**DESCRIPTION OF ITEMS**

**PRODUCTION-HOUR WORKSHEET**

(Revised 9/27/22)

# SURVEY

## RECONNAISSANCE

### 1 Control (existing)

A field and record search for any existing control that may be utilized, including controls established for aerial photogrammetry. Sources of any existing control shall be identified.

### 2 Utilities (data gathering, identification, & contact)

Identify all utility companies within the project corridor and maintain a current contact list of those utility companies and their representatives. Contact utility companies, Kentucky 811, KYTC District Utilities Staff and any other sources for utility facility mapping or other information concerning the location of any utilities. Collect all available GIS data pertaining to utility locations.

### 3 Drainage (sink holes, streams, pipes, etc.)

Identify drainage features within the survey limits.

## CONTROL

### 4 Horizontal

Establish any new or additional horizontal coordinate control including the monumentation.  All control information, including pre-established, shall be documented in a survey report and submitted to the KYTC Project Manager and KYTC Survey Coordinator.

### 5 Vertical

Establish any new or additional vertical control including the monumentation.  All control information, including pre-established, shall be documented in a survey report and submitted to the KYTC Project Manager and KYTC Survey Coordinator.

### 6 Process data

Process data obtained from field survey and check for accuracy and closure.   Prepare a survey report containing all new Horizontal and Vertical control.

## UTILITY SURVEY

### 7 Subsurface Utility Engineering, Quality Level C & D

Utilize reconnaissance utility data to depict utility facilities on plans. Locate all visible utility facility features (e.g., poles, valves, manholes, markers, etc.) and depict them on the plans. Utilize both the reconnaissance data and field located data to depict the approximate location of the utility facilities within the project corridor.

### 8 Subsurface Utility Engineering, Quality Level B

Identify locations where the road project may conflict with the existing utility facilities and a more precise location of the utility is needed. Quality Level B location is recommended if precision is needed to validate the conflict, confirm the facility may remain in situ, or design to avoidance. Quality Level B locations shall be non-excavation field procedures using geophysical technologies and shall provide a more precise location of the facility without providing elevations. The consultant shall depict the Quality Level B location on the plans.

### 9 Subsurface Utility Engineering, Quality Level A

Identify locations where the exact location of the utility is needed. Quality Level A locations is recommended when a precise elevation is needed to validate the conflict, confirm the facility may remain in situ, or design to avoidance. For those locations, validate the Quality Level B location, confirm facility type, size, and provide elevations via vacuum excavation or other valid means. The consultant shall communicate with the utility owner, providing the owner the option to be present during the facility location. The consultant shall depict the Quality Level A locations on the plans.

### 10 Process data

Process all data to produce a planimetric map and submit electronic files to the designer. A 3D model of all existing utility facilities using best known elevation data should be submitted to the designer and KYTC Project Manager.

## TERRAIN SURVEY

### 11 Prepare Statewide LiDAR

Download, clean up, trim, and adjust statewide LiDAR necessary for the project.

### 12 Determine Roadway Elevations (Crown and EP)

When the terrain model is developed from aerial photogrammetry and accurate pavement elevations are required, the surveyor shall locate and depict the crown lines, edge of pavement lines, shoulder lines and other similar longitudinal features to provide a more detailed terrain model suitable for overlay and widening design. These features shall be depicted on the plans, replacing photogrammetry drawn features as needed.

### 13 Static LiDAR

Static LiDAR is any system that is ground based. It is typically set up at a stationary location and gives a more detailed/in-depth look at objects that are on the ground.

### 14 Mobile LiDAR

Mobile LiDAR is typically a unit mounted on a vehicle of some kind that has several different cameras and sensors. It has GPS integrated with the system itself. This is a great option for a corridor that may be several miles in length.

### 15 Planimetric Pickup

Locate and/or identify all necessary planimetric features. This should require only identification of planimetric features, such as ditch lines, buildings, tree lines, ponds, and any other item necessary in plan view, in areas where statewide LiDAR is used.

### 16 Verify terrain model accuracy

Check for accuracy of LiDAR, breaklines, random points, contours, etc., including terrain model. Rectify any errors to ensure tolerances meet KYTC Standards.

*Note: The density of points taken in the field to check the terrain will be determined at the Predesign Conference.*

### 17 Tie-ins

Field verification of all field data necessary for tying of project to existing features, pavements, etc. Include all road approaches not included in items 12-14. Entrances are not generally required and will only be required if specifically directed by the KYTC Project Manager.

*Note: Do not include when LiDAR or GPS is to pick up tie-in point.*

### 18 Drainage situation survey (Bridge)

Obtain all necessary field data to represent situation survey for bridges, including stream profile and necessary terrain data to merge into the existing terrain model.

### 19 Drainage situation survey (Culvert)

Obtain all necessary field data to represent situation survey for culverts.

### 20 Drainage pipe section (non-situation size)

Obtain all necessary field data to define the accuracy of the existing flowlines and inlet and outlet location and elevations of cross drains.

*Note: Does not include entrance pipes.*

### 21 Flood plain data

Collect field data necessary for flood plain analysis.

### 22 Railroad Surveys

Obtain all necessary terrain data to represent railroad survey (top of rail, ballast, ditches, fills, cuts, RR milepost, etc.).

### 23 Additional necessary Terrain data

Collect other necessary data to produce an accurate digital terrain model (obscured areas, field checked areas, areas needing greater accuracy, etc.).

### 24 Process data

Process all pertinent data necessary to generate a single terrain model. Submit the terrain model to the designer and the KYTC Project Manager.

### 25 Prepare existing manuscripts

Depict locations of all existing facilities. Manipulation/addition of text and notes identifying topography, planimetrics, and drainage structures. Submit the manuscript to the designer and the KYTC Project Manager.

## ESTABLISH PROPERTY LINES & OWNERSHIP

### 26 Develop Contact Letter

Develop Contact Letter **prior** to any field work is performed. The contact letter shall include the name of a person from the consultant that may be contacted in case of problems and the KYTC Project Manager.

*Note: The project manager shall decide if the letter will be sent to property owners or carried with field personal.*

### 27 Contact & Interview Property Owners

Contact property owners requesting permission for access and discuss general scope of project, locations of property lines, septic system, drainage, and any other pertinent information. A report is to be generated with a copy of the contact letter and all completed contact information forms from property owners, upon request.

### 28 Field tie property lines/corners

Locate all monuments (rebars, pins, etc.) and other evidence of property lines (fences, tree lines, drains, etc.) and depict these on the plans.

## STAKING

### 29 Stake centerlines, approaches, detours

Accurately stake centerline at intervals determined at the Predesign Conference and process data.

### 30 Stake core holes - structures

Stake and/or locate all geotechnical borings required for structural design and process data.

*NOTE: The unit is per individual structure, NOT per hole.*

### 31 Stake core holes - roadway

Stake and/or locate all geotechnical borings required for geotechnical soil/rock analysis and process data.

*NOTE: The unit is per individual core hole.*

## SURVEY MISCELLANEOUS

### 32 Septic Tanks

Establish use of septic tank and coordinate with the property owner and health department to best establish the tank location and any lateral lines on the property.

### 33 Cemeteries

Establish cemetery boundaries within the corridor that may be impacted. Contact any known owners or organizations that have knowledge of the cemetery.

*NOTE: It is the discretion of the project manager if any headstones are to be surveyed.*

### 34 Environmental areas

Locate areas and features that are considered environmental issues, process the data, and depict on the plans.

### 35-40 Reserved for additional miscellaneous survey items required

# PRELIMINARY LINE AND GRADE

### 41 Computer setup

Load and organize project data (manuscripts, mapping, ortho-rectified photographs, etc.) into computer system, the establishment and maintenance of a file management system for project data, including the storage and manipulation of all project files required for project development. Adhere to current CADD standards and file naming conventions.

### 42 Establish preliminary property lines and ownership

Using PVA data or documents, establish approximate existing right of way and property lines and denote the property ownership, parcel numbers, and lines on the manuscript.

### 43 Develop preliminary pavement design

Analyze and document a preliminary proposed pavement design for each roadway.

### 44 Develop typical sections

Develop and document all necessary typical sections (including alternatives) for the mainline and all other roadways.

### 45 Develop horizontal alignments

Develop, and document all horizontal alignments including approaches. Depict these alignments on the manuscripts with appropriate labels.

### 46 Develop vertical alignments

Develop, and document the vertical alignments for each horizontal alignment including approaches and entrances.

### 47 Preliminary Roadway Model - Mainline Backbone

Create a proposed model from paved shoulder to paved shoulder for the mainline roadway. The Preliminary Model should be modeled to a point to allow for accurate quantifying of the project. This will require, but is not limited to, modeling super elevation, accurate pavement block, all lane widths and tapers, and shoulder widths. Depict the pavement and shoulder lines on the manuscripts.

*Note: Unless noted by the project manager, it is not expected that milling and leveling and wedge be included.*

### 48 Preliminary Roadway Model - Approach Backbone

Create a proposed model from paved shoulder to paved shoulder for each approach roadway. The Preliminary Model should be modeled to a point to allow for accurate quantifying of the project. This will require, but is not limited to, modeling super elevation to ties to the mainline pavement, accurate pavement block, all lane widths and tapers, and shoulder widths. Radii and Intersection Graded are not expected unless called for in Item 51 (Intersection Grading). Depict the pavement and shoulder lines on the manuscripts.

*Note: Unless noted by the project manager, it is not expected that milling and leveling and wedge be included. When length is small, a unit of each can be used.*

### 49 Preliminary Roadway Model - Mainline Grading

The preliminary model should convey all design intent and be modeled to a point necessary to measure accurate impacts and calculate a preliminary estimate for each alternative. It is recommended to model the guardrail locations, side slopes, berms, ditches, and walls. It is not necessary to transition slopes, design or tie in ditches, and model headwalls. Depict the disturb limits on the manuscripts.

*Note: Left and Right sides are considered independent to each other and should be added for a combined total. Grading can be combined in one model with the mainline backbone or generated separately.*

### 50 Preliminary Roadway Model - Approach Grading

The preliminary model should convey all design intent and be modeled to a point necessary to measure accurate impacts and calculate a preliminary estimate for each alternative. It is recommended to model the guardrail locations, side slopes, berms, ditches, and walls. It is not necessary to transition slopes, design or tie in ditches, and model headwalls. Depict the disturb limits on the manuscripts.

*Note: Left and Right sides are considered independent to each other and should be added for a combined total. Grading can be combined in one model with the mainline backbone or generated separately. When length is small, a unit of each can be used.*

### 51 Preliminary Roadway Model - Intersection Grading

Model the intersection radii, ensuring to tie the pavement and ditches in. Pavement block would be modeled correctly. Depict the disturb limits on the manuscripts.

*Note: This item should only be used when required by the Project Manager. In general, radii will not need to be modeled during Phase I. This item assumes modeling four radii.*

### 52 Preliminary Roadway Model - Roundabouts – Single / Multi Lane

Model a roundabout to the point necessary to measure accurate impacts, calculate preliminary quantities, and complete the conceptual design review process. Depict the pavement edges and the disturb limits on the manuscripts.

### 53 Preliminary Roadway Model - Entrances

Model each entrance to measure impacts and prove constructability. Model accurate lane widths and shoulder widths, and tapers if impacts are critical. Radii are not necessary at this stage. Depict the entrances on the manuscripts.

### 54 Pre-size pipes (all alternates)

Determine preliminary diameter, length, and end treatment for all drainage pipes. Depict the pipes on the manuscripts.

### 55 Pre-size culverts (all alternates)

Determine preliminary size, length, and end treatment for all culverts. Depict the culverts on the manuscripts.

### 56 Pre-size bridges (all alternates)

Determine preliminary size (deck width, span arrangement, hydraulic openings, and/or clearances) for all bridges. Depict the bridges on the manuscripts.

### 57 Conduct Traffic Engineering Analysis (Basic; HCM Procedures)

Conduct and document traffic engineering analysis for each roadway section and each major intersection, using the appropriate Highway Capacity Manual/Highway Capacity (HCM/HCS) procedures.  This analysis will determine the appropriate lane configuration to meet the desired performance of the roadway.  Production hours will be based on the number of intersections for the project. Roadway lengths between intersections will be considered incidental to the overall analysis.

*Note: Number of major intersections to be analyzed, along with appropriate analysis scenarios and roadway sections will be determined and documented at the Predesign Conference.*

### 58 Conduct Traffic Engineering Analysis (Advanced; Micro-Sim)

Conduct and document traffic engineering analysis for each roadway section and each major intersection, using micro-simulation.  This analysis will evaluate the ability of the project to operate as a comprehensive system.  Production hours will be based on the number of major intersections on the project. Analysis should account for roadway lengths and minor intersections along the approaches to the major intersections.

*Note: Major intersections to be analyzed, along with appropriate analysis scenarios and roadway sections will be determined and documented at the Predesign Conference.*

### 59 Development of interchange

Develop and document preliminary interchange layouts including capacity analysis for weaving areas and merge/diverge.

*Note: The specific scope of work and methodology of analysis will be determined at the Predesign Conference.*

### 60 Develop maintenance of traffic scheme

Develop and document alternative traffic control scheme including construction phasing and/or detour routes.

### 61 Print copies of project

Print, Plot, or pdf copies of project including the necessary copies for distribution at project milestones (inspections, meetings, etc.).

*Note: The format and number of plans for meetings and inspections shall be determined at the Predesign Conference.*

### 62 Calculate preliminary quantities and develop cost estimates

Develop and document cost estimates for each alternate, including calculating preliminary quantities for each alternative. Place cost estimates in a format to weigh all alternatives. Matrix should include Construction cost (consisting of, at minimum, Pavement, Earthwork, Drainage Features, and Structures), Utility Cost, and Right of Way Cost.

### 63 Revise design and estimates

Revise design and estimates as directed from reviews and inspections. Upon completion of the Preliminary Line and Grade Inspection, the Consultant shall incorporate all significant comments into the preliminary design and submit the revised manuscripts and electronic files to the KYTC Project Manager.

### 64 Preliminary Right of Way with taking areas

Layout preliminary Right of Way and calculate approximate Right of Way taking areas from each parcel, for each alternate. Document the areas of taking for each alternate and depict the preliminary Right of Way and easements on the manuscript.

### 65 Prepare Design Executive Summary

Prepare and submit Design Executive Summary, including all necessary documentation, location map, typicals, etc.

### 66 Develop “Avoidance Alternatives to Water Related Impacts”

Prepare documentation concerning all blue line streams as denoted on topographic quad maps.

## PRELIMINARY LINE & GRADE MISCELLANEOUS

### 67 Project Scheduling

Prepare and maintain a Project Development Schedule (example, using Microsoft Project to create a Gantt Chart). Create initial schedule, including relevant milestones and critical path, and provide an updated PDF to the Project Manager monthly, quarterly or another schedule as directed.

### 68 Highway Safety Analysis

Perform a safety analysis for a specific location or various segments of a project, to help evaluate the effectiveness of proposed improvements. At minimum, gather, analyze, and report on the crash history. Depict crash diagrams and a report discussing benefit/costs of proposed options at the Preliminary Line & Grade meeting, or other milestone outlined in the Pre-Design Conference minutes. For more complex projects, may require the use of Highway Safety Manual or IHSDM software for analysis.

### 69 Model Rock Line – Preliminary

If requested by the project manager, create a 3d terrain of the rock line using physical features and/or boring locations.

*Note: This item should only be used in special circumstances where the amount of rock is critical to the success of the project.*

### 70 Prepare Roundabout Conceptual Report

If a roundabout is identified as a viable alternative, prepare a roundabout conceptual report as defined in the Highway Design Manual. This submittal should occur prior to public involvement activities that depict the roundabout, and no later than the preliminary line and grade meeting.

### 71 Prepare KMZ’s

Prepare a proposed for all alternates. The Google Earth files shall include custom line styles and shall all necessary to depict the alternate (should include, but not limited to, centerlines, pavement lines, drainage features, disturb limits, right of way, etc.)

### 72-75 Reserved for additional miscellaneous PL&G items required

# UTILITY COORDINATION

### 76 Utility Coordination Meeting

The intent of this type of meeting is to identify critical conflicts and easement needs, discuss avoidance possibilities, consider relocation placements and costs, phasing, and schedule, and identify Quality Level A or Quality Level B location needs. This meeting shall take place prior to the joint inspection but for complex projects and projects with a prevalence of utilities, it is recommended to hold at least two meetings.

### 77 Develop Utility Relocation Layout Sheets

Develop preliminary relocation layout sheets that show all existing utility facilities with quality level identified, all identified conflicts with the project, and proposed relocation alignments.

*Note: Scale of sheets to be determined at the preconference meeting.*

### 78 Develop Utility Relocation Plans

Develop utility relocation plans for utilities that have agreed to have KYTC’s consultant perform relocation design services. These plans shall provide a detailed horizontal and vertical alignment of the facilities to be relocated. Plan sheets, profile sheets, and cross sections shall be required. Plans shall adhere to the utility company’s standards and specifications.

*Note: Scale of sheets to be determined at the preconference meeting.*

### 79-80 Reserved for additional miscellaneous Utility Coordination items required.

# RIGHT OF WAY PLANS

### 81 Deed research

Research of all documents necessary to determine property lines, existing easements, encumbrances, and ownership including a copy of the deed with deed book and page number and available plats.

### 82 Establish property and ownership

Using field evidence and research documentation to accurately establish property lines, existing Right of Way, existing easements, owner names, lessee names, and parcel numbers. Document on plans.

### 83 Calculate Right of Way

Calculate lines and areas of all proposed right of way and easement takings for each parcel. Depict all right of way and easements, including metes and bounds, on plans.

### 84 Prepare legal descriptions

Prepare and check legal descriptions for each area of taking.

### 85 Prepare Right of Way summary sheet

Complete Right of Way summary sheet including all affected parcels.

### 86 Generate Right of Way strip map

Prepare Right of Way strip map covering all affected parcels.

### 87 Prepare Right of Way Plans Submittal

Generate the computer files of the Right of Way plans, prepare electronic submittal of plans and deeds, and submit plans, computer files, source deeds and proposed deed descriptions to the District Office. Detour runarounds or other maintenance of traffic plans that have impacts to the right of way or utilities shall be included in the Right of Way plans. A set of prints of drainage and cross sections may also be required to be included in the submittal.

*Note: A set of plans is to be submitted to the KYTC Project Manager for review prior to submittal of Right of Way plans, if requested.*

### 88 Right of Way revisions after Right of Way submittal

Prepare Right of Way plan revisions as necessary. Post Right of Way Plan submittal and prior to the final construction plan submittal. Includes re-submittal of revised plans, 1 set of pdfs with changes marked in red, plats, deed descriptions and electronic files.

### 89 Prepare Legal Descriptions for Right of Way Transfer

Prepare legal deed descriptions for each parcel to be transferred to local government responsibility.

### 90-95 Reserved for additional miscellaneous Right of Way items required

# FINAL PLANS

## PREPARATION / UPDATES

### 96 Computer setup

Load and organize electronic data files (manuscripts, centerline data, coordinates data, terrain models etc.).

*Note: In most cases much of this work was completed in Phase 1.*

### 97 Develop pavement design

Analyze, document, and submit for review and approval the proposed pavement design folder for each roadway, including pavement calculations, life cycle costs, typical sections, and pavement details.

### 98 Prepare interchange geometric approval sheet

Prepare geometric approval sheet, including all required alignments, curve data, coordinates, etc. for requesting approval of the interchange geometrics.

### 99 Prepare intersection geometric approval sheet

Prepare geometric approval sheet, including all required alignments, curve data, coordinates, etc., for requesting approval of the intersection geometrics.

### 100 Refine alignments (horizontal & vertical)

Refine, adjust, and document the preferred horizontal and vertical alignments, incorporating, as needed, greater detail in tie-down points, approaches, detours, etc.

### 101 Revise roadway plans from soils report

Modify the roadway model incorporating geotechnical report recommendations.

*Note: Length is based on expected area requiring changes due to geotechnical report, not entire project length.*

## MODELING

### 102 Final Roadway Model - Mainline Backbone

Create a proposed model from paved shoulder to paved shoulder for the mainline roadway. The Final Model should be modeled to meet KYTC CADD Standards. This will require, but is not limited to, modeling super elevation, accurate pavement block including milling and leveling and wedging, all lane widths and tapers, and shoulder widths. Depict the pavement and shoulder lines on the plans.

### 103 Final Roadway Model - Approach Backbone

Create a proposed model from paved shoulder to paved shoulder for each approach roadway. The Final Model should be modeled to meet KYTC CADD Standards. This will require, but is not limited to, modeling super elevation to ties to the mainline pavement, accurate pavement block including milling and leveling and wedging, all lane widths and tapers, and shoulder widths. Depict the pavement and shoulder lines on the plans.

*Note: Radii and Intersection Graded will be captured in Item 106 (Intersection Grading.) When length is small, a unit of each can be used.*

### 104 Final Roadway Model - Mainline Grading

The final model should convey all design intent and be modeled to a point necessary to measure accurate impacts and calculate each alternative. It is required to model the guardrail locations, end conditions, side slopes, slope transitions, berms, ditches, and walls. If parking lots are impacted, pavement, curbing, and slopes shall be modeling. Depict the disturb limits on the plans.

*Note: Left and Right sides are considered independent to each other and should be added for a combined total. Grading can be combined in one model with the mainline backbone or generated separately.*

### 105 Final Roadway Model - Approach Grading

The final model should convey all design intent and be modeled to a point necessary to measure accurate impacts and calculate each alternative. It is required to model the guardrail locations, end conditions, side slopes, slope transitions, berms, ditches, and walls. If parking lots are impacted, pavement, curbing, and slopes shall be modeling. Depict the disturb limits on the plans.

*Note: Left and Right sides are considered independent to each other and should be added for a combined total. Grading can be combined in one model with the mainline backbone or generated separately. When length is small, a unit of each can be used.*

### 106 Final Roadway Model - Intersection Grading

Model the intersection radii, ensuring to tie the pavement and slopes / ditches in. Pavement block shall be modeled correctly.

### 107 Final Roadway Model Roundabouts – Single Lane

Create a proposed model for the roundabout. The Final Model should be modeled to meet KYTC CADD Standards. This will require, but is not limited to, modeling super elevation to ties to the mainline pavement, accurate pavement block including milling and leveling and wedging, all lane widths and tapers, shoulder widths, the guardrail locations, end conditionals, side slopes, berms, ditches, and walls. Depict the pavement edges and the disturb limits on the plans.

### 108 Final Roadway Model Roundabouts – Multilane

Create a proposed model for the roundabout. The Final Model should be modeled to meet KYTC CADD Standards. This will require, but is not limited to, modeling super elevation to ties to the mainline pavement, accurate pavement block including milling and leveling and wedging, all lane widths and tapers, shoulder widths, the guardrail locations, end conditionals, side slopes, berms, ditches, and walls. Depict the pavement edges and the disturb limits on the plans.

### 109 Final Roadway Model – Entrances - Low

Model each entrance accurately, with pavement block, all lane widths and tapers, and shoulder widths. Low Modeled Entrances are for simple entrances with minimal modeling effort and no radii. Depict the pavement edges and the disturb limits on the plans.

### 110 Final Roadway Model – Entrances - Medium

Model each entrance accurately, with pavement block, all lane widths and tapers, shoulder widths and radii. This is the standard entrance with normal modeling effort. Depict the pavement edges and the disturb limits on the plans.

### 111 Final Roadway Model – Entrances - High

Model each entrance accurately, with pavement block, all lane widths and tapers, shoulder widths and radii. This is intended for complex entrances with unusually high level of modeling effort. Depict the pavement edges and the disturb limits on the plans.

### 112 Model Rock Line

Create a 3d model of the rock line using Geotechnical information. Engineering judgement, using physical features, and boring locations, should be used to determine the elevations between boring locations.

## DRAINAGE

### 113 Develop pipe sections (< 54”)

Create and design pipe sections including quantities, notes and depicting them in the plans.

*Note: Includes cross drains, etc.*

### 114 Develop drainage system map

Create a comprehensive map describing the proposed drainage system and delineates drainage areas.

### 115 Develop blue line stream channel changes (=> 200’)

Develop and prepare drawing of alignment, profiles, sections, and plan to represent channel change, including stream mitigation requirements.

### 116 Drainage structure analysis (entrance pipes)

Conduct and document drainage analysis to determine frequency flows and required structure size of entrance pipes.

### 117 Drainage structure analysis (A <= 200 acres)

Conduct and document drainage analysis to determine frequency flows and required structure size, includes outlet protection analysis

*Note: Storm Sewers are to be analysis in Items 127 and 128.*

### 118 Drainage structure analysis (200 acres < A < 1.0 sq. mile)

Conduct and document drainage analysis to determine frequency flows and required structure size, includes outlet protection analysis.

*Note: Storm Sewers are to be analysis in Items 127 and 128.*

### 119-121 Drainage structure analysis (A => 1.0 sq. mile) -- Levels 1, 2, & 3 Analysis

Conduct and document drainage analysis to determine frequency flows, required structure size, location, and risk assessment, includes outlet protection analysis.

*Note: Storm Sewers are to be analysis in Items 127 and 128.*

### 122 Special drainage studies

Conduct special drainage studies, which may include HEC-HMS, HEC-RAS, TR-20, TR-55, Unsteady Flow Models, 2D Stream Hydraulic Models, FESWMS-2DH, Detention Basin Design, Energy Dissipater Design, Dynamic Culvert Design, or other Hydrologic/Hydraulic design as deemed appropriate.

### 123 Roadway ditches and channels

Determine hydraulic capacity (ditch size) and necessary channel lining of all ditches and channels, includes documentation of design calculations and completion of forms.

*Note: Left and right sides are independent to each other and should be added for a combined total.*

### 124 Inlet spacing calculations

Conduct necessary calculations to determine structure types, and inlet spacing for the layout and design of storm sewer systems. Includes documentation of design calculations and completion of forms.

### 125 Storm sewer calculations

Conduct necessary calculations to determine pipe size, storage volumes, etc. for the layout and design of storm sewer systems. Includes documentation of design calculations and completion of forms.

### 126 Develop storm sewer profile

Depict the Storm Sewer on pipe sheets. The profile shall be shown along the Storm Sewer and structures labeled to avoid confusion.

### 127 Perform scour analysis

Perform scour analysis as referenced in the FHWA HEC-18 and HEC-20 and the current Drainage Manual. Includes documentation of design calculations and completion of forms.

### 128 Assemble preliminary and final drainage submittals

Print and assemble drainage submittals.

### 129 Prepare advanced situation submittal - bridge

Prepare required documentation and assemble the submittal.

*Note: Submittal contents are to conform to requirements outlined in the Drainage and Bridge Manuals.*

### 130 Prepare advanced situation submittal - culvert

Prepare required documentation and assemble the submittal.

*Note: Submittal contents are to conform to requirements outlined in the Drainage and Bridge Manuals.*

### 131-134 Reserved for additional miscellaneous Drainage items required

## FINAL PLAN SET

### 135 Prepare layout sheet

Prepare layout sheet for the Construction Plans.

### 136 Prepare typical sections

Prepare all typical sections including the proposed pavement design and other necessary details for each roadway, detour, and entrance.

### 137 Generate plan sheets

Perform necessary work to create individual plan sheets, including creation of named boundaries, associated drawing, and sheet models, annotation of plan elements, placing of construction notes, reference masking as applicable, manipulation of text and notes, and completing sheet title blocks.

### 138 Generate additional RW Plan Sheets

Create a separate plan sheet to display the proposed and existing Right of Way information. Perform necessary work to create individual plan sheets, including creation of named boundaries, associated drawing, and sheet models, annotation of plan elements, reference masking as applicable, manipulation of text and notes, and completing sheet title blocks.

*Note: This is only intended for busy projects when plan sheets become too cluttered.*

### 139 Generate profile sheets

Perform necessary work to create individual profile sheets, including creation of named boundaries, associated drawing, and sheet models, annotation of proposed grade line, annotation of proposed ditch lines, depiction, and annotation of cross drains with applicable flood data boxes, and completing sheet title blocks.

Note: The depiction of longitudinal storm sewers is not to be included on the roadway profile sheets.

### 140 Detail cross sections

Perform necessary work to create cross section sheets, including creation of named boundaries, associated drawing, and sheet models, annotation including proposed roadway, special ditches, superelevation, guardrail, embankment benching, depiction and annotation of cross drains with applicable flood data boxes, and completing sheet title blocks.

*Note: The majority of work required for the development of cross sections is under Item 102-112 (Modeling).*

### 141 Prepare coordinate control sheet

Develop all coordinate control information, including proposed centerlines, event points, control points, and benchmarks with appropriate descriptions, and place into the plans in tabular form and generate individual sheets.

### 142 Prepare elevation development sheets

Prepare elevation development sheets including all geometric data and elevation data necessary.

### 143 Prepare striping plans

Prepare details for striping plans as outlined in the Predesign Conference.

### 144 Develop Erosion Control Plan

Determination of required erosion control items and depiction in the plans, including required calculations and generating the individual sheets. Includes documentation of design calculations and completion of forms.

*Note: Specific scope of work and level of effort is to be discussed at the Predesign Conference*

### 145 Calculate final quantities

Calculate and document all quantities required for the construction of the final roadway and maintenance of traffic during construction, including permanent and temporary items.

### 146 Complete general summary

### 147 Complete paving summary

### 148 Complete drainage summary

### 149 Complete pavement under-drain summary

### 150 Prepare cost estimate

Prepare and document cost estimates including bid prices for each item, using best engineering judgement, for inspections, meetings, and final plan submittal. The estimate must utilize the Standard Highway Design Estimator Template as outlined in the AASHTOWare Project Estimator Manual for Design.

### 151 Prepare KMZ’s

Prepare a proposed and existing Google Earth file. The Google Earth files shall include custom line styles and shall contain all data as described in the CADD Standards.

## MAINTAINENCE OF TRAFFIC

### 152 Write maintenance of traffic notes (TCP)

Write and submit the required Traffic Control Plan, including the construction phasing for the project.

### 153 Prepare construction phasing plans

Prepare plans for maintenance of traffic, construction phasing, and/or detours necessary for the construction of the project, including all phasing, barrier locations, special notes, signs, temporary pavement markings, and quantities. When maintenance of traffic details have been completed, a Traffic Control Plan shall be prepared and submitted to the KYTC Project Manager to obtain the necessary approval signatures. Once approved, the notes and phasing details will be incorporated into the final construction plans.

### 154 Show construction phasing on cross sections / pipe sheets

Show on cross sections any temporary widening, temporary ditches, temporary pipes, and temporary slopes necessary to meet the phasing plans. Pipes that are to be constructed part width shall have the construction phasing shown on the Pipe Sheets.

### 155 Develop diversion plan sheets

Create a separate diversion sheet to depict the location and data of the diversion. Show centerline, pavement edges, and limits on the plan sheet.

### 156 Develop diversion profile sheets

Create a separate diversion profile sheet, or place profile on the plan sheet. Label the vertical and insure all drainage features are shown and labeled.

### 157 Develop diversion cross sections

Create separate diversion cross sections, including creation of named boundaries, associated drawing, and sheet models. Annotate proposed roadway and any special ditches, superelevation, guardrail, embankment benching, and drainage with applicable flood data boxes applicable.

### 158 Develop temporary drainage

Develop temporary ditches and pipes, create and design pipe sections including quantities and notes, and depicte them in the plans.

## FINAL PLANS MISCELLANEOUS

### 159 Print copies of plans

Print, Plot, or pdf copies of plans including the necessary copies of plans for distribution at project milestones (inspections, meetings, etc.).

*Note: The format and number of plans for meetings and inspections shall be determined at the Predesign Conference.*

### 160 Plan revisions

Complete any necessary and unexpected plan revisions that arise during the project that are beyond the control of the consultant, including revisions to plans required due to Right of Way Revisions that are not directly shown on the Right of Way Plans.

### 161 Prepare final construction plans submittal

Prepare electronic submittal of final plans and required files according to the Final Plan Submittal checklist. Also includes submittal of a set of Review Plans and making any necessary changes identified by the roadway plan review.

### 162-168 Reserved for additional miscellaneous Final Plans items required

# MEETINGS

### 169 Preliminary line and grade inspection

Prepare for and attend the preliminary line and grade inspection and prepare the inspection report.

*Note: Travel to and from, if in person, will be taken into consideration*

### 170 Geometric review meeting

To be held at the request of the project manager. Prepare for and attend the geometric review meeting and prepare meeting minutes if necessary. This meeting should be held before drainage design but after the project horizontal/vertical alignments, typicals, and initial modeling are complete to ensure consistency with expectations. At a minimum, the project team should discuss possible right-of-way, drainage, utility, and/or maintenance of traffic issues and discuss involving structures, drainage, environmental and/or geotech if applicable.

*Note: Travel to and from, if in person, will be taken into consideration*

### 171 Drainage inspection

Prepare for and attend the drainage inspection and prepare the inspection report and prepare meeting minutes.

*Note: Travel to and from, if in person, will be taken into consideration*

### 172 Final inspection

Prepare for and attend the final inspection and prepare the inspection report and prepare meeting minutes.

*Note: Travel to and from, if in person, will be taken into consideration*

### 173 Virtual project team meetings

Prepare for and attend any virtual project team meeting scheduled by the Project Manager and prepare meeting minutes if necessary.

*Note: The number of virtual project team meetings shall be determined at the Predesign Conference.*

### 174 Project team meetings

Prepare for and attend any project team meeting scheduled by the Project Manager and prepare meeting minutes if necessary.

*Note: The number of project team meetings shall be determined at the Predesign Conference.*

## Meetings Miscellaneous

### 175 Value Engineering Study

Preparation of presentation for the project briefing. Preparation and compilation of project plans and documents for the VE team. Meeting attendance by the project engineer with KYTC project manager to review VE recommendations for further implementation.

*Note: This item is applicable only for a project requiring a VE study or project where the KYTC project manager specifies that a VE study will be done.*

### 176 Constructability Review

Prepare meeting materials, including any constructability related details (draft phasing, maintenance of traffic, seasonal restrictions, as well as standard plan information) prior to the meeting.  Write and distribute minutes after the meeting. Includes consideration of travel to and from the meeting.

The constructability review meeting is scheduled to facilitate the design decision making process and the development of final plans.  Typical projects are those for which the project engineer anticipates a complicated maintenance of traffic plan or unusual construction work restrictions.   Attendees should include the project engineer and others as necessary.

*Note: This item is applicable to any project for which the KYTC project manager determines a standalone constructability meeting is warranted.*

### 177-179 Reserved for additional miscellaneous Meeting items required

# PUBLIC INVOLVEMENT

*Note: The level of Public Involvement shall be discussed in the Predesign Conference and documented in the minutes.*

### 180 Develop and maintain mailing list

Prepare and maintain an up-to-date mailing list consisting of all potential property owners, local officials, and other interested individuals.

### 181 Prepare for advisory committee/officials meetings

Prepare and deliver all necessary materials (project plans, photographs, exhibits, maps, handouts, etc.) to facilitate advisory committee and local officials meetings.

### 182 Attend advisory committee/officials meetings

Attend the required meetings and prepare the meeting minutes.

*Note: Travel to and from, if in person, will be taken into consideration*

### 183 Prepare for public meetings/hearings

Prepare and deliver all necessary materials (project plans, photographs, exhibits, maps, handouts, etc.) to facilitate public meetings/hearings.

### 184 Attend public meetings/hearings

Attend the public meetings and prepare the meeting minutes.

*Note: Travel to and from, if in person, will be taken into consideration*

### 185 Prepare and distribute newsletters

Develop and distribute project newsletters to individuals on the project mailing list and other interested parties.

*Note: The specific extent of the type of newsletter to be prepared will be determined at the Predesign Conference.*

### 186 Property owner coordination

Coordination with property owners with respect to project impacts.

*Note: The specific extent of property owner coordination will be determined at the Predesign Conference.*

### 187-189 Reserved for additional miscellaneous Public Involvement items required

# QA/QC

*Note: This section is generally ONLY required with large projects that have multiple sections and consultants.*

### 190 Plan review

Review by a Senior Engineer to ensure the quality of the design and quality of the plans.

### 191 Structure review

Review by a Senior Engineer to ensure the quality of the design and quality of the plans.