

**Using the  
MIXED USE TRIP GENERATION MODEL V 4.0**  
developed by the  
**San Diego Association of Governments (SANDAG), Fehr & Peers (consultants),**  
and the  
**U.S. EPA Office of Smart Growth**

This spreadsheet-based trip generation and reduction tool is well documented on the first page of the first sheet of the workbook and throughout the input sheet. The spreadsheet is available at:

- [http://www.epa.gov/smartgrowth/mxd\\_tripgeneration.html](http://www.epa.gov/smartgrowth/mxd_tripgeneration.html) or
- [http://www.epa.gov/smartgrowth/pdf/mxd\\_trip\\_generation\\_model.xlsx](http://www.epa.gov/smartgrowth/pdf/mxd_trip_generation_model.xlsx)

The concept and analysis are documented by co-developer SANDAG at this webpage:

- [http://www.sandag.org/uploads/publicationid/publicationid\\_1500\\_11604.pdf](http://www.sandag.org/uploads/publicationid/publicationid_1500_11604.pdf)

Most of the data inputs are naturally part of a Mixed Use Development (MXD), or in the Virginia case, a Small Area Plan per 24VAC30-155-10 and -155-30 of the Traffic Impact Analysis Regulations.<sup>1</sup>

**Small Area Plan Site Specific Information (Fehr & Peers, Cool Connections: MXD Method, 2011)**

The following worksheet inputs are expected to be part of, and unique to, a proposed Small Area Plan site:

- Land Area (of project site in acres)
- # of Intersections
- Is Transit (Bus or Rail) Present Within the Site?
- Number of Dwelling Units or Population (separated by single family, multi-family)
- Retail Thousand Square Feet (KSF) or Employment (separated as specifically as possible)
- Office KSF or Employment (non-medical and medical if possible)
- Industrial KSF or Employment (light industrial, manufacturing, or warehouse if possible)
- Hotel Rooms, Motel Rooms, Movie Theater Screens
- School (by number of students for University, High School, Middle School, or Elementary)
- Miscellaneous Trips (any special generators or anticipated trips not captured above)

**Surrounding Area Variables** (Assumptions can be developed via a GIS database or Travel Demand Model if necessary)

The input page on the MXD worksheet also requires some data that the Fehr and Peers website (Fehr & Peers, Cool Connections: MXD Method, 2011) describes as follows:

- Is the site in a CBD or TOD? (Central Business District or Transit-Oriented Development)
- Employment: Local (within one mile of the project, but not including the project)
- Employment: Regional (within a 30 minute transit trip including the project)

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<sup>1</sup> 24VAC30-155-10 of the Traffic Impact Analysis Regulations

"Small area plan" means a plan of development for multiple contiguous properties that guides land use, zoning, transportation, urban design, open space, and capital improvements at a high level of detail within an urban development area or for a transit-oriented development that is at least 1/2 square mile in size unless otherwise approved by VDOT due to proximity to existing moderate to high density developments. A small area plan shall include the following: (i) densities of at least four residential units per acre and at least a floor area ratio of 0.4 or some proportional combination thereof; (ii) mixed-use neighborhoods, including mixed housing types and integration of residential, office, and retail development; (iii) reduction of front and side yard building setbacks; and (iv) pedestrian-friendly road design and connectivity of road and pedestrian networks.

**Information Attainable from Census or Other Data Sources (Site specific is always better if available)**

- Average Vehicles Owned Per Dwelling Unit
- Average Household Size (by dwelling type is best)
- Jobs per KSF (retail, office, light industrial, manufacturing, warehousing, misc. uses)
- Jobs per Unit (hotel room, movie screen, student)
- Trip Purpose Splits (home-based work, home-based other, and non-home-based splits per land use type and time period)
- Average Trip Lengths (external trips from home-based work, home-based other, and non-home-based trips). This is not needed to compute vehicle trip reduction, but can be used to estimate VMT as a secondary result.

These variables are all examples of one or more of the “Ds”<sup>2</sup> known to influence travel behavior.

**Census Bureau, Virginia Employment Commission, and Others Data Sources**

Specific U.S. Census Bureau sources can be found at the following links:

- Virginia Quickfacts: <http://quickfacts.census.gov/qfd/states/51000.html>
- Another U.S. Census resource, the “On the Map” tool at <http://lehdmap.did.census.gov/> offers employment data. However, users should be careful with this interactive web-mapping resource, as it might not include Federal or State employment. Therefore it might not be the best tool to use in areas such as Northern Virginia, Hampton Roads, or downtown Richmond.

The Virginia Employment Commission web page is another potential data source:

<http://www.vec.virginia.gov/vecportal/index.cfm//vecportal/index.cfm>

The Virginia Workforce Connection can supply information regarding employment trends, including by county, city or town: <http://www.vawc.virginia.gov/analyzer/default.asp>

Local government planning departments and the transportation planning staff at the Planning District Commissions and the greater metropolitan regional planning agencies serving the localities in Northern Virginia and Hampton Roads may have data of value to the Mixed Use Trip Generation Model.

Aerial and street-view photography available on Google Map, Google Earth, and other websites can prove useful in this regard.

**REFERENCES**

Fehr and Peers. “Cool Connections: MXD Method.”

Online at - <http://coolerconnections.wordpress.com/solutions/mxd-method/>

U.S. EPA Office of Smart Growth. “Trip Generation Tool for Mixed-Use Developments.”

Online at - [http://www.epa.gov/smartgrowth/mxd\\_tripgeneration.html](http://www.epa.gov/smartgrowth/mxd_tripgeneration.html)

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<sup>2</sup> The “D” variables are factors that effect trip generation and other aspects of suburban and urban life such as Density, Diversity (e.g. mix of uses), Design (e.g. located on, integrated with, or setback from a boulevard or suburban arterial), Distance-to-competing-uses, and Distance-to-transit. The SANDAG/Fehr & Peers/EPA MXD method and its spreadsheet are backed by analyses that use these factors.