# Development and Use of a Rail Freight Commodity Model for the Iowa DOT

## Chicago Area Model Users Group

## August 6, 2014


CDM Smith
listen. think. deliver.

PB
125 YEARS

# Deliverables

1. National rail freight assignment network and national commodity flow tables
2. Iowa rail freight assignment network and Iowa commodity flow tables
3. Intermodal diversion model

# State Level Rail Planning

## National Rail Freight Network Impacts on State

- Longer-range planning
- Impacts from changes in national commodity flow patterns
- Impacts from rail class I expansions/abandonments
- Proposed rail passenger service within Iowa (available capacity)

## Iowa Detailed Network for In-State Implementation

- Shorter-term implementation issues facing the DOT
- Evaluate in-state investments in intermodal facilities
- Support for Iowa class III rail lines

# Two Levels of Network Analyses

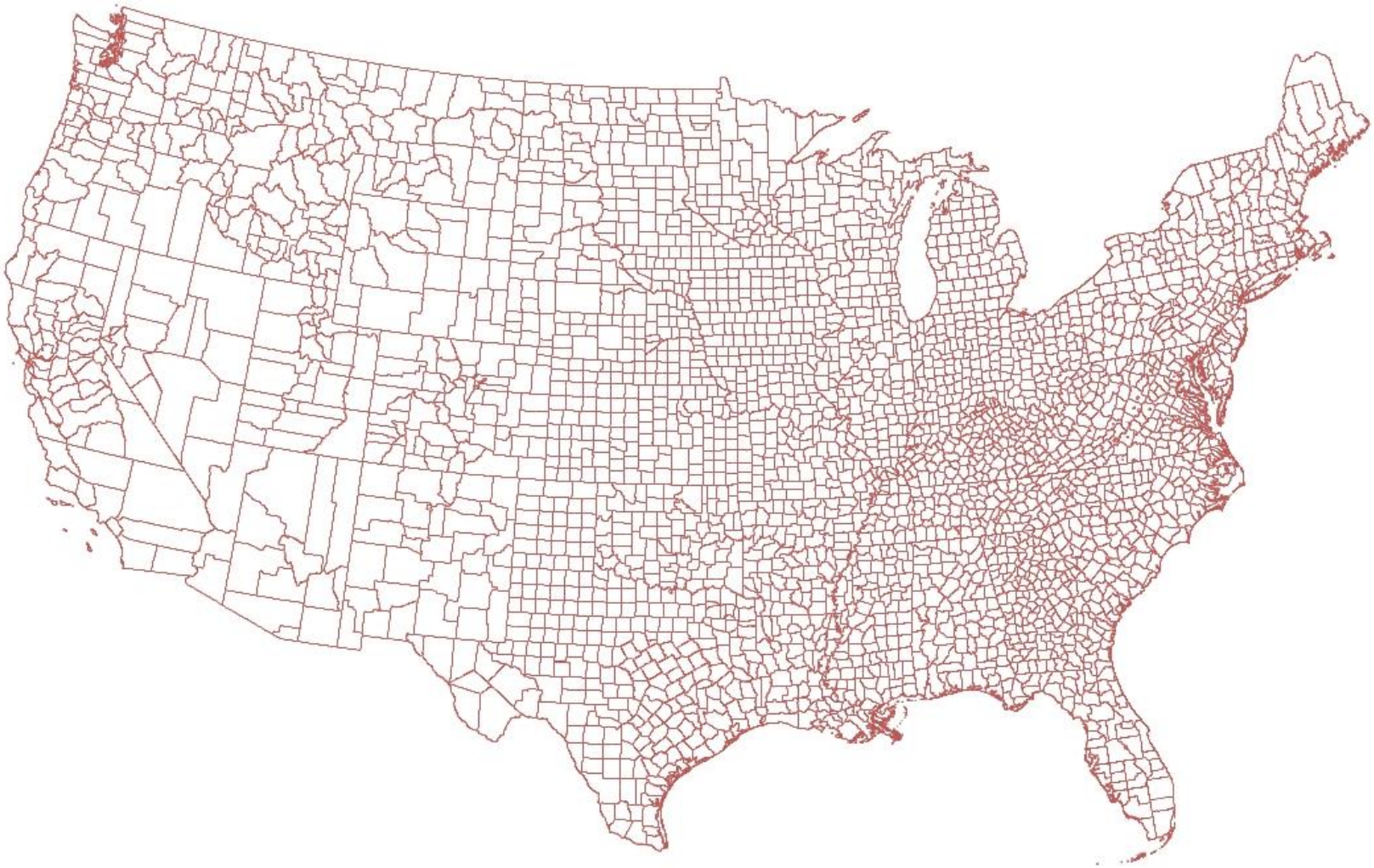
## National Network

- Class I railroads plus IAIS (class II)
- Freight Analysis Framework commodity flows for 2007 and 2040
- County to county commodity flows

## Iowa Detailed Network

- National network plus Iowa class III railroads
- Averaged 2009-2010 Carload Waybill Sample commodity flows
- Commodity flows from Iowa freight stations to/from counties outside Iowa

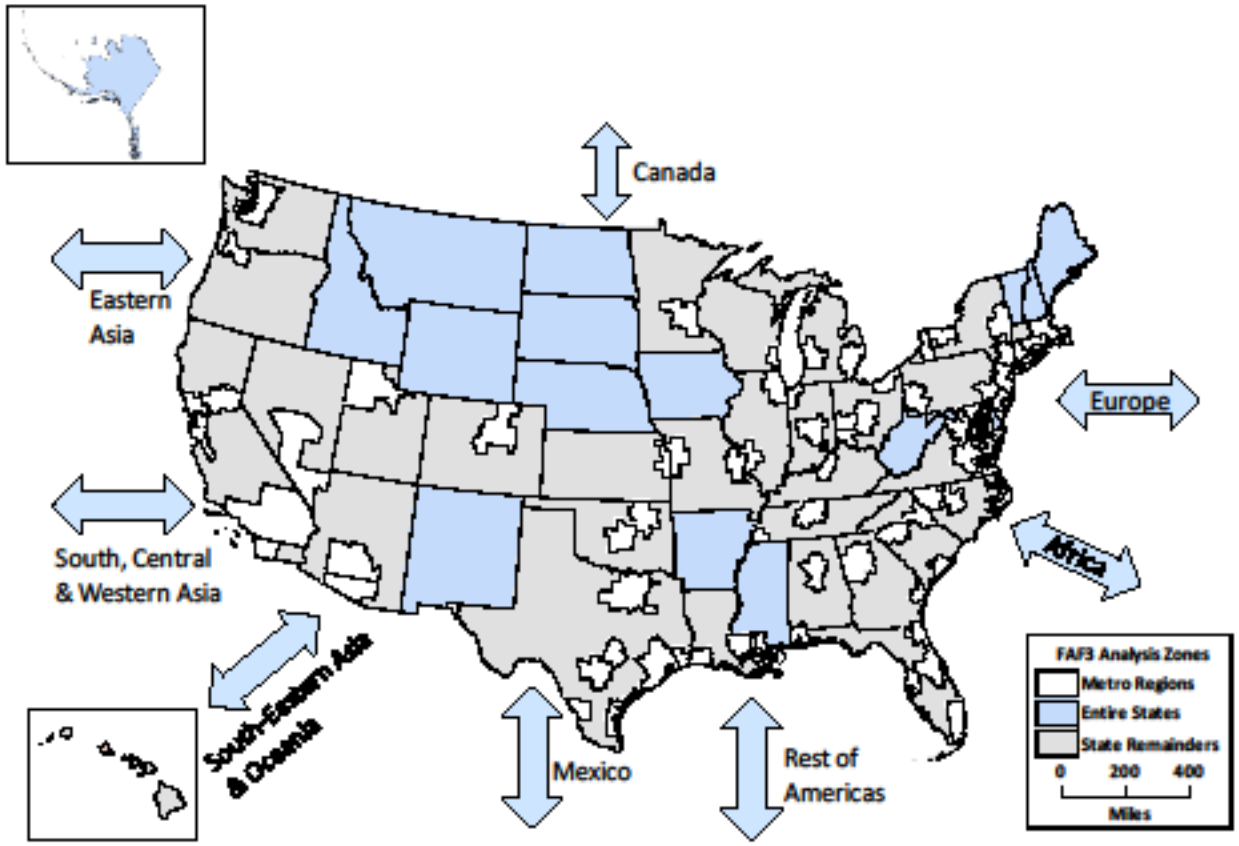
# National County Zones



# Commodity Flow Data: FAF$^3$

- Based on 2007 Commodity Flow Survey with updating, expansion, and forecasts by Oak Ridge National Lab
- Commodities identified by two digit Standard Classification of Transported Goods (SCTG)
- Eight modes, but multiple modes, parcel delivery services, and U.S. Postal Service or couriers are combined (not possible to identify COFC/TOFC shipments)
- Coded to 123 domestic regions (states and metropolitan areas) and eight international points of entry
- Tons, ton-miles (domestic part), shipment values

# FAF$^3$ Geography



# FAF$^3$ Disaggregation to Counties

- Match counties to FAF$^3$ regions
  - 3143 counties including Hawaii and Alaska
  - Renumbered counties and FAF$^3$ regions
- Relate types of employment to the origins and destinations of SCTG category commodity flows
- County as share of FAF$^3$ region allocation factors

$$\frac{w_1 * sctg_1^{co} + w_2 * sctg_2^{co} + \bullet\bullet\bullet\bullet}{w_1 * sctg_1^{FAF} + w_2 * sctg_2^{FAF} + \bullet\bullet\bullet\bullet}$$

- Expand 2007 to 2040 by employment growth

# National Rail Freight Model FAF Commodity Flow Components

- 2007 and 2040 FAF county to county TransCAD commodity flow tables
- Multiple flow tables for each year
  1. Domestic flow tables: truck, rail, water, multimode
  2. Eight world regions with separate import and export flow tables: truck, rail, water, multimode
  3. Combined domestic, import and export flow tables: truck, rail, water, multimode
  4. Estimated rail portion of multimode commodity flow tables
  5. Combined total rail – rail plus multimode rail portion – commodity flow table
  6. Truck and rail all commodity matrices
  7. Table indices
     - County FIPS
     - County code in tables
     - County centroid node number in network
- Commodities identified by SCTG Codes

# SCTG Codes

| | Description |
|---|---|
| 01 | Farm Products |
| 08 | Forest Products |
| 09 | Fresh Fish or Other Marine Products |
| 10 | Metallic Ores |
| 11 | Coal |
| 13 | Crude Petroleum, Natural Gas, or Gasoline |
| 14 | Non-metallic Minerals |
| 19 | Ordinance or Accessories |
| 20 | Food or Kindred Products |
| 21 | Tobacco Products, excluding Insecticides |
| 22 | Textile Mill Products |
| 23 | Apparel or Other Finished Textile Products |
| 24 | Lumber or Wood Products, excluding Furniture |
| 25 | Furniture or Fixtures |
| 26 | Pulp, Paper, or Allied Products |
| 27 | Printed Matter |
| 28 | Chemicals or Allied Products |
| 29 | Petroleum or Coal Products |
| 30 | Rubber or Miscellaneous Plastics Products |

| | Description |
|---|---|
| 31 | Leather or Leather Products |
| 32 | Clay, Concrete, Glass, or Stone Products |
| 33 | Primary Metal Products |
| 34 | Fabricated Metal Products |
| 35 | Machinery, excluding Electrical |
| 36 | Electrical Machinery, Equipment, or Supplies |
| 37 | Transportation Equipment |
| 38 | Instruments, Photographic Goods, Optical Goods, Watches, or Clocks |
| 39 | Miscellaneous Products of Manufacturing |
| 40 | Waste or Scrap Materials |
| 41 | Miscellaneous Freight Shipments |
| 42 | Containers, Carriers or Devices, Shipping, Returned Empty |
| 43* | Mail |
| 44* | Freight Forwarder Traffic |
| 45* | Shipper Association or Similar Traffic |
| 46* | Freight All Kinds |
| 47* | Small Packages, LTC or LTL |
| 48 | Waste Hazardous Materials or Waste Hazardous Substances |
| 49* | Hazardous Materials |
| 50* | Bulk Movement in Boxcars |

# Sample Commodity Flow Table

(TransCad Dataview of Commodities by Standard Classification of Transported Goods)

2007_TRUCK_DOM.dvw - 2007_TRUCK_DOM

| MODE | CO_FROM | CO_TO | SCTG1 | SCTG2 | SCTG3 | SCTG4 | SCTG5 | SCTG6 | SCTG7 | SCTG8 | SCTG9 | SCTG10 | SCTG11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 0.000 | 0.762 | 0.041 | 0.168 | 0.011 | 0.001 | 0.007 | 0.001 | 0.000 | 0.020 | 0.296 |
| 1 | 1 | 2 | 0.000 | 0.000 | 0.002 | 0.018 | 0.010 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.005 |
| 1 | 1 | 3 | 0.001 | 1.572 | 1.488 | 0.914 | 0.007 | 0.021 | 0.042 | 0.005 | 0.000 | 0.000 | 0.000 |
| 1 | 1 | 4 | 0.012 | 0.000 | 0.006 | 0.022 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.174 |
| 1 | 1 | 5 | 0.899 | 0.000 | 0.447 | 0.328 | 0.001 | 0.007 | 0.004 | 0.000 | 0.000 | 0.001 | 0.331 |
| 1 | 1 | 6 | 0.000 | 0.762 | 0.656 | 0.469 | 0.004 | 0.009 | 0.018 | 0.003 | 0.000 | 0.000 | 0.000 |
| 1 | 1 | 7 | 0.000 | 0.000 | 0.004 | 0.094 | 0.004 | 0.000 | 0.003 | 0.000 | 0.000 | 0.007 | 0.098 |
| 1 | 1 | 8 | 0.000 | 0.000 | 0.290 | 0.218 | 0.035 | 0.015 | 0.025 | 0.046 | 0.000 | 0.038 | 0.578 |
| 1 | 1 | 9 | 0.000 | 0.000 | 0.000 | 0.060 | 0.006 | 0.000 | 0.004 | 0.002 | 0.000 | 0.012 | 0.187 |
| 1 | 1 | 10 | 0.000 | 0.810 | 0.000 | 0.132 | 0.005 | 0.000 | 0.003 | 0.000 | 0.000 | 0.008 | 0.121 |
| 1 | 1 | 11 | 0.072 | 0.000 | 0.091 | 0.086 | 0.002 | 0.006 | 0.002 | 0.000 | 0.000 | 0.001 | 0.202 |
| 1 | 1 | 12 | 0.000 | 0.000 | 0.004 | 0.048 | 0.003 | 0.000 | 0.002 | 0.000 | 0.000 | 0.005 | 0.081 |
| 1 | 1 | 13 | 0.000 | 0.000 | 0.013 | 0.062 | 0.005 | 0.001 | 0.004 | 0.001 | 0.000 | 0.009 | 0.136 |
| 1 | 1 | 14 | 0.000 | 0.000 | 0.312 | 0.232 | 0.002 | 0.004 | 0.010 | 0.001 | 0.000 | 0.006 | 0.083 |
| 1 | 1 | 15 | 0.000 | 0.000 | 0.000 | 0.073 | 0.003 | 0.000 | 0.002 | 0.000 | 0.000 | 0.012 | 0.177 |
| 1 | 1 | 16 | 0.001 | 0.762 | 2.012 | 1.210 | 0.018 | 0.034 | 0.060 | 0.015 | 0.000 | 0.019 | 0.285 |
| 1 | 1 | 17 | 0.000 | 0.000 | 0.077 | 0.160 | 0.012 | 0.003 | 0.009 | 0.014 | 0.000 | 0.037 | 0.555 |
| 1 | 1 | 18 | 0.000 | 0.000 | 0.146 | 0.143 | 0.002 | 0.002 | 0.005 | 0.001 | 0.000 | 0.003 | 0.043 |
| 1 | 1 | 19 | 0.000 | 0.000 | 0.000 | 0.035 | 0.002 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 | 0.021 |
| 1 | 1 | 20 | 0.001 | 4.569 | 0.222 | 0.682 | 0.015 | 0.001 | 0.006 | 0.001 | 0.000 | 0.018 | 0.273 |
| 1 | 1 | 21 | 0.000 | 0.000 | 0.173 | 0.186 | 0.005 | 0.005 | 0.007 | 0.005 | 0.000 | 0.005 | 0.076 |
| 1 | 1 | 22 | 2.657 | 2.470 | 0.553 | 0.690 | 0.003 | 0.008 | 0.004 | 0.000 | 0.000 | 0.002 | 0.584 |
| 1 | 1 | 23 | 0.000 | 0.000 | 0.035 | 0.104 | 0.011 | 0.003 | 0.008 | 0.003 | 0.000 | 0.022 | 0.325 |
| 1 | 1 | 24 | 0.000 | 0.810 | 0.173 | 0.192 | 0.010 | 0.005 | 0.010 | 0.014 | 0.000 | 0.010 | 0.147 |
| 1 | 1 | 25 | 0.001 | 4.569 | 1.628 | 1.634 | 0.021 | 0.021 | 0.047 | 0.005 | 0.000 | 0.037 | 0.557 |
| 1 | 1 | 26 | 0.000 | 0.762 | 0.032 | 0.196 | 0.016 | 0.000 | 0.010 | 0.000 | 0.000 | 0.031 | 0.470 |
| 1 | 1 | 27 | 0.000 | 0.000 | 0.035 | 0.097 | 0.009 | 0.003 | 0.006 | 0.003 | 0.000 | 0.015 | 0.225 |
| 1 | 1 | 28 | 0.001 | 0.762 | 1.308 | 0.849 | 0.027 | 0.024 | 0.048 | 0.023 | 0.000 | 0.039 | 0.590 |
| 1 | 1 | 29 | 0.000 | 0.000 | 0.008 | 0.074 | 0.003 | 0.000 | 0.002 | 0.000 | 0.000 | 0.006 | 0.087 |
| 1 | 1 | 30 | 0.001 | 0.000 | 1.460 | 0.891 | 0.006 | 0.021 | 0.042 | 0.005 | 0.000 | 0.009 | 0.141 |

# Commodity Flow Statistics

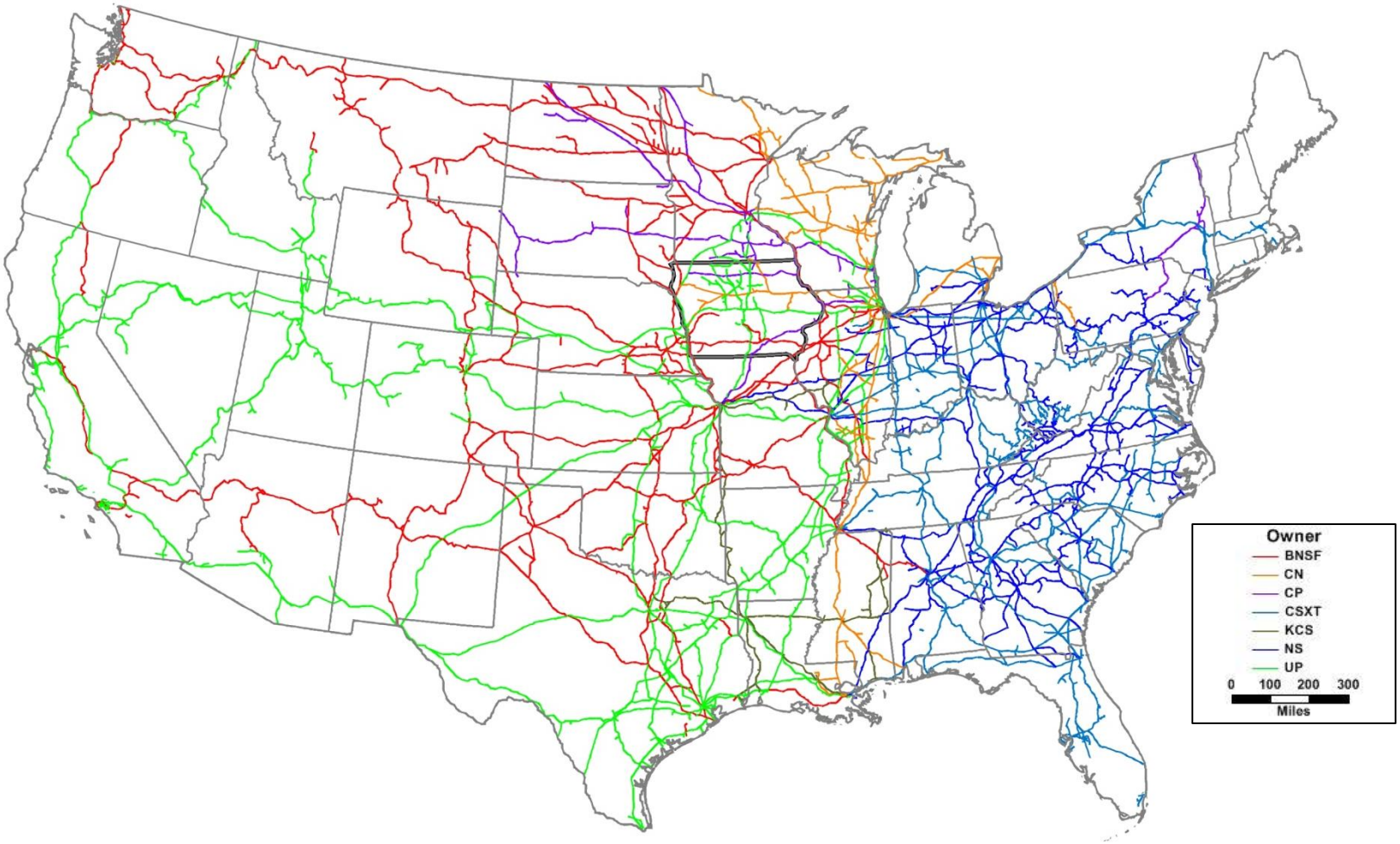
Dataview4 - 2007_SUM_RRAIL Statistics

| Field | Count | Sum | Minimum | Maximum | Mean | [Std. Dev.] |
|---|---|---|---|---|---|---|
| MODE | 9878449 | 19756898.000 | 2.000 | 2.000 | 2.00000 | 0.0000 |
| CO_FROM | 9878449 | 15528921828.000 | 1.000 | 3143.000 | 1572.00000 | 907.3059 |
| CO_TO | 9878449 | 15528921828.000 | 1.000 | 3143.000 | 1572.00000 | 907.3059 |
| SCTG1 | 9878449 | 21.284 | 0.000 | 0.409 | 0.00000 | 0.0004 |
| SCTG2 | 9878449 | 164295.440 | 0.000 | 749.319 | 0.01663 | 0.7557 |
| SCTG3 | 9878449 | 17195.670 | 0.000 | 60.341 | 0.00174 | 0.0699 |
| SCTG4 | 9878449 | 26714.836 | 0.000 | 91.904 | 0.00270 | 0.0728 |
| SCTG5 | 9878449 | 494.559 | 0.000 | 10.168 | 0.00005 | 0.0088 |
| SCTG6 | 9878449 | 11164.890 | 0.000 | 57.249 | 0.00113 | 0.0629 |
| SCTG7 | 9878449 | 30826.228 | 0.000 | 100.589 | 0.00312 | 0.0963 |
| SCTG8 | 9878449 | 10244.131 | 0.000 | 621.281 | 0.00104 | 0.2449 |
| SCTG9 | 9878449 | 2.439 | 0.000 | 0.302 | 0.00000 | 0.0002 |
| SCTG10 | 9878449 | 151.789 | 0.000 | 8.600 | 0.00002 | 0.0043 |
| SCTG11 | 9878449 | 16619.920 | 0.000 | 238.184 | 0.00168 | 0.1639 |
| SCTG12 | 9878449 | 77880.346 | 0.000 | 3570.825 | 0.00788 | 1.5173 |
| SCTG13 | 9878449 | 42340.175 | 0.000 | 1122.144 | 0.00429 | 0.5637 |
| SCTG14 | 9878449 | 57565.035 | 0.000 | 2656.830 | 0.00583 | 2.0358 |
| SCTG15 | 9878449 | 1016546.756 | 0.000 | 7823.081 | 0.10291 | 10.5612 |
| SCTG16 | 9878449 | 637.154 | 0.000 | 35.257 | 0.00006 | 0.0210 |
| SCTG17 | 9878449 | 7835.555 | 0.000 | 839.870 | 0.00079 | 0.3800 |
| SCTG18 | 9878449 | 4219.386 | 0.000 | 202.781 | 0.00043 | 0.1325 |
| SCTG19 | 9878449 | 84513.449 | 0.000 | 5239.328 | 0.00856 | 1.8801 |
| SCTG20 | 9878449 | 118773.565 | 0.000 | 3003.917 | 0.01202 | 1.5763 |
| SCTG21 | 9878449 | 10.144 | 0.000 | 0.954 | 0.00000 | 0.0005 |
| SCTG22 | 9878449 | 45595.624 | 0.000 | 723.459 | 0.00462 | 0.4544 |
| SCTG23 | 9878449 | 8750.042 | 0.000 | 253.321 | 0.00089 | 0.1253 |
| SCTG24 | 9878449 | 46735.766 | 0.000 | 6874.808 | 0.00473 | 2.3009 |

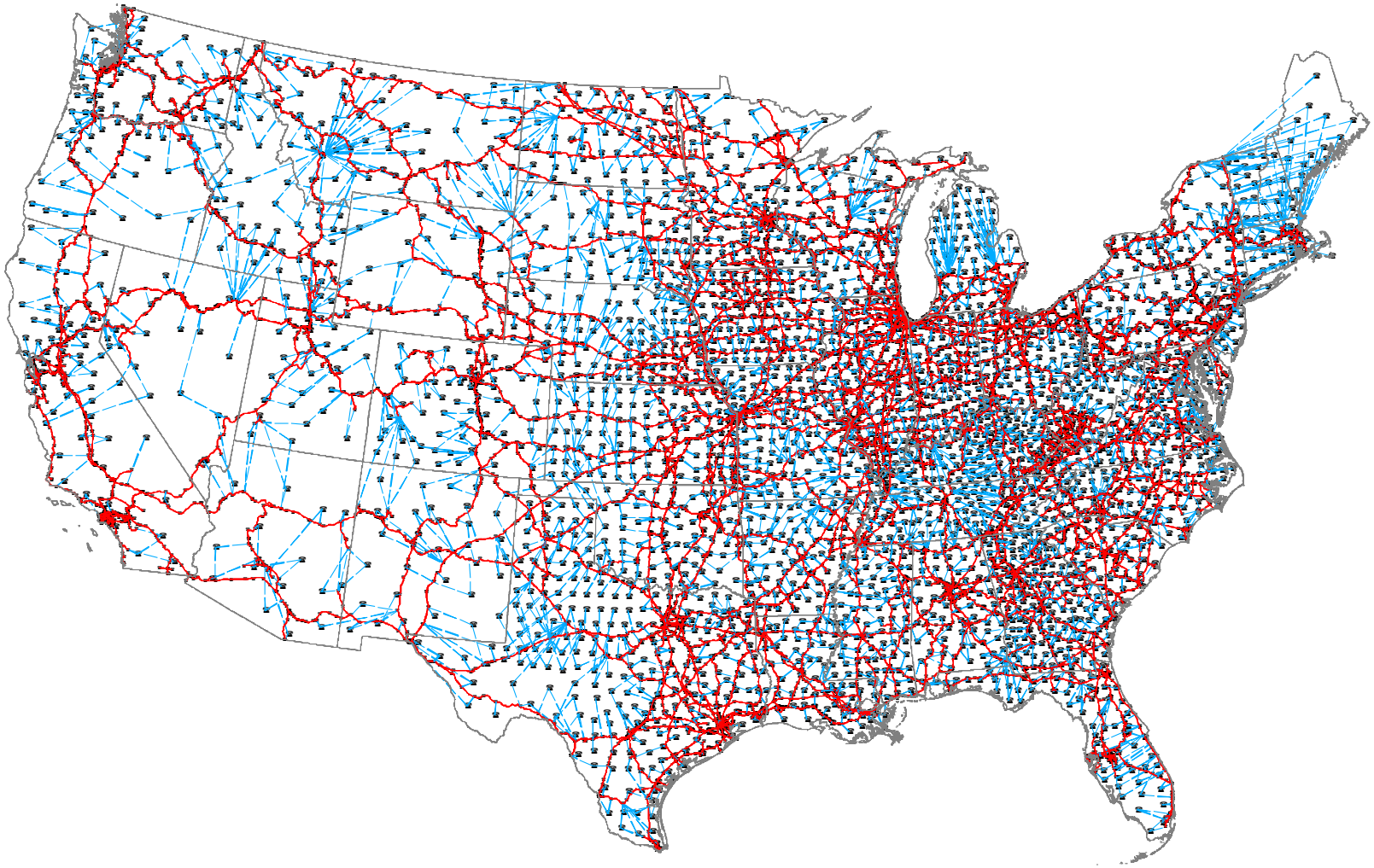
# National Rail Network of Class 1 and IAIS Links

- Network in TransCAD Standard Geographic Database
- Eleven sub-networks defined by rail company ownership and usage
  1. County geographic centroid connections
  2. Terminal railroads
  3. BNSF
  4. CN
  5. CP
  6. CSXT
  7. IAIS
  8. KCS
  9. NS
  10. UP
  11. Interline connections
- Built from ORNL Center for Transportation Analysis rail network (edition 28, August 2012)

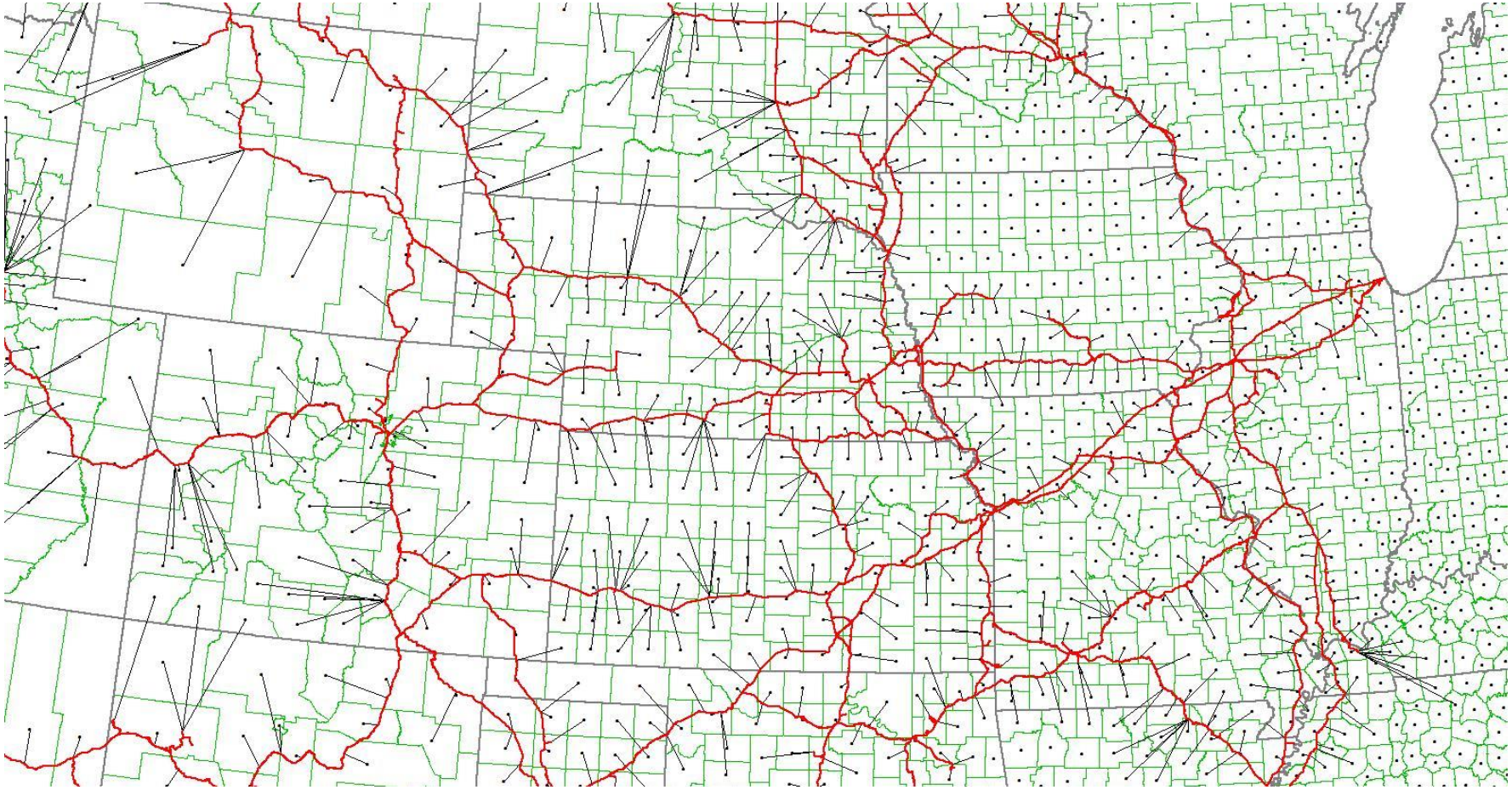
# National Class I Rail Network



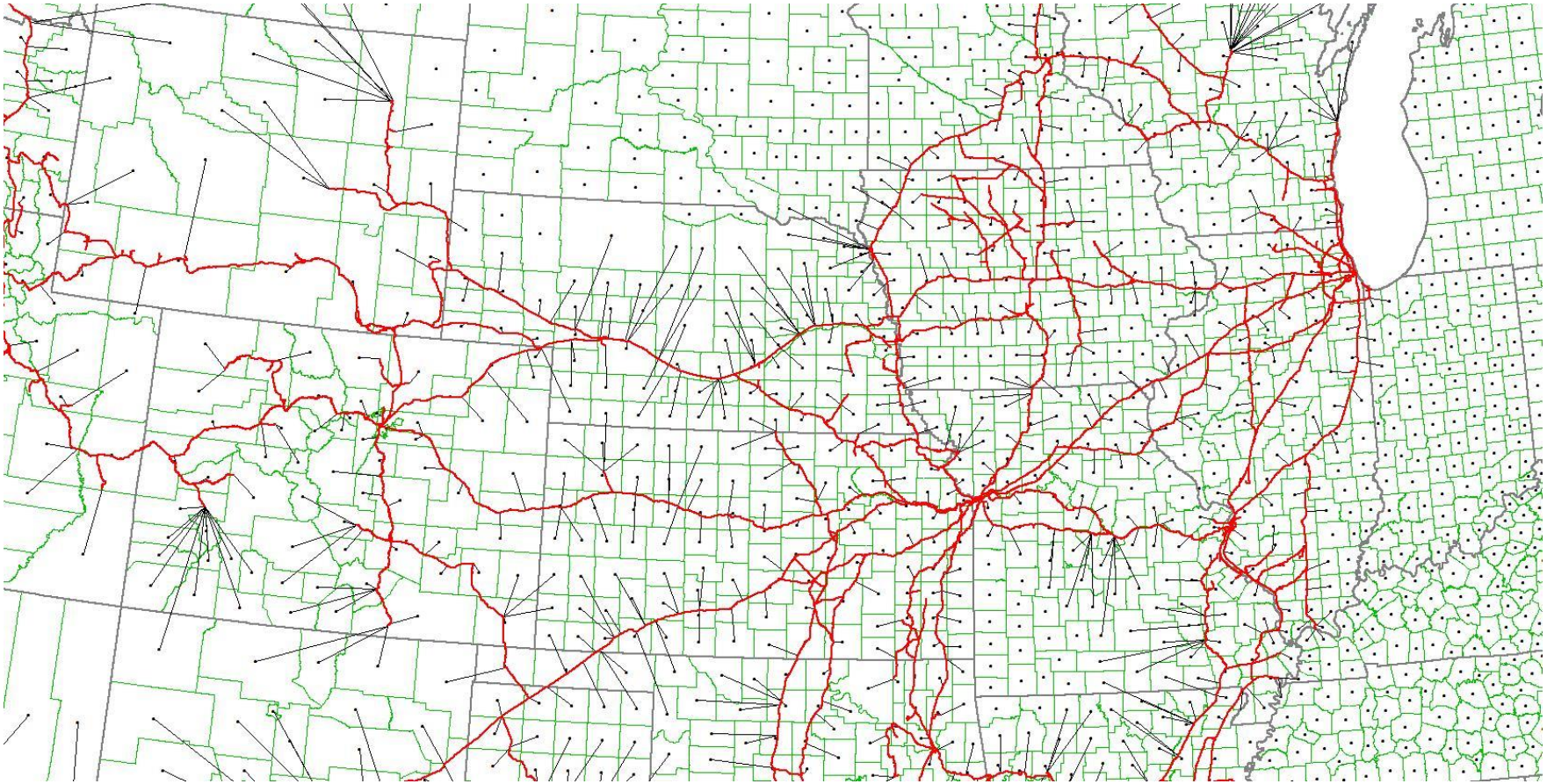
# Network Coding



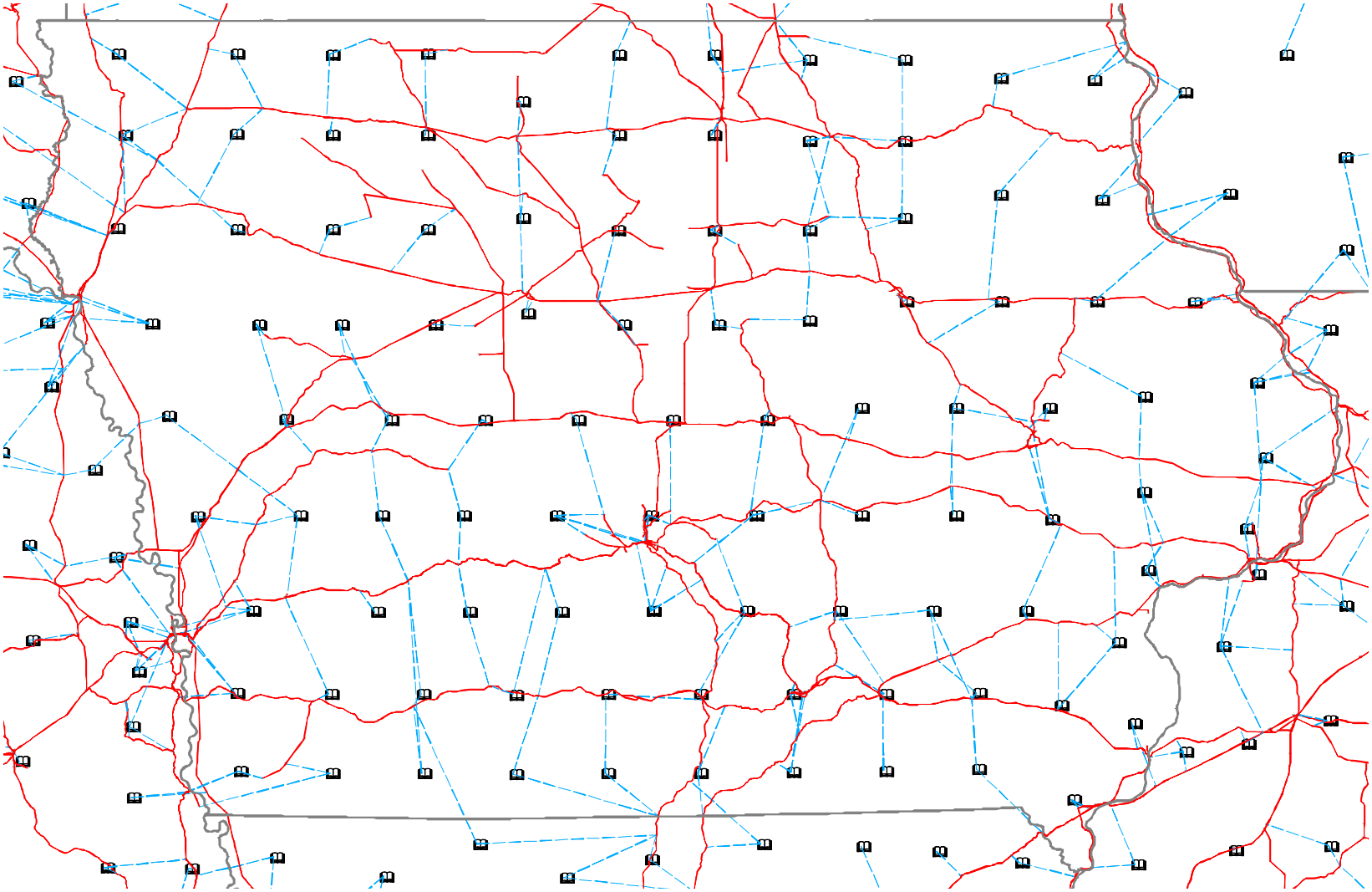
# BNSF Subnet and Connectors



# UP Subnet and Centroid Connectors

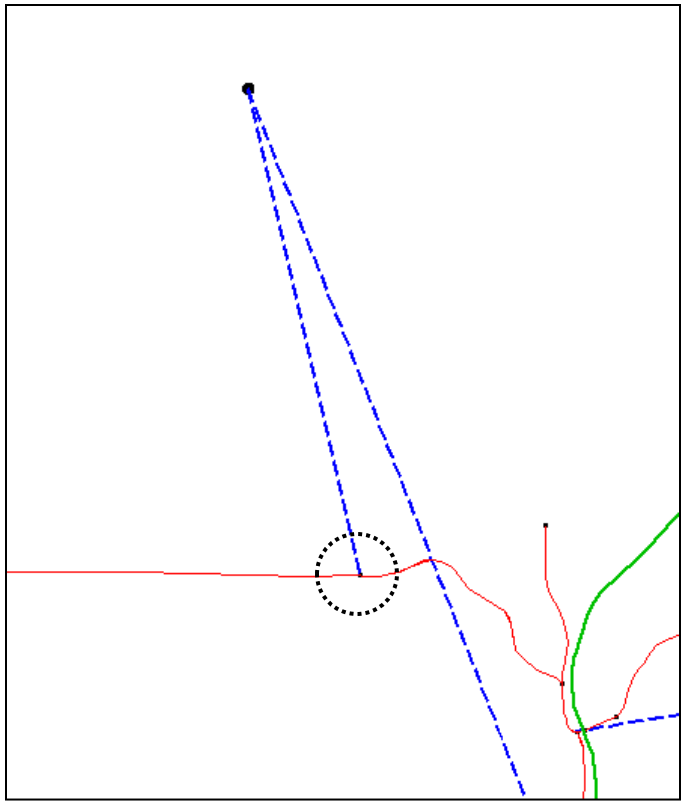


# Iowa Portion of National Network

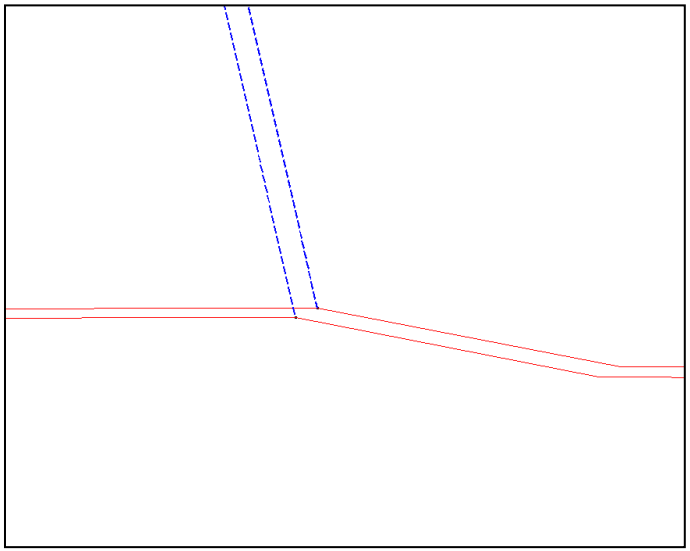


# Multiple Links for Class I Sub-Networks

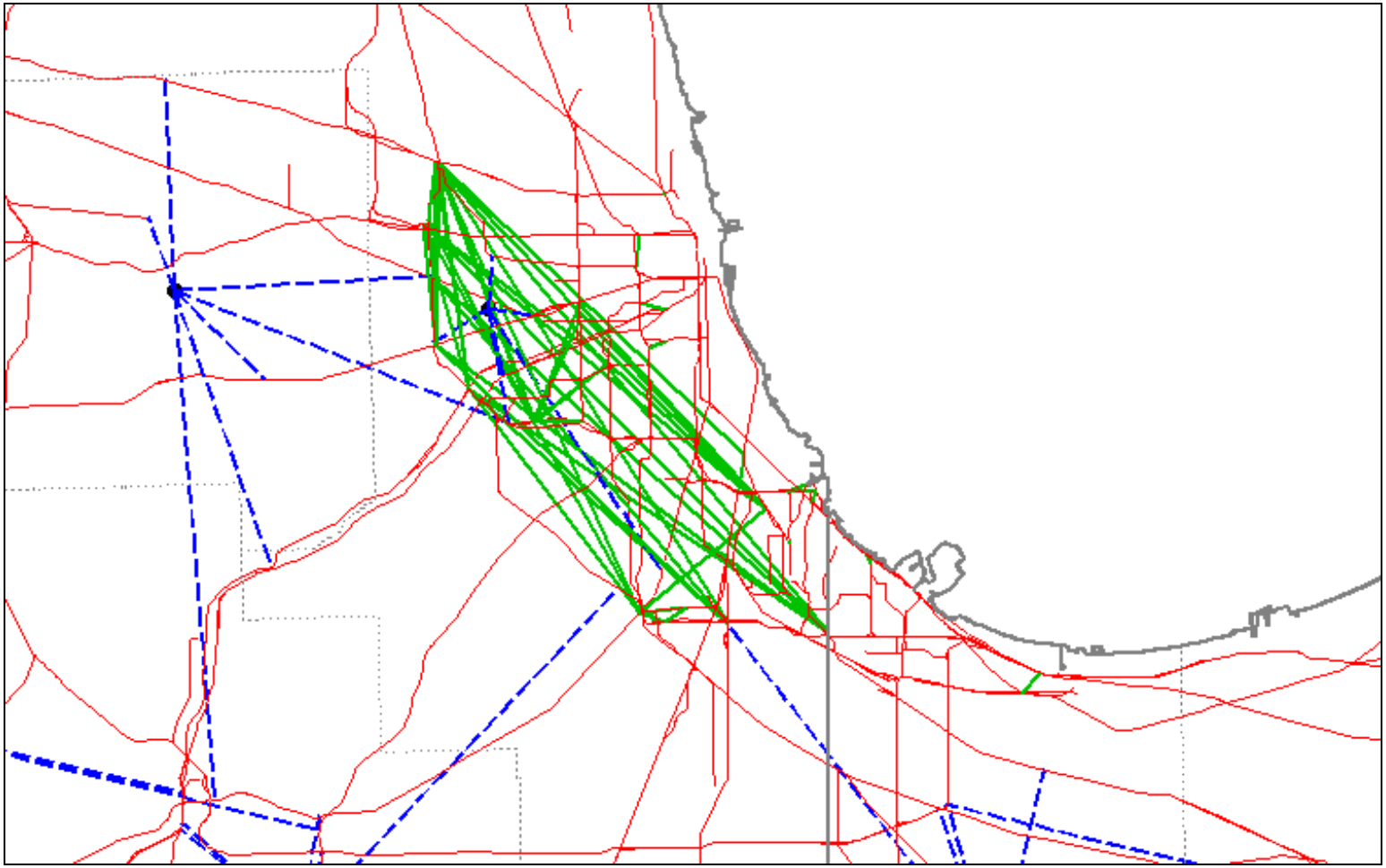
- Overview



- Zoom In



# Interline Transfers



# National Network Files

- TransCAD network
- Centroid indices (network node-county code match file)
- Assignment template network
  - Multiple links for sub-networks
  - Need to combine for display purposes
- Template network with link train capacities
  - AAR's National Rail Freight Infrastructure Capacity and Investment Study
  - Function of number of tracks and signaling

# Network Dataview

Dataview22 - Net_14_Link

| ID | Length | Dir | [From ID:1] | [From LATITUDE:1] | [From LONGITUDE:1] | [To ID:1] | [To LATITUDE:1] | [To LONGITUDE:1] | ALID | RTID | QAUX | MILES | DIRCTN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46908 | 10.52 | 0 | 46632 | 33505710 | -117664750 | 46640 | 33387560 | -117594720 | 06005480 | SCRA | tBNSF | 10.53 | S |
| 47066 | 16.56 | 0 | 46640 | 33387560 | -117594720 | 46648 | 33223450 | -117393190 | 06004630 | SDNR | tBNSF | 16.64 | S |
| 47225 | 9.18 | 0 | 46656 | 32965950 | -117264620 | 46664 | 32876850 | -117173540 | 06007110 | SDNR | tBNSF | 9.19 | S |
| 47392 | 0.43 | 0 | 46672 | 32702200 | -117153450 | 46680 | 32697620 | -117148660 | 06005960 | ATSF | wBNSF | 0.43 | S |
| 47405 | 0.42 | 0 | 46680 | 32697620 | -117148660 | 46672 | 32702200 | -117153450 | 06008530 | ATSF | wBNSF | 0.42 | N |
| 47419 | 3.00 | 0 | 46680 | 32697620 | -117148660 | 46688 | 32670140 | -117112920 | 06008520 | ATSF | wBNSF | 3.00 | S |
| 47474 | 16.02 | 0 | 46664 | 32876850 | -117173540 | 46672 | 32702200 | -117153450 | 06007120 | SDNR | tBNSF | 16.03 | S |
| 47738 | 16.29 | 0 | 46696 | 33181800 | -117369760 | 46656 | 32965950 | -117264620 | 06001210 | SDNR | tBNSF | 16.30 | S |
| 47880 | 1.35 | 0 | 46704 | 33197790 | -117383280 | 46696 | 33181800 | -117369760 | 06007130 | SDNR | tBNSF | 1.35 | S |
| 47891 | 1.88 | 0 | 46648 | 33223450 | -117393190 | 46704 | 33197790 | -117383280 | 06000440 | SDNR | tBNSF | 1.88 | S |
| 47909 | 21.29 | 0 | 46696 | 33181800 | -117369760 | 46712 | 33116130 | -117084700 | 06001240 | SDNR | tBNSF | 21.29 | E |
| 48429 | 21.14 | 0 | 46720 | 33035838 | -116732998 | 46712 | 33116130 | -117084700 | | | | 21.14 | |
| 48435 | 53.01 | 0 | 46720 | 33035838 | -116732998 | 46728 | 33580480 | -116085990 | | | | 53.01 | |
| 48441 | 99.89 | 0 | 46736 | 33039506 | -115365317 | 46712 | 33116130 | -117084700 | | | | 99.89 | |
| 48448 | 16.85 | 0 | 46728 | 33580480 | -116085990 | 46744 | 33454450 | -115854090 | 06010450 | SP Yuma | wUP | 16.85 | E |
| 48600 | 17.11 | 0 | 46752 | 32789560 | -115843580 | 46760 | 32801540 | -115553580 | 06000400 | SP | wUP | 17.10 | E |
| 48693 | 2.38 | 0 | 46768 | 32664750 | -115495730 | 46776 | 32642980 | -115467820 | 91003340 | FXE | wFXE tUP | 2.38 | S |
| 48728 | 2.13 | 0 | 46768 | 32664750 | -115495730 | 46784 | 32692850 | -115509500 | 06005000 | SP | wUP | 2.13 | N |
| 48749 | 7.62 | 0 | 46784 | 32692850 | -115509500 | 46792 | 32797510 | -115551960 | 06001400 | SP | wUP | 7.63 | N |
| 48791 | 0.29 | 0 | 46792 | 32797510 | -115551960 | 46760 | 32801540 | -115553580 | 06007070 | SP | wUP | 0.29 | N |
| 48805 | 12.91 | 0 | 46800 | 32983270 | -115527330 | 46760 | 32801540 | -115553580 | 06007090 | SP | wUP | 12.92 | S |
| 48877 | 9.98 | 0 | 46792 | 32797510 | -115551960 | 46808 | 32809380 | -115383030 | 06001390 | SP | wUP | 9.97 | E |
| 48986 | 27.46 | 0 | 46744 | 33454450 | -115854090 | 46816 | 33242320 | -115510470 | 06007870 | SP Yuma | wUP | 27.46 | E |
| 49200 | 9.96 | 0 | 46824 | 33120970 | -115508290 | 46800 | 32983270 | -115527330 | 06001230 | SP | wUP | 9.97 | S |
| 49328 | 8.45 | 0 | 46816 | 33242320 | -115510470 | 46824 | 33120970 | -115508290 | 06001220 | SP | wUP | 8.45 | S |
| 49367 | 10.02 | 0 | 46736 | 33039506 | -115365317 | 46824 | 33120970 | -115508290 | | | | 10.01 | |
| 49373 | 20.60 | 0 | 46832 | 32992550 | -115062870 | 46840 | 32788980 | -114803470 | 06009820 | SP Yuma | wUP | 20.60 | E |
| 49443 | 31.26 | 0 | 46816 | 33242320 | -115510470 | 46832 | 32992550 | -115062870 | 06000390 | SP Yuma | wUP | 31.25 | E |
| 49534 | 14.00 | 0 | 46848 | 32726840 | -114686860 | 46856 | 32571450 | -114789450 | 04001000 | YUMA | tUP | 14.01 | S |
| 49713 | 6.19 | 0 | 46864 | 32747340 | -114713690 | 46872 | 32732890 | -114618760 | 06007890 | SP Yuma | wUP | 6.18 | E |

# County Centroid Dataview

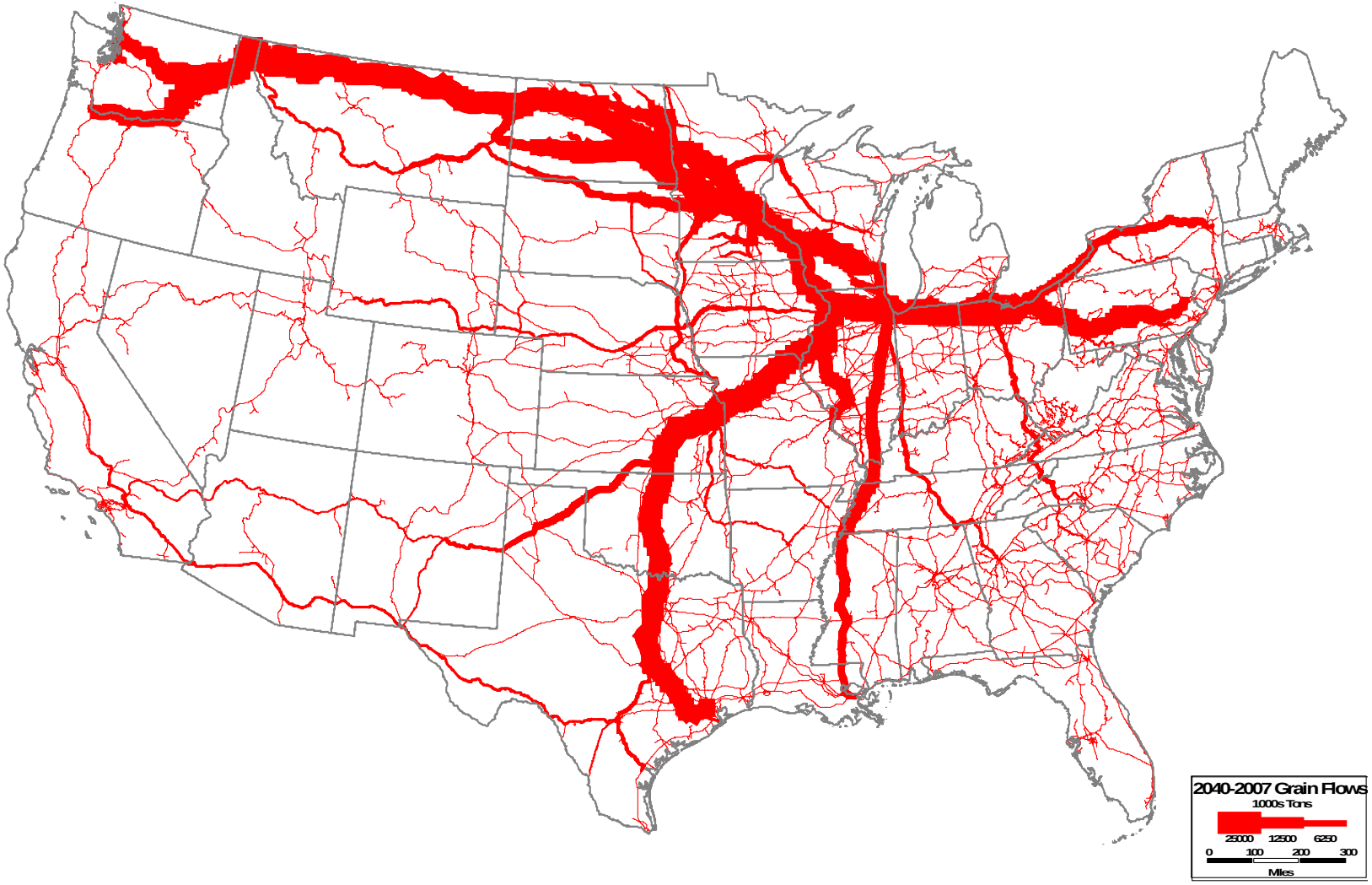
CENTROID INDICES.dvw - CENTROID INDICES

| CO_CENT | TC_NODE | FIPS | NAME | TC_NAME |
|---|---|---|---|---|
| 1 | 672242 | 1001 | Autauga AL | Autauga_AL |
| 2 | 661236 | 1003 | Baldwin AL | Baldwin_AL |
| 3 | 696888 | 1005 | Barbour AL | Barbour_AL |
| 4 | 669080 | 1007 | Bibb AL | Bibb_AL |
| 5 | 1253066 | 1009 | Blount AL | Blount_AL |
| 6 | 694491 | 1011 | Bullock AL | Bullock_AL |
| 7 | 672170 | 1013 | Butler AL | Butler_AL |
| 8 | 1269873 | 1015 | Calhoun AL | Calhoun_AL |
| 9 | 698940 | 1017 | Chambers AL | Chambers_AL |
| 10 | 1272252 | 1019 | Cherokee AL | Cherokee_AL |
| 11 | 674774 | 1021 | Chilton AL | Chilton_AL |
| 12 | 654417 | 1023 | Choctaw AL | Choctaw_AL |
| 13 | 664296 | 1025 | Clarke AL | Clarke_AL |
| 14 | 698836 | 1027 | Clay AL | Clay_AL |
| 15 | 1270001 | 1029 | Cleburne AL | Cleburne_AL |
| 16 | 690033 | 1031 | Coffee AL | Coffee_AL |
| 17 | 1247613 | 1033 | Colbert AL | Colbert_AL |
| 18 | 664232 | 1035 | Conecuh AL | Conecuh_AL |
| 19 | 684603 | 1037 | Coosa AL | Coosa_AL |
| 20 | 664240 | 1039 | Covington AL | Covington_AL |
| 21 | 672274 | 1041 | Crenshaw AL | Crenshaw_AL |
| 22 | 1251433 | 1043 | Cullman AL | Cullman_AL |
| 23 | 690081 | 1045 | Dale AL | Dale_AL |
| 24 | 666672 | 1047 | Dallas AL | Dallas_AL |
| 25 | 1272236 | 1049 | DeKalb AL | DeKalb_AL |
| 26 | 684587 | 1051 | Elmore AL | Elmore_AL |
| 27 | 661460 | 1053 | Escambia AL | Escambia_AL |
| 28 | 1253170 | 1055 | Etowah AL | Etowah_AL |
| 29 | 1243373 | 1057 | Fayette AL | Fayette_AL |
| 30 | 1243389 | 1059 | Franklin AL | Franklin_AL |
| 31 | 690065 | 1061 | Geneva AL | Geneva_AL |

# National Model Applications

- National rail assignment without Iowa origins and destinations
  - Background national rail through Iowa movements
  - Implications of 2040 FAF forecast on available Iowa rail capacity
  - Implications of alternative freight forecast scenarios (growth factoring of national commodity flow tables)
- Assignment of Iowa origins and destinations (county level on national network)
  - Where Iowa commodity flows enter national rail network
  - Base and future Iowa commodity mode shares
  - Rail points of entry flows at Iowa study area boundaries

# Network Assignment Plot



# Preliminary Results

| | Reported Iowa Car-Miles | | Carload Waybill | Estimated Ton-Miles | | Estimated Car-Miles | |
|---|---|---|---|---|---|---|---|
| RR Company | 2009 | 2010 | Tons/Car | All-or-Nothing | Stoch Θ=0.05 | All-or-Nothing | Stoch Θ=0.05 |
| BNSF | 204,856 | 211,168 | 110 | 24,016,754 | 21,280,959 | 217,489 | 192,715 |
| CN | 19,108 | 19,488 | 93 | 454,261 | 516,992 | 4,888 | 5,563 |
| CP | 32,526 | 33,957 | 100 | 460,651 | 520,636 | 4,620 | 5,222 |
| NS | 1,697 | 1,102 | 88 | 26,171 | 942,227 | 296 | 10,661 |
| UP | 422,765 | 462,503 | 97 | 41,097,095 | 39,095,033 | 422,785 | 402,189 |
| IAIS | 11,645 | 13,173 | 83 | 27,559 | 59,906 | 331 | 720 |
| Total | 692,597 | 741,391 | 103 | 66,082,491 | 62,415,753 | 639,734 | 604,237 |

# Detailed Iowa Rail Freight Model Carload Waybill Sample Components

- 2009 and 2010 combined Iowa Carload Waybill Sample
- Four folders
  - All records in both years of Iowa Combined Waybill Sample files with county codes used for national rail network assignment
  - FIPS-county code match file
  - Iowa freight station DeskMAP Systems Inc. file
  - Iowa only Carload Waybill Sample file
    - All waybill file records originating or terminating in Iowa
    - Iowa waybill records origin/terminal are coded to freight station centroids (approximately a third of all freight stations in Iowa)
    - Outside Iowa waybill records origin/terminal are coded to counties
  - Match file between network nodes and freight station/county centroids (matrix indices)
  - TransCAD matrices for commodity flows in Carload Waybill Sample files
    - Tons
    - Cars
    - Containers

# Commodity Flow Data: STB Carload Waybill Sample

- All U.S. railroads that terminate more than 4,500 revenue carloads must participate
- **SAMPLE** of shipment waybills or comparable documents
  - Sample size based on number of carloads on waybill

| Carloads/ Waybill | Sample Rate |
|---|---|
| 1-2 | 1/40 |
| 3-15 | 1/12 |
| 16-60 | 1/4 |
| 61-100 | 1/3 |
| >100 | 1/2 |

# Commodity Flow Data: STB Carload Complete Restricted Waybill Sample

- Distribution is restricted but used by many states for state transportation plans (state by state basis)
- Contents
  - Routing information: origin railroad/station, intermediate interchange points and bridge railroads, and terminating railroad and station
  - Commodity carried by seven digit Standard Transportation Commodity Code (STCC), generally compatible with SCTG
  - Type of railcar
  - Intermodal characteristics
  - Origin-destination commodity flows coded to counties and BEA economic areas

# Matrix Source Dataview

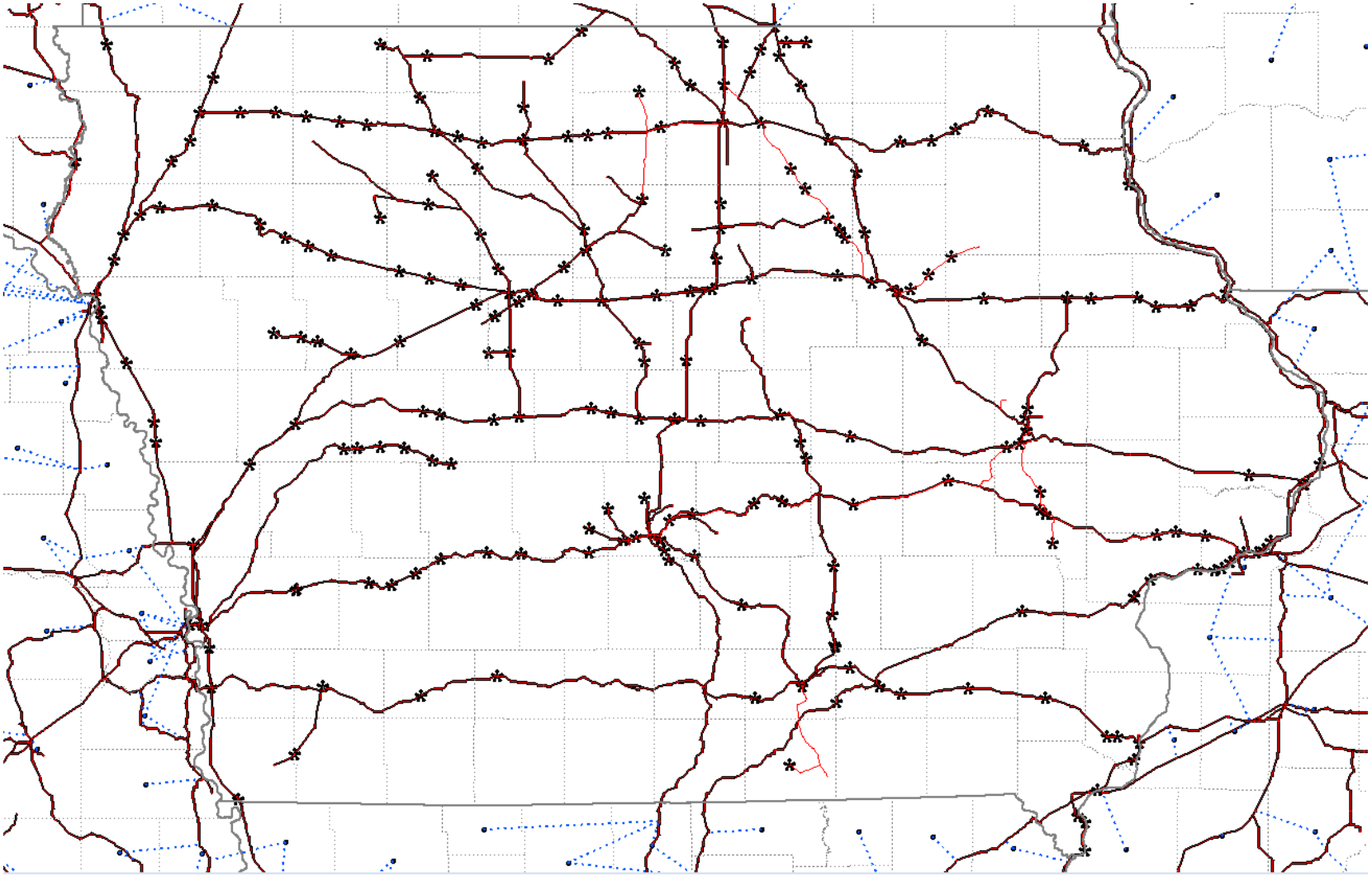
IADOT Iowa Only Assign.dvw - IADOT Iowa Only Assign

| SOURCE | SERIAL_NO | FROM | TO | EXP_FACTOR | STCC_2 | CARS | TONS | TC_UNITS | A_CARS | A_TONS | A_TC_UNITS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IA2010 | 101351 | 90004043 | 90000106 | 100 | 20 | 100 | 10700 | 0 | 50.00 | 5350.00 | 0.00 |
| IA2010 | 101377 | 90002411 | 90004144 | 5 | 14 | 150 | 13005 | 0 | 75.00 | 6502.50 | 0.00 |
| IA2010 | 101378 | 90002411 | 90004144 | 5 | 14 | 150 | 12540 | 0 | 75.00 | 6270.00 | 0.00 |
| IA2010 | 101379 | 90002411 | 90004144 | 5 | 14 | 150 | 12970 | 0 | 75.00 | 6485.00 | 0.00 |
| IA2010 | 101380 | 90002411 | 90004144 | 5 | 14 | 150 | 12490 | 0 | 75.00 | 6245.00 | 0.00 |
| IA2010 | 101381 | 90002411 | 90004144 | 5 | 14 | 235 | 21030 | 0 | 117.50 | 10515.00 | 0.00 |
| IA2010 | 101382 | 90002411 | 90004143 | 10 | 14 | 150 | 16280 | 0 | 75.00 | 8140.00 | 0.00 |
| IA2010 | 101383 | 90002411 | 90004143 | 10 | 14 | 150 | 16360 | 0 | 75.00 | 8180.00 | 0.00 |
| IA2010 | 101384 | 90004143 | 90004144 | 10 | 14 | 200 | 20310 | 0 | 100.00 | 10155.00 | 0.00 |
| IA2010 | 101385 | 90002411 | 90004144 | 10 | 14 | 200 | 21700 | 0 | 100.00 | 10850.00 | 0.00 |
| IA2010 | 101386 | 90002411 | 90004144 | 10 | 14 | 200 | 21700 | 0 | 100.00 | 10850.00 | 0.00 |
| IA2010 | 101387 | 90002411 | 90004144 | 10 | 14 | 240 | 19900 | 0 | 120.00 | 9950.00 | 0.00 |
| IA2010 | 101388 | 90002411 | 90004144 | 10 | 14 | 250 | 27820 | 0 | 125.00 | 13910.00 | 0.00 |
| IA2010 | 101389 | 90002411 | 90004144 | 10 | 14 | 250 | 27210 | 0 | 125.00 | 13605.00 | 0.00 |
| IA2010 | 101390 | 90002411 | 90004144 | 10 | 14 | 250 | 27470 | 0 | 125.00 | 13735.00 | 0.00 |
| IA2010 | 101391 | 90002411 | 90004144 | 5 | 14 | 150 | 16420 | 0 | 75.00 | 8210.00 | 0.00 |
| IA2010 | 101392 | 90002411 | 90004144 | 5 | 14 | 150 | 15255 | 0 | 75.00 | 7627.50 | 0.00 |
| IA2010 | 101393 | 90002411 | 90004144 | 5 | 14 | 175 | 14795 | 0 | 87.50 | 7397.50 | 0.00 |
| IA2010 | 101394 | 90002411 | 90004144 | 5 | 14 | 200 | 22235 | 0 | 100.00 | 11117.50 | 0.00 |
| IA2010 | 101395 | 90002411 | 90004144 | 5 | 14 | 250 | 25980 | 0 | 125.00 | 12990.00 | 0.00 |
| IA2010 | 101396 | 90002411 | 90004144 | 10 | 14 | 150 | 16460 | 0 | 75.00 | 8230.00 | 0.00 |
| IA2010 | 101397 | 90002411 | 90004144 | 10 | 14 | 200 | 21670 | 0 | 100.00 | 10835.00 | 0.00 |
| IA2010 | 101398 | 90002411 | 90004144 | 10 | 14 | 200 | 16350 | 0 | 100.00 | 8175.00 | 0.00 |
| IA2010 | 101399 | 90002411 | 90004144 | 10 | 14 | 200 | 21930 | 0 | 100.00 | 10965.00 | 0.00 |
| IA2010 | 101400 | 90002411 | 90004144 | 10 | 14 | 250 | 26740 | 0 | 125.00 | 13370.00 | 0.00 |
| IA2010 | 101401 | 90002411 | 90004144 | 10 | 14 | 250 | 24900 | 0 | 125.00 | 12450.00 | 0.00 |
| IA2010 | 101402 | 90002411 | 90004144 | 10 | 14 | 250 | 25340 | 0 | 125.00 | 12670.00 | 0.00 |
| IA2010 | 101403 | 90002411 | 90004144 | 5 | 14 | 150 | 14720 | 0 | 75.00 | 7360.00 | 0.00 |
| IA2010 | 101404 | 90002411 | 90004144 | 5 | 14 | 150 | 15400 | 0 | 75.00 | 7700.00 | 0.00 |
| IA2010 | 101405 | 90002411 | 90004144 | 5 | 14 | 150 | 16415 | 0 | 75.00 | 8207.50 | 0.00 |

# Detailed Iowa Rail Network

- Includes most Iowa class III railroads
  - Appanoose County Community Railroad
  - Keokuk Junction Railway
  - Cedar Rapids and Iowa City Railway Company
  - Iowa Northern Railway Company
  - Dakota and Iowa Railroad
  - Iowa Traction Railway
- County centroids in Iowa replaced by freight stations in Carload Waybill Sample files
- Three network folders
  - TransCAD Standard Geographic Database
  - Assignment template network
  - Grouping variable for template network

# Freight Station Coding



# Centroid Indices

## County Centroids (Outside Iowa)

CWB Node 5.dvw - CWB Node 5

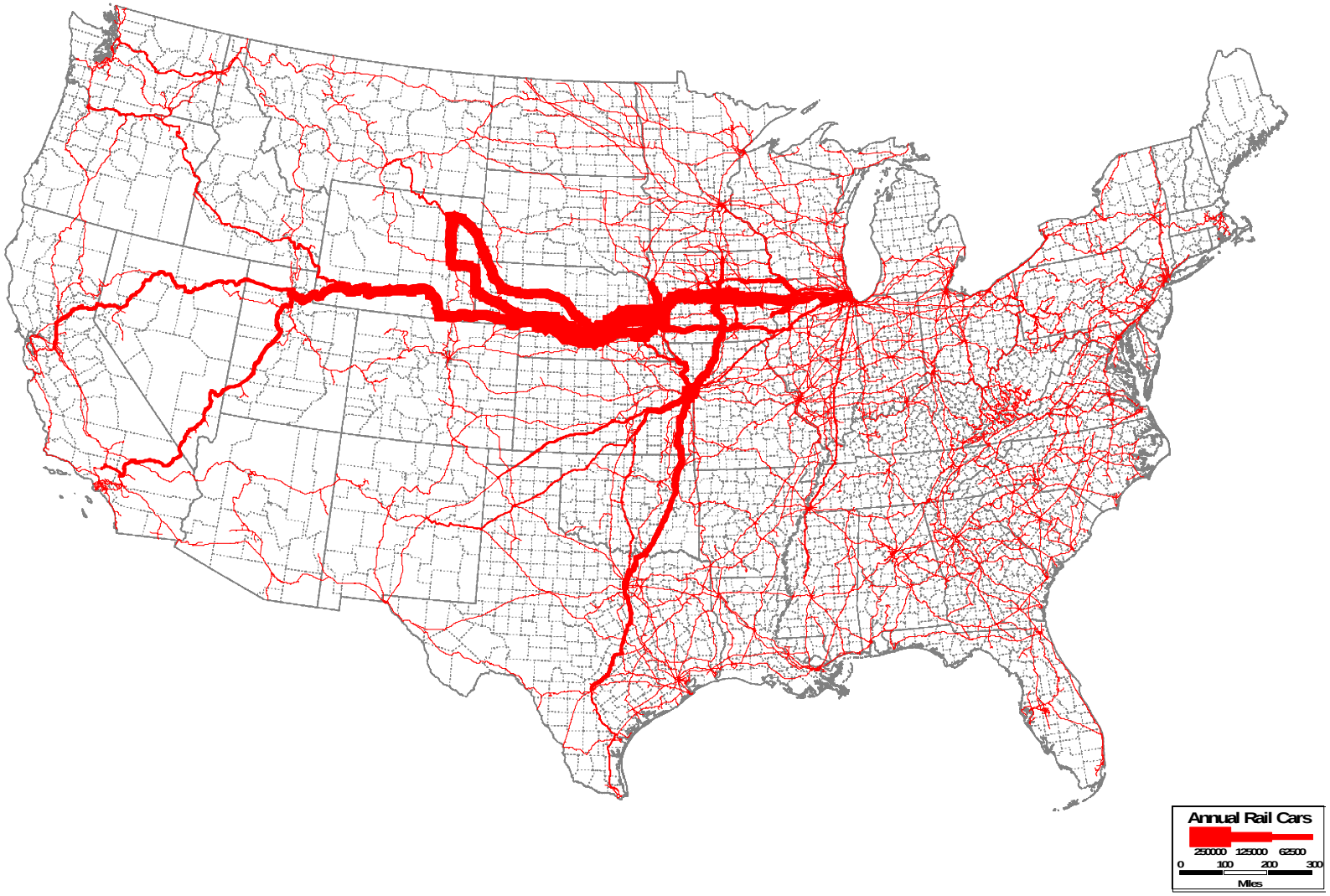
| ID | Longitude | Latitude | TC_NODE | CENTROID_9 | CENTROID | FIPS |
|---|---|---|---|---|---|---|
| 671904 | -86642762 | 32534922 | 671904 | 90000001 | 1 | 1001 |
| 660898 | -87724696 | 30735463 | 660898 | 90000002 | 2 | 1003 |
| 696550 | -85393199 | 31869595 | 696550 | 90000003 | 3 | 1005 |
| 668742 | -87126439 | 32998644 | 668742 | 90000004 | 4 | 1007 |
| 1248236 | -86567404 | 33980863 | 1248236 | 90000005 | 5 | 1009 |
| 694153 | -85715697 | 32100554 | 694153 | 90000006 | 6 | 1011 |
| 671832 | -86680288 | 31752433 | 671832 | 90000007 | 7 | 1013 |
| 1265081 | -85826036 | 33771428 | 1265081 | 90000008 | 8 | 1015 |
| 698602 | -85392043 | 32914373 | 698602 | 90000009 | 9 | 1017 |
| 1266453 | -85603795 | 34175956 | 1266453 | 90000010 | 10 | 1019 |
| 674436 | -86718814 | 32847853 | 674436 | 90000011 | 11 | 1021 |
| 654079 | -88263201 | 32019610 | 654079 | 90000012 | 12 | 1023 |
| 663958 | -87830811 | 31676660 | 663958 | 90000013 | 13 | 1025 |
| 698498 | -85860553 | 33269082 | 698498 | 90000014 | 14 | 1027 |
| 1266413 | -85518768 | 33674558 | 1266413 | 90000015 | 15 | 1029 |
| 689695 | -85988206 | 31402626 | 689695 | 90000016 | 16 | 1031 |
| 1244505 | -87805299 | 34700255 | 1244505 | 90000017 | 17 | 1033 |
| 663894 | -86993683 | 31429267 | 663894 | 90000018 | 18 | 1035 |
| 684265 | -86247665 | 32936223 | 684265 | 90000019 | 19 | 1037 |
| 663902 | -86451246 | 31248496 | 663902 | 90000020 | 20 | 1039 |
| 671936 | -86313549 | 31731487 | 671936 | 90000021 | 21 | 1041 |
| 1248140 | -86867621 | 34131941 | 1248140 | 90000022 | 22 | 1043 |
| 689743 | -85611032 | 31431821 | 689743 | 90000023 | 23 | 1045 |
| 666334 | -87106479 | 32325975 | 666334 | 90000024 | 24 | 1047 |
| 1266445 | -85804140 | 34459775 | 1266445 | 90000025 | 25 | 1049 |
| 684249 | -86149151 | 32596645 | 684249 | 90000026 | 26 | 1051 |
| 661122 | -87161618 | 31126123 | 661122 | 90000027 | 27 | 1053 |
| 1250653 | -86034801 | 34045250 | 1250653 | 90000028 | 28 | 1055 |
| 1238767 | -87738862 | 33721205 | 1238767 | 90000029 | 29 | 1057 |
| 1239596 | -87843811 | 34441670 | 1239596 | 90000030 | 30 | 1059 |
| 689727 | -85838987 | 31095015 | 689727 | 90000031 | 31 | 1061 |
| 668614 | -87952236 | 32853137 | 668614 | 90000032 | 32 | 1063 |

## Freight Station Centroids (Inside Iowa)

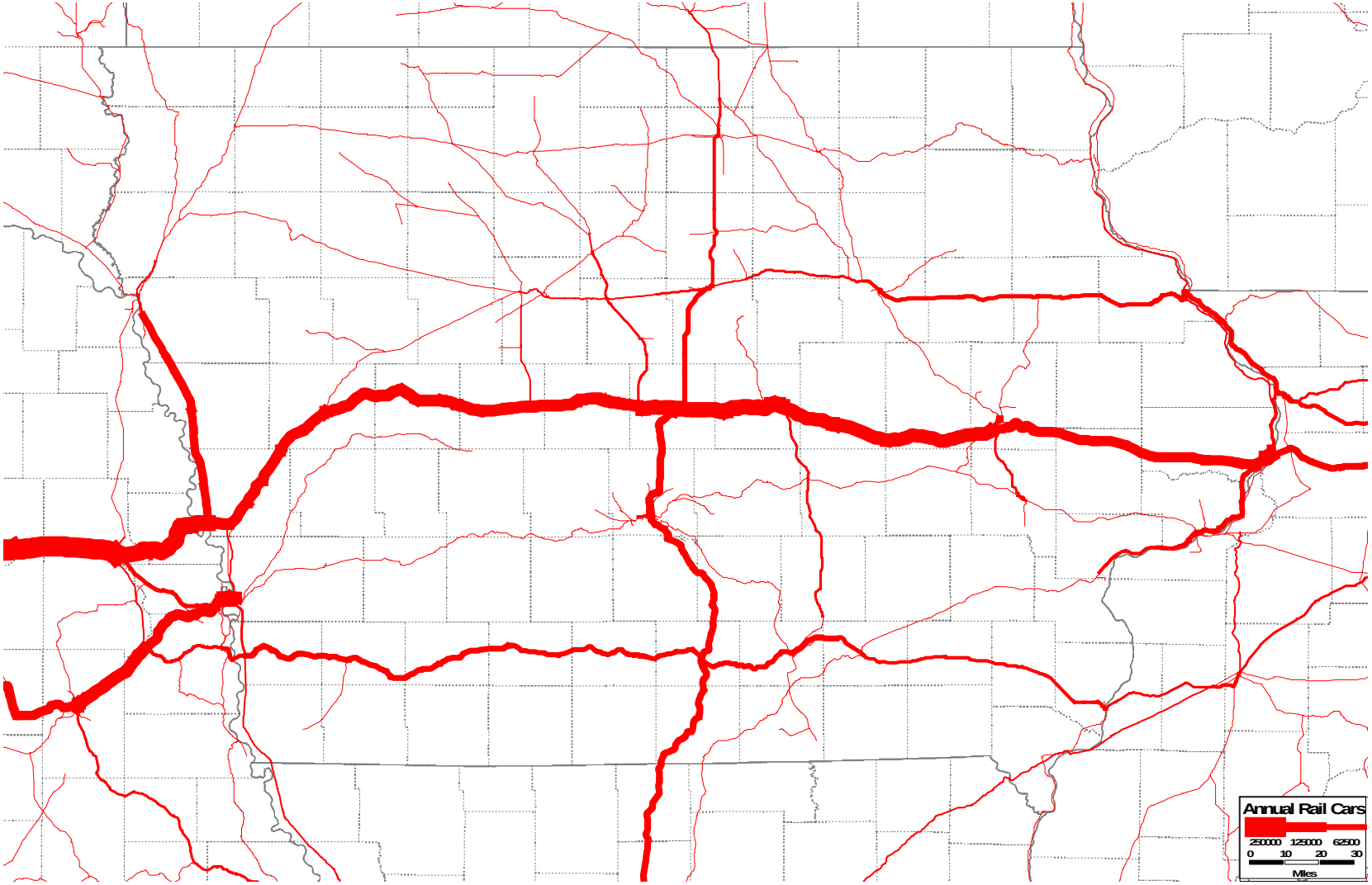
CWB Node 5.dvw - CWB Node 5

| ID | Longitude | Latitude | TC_NODE | CENTROID_9 | CENTROID | FIPS |
|---|---|---|---|---|---|---|
| 2064515 | -96391613 | 42491519 | 2064515 | 90004001 | 4001 | 99999 |
| 2064367 | -96291741 | 42625012 | 2064367 | 90004002 | 4002 | 99999 |
| 2064519 | -96291603 | 42625000 | 2064519 | 90004002 | 4002 | 99999 |
| 2064520 | -96248102 | 42719715 | 2064520 | 90004003 | 4003 | 99999 |
| 2064526 | -96332062 | 43436146 | 2064526 | 90004004 | 4004 | 99999 |
| 2064655 | -91100260 | 40806715 | 2064655 | 90004005 | 4005 | 99999 |
| 2064654 | -91211130 | 40828557 | 2064654 | 90004006 | 4006 | 99999 |
| 2064641 | -91260925 | 40829439 | 2064641 | 90004007 | 4007 | 99999 |
| 2064645 | -91571870 | 40973794 | 2064645 | 90004008 | 4008 | 99999 |
| 2064642 | -91965552 | 41011281 | 2064642 | 90004009 | 4009 | 99999 |
| 2064507 | -92305907 | 40992425 | 2064507 | 90004010 | 4010 | 99999 |
| 2064505 | -92417537 | 41020316 | 2064505 | 90004011 | 4011 | 99999 |
| 2064502 | -92562824 | 41089198 | 2064502 | 90004012 | 4012 | 99999 |
| 2064503 | -92641130 | 41177510 | 2064503 | 90004013 | 4013 | 99999 |
| 2064497 | -92804893 | 41018639 | 2064497 | 90004014 | 4014 | 99999 |
| 2064496 | -93047348 | 40974411 | 2064496 | 90004015 | 4015 | 99999 |
| 2064477 | -94349693 | 41057442 | 2064477 | 90004016 | 4016 | 99999 |
| 2064469 | -94736328 | 40985390 | 2064469 | 90004017 | 4017 | 99999 |
| 2064703 | -95236421 | 41019448 | 2064703 | 90004018 | 4018 | 99999 |
| 2064704 | -95802488 | 41016760 | 2064704 | 90004019 | 4019 | 99999 |
| 2064312 | -91374091 | 40399800 | 2064312 | 90004020 | 4020 | 99999 |
| 2064705 | -91374072 | 40399799 | 2064705 | 90004020 | 4020 | 99999 |
| 2064638 | -91375813 | 40506652 | 2064638 | 90004021 | 4021 | 99999 |
| 2064637 | -91410894 | 40531059 | 2064637 | 90004022 | 4022 | 99999 |
| 2064653 | -91122523 | 40743769 | 2064653 | 90004023 | 4023 | 99999 |
| 2064458 | -95661926 | 40593479 | 2064458 | 90004024 | 4024 | 99999 |
| 2064707 | -95810314 | 41163908 | 2064707 | 90004025 | 4025 | 99999 |
| 2064709 | -95849558 | 41252565 | 2064709 | 90004026 | 4026 | 99999 |
| 2064714 | -96488735 | 42996940 | 2064714 | 90004027 | 4027 | 99999 |
| 2064639 | -91308069 | 40629478 | 2064639 | 90004028 | 4028 | 99999 |
| 2064700 | -90660494 | 42502897 | 2064700 | 90004029 | 4029 | 99999 |
| 2064665 | -90568203 | 41520999 | 2064665 | 90004030 | 4030 | 99999 |

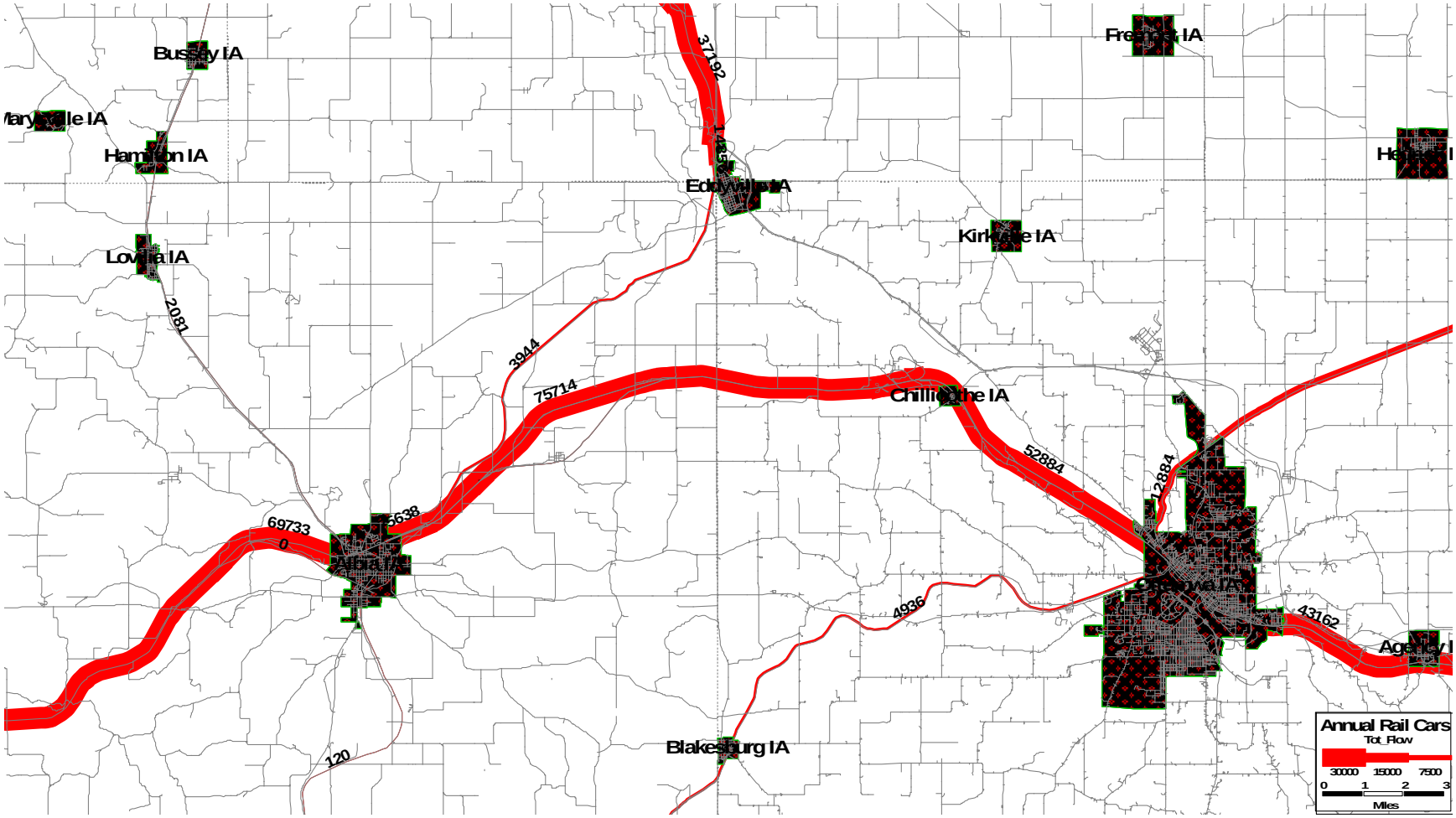
# Annual Rail Cars from/to Iowa



# Annual Rail Cars from/to Iowa



# Eddyville Area Detail



# Iowa Carload Waybill Sample Applications

- Impacts on rail network from new terminals and commodity flows within Iowa
- Rail shipping times plus costs (from Carload Waybill Sample) for intermodal diversion estimates
- Marketing of sites for development
- Viability of Iowa class III rail operations

# Questions?