NORTH I-25 EIS

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TRAVEL FORECASTING NEEDS/DESIRES

- Multimodal: Roadway, HOV, HOT, Rail, Express Bus
- Defensible
- Reflect actions and impacts on SH 119, US 287 and US 85
- Inter-regional activity
- Land use sensitivity
- Connectivity to DUS and RTD transit system
- Estimate Measures of Effectiveness
    - Speeds
    - Congestion, LOS, screenline v/c
    - Travel Times
    - Roadway Volumes
    - Transit Ridership
    - VMT, VHT
    - Other
- Inter- and intra-transit activity
- Special events
- FTA standards
- Suppressed demand (latent and induced)
- Transit-dependent travel demand

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NORTH I-25 FRONT RANGE EIS
DRAFT Model Options

Brief descriptions and pros/cons of the following possible options are provided by this memo:

A. Combination of Two MPO Models

B. Combination of Two MPO Models and Create Long Trip Purposes

C. Separate MPO models with Inter-regional Submodel

D. Inter-regional Sketch Planning Model

E. Trip Table Analysis for Inter-Regional Travel

F. Experts' Choice – To Be Determined

A. Combination of Two MPO Models

DESCRIPTION:

- Involves the combination of the existing two TransCAD models into one inter-regional model.
- Networks and zone detail will be added in geography not currently included in the 2 models at their common boundaries. Zone aggregation may be explored in existing MPO coverage in order to reduce total number of zones.
- Number of zones will be about 3,800 to 4,000 total.
- Trip generation – the existing trip production and trip attraction models can be used with some modifications. Currently, DRCOG model has 3 trip purposes and the NFR has 6 trip purposes. For the new model, the number of trip purposes should be the same. If a decision is made to use DRCOG's three trip purposes, the NFR's trip generation models must be re-estimated. This task will likely involve combining the home-based university, home-based shop, work-based other, and other-based other purposes into one of DRCOG's three trip purposes (there may be a desire to make sure the income breakpoints for the home-based work trip purpose are consistent for the two models)
- Trip distribution – the approach tries to include each models' long inter-city trips (internal-external and external-internal) into the existing friction factor curves. The survey data will be reanalyzed to determine the production zone and attraction zone and trip purpose for DRCOG's IE and EI trips. The TAFS consultant team apparently conducted a survey on long trips in the NFR region. If available, these data will be analyzed for the same information. The friction factor curves by trip purpose will be modified to allow the inclusion of trips exceeding 40 miles in length.
- Mode choice – the NFR model currently uses a simple factor approach to determine mode shares. DRCOG uses a multinomial logit model that estimates the probability a trip is made by SOV, HOV 2 persons, HOV 3+, transit–walk, and transit-drive. DRCOG's mode choice model structure is one option that can be evaluated for use in the combined model.
- Trip assignment - on the highway side, DRCOG's model performs a 10-period traffic assignment; the NFR model performs a 4-period assignment. DRCOG uses an equilibrium process while the NFR model uses an equilibrium process for peak periods and a stochastic process for the off-peak periods. These differences will need to be reconciled. In addition, the VDF functions in both models are different. On the transit side, the

DRCOG model performs an all-or-nothing assignment for peak and off-peak networks. After mode choice, the DRCOG model applies time-of-day factors to estimate the percentage of transit trips by trip purpose that fall into the peak and off-peak periods. There is currently no transit in the NFR model.

- Common parameters will need to be evaluated for possible combination where necessary – facility types, area types, capacities, free flow speeds, input speeds, volume-delay functions, trip purposes, friction factors, highway skim assumptions (per mile costs), terminal times, and etc.

PROS:

- Relatively simple concept
- Uses DRCOG's current mode choice structure

CONS:

- Number of zones could result in long computer running times
- Calibration and validation data for inter-regional trip distribution is limited
- DRCOG's mode choice model not suited for inter-regional trips. Existing mode choice parameters may not be suited for long transit trips where other factors besides total travel time may affect travel behavior. No stated preference survey data available. May borrow from I-70 Mountain Corridor effort, but corridor characteristics are probably too different.
- Intensive model development effort
  - Network and zone modifications
  - Combining of model parameters not entirely straightforward
  - Will involve re-analyzing survey data, as available
  - Extensive calibration/validation required
- No data for mode choice model calibration/validation; no existing transit service between two regions.
- Forecasts could conflict with current long range plans (RTP)

B. Combination of Two MPO Models and Create Long Trip Purposes

DESCRIPTION:

- Same as Option B except,
- Add new "long" trip purposes for inter-regional trips
  - Remove current internal-external and external-internal trips at common borders
  - Define HBW, HBO, NHB "long" trip rates & friction factors, primarily based on DRCOG TBI data and possible TAFS survey data. Mode choice coefficients would be borrowed from another model.

PROS:

- Do not need to modify existing friction factors to accommodate long trips; instead, develop friction factor curves for new long trip purposes.
- Same as Option A

CONS:

- Same as Option A.

C. Separate MPO models with Inter-regional Submodel

DESCRIPTION:

- Run two MPO models independently. In effect, the NFRMPO model would be the primary model for highway alternatives.
- Build separate sub-model for inter-regional trips
  - Zone system and network will have to be developed with particular attention especially if transit options are considered.
  - Build inter-regional trip tables based on the internal-external trip tables of the two MPO models and available survey data
  - Focus on development of good trip tables for sub-model
  - Will need to decide on what type of mode choice model to use and how to implement: pivot-point or logit; spreadsheet or TransCAD.

PROS:

- Allow for focus on inter-regional sub-model
- May not require the standardization of common model parameters such as facility types, volume-delay functions, trip purposes, time-of-day factors, and others.

CONS:

- Desire to see intra-corridor transit ridership in NFR is limited since there is very little transit up north; also no HOV experience up north.
- Possibility of reduced congestion effect in sub-model; lack of sensitivity
- Lack of dynamic routing at border region
- No data for calibration/validation for mode choice

D. Inter-regional Sketch Planning Model

DESCRIPTION:

- Essentially, revisiting TAFS model and updating with new data (2001 NFR HH survey, DRCOG External Survey)
- Aggregate inter-regional model into 12 districts. Review what was performed for TAFS and determine whether these still make sense. Review long trip factors by purpose and district. Also review 2nd set of long distance trip factors used to adjust volumes to match screenlines. Re-estimate based on new 2001 NFR HH Survey and new data.
- Trip generation – use existing trip generation results from DRCOG and NFR travel models for internal trips. Combine together into a single set of trip ends by trip purpose and type. Trip purposes for the inter-regional model should be the same. This will require the combination of the 6 NFR trip purposes into 3.
- Internal-external (IE) trips from both models will be replaced and will become new internal-internal trips in combined model. Long-distance trip generation will be re-estimated based on the 2001 NFR Survey and DRCOG's External Survey. The IE trips will be added to the internal trips of each region into the single data set. These will need to be apportioned by trip purpose. This would be accomplished by either using the same percentages by trip purpose for true internal trips for each model or analyzing the external survey data to determine purpose.
- Apply long trip factors to the total internal/internal and internal/external person trips by purpose.
- Apply 2nd set of long distance trip factors to adjust for screenline volumes.
- Balance attractions to productions using the procedures in TransCAD.
- Combine trip ends in two regions by direction and purpose.
- Trip distribution – 6 gravity models by purpose and direction are needed; friction factors for the long trips will need to be estimated
- Mode choice – pivot point model implemented using a spreadsheet; potential transit markets estimated by overlaying a 10-mile radius buffer around rail stations for drive-access and a 1-mile radius for walk-access to rail.
- Estimated transit level-of-service variables for each transit alternative including in-vehicle travel time, out-of-vehicle travel time, and wait time.

- Use DRCOG mode choice coefficients for IVTT, OVTT, and wait time or consider borrowing from region with similar characteristics, but with inter-regional transit.
- Trip Assignment – a daily assignment was performed in original TAFS model. All trip purposes and trip types were combined into one matrix and assigned using an off-peak network. Alpha and beta parameters used were specific to the link types. The assignment procedure was specified to run for 20 iterations with a convergence criterion of 0.01. This will need to be revisited. An assignment that is not performed by time-of-day reduces flexibility of model to examine improvements for the most congested time-of-day.

PROS:

- Simplified approach for inter-regional travel

CONS:

- No data for calibrating base year mode shares for pivot points (no inter-regional transit exists today).
- Original TAFS results not well accepted.
- No capability to examine shorter, intra-regional transit or HOV trips in the north
- Resulting model may not be rigorous enough for FTA if there is a desire to seek FTA New Starts funding in the future.

E. Trip Table Analysis for Inter-Regional Travel

DESCRIPTION:

- Short trips would be modeled with either the NFRMPO model or a simplified combined model.
- Inter-regional trips: Focus on developing sound base and future inter-regional trip tables. This could be done using aggregated districts and/or GIS; assume basic parameters for transit capture.
- A pre-screening methodology where non cost-effective solutions are quickly eliminated from the universe of viable alternatives. Using very optimistic assumptions, illustrate how certain alternatives may not be viable given cost estimates and potential ridership.

PROS:

- Practical approach to provide "reality check".
- Allows consultant team to focus on the development of other alternatives.

CONS:

- Simplified approach for inter-regional travel.
- May not be acceptable for alternative mode proponents.
- No capability to examine shorter, intra-regional transit or HOV trips in the north.

F. Experts' Choice – To Be Determined

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Forecast Model Approach

Terminology

Bi-Regional: Trips that have one endpoint in the NFR model area, and one endpoint in the COG model area.
Intra-Regional or **Internal-Internal (I-I):** I-I trips from either the NFR or DRCOG models.
Internal-External (I-E): I-E trips from either the NFR or DRCOG models.

Structure

Join zone systems and networks into a combined framework (see Figure 1)

- Maintain all attributes of each MPO zone system and network
- Create common set of attributes for combined system

Process

Trip Generation and Trip Distribution

1. Intra-regional Trips

   Implement MPO trip generation, pathbuilding, and trip distribution models separately within the combined framework

   - During the processing of NFR zones, apply NFR model
   - During the processing of COG zones, apply COG model

2. Bi-regional Trips

   Create bi-regional trip table based on Internal-External tables of each MPO model

   - Join I-E trips at I-25, US-287, and US-85
   - Use roadside TBI survey as a reference

3. Combine intra- and bi-regional trip tables
   - Combine trip purposes as necessary

Pathbuilding

1. Build bi-regional skims with parameters based on DRCOG model

Mode Choice

Perform mode choice

- Parameters based on DRCOG mode choice models

Assignment

Perform time-of-day and assignment using parameters based on DRCOG model

Reasonableness Comparisons/Quality Control

- FTA quality control standards
- Comparisons with other transit systems
- Use Summit as diagnostic tool
- Van pool programs—NFR & DRCOG
- Ridership estimates for RTD's existing regional routes
- Actual traffic counts—model cordon boundaries and other areas

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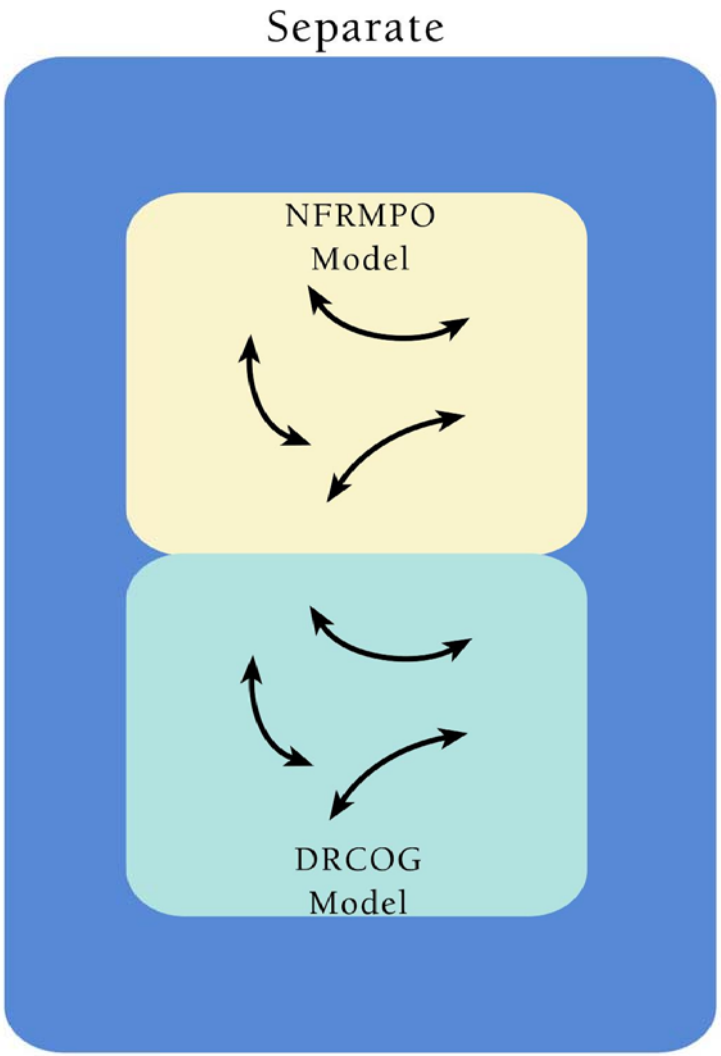
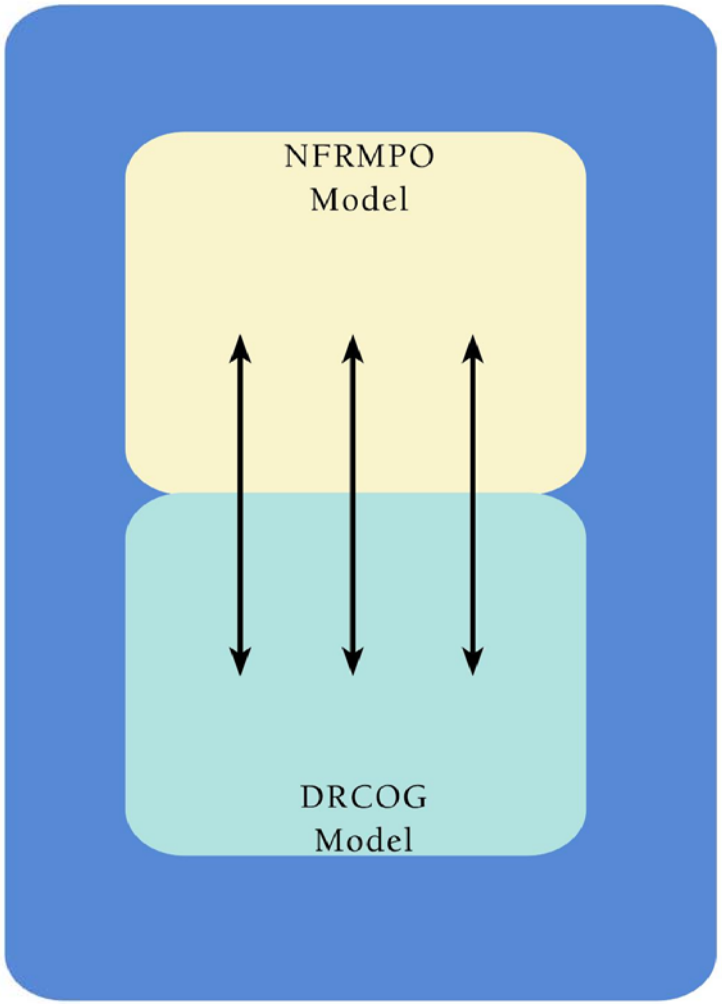
Combined Framework for Model Process



Intra-regional Trips
(Trips that stay in each region)



Bi-regional Trips
(Trips that travel between regions)