**Signal Timing Project Scope (Consultant: [ABC], PID [123456])**

This project will provide optimized traffic signal timings for the following signals listed below:

|  |  |  |
| --- | --- | --- |
| **Main Street** | **Cross Street** | **Maintaining Agency** |
| Main Street 1 | Cross Street 1 | ODOT DX |
| Main Street 2 | Cross Street 2 | ODOT DX |
| Main Street 3 | Cross Street 3 | ODOT DX |
| Main Street 4 | Cross Street 4 | ODOT DX |

Google map link of limits: [insert link]

**Task 1: Equipment Inspection** - A field inspection should be conducted to identify any detectors, pushbuttons or other appurtenances that are not operational that could affect system operation. The inspection shall be performed by an International Municipal Signal Association (IMSA) certified Level II Field Technician (minimum) traffic signal inspector. Included shall be a confirmation that internal controller clocks are synchronized (system parent and local clocks). A list of deficiencies will be provided to the maintaining agency identifying any problems. Prior to commencing any additional work, repairs must be made by the maintaining agency in order for the system to work as intended. The consultant shall report to the maintaining agency, systems that show excessive clock drift during the inspection. The maintaining agency will consider this information to determine if physical system changes are required to prevent future clock drifting from affecting system operation. If non-ODOT signals are involved, include a summary that indicates a list of intersections with controller type, cabinet type, and time sync capabilities.

As part of the equipment inspection, the technician shall fill out the ODOT Traffic Signal Timing Inspection Form, included in *Appendix F*. Overlaps shall be identified as either hard wired into a parent phase, or driven via load switch and controller software. If a central signal system is in use, it shall be noted and verified as operational. If Leading Pedestrian Intervals (LPI) are desired for an intersection that is not suitable for implementation, district and central office contacts shall be notified. LPI programming information can be found [here](http://www.dot.state.oh.us/Divisions/Operations/Traffic/miscellaneous/Pages/Traffic-Signal-Resources.aspx).

**Task 2: Counts** – The consultant shall provide 24-hour Automatic Traffic Recorder (ATR) road volume counts at a critical location(s). These counts should then be evaluated and used to determine when weekday and weekend timing plan changes are necessary and if/when the system should be set to free operation. The consultant shall determine the AM Peak, off peak, PM Peak and Midday hours for the timing plans and models based off the 24-hour critical location count(s). If authorized, consultant shall determine weekend off peak and weekend peak hours for the timing plans and models based off the 24-hour critical location count(s). Once determined, the consultant shall contract with a traffic data video processing company to improve efficiency in obtaining necessary traffic counts for the remaining intersections listed for the proposed timing plan hours (typically only 4 noncontiguous hours’ worth of turning movement counts at each intersection are required to create a weekday plan).

Turning movement counts will be provided to the maintaining agency and ODOT in a format that can be input directly into Synchro 10 and the [ODOT signal warrant spreadsheet](https://www.transportation.ohio.gov/wps/portal/gov/odot/working/publications/signal-resources), or Jamar Petra Pro and PC Warrants for Windows to save additional time/money and improving data entry accuracy. Pedestrian counts should be included in the typical turning movements counts.

Summarize counts used in the model per the ODOT standard spreadsheet in *Appendix E*.

The consultant should compare counts to the Office of Technical Services seasonal adjustment factors charts to determine if adjustments should be made based upon the time of year the counts are taken**.**

During the Covid-19 pandemic, an informal report comparing data collection vs. a recent historical count shall be done. A determination to use adjustment factors will be made at that point between all stakeholders—ODOT District & CO and Local Agency (if applicable).

**Task 3: Measures of Effectiveness (existing timing)** - The consultant shall perform travel time studies documenting existing conditions. Generally, four to six sets of travel time studies shall be made, one for each of the weekday AM, Midday, PM and off-peak timing plans; as well as the off-peak and peak weekend periods, if authorized, identified from the ATR counts. See Task 5.ii. for required proposed models.

Each travel time study shall have at least 6 bi-directional timing runs when following the Floating Car Method. All travel time studies shall be made using Institute of Transportation Engineers (ITE) recommendations and shall be accomplished using a GPS-based automated device using Tru-Traffic OR using Inrix Analytics (dataset of M-F and/or Sat-Sun with minimum one month of comparable data).

**Task 4: Timing Parameters** - Minimum green times shall be per local agency policy or, in the absence of a policy, shall be provided per the typical times listed below:

|  |  |
| --- | --- |
| **Movement** | **Minimum Green (s)** |
| Mainline Through | 20-30 |
| Side street Through | 8-12 |
| All Left Turns | 6-8 |

Vehicle clearance intervals (Y+R) shall be calculated per ODOT Traffic Engineering Manual (TEM), Section 403-2. Pedestrian clearance intervals shall be calculated per the Ohio Manual of Uniform Traffic Devices (OMUTCD) 4E.06 and adhere to the criteria in the Office of Traffic Operations Signal Design Reference Packet (SDRP). Where applicable - authorization may be given to update railroad preemption clearance intervals.

Peak-hour factors for each intersection/timing plan shall be calculated based upon traffic volumes. Right turn on red will be allowed in the model when the condition is allowable in the field.

Note: One critical intersection should always be forced to have an offset of zero in all timing plans. This will allow the critical intersection to always be at the proper offset when timing plan changes are implemented. This will be the Zero Offset intersection in the synchro base model.

**Task 5: Modeling** – The initial complete and optimized base Synchro model shall be emailed to Charles.Fisher@dot.ohio.gov and Patrick.Mead@dot.ohio.gov of the Office of Traffic Operations (OTO) for review and approval PRIOR to any timing plans being created. This initial model shall include the correct minimum initials, vehicular clearance, pedestrian intervals, and aerial background image. With the model shall be an “Existing Geometrics and Signal Layout” diagrams including intersection phasing. This is a one page per intersection diagram with an aerial of the intersection showing the signal layout (and phase diagram). An example template is in *Appendix C*.

The time of day models should use the highest volume hour. Model approval and/or required revisions will be returned typically within two weeks to the consultant via email. The time of day models should be complete with the various applicable local timing parameters including:

1. Min Initials;
2. Min Splits;
3. Pedestrian Intervals;
4. Yellow Time;
5. Red Time;
6. Vehicle Extension/Min Gaps

The models shall use a csv data file for the counts and read accordingly for each Time of Day plan.

The specific tasks related to modeling are:

**(i) Field Work -** shall be performed, if necessary, to gather necessary model parameters, including basic geometrics, lane use, turn lane storage length, intersection widths (red calculation), pedestrian crossing widths, lane widths, intersection spacing, signal phasing, etc.

**(ii) Model Creation -** Shall consist of the physical creation of the Synchro 10 timing model using already gathered volume information and field work information. ODOT Office of Traffic Operations will provide the Synchro template and checklist that shall be used to create the models (<http://www.dot.state.oh.us/Divisions/Operations/Traffic/miscellaneous/Pages/Synchro-Template.aspx>). The Synchro Model checklist shall be filled out, signed, and submitted along with the model. A base model should be created and submitted to ODOT for review/approval as described above. The consultant may at his/her discretion create the other timing plan models; however, they shall be revised accordingly based upon any comments received from ODOT on the submitted base model. Models shall be created for each of the following timing plans with checkmarks:

* [ ]  Weekday AM peak
* [ ]  Weekday MID peak
* [ ]  Weekday PM peak
* [ ]  Weekday Off peak
* [ ]  Weekend Off peak (if authorized)
* [ ]  Weekend peak (if authorized)
* [ ]  High Volume plans (if authorized)
	+ When authorized, three High volume plans shall be created by adding 30% to traffic volumes. One plan shall be created that favors a balanced progression, and two more plans shall be created, each one favoring a different mainline direction progression. The High Volume plans shall be developed by adding no more than 20% of the highest cycle length developed from the standard timing plans. These plans will not be put into service by Time of Day but will be reserved for future use for incidents or events impacting the corridor.
	+ Specific High Volume corridor characteristics to model and create:
		- Balanced Plan, which uses Plan highest volumes + 30%
		- (ie— SB progression (Plan to be determined by study) + 30% NBLT and SBRT from the ramps to travel SB on SR-xx)
		- (ie— NB progression (Plan to be determined by study) + 30% volume increase NBRT and SBLT from the ramps to travel NB on SR-xx)

**(iii) Model Check/Calibration -** shall consist, when necessary, of making vehicle and driver parameter changes to ensure the model accurately represents real-world conditions. If available, upon request, ODOT will provide initial INRIX speed data for the corridor.

**(iv) Bandwidth Check** – Tru-Traffic shall be utilized during the Measure of Effectiveness of the proposed timing plans (the post runs) to verify that the timing plan is being properly implemented by the signal system.

**(v) Timing Table Creation-** shall consist of making easily readable timing tables for use in the field (or via download) to program controllers with optimized timing plans. Existing controller timings will be provided at each intersection, if requested, such timings should then be summarized into the spreadsheet for ease of reviews and to compare existing to proposed timing. Included shall be cycle lengths, splits, offsets, local timing parameters (min, max, recalls, yellow, red, ped timing, memory settings, etc). Also included shall be plan transition times (time when a plan is scheduled to begin). The standard ODOT timing tables are provided in *Appendix D.*

Note: The implementation of a new timing plan (plan transition time) should normally occur at least a half hour prior to when it is needed. The implementation of a new timing plan can cause a lack of coordination for 2-4 cycle lengths, so this disruption should be completed prior to the onset of peak hours.

**Task 6: Field Timing Plan Implementation** – The maintaining agency or an equipment vendor will install the new timing plans. Consultant should review installed timings via database print outs and/or field checks to insure they are correct in the controller.

**Task 7: Field Observation and Timing Adjustment Recommendations** – The consultant shall make field observations of implemented, optimized signal timings. The recommended timing adjustments shall be submitted to the maintaining agency for approval. The maintaining agency or an equipment vendor will install the recommended timing adjustments.

**Task 8: Measures of Effectiveness (optimized timing)** - The consultant shall perform travel time studies documenting optimized conditions. Generally, four to six sets of travel time studies shall be made, one for each of the weekday AM, Midday, PM and off-peak timing plans; as well as the off-peak and peak weekend periods, if authorized, identified from the ATR counts. See Task 5.ii. for required proposed models.

Each travel time study shall have at least 6 bi-directional timing runs. All travel time studies shall be made using ITE recommendations and shall be accomplished using a GPS based automated device using Tru-Traffic OR using Inrix Analytics (dataset of M-F and/or Sat-Sun with minimum one month of comparable data to existing data).

The optimized travel time runs shall be performed as nearly as practical on the same days and times as the existing condition runs.

**Task 9: Meetings** - The consultant shall attend a pre-meeting with ODOT Office of Traffic Operations and the maintaining agency, and a post implementation meeting. The pre-meeting can be performed via conference call if this is agreed upon by all parties prior to the meeting. The ODOT Signal Timing Kick-Off Document shall be completely filled out and signed by the maintaining agency prior to the pre-meeting. After the pre-meeting, the consultant shall submit a project schedule to both ODOT Office of Traffic Operations and the maintaining agency for approval. At the post implementation meeting, the local agency, ODOT Office of Traffic Operations, and the consultant shall review the reports and discuss changes to be made.

**Task 10: Deliverables** -

Deliverables (I – XIV) shall be supplied by the consultant to ODOT Office of Traffic Operations via a consultant provided ftp site for every project without regard to who maintains/operates the signals.

All deliverables shall be separately provided to the maintaining agency for any signal system not maintained by ODOT.

As noted earlier, project tasks will vary by location. In those cases, the deliverables will be adjusted as appropriate. The following deliverables shall be provided:

1. **Operational Report:** This report will be provided for every signal timing project. The following shall be included in the operational report:
2. Brief executive report
	* 1. Include summarized tables showing before/after Measurements of Effectiveness (MOEs) using Tru-Traffic or Inrix Analytics.
	1. Estimated Signal Retiming Benefits Summary
		1. See specific template for Tru-Traffic vs. Inrix Analytics on ODOT Signal Timing website
	2. Existing Geometrics and Signal Layout/Phasing (one per intersection).
		1. This is one page per intersection and the format will be provided (the same document that was provided with the Synchro model review).
	3. Signal timing summary of existing and proposed timings.
	4. Summarized traffic counts.
	5. Traffic signal timing inspection forms.
	6. Screen shot of the time space diagram (TSD) for each timing plan. The TSD shall have the flows and queue features activated.

**Electronic**

1. A copy of the .SYN and .SIM files for the proposed timings (one each for every timing plan)
	1. Include the aerial image used in the model.
2. A signal system layout diagram, per Visio example
3. Tru-Traffic files (if applicable)
4. Signal Timing spreadsheets; Original and PDF
5. Existing Geometrics and Signal Layout/Phasing files in Visio
6. Summarized Volume spreadsheets and charts; Original and PDF
7. Traffic Signal Timing and Inspection Reports
8. Estimated Signal Retiming Benefits Spreadsheet; Original and PDF
9. .CSV volume data file used for the Synchro time of day models
10. Photos
	1. Include pictures taken of signal heads, cabinets, controller, detection, approaches, etc.
11. Turn Movement Counts in ODOT Signal Warrant spreadsheet format (or Jamar Petra Pro format or PC Warrants for Windows)
12. Access to traffic data video processing account for ODOT
13. Intersection Summary Diagram
	1. Include existing Geometrics and Signal Layout/Phasing information as well as intersection timing data and setting for each re-timed intersection. Example in *Appendix G*.