VISSIM MODELING GUIDANCE

This document outlines standard practice methodologies for VISSIM related microsimulation operational analysis on Louisiana Roadways.

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

Calibration

Two calibration metrics are required of all VISSIM models submitted to DOTD:

- Travel time and/or speed
- Vehicle throughput

Additionally, engineering judgment will be required for locations with existing queues and overall network operations. All calibration must consider the following:

- Seeding time must allow a car to travel from one end of the network to the other.

- A minimum of 10 simulation runs must be completed before average outputs of all runs can be used for analysis. Additional runs may be necessary, up to 15 runs or by showing convergence of the model.

VISSIM MODELING TECHNIQUES

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Modeling Techniques

Vehicle Inputs

Vehicle inputs must reflect current vehicular composition and speeds using existing vehicle traffic counts and travel data. At a minimum, Vehicle Inputs will take into consideration automobiles (class 1-3), buses (class 4-7), and trucks (class 8-13).

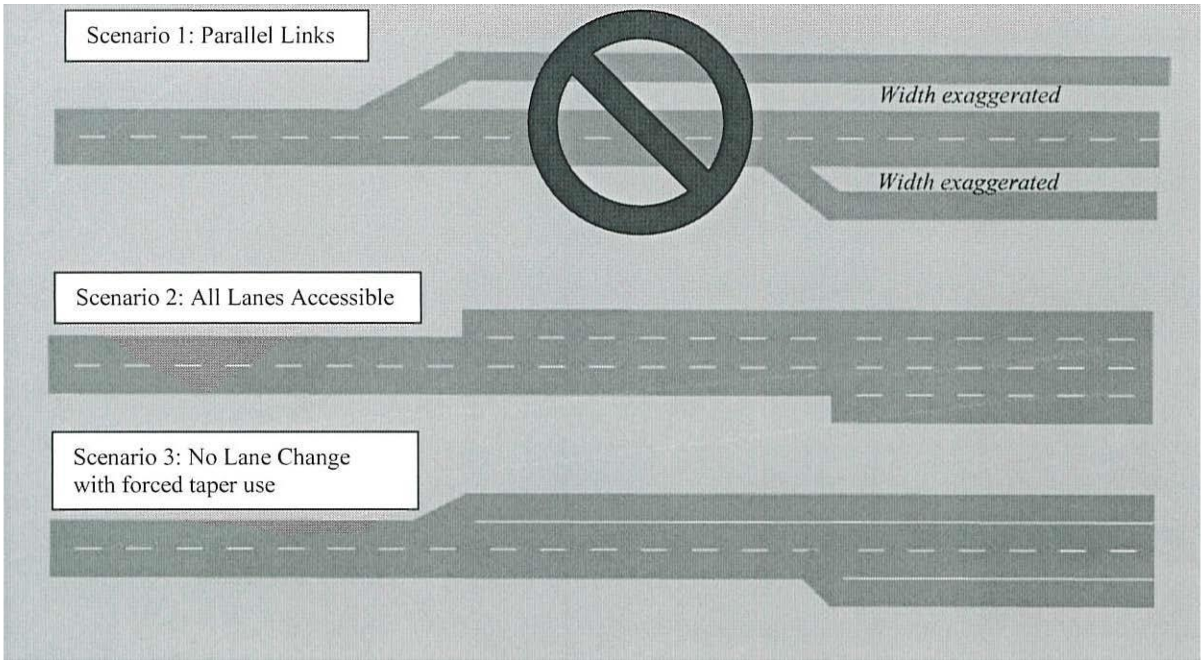
For all project studies, multiple Vehicle Input types must be created for all roadways entering the project area. For example, side streets with no trucks might use 100% automobiles, whereas mainline streets might use 90% automobiles and 10% trucks.

Links and Connectors

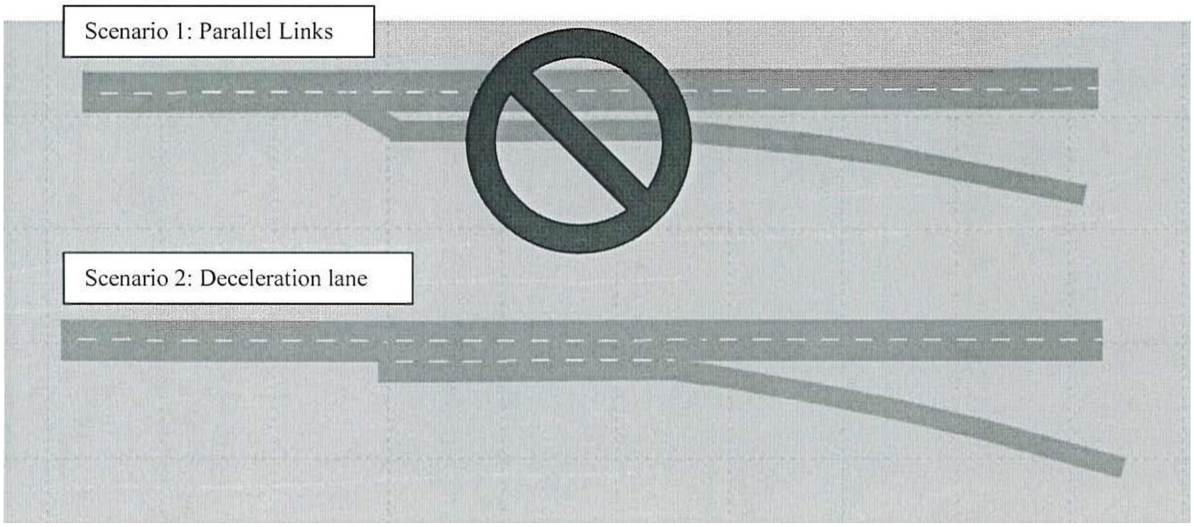
Network links shall be modeled per existing lane geometry.

Note that **Google or Bing** imagery (from Google Maps/Earth or Bing Maps for example) may not be accepted as a background image for large project areas due to scaling problems noted in past projects. Ensure scaling is accurate throughout the entire corridor if you use these images.

Segments of roadway with turning bays shall be modeled as links with all lanes accessible, rather than multiple parallel links (Scenario 1) each associated to a turning movement, as shown below, unless the existing conditions include a physical barrier between turn lanes. DOTD recognizes this approach differs from the PTV modeling technique. However, this approach allows users to then model forced lane use (with the use of no lane change options) through connectors if necessary (Scenario 3) or allow vehicles to merge smoothly into the turning bay (Scenario 2). Generally, this approach works best for longer turning bays, but for consistency, all models should use the "one link-all lanes" approach and adapt as needed.



Merges and diverges with acceleration and deceleration lanes shall be modeled similarly (one link-all lanes), one link with the acceleration or deceleration lane included as part of the mainline link, as shown below, unless the existing conditions include a physical barrier between the mainline and the ramp lanes (ex. Collector-Distributor lane).



In general, parallel link modeling is not an accepted methodology for operational analysis using VISSIM software unless specific roadway geometry prohibits movement along the lane (ex. solid barriers), ramp design allows for single on/off access from the freeway (ex. tapered diverge/merge), or the modeler can provide field data to show that all drivers merge/diverge using the taper only. There may be case-by-case exceptions, but the modeler should consider the above one link-all lanes approach unless the conditions suggest otherwise.

All connectors should be short and should not significantly overlap over the two links it connects.

Driver Behavior Parameters

Modelers are encouraged to develop driver behavior models in addition to the default VISSIM driver behavior models. Each corridor is unique and driver behavior models should reflect these patterns.

Driver behavior models shall not be altered when a VISSIM model is supplied and confirmed calibrated, unless specified otherwise. All alternatives analysis may alter driver behavior where improvements are implemented, but not where improvements are not implemented.

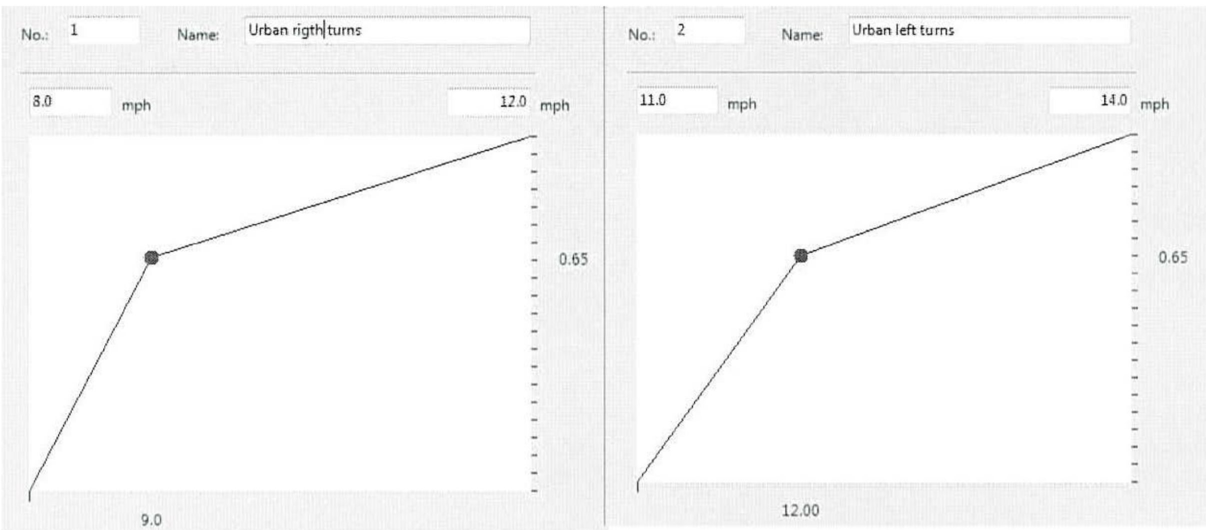
Pedestrian Models

Pedestrians should be modeled as a Vehicle Input instead of using the pedestrian module. If the modeler expects more than 30 pedestrians within the model, then the above Vehicle Input method must be used due to software limitations. Pedestrians should always be modeled where appropriate, unless specified otherwise.

Transit
For all Transit, bus alighting and boarding should be considered in addition to bus travel times, schedules, capacity (vehicle types), all stop locations, etc. On street bus stops should modeled as 50 feet to 100 feet depending on urban density. An alternative to boarding/alighting data is to use dwell time information, though this must be supported with field verified information.

Speeds

Turning Speeds
Turning speeds for intersection movements, or tight left/right turning vehicles, should be modeled using the speed distributions provided below. These speeds differ from the Synchro/Vistro defaults.



Speed reduction zones should be placed at the sharpest point on the curve of the link or connector. The speed reduction zones for turning movements should be short, usually within 5-15 feet depending on the curve length. Excessively long reduced speed zones will reduce the turning movement volume capacity and should only be used if the turning movement excessively reduces vehicle throughput.

Wide left turning movements or free right movements where vehicles can travel faster are especially susceptible to this condition and can be modeled with higher turning speed distributions with longer speed reduction zones (e.g. 5-30 feet at 25mph), if appropriate.

Speed reduction zones for ramps, specifically loop ramps, shall use a distribution of the ramp caution speed limit, usually within the 30-45 mph range. These can span the entire ramp (ex. tight loops) or only the sharpest curve of the ramp (ex. slip ramps) depending on field data.

All speed distributions above may be replaced with field based data, which must be documented.

Mainline Speeds

Mainline desired speeds should be modeled as a distribution of existing speeds along the corridor, **not** as the posted speed limit. Vehicles modeled in VISSIM must reflect existing conditions as accurately as possible. Scenario analysis may be performed after the base calibration is complete; however, existing conditions must be reflected in the models.

Use the default VISSIM Maximum Acceleration and Deceleration distributions. Make note should these be altered in the modeling effort.

Conflict Areas and Priority Rules

Conflict areas should be modeled for all conflicting movements that might occur. Specifically, permissive left turns, right-turn-on-red, and pedestrian conflicts. Not all movements must be coded, but those occurring in the field and specifically under congested conditions where an intersection might spillback should be coded.

Note that conflict zones work most efficiently for non-congested locations and tight conflict areas. For wide turns, congested networks, and other complex facilities, priority rules may be more appropriate to allow for smoother traffic flow.

Signals

Signal timings shall use RBC NEMA phasing standards or VAP for complex/innovative signals. All signal timings must use LADOTD timing sheets. New signals must meet DOTD standard practice and RBC timing sheet must be supplied for review.

Permissive left turn signal heads should be coded as an “Overlap” with parent phases as the through and left movement combined. This movement should not be coded through the “Or signal group” option in the Signal Head tool, but instead through the Signal Controller, which would then assign the Overlap phase in the Signal Head.

Right Turn On Red (RTOR) conditions must be coded into the networks where vehicles are permitted to turn if the signal is red. To code RTOR, use the stop sign tool and under the “RTOR” tab, select the “Only on Red” option for the appropriate Signal Controller and Signal Group. The stop sign should be positioned on the link/connector performing the right turn while a signal head for the through movement should still be coded in on the through link.

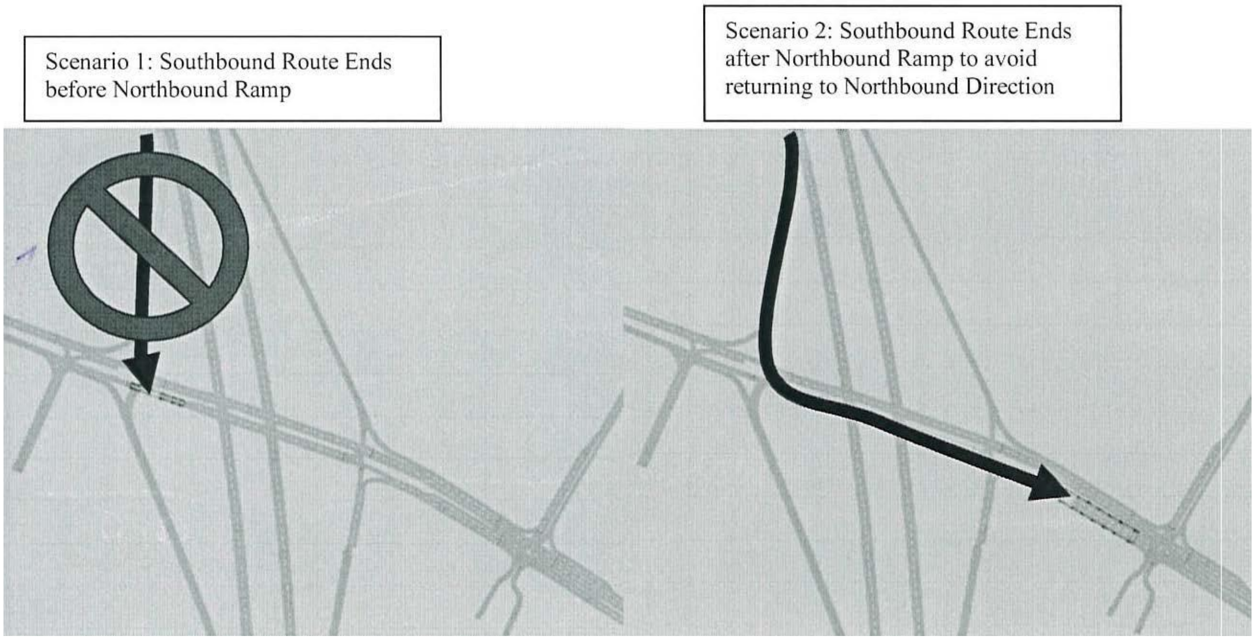
Caution: Import of Synchro files into VISSIM can lead to multiple errors and should be done with caution. Always confirm Synchro timings with actual controller timing sheets when possible.

Routing

Static Routing

DOTD currently uses Static Routing for most VISSIM simulation models. This requires a balanced network of traffic volumes to input in the VISSIM model that must be approved by DOTD. Routes should start at the farthest point from a “split” or volume change location to ensure the most distance for vehicles to make a decision.

Caution is advised for interchange locations where routing might cause “loop” conditions where a vehicle will be removed from the highway only to return in the opposing direction. To avoid these conditions, push highway traffic at interchanges through the following intersections rather than stopping a route right after the end of the ramp movement, as shown below.



Route end points **must** be on the same link as the following route’s start point.

Breakdown of truck routes versus automobile routes, or route combinations will be left at the discretion of the modeler. However, methodologies are expected to be submitted to DOTD for review.

<u>Dynamic Routing</u>
Dynamic routing shall be discussed on a case-by-case basis with the DOTD staff, as this requires an additional macroscopic modeling effort.