Appendix C

DMATS Model
Future Employment Forecasting and Spatial Distribution Methods
4/10/2026

Purpose

Commercial and industrial square footage is a key input to the DMATS Travel Demand Forecast Model. For the base year, this information is compiled from parcel data provided by local property tax assessors. For future years, commercial and industrial square footage is derived from forecasts developed by DMATS staff. These forecasts are based on area-wide projections of future employment, which are converted to thousands of square feet (KSF) using an estimated employment-to-square-footage ratio. The resulting total projected KSF is then distributed to planned future growth areas across the DMATS region as identified through the planning process. The purpose of this document is to describe the commercial and industrial square footage distribution process in detail to ensure it can be consistently replicated in future model updates.

The process can be divided into the following four sections:

1) Employment Control Totals
2) Employment Data
3) Employment and Land Use
4) 4 Future Growth Locations

Employment Control Totals

The forecasting process begins with the development of area-wide employment control totals. DMATS staff review historical employment trends and data from multiple sources, including Iowa Workforce Development, the U.S. Census Bureau's OnTheMap application, and ESRI's Business Analyst application. Using this information, staff establish a base year employment total and a forecast year employment projection for the DMATS planning area.

These employment figures are presented to the DMATS Technical and Policy Committees for review and adoption. Once approved, the employment totals are referred to as the model "control totals" and serve as the foundation for the commercial and industrial square footage forecasts used in the Travel Demand Forecast Model.

2055 Employment Control Totals

- Base Year (2021): 53,481
- Forecast Year (2055): 65,068

Employment Data

To convert employment to thousands of square feet (KSF), localized employment data must be spatially joined to the parcel file and used to calculate employment density rates by land use category. For the 2055 model, two sources of employment data were used for this process.

The primary dataset was point-level employment data from ESRI's *Business Analyst* (BA) application. The BA dataset includes XY location information, which allows individual employment records to be converted to point features and spatially joined to parcel polygons.

Employment data from the U.S. Census Bureau's *OnTheMap* (OTM) application was also used. The OTM data are provided at the Census Block level and were used to verify the reasonableness of the ESRI BA employment totals. The two datasets produced similar area-wide employment estimates for the DMATS region. ESRI BA data indicated approximately 54,000 jobs, while the OnTheMap data indicated approximately 53,000 jobs.

It should be noted that both data sets are counting "all jobs" and include both full-time and part-time employment. In many cases individuals may hold more than one job. These numbers to not represent full time equivalents.

Employment Data Acquisition

Employment data from the U.S. Census Bureau's OnTheMap (OTM) application was relatively straightforward to obtain using the online interface. Employment data from ESRI's Business Analyst (BA) application required additional steps to extract in a usable format. The BA employment data were ultimately obtained as a CSV file with X,Y point locations using the following process:

- ESRI Business Analyst was used to create a map of the DMATS area. County subdivisions (townships) were used to approximate the DMATS regional boundary. A total of ten county subdivisions were included: eight in Iowa, Dunleith Township in Illinois, and Jamestown Township in Wisconsin.
- In the online Business Analyst application, employment data were added to the map by selecting Points of Interest (POI) Search and using the following settings:
    - Data Source: Data Axle
    - Area of Interest: Your Sites
    - Selected Sites: 10 County Subdivisions
- Business Analyst includes an "Export to Excel" option; however, this export does not include exact business addresses or X,Y coordinate data. The exported table contains street names only and cannot be directly used to generate spatial point locations.
- To obtain exact point locations, the results were shared from Business Analyst as an ArcGIS web map by selecting Share Results > ArcGIS Web Map and sharing the map with the ECIA ArcGIS Online organization. The option to export map layers in a hosted feature service was enabled.
- Once published in ArcGIS Online, the All Businesses layer was exported to a CSV file. This file includes X,Y coordinate data that can be used to map business point locations in ArcGIS Pro and spatially join employment data to parcel polygons.

Employment Data Clean Up

Once employment point locations were mapped, the dataset was reviewed for accuracy. Several issues were identified that required correction before the data could be used for parcel-level analysis and employment density calculations.

Point Locations

Most employment points were initially located at either a parcel or building centroid. The dataset includes a location confidence field that indicates the reliability of each point location. Approximately 90 percent of locations were classified as High Confidence and were placed at parcel centroids. An additional 297 of the 3,708 locations (approximately 8 percent) were classified as Medium Confidence.

These locations were typically interpolated or placed at a ZIP+4 centroid. Sixty-three locations were classified as Low Confidence and were placed at the ZIP code centroid.

Low-confidence employment locations were manually reviewed and relocated, beginning with businesses that had the largest number of employees and proceeding downward. This process improved the accuracy of employment placement for the most influential records in the dataset.

A more detailed review identified additional cases where point locations required adjustment. In some areas, multiple businesses shared identical X,Y coordinates even though they occupied different parcels. For example, in the Warren Plaza area, employment records for multiple businesses were assigned to the same parcel centroid, resulting in several points being stacked on the Target store parcel, even though many of the businesses were located in adjacent strip mall parcels or near the Hy-Vee store across the parking lot. These points were manually relocated so they could be correctly joined to their respective parcels. Similar corrections were made in other major retail areas, including the Kennedy Mall.

Additional cleanup was performed to address point locations that did not intersect with any parcel. These records were identified using the Select by Location tool in ArcGIS Pro with the invert spatial relationship option enabled. Approximately 50 non-intersecting points were identified. Some of these points were relocated to the correct parcel, while others were removed if they were outside the DMATS area or could not be reasonably assigned to a parcel.

Employee Counts

Adjustments were also made to the Employee Count field for several of the region's largest employers. In some cases, employment totals reflected company-wide figures rather than employment specific to the DMATS area.

For example, Cottingham & Butler (C&B) was listed with an employment total of approximately 1,300 employees, representing company-wide employment. According to information from the Greater Dubuque Development Corporation (GDDC), the number of employees located within the DMATS area is closer to 850. In addition, the C&B employment total was duplicated across multiple records due to variations in the company name. These records were consolidated and corrected.

John Deere employment was also adjusted. The initial dataset listed a relatively small number of employees at the Dubuque location. This value was updated to approximately 2,800 employees based on information from GDDC and corroborated using OnTheMap employment data.

Additional employee count adjustments were made for other major employers by reviewing GDDC's list of the area's largest employers and correcting records as needed, starting with the largest employers and working downward.

Employment and Land Use

With the employment data cleaned and finalized, the next step is to spatially join business location points to the parcel file and examine the relationship between employment and land use. The base year relationship between employment and land use provides the foundation for estimating future year commercial and industrial development patterns.

Analysis of the base year data is used to identify key parameters that inform the future-year forecasting process. These parameters include the proportion of employment by land use type (commercial versus

industrial), employment density by land use category, and floor area ratios. Later in the process, these values are applied in the distribution of future commercial and industrial square footage across the DMATS region.

Joining Business Points to Parcels

Business location points were joined to parcel polygons using ArcGIS Pro's *Spatial Join* tool. The key step in this process is to ensure that the sum option is selected for the "Employee Count" filed in the business point file. This ensures that employee counts will be summed for any parcels containing more than one business point.

Employment by Land Use Type

Using the joined databases, the next step involved determining employment by land use type. These proportions are used to divide projected future employment into two broad categories: Future Commercial and Future Industrial. The ISMS manual recommends assigning these general categories code 306 for Future Commercial and Code 308 for Future Industrial.

Existing parcels were sorted into general categories based on their existing land use codes. The general industrial category includes codes 30-32. Commercial parcels are defined using codes 50-80, however inly land uses that had KSF predictive values were included. As a result, Cemetery and Military land uses were excluded from the selection because they use acres as their predictive values. Parcels were selected in ArcGIS pro using the Select by Attributes tool and employee count fields for the selected parcels were summed. Table 1 lists the industrial land use codes and Table 2 includes the commercial codes.

Table 1. Future Industrial - LUC 308		
Industrial codes with KSF Predictive Variables		
Description	**Label**	**LUC**
Manufacturing	MFG	30
Industrial Park/Light Industry	IPK	31
Warehousing	WAR	32

Table 2. Future Commercial - LUC 306		
Commercial codes with KSF Predictive Variables		
Description	**Label**	**LUC**
Street Front Commercial	SFC	50
Neighborhood Shopping Center	NSC	51
Community Shopping Center/Big Box	CSC	52
Regional Shopping Center	RSC	53
Auto Dealership	AUC	55
Service Station	SS	56
Fast Food	FF	57
Sit-down Restaurant	SDR	58
Other Commercial	ORC	59
Office Service codes with KSF Predictive Values	**Removed LUC 67 Cemetery**	
Description	**Label**	**LUC**
General Office	GO	60
Government Office	GOV	61
High Rise Office	HRO	62
Library	LIB	63
Post Office/Shipping Office	PO	64
Bank	BNK	65

Fire/Police Station	FS	66
Religious Facility	RF	68
Other Public Service	OPS	69
Institutional Codes with KSF Predictive Values	**Removed LUC 77 Military**	
Description	**Label**	**LUC**
Hospital	HOSP	70
Other Health Care	OHC	71
Recreational Use	REC	73
Cultural Facility	CUL	74
Convention Center	CCEN	75
Public Assembly	PA	76
Military	MIL	77
Prisons/Jails	JAIL	78
Tourist Attractions	TOUR	79
Day Care/Preschool	PS	80

A total of 589 industrial parcels were identified, with a combined employment total of 12,072 employees. A total of 1,224 commercial parcels were identified, with a combined employment total of 27,796 employees. This results in a commercial-to-industrial employment ratio of approximately 63 percent commercial and 37 percent industrial. The ratio which is used to allocate future employment control totals between the two land use categories.

Employment Density and Floor Area Ratio

The same parcel selections described above were used to calculate the Employment Density and Floor Area Ratio Values. Employment density is the calculated by dividing a category's total employment count by its total building area. The result is employment density expressed in jobs per thousand square feet or Jobs/KSF. Floor Area Ratio is calculated by dividing the total building area by the total parcel area, with both values expressed in KSF. Results of the employment density and Far calculations are provided in tables 3 and 4.

Table 3 Industrial Employment Density and FAR	
Number of Parcels	589
Total KSF	18388.1758
Total Employee Count	12072
Employment Density Jobs/KSF	0.65650884
Total Parcel KSF	122878.345
Building KSF/Parcel KSF	0.14964537

Table 4 Commercial Employment Density and FAR	
Total Parcels	1224
Total KSF	17,304.27
Total Employee Count	27,796.00
Employment Density Jobs/KSF	1.60630857
Total Parcel KSF	99,228.29
Building KSF/Parcel KSF	0.17438848

Future Growth Locations

Two conceptual models were used for assigning future commercial and industrial growth locations: **New Growth Areas** and **Intensification Areas**.

New Growth Areas are greenfield development areas identified through the planning process as potential future commercial or industrial growth areas. Employment growth happens in these areas primarily through new construction.

Intensification Areas are locations that already have commercial or industrial development. New growth may occur in these areas through a variety of mechanisms such as, an existing employer expands its workforce, a vacant building is converted to a new use, or an existing building is torn down and replaced with a new one that has more floor area.

To inform the distribution of future employment growth between the two location categories, historical employment data from the US Census Bureau's OnTheMap application and GIS Annexation data from Dubuque County were analyzed. Annexation data was only available from Dubuque County, so the Dubuque County potion was used to approximate the full region. In the analysis, new growth areas were represented by areas that had been annexed into any Dubuque County city in the DMATS area since 1975. The OTM data looked at total employment starting in 2002 through 2022.

The analysis showed relatively steady employment growth in areas associated with new annexation, while employment change within existing developed areas exhibited greater year-to-year variability. Based on these observed trends, DMATS staff established an assumption that 30 percent of future employment growth will occur within Intensification Areas, while 70 percent will occur within New Growth Areas. Applying this assumption to the forecast employment control total results in the allocation shown in the table below.

Total 2055 Employment Growth		11,587
Intensification Areas	30%	3,476
New Growth Areas	70%	8,111

Using this assumption on the employment growth control total, 8,111 new jobs would be allocated to the new growth areas and 3,476 new jobs would be allocate to the Intensification areas.

Intensification Growth Method

Within the Intensification areas, the assumption was made that new employment growth would be distributed across all parcels with existing commercial and industrial development. New growth was distributed proportionally based on each parcel's share of the total employment with in its land use category. This assumption spreads growth across the area while allocating larger employment increases to areas that already support higher employment replicating the clustering of employment around key areas in the region.

The intensification allocation process included the following steps:

1. The employment growth total was split into commercial and industrial based on the commercial to industrial ratio of 63% to 37%.

Land Use	Jobs	Percent
Commercial	2,189.880	0.630
Industrial	1,286.120	0.370

2. Jobs were converted to KSF based on the Employment Density Rate (Jobs/KSF)

Land Use	New KSF	Employment Density (Jobs Per KSF)
Commercial	1,363.300	1.606
Industrial	1,959.029	0.657

3. Finally, the percent growth was applied to the parcels in the two land use categories to provide the final KSF growth. Results are shown in the table below. Note that the growth is shown for the two future years 2035 and 2055. The table also shows KSF growth values converted to Job growth values using the employment density rates.

Industrial	KSF (AMT)	Growth %	KSF	Jobs	Job Growth
Base Year	18,388.176			12,072.000	
KSF Growth	1,959.029				
KSF 2055	20,347.205				
% growth	10.65%				
Future 2035	979.51	0.053268721	19,367.690	12,715.060	643.06
Future 2055	979.51	0.106537442	20,347.205	13,358.120	1,286.12
Total Parcels: 589					
Commercial	KSF (AMT)	Growth %	KSF	Jobs	Job Growth
Base Year	17,304.272			27,796.000	
KSF Growth	1,363.300				
KSF 2055	18,668				
% growth	7.878%				
Future 2035	681.650	0.039391999	17,985.922	28,890.940	1,094.94
Future 2055	681.650	0.078783998	18,667.571	29,985.880	2,189.88

Highlighted values will be AMT1 and AMT2 field sums in the model parcel file.

New Growth Area Method

The Growth Area method begins much like the intensification area method but differs in how employment growth is distributed spatially. While intensification growth is allocated proportionally based on existing employment patterns, new growth is distributed based on estimated development capacity of identified future growth sites.

1. The employment growth total was split into commercial and based on the commercial to industrial ratio of 63% to 37%.

Land Use Split	Jobs	Percent
Commercial	5,109.867	63.000%
Industrial	3,001.033	37.000%

2. Jobs were converted to KSF based on the Employment Density Rate Jobs/KSF

Land Use	New KSF	Employment Density (Jobs Per KSF)
Commercial	3,181.124	1.606308567
Industrial	4,571.200	0.656508843

3. Parcels designated for future commercial and industrial development were identified through the LRTP development process. DMATS staff met with cities and counties within the planning area to discuss their future land use plans.

Future land use maps and from the cities and counties were georeferenced and overlaid with the DMATS parcel file. Future land use code fields (LUC1 & LUC2) were populated based on information from the future land use maps. Two Future land use codes were used 308 Future Industrial and 306 Future Commercial. These are general codes recommended in the ISMS manual.

In some cases, edits to the parcel file were needed during this process, including splitting some multi-part parcels that crossed over roadways – especially in the SW Arterial aera – and making some parcel boundary edits to better reflect anticipated development patterns.

The total area of parcels designated for future development is summarized below:

Land Use	Total Parcel Area (KSF)
Future Commercial	24,003.316
Future Industrial	33,009.782

4. The potential building area was estimated using the estimated Floor Area Ratio (FAR) of each future land use category.

Land Use	Potential Building KSF	Building KSF/Parcel KSF
Future Commercial	4,185.902	0.1743884845
Future Industrial	4,939.761	0.1496453730

5. After populating data for all the future commercial and industrial growth areas identified by cities and counties, the potential building area was estimated by multiplying the floor are ratio (FAR) for each land use by the total parcel area.

After applying this calculation, it was determined that the potential building area was much larger than what was needed to accommodate the projected future development. To align potential building capacity with the projected growth totals, staff reviewed the data identifying areas with the highest potential for future growth and eliminating areas that were least likely to be developed within the model forecast period. Locations with high potential for future growth were selected based on following criteria: sites in platted subdivisions, sites on existing roadways, sites in city limits or next to city limits. Using this criteria, the potential building area was brought in line with the predicted future growth totals.

6. A Parcel Weight value was calculated for each parcel by dividing the individual parcel Potential Building KSF by the sum of all parcel Potential Building KSF. Final building floor area growth was distributed to each parcel by multiplying the Parcel Weight by the total building floor area growth for the corresponding land use category.

Wrap Up

Following the allocation of future employment growth, all parcel-level results were reviewed against the employment growth control totals to confirm accuracy. The updated parcel file was then added to the TransCAD model input folder for use in the travel demand forecasting process.

Data Sources:

The table below includes a summary of the data sets used for future employment forecasting and distribution.

Data Set	Source	Data Year	Accessed
Business Point Data	Esri Business Analysist, Data Axel	2025	3/24/2026
Census Block Employment	US Census Bureau, On The Map	2022	2025
Parcel Data	Area City and County Assessors	2023	2023