North Jersey Transportation Planning Authority (NJTPA)
Asset Management Data Model
2015 IHEEP CONFERENCE
Pittsburg, PA
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Presenters

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Presentation Agenda

1. Project goals and tasks
2. Project workflow
3. ArcGIS Online and Reporting tool
NJTPA Region

Bergen  Morris  Newark
Essex    Ocean
Hudson   Passaic
Hunterdon  Somerset
Jersey City  Sussex  Union
Middlesex  Warren
Monmouth
North Jersey Transportation Planning Authority
The Metropolitan Planning Organization for Northern New Jersey

STANDING COMMITTEES
Planning & Economic Development Committee
Project Prioritization Committee
Freight Initiative Committee
Regional Transportation Advisory Committee
NJTPA Regional Transportation System

Road Network:
- 147 million vehicle miles each day
- 26,000 miles of roads, including 177 miles of toll roads
- 4,800 bridges

Transit Network:
- 732,000 trips daily
- 13% of commuters ride transit
- 250 bus routes
- Commuter rail: 390 miles of track, 150 stations
Primary Project Goals

1. To develop a system and process to access key asset data from within the 13 county sub regions

2. To develop a **unified data model** that transformed the individual county asset data layers into a singular (region wide) dataset

3. To develop a reporting tool set that would support Federal MAP-21 Reporting Requirements
Project Tasks

Task 1: Data Gathering and Assessment

Task 2: Design Data Model

Task 3: Deploy and Refine Model

Task 4: Documentation and Training
Project Tasks

Task 1: Data Gathering and Assessment

- Gathered approximately 91 datasets (13x7)
  - Bridge
  - Pavement
  - Signs
  - Signals
  - Inlets
  - Outfalls
  - Guiderails

- Performed detailed review of exiting data
  - Type, format, quality, attributes, domains, commonalities, etc.
## Identified County Data Sets

<table>
<thead>
<tr>
<th></th>
<th>Pavement</th>
<th>Bridges</th>
<th>Signs</th>
<th>Guiderail</th>
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</table>

**LEGEND**

- County data submitted and consolidated to geodatabase - as of 6/4/14
- X Denotes originally identified as available data source by County

**NOTE:** Pavement and bridge data provided by NJDOT
Project Tasks

Task 2: Design Data Model

- Developed project workflow
- Design of unified AMDM schema
- Design and development of ETL scripts
- Design and development of reporting tools
13 County Sub Regions
- Bergen County
- Ocean County
- Essex County
- Passaic County
- Hudson County
- Somerset County
- Hunterdon County
- Sussex County
- Middlesex County
- Union County
- Monmouth County
- Warren County
- Morris County

Data included spreadsheets, shapefiles, PDF's, etc.

Data uploaded to Secure SharePoint Site by Counties
Data downloaded from SharePoint site by Project Team

Data compiled into 13 Geodatabases
Perform common attribute analysis and developed technical matrix document

Database schema developed for unified model

Unified geodatabase model developed

County GDB’s loaded into ArcGIS Online as map services

County-Level map services consumed by ETL process to populate unified data model

ETL scripts developed to populate unified data model

NJTPA Unified Data Model (ArcSDE Geodatabase)

Feature services published to AGO

NJTPA ArcGIS Online Regional-Level

The server will also be used to provide ad hoc reporting

ArcGIS Server will be used to publish and host asset feature services from unified data model

NOTES:
1) The following are the asset-level feature classes gathered from each of the 13 counties (if available)
   - Signs
   - Sign Posts
   - Signals
   - Guiderail
   - Inlets
   - Outfalls
   - Bridges
   - Pavements

   Bridge and pavement data will be provided by the NJDOT

2) The unified data model will be a single Geodatabase that will contain the 8 asset-level features – merged together from each County.
NJTPA Asset Management Data Model
Logical Data Diagram for the Unified Model

**Legend:**
- Denotes County submitted data sources
- Note: County data may not include attributes for all fields
- NJDOT data sources

**Notes:**
Field values for County-level tables (non-State) were derived from the following three sources:
1. NJTPA SIGN SCHEMA
2. SUB-REGION COUNTY DATA (Submitted)
3. NJTPA VISION QUESTIONS

Date of last update: March 16, 2015
ETL Process

**Individual County-level Geodatabases (91 datasets)**

**NJTPA Unified Geodatabase**
Single GDB containing 7 FC’s
Project Tasks

Task 3: Deploy and Refine Model

➢ On-site installation
  • Populated unified geodatabase
  • ETL scripts
  • Scheduled task
  • Reporting tools
Project Tasks

Task 4: Documentation and Training

- System Requirements
- Implementation Plan
- User Manuals
- Conduct On-Site Training Sessions
Overview of Project Workflow

Workflow Steps:

- Step 1: Acquisition of data from county sub-regions
- Step 2: Consolidation of county sub region data into file GDB’s
- Step 3: Publishing of county-level feature services to NJTPA’s AGO
- Step 4: Development of unified schema and geodatabase model
- Step 5: Development of ETL data migration scripts
- Step 6: Migration of county-level feature services to unified GBD
- Step 7: Deployment of unified GDB and ETL to NJTPA (Alpha)
- Step 8: Deployment of reporting tools to NJTPA (Beta Version)
- Step 9: Publishing of unified feature services to NJTPA AGO
Project Workflow Steps

**STEP 1:**
Acquisition of relevant county data

**13 County Sub Regions**
- Bergen County
- Ocean County
- Essex County
- Passaic County
- Hudson County
- Somerset County
- Hunterdon County
- Sussex County
- Middlesex County
- Union County
- Monmouth County
- Warren County

Data included spreadsheets, shapefiles, PDF’s, etc.

**STEP 2:**
Consolidation of County Data
Data uploaded to Secure SharePoint Site by Counties

**Data downloaded from SharePoint site by Project Team**
Data compiled into County-Level Geodatabases

**STEP 3:**
Publish county-level feature services

NJTPA ArcGIS Online County-Level

Same NJTPA AGO Account (Org)

**Workflow Steps:**
Step 1. Acquisition of relevant data from NJTPA county sub-regions
Step 2. Consolidation of county sub region data into file geodatabases
Step 3. Publishing of county-level feature services to NJTPA’s AGO Organization
Step 4. Development of unified schema and geodatabase model
Step 5. Development of ETL data migration scripts
Step 6. Migration of county-level feature services to unified geodatabase
Step 7. Deploy populated unified geodatabase and ETL scripts to NJTPA server (Alpha)
Step 8. Deployment of the reporting tools to NJTPA’s server (Beta Version)
Step 9. Publishing of regional level feature services to NJTPA ArcGIS Online Org

**STEP 4:**
Development of unified schema and geodatabase model

**STEP 5:**
Development of ETL data migration scripts

**STEP 6:**
Migration of county-level feature services (from AGO) to unified geodatabase

**STEP 7:**
Deploy populated unified geodatabase and ETL scripts to NJTPA’s server

**Populated Unified Geodatabase in NJTPA/EGIS Environment (ALPHA)**

Step 7 output

**Populated Unified Geodatabase in NJTPA/EGIS Environment (BETA/FINAL)**

Step 8 input

**STEP 8:**
Deployment of reporting tools

**STEP 9:**
Feature services published to AGO (from NJTPA ArcGIS Server)
**STEP 1**
Acquisition of data from county sub-regions

**Workflow Steps:**
Step 1. Acquisition of relevant data from NJTPA county sub-regions
Step 2. Consolidation of county sub region data into file geodatabases
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**Data included spreadsheets, shapefiles, PDF's, etc.**
STEP 2
Consolidation of county data into file GDB’s

13 County Sub Regions
- Bergen County
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- Passaic County
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- Warren County

Data included spreadsheets, shapefiles, PDF’s, etc.

STEP 1:
Acquisition of relevant county data

STEP 2:
Consolidation of County Data
Data uploaded to Secure SharePoint Site by Counties

STEP 3:
Publish county-level feature services
Data downloaded from SharePoint site by Project Team
Data compiled into County-Level Geodatabases
NJTPA ArcGIS Online County-Level
Same NJTPA AGO Account (Org)
NJTPA ArcGIS Online Regional-Level

Workflow Steps:
Step 1. Acquisition of relevant data from NJTPA county sub-regions
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STEP 4:
Development of unified schema and geodatabase model

STEP 5:
Development of ETL data migration scripts

STEP 6:
Migration of county-level feature services (from AGO) to unified geodatabase

STEP 7:
Deploy populated unified geodatabase and ETL scripts to NJTPA’s server

STEP 8:
Deployment of reporting tools

STEP 9:
Feature services published to AGO (from NJTPA ArcGIS Server)

Populated Unified Geodatabase in NJTPA/EGIS Environment (ALPHA)

Populated Unified Geodatabase in NJTPA/EGIS Environment (BETA/FINAL)
**STEP 3**

Publishing of county data to AGO

**Workflow Steps:**
1. Acquisition of relevant data from NJTPA county sub-regions
2. Consolidation of county sub-region data into file geodatabases
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9. Publishing of regional level feature services to NJTPA ArcGIS Online Org

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- Monmouth County
- Warren County

Data included spreadsheets, shapefiles, PDF’s, etc.
County Data Published to AGO

**STEP 2:** Consolidation of County Data
- Data downloaded from SharePoint site by Project Team
- Data compiled into County-Level Geodatabases

**STEP 2:** Convert to geodatabases

**STEP 3:** Publish county-level feature services

NJTPA ArcGIS Online County-Level
STEP 4
Development of unified geodatabase schema

13 County Sub Regions
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Data included spreadsheets, shapefiles, PDF’s, etc.

STEP 1:
Acquisition of relevant county data

STEP 2:
Consolidation of County Data
Data uploaded to Secure SharePoint Site by Counties
Data downloaded from SharePoint site by Project Team
Data compiled into County-Level Geodatabases

Workflow Steps:
Step 1. Acquisition of relevant data from NJTPA county sub-regions
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Step 9. Publishing of regional level feature services to NJTPA ArcGIS Online Org

STEP 3:
Publish county-level feature services
NJTPA ArcGIS Online County-Level
Same NJTPA AGO Account (Org)

STEP 4:
Development of unified schema and geodatabase model

STEP 5:
Development of ETL data migration scripts

STEP 6:
Migration of county-level feature services (from AGO) to unified geodatabase

STEP 7:
Deploy populated unified geodatabase and ETL scripts to NJTPA’s server

STEP 8:
Feature services published to AGO (from NJTPA ArcGIS Server)

STEP 9:
Deployment of reporting tools
Populated Unified Geodatabase in NJTPA EGIS Environment (BETA/FINAL)

STEP 5
Development of ETL data migration scripts

STEP 1: Acquisition of relevant county data

13 County Sub Regions
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Data included spreadsheets, shapefiles, PDF’s, etc.

STEP 2: Consolidation of County Data
- Data uploaded to Secure SharePoint Site by Counties
- Data downloaded from SharePoint site by Project Team
- Data compiled into County-Level Geodatabases

STEP 3: Publish county-level feature services
- NJTPA ArcGIS Online County-Level
- Same NJTPA AGO Account (Org)

Workflow Steps:
- Step 1. Acquisition of relevant data from NJTPA county sub-regions
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- Step 9. Publishing of regional level feature services to NJTPA ArcGIS Online Org

STEP 4: Development of unified schema and geodatabase model

STEP 5: Development of ETL data migration scripts

STEP 6: Migration of county-level feature services (from AGO) to unified geodatabase

STEP 7: Deploy populated unified geodatabase and ETL scripts to NJTPA’s server

STEP 8: Feature services published to AGO (from NJTPA ArcGIS Server)

STEP 9: Deployment of reporting tools

STEP 9: Populated Unified Geodatabase in NJTPA/EGIS Environment (BETA/FINAL)
STEP 6
Migration of county data to unified GBD

**STEP 1:**
Acquisition of relevant county data

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- Monmouth County
- Warren County
- Morris County

Data included spreadsheets, shapefiles, PDF’s, etc.

**STEP 2:**
Consolidation of County Data

Data uploaded to Secure SharePoint Site by Counties

Data downloaded from SharePoint site by Project Team

Data compiled into County-Level Geodatabases

**STEP 3:**
Publish county-level feature services

NJTPA ArcGIS Online County-Level

Same NJTPA AGO Account (Org)

Populated Unified Geodatabase in Baker Development Environment (ALPHA)

Step 6 output

**STEP 4:**
Development of unified schema and geodatabase model

**STEP 5:**
Development of ETL data migration scripts

**STEP 6:**
Migration of county-level feature services (from AGO) to unified geodatabase

**Workflow Steps:**
- Step 1: Acquisition of relevant data from NJTPA county sub-regions
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- Step 8: Deployment of the reporting tools to NJTPA’s server (Beta Version)
- Step 9: Publishing of regional level feature services to NJTPA ArcGIS Online Org

**Step 7:**
Deploy populated unified geodatabase and ETL scripts to NJTPA’s server

**Step 8:**
Deployment of reporting tools

**Step 9:**
Feature services published to AGO (from NJTPA ArcGIS Server)

**Populated Unified Geodatabase in NJTPA/EGIS Environment (BETA/FINAL)**

Step 7 output
Results of ETL Process

**Individual County-level Geo-databases (91 datasets)**

**NJTPA ArcGIS Online County-Level**

**NJTPA Unified Geo-database Single GDB containing 7 FC's**
STEP 7
Deployment of unified GDB and ETL to NJTPA

Workflow Steps:
Step 1. Acquisition of relevant data from NJTPA county sub-regions
Step 2. Consolidation of county sub region data into file geodatabases
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Step 8. Deployment of the reporting tools to NJTPA’s server (Beta Version)
Step 9. Publishing of regional level feature services to NJTPA ArcGIS Online Org
**STEP 8**
Deployment of reporting tools to NJTPA

**Workflow Steps:**
1. Acquisition of relevant data from NJTPA county sub-regions
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Data included spreadsheets, shapefiles, PDF’s, etc.
**STEP 9**

Publishing of unified asset data to AGO

**Workflow Steps:**
1. Acquisition of relevant data from NJTPA county sub-regions
2. Consolidation of county sub-region data into file geodatabases
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8. Deployment of the reporting tools to NJTPA’s server (Beta Version)
9. Publishing of regional level feature services to NJTPA ArcGIS Online Org
Project Workflow Process

County-level data posted to project Sharepoint site
Project Workflow Process

County data was downloaded, assessed, and compiled into geodatabases
Project Workflow Process

Publish Individual County-Level Geo-databases into NJTPA ArcGIS Online Organization
Project Workflow Process

County Users have access to the feature services in AGO
Project Workflow Process

The ETL process populates the unified data model (ArcSDE) with current information. Scheduled to run on a periodic basis.

NJTPAArcGIS Online County-Level
Project Workflow Process

Feature services from unified model were published into NJTPA AGO
Project Workflow Process

NJTPA staff have access to the asset data via AGO
Project Workflow Process

AGO Collector

County Users

NJTPA ArcGIS Online County-Level

Reporting Tool

NJTPA ArcGIS Online Regional-Level

NJTPA Users
NJTPA Asset Management Data Model Work Flow Process

NOTES:
1) The following are the asset-level feature classes gathered from each of the 13 counties (if available)
   - Signs
   - Sign Posts
   - Signals
   - Guiderail
   - Inlets
   - Outfalls
   - Bridges
   - Pavements
   Bridge and pavement data will be provided by the NJDOT

2) The unified data model will be a single Geodatabase that will contain the 8 asset-level features – merged together from each County.
Lesson Learned

 County data schemas were variable and inconsistent (except for signs)
 Build consensus early and often
 Need common workflow from counties to maintain integrity of unified data base
Questions?
The NJTPA is the federally authorized Metropolitan Planning Organization for 6.6 million people in the 13-county northern New Jersey region. Each year, the NJTPA oversees more than $2 billion in transportation improvement projects and provides a forum for interagency cooperation and public input. It also sponsors and conducts studies, assists county planning agencies and monitors compliance with national air quality goals.
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<td>Organization</td>
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<td>Organization</td>
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<td>Organization</td>
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<tr>
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<td>Service Definition</td>
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<td>Organization</td>
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<td>Organization</td>
</tr>
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<td>Organization</td>
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<td>Organization</td>
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<td>Jul 15, 2014</td>
<td>Organization</td>
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</tbody>
</table>
Using ArcGIS Online

My Groups

CREATE A GROUP

Show

All My Groups

 Owned by Me
 Owned by Others
 With New Membership Requests

You are a member of 25 groups

1. Bergen County Asset Management
   Bergen County Asset Management
   created by gfausel on November 12, 2014

2. Essex County Asset Management Data
   Essex County Asset Management Data
   created by gfausel on November 12, 2014

3. Hudson County Asset Management
   Hudson County Asset Management
   created by gfausel on November 12, 2014

4. Hunterdon County Asset Management Data
   Hunterdon County Asset Management Data
   created by gfausel on November 12, 2014

5. Monmouth County Asset Management Data
   Monmouth County Asset Management Data
   created by gfausel on November 12, 2014

6. Ocean County Asset Management Data
   Ocean County Asset Management Data
   created by gfausel on November 12, 2014

Ocean_County_Assets

Ocean_County_Assets

Feature Layer by NickHutton_NJTPA
Last Modified: July 15, 2014
(0 ratings, 0 comments, 70 views)

Ocean_County_Assets

Ocean county assets contains guiderails, signs, signals, outfalls and inlets

Web Map by NickHutton_NJTPA
Last Modified: July 22, 2014
(0 ratings, 0 comments, 12 views)
Using ArcGIS Collector
Using ArcGIS Collector
Using ArcGIS Collector
Using ArcGIS Collector

**Ocean Signs**
long: -74.259578 lat: 39.921475

**BARCODE_ID**
030500

**MUTCD_CODE**
M1-6

**CLASS**
Guide

**DESCRIPTION**
Rt 530

**SHEETING**
Engineer Grade

**BACKING**
Wood

**BACKGROUND**
Reporting Tool

NJTPA Asset Management Data Model Reports

Reports
- Pavement
- Bridge
- Signs
- Signals
- Guiderail
- Inlets
- Outfalls

NJTPA
NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY
Reporting Tool

Reports

- Pavement
- Bridge
- Signs
- Signals
- Guiderail
- Inlets
- Outfalls

Pavement Condition
Reporting Tool

Reports

- Pavement
- Bridge
  - Deficient Bridge Deck
- Signs
- Signals
- Guiderail
- Inlets
- Outfalls
Reporting Tool

Reports
- Pavement
- Bridge
- Signs
- Signals
- Guiderail
- Inlets
- Outfalls

Signs
- Sign Summary
- Sign Condition Summary
- Sign Type Summary
Reporting Tool

Reports

- Pavement
- Bridge
- Signs
  - Signals
- Guiderail
- Inlets
- Outfalls

Signals

- Signals Summary
- Signals Condition Summary
- Signals Type Summary
Reporting Tool

Reports

- Pavement
- Bridge
- Signs
- Signals
- Guiderail
- Inlets
- Outfalls

Guiderail

- Guiderail Summary
- Guiderail Condition Summary
- Guiderail Type Summary
Reporting Tool

**Reports**

- Pavement
- Bridge
- Signs
- Signals
- Guiderail
- Inlets
- Outfalls

**Inlets**

- Inlets Summary
- Inlets Condition Summary
- Inlets Type Summary
Reporting Tool

Reports

- Pavement
- Bridge
- Signs
- Signals
- Guiderail
- Inlets
- Outfalls

Outfalls

Outfalls Summary
Outfalls Condition Summary
Outfalls Type Summary
## INTERNATIONAL ROUGHNESS INDEX (IRI) CONDITION SUMMARY REPORT

Click here for additional information

<table>
<thead>
<tr>
<th>County / Subregion</th>
<th>Good (mi) (&lt;95)</th>
<th>Fair (mi) (&gt;=95 and &lt;=170)</th>
<th>Deficient (mi) (&gt;170)</th>
<th>Other (mi)</th>
<th>NHS Mileage (mi)</th>
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<td>291.28</td>
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<td>65.41</td>
<td>38.96</td>
<td>128.27</td>
<td>274.68</td>
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</tbody>
</table>

| Totals             | 656.89          | 929.62                    | 858.45                | 4,459.89   | 6,904.85        |
NOTES:
The mileage shown in this report reflects the centerline length of those pavement sections that are contained within the State’s Highway Performance Monitoring System (HPMS).

All roads included in the HPMS database are federally funded National Highway System (NHS) routes.

IRI Rating based on roughness calculated by inches per mile.

4/18/2015
# DEFICIENT BRIDGE DECK AREA REPORT
(Based on Deck Condition Rating of 4 or Less)

Click here for additional information

<table>
<thead>
<tr>
<th>County</th>
<th>Summary of Deficient Deck Area (Sq. Ft.)</th>
<th>Total Deck Area (Sq. Ft.)</th>
<th>Deficient Deck Area Percentage</th>
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</thead>
<tbody>
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<td>Bergen</td>
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<td>647,179</td>
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<td>Essex</td>
<td>49,384</td>
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<tr>
<td>Hudson</td>
<td>118,745</td>
<td>627,610</td>
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<td>Hunterdon</td>
<td>4,327</td>
<td>109,026</td>
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<tr>
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<td>20,323</td>
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<td>6,240</td>
<td>342,106</td>
<td>2 %</td>
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<tr>
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<td>19,585</td>
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<tr>
<td>Ocean</td>
<td>18,755</td>
<td>170,587</td>
<td>11 %</td>
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<tr>
<td>Passaic</td>
<td>8,929</td>
<td>310,021</td>
<td>3 %</td>
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<tr>
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<td>9,596</td>
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<tr>
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<td>470,820</td>
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<tr>
<td>Warren</td>
<td>5,841</td>
<td>86,512</td>
<td>7 %</td>
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</table>

Total Deficient Deck Area in NJTPA Subregion: 317,399.00
## Sign Summary Report

[Click here for additional information](#)

<table>
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<tr>
<th>County</th>
<th>Total Number of Signs by County</th>
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<tbody>
<tr>
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<td>Monmouth</td>
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<tr>
<td>Morris</td>
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<td>Ocean</td>
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<tr>
<td>Passaic</td>
<td>14,378</td>
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<tr>
<td>Somerset</td>
<td>9,129</td>
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<td>Sussex</td>
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<td>Warren</td>
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</table>

**Total number of signs in NJTPA Subregion**: 188,925
Number of Signs by County

- Bergen
- Essex
- Hunterdon
- Middlesex
- Monmouth
- Morris
- Ocean
- Passaic
- Somerset
- Sussex
- Union
- Warren

NOTES:

4/18/2015
# Sign Condition Summary Report

[Click here for additional information](#)

<table>
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<th>County / Municipality</th>
<th>Excellent</th>
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<th>Fair</th>
<th>Poor</th>
<th>Other</th>
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<td>-</td>
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## Sign Type Summary Report

Click here for additional information

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<th>Guide</th>
<th>Recreational Cultural</th>
<th>Regulatory</th>
<th>School</th>
<th>Warning</th>
<th>Other</th>
<th>Total</th>
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**Totals**

19 10,430 163 13,152 958 14,805 149,398 188,925
Signs Type by Subregion

NOTES:

4/18/2015
Sign Type Summary Report

Click here for additional information

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<th>Emergency</th>
<th>Guide</th>
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4/18/2015
Questions?