	05-Oct-20	19-Oct-20
S02-1590	Demo Exist Rdwy & Temp Paving - Seg B, Ph 2	6	20-Oct-20	28-Oct-20
S02-1600	Earthwork and Drainage - Seg B, Ph 2	55	29-Oct-20	08-Feb-21
S02-1610	Construct SWM Ponds - Seg B, Ph 2	15	21-Dec-20	25-Jan-21
S02-1630	Construct Pavement - Seg B, Ph 2	50	11-Feb-21	17-May-21
S02-1640	Install Sign, Signal and Lightings - Seg B, Ph 2	38	12-Mar-21	24-May-21
Structure S5		68	05-Oct-20	05-Feb-21
S02-1650	Site Work & Temp Stream By-Pass - S5, Seg B, Ph 2	3	05-Oct-20	07-Oct-20
S02-1660	Construct Box Culvert - S5, Seg B, Ph 2	43	08-Oct-20	22-Dec-20
S02-1670	Stream Relocation, Seg B, S5, Ph 2	16	28-Dec-20	28-Jan-21
S02-1680	Abandon Exist Box Culvert - S5, Seg B, Ph 2	6	29-Jan-21	05-Feb-21
Phase 3 - 4		43	07-Jun-21	27-Aug-21
S03-1370	Complete Median Construction, Seg B, Ph 3	40	07-Jun-21	23-Aug-21
S03-1380	Final Paving & Complete Signal Work, Seg B, Ph 4	13	06-Aug-21	27-Aug-21



Remaining Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work

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LANE

B. Maintenance of Traffic Approach

As a major commuter and local access route, the Team understands the critical importance of minimizing inconvenience to the community and the traveling public.

To achieve the project's goals of impact minimization, safety and mobility, the design team will develop a comprehensive Transportation Management Plan (TMP). To develop this plan our Team will adhere to the following four-step process:

Data Collection

Critical to the success of the MOT plan is data collection. Elements of data collection include:

- **Traffic Data**: Existing year traffic volumes provided by MDOT SHA will be used along with applicable growth rates to develop Construction Design Year Traffic volumes to analyze all MOT phases to ensure there are no operational or safety issues. This data will be supplemented, as necessary, with additional counts to validate proposed operations.
- **Roadway Data**: Lane widths, shoulder widths and type, turn lane lengths, driveways, intersecting streets, clear zone grading, pavement/ shoulder condition, horizontal and vertical geometry
- **Project Site Data**: Document the locations of businesses, bus stops, local special events – parades, festivals, emergency services locations, pedestrian paths, pedestrian/bicycle trip generators, etc.

Testing and Selecting Alternatives

The Team will perform a Maintenance of Traffic Alternatives Analysis (MOTAA) to test various MOT strategies. The review will include calculating the level of service and queues during construction using MD QuickZone 2.0, LCAP or CORSIM. Other factors considered in the evaluation include safety, potential work zone speed reduction, impacts on transit/school buses, impacts on emergency services, constructability and construction vehicle access, environmental impacts, right-of-way impacts, access to properties, ability to maintain proper drainage, impacts to pedestrian and bicycle traffic and utility relocation issues.

Safety and measures that the Team intends to utilize are concrete barrier for worker and driver protection, temporary raised pavement markers, the maintenance of a continuous "no passing" zone within the project limits for 2-lane sections of roadway, the use of an Incident Management Plan (IMP), and the use of a Traffic Manager. We also understand the need to maintain access to all properties and cross streets, including large vehicle access to the Dayton Shop.

Transportation Management Plan Preparation

We will develop a TMP that focuses on safety for all parties as well as minimizing community impacts. Notably, the TMP must address additional traffic related to work vehicles as well as actual construction operations within the limits of the existing MD 32 roadway such as pipe and box culvert construction. To address the two key issues, the TMP includes a Safety Management Plan for construction vehicles, the MOT

traffic control plan sheets, a public outreach campaign, a safety management plan for the contractor and an Incident Management Plan (IMP). Specific strategies include:

- Providing access points with areas of adequate sight distance along MD 32
- Providing acceleration/deceleration lanes to/from construction access points where feasible
- High conspicuity materials and lights on construction vehicles
- Intense and repeated driver/operator training
- Temporary light plants to illuminate areas of construction activity/access
- Escorts for slowing traffic to facilitate entry
- Potential use of Hazard Identification Beacons (HIBs) for major construction access points.
- Wide pavement markings, where appropriate; and reduced channelizing device spacing

Traffic Control Plan

Our MOT strategy provides for detailed plans that will be prepared and will illustrate locations for all construction signing, tapers/ transitions, temporary pavement, portable variable message signs and messages, temporary markings, and RPM's. Construction notes will include time limitations for lane closures, special haul routes that must remain open and any other special local considerations. Traffic control and channelization device placement will be checked to ensure sight distance is not impacted.

As seen in the below sequence, we have established our MOT plan with **additional barrier protection to increase safety for our workers and the traveling public**. This barrier usage provides further minimization of inconvenience to the community and the traveling public by avoiding the need for lane closures for daily construction activities near the edge of the existing roadway. Although extensive lane closures with flagging operations are permitted in the RFP Temporary Lane or Shoulder Closure Schedule, we believe that the high traffic volumes along MD 32 have the possibility to exceed the capacity of a one-lane flagging operation at the tail ends of the allowable lane closure window. Therefore, to avoid the possibly of significant motorist delay, we developed a sequence that **minimizes the use of lane closures**.

In addition, given the lack of convenient parallel detour routes and roadways able to safely accommodate heavy traffic volumes, detouring of traffic from MD 32 would add significant travel time. Therefore, our **MOT design does not include any road closures that require detouring traffic off of MD 32 and onto the local roadway network**. As detailed below, our anticipated strategy will include four phases as follows:

MOT Phase 1: Narrow existing SB shoulder to 2', maintaining existing 12' lanes and existing NB shoulder (generally 10' wide). Install temporary concrete barrier. Clear and grub for utilities. Install smaller pipe crossings (typically less than 48" diameter) across proposed/ existing MD 32 using overnight flagging, trench boxes, backfilling and patching as necessary. Construct proposed MD 32 SB roadway, and construct temporary pavement and crossovers to be utilized in Phase 2.

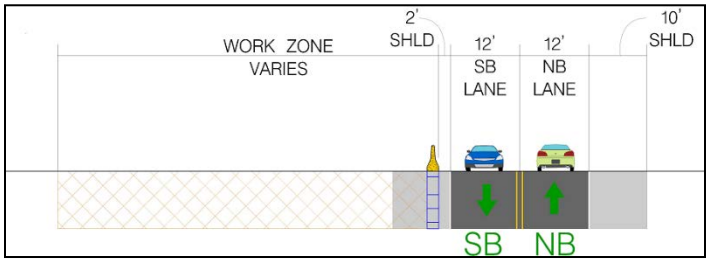


Figure 4.3.i. Phase 1

MOT Phase 2**:** Shift lanes onto the newly constructed SB roadway at temporary crossovers constructed in Phase 1. Install temporary concrete barrier. Temporary turn lanes will be maintained utilizing temporary pavement in the permanent median as necessary. Install large pipe and culvert crossings across existing MD 32. Complete rehabilitation and applicable reconstruction of existing MD 32 (permanent NB lanes).

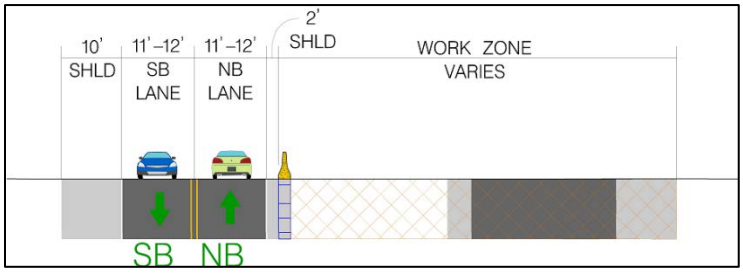


Figure 4.3.ii. Phase 2

MOT Phases 3 and 4: Phase 3: Split NB and SB traffic onto respective permanent alignments maintaining one 12' wide lane in each direction. Utilize excess pavement width for temporary turn lanes. Remove temporary crossovers utilized in Phase 2 and complete the permanent median. Phase 4: Install final surface course on NB and SB MD 32 while maintaining a single lane of traffic in each direction. Install final pavement markings.

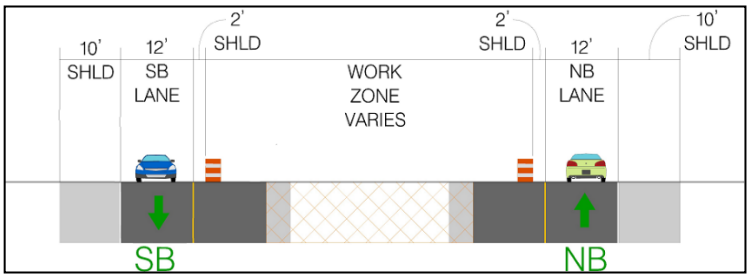


Figure 4.3.iii. Phases 3 and 4

Construction Phase Services

The safety and operations of the work zone will be constantly monitored and if safety or mobility deficiencies are identified, the design team will work with the contractor and stakeholders to quickly and efficiently address the situation. As detailed in the TMP section above, the Team commits to numerous strategies for minimizing impacts during construction. A major element in our construction Phase services will be the use of a Traffic Manager (TM), who will be on-site to supervise and continuously monitor the installation and maintenance of all traffic control devices and to monitor traffic operations. The TM will be responsible for identifying any safety or mobility issues that occur in the work zone. After each event, the TM will meet with the design team to determine how well the contingency plan worked and any modifications that would be required to address deficiencies identified in the plan. The TM will also work with the design team regarding any required changes to the traffic control plan based on field observations or stakeholder input of safety or mobility issues or unanticipated field conditions. Issues addressed by the TM will include:

- Inclement Weather: The TM will decide prior to all traffic restrictions whether there is the potential for a weather event which could cause a hazardous situation. During an event, operations will be suspended until it is determined safe for the work to continue. At no time will work procced when there is reduced visibility or other weather-related hazards. Also, snow removal will be considered in placement of temporary barrier to ensure there is adequate snow storage adjacent to the traveled way.
- Crash/Disabled Vehicle: If it is determined that the traffic restriction should be removed either for safety reasons or to relieve traffic queues, on-site personnel will remove the restriction and assist emergency personnel as directed to clear the incident as quickly as possible. Lane understands police will direct all activities at a crash scene.
- Lengthy Queues: If queues extend beyond the acceptable thresholds outlined in the RFP, on-site

personnel will remove the restriction – if deemed safe to do so – to clear the queue until such time that the TM determines the restriction may be restored. The TM will work with the design team to adjust the traffic control and eliminate the queues.

- Incident Management Plan: Lane will implement the IMP to address work zone incidents and return traffic to normal operations quickly and efficiently.

C. Triadelphia Road Bridge Construction

The Team has incorporated significant innovations into the replacement of the Triadelphia Road Bridge (S-4) to economize its construction and simplify its complexity. The benefits resulting from these innovations include minimized inconvenience to the public through a **decreased detour duration of 322 Days** and the **increased dualization of MD 32**. The innovations summarized here are available in full in this Proposal's Appendix, along with the complete Project CPM schedule:

- **ATC-27 Bridge S-4 (Triadelphia Road) single span bridge**. Our Team has developed a modified alignment for MD 32 which permits a shorter bridge span for S-4, resulting in the elimination of the center pier, minimized excavation, reduced girder splices and **reduced construction time.**

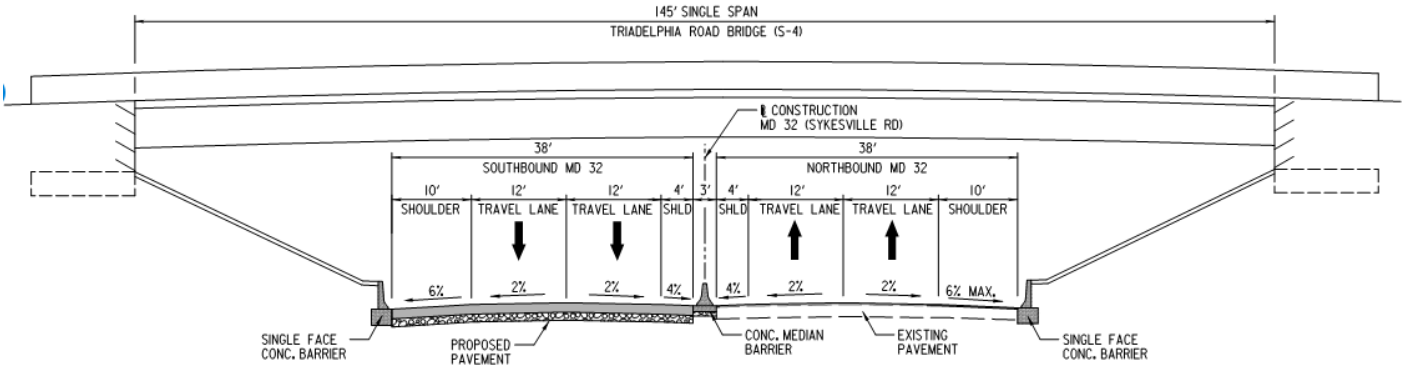


Figure 4.3.iv: ATC-27, Bridge S-4 Single Span Bridge

- **ATC-60 Alternative Typical Section of Bridge S-4**. The Team has incorporated practical design into the proposed S-4 Bridge typical section, and narrowed shoulders, bike lanes, and deleted one sidewalk to match the roadway approach sections.

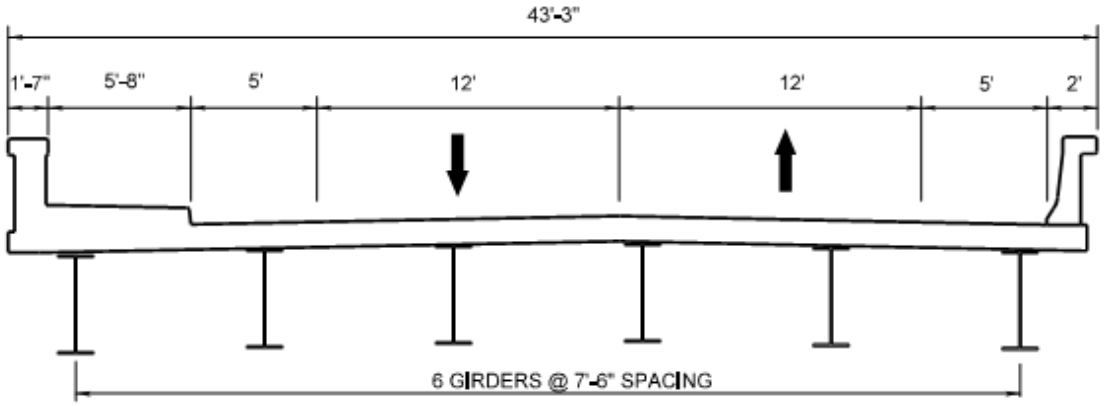


Figure 4.3.v: ATC-60, Alternative Typical Section

During the projects design development, our Team analyzed alternative MOT scenarios for the construction of S-4. Considerations included; temporary bridges, full detours with single stage reconstruction, and the rehabilitation of the existing structure in lieu of replacement. Analysis of these alternatives revealed the concept detour provided by the RFP was the best solution economically while providing the required mobility to the public and the necessary replacement of the structurally deficient structure. All full detours increased school bus travel times beyond permitted durations, and the cost of a temporary parallel bridge could not be justified over the needed dualization of MD 32. Hence, our Team will follow the concept phasing and detours provided in the RFP. As indicated in the following CPM Schedule excerpt, the detour duration for the reconstruction of the Triadelphia Bridge proposed by our DBT is from **October 18, 2019** to **September 3, 2020** for a total duration of **322 calendar days**.

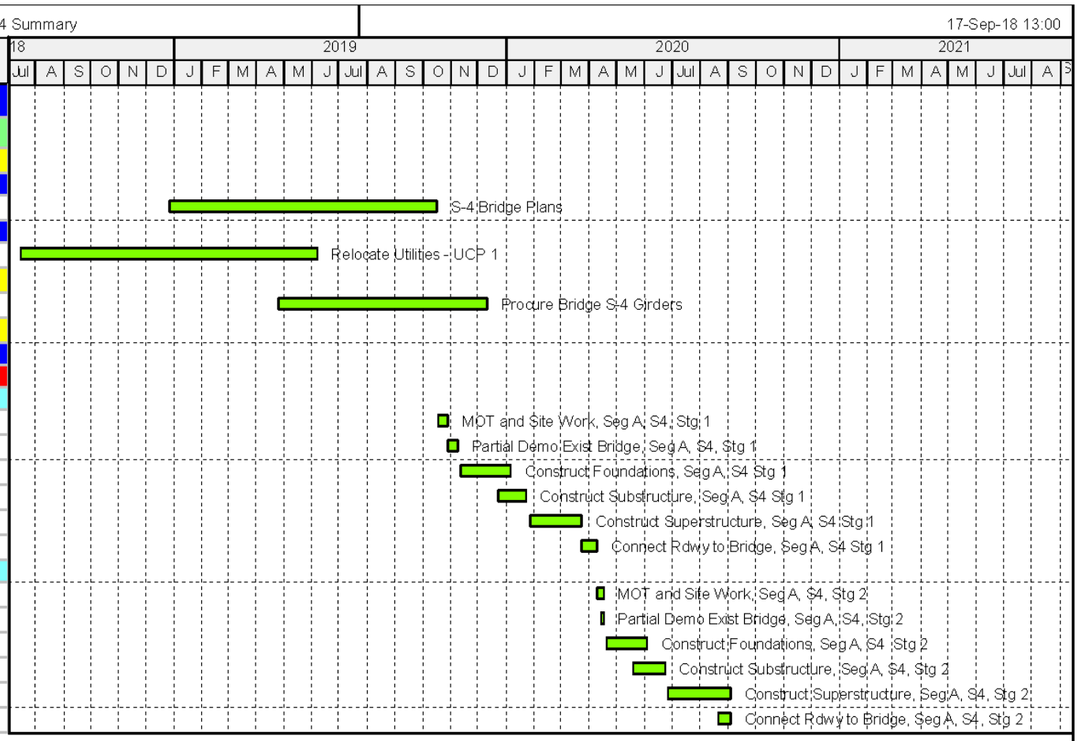
While generating our Project's CPM Schedule, it grew apparent that the timeline issued by PR Section 10.3.1 Maintenance of Traffic - General Requirements for the replacement of S-4 was challenging because of a later-than-optimal starting date. This section requires that that the Design-Builder is to "Maintain one WB lane on the Triadelphia Bridge at all times during construction and implement the detour from Summer 2019 to Summer 2020 impacting the 2019-2020 school year only." To accommodate the commitments made by the Administration, our Team has included multiple points of acceleration into our planned schedule. To achieve this rapid replacement, we will:

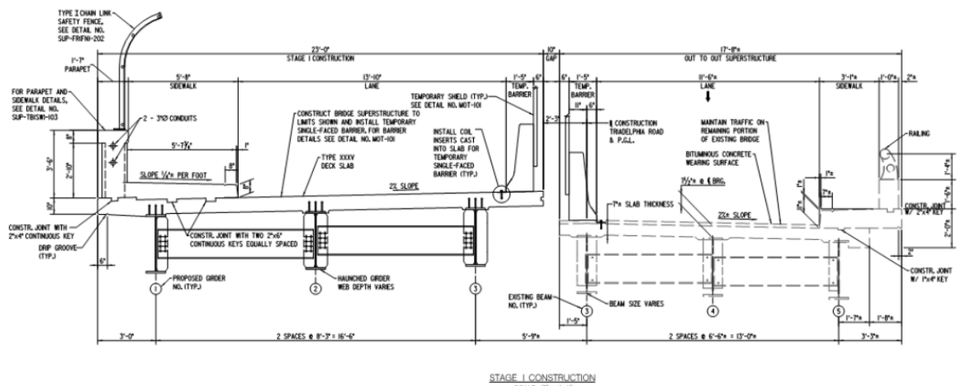
- Begin design development at notice of Initiate Shop Drawings for Structural Steel immediately after TSL approval
- Procure steel plate for girders prior to the completion of the bridge design
- Allow full design and shop drawing review periods for MDOT SHA by expediting design and procurement.
- Include the costs of winter concreting, including superstructure placement, in our pricing.

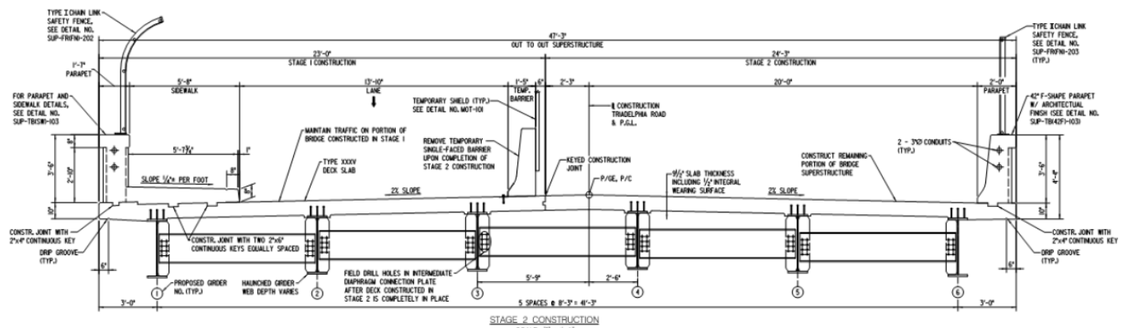
Through the incorporation of innovation into our DBT's project design and schedule, we complete the reconstruction of the Triadelphia Bridge detour in **148 Days fewer** than permitted by the RFP with no additional detours or closures, thereby providing the community and the traveling public with the least inconvenience and maximum safety, all while meeting all RFP requirements.

MD-32 from Linden Church to I-70 (Fast Track Tridaphia Bridge) to Sta 467+50 | Bridge S-4 Summary | 17-Sep-18 13:00

Activity ID	Activity Name	Original Duration	Start	Finish
MD-32 from Linden Church to I-70 (Fast Track Tridaphia Bridge) to Sta 4		444	16-Jul-18	03-Sep-20
Summary		444	16-Jul-18	03-Sep-20
Design		274	16-Jul-18	17-Oct-19
Structures		295	27-Dec-18	17-Oct-19
D00-5220	S-4 Bridge Plans	295	27-Dec-18	17-Oct-19
Utilities		230	16-Jul-18	07-Jun-19
D00-5570	Relocate Utilities - UCP 1	230	16-Jul-18	07-Jun-19
Procurement		231	25-Apr-19	11-Dec-19
S01-1120	Procure Bridge S-4 Girders	231	25-Apr-19	11-Dec-19
Construction		170	18-Oct-19	03-Sep-20
Segment A - Sta 220+00 to 345+00		170	18-Oct-19	03-Sep-20
Bridge S4 - Triadelphia (ATC 27)		170	18-Oct-19	03-Sep-20
Stage 1		92	18-Oct-19	09-Apr-20
S01-1190	MOT and Site Work, Seg A, S4, Stg 1	5	18-Oct-19	28-Oct-19
S01-1240	Partial Demo Exist Bridge, Seg A, S4, Stg 1	8	29-Oct-19	08-Nov-19
S01-1200	Construct Foundations, Seg A, S4 Stg 1	29	11-Nov-19	06-Jan-20
S01-1210	Construct Substructure, Seg A, S4 Stg 1	17	23-Dec-19	22-Jan-20
S01-1220	Construct Superstructure, Seg A, S4 Stg 1	31	27-Jan-20	23-Mar-20
S01-1230	Connect Rdwy to Bridge, Seg A, S4 Stg 1	9	24-Mar-20	09-Apr-20
Stage 2		78	10-Apr-20	03-Sep-20
S02-1330	MOT and Site Work, Seg A, S4, Stg 2	5	10-Apr-20	17-Apr-20
S02-1340	Partial Demo Exist Bridge, Seg A, S4, Stg 2	3	14-Apr-20	17-Apr-20
S02-1350	Construct Foundations, Seg A, S4 ,Stg 2	24	20-Apr-20	03-Jun-20
S02-1360	Construct Substructure, Seg A, S4, Stg 2	18	19-May-20	23-Jun-20
S02-1370	Construct Superstructure, Seg A, S4, Stg 2	39	26-Jun-20	03-Sep-20
S02-1380	Connect Rdwy to Bridge, Seg A, S4, Stg 2	9	21-Aug-20	03-Sep-20







Remaining Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work

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4.4 WELL MANAGED PROJECT

4.4 Well Managed Project

A. Approach to Coordinating Design & Construction with Utility Relocations

One of the most critical elements of a design-build project is the effective and efficient integration of the utility process into each project discipline. Knowing how much of an impact utilities can have on the Project Schedule, our Team has expended considerable effort to coordinate with all utility owners regardless of whether modifications are designed and/or constructed by the Design-Builder or by others. We carefully studied the RFP Conceptual Plans, reviewed the utilities in the field, discussed the Project extensively with each utility company, researched available records, and developed our Conceptual Plan and Proposal Schedule accordingly. This information has directly influenced our Team's concept, proposed phasing and sequence of work. As a result of these efforts, we have reduced the number of conflicts with the Project and avoided numerous utility conflicts that reduces the risk of schedule delays.

Approach To Utility Coordination

For this Project, our Team will be following the MDOT SHA's Utility Procedures Manual. As discussed above, we have already begun activities to ensure the success of the utility relocation process, and below is a general outline of the steps and activities we will perform once the Project is underway:

- Obtain additional utility designations and test pits.
- Identify locations of existing easements.
- Incorporate existing and proposed utilities in 3D model to identify/verify impacts and have other design disciplines review for potential conflicts.
- Develop plans for avoidance of utilities or minimize utility relocations.
- Coordinate with and review plans with utility companies.
- Hold a utility coordination meeting shortly after notification as the successful proposer.
- Hold reoccurring meetings with utility owners to coordinate relocation plans.
- Establish utility relocation schedule.
- Incorporate approved utility plans into the construction schedule.
- Identify any utility relocation activities on the critical path.
- Evaluate resources needed to accomplish critical relocations.
- Proceed with utility relocations.
- Take immediate action on unforeseen utility conflicts.
- Maintain partnering approach to achieve quick actions on unforeseen conditions and other issues if they arise in the field.

The Team has been successfully managing utilities on multiple design-build projects for MDOT SHA and other owners for over 10 years. The key to our success is having the experienced in-house resources, with intimate knowledge of governing bodies' policies and procedures, and positive relationships with each utility owner. Our Utility team is fully engaged in the design process coordinating with assisting permitting, construction, and scheduling of all other project disciplines. While coordinating with other project disciplines, our first and highest priority throughout the design and construction phases of the Project will be to completely avoid utility impacts. If conflicts cannot be avoided by design, then we will work diligently with each utility Owner to minimize these relocations through a combination of design and/or protection measures that allow the utilities to remain in place. Only as a last resort will we relocate utilities to eliminate conflicts with new construction. During construction, our Utility team remains fully engaged to coordinate relocations between the utility companies and the construction team, ensuring their timely and successful completion.

Specific Utility Impacts

At this stage our Team has reviewed the utility matrix in the RFP documents and identified multiple conflicts within the proposed corridor of work. Listed below is a summary of the utilities identified in the RFP utility matrix along with newly identified conflicts within the limits of the proposed dualization, their potential conflicts, and our Team's solution for accommodating them:

Utility Description	Utility ID #	Potential Conflict	Team's Approach
Power			
BGE Electric	18a	Conflict with proposed SWM	**Optimize design to remove impact.**
SHA Electric	26	Intersection lighting in conflict with proposed widening	Reevaluate potential relocation with ATC-12 Rev 1 changes.
BGE Electric	28	Conflict with proposed widening	Reevaluate potential relocation with ATC-12 Rev 1 changes.
BGE Electric	35	Conflict with proposed SWM	**Optimize proposed SWM facility to remove conflict.**
Communication			
Howard County Underground Fiber	8	Conflicts with guardrail and SWM	Lift and lay to avoid splicing. **Optimize design to reduce impact.**
Howard County Underground Fiber	13	Conflict with proposed bridge	Relocate outside of proposed bridge limits.
Comcast	20	Conflict with proposed SWM	**Optimize proposed SWM facility to remove conflict.**
Howard County Underground Fiber	22	Conflict with roadway	Reevaluate potential relocation limits with ATC-12 Rev 1 changes.
Comcast	23	Conflict with roadway	Reevaluate potential relocation with ATC-12 Rev 1 changes.
Verizon	25	Conflict with roadway	Reevaluate potential relocation with ATC-12 Rev 1 changes.
Verizon	27	Conflict with roadway	Reevaluate potential relocation with ATC-12 Rev 1 changes.
Gas			
BGE Gas	12	Conflict with proposed bridge	Reevaluate relocation with ATC-27 and ATC-60 changes.

Mitigation Strategies

Our Team developed a design concept that avoided or reduced several utility impacts along east shoulder of existing NB MD 32 by maintaining the existing crown point of MD 32. By keeping the existing crown point, impacts to existing utilities along the east side of MD 32 reduced. Utilizing of the existing crown point **reduces the runoff** to the east side of the road by a half results allows for decreasing the width of the drainage ditch and the number of SWM facilities to that side of the existing roadway.

The potential optimizing of the SWM design from grass swales to enhanced grass swales provides a 12-foot reduction in swale width reducing the limits of cut/fill slopes further reducing the relocations are needed.

The adoption of ATC-12 Rev 1 moves NB MD 32 back on the existing MD 32 alignment from Sta. 405+00 to Sta. 455+00. This shift eliminates the need to relocate portions of the Howard County fiber optic cable currently proposed in the RFP concept.

Avoiding these impacts reduces the cost of providing access to relocated facilities, schedule impacts, and the risk of any possible delays. A table listing our ATCs and their benefits is provided in Section 4.2.A and in the Appendix of this proposal.

Verifying Utilities and Coordination During Design

Discovering utilities during design or construction that are not shown in the RFP can delay the Project schedule and add cost. Our Team has proactively met with each utility owner, reviewed as-built records, and the facilities in the field to reduce this risk. As we move through the design phase, we will confirm the presence of utilities by completing detailed records research, supplementary field designations, and test pitting. This information will be integrated with the design to address any conflicts that arise. Monthly Utility Coordination meetings will be held throughout design development until all identified conflicts are resolved through avoidance or relocation. These meetings will include updating utilities on design progress, project schedule coordination for planned relocations, and conversely provide the design team with updates from the utility companies. These efforts will result in utility avoidance and minimization through design, or a utility relocation plan in accordance with the project's schedule The Team will also develop a project specific "Utility Strike Prevention Plan" that outlines the procedures to be followed during construction to establish clear lines of communication and authority, train workers about safety policies when working around utilities, describe plans for utility strike avoidance, and address steps to be taken should strikes occur. This plan will be incorporated into Lane's Emergency Action Plan, mandated on all projects.

Verifying Utilities and Coordination During Construction

Once construction begins, field markings by Miss Utility will be compared to known utilities identified in the design phase and included on the plans. Additional investigations will be completed as necessary to resolve any discrepancies. Lane will perform a field verification of all located utilities and compare the locate to the utility plans. Any additional or unmarked utilities will be identified immediately and investigated. As further reassurance, prior to beginning any field activities, Lane procedures require the development of a work plan for the crews performing each activity. The work plan identifies all hazards anticipated throughout the stages of the operation. The plan identifies safety, environmental, and utility hazards along with other hazards that may be present within the work area. Specific guides are provided in the work plan identifying notification, Miss U ticket validation and test pitting as necessary. As required before excavating near any utility, crews will perform test pitting in their work area to verify that there are no unforeseen conflicts with the proposed work. If, during construction, an unforeseen utility is encountered, the crew will immediately cease work, notify the Utility Manager, Construction Manager and Project Manager, and stabilize the work area. The Utility Manager will attempt to determine the owner of the facility and contact their field representative to investigate whether the utility is still active or abandoned. Concurrently, after an initial assessment is made, the Construction Manager will make a determination about moving the crew to a different location/activity, or crews may remain to assist the utility in performing the relocation or providing support. Once the parties have determined what efforts are required to address the unforeseen utility, the Team will update the Project CPM and evaluate for delays. If delays are expected, there are several steps that can be taken to mitigate these delays. Lane's MD 5 at Brandywine Interchange Project (PG1755170) is an excellent example of Lane's operational flexibility. This Contract has experienced miss-information from five separate utilities and in all cases, Lane's project team has modified MOT and E&S sequences to adapt to the

unforeseen conditions and contributed to the project redesign to expedite solutions.

Schedule Management and Mitigation of Utility Delays

As we prepared this Technical Proposal, our Team coordinated extensively with each design discipline to develop schedule and sequence of work for each utility relocation. This advanced schedule coordination has been developed through discussions with each utility owner, the relocation timelines provided by MDOT SHA and historical data developed from our experience with each owner on numerous design-build projects.

The progress of the schedule will be continually updated by our Utility Coordinator and Construction Manager during design both construction phases of the project. This regular monitoring and reporting to utility stakeholders regularly will identify delayed or early completion of utility relocations. With this information, our Team can revise the detailed schedule in order to avoid any delays due to utility relocations. As noted previously, this schedule management is currently providing MDOT SHA the greatest possible benefit at our MD 5 project.

B. Avoidance and Minimization of Environmental Resources

The Team understands that avoiding and minimizing impacts to forests, wetlands, waters of the United States (WUS), and other regulated resources is not just good for the environment, it's good business. Adopting a philosophy of avoidance and minimization is also a hallmark of a well-managed project. While often done under the pretext of protecting natural resources, adopting a culture of avoidance and minimization can also lead to reductions in costs, compensatory mitigation requirements, construction time, and inconvenience to the travelling public. To this end, we have engaged in strategic partnerships to make sure our Team includes firms that are renowned for their commitment to common sense environmental compliance. Our Environmental Compliance Team (ECT) includes highly qualified scientists and engineers organized around clear, mission-driven goals. Our Environmental Compliance Plan (ECP) empowers the ECT to work with design engineers and construction personnel throughout the duration of the project and ensure that other priorities and commitments are evaluated with our environmental commitments, avoiding impacts wherever possible. Where impacts cannot be avoided, the ECT and design teams will jointly develop strategies to minimize impacts. The ECT and design teams will provide continuity during construction by working with the construction crews to ensure that the project is built to comply with regulatory authorizations and preserve the natural environment.

During this project proposal phase, the Team has already developed a variety of Alternative Technical Concepts (ATCs) that have the resulted in significant reductions to wetlands, waters of the US (WUS), and forests (see Figure 4.4.i). To date, the Team has developed a concept design with a limit of disturbance (**LOD**) **41.2% smaller** than that of the RFP concept. Reductions in the LOD and associated impacts to regulated resources during the Design phase will lead to shorter amounts of time required to obtain permits and authorizations, thus construction can start more quickly.

MD 32 from Linden Church to I-70 (Phase II)
Avoidance and Minimization Summary Table - September 2018

Avoidance and Minimization	Wetland						Wetland Buffer		WUS				Forests	TMDL Forests	Total Forest	Specimen Trees	LOD
	sf						sf		sf		lf		sf			Count	ac
	Temp			Perm			Temp	Perm	Temp	Perm	Temp	Perm					
	PEM	PSS	PFO	PEM	PSS	PFO											
NEPA LOD (Lane Project Limits)	27,984	1,430	1,779	23,653	2,326	17,745	55,457	130,512	32,759	66,466	2,900	7,152	3,352,188	435,346	3,787,534	233	205.2
Design LOD (Lane Project Limits)	18,074	-	890	23,178	2,326	17,745	28,346	125,356	6,372	56,332	760	6,213	2,404,029	191,763	2,595,792	165	120.7
Difference, sf	9,910	1,430	889	476	-	-	27,111	5,156	26,387	10,134	2,140	939	948,159	243,584	1,191,743	68	
Difference, ac	0.23	0.03	0.02	0.01	-	-	0.62	0.12	0.61	0.23			21.77	5.59	27.36		84.57
Percent Reduction	35.4%	100.0%	50.0%	2.0%	0.0%	0.0%	48.9%	4.0%	80.5%	15.2%	73.8%	13.1%	28.3%	56.0%	31.5%	29.2%	41.2%

Figure 4.4.i: Avoidance & Minimization Summary Table

The Team's culture of Avoidance and Minimization will continue through each project phase. During the Preliminary Design Phase our ECT will review all environmental documentation to become intimately familiar with all aspects of the project, develop a compliance checklist and plan for subsequent project phases. Mapped resources will also be verified in the field to ensure that all environmental resources have been accurately conveyed from the documents to the project constraints mapping and confirm the impact status of the resource. The mapping will highlight resources of concern for regulatory agencies and facility design with avoidance and minimization in mind.

Environmental personnel will be deployed throughout the design phase to perform pre-, interim, and final design coordination to ensure environmental commitments, environmental performance specifications, special provisions, and standard provisions are being implemented in a streamlined approach. We will evaluate avoidance and minimization opportunities to wetlands and waterways as to their feasibility and effectiveness of using measures such as retaining walls, steeper fill slopes, increased headwall heights, reduced roadway sections and any other feasible minimization efforts. To assist in the review process and to ensure environmental, constructability, schedule compliance, various members of the ECT will have received SHA Plan Review Division (PRD) and Highway Hydraulics Division (HHD) training for Stormwater Management/Erosion & Sediment Control (SWM/ESC) and completed the "Designers Erosion and Sediment Control Training". We also have Certified MDE Reviewers as part of the design team. This knowledge and experience allow us to develop design plans that satisfy the commitments and permit requirements in order to streamline the permitting process. Throughout design and construction, the ECT will attend weekly Task Force Meetings, such as Roadway, Utility, and Drainage to provide recommendations for avoidance and minimization of impacts to natural, cultural, and socio-economic resources. Actions items will be developed from the Task Force Meetings with prioritization and deadlines to resolve issues.

The ECT will prepare mapping, resource delineation, avoidance and minimization documentation, and proposed design drawings for the SHA EPD's submittal for acceptance and regulatory agency approval. Design compliance reviews will be performed by the ECT, approved by the Environmental Manager (EM), and submitted with the design submittal. The ECT will coordinate with SHA EPD to resolve Non-conformance Findings and will meet with the SHA EPD as needed to resolve issues, provide information, and assist in coordination with regulatory and/or environmental agencies and Public Outreach efforts. If during the final design or construction, a proposed LOD exceeds the NEPA documented LOD, we will exhaust all avoidance opportunities to not impact areas outside the permitted LOD. If additional impacts are unavoidable, then we will coordinate with the SHA EPD to obtain FHWA's NEPA post-ROD refinement approval of the change; to provide an environmental re-evaluation that includes documentation of avoidance and minimization efforts, environmental assessment, mapping, changes in impacts to natural, cultural or socio-economic impacts and proposed remediation to compensate for any additional losses.

During construction, the ECT will coordinate with survey crews to demarcate and label with appropriate flagging rights-of-way, wetlands and buffers, Limits of Disturbance (LOD), 100-year floodplains, significant trees, protective habits, and cultural resources. Once construction stakeout has been completed, members of the ECT will review the stakeout for accuracy and provide recommendations to the Construction Manager (CM) for additional avoidance and minimization opportunities, if they exist. During construction, ECT members will be assigned to the project to monitor daily environmental compliance. The following outlines the typical ECT's responsibilities to assist with the daily construction operations to maintain the schedule:

- Monitor and document compliance and provide technical environmental assistance and proactive recommendations improvements.

- Implement a pre-activity meeting for specific activities such as maintenance of stream flow and de-watering, and document construction challenges, compliance constraints, and recommendations.
- Perform joint field inspections with Erosion & Sediment Control Manager, SHA Inspection Staff, Independent Environmental Monitor, SHA, and if available, SHA E&S QA Inspector, MDE Compliance Inspector, and USACE representative.
- Assist the Erosion and Sediment Control Manager in preparing OOC 062 Forms to modify the approved plan in order facilitate construction operations when unforeseen issues arise. If major E&S plan modifications are required, the EM will coordinate modifications and submit to SHA PRD, SHA EPD, MDE, and USACOE for approval.
- Perform water quality monitoring for dewatering activities associated with construction and provide recommendations for treatment to the construction staff should water quality parameters be exceeded.

Once construction has been completed, the ECT will inspect temporary wetland and waters of the US impact restoration to assure impacted areas have been restored satisfactorily. The ECT will finalize environmental impact tables and submit for review and approval to SHA EPD, MDE, and USACOE to obtain the final permit modification for impacts. Forest Impact Plates and Reforestation Plans will be submitted to SHA EPD and MD DNR for final approval. The ECT will monitor the removal of remnant E&S control measures and temporary sediment trap removal and site restorations; and will monitor reforestation planting and stream restoration that may have been constructed.

C. Customer Outreach Plan

The Team will establish and maintain open lines of communication with residents, farmers, tenants, and businesses in the immediate area of the work site. Our Team will partner with SHA to provide timely information, support and assistance with community participation, and interaction activities during the development of the design and throughout construction of the Project. Construction inconveniences will be minimized and ongoing information will be provided to the traveling public about travel impacts.

A key element of the public outreach program is the preparation and distribution of project information to the public. Our Team will share the responsibility for the Public Outreach program by:

1. Committing to significant assistance for community participation and interaction activities;
2. Providing a Public Outreach Manager;
3. Participating in meetings with individual land owners, local officials, and community groups and public meetings;
4. Providing a good faith effort in addressing public inquiries and comments;
5. Facilitating notifications to the public and surrounding community;
6. Maintaining a consistent system for documenting all contact with stakeholders; and
7. Assisting with public forums.

Our outreach is designed to be flexible and responsive to the changing needs and conditions of the project.

Roles and Responsibilities

MDOT SHA will be the lead on public outreach activities with active support provided by our Team, to include necessary project information/materials and adequate staff support/representation. Unless otherwise directed, our Team members will not act as spokesman for the Project. If requested by MDOT SHA, the Public Outreach Manager, supported by the Design-Build Project Manager, will serve as spokesperson for the Project for technical and safety issues with certain audiences. Our Team will:

- Research, write and draft news releases, fact sheets, traffic alerts, briefing memos, web content, social media content, newsletters, brochures and other collateral materials that will be submitted to SHA for approval and use;
- Provide clips of media coverage for inclusion in MDOT SHA's daily report;
- Distribute construction and project timelines updates through applicable channels with SHA oversight;
- Draft responses to correspondence and other inquiries;
- Assist with website content management;
- Facilitate and coordinate photography;
- Coordinate and participate in community and stakeholder events;
- Implement and coordinate stakeholder/public meetings;
- Develop and manage distributions for collateral materials; and,
- Research inquiries from the public and develop responses for SHA distribution.

Key Stakeholder Outreach

The Team will maintain a database of individuals and groups impacted by the project. The database will include contact information such as phone, address and e-mail information. This database will form the foundation for the documentation of all contacts with business owners, residents, media and property owners throughout design and construction.

Key stakeholders include: Adjacent property owners and tenants within the roadway corridor; businesses including Town and Country Auto Repair, High's, Royal Farms, Nixon's Farm, etc.; local government and elected officials in Howard County; media representatives for Project updates and traffic impacts/lane closures; public service providers (schools, EMS, Police, Fire, USPS); commuters

Early during the design phase, our Team will meet with the stakeholders to share designs and associated impacts in order to collect comments and concerns. We will make a good faith effort to address any concerns the public may have, and take under consideration any suggestions or wishes they express if those suggestions are reasonable in regard to cost, time, and construction effort. Our Team will maintain a log of all public comments/ questions and include the person's address, phone number and/or e-mail. This database will be continually updated and maintained and used as a resource for the Team when communicating with stakeholders, with updates provided to the District Communications Liaison. Our Team will coordinate with the postmaster to maintain mail delivery/mail box access throughout construction. If changes are made in the location or method of delivery of mail, we will contact the business or resident(s) and inform them of the change. The Team will also meet with local trash companies, prior to and during construction, to determine if there will be any ongoing impacts at trash pick-up locations. If there are impact, we will assist the trash companies in notifying their customers.

Coordination with Emergency Responders: Advanced and consistent coordination with local first responders and emergency service providers is a priority to our Team. During the design phase, our Team will meet with fire, police, and rescue representatives to coordinate construction activities and discuss impacts. These meetings provide an opportunity to first responders to offer valuable input on construction plans. In case of an emergency in the project area during construction, we will implement an Emergency Services Response Tree which include first responders, and MDOT SHA and our Team construction and outreach managers.

Coordination with Schools: Coordination with Howard County schools, especially Dayton Oaks Elementary School, Folly Quarter Middle School and Triadelphia Ridge Elementary School, will be an important step during the design phase of the Project. As with the first responders, early coordination

prior to construction is important to understand the needs of the school systems, bus routes and student movement through the corridor.

Communicating with stakeholders: Our Team will make use of communication opportunities and venues to keep the roadway users, adjacent property owners, and greater community informed on the progress and potential project impacts. Communication will be done in complete coordination with the MDOT SHA to ensure a consistent message. The Public Outreach Manager will assist with developing communication for public dissemination. A variety of outreach tools will be used to keep the public fully informed on how the project may affect them, including the following:

- Press releases to local newspapers, radio, TV
- Informational website (hosted by SHA)
- Social media – Facebook, Twitter
- Project information mailers/email blasts
- Stakeholder meetings
- Local 'bulletin board' notices
- Variable Message Signs
- Develop graphics/content for SHA website
- Hosting community input meetings
- Fixed signage

Modes of Communication: Fully coordinated with MDOT SHA, our Team will implement the following tools to ensure transparent, two-way communications with major Project stakeholders:

- ***Stakeholder meetings*** – Multiple stakeholder meetings will be held through design, pre-construction and construction to discuss access issues, project schedule and progress, lane closures, and other construction impacts. These meetings will include one-on-ones with businesses and property owners, such as farmers, to address access challenges; public meetings prior to construction activities, and presentations to local neighbor/stakeholder groups.
- ***Web page*** – Our Team will provide timely and comprehensive content for the MDOT SHA Project website regarding project schedule, construction impacts and project progress. The Project hotline and email address will be provided here.
- ***Media*** – Our Team will provide timely content to the MDOT SHA Communications Team for response to inquiries and to support media outreach activities.
- ***Public notifications*** – News releases, fact sheets, traffic alerts, construction updates, utility shutdowns/shutoffs, and project timelines will be provided to SHA for stakeholder distribution.
- ***Collateral*** – Fliers, postcards, door hangers, etc. may be created, in compliance with MDOT SHA, to support the public outreach efforts.
- ***E-mail updates*** – A stakeholder database will be established by our Team. Regular Project updates will be e-mailed to this stakeholder list outlining the Project status and upcoming activities. A project-specific email address will be publicized for public inquiries.
- ***Project hotline*** – Our Team will establish a project hotline telephone number for the public to relay questions and concerns. We will maintain a log of calls made to the number including date, time, name of caller, reason for call, caller's address, phone number, and e-mail. The logs will be provided to MDOT SHA.

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