

## CHECKLIST TO DESIGNATE AREAS OF EVALUATION FOR REQUESTS FOR PROPOSAL (RFP)

	REQUISITION NUMBER	DUE DATE	TIME DUE
MDOT PROJECT MANAGER	JOB NUMBER (JN)	CONTROL SECTION (CS)	
DESCRIPTION			
<b>MDOT PROJECT MANAGER:</b> Check all items to be included in RFP  WHITE = REQUIRED ** = OPTIONAL  Check the appropriate Tier in the box below		<b>CONSULTANT:</b> Provide only checked items below in proposal	
<input type="checkbox"/> <b>TIER I</b> (\$50,000 - \$150,000)	<input type="checkbox"/> <b>TIER II</b> (\$150,000-\$1,000,000)	<input type="checkbox"/> <b>TIER III</b> (>\$1,000,000)	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Understanding of Service **
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Innovations</i>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Organizational Chart
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Qualifications of Team
Not required as part of Official RFP	Not required as part of Official RFP	<input type="checkbox"/>	Quality Assurance/Quality Control **
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<b>Location:</b> The percentage of work performed in Michigan will be used for all selections unless the project is for on-site p=inspection or survey activities, then location should be scored using the distance from the consultant office to the on-site inspection or survey activity.
N/A	N/A	<input type="checkbox"/>	Presentation **
N/A	N/A	<input type="checkbox"/>	Technical Proposal (if Presentation is required)
3 pages (MDOT Forms not counted) ( <b>No Resumes</b> )	7 pages (MDOT Forms not counted)	14 pages (MDOT forms not counted)	Total maximum pages for RFP <b>not including key personnel resumes.</b> Resumes limited to 2 pages per key staff personnel.

**PROPOSAL AND BID SHEET EMAIL ADDRESS – [mdot-rfp-response@michigan.gov](mailto:mdot-rfp-response@michigan.gov)**

### GENERAL INFORMATION

Any questions relative to the scope of services must be submitted by e-mail to the MDOT Project Manager. Questions must be received by the Project Manager at least five (5) working days prior to the due date and time specified above. All questions and answers will be placed on the MDOT website as soon as possible after receipt of the questions, and at least three (3) days prior to the RFP due date deadline. The names of vendors submitting questions will not be disclosed.

MDOT is an equal opportunity employer and MDOT DBE firms are encouraged to apply. The participating DBE firm, as currently certified by MDOT's Office of Equal Opportunity, shall be listed in the Proposal.

### MDOT FORMS REQUIRED AS PART OF PROPOSAL SUBMISSION

**5100D** – Request for Proposal Cover Sheet

**5100J** – Consultant Data and Signature Sheet (Required only for firms not currently prequalified with MDOT)

**(These forms are not included in the proposal maximum page count.)**

# REQUEST FOR PROPOSAL

The Michigan Department of Transportation (MDOT) is seeking professional services for the project contained in the attached scope of services.

If your firm is interested in providing services, please indicate your interest by submitting a Proposal, Proposal/Bid Sheet or Bid Sheet as indicated below. The documents must be submitted in accordance with the latest (Consultant/Vendor Selection Guidelines for Services Contracts” and “Guideline for Completing a Low Bid Sheet(S)\*, if a low bid is involved as part of the selection process. **Reference Guidelines are available on MDOT’s website under Doing Business > Vendor/Consultant Services >Vendor/Consultant Selections.**

**RFP SPECIFIC INFORMATION**

ENGINEERING SERVICES                       BUREAU OF TRANSPORTATION PLANNING                       OTHER

THE SERVICE WAS POSTED ON THE ANTICIPATED QUARTERLY REQUESTS FOR PROPOSALS  
 NO     YES    DATED \_\_\_\_\_ THROUGH \_\_\_\_\_

<input type="checkbox"/> <b>Prequalified Services</b> – See the attached Scope of Services for required Prequalification Classifications.	<input type="checkbox"/> <b>Non-Prequalified Services</b> – If selected, the vendor must make sure that current financial information, including labor rates, overhead computations, and financial statements, if overhead is not audited, is on file with MDOT’s Office of Commission Audits. This information must be on file for the prime vendor and all sub vendors so that the contract will not be delayed. <b>Form 5100J is required with Proposal for firms not currently prequalified with MDOT</b>
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**Qualifications Based Selection** – Use Consultant/Vendor Selection Guidelines

**For all Qualifications Based Selections**, the selection team will review the information submitted and will select the firm considered most qualified to perform the services based on the proposals. The selected firm will be asked to prepare a priced proposal. Negotiations will be conducted with the firm selected.

**For a cost plus fixed fee contract**, the selected vendor must have a cost accounting system to support a cost plus fixed fee contract. This type of system has a job-order cost accounting system for the recording and accumulation of costs incurred under its contracts. Each project is assigned a job number so that costs may be segregated and accumulated in the vendor’s job-order accounting system.

**Qualification Based Selection / Low Bid** – Use Consultant/Vendor Selection Guidelines. See Bid Sheet instructions for additional information.

For Qualification Review/Low Bid selections, the selection team will review the proposals submitted. The vendor that has met established qualification threshold and with the lowest bid will be selected.

**Best Value** – Use Consultant/Vendor Selection Guidelines, See Bid Sheet Instructions below for additional information. The bid amount is a component of the total proposal score, not the determining factor of the selection.

**Low Bid** (no qualifications review required – no proposal required.) See Bid Sheet Instructions below for additional instructions.

**BID SHEET INSTRUCTIONS**

Bid Sheet(s) must be submitted in accordance with the “Guidelines for Completing a Low Bid Sheet(s)\* (available on MDOT’s website). Bid Sheet(s) are located at the end of the Scope of Services. Submit bid sheet(s) with the proposal, to the email address: [mdot-rfp-response@michigan.gov](mailto:mdot-rfp-response@michigan.gov). Failure to comply with this procedure may result in your bid being rejected from consideration.

**PARTNERSHIP CHARTER AGREEMENT**

MDOT and ACEC created a Partnership Charter Agreement which establishes guidelines to assist MDOT and Consultants in successful partnering. Both the Consultant and MDOT Project Manager are reminded to review the [ACEC-MDOT Partnership Charter Agreement](#) and are asked to follow all communications, issues resolution and other procedures and guidance’s contained therein.

**NOTIFICATION  
MANDATORY ELECTRONIC SUBMITTAL**

**Proposals submitted for this project must be submitted electronically.**

**The following are changes to the Proposal Submittal Requirements:**

- Eliminated the Following Requirements:
  - Safety Program
  - Communication Plan
  - Past Performance as *a separate section*
  - Separate section for DBE Statement of goals. Include information in Qualification of Team section
  
- Implemented the Following Changes:
  - All proposals require an Organization Chart
  - Resumes must be a maximum of two pages
  - Only Key (lead) staff resumes may be submitted
  - Tier III proposal reduced from 19 to 14 pages
  - Forms 5100D, 5100I, and 5100G combined – 5100D
  - Forms 5100B and 5100H combined – 5100B
  - RFP's will be posted on a weekly basis -- on Mondays

**The following are Requirements for Electronic Submittals:**

- Proposals must be prepared using the most current guidelines
- The proposal must be bookmarked to clearly identify the proposal sections (See Below)
- For any section not required per the RFP, the bookmark must be edited to include “N/A” after the bookmark title.  
**Example:** Understanding of Service – N/A
- Proposals must be assembled and saved as a single PDF file
- PDF file must be 5 megabytes or smaller
- PDF file must be submitted via e-mail to [MDOT-RFP-Response@michigan.gov](mailto:MDOT-RFP-Response@michigan.gov)
- MDOT's requisition number and company name must be included in the subject line of the e-mail. The PDF shall be named using the following format:
  - Requisition#XXX\_Company Name.PDF
- MDOT will not accept multiple submittals
- Proposals must be *received* by MDOT on or before the due date and time specified in each RFP

**If the submittals do not comply with the requirements, they may be determined unresponsive.**

The Consultant's will receive an e-mail reply/notification from MDOT when the proposal is received. Please retain a copy of this e-mail as proof that the proposal was received on time. **Consultants are responsible for ensuring the MDOT receives the proposal on time.**

**\*\*Contact Contract Services Division immediately at 517-373-4680 if you do not get an auto response\*\***

**Required Bookmarking Format:**

- I. Request for Proposal Cover Sheet Form 5100D
  - A. Consultant Data and Signature Sheet, Form 5100J (if applicable)
- II. Understanding of Service
  - A. Innovations
- III. Qualifications of Team
  - A. Structure of Project Team
    - 1. Role of Firms
    - 2. Role of Key Personnel
  - B. Organization Chart
  - C. Location
- IV. Quality Assurance / Quality Control Plan
- V. Resumes of Key Staff
- VI. Pricing Documents/Bid Sheet (if applicable)

**2/14/12**

**NOTIFICATION  
E-VERIFY REQUIREMENTS**

E-Verify is an Internet based system that allows an employer, using information reported on an employee's Form I-9, Employment Eligibility Verification, to determine the eligibility of that employee to work in the United States. There is no charge to employers to use E-Verify. The E-Verify system is operated by the Department of Homeland Security (DHS) in partnership with the Social Security Administration. E-Verify is available in Spanish.

The State of Michigan is requiring, under Public Act 200 of 2012, Section 381, that as a condition of each contract or subcontract for construction, maintenance, or engineering services that the pre-qualified contractor or subcontractor agree to use the E-Verify system to verify that all persons hired during the contract term by the contractor or subcontractor are legally present and authorized to work in the United States.

Information on registration for and use of the E-Verify program can be obtained via the Internet at the DHS Web site: <http://www.dhs.gov/E-Verify>.

The documentation supporting the usage of the E-Verify system must be maintained by each consultant and be made available to MDOT upon request.

It is the responsibility of the prime consultant to include the E-Verify requirement documented in this NOTIFICATION in all tiers of subcontracts.

9/13/12

Michigan Department of Transportation

**SCOPE OF SERVICE  
FOR  
DESIGN SURVEY SERVICES  
REVISED 6.3.14**

**CONTROL SECTION:** 82194

**JOB NUMBER:** 116287 D

**PROJECT LOCATION:**

I-75: B-01 and S-06, City of Detroit, Wayne County.

**PROJECT DESCRIPTION:**

This project is for bridge deck / superstructure replacements, bridge approach and ramp reconstruction, and barrier wall / guardrail upgrades of Structures B-01 and S-06.

Mapping of the existing highway (I-75 Fisher Freeway) from 500 feet south of the south abutment of structure B-01 (approx. sta. 987+73.00) thence north to 500 feet north of the north abutment of structure S-06 (approx. sta. 1098+60.00). Mapping the structure elements of B-01 and S-06 as noted on the attached Survey / Mapping Action Requests this Scope of Service.

**Each Structure is required to be packaged individually per the attached Survey / Mapping Action Requests.**

**PROJECT APPROACH:**

Due to safety concerns and to minimize the impact to the motoring public, MDOT requests that Mobile Terrestrial LiDAR (MTL) be used to acquire the mapping of the I-75 roadway, bridge decks, and appurtenances above the deck. Static Terrestrial LiDAR (STL) is recommended for acquiring the survey data and mapping under the bridge and below the bridge deck. The approach proposed by the selected consultant for all MTL and STL work shall be discussed with MDOT Lansing Surveys prior to completion of the Price Proposal. MTL and STL shall follow the standards and guidelines referred to in May 2014 Standards of Practice for MDOT Design Surveys or as approved by the MDOT Project Manager and Lansing Survey Support.

**PRIMARY PREQUALIFICATION CLASSIFICATION:**

PPMS Task 3330	Road Design Survey
PPMS Task 3340	Structure Survey
PPMS Task 4510	Right of Way Survey
PPMS Task 3320	Photogrammetric Control Survey

**SECONDARY PREQUALIFICATION CLASSIFICATION:**

Photogrammetry (Precautionary)

**ANTICIPATED START DATE:** July 1, 2014

**ANTICIPATED COMPLETION DATE:** October 31, 2014

**DISAVANTAGED BUSINESS ENTERPRISE (DBE) PARTICIPATION:**

This Scope of Services has a **0 %** DBE qualification.

**MDOT TEAM**

**Survey Project Managers:**

Thomas W. Benson, P.S. Michigan Department of Transportation Van Wagoner Building 425 W. Ottawa Street, B220 <i>Delivery</i> P.O. Box 30050 <i>Mail</i> Lansing, MI 48909 517-373-0020 <a href="mailto:bensont2@michigan.gov">bensont2@michigan.gov</a>	Kelvin J. Wixtrom, P.S. Michigan Department of Transportation Van Wagoner Building 425 W. Ottawa Street, B220 <i>Delivery</i> P.O. Box 30050 <i>Mail</i> Lansing, MI 48909 517-335-1914 <a href="mailto:wixtromk@michigan.gov">wixtromk@michigan.gov</a>
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**Bridge Design Project Manager:**

Kyle Kopper, P.E. Michigan Department of Transportation Van Wagoner Building 425 W. Ottawa Street, B220 <i>Delivery</i> P.O. Box 30050 <i>Mail</i> Lansing, MI 48909 517-241-4175 <a href="mailto:kopperk@michigan.gov">kopperk@michigan.gov</a>
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Submit a Proposal based upon the current requirements of the Request for Proposal and this Scope. A detailed Survey Work Plan must be included in the project proposal.

A **spreadsheet estimate** of hours by specific survey task such as traversing, leveling, mapping, etc., **must** also be included.

### **PAYMENT SCHEDULE**

Compensation for this Scope of Design Services shall be on a Cost Plus Fixed Fee basis.

### **FINAL PROJECT / PLOT SCALE:**

**1 inch = 40 feet**

### **WORK RESTRICTIONS**

The selected consultant survey firm must have the Professional Surveyor in charge of the project, contact the Traffic and Safety Engineer Georgina McDonald, at (313) 967-5431 or email at [McDonaldG@michigan.gov](mailto:McDonaldG@michigan.gov), who has jurisdiction over the project location, to determine what work restrictions will be imposed and which maintaining traffic scenarios will be acceptable.

### **FIELD SURVEY**

The purpose of this field survey is to obtain all information and/or data required for the design of this project, to leave horizontal and vertical control in the field for future construction staking, and to provide a sufficient history of the area to enable the MDOT Design Survey Unit to perform dependable surveys in the future if required.

The field survey must include, but is not limited to, the following:

### **GENERAL REQUIREMENTS:**

1. Surveys must meet all requirements of the Michigan Department of Transportation (MDOT) Standards of Practice dated May 2014. Please contact our office to clarify any specific questions regarding these standards.
2. Consultants must obtain all necessary permits, including an up-to-date permit from the MDOT Utilities Coordination and Permits Section, required to perform this survey on any public and/or private property. Necessary permits for this project may also include permits to operate within railroad right of ways.
3. The consultant must adhere to all applicable OSHA and MIOSHA safety standards, including the appropriate traffic signs for the activities and conditions for this job.
4. Consultants are responsible for a comprehensive and conscientious research of all records essential for the completion of this project.
5. Surveys must comply with all Michigan law relative to land surveying.
6. Surveys must be done under the direct supervision of a Professional Surveyor licensed to



- c. The **Control** section contains the data collected and copies of all research documents used to establish the **horizontal and vertical** reference systems for the project (ie: OPUS and post processing output), and includes a thorough written explanation describing how the systems were established. This section should also contain a complete list of control coordinates, control traverse raw data, least squares analysis for both traverse and benchmarks, a separate listing of control points to include **coordinates and witnesses, station and offset, and scale factor if grid coordinates are listed** for mapping and construction staking of the project. A complete benchmark list with datum, station and offset, elevation, and description of each benchmark shall also be included. This information must be submitted in hardcopy and PDF electronic file format per MDOT May 2014 Standards of Practice Appendix F. Also, a sketch of the control traverse, showing any ties (government corners, property, alignment, etc.) shall be included in this section.
  - d. The **Property** section contains all information that is utilized regarding the real property affected by the project, and all necessary property ties. This may include copies of all **recorded** land corner recordation certificates for the government corners used, reestablished, or in danger of obliteration by impending road construction; recorded plats, recorded certified surveys, tax maps, tax descriptions, and adjacent/riparian owners.
  - e. The **Mapping** section contains all survey notes, research documents, and collected data used to plot the maps necessary for this project. All plots for topography are to be placed in this section, as well as utilities and drainage information. Refer to Appendix F of the May 2014 Standards of Practice for specifics.
  - f. The **Miscellaneous** section contains any information not included in the previous sections. The surveyor project report should specify any items included in this section.
11. A portfolio may contain several types of data, but no section is to contain more than a single type. For example, a Bridge survey must be packaged separately from a Road survey. **All sheets in a portfolio must be marked with the control section, job number; section number and page number and relate to the Table of Contents. Electronic Data Storage Device(s) must be labeled with the control section, job number, data type and file names and should be setup to match the portfolio (6 subdirectories per item 10).**

12. The following information is to be submitted on **Electronic Data Storage Device(s)**:
  - a. Text files, in ASCII format per the MDOT Standards of Practice dated May 2014, containing the witness lists for the horizontal alignment ties, horizontal control points, bench marks, and government corners **as well as the Survey Info Sheet containing this data.**
  - b. Any other text files are to be in ASCII Text Format only.
13. Documents are to be submitted as follows:
  - a. All recorded instruments on 8.5" x 11" sheets.
  - b. All text files printed on 8.5" x 11" sheets.
  - c. All recorded plats and condominiums on 18" x 24" sheets.
  - d. All plots on 24" x 36" sheets.
  - e. All documents and plots are to be legibly printed or reproduced on white paper.
14. The Consultant representative shall record and submit type-written minutes for all project related meetings to the MDOT Survey Project Manager within two weeks of the meeting. The consultant shall also distribute the minutes to all meeting attendees.
15. The MDOT Survey Project Manager will be the official contact for the Consultant. The Consultant must either address, or send a copy of all correspondence to the MDOT Survey Project Manager. The MDOT Survey Project Manager shall be made aware of all communications regarding this project.
16. **All data, electronic or paper, must meet the appropriate sized electronic media format as detailed in Appendix F of the 2014 Standards of Practice. All paper pages / files, including Microstation files, contained in the portfolio are required to be scanned and / or converted to Adobe Acrobat PDF (portable document format) format and placed in the appropriate subdirectory on the Electronic Data Storage Device(s). The Table of Contents (PDF format) will have all PDF pages for the project book marked / linked so that each section or page in the file can be accessed with a single computer mouse click. All original specified electronic files, such as ASCII text, Microstation DGN, etc. must be accessible in their original format. All photos must be in JPEG format.**
17. All **Electronic Data Storage Device(s)** submitted must be labeled with the route, location, control section, job number, consultant's name and data type.
18. It is required that the consultant check the FTP site for the latest updated specifications, material formats and file presentation.

Any questions regarding this project should be directed to Thomas W. Benson or Kelvin J. Wixtrom, Design Survey Project Managers at the above noted contact info.

At the completion of this survey, all field survey notes, all electronic data, and all research records obtained for this project will be considered the property of MDOT and must be sent to the MDOT, Design Division, Survey Project Manager at the above noted address.

### **COORDINATION WITH OTHER CONTRACTS IN THE VICINITY**

The Consultant shall coordinate operations with contractors performing work on other projects within or adjacent to the Construction Influence Area (CIA).

MDOT maintenance crews and/or Contract Maintenance Agencies may perform maintenance work within or adjacent to the CIA. The Maintenance Division of MDOT and/or Contract Maintenance Agency will coordinate their operations with the MDOT Project Manager or Designate to minimize the interference to the Consultant.

The Consultant must contact the Development Engineer at the nearest MDOT TSC for information regarding project coordination.

The Consultant's attention is called to the requirements of cooperation with others as covered in the 2013 Standard Specifications for Construction. Other contracts or maintenance operations may occur during the life of the project.

No claim for extra compensation or adjustment in contract unit prices will be allowed on account of delay or failure of others to complete their scheduled work.

### **FIELD SURVEY**

The purpose of the field survey is to obtain all information and data required by the project design engineer, to leave control in the field for future construction staking, and to provide a sufficient history of the area to enable the MDOT Design Survey Unit to perform dependable surveys in the future.

### **CONTROL**

A three dimensional control system must be established throughout the project area. This control shall be based on the Michigan State Plane Coordinate System NAD1983(2011) International feet then **CONVERTED TO A GROUND BASED SYSTEM** for the horizontal datum and NAVD 1988 for the vertical datum. All subsequent control must be based on the established control. Any traverse/control points or bench marks established must adhere to the Michigan Department of Transportation (MDOT) Design Surveys *Standards of Practice* dated May 2014 and be listed in the Control pocket of the portfolio. Contact the MDOT Survey Consultant Coordinator/Project Manager or Region Surveyor for existing control in the area.

## **HORIZONTAL CONTROL**

At a minimum, three (3) Primary Control Monuments need to be established to form pairs with the existing NGS control points in the vicinity such that there should be a pair at the south end, the middle, and north end of the project limits. Reference the May 2014 Standards of Practice for specific requirements.

The horizontal project control for this project will be classified as intermediate project control according to the MDOT Standards of Practice dated May 2014. These points are intended for mapping and should be located outside the proposed construction area to insure their availability for all phases of construction. Each control point must be accurately described and witnessed to at least four nearby features. Please refer to MDOT Standards of Practice dated May 2014 for the minimum requirements for these points.

All field observations, unadjusted traverse computations and final adjusted coordinates must be included in the notes. A list of all horizontal control points must be developed which includes datum, all point designations, descriptions, coordinates, station and offset, and witnesses. This list must be printed on 8.5" x 11" sheets and placed on **Electronic Data Storage Device(s)**, in ASCII format per MDOT Standards of Practice dated May 2014 and the Survey Info Sheet. All data relating to the horizontal component of the system must be included in the portfolio. **Also, all raw field data files from GPS receivers and or Total Station data collectors must be included on the Electronic Data Storage Device(s).**

RTK GPS techniques (MDOT Standards May 2014 APENDIX C) will be allowed to establish the Intermediate Horizontal Control Points for this project. A minimum of double occupancy from different Primary Control Stations / CORS Stations is required per each setup on each point, the data must be post processed, adjusted and all data must be submitted in electronic format and be contained in the Control folder on the **Electronic Data Storage Device(s)**.

## **SURVEY METHODS AND TECHNOLOGIES – LiDAR and Mobile Mapping**

Use of static terrestrial laser scanning and mobile mapping (mobile terrestrial laser scanning or LiDAR) methods will be considered for completion of portions of this project providing a savings in schedule, time and costs, improved safety and reduced traffic control and costs, among other benefits can be shown while providing the required data accuracy.

Any use of these technologies shall conform to and utilize the **2014 MDOT Standards of Practice for Design Surveys** and the existing terrestrial scanning standards in **Appendix D (MDOT Interim Mobile Terrestrial LiDAR (MTL) Standards and Guidelines)** and the Specifications/Guidelines based on the **Caltrans Survey Manual Chapter 15 Terrestrial Laser Scanning Specifications**. **Project deliverables and reports shall include the information, electronic files and reports referred to in Appendix D of the MDOT Standards of Practice for Mobile Terrestrial LiDAR, the MTL portion of the MDOT QA/QC Checklist, and the Caltrans Specifications under MTL Documentation.**

**Mobile Mapping is approved to be used on this MDOT project and the following shall apply:**

A Mobile Mapping trajectory plan and a ground control target layout plan (including the locations of any CORS GPS Stations and/or any local GPS base stations and how they are/were established) shall be submitted with the work plan and priced proposal and prior to start of work for review by Thomas W. Benson, P.S. and /or Kelvin J. Wixtrom, P.S. and Lansing Design Surveys.

LiDAR acquisition shall be done when pavement is dry.

LiDAR acquisition should be obtained at traffic speeds to avoid impeding traffic but also ensuring adequate spacing from surrounding traffic so LiDAR collection is not obscured by traffic.

Multiple passes may be needed to eliminate as much obscured areas as possible.

LiDAR acquisition settings and operating speed shall be done in a manner to maintain accurate data and consistent data spacing throughout the project. Data extracted from LiDAR shall be delivered with a consistent spacing used by all operators. No significant spacing differences should be detectable in the extracted mapping throughout the project.

LiDAR acquisition shall include collecting images along the trajectory routes to colorize the point cloud. Images will also be required for supplemental viewing by designers. These images shall be rotated to an upright view, if needed, indexed, geo-referenced and delivered with associated trajectory and with the LiDAR data.

The trajectories, as driven, shall be processed/refined and, combined with the LiDAR data that has been acquired, shall be registered to the ground control targets. A portion of the ground control targets (typically about 1/3 to 2/3 of the total targets) shall be withheld from the registration process and used as independent points solely for validation of the point cloud and derived project data.

**Early MTL Deliverables**

Upon completion of the raw LiDAR processing and registration and **prior to mapping** extraction, copies of the following shall be provided to Lansing Design Surveys and the Survey Project Manager for review:

- Project report describing in detail how the mobile mapping project was done, number and general location of passes to acquire data, equipment used, datum surveyed on, and results of the processing.
- The trajectory plan and a ground control target layout plan (including the locations of any CORS GPS Stations and/or any local GPS base stations) use to complete the LiDAR data acquisition. Provide a copy of manufacturer's trajectory plot, a set of TopoDOT TopoMission project files and set of .kml/.kmz files.

- Reports and printouts from the processing software showing the results of the registration process.
- Target to cloud registration – Statistics and comparison of the point cloud to the targets
- Cloud to cloud registration – Statistics and comparison of adjoining overlapping point clouds.
- Separation of forward and reverse solution (difference between forward and reverse post-process roll, pitch, yaw and XYZ positions solution).
- Areas of the project that the data collected exceeded the maximum elapsed time or distance traveled of uncorrected IMU drift due to GNSS signal loss or obstruction.
- Comparison of elevation data from overlapping (side lap) runs
- Comparison of points at the area of overlap (end lap) if more than one GNSS base is used.
- Primary control list and least squares adjustment reports (i.e. LGO, Starnet, etc.) for the control.
- Intermediate control list and least squares adjustment reports (i.e. LGO, Starnet, etc.) for the control.
- Point listing of the Targets used for the Mobile mapping and the least squares adjustment reports (i.e. LGO, Starnet, etc.) for these points.
- Point listing of the Validation points used for the Mobile mapping and the least squares adjustment reports (i.e. LGO, Starnet, etc.) for these points.
- Project Accuracy reports of IMU data.
- Project Accuracy reports of GNSS data as well as PDOP and SV visibility.
- Project Trajectory reports showing forward/reverse comparison and amount of difference between runs, final results of combined forward/reverse adjusted trajectory and report of accuracies to the project control.
- Comparison spreadsheet showing the differences (fit) of the point cloud to the validation points. This spreadsheet shall include a resultant summary in NSSDA format showing the 95% difference in horizontal X and Y, and Vertical Z for the project.
- 3D Microstation DGN file and a .kmz file providing the graphical representation of the resulting differences between the project Point Cloud dataset and the targets and validation points.

### **Final MTL Deliverables**

Copies of the final deliverables shall be provided to the Survey Project Manager and to Lansing Design Surveys and shall include the following:

- Project report describing in detail how the mobile mapping project was done, number and general location of passes to acquire data, equipment used, datum surveyed on, and results.
- Complete listing of the Registration processing reports listed above.
- Comparison spreadsheet showing the fit of the control points/targets to the point cloud. (The TopoDOT Control points to point cloud analysis tool that outputs a spreadsheet and chart diagram is one accepted option.)
- Comparison spreadsheet showing the fit of the validation points/targets to the processed

point cloud.

- Comparison spreadsheet showing the differences (fit) of the final project DTM surface to the validation points. This spreadsheet shall include a resultant summary in NSSDA format showing the 95% difference in horizontal X and Y, and Vertical Z for the project.
- 3D Microstation DGN file and a .kmz file providing the graphical representation of the resulting differences between the final project DTM surface and the targets and validation points.
- 3D Microstation DGN file containing all mapping extracted from LiDAR point cloud.
- 3D Microstation DGN triangle file containing the terrain surface triangles created from the point cloud data.
- Terrain surface saved as a Geopak .TIN file generated from the point cloud data.
- LiDAR data tiled and saved in scanner native file format (such as Riegl .3dd, Cyclone .pts/.imp, etc.)
- LiDAR data with RGB and Intensity values tiled and saved as colorized .POD (Point Tools/Microstation point cloud file) files.
- DGN file showing the tile layout and naming of the .POD files. (If possible, use the same tile layout for both .POD and .LAS files.)
- LiDAR data collected shall be submitted in .LAS format with RGB values and intensity values.
- DGN file showing the tile layout and naming of the .LAS files. (If possible, use the same tile layout for both .POD and .LAS files.)
- Photo mosaic/Images along route that support the LiDAR .LAS point cloud. Provide a kml/kmz file, dgn index or direct folder naming that describes the organization of the images for easy access.

Point cloud files shall be provided on electronic media of an appropriate size to contain all project information. Two (2) copies shall be provided to MDOT Lansing Survey Support Unit. A third (3<sup>rd</sup>) copy shall be provided for use by the MDOT Region Surveyor.

LiDAR and Mobile Mapping information should be prepared and placed in a separate sub-folder named "LiDAR/Mobile Mapping" under the Project Mapping Folder and shall contain all information and LiDAR/Mobile Mapping deliverables relative to the project.

When other methods of survey and mapping are also employed for the project, the data shall be combined and merged with the mobile mapping data and the merged information provided in the appropriate electronic files per the project's scope and requested deliverables.

Due to the fact that no targets can be placed in or along the median side of the driving lanes, it is required that a check shot be obtained on the top of the median barrier wall. At a minimum of every 4<sup>th</sup> target, a Total Station will be set up and the top of the median barrier wall perpendicular to that set up will be Red Lasered with that point being compared to the LiDAR extracted data and placed in a spreadsheet. These locations may be altered if a more definable point is visible. The approach and plan shall be discussed with the Survey Project Manager.

## **VERTICAL CONTROL**

Bench marks need to be set at intervals of approximately 1000 feet and outside the proposed construction and must be accurately described and referenced by station and distance offset from alignment.

Intermediate Vertical Control for project bench marks shall meet an unadjusted error of closure between known bench marks of not more than **0.05 feet times the square root of the distance between the marks in miles**. Any error of closure must be distributed throughout the level runs by means of a suitable least squares adjustment software program.

Open level loops are **NOT** acceptable.

The bench mark notes must include all field observations, the unadjusted loop closures and the final adjusted elevations. A bench mark list must be developed that includes datum, designations, descriptions, elevations, and station and offset (left or right) out from the plan centerline. This bench mark list must be printed on 8.5" x 11" sheets and placed on a **Electronic Data Storage Device(s)**, in ASCII format per MDOT Standards of Practice dated May 2014 and the Survey Info Sheet. The printed list and the **Electronic Data Storage Device(s)** are to be submitted with the consultant's final report.

The methods used to establish the intermediate horizontal and vertical components of the project coordinate control system must be fully discussed in the Surveyor's Project Report.

## **ALIGNMENT**

**The Legal and As-constructed alignments are to be established for this project. As Built Plans will be provided to the selected consultant, as well as old MDOT survey notes, etc. upon request. A text file per the MDOT Standards of Practice dated May 2014 must be supplied with all the required data.**

**All recovered P.C., PT., P.I., and P.O.T. Alignment points located in hard surface roads are to be protected by a monument box.**

A detailed explanation of how the alignment was established, along with all documentation, is required as part of the surveyors report.

At least two alignment control points must be found or set and witnessed on each tangent. These points must be inter-visible. The project surveyor must provide a sufficient number of primary and intermediate control points to allow staking of the computed alignment without additional traversing by construction survey crews. The alignment notes must include the state plane coordinates and at least four witnesses for each alignment control point set or found.

The consultant must include a sketch or CADD drawing of the alignment in the portfolio, showing stationing, horizontal coordinates, curve data (Radius, External, Tangent length, PC station, PI station and PT station), alignment points found or set, and the basis from which the project stationing was determined. **An ASCII file named JN#ALI.TXT will be created and a JN#ALI.XML file must be exported into the Geopak folder for design use.**

**The alignment drawing will show the tie / correlation to the actual location of the Legal Alignment.**

**Non Legal Right of Way lines are required to be placed on the MicroStation drawing. A disclaimer should be included, within the CAD file, as to this also.**

#### **PROPERTY**

**MDOT may or may not be acquiring Right Of Way or Grading Permits for this project, however, perpetuation of found property irons within the reconstruction area will be necessary.**

**Also required is the Structure / Building type and address for all parcels within the project limits. This information shall be placed in the Microstation drawing. A GIS type database may also be created and supplied to satisfy this requirement.**

The property section is comprised of all PROPERTY CORNER/SURVEY information required for this project. This includes all pertinent recorded plats (subdivisions and condominiums), tax maps, tax descriptions, recorded and unrecorded surveys, and ties to the project coordinate system for found or set monuments. This information will be used, in part, to identify the ownership of the abutting property which may be affected by this project and to prepare the legal descriptions for any property and/or easements which MDOT may need to obtain. All existing plat monuments and property corners shall be located and tied to the legal alignment. This shall include property along side streets for 100 feet from the structure fascia's.

#### **GOVERNMENT CORNERS**

**Government corners may or may not be required for this project. If a PLSS Corner is recovered or established as part of this project then the requirements of Act 74 and its updates shall be accomplished.**

## **MAPPING**

**Mapping of I-75 (Fisher Freeway) will begin 500 feet south of the south abutment of Structure B-01 (approx. sta. 987+73.00) and conclude 500 feet north of the north abutment of Structure S-06 (approx. sta. 1098+60.00) All intersecting streets will be mapped for a distance of 100 ft. from the bridge fascia or as far as possible. Driveways will be mapped as far as possible or up to 100 ft. for matching grade lines. The on / off ramps for Dearborn Street will also be required as part of this project. The substructure elements of both structures – B-01 and S-06 – as well as the surrounding ground to a limit of 100 feet from the bridge fascia's needs to be obtained as part of this survey. See the attached Survey / Mapping Action Requests.**

**Also, Elevation View sheets will need to encompass no more than 4 piers per 11 x 17" size paper to display the required information legibly. These views are required to include the vertical differences between the substructure elements from the top of the pier to the bottom of the beam as well as the requested information on the Survey / Mapping Action Request.**

### **Topographic Mapping and Terrain Elevations**

All features / surface manifestations / elevations that might affect the design of this project must be shown on a comprehensive plot prepared from field survey measurements. The sight distance between observations should not exceed 660 feet to obtain any elevation data, especially for hard surface elevations. Elevations of the ground surfaces should be recorded to the nearest 0.01 foot. The standard error for ground elevations must be no greater than 0.05 feet. All hard surfaced roads, curbs, sidewalks and water surface elevations must be recorded to the nearest 0.01 feet. The standard error for these elevations must be no more than 0.02 feet. This standard can be met by differential leveling or by total station trigonometric survey. The instrument height and target height must be measured and recorded to the nearest 0.01 foot and sights must be taken to targets on prisms.

All drainage structures (Catch Basins, Sanitary Manholes, Storm Manholes, Culverts, etc.) within the defined project limits will be located and identified - a spreadsheet report is required which correlates to the Microstation drawing and shall depict whether structure is mainline or driveway, location by station and offset, size, pipe direction, connection point, rim and invert elevations, material, end treatment or not, and any other pertinent data.

When mapping field work, the horizontal and vertical control for the project must be checked into as random shots to the recorded designations. The difference between mapping checked coordinates and previously adjusted coordinates must not exceed 0.05 feet in x, y or z.

This section of the portfolio will contain sections for all topography, elevations, surface / subsurface utility locations, and surface / subsurface drainage, including any and all cross culverts.

A statement, similar to the following, must be affixed to each sheet of all plots which certifies to the maps accuracy and signed and sealed by the project surveyor:

*I hereby certify that this map has been developed from survey data collected, and that the accuracy standards are in accordance with the MDOT Design Survey Standards. This map correctly represents the existing conditions at the time the survey was completed.*

**The Consultant is responsible for using the most current version of Power GeoPak and Microstation.**

*As there are many variations in standard practices throughout the industry, it is recommended that the consultant refer to the attachments and the MDOT Design Division Plans Preparation Guidelines for additional information regarding such things as font size, display attributes, symbology, levels, etc., to be displayed in the submitted planimetric file. Any questions or confusion should be immediately brought to the attention of the MDOT Project Manager for clarification.*

Specific descriptive information to be shown on certain items are: Tree descriptions shall include species type and trunk diameter, in inches, 4 ft. above the ground; Culvert type, size in inches and flow line elevation; Brush and wooded areas should be outlined and classified as to average size and density. Additional information that should be noted is surface materials, changes in surface materials, curb detail (profile type), ditch type (e.g. 2 ft. round bottom), contours on the appropriate level and interval, building or mailbox addresses and other noteworthy items. This information may be included on the CADD file (on the proper level), or handwritten on a field verification plot. The plots will be submitted as described under the section of Final Reports.

A statement, similar to the following, must be affixed to each sheet of all plots which certifies to the maps accuracy and signed and sealed by the project surveyor:

*I hereby certify that this map has been developed from survey data collected, and that accuracy standards are in accordance with the MDOT Design Survey Standards. This map correctly represents the existing conditions at the time the survey was completed.*

All plots must be clearly defined and legible. An illegible plot will not be acceptable.

## **UTILITIES**

**The consultant will be responsible for any local utility information within the project limits.**

All surface manifestations of utilities within the project area must be identified and their location tied to the projects horizontal coordinate system. A list of all utilities within the project limits must be submitted on a **Electronic Data Storage Device(s)** as well as on a printed list. This list must include the feature name of each utility, its horizontal coordinates and elevation, and station and offset. A GeoPak generated station and offset report will satisfy this requirement. **Each report per feature code shall be a separate document.**

From each utility in the project area, the consultant shall submit the name of utility, address, phone number, and have a contact person listed.

## **DRAINAGE**

The consulting firm is required to contact all local officials necessary to obtain all surface and subsurface drainage information regarding the project. The consultant must also ask the local officials about any known drainage problems within the project area and report their findings, as well as any observed drainage problems in a separate drainage report.

The following information is required for all surface and subsurface drainage:

The type, size, condition, end section treatment, location, station, offset distance, surface and bottom or invert elevation of each drainage structure, horizontal and vertical misalignment and visible damage to any structure. This information must be printed in an .XLS spreadsheet format and submitted on an **Electronic Data Storage Device(s)** in ASCII format.

Descriptions of underground drainage structures shall include: description and type of structure, type of system (storm, sanitary, etc.), description or type of structure cover, size, type, invert elevation and direction of each pipe leading into or out of the structure.

The location of all catch basins, manholes, and cross culverts must be shown on the topographic map showing connectivity. It may be necessary to prepare a separate plot to clearly show the surface drainage systems. Underground sanitary and storm systems must be mapped to show the connectivity of the structures. This may be added to the CADD file or hand sketched and submitted on a separate topographic plot made specifically for this purpose.

## **MISCELLANEOUS**

Any information that would not be appropriately placed in the control, property or mapping sections should be included in this section. General photographs, local newspaper articles and project-related comments from residents are examples of miscellaneous data.

The surveyor must describe, in the final report, the data included in this section.

**FINAL REPORT: 3 Electronic Data Storage Device(s) shall be submitted to the Survey Project Managers listed on page 2 of this scope.**

The final report for this project shall include:

1. In the first pocket of the portfolio, labeled **ADMINISTRATIVE**, the following will appear:
  - a. MDOT's Form 222(5/01) entitled "SURVEY NOTES: RECEIPT AND TRANSMITTAL"
  - b. The project's Professional Surveyor's Report on company letterhead consisting of:
    - i) A comprehensive synopsis of the work performed on this project, signed **and sealed** by the project's Professional Surveyor.
    - ii) The source and methods used to establish the project horizontal and vertical control and alignment(s) for this project.
    - iii) A detailed explanation of anything discovered during the survey of this project that may create a problem for the designer or another surveyor.

- c. **Electronic Data Storage Device(s)** with all documents scanned or converted into PDF files. Each page must be inserted in a master PDF file and bookmarked for easy retrieval. An example can be provided upon request.
  - d. MDOT QA/QC Checklist.
2. In the second pocket of the portfolio, labeled **ALIGNMENT**, the following will appear:
    - a. A sketch or CADD drawing of the alignment(s):
      - i) A statement defining the alignment(s) as **legal or as-constructed**
      - ii) Stationing, source of stationing, and station equation to existing stationing
      - iii) Horizontal coordinates
      - iv) Curve data
      - v) Alignment points found or set
      - vi) Control points
      - vii) Reference lines and angles of crossing (if appropriate)
      - viii) Government corners
    - b. Witness list for the alignment points found or set, which shows coordinates, stationing and four witnesses for each alignment point
    - c. LCRC's for alignment points found.
  3. In the third pocket of the portfolio, labeled **CONTROL**, the following will appear:
    - a. Documentation of horizontal and vertical datum sources.
    - b. OPUS documentation
    - c. Least squares adjustments for the horizontal and vertical control.
    - d. Text files in ASCII format, hard copy and on **Electronic Data Storage Device(s)**, which contain the witness lists for the horizontal alignment ties, horizontal control points, benchmarks and government corners. All witness lists must note the datum(s), a combined scale factor for state plane grid-to-ground conversion, and an example thereof.
    - e. A GeoPak MicroStation drawing file showing the above data.
  4. In the fourth pocket of the portfolio, labeled **PROPERTY**, the following will appear:
    - a. Tax maps and descriptions with owner names, addresses and phone numbers, if Right of Way is to be acquired
    - b. Property ties to the project coordinate system with maps, plats, and recorded surveys marked with point numbers, if Right of Way is to be acquired.
    - c. Legible **recorded** copies of all Land Corner Recordation Certificates (LCRC) filed for the government corners (PLSS corners and Property Controlling Corners) used for computations and/or in danger of obliteration by impending construction.
  5. In the fifth pocket of the portfolio, labeled **MAPPING**, the following will appear:
    - a. Mapping file in MicroStation format, and converted to .PDF format. Hardcopy signed and sealed.
    - b. A **separate folder named Geopak** to contain all related Geopak files.
    - c. All field survey notes, electronic data and research records obtained for the project. It is not necessary to submit electronic raw survey data in hardcopy form.
    - d. All supporting and supplemental information or data.
  6. In the sixth pocket of the portfolio, labeled **MISCELLANEOUS**, the following will appear:
    - a. Any photographs taken for clarity of an area in **JPG format**

- b. Any newspaper clippings related to the project
- c. Any information not covered in this scope that will be of benefit to the designer or another surveyor

### **General Notes**

- a. It is the responsibility of the consultant to insure that all electronic files submitted to MDOT conform to the required format and that all documents are legible.
- b. The consultant must organize and label the various sections of the portfolio as required by the Standards of Practice for MDOT Design Surveys dated May 2014.
- c. All research documents are required to be scanned and placed on the **Electronic Data Storage Device(s)**.
- d. It is desirable to limit paper and to include as much electronic data as possible on a **Electronic Data Storage Device(s)**, including scanned items, to facilitate future electronic storage and transmission of survey data. **THREE Duplicate Electronic Data Storage Device(s) must be included in the portfolio, with one set labeled "Region Surveyor"**.
- e. **The MDOT QA/QC Checklist dated May 2014 will be one of the documents followed during the review. Be sure all aspects are accounted for during the survey and submittal.**

### **CONSULTANT PAYMENT:**

Compensation for this project shall be on an **actual cost plus fixed fee** basis. This basis of payment typically includes an estimate of labor hours by classification or employee, hourly labor rates, applied overhead, other direct costs, subconsultant costs, and applied fixed fee. The fixed fee for profit allowed for this project is 11.0% of the cost of direct labor and overhead.

All billings for services must be directed to the Department and follow the current guidelines. The latest copy of the "Professional Engineering Service Reimbursement Guidelines for Bureau of Highways" is available on MDOT's website. This document contains instructions and forms that must be followed and used for billing. Payment may be delayed or decreased if the instructions are not followed.

Payment to the Consultant for services rendered shall not exceed the maximum amount unless an increase is approved in accordance with the contract with the Consultant. Typically, billings must be submitted within 60 days after the completion of services for the current billing. The final billing must be received within 60 days of the completion of services. Refer to your contract for your specific contract terms.

Direct expenses, if applicable, will not be paid in excess of that allowed by the Department for its own employees in accordance with the State of Michigan's Standardized Travel Regulations. Supporting documentation must be submitted with the billing for all eligible expenses on the project in accordance with the Reimbursement Guidelines. The only hours that will be considered allowable charges for this contract are those that are directly attributable to the activities of this project.

MDOT will reimburse the consultant for vehicle expenses and the costs of travel to and from project sites in accordance with MDOT's Travel and Vehicle Expense Reimbursement Guidelines, dated May 1, 2013. The guidelines can be found at [http://www.michigan.gov/documents/mdot/Final\\_Travel\\_Guidelines\\_05-01-13\\_420289\\_7.pdf?20130509082418](http://www.michigan.gov/documents/mdot/Final_Travel_Guidelines_05-01-13_420289_7.pdf?20130509082418). MDOT's travel and vehicle expense reimbursement policies are intended primarily for construction engineering work. Reimbursement for travel to and from project sites and for vehicle expenses for all other types of work will be approved on a case by case basis.

MDOT will pay overtime in accordance with MDOT's Overtime Reimbursement Guidelines, dated May 1, 2013. The guidelines can be found at [http://www.michigan.gov/documents/mdot/Final\\_Overtime\\_Guidelines\\_05-01-13\\_420286\\_7.pdf?20130509081848](http://www.michigan.gov/documents/mdot/Final_Overtime_Guidelines_05-01-13_420286_7.pdf?20130509081848). MDOT's overtime reimbursement policies are intended primarily for construction engineering work. Overtime reimbursement for all other types of work will be approved on a case by case basis.