

Modeling

The 4 step modeling process is the national standard for travel demand modeling and forecasting in the United States. The first comprehensive application of the four step process was utilized for the Chicago Area Transportation Study developed in the early 1950s.¹ While there are criticisms of the four-step process, there is an expected amount of error with any form of forecasting. While the federal government does not require an MPO to have a travel demand model, they are required to implement and conduct a technical process that is used throughout the long range transportation planning process and ultimately drives the development of the plan. Ultimately, travel demand models using the four-step process are widely accepted as the most effective way to forecast traffic in an MPO. The Federal Highway Administration (FHWA) and Travel Model Improvement Program (TMIP) have endorsed the recognition and need for improved modeling practices within the country. Ultimately, it is through the 4SM process and advancements in the practice that will lead to effective decision making, better transportation investments, and improved air quality analysis.

Trip Generation

The first phase of the four step process is to generate the number of vehicle or person trips from Traffic Analysis Zones (TAZs) within a study area or cordon. TAZs can be disaggregated or aggregated data that include the number of dwelling units, population, employment by type, and auto occupancy of a particular area within the cordon. Through various statistical methods, the number of trips produced and attracted to each TAZ is estimated. After productions and attractions are determined, they are then balanced to validate that there is roughly two attractions for every two productions. In addition to the inter-zonal and intra-zonal productions and attractions is the development and estimation of trips coming and going, leaving and going through the cordon. These trips are known as internal-external, external-internal, external-external or I-E/E-I and E-E trips. (NCHRP 365)

Trip Distribution

The second phase of the four step process 'distributes' the number of inter-zonal and intra-zonal trips based on the productions and attractions as derived in the Trip Generation phase. Through the application of the Gravity Model travel impedance can be determined and the number of trips estimated. According to the FHWA *Model Validation & Reasonableness Checking Manual*, "...the gravity model theory states that the number of trip interchanges between two traffic analysis zones will be directly proportional to the number of productions and attractions in the zones, and inversely proportional to the spatial separation between the zones." In another words, the shorter the distance a person has to travel and the more draw a business or destination has, the more likely the trip will be made to that location verse a destination with less attraction and a longer distance. Inputs to the Gravity Model include Trip Generation results, inter-zonal & intra-zonal travel times, friction factors for each trip purpose and K-factors

¹ The Four Step Model. Michael G. McNally. 2000

Mode Split

The third phase of the four step process is where trips are 'split' into each mode that is accessible within the cordon. Mode Split may include the following choices: transit, (Bus, Light Rail, and Commuter Rail) automobile (SOV, HOV2 and HOV3+) & non-motorized (bicycle and pedestrian). Most often logit and nested logit models are used and compare the disutility of travel for all modes available. Disutility represents a combination of the travel time, cost, and convenience of a mode between an origin and destination.²

Traffic Assignment

The final phase of the four step process utilizes the outputs from all other phases and 'assigns' trips to the transportation network. Within Traffic Assignment, trips within an origin and destination (OD) matrix are assigned to the road network by the shortest path and are constrained by the roadway or link capacity.

- Statewide and MPO Models are available using TransCAD Transportation Planning Software and the files located in:
 - o W:\Planning\SystemPlanning\Forecasting\TrafficModeling\Statewide Model
- Urban MPO Models consist of the following (MPO Name) – (Area):
 - o (Planning Area Boundaries for the following MPO's are Attached)
 - Ames Area MPO (AAMPO) – Ames
 - Bi-State Regional Commission – Davenport
 - Corridor MPO (CMPO) – Cedar Rapids
 - Des Moines Metropolitan Planning Organization (DMAMPO)
 - Des Moines / Surrounding Area
 - East Central Intergovernmental Association (ECIA) - Dubuque
 - Iowa Northland Regional Council of Governments (INRCOG)
 - Waterloo / Cedar Falls
 - Johnson County Council of Governments (JCCOG)
 - Iowa City / Coralville
 - Metropolitan Area Planning Agency (MAPA) – Council Bluffs
 - Siouxland Interstate Metropolitan Planning Council (SIMPCO)
 - Sioux City

² Beimborn A. Edward. 1995. *A Transportation Modeling Primer* (Inside the Blackbox, Making Transportation Models Work for Livable Communities) <http://www.uwm.edu/Dept/CUTS/primer.htm>

Traffic Count Program

- Future and Past Traffic Count Maps for the State of Iowa for the Years 2005 – 2012 (Attached)

Traffic Forecasting Process:

- Traffic Forecasting
 - The forecasting team prepares estimates of future automobile and truck volumes to assist corridor/ project location Studies conducted by the Office of Project Planning, and design studies conducted by the Office of Design and the Engineering Division.
- Data (Located):
 - o W:\Planning\SystemPlanning\Forecasting\TrafficEstimates\ESTAT.xls
 - ESTAT.xls consists of the following forecasts: rural & urban log
 - Requests could be 24-Hour ADT or 24-Hour Turning Movements
 - o More data located in mod5 which takes special permission to access
- Trafcom
 - o Trafcom is the current process of figuring a future traffic forecast
- Traffic Forecast Process (Brief Explanation):
 - o Forecast is requested by another government agency or a public / private sector
 - o Review Historical & Existing Traffic Count Data
 - o Provide a Conservative Growth Rate Based on the Historical Traffic Count Data
 - o Apply Growth Rate to the Existing or Year used to figure the long-term forecast
 - Calculated in Trafcom
- The current traffic forecasting process manual is currently being updated
 - o The updated traffic forecasting process will provide a tech memo to document the steps taken to complete the traffic forecast.
 - o The current traffic forecasting process, as a whole, is currently being updated.

Intersection Justification Reports

- Interchange Justification

The team assists Transportation Center Planners, MPOs and others to complete interchange justification Studies required for the addition or modification of interchanges on the Interstate system and controlled-access highway routes in Iowa.

- Referenced Material
 - Requirements for the Federal Highway Administration are located within PPM or Process for New or Revised Interstate Access (See Below)
 - <http://dotnet/planning/sysplan/sysplan.htm>
 - Follow Path:
 - Forecast & Planning
 - Process for New or Revised Interstate Access in Iowa – March 2002 (Attached)
 - Policies and Procedures Manual – Process for New or Revised Interchanges (Attached)
 - <http://dotnet/>
 - Follow Path:
 - Publications
 - Policies and Procedures (PPMs)
 - Policy No. 500.15

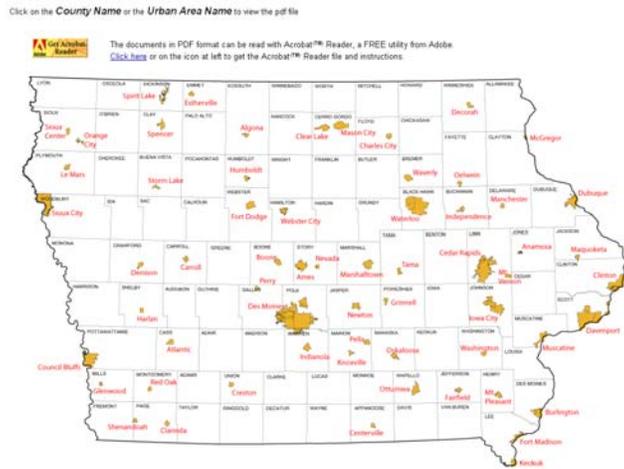
Iowa Mileage and Vehicle Miles of Travel (VMT) Summary:

- Website: <http://www.iowadotmaps.com/msp/vmt/index.htm>
- Vehicle Miles of Traveled by County, Statewide, and Classification located in folder

Federal Functional Class:

- Policies and Procedures Manual – Federal Functional Classification or Federal-Aid Status (Attached)
 - <http://dotnet/>
 - Follow Path:
 - Publications
 - Policies and Procedures (PPMs)
 - Policy No. 800.07
- Website from IDOT: <http://www.sysplan.dot.state.ia.us/fedfuncclass.html>

Federal Functional Classification Maps - Urban and Rural



Counties:				Urban Areas:		
01-Adair	26-Davis	51-Jefferson	76-Pocahontas	Algona	Grinnell	Red Oak
02-Adams	27-Decatur	52-Johnson	77-Polk	Ames	Harlan	Shenandoah
03-Allamakee	28-Delaware	53-Jones	78-Pottawattamie	Anamosa	Humboldt	Sioux Center
04-Appanoose	29-Des Moines	54-Keokuk	79-Poweshiek	Atlantic	Independence	Sioux City
05-Audubon	30-Dickinson	55-Kossuth	80-Ringgold	Boone	Indianola	Spencer
06-Benton	31-Dubuque	56-Lee	81-Sac	Burlington	Iowa City	Spirit Lake
07-Black Hawk	32-Emmet	57-Linn	82-Scott	Carroll	Keokuk	Storm Lake
08-Boone	33-Fayette	58-Louisa	83-Shelby	Cedar Rapids	Knoxville	Tama
09-Bremer	34-Floyd	59-Lucas	84-Sioux	Centerville	Le Mars	Washington
10-Buchanan	35-Franklin	60-Lyon	85-Story	Charles City	Manchester	Waterloo
11-Buena Vista	36-Fremont	61-Madison	86-Tama	Clarinda	Maquoketa	Waverly
12-Butler	37-Greene	62-Mahaska	87-Taylor	Clear Lake	Marshalltown	Webster City
13-Calhoun	38-Grundy	63-Marion	88-Union	Clinton	Mason City	
14-Carroll	39-Guthrie	64-Marshall	89-Van Buren	Council Bluffs	McGregor	
15-Cass	40-Hamilton	65-Mills	90-Wapello	Creston	Mount Pleasant	
16-Cedar	41-Hancock	66-Mitchell	91-Warren	Davenport	Mount Vernon	
17-Cerro Gordo	42-Hardin	67-Monona	92-Washington	Decorah	Muscatine	
18-Cherokee	43-Harrison	68-Monroe	93-Wayne	Denison	Nevada	
19-Chickasaw	44-Henry	69-Montgomery	94-Webster	Des Moines	Newton	
20-Clarke	45-Howard	70-Muscatine	95-Winnebag	Dubuque	Oshwin	
21-Clay	46-Humboldt	71-O'Brien	96-Winneshek	Estherville	Orange City	
22-Clayton	47-Iida	72-Osceola	97-Woodbury	Fairfield	Oskaloosa	
23-Clinton	48-Iowa	73-Page	98-Worth	Fort Dodge	Ottumwa	
24-Crawford	49-Jackson	74-Palo Alto	99-Wright	Fort Madison	Pella	
25-Dallas	50-Jasper	75-Plymouth		Glenwood	Perry	
[State Of Iowa]		[Iowa DOT]		[Systems Planning Home]		

Farm to Market:

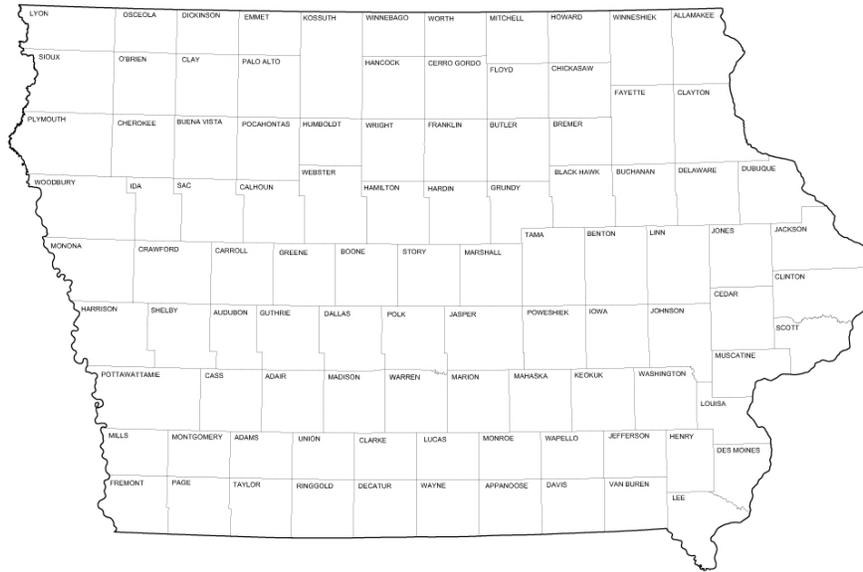
- Website from IDOT: www.sysplan.dot.state.ia.us/farm2Market.html

Farm-to-Market System Maps

Click on the County to view the pdf file



The documents in PDF format can be read with Acrobat™ Reader, a FREE utility from Adobe.
[Click here](#) or on the icon at left to get the Acrobat™ Reader file and instructions.



From Our Website: Definitions

- Urban Transportation Planning Support
Team members provide technical support and assistance to Metropolitan Planning Organizations for the operation of urban travel demand models (Tranplan), and other traffic forecasting activities.
- Research
Management and guidance is provided for forecasting-related research projects conducted by universities and funded by the Iowa DOT or U.S. DOT.

Glossary:

- Average Daily Traffic (ADT)
The number of vehicles that traverse a segment of roadway over a 24-hour period
- Annual Average Daily Traffic (AADT)
A measurement of the number of vehicles which use a highway over a period of a year divided by 365 to obtain the average for a 24-hour period
- Arterial street or highway
A major thoroughfare used primarily for through traffic, rather than access to private land
- Automatic Traffic Recorder (ATR)
An automatic traffic recorder is a sensor embedded in the roadway that detect vehicle movement and provide traffic data through nightly telemetric polling
- Expressway
An expressway is a divided highway facility usually having two or more lanes for the exclusive use of traffic in each direction and partial control of access; as opposed to a freeway which has full control of access.
- Farm-to-market
An identifier for a roadway designated by the Iowa Transportation Commission to be part of the statewide highway system; normally associated as a two-lane roadway in rural areas, but are located in urban areas and can be a 4- or 6- lane divided roadway
- Functional roadway classification
The organization of roadways into a hierarchy based on the character of service provided; typical classifications include arterial, local and collection roadways
- Geographic Information System (GIS)
Computerized mapping and planning tool
- Global positioning system (GPS)
A navigation system that uses satellites to provide a receiver on Earth with extremely accurate measurements of its three-dimensional position, velocity and time
- "Green Book"
The official title of this book is : "A Policy on Geometric Design of Highways and Streets." This book is published by AASHTO and contains accepted practices for designing the physical features of a roadway. Examples of these features are: sight distance, design speeds, lane width, horizontal and vertical curves, etc.
- Interchange (grade separation)

A system of interconnecting roadways that provides for the movement of traffic between two or more highways on different levels

- Interstate Highway System
A network of freeways in the United States; the Interstate Highway System is a separate system within the larger National Highway System; the entire system, as of October 2002, had a total length of 46,726 miles
- Lane miles
The product of centerline miles and number of lanes; a four-lane road, two miles long, has eight lane miles
- Level of Service (LOS)
A qualitative measure describing operational conditions within a traffic stream, based upon service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience; LOS A represents completely free flow of traffic allowing traffic to maneuver unimpeded; LOS F represents a complete breakdown in traffic flow resulting in stop and go travel; LOS is typically calculated based upon peak-hour conditions.
- Manual on Uniform Traffic Control Devices (MUTCD)
This manual is published by the Federal Highway Administration and used by most departments of transportation across the country as the standard for traffic control devices. These devices include signals, signs and pavement striping.
- Metropolitan Transportation Improvement Program (MTIP)
A staged, multi-year, intermodal program of transportation projects that is consistent with the metropolitan transportation plan
- Mass Transportation
Transportation by bus, rail, boat or other conveyance, either publicly or privately owned, that provides general or special service to the public on a regular and continuing basis (not including school bus, charter or sight-seeing service)
- Off-peak
Those periods of time outside the morning and afternoon peak travel periods, the non-rush hour periods when travel activity tends to be lower
- Primary Highway System
Highways that have been functionally classified by the Department of Transportation as either principal or minor arterials, and that have been selected by the Transportation Commission to be placed on the Primary Highway System.
- Public transportation
Services provided for the public on a regular basis by vehicles such as a bus or rail on public ways, using specified routes and schedules; usually on a fare-paying basis; also includes non-scheduled, on-demand transit services
- Right of way/Right-of-way
Right of way The land (usually a strip) acquired for or devoted to transportation purposes. For example, highway Row and railroad Row. Right-of-way (hyphenated if an adjective, e.g., right-of-way agreement) A general term denoting land or property acquired for or devoted to transportation purposes, but with other associated uses such as utilities, water and sewage lines and buffer zones
- Roundabout
A type of road junction (or traffic calming device) at which traffic streams around a central island, after first yielding (giving way) to the circulating traffic

- SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users)
The federal surface transportation legislation (Public Law 109-59) that authorizes programs for highways, highway safety, and transit for the five-year period 2005-2009
- Iowa Statewide Transportation Improvement Program (STIP)
A two-year program of transportation projects required by SAFETEA-LU, consisting of a federally required document that allocates transportation funds to a staged, multi-year, statewide, intermodal program of transportation projects; consistent with the statewide transportation plan and planning processes and metropolitan plans, TIPs and processes; the metropolitan TIP must be included in the STIP without change
- Traffic calming
A transportation system management technique that aims to prevent inappropriate through-traffic and reduce motor vehicle travel speed on a particular roadway; traditionally, this technique has been applied to local residential streets and collectors, and may include speed bumps, curb extensions, planted median strips or rounded and narrowed travel lanes
- Traffic Control Device
The prime, and often the only, means of communicating with the driving public; these devices (e.g., signs, markings, signals, islands) must be used discriminately, uniformly and effectively to assure correct driver interpretation and response
- Traffic count
A tabulation of the number of vehicles passing a certain point over a specified time period; this is often a 12- or 24-hour period
- Vehicle Miles of Travel (VMT)
The total distance traveled in miles in a given time period