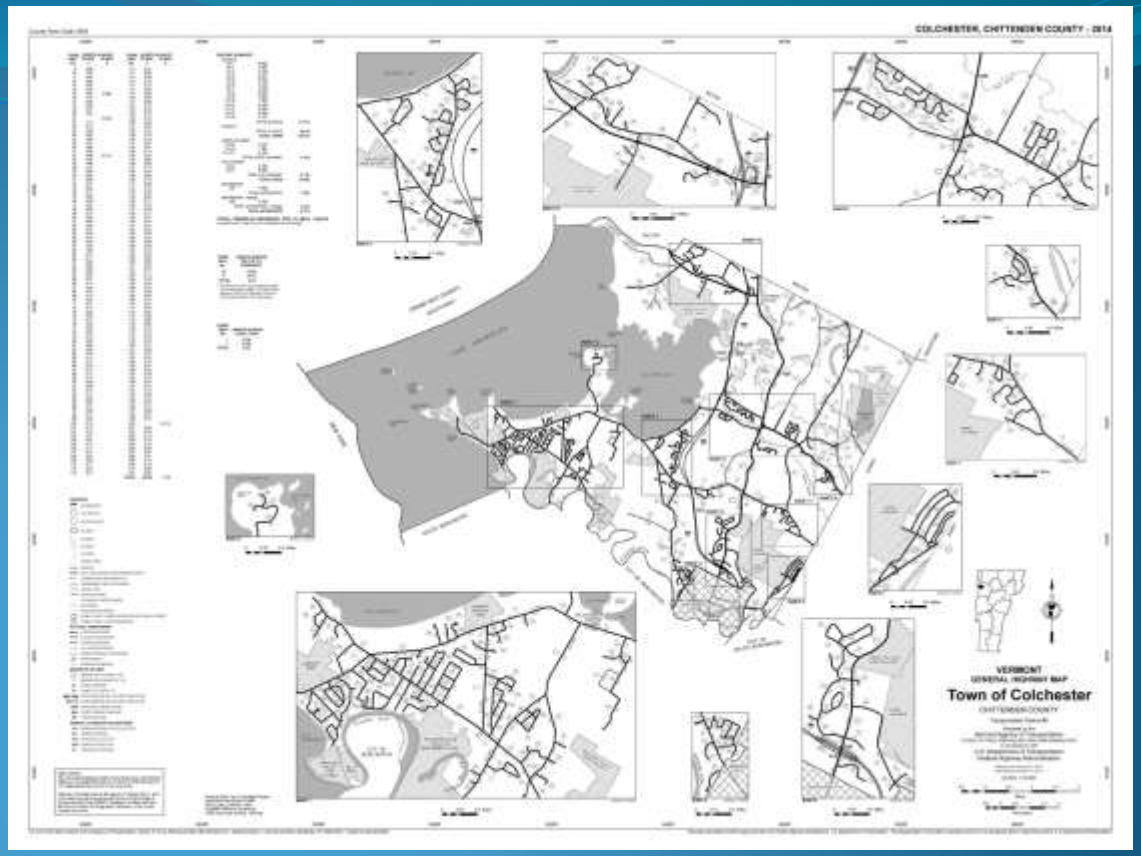
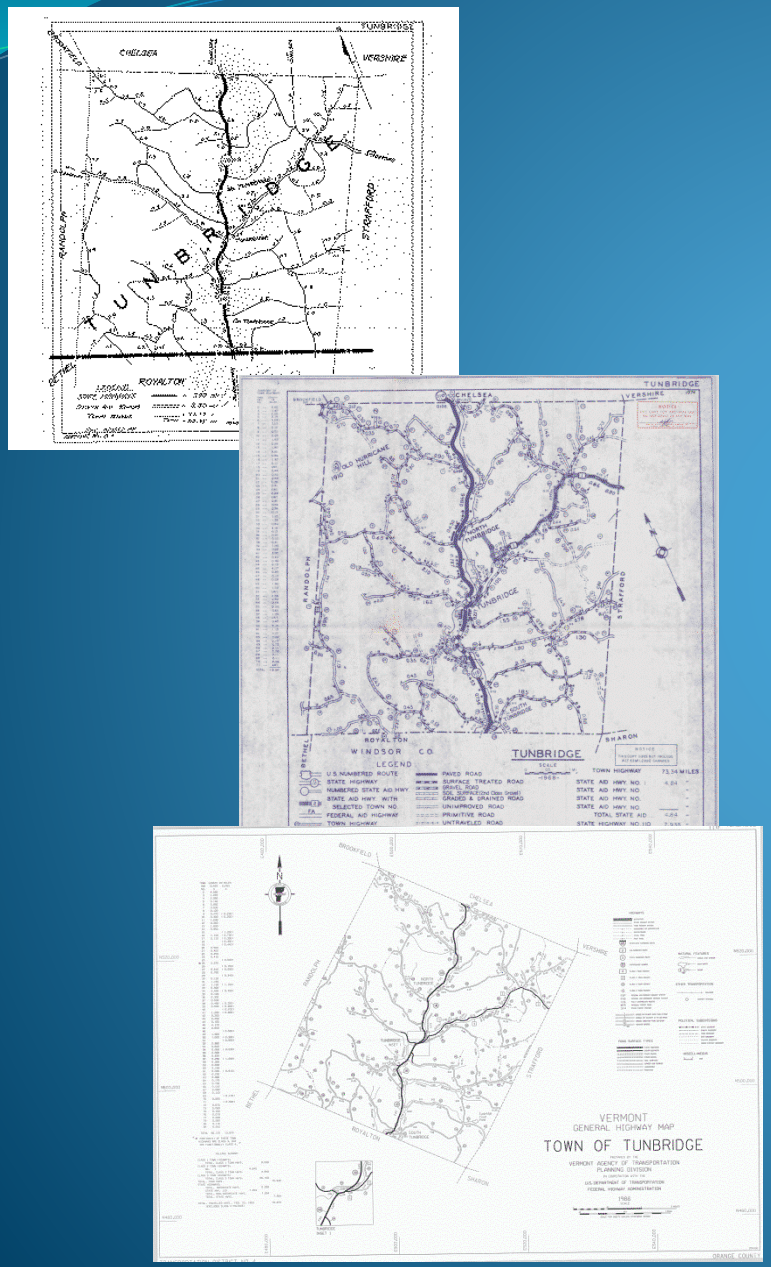


Leveraging Python to Revolutionize the Production of the Vermont Town Highway Maps

Vermont Agency of Transportation
Mapping Section

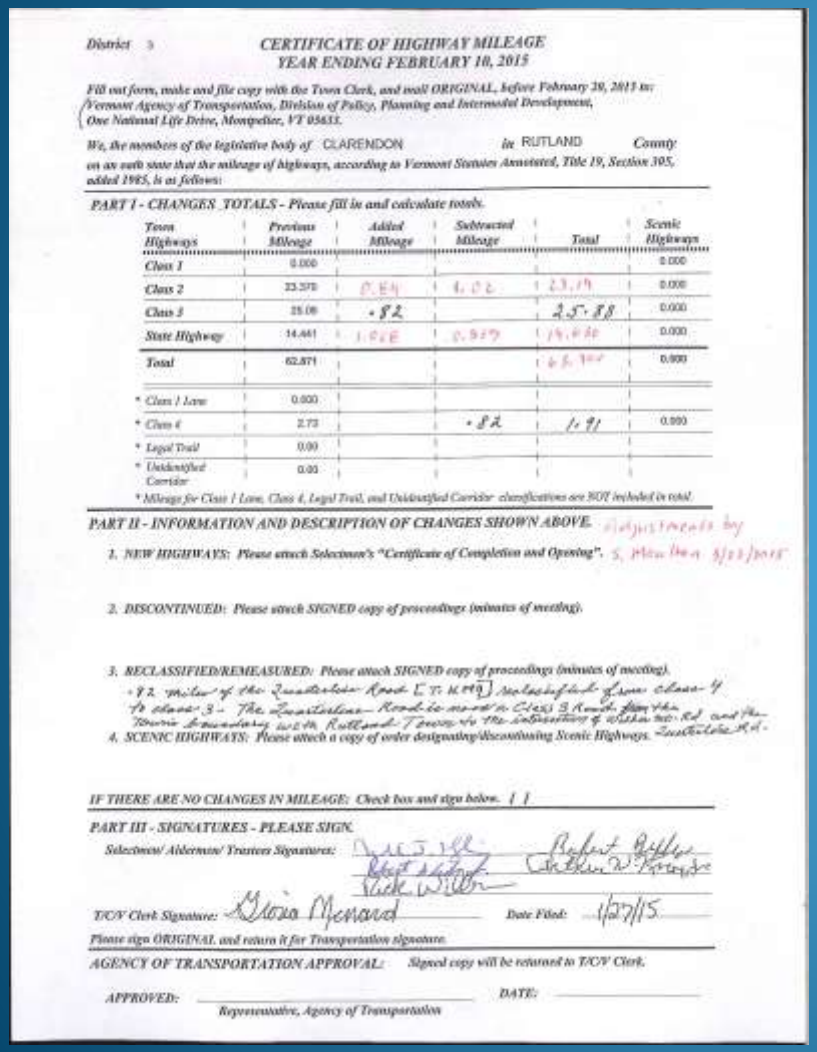
The Purpose



The Mapping Section of the Vermont Agency of Transportation has produced Town Highway Maps since 1931, based on a statutory requirement. The main purpose of these maps is to document highway classification and mileage of town highways for use in calculating State Aid for town highway maintenance. The Highway Mapping System (HMS) is the tool used to create the maps.

http://vtransplanning.vermont.gov/maps/archive

Annual Map Updates



District 3

CERTIFICATE OF HIGHWAY MILEAGE
YEAR ENDING FEBRUARY 10, 2015

Fill out form, make and file copy with the Town Clerk, and mail ORIGINAL, before February 20, 2015 to: Vermont Agency of Transportation, Division of Policy, Planning and Intermodal Development, One National Life Drive, Montpelier, VT 05633.

We, the members of the legislative body of CLARENDON in RUTLAND County on an oath state that the mileage of highways, according to Vermont Statutes Annotated, Title 19, Section 305, added 1985, is as follows:

PART I - CHANGES TOTALS - Please fill in and calculate totals.

Town Highways	Previous Mileage	Added Mileage	Subtracted Mileage	Total	Scenic Highways
Class 1	0.000				0.000
Class 2	23.370	0.84	1.02	23.19	0.000
Class 3	25.08	.82		25.88	0.000
State Highway	14.441	1.02	0.929	14.530	0.000
Total	62.871			63.700	0.000
* Class 1 Lane	0.000				
* Class 4	2.73		.82	1.91	0.000
* Legal Trail	0.00				
* Undentified Corridor	0.00				

* Mileage for Class 1 Lane, Class 4, Legal Trail, and Unidentified Corridor classifications are NOT included in total.

PART II - INFORMATION AND DESCRIPTION OF CHANGES SHOWN ABOVE. Adjustments by S. Mountain 3/23/2015

1. NEW HIGHWAYS: Please attach Selectmen's "Certificate of Completion and Opening".

2. DISCONTINUED: Please attach SIGNED copy of proceedings (minutes of meeting).

3. RECLASSIFIED/REMEASURED: Please attach SIGNED copy of proceedings (minutes of meeting).
.82 Miles of the Lustrelake Road [T. 11.09] reclassified from class 4 to class 3 - The Lustrelake Road is now a Class 3 Road from the Town boundary with Rutland Town to the intersection of Wilson Rd. Rd and the Lustrelake Rd.

4. SCENIC HIGHWAYS: Please attach a copy of order designating/discontinuing Scenic Highways.

IF THERE ARE NO CHANGES IN MILEAGE: Check box and sign below. [ ]

PART III - SIGNATURES - PLEASE SIGN.

Selectmen/ Aldermen/ Trustees Signatures: Robert Butler

T/C/V Clerk Signature: Gloria Menard Date Filed: 1/27/15

Please sign ORIGINAL and return it for Transportation signature.

AGENCY OF TRANSPORTATION APPROVAL: Signed copy will be returned to T/C/V Clerk.

APPROVED: _____ DATE: _____
Representative, Agency of Transportation

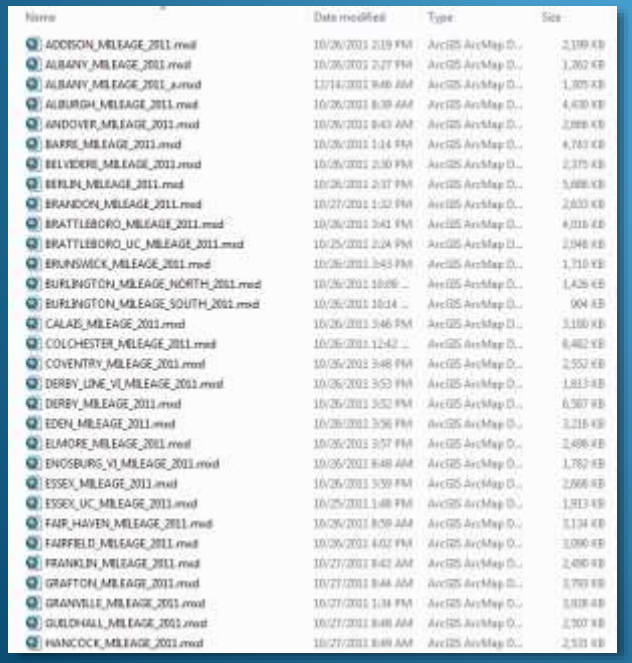
The maps are updated annually based on information supplied by municipalities on a formal Mileage Certificate. Typically between 50 and 100 municipalities submit changes during any given year.

These changes include additions, alterations, reclassifications and discontinuances.

The mileage summary feeds the Certified Public Highway Mileage Report.

Map Production

Master datasets maintained in ArcSDE are used to render the highways, structures, mileage annotation, shields, and other features.



Name	Date modified	Type	Size
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ALBANY_MILEAGE_2011.mxd	10/26/2011 2:27 PM	ArcGIS ArcMap D...	1,262 KB
ALBANY_MILEAGE_2011_a.mxd	12/14/2011 9:46 AM	ArcGIS ArcMap D...	1,305 KB
ALBURGH_MILEAGE_2011.mxd	10/26/2011 8:39 AM	ArcGIS ArcMap D...	4,430 KB
ANDOVER_MILEAGE_2011.mxd	10/26/2011 8:43 AM	ArcGIS ArcMap D...	2,898 KB
BARRE_MILEAGE_2011.mxd	10/26/2011 1:14 PM	ArcGIS ArcMap D...	4,743 KB
BELVIDERE_MILEAGE_2011.mxd	10/26/2011 2:30 PM	ArcGIS ArcMap D...	2,375 KB
BERLIN_MILEAGE_2011.mxd	10/26/2011 2:37 PM	ArcGIS ArcMap D...	5,888 KB
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BRUNSWICK_MILEAGE_2011.mxd	10/26/2011 3:43 PM	ArcGIS ArcMap D...	1,710 KB
BURLINGTON_MILEAGE_NORTH_2011.mxd	10/26/2011 10:09 ...	ArcGIS ArcMap D...	1,426 KB
BURLINGTON_MILEAGE_SOUTH_2011.mxd	10/26/2011 10:14 ...	ArcGIS ArcMap D...	904 KB
CALAIS_MILEAGE_2011.mxd	10/26/2011 3:46 PM	ArcGIS ArcMap D...	3,180 KB
COLCHESTER_MILEAGE_2011.mxd	10/26/2011 12:42 ...	ArcGIS ArcMap D...	8,482 KB
COVENTRY_MILEAGE_2011.mxd	10/26/2011 3:48 PM	ArcGIS ArcMap D...	2,552 KB
DERBY_LINE_VI_MILEAGE_2011.mxd	10/26/2011 3:53 PM	ArcGIS ArcMap D...	1,813 KB
DERBY_MILEAGE_2011.mxd	10/26/2011 3:52 PM	ArcGIS ArcMap D...	6,567 KB
EDEN_MILEAGE_2011.mxd	10/26/2011 3:56 PM	ArcGIS ArcMap D...	1,216 KB
ELMORE_MILEAGE_2011.mxd	10/26/2011 3:57 PM	ArcGIS ArcMap D...	2,498 KB
ENOSBURG_VI_MILEAGE_2011.mxd	10/26/2011 8:48 AM	ArcGIS ArcMap D...	1,782 KB
ESSEX_MILEAGE_2011.mxd	10/26/2011 3:59 PM	ArcGIS ArcMap D...	2,668 KB
ESSEX_UC_MILEAGE_2011.mxd	10/25/2011 1:48 PM	ArcGIS ArcMap D...	1,913 KB
FAIR_HAVEN_MILEAGE_2011.mxd	10/26/2011 8:59 AM	ArcGIS ArcMap D...	3,134 KB
FAIRFIELD_MILEAGE_2011.mxd	10/26/2011 4:02 PM	ArcGIS ArcMap D...	3,086 KB
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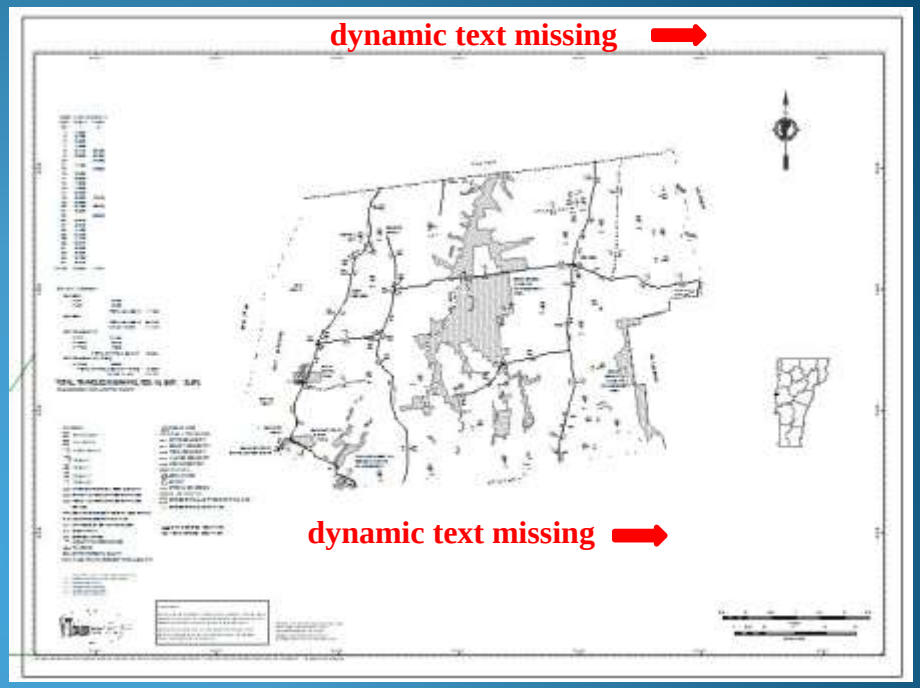
GRAFTON_MILEAGE_2011.mxd	10/27/2011 8:44 AM	ArcGIS ArcMap D...	3,793 KB
GRANVILLE_MILEAGE_2011.mxd	10/27/2011 1:34 PM	ArcGIS ArcMap D...	3,828 KB
GUILDHALL_MILEAGE_2011.mxd	10/27/2011 8:48 AM	ArcGIS ArcMap D...	2,507 KB
HANCOCK_MILEAGE_2011.mxd	10/27/2011 8:49 AM	ArcGIS ArcMap D...	2,531 KB

319 individual ArcGIS project files (MXD's) were used until 2012 to generate the Town Highway Maps. Each MXD was updated individually.

The Problem

Esri software upgrades broke previously created MXD's, requiring the overhaul and rebuilding of each MXD to create the same Town Highway Map. Key issues included inserted Objects, such as the Mileage Reports and Dynamic Text through PLTS not supported the same way from one version to the next.

Components of the maps used VBA, and Esri was ending support for VBA, which became problematic



In 2007, about 100 MXD's using ArcInfo 9.1 were rebuilt for that year's production, plus another 100 in preparation for future years.

All the maps needed to be retooled due to changes in 9.2 PLTS dynamic text changes. Every MXD was rebuilt.

The Big Problem – Mileage Reports

The Mileage Reports and Summaries on each Town Highway Map was generated from MS Access as an RTF file that was then added to ArcMap via a linked object.

This allowed great formatting, but bad forward compatibility. Each version would break the links and the objects would be lost, creating a huge amount of work to re-add the Mileage Report as an object.

There was also the issue that MS Access connected to the Default table of the SDE road centerline data, so either we had to build a model to copy the data out to a personal geodatabase or wait until after the overnight compress to occur, which moved the day's data edits to the Default table. To much latency in the Mileage Reports.

Because of the Object – a script to auto generate the PDFs from multiple MXDs could not be used and each map had to be manually exported.

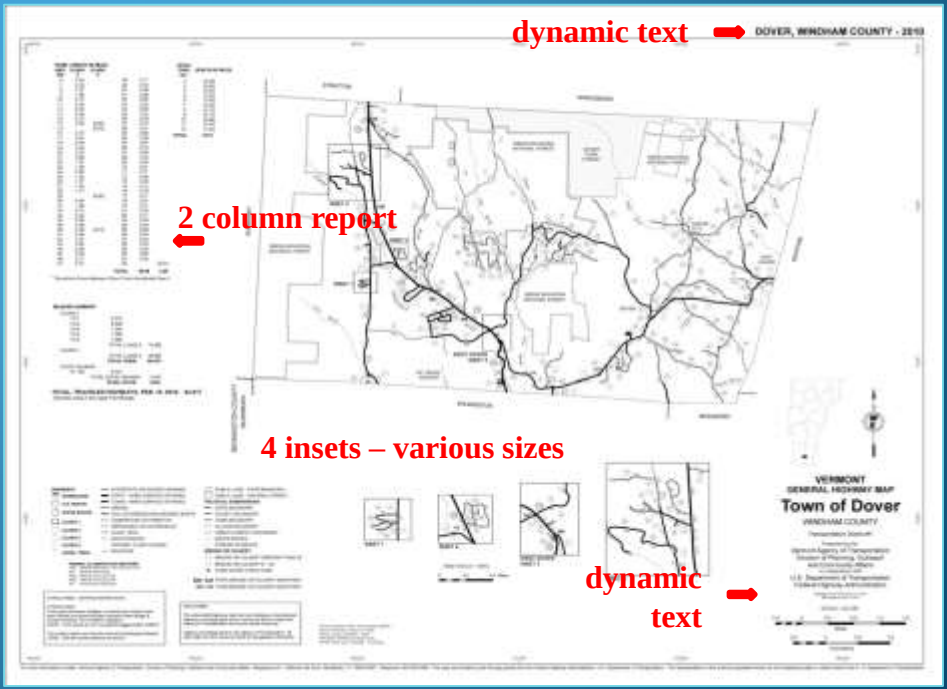
TOWN HWY. NO.	LENGTH IN MILES CLASS 3	CLASS 4
4	4.050	
5	3.750	
6	2.950	
7	1.200	
8	0.440	(0.150)
9	0.060	(0.780)
10		(1.400)
11	1.450	
12		(1.090)
13	2.520	
14	0.950	
15	1.080	
16	1.600	
17	0.550	
18	0.560	(1.340)
19	0.200	
20	0.450	(0.070)
21	0.550	
22		(0.250)
23	0.070	
24	3.640	
25	1.700	
26	0.160	
28	1.470	
30	0.070	
31	0.220	
32	0.350	
33	0.190	
34	0.210	
TOTAL	**30.440**	**5.080**

Solution - Data Driven Pages or Production Mapping?

NO! - There is too much variability in each map to be able to leverage Data Driven Pages or Production Mapping.

Variable Map Scales
Variable Insets – #, Size & Scale
Variable Mileage Summary Sizes
Variable Reports -
- Class 3 & 4
- Legal Trail
- Not-Up-To-Standards

Variable Town Shapes and Sizes

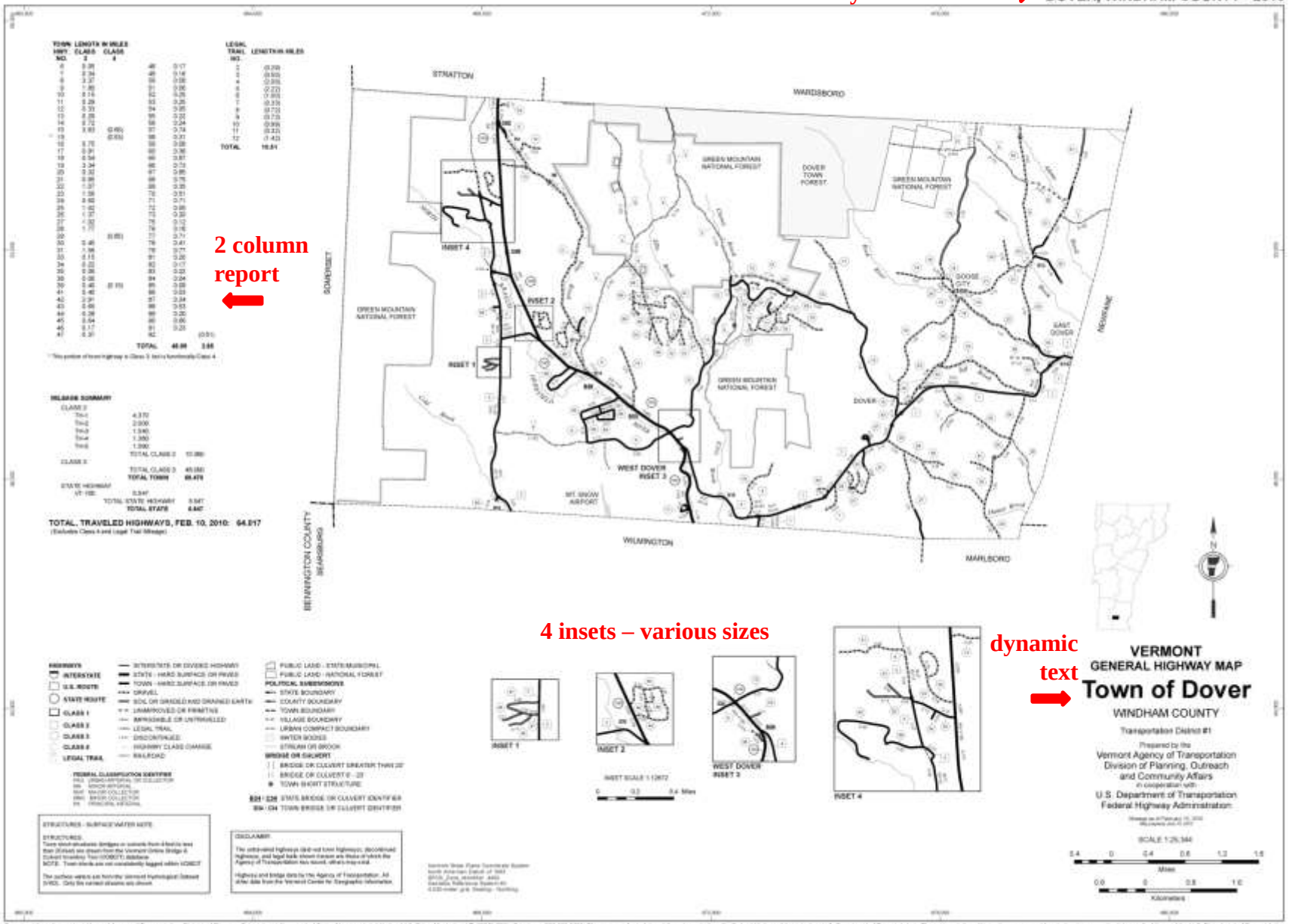


dynamic text → DOVER, WINDHAM COUNTY - 2010

2 column report

4 insets – various sizes

dynamic text →

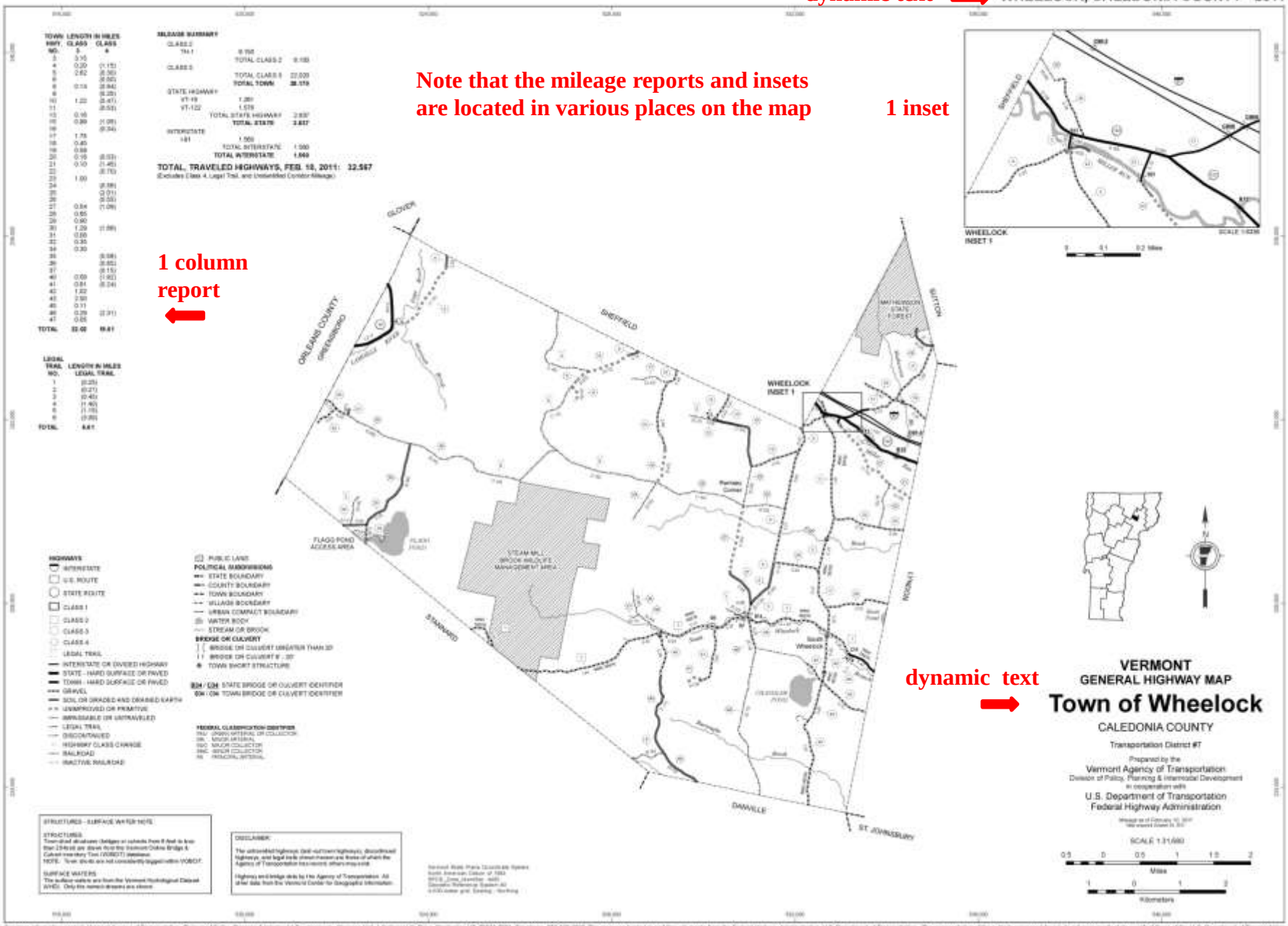


dynamic text → WHEELOCK, CALEDONIA COUNTY - 2011

Note that the mileage reports and insets are located in various places on the map

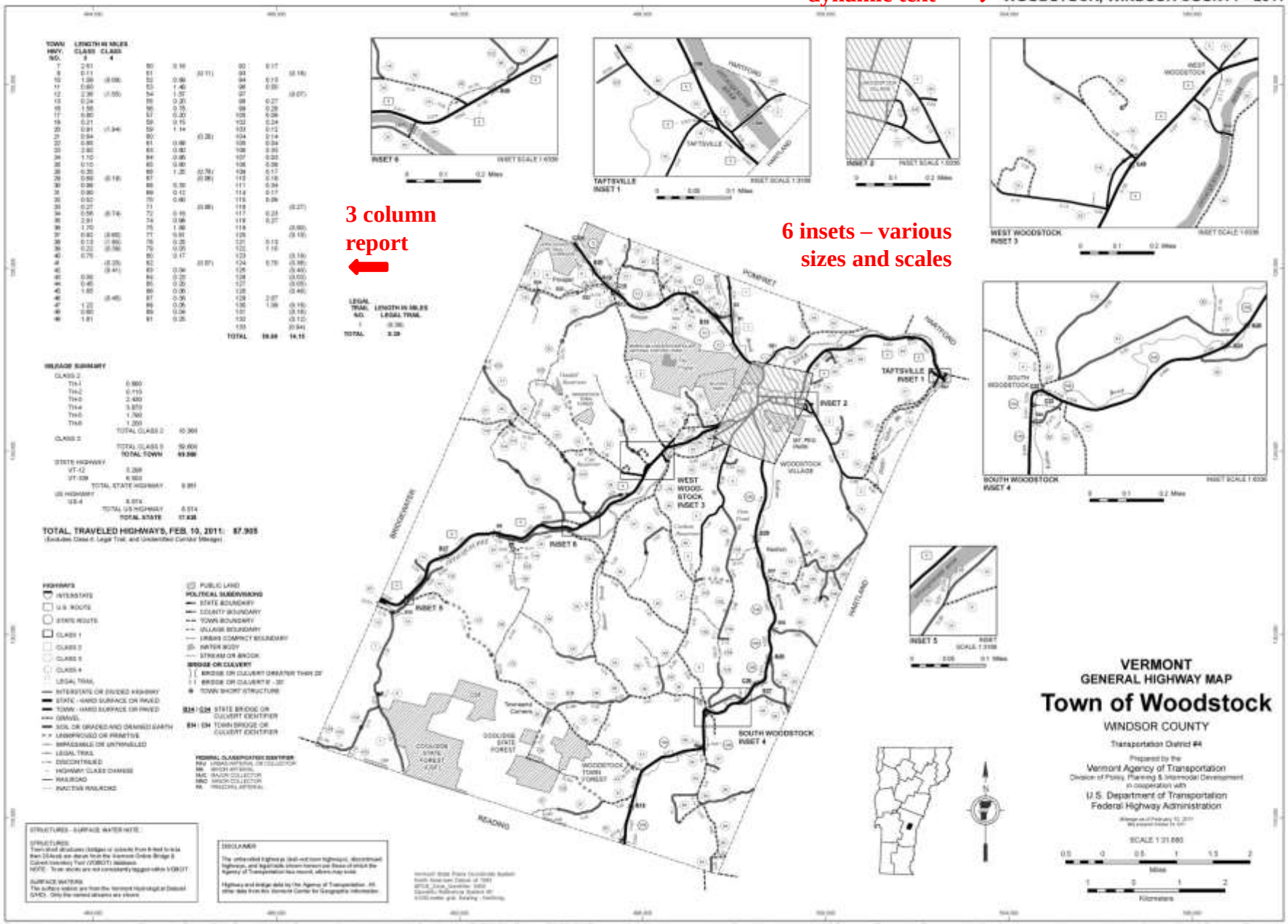
1 inset

1 column report

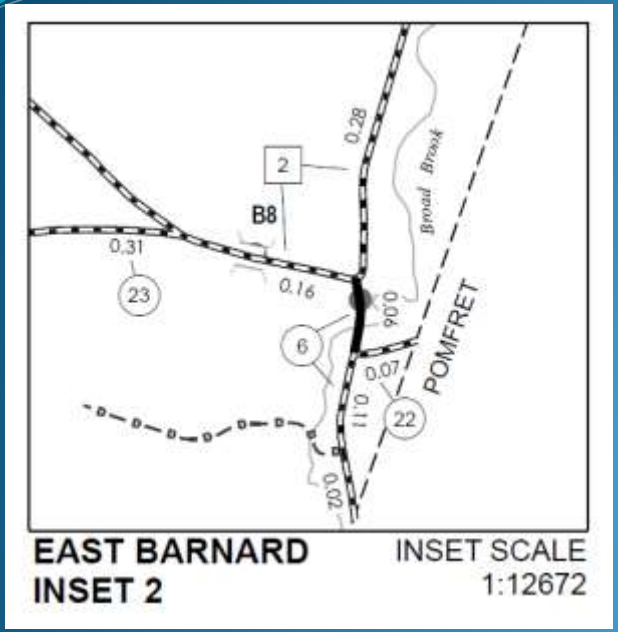


dynamic text → VERMONT GENERAL HIGHWAY MAP Town of Wheelock

dynamic text → WOODSTOCK, WINDSOR COUNTY - 2011



Challenges & System Requirements



TOWN HWY. No.	LENGTH IN MILES "NOT UP TO STANDARD"
18	(0.10)
21	(0.22)
53	(0.08)
91	(0.06)
101	(0.08)
TOTAL	0.54

* The sections of the town highways listed above are legally Class 3, but have been deemed "Not Up To Standard" and are functionally Class 4 Town Highways

The Solution needed to accommodate the following requirements:

Multiple Insets – MPS-Atlas and Data Driven Pages couldn't handle them

Mileage reports – couldn't use the reporting tool in ArcMap – it wouldn't limit the report to a single town's data, also dynamic graphic table didn't work – the reports were too sophisticated

Variable Town Shape, Size and Page Layout

Need to eliminate annual Retooling

The Solution – Python

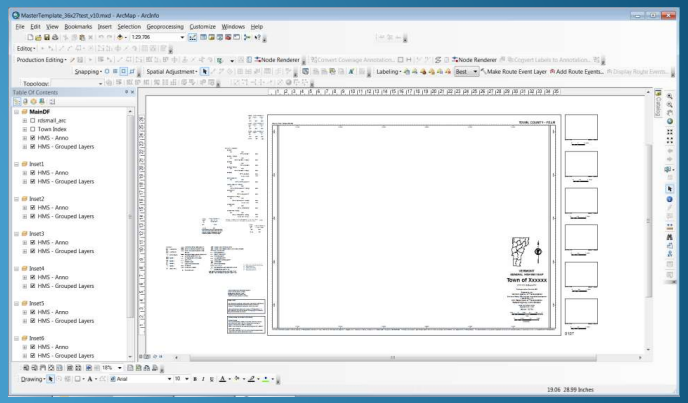
VTrans reached out to Esri Boston for assistance and was connected with Jeff Barrette, Product Developer in Esri's Holistic Testing and the Map Automation teams. Jeff provided a very creative and elegant solution.

The Solution - A Python Script based tool suite and Template MXD.

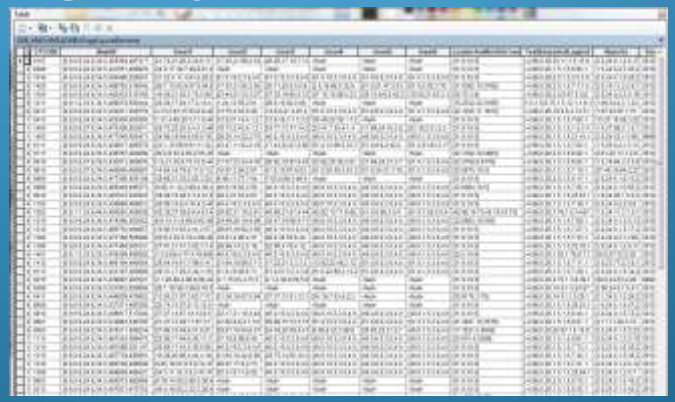
Key Components

Data

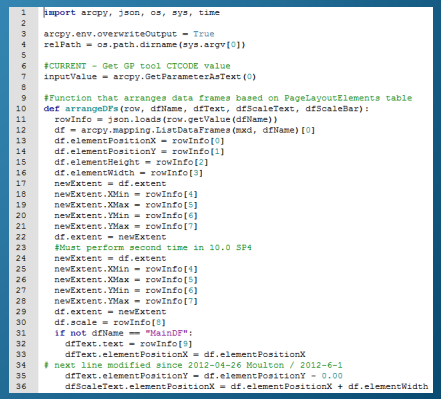
ArcMap Template



Page Layout Elements Table



Python Scripts



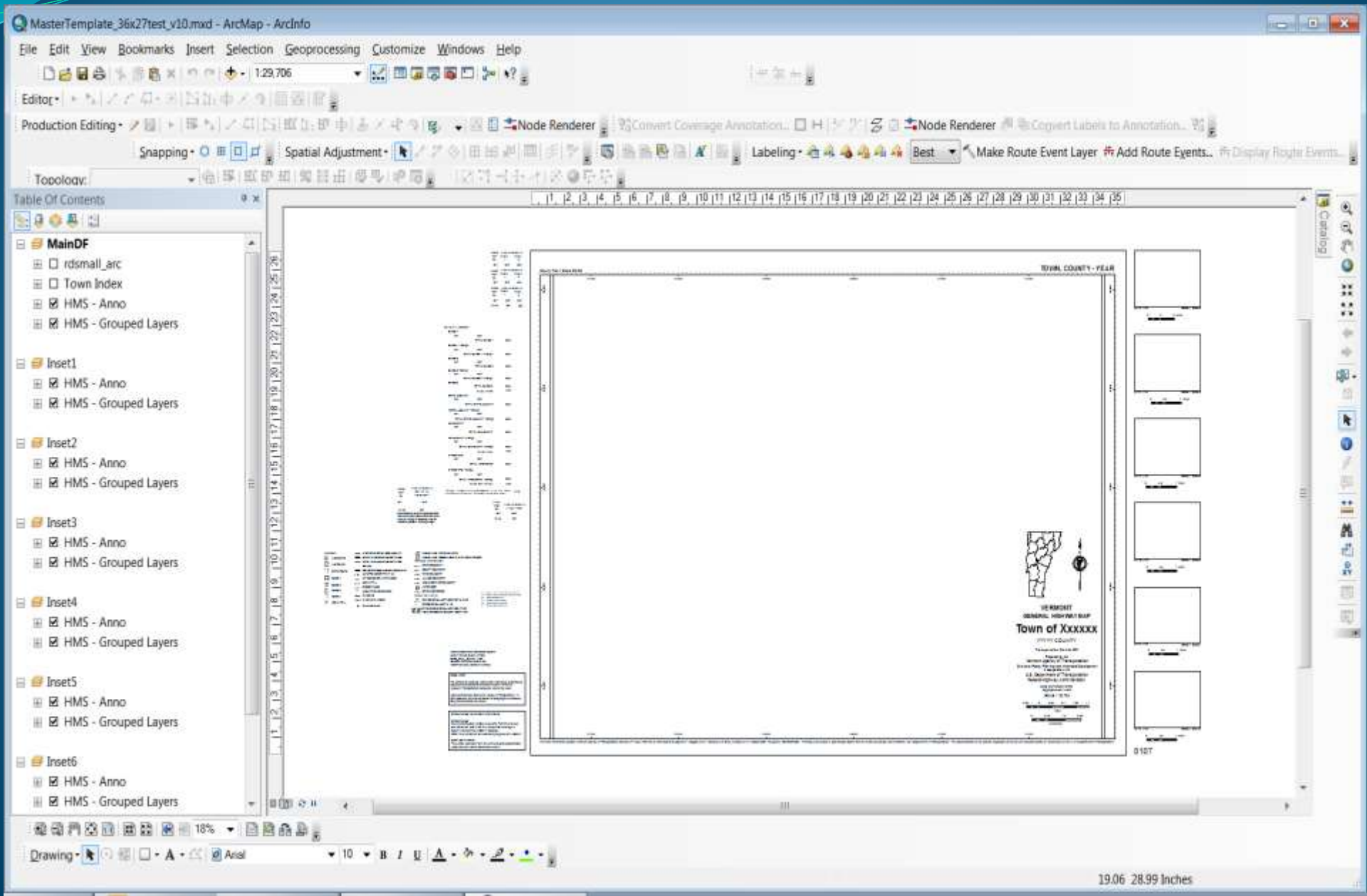
```python
import arcpy, json, os, sys, time

arcpy.env.overwriteOutput = True
relPath = os.path.dirname(sys.argv[0])

#CURRENT - Get GP tool CTCODE value
inputValue = arcpy.GetParameterAsText(0)

#Function that arranges data frames based on PageLayoutElements table
def arrangeDFs(row, dfName, dfText, dfScaleText, dfScaleBar):
  rowInfo = json.loads(row.getValue(dfName))
  df = arcpy.mapping.ListDataFrames(mxd, dfName)[0]
  df.elementPositionX = rowInfo[0]
  df.elementPositionY = rowInfo[1]
  df.elementHeight = rowInfo[2]
  df.elementWidth = rowInfo[3]
  newExtent = df.extent
  newExtent.XMin = rowInfo[4]
  newExtent.XMax = rowInfo[5]
  newExtent.YMin = rowInfo[6]
  newExtent.YMax = rowInfo[7]
  df.extent = newExtent
  #Must perform second time in 10.0 SP4
  newExtent = df.extent
  newExtent.XMin = rowInfo[4]
  newExtent.XMax = rowInfo[5]
  newExtent.YMin = rowInfo[6]
  newExtent.YMax = rowInfo[7]
  df.extent = newExtent
  df.scale = rowInfo[8]
  if not dfName == "MainDF":
    dfText.text = rowInfo[9]
    dfText.elementPositionX = df.elementPositionX
# next line modified since 2012-04-26 Moulton / 2012-6-1
    dfText.elementPositionY = df.elementPositionY - 0.00
    dfScaleText.elementPositionX = df.elementPositionX + df.elementWidth
```

ArcMap Master MXD Template



Page Layout Elements Table

Each record represents the layout specifications for a map, and each field contains the layout parameters for a Data Frame or other layout element within that map.

Town

Table

PageLayoutElements

OBJECTID *	CTCODE	MainDF	Inset1	
1	0107	[0.9,0.9,24.8,34.5,459394,487317,157306,177262,31680]	[21.74,21.26,3.24,6.17,468768,470759,165635,166680,12672,"INSET 1"]	[17.45,21.
2	0406	[0.9,0.9,24.8,34.5,441051,468976,216649,236607,31680]	[24.9,17.38,7.48,9.61,448381,451312,222621,224903,12000,"INSET 1"]	<Null>
3	1016	[0.9,0.9,24.8,34.5,500486,528247,259145,279101,31680]	[21.22,4.11,4.91,6.28,514819,515830,271801,272591,6336,"NEWPORT CENTER \nINSET 1"]	[51.0,19.5

. . .

[Data Frame $X_{position}$, $Y_{position}$, height, width, extent, scale]

Possible to include formatted text

Table

PageLayoutElements

Inset6	LocatorAndNorthArrow	TextBoxesAndLegend	Reports	Year	Layout
<Null>	[31.9,10.5]	[-4.96,0.26,23.11,1.5,15.88,1.5,2.0,1.5]	[2.0,24.0,1,2.0,17.0,5.5,24.0,40.0,12.36]	2012	36x27
<Null>	[31.9,10.5]	[-4.96,0.26,1.5,1.5,6.85,1.5,12.45,20.7]	[1.5,24.0,2,7.05,23.83,40.0,13.65,1.5,6.78]	2012	36x27
[51.0,1.5,3.0,4.0,510151,535447,61766,80738,248973,"Inset6 Text"]	[31.9,10.5]	[-4.96,0.26,2.0,1.5,2.0,3.94,1.5,10.33]	[2.0,24.0,1,6.28,23.83,51.0,17.08,6.39,18.21]	2012	36x27
[51.0,5.02,3.75,2.68,497389,498254,140526,141737,12672,"INSET 6"]	[31.8392,10.3765]	[-4.96,0.26,2.0,1.5,7.7,1.5,12.19,1.5]	[2.0,18.13,3,2.0,10.16,9.53,24.45,13.0,23.93]	2012	36x27
[10.55,21.63,3.17,5.05,494246,495061,122148,122659,6336,"INSET 6"]	[25.75,3.9]	[-4.96,0.26,2.0,5.67,2.0,8.07,2.0,1.5]	[2.0,24.0,3,2.0,16.0,9.5,20.0,51.0,23.93]	2012	36x27

(Page Layout Elements Tables continued)

Python Scripting

Can produce individual maps or batch production of PDFs

Updates CTCODE (town) in layer definition queries

Moves layout elements according to properties saved in Page Layout Elements Table (moves unwanted elements off the page)

Updates data-driven text:

- Town Map title block, production year, margin text, etc.
- Reads mileage data from primary data, processes it, and updates "Mileage Report" text elements

```python
import arcpy, json, os, sys, time

arcpy.env.overwriteOutput = True
relPath = os.path.dirname(sys.argv[0])

#CURRENT - Get GP tool CTCODE value
inputValue = arcpy.GetParameterAsText(0)

#Function that arranges data frames based on PageLayoutElements table
def arrangeDFs(row, dfName, dfText, dfScaleText, dfScaleBar):
  rowInfo = json.loads(row.getValue(dfName))
  df = arcpy.mapping.ListDataFrames(mxd, dfName)[0]
  df.elementPositionX = rowInfo[0]
  df.elementPositionY = rowInfo[1]
  df.elementHeight = rowInfo[2]
  df.elementWidth = rowInfo[3]
  newExtent = df.extent
  newExtent.XMin = rowInfo[4]
  newExtent.XMax = rowInfo[5]
  newExtent.YMin = rowInfo[6]
  newExtent.YMax = rowInfo[7]
  df.extent = newExtent
  #Must perform second time in 10.0 SP4
  newExtent = df.extent
  newExtent.XMin = rowInfo[4]
  newExtent.XMax = rowInfo[5]
  newExtent.YMin = rowInfo[6]
  newExtent.YMax = rowInfo[7]
  df.extent = newExtent
  df.scale = rowInfo[8]
  if not dfName == "MainDF":
    dfText.text = rowInfo[9]
    dfText.elementPositionX = df.elementPositionX
# next line modified since 2012-04-26 Moulton / 2012-6-1
    dfText.elementPositionY = df.elementPositionY - 0.00
    dfScaleText.elementPositionX = df.elementPositionX + df.elementWidth
```

Suite of Python Scripts

Core.py

Geoprocessing to make map layout according to PageLayoutElements table.

```
import arcpy, Toolbox2_Core

mxdPath = "CURRENT"
inputValue = arcpy.GetParameterAsText(0)

ctCodeList =[]
ctCodeList.append(inputValue)

Toolbox2_Core.mainScript(ctCodeList, mxdPath)

arcpy.RefreshActiveView()
```

Gateway Scripts: Generate lists of towns to be mapped by **Core.py**

ZoomToPage.py

(one town)

ExportToPDF.py

(batch of towns by year and layout size)

```
import arcpy, string, Toolbox2_Core

mxdPath = "CURRENT"
pageSize = arcpy.GetParameterAsText(0)
year = arcpy.GetParameterAsText(1)
ctCodeList = string.split(arcpy.GetParameterAsText(2), ";")

Toolbox2_Core.mainScript(ctCodeList, mxdPath, year)

arcpy.RefreshActiveView()
```

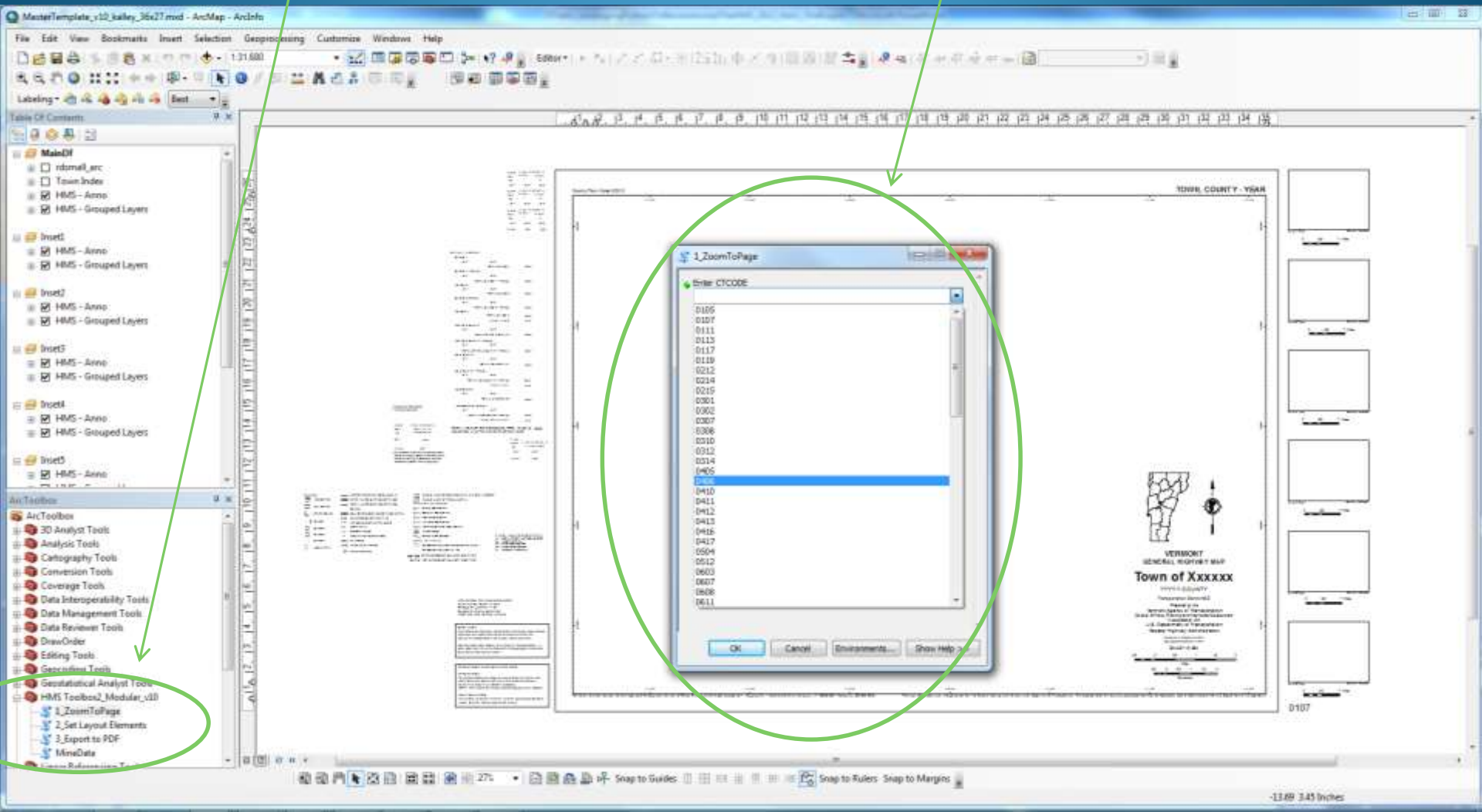
SetLayoutInfo.py

Inserts or updates page layout information for a map in PageLayoutElements table based on current mxd layout.

HMS Toolbox –Making the Map

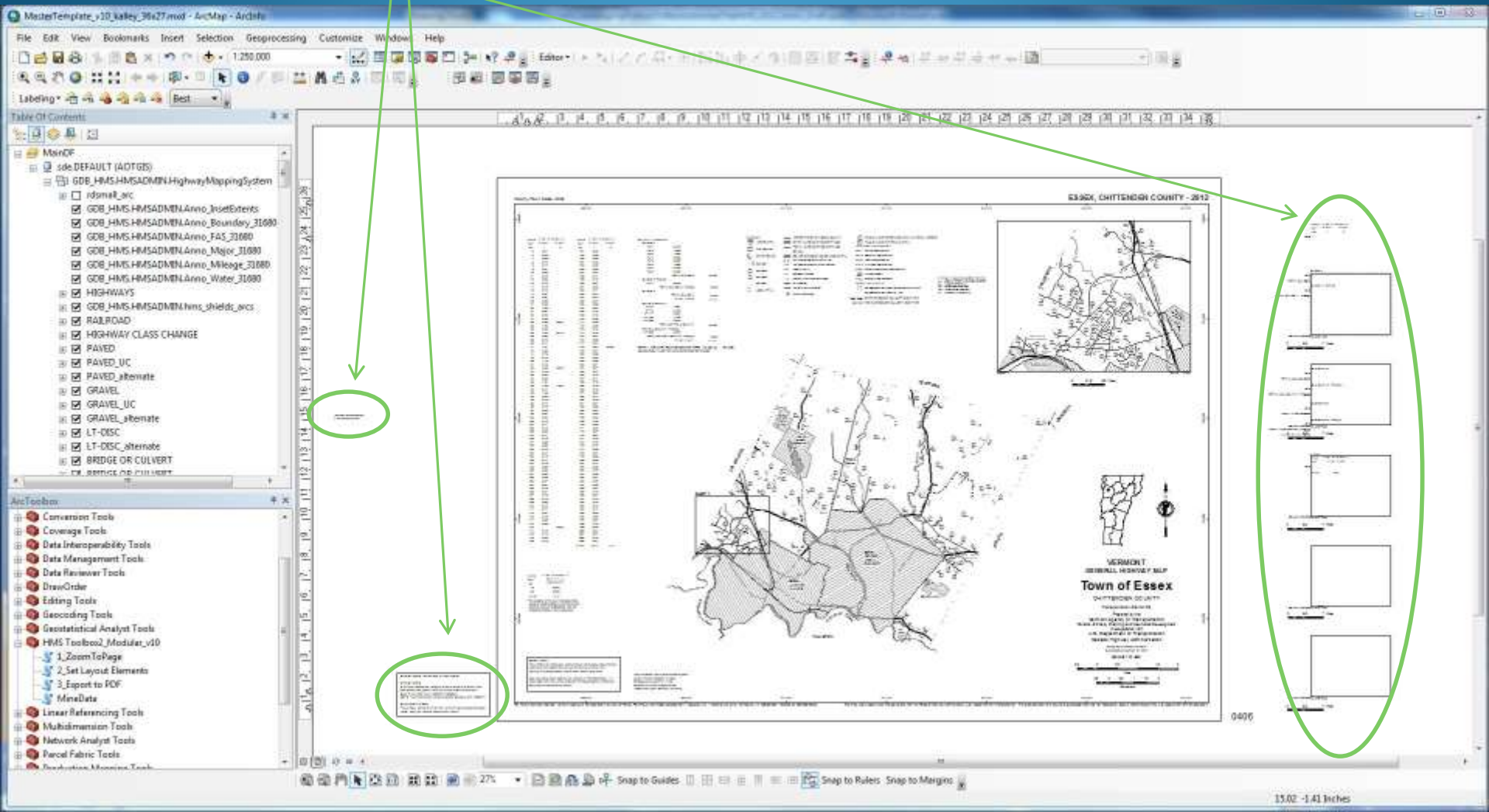
HMS Toolbox: ZoomToPage
Set Layout Elements
Export to PDF

ZoomToPage interface



HMS Toolbox - ZoomToPage

Elements not used in layout



TOWN HWY. No.	LENGTH IN MILES CLASS 3	CLASS 4
2	0.21	
3	0.25	
4	0.29	
5	0.18	
6	0.17	
9	0.21	
10	0.33	
11	0.43	
12	0.09	
13	0.15	
14	0.12	
15	0.15	
17	0.34	
18	0.07	
20	0.50	
21	0.50	
23	1.22	
24	0.91	
26	0.20	
27	3.20	
29	0.08	(0.20)
30	1.25	
32	0.23	
33	1.25	(0.15)
34	2.95	
36	0.75	
39	0.11	
41	1.34	
42	3.53	
44	0.76	
46	0.43	
50	1.10	
51	2.46	
53	0.30	(0.55)
54	0.10	
56	0.85	
57	0.39	
59	1.04	
60	1.20	(1.95)
62	0.47	
63	1.50	
65	0.35	
66	0.73	
85	0.13	
86	0.12	
87	0.29	
90	0.04	
105	0.23	
106	0.12	
107	0.11	
108	0.16	
109	0.09	
110	0.17	
120	0.10	
121	0.80	
122	0.08	
123	0.13	
132	0.47	
136	0.18	
136	0.47	
137	0.10	
138	0.08	
700	0.85	
701	0.22	
702	0.20	
703	0.27	
704	0.07	
705	0.18	
706	0.21	
707	0.10	
708	0.08	
709	0.05	
710	0.48	
711	0.14	
712	0.07	
713	0.10	
714	0.88	
715	0.08	
716		(0.20)
717	0.70	
718	0.15	
719	0.35	
720	0.19	

TOWN HWY. No.	LENGTH IN MILES CLASS 3	CLASS 4
721	0.82	
722	0.39	
723	0.06	
724	0.10	
725	0.22	
726	0.05	
727	0.31	
728	0.11	
729	0.18	
730	0.27	
731	0.55	
732	0.11	
733	0.57	
734	0.31	
735	0.37	
736	0.06	
737	0.07	
738	0.13	
739	0.18	
740	0.38	
741	0.39	
742	0.55	
743	0.15	
744	0.72	
745	0.34	
746	0.30	
747	0.24	
748	0.04	(0.05)
749	0.27	
750	0.28	
751	0.29	
752	0.09	
753	0.31	
754	0.57	
755	0.41	
756	0.42	
757	0.44	
758	0.19	
759	0.19	
760	0.19	
761	0.35	
762	0.14	
763	0.43	
764	0.34	
765	0.65	
766	0.54	
767	0.33	
768	0.65	
769	0.49	
770	0.22	
771	0.28	
772	0.07	
773	0.27	
774	0.13	
775	0.10	
776	0.72	
777	0.29	
778	0.21	
779	0.05	
780	0.26	
781	0.17	
782	0.08	
783	0.13	
784	0.29	
785	0.27	
786	0.26	
787	0.36	
788	0.07	
789	0.12	
790	0.04	
791	0.13	
792	0.76	
793	0.13	
794	0.14	
795	0.23	
796	0.26	
797	0.04	
798	0.43	
799	0.22	
800	0.34	
801	0.21	
802	0.13	
803	0.31	
TOTAL	64.32	3.10

TOWN HWY. No.	LENGTH IN MILES "NOT UP TO STANDARD"
15	(0.22)
65	(0.08)
TOTAL	0.30

* The sections of the town highways listed above are legally Class 3, but have been deemed "Not Up To Standard" and are functionally Class 4 Town Highways

MILEAGE SUMMARY

CLASS 2		
TH-1	0.340	
TH-2	4.000	
TH-3	1.260	
TH-4	2.250	
TH-5	0.880	
TH-6	1.000	
TH-7	0.460	
TH-8	0.930	
TOTAL CLASS 2		10.790
CLASS 2- Ramps		
TH-4	0.040	
TOTAL CLASS 2 - Ramps		0.040
CLASS 3		
TOTAL CLASS 3		64.32
TOTAL TOWN		75.150
STATE HIGHWAY		
VT-2A	1.807	
VT-15	5.436	
VT-117	3.204	
VT-128	4.402	
VT-289	3.940	
TOTAL STATE HIGHWAY		18.789
STATE HIGHWAY - Ramps		
VT-289	3.523	
TOTAL STATE HIGHWAY - Ramps		3.523
TOTAL STATE		22.312

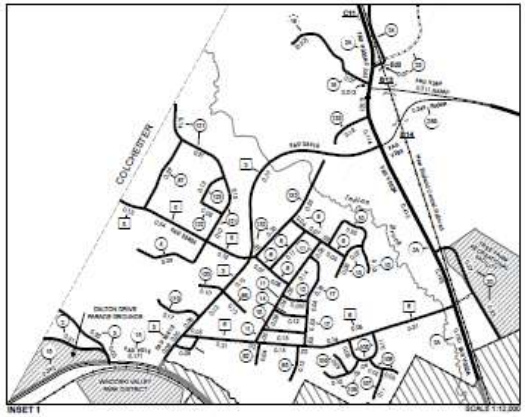
TOTAL, TRAVELED HIGHWAYS, FEB. 10, 2012: 97.462
(Excludes Class 4, Legal Trail, and Unidentified Corridor Mileage)

HIGHWAYS
- INTERSTATE
- U.S. ROUTE
- STATE ROUTE
- CLASS 1
- CLASS 2
- CLASS 3
- CLASS 4
- LEGAL TRAIL
- INTERSTATE OR DIVIDED HIGHWAY
- STATE - HARD SURFACE OR PAVED
- TOWN - HARD SURFACE OR PAVED
- GRAVEL
- SOIL OR GRADED AND DRAINED EARTH
- UNIMPROVED OR PRIMITIVE
- IMPASSABLE OR UNTRAVELED
- LEGAL TRAIL
- DISCONTINUED
- HIGHWAY CLASS CHANGE
- RAILROAD
- INACTIVE RAILROAD
- P PARK AND RIDE
- PUBLIC LAND - GREEN MOUNTAIN NATIONAL FOREST
- PUBLIC LAND - STATE/MUNICIPAL

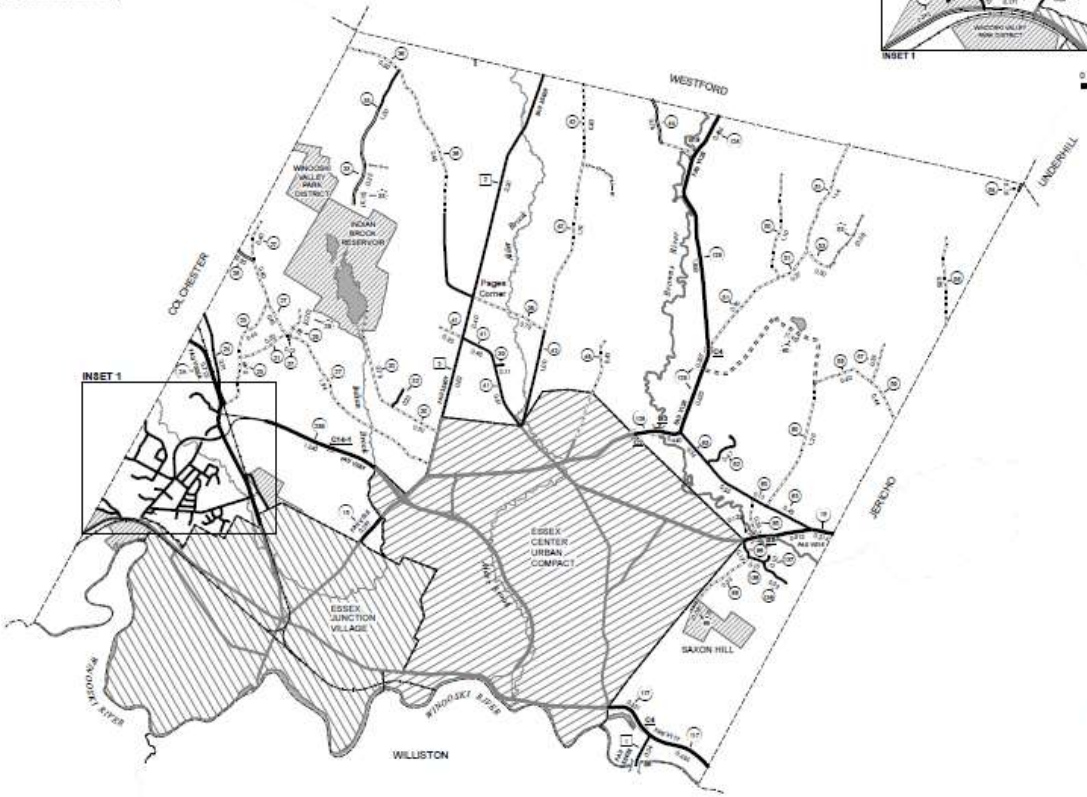
POLITICAL SUBDIVISIONS
- STATE BOUNDARY
- COUNTY BOUNDARY
- TOWN BOUNDARY
- VILLAGE BOUNDARY
- URBAN COMPACT BOUNDARY
- WATER BODY
- STREAM OR BROOK

BRIDGE OR CULVERT
- BRIDGE OR CULVERT GREATER THAN 20'
- BRIDGE OR CULVERT 8' - 20'
- B34 / C34 STATE BRIDGE OR CULVERT IDENTIFIER
- B34 / C34 TOWN BRIDGE OR CULVERT IDENTIFIER

FEDERAL CLASSIFICATION IDENTIFIER
- PA2 URBAN ARTERIAL OR COLLECTOR
- MA MINOR ARTERIAL
- MAC MAJOR COLLECTOR
- MNC MINOR COLLECTOR
- PA PRINCIPAL ARTERIAL



0 0.15 0.3 Miles



VERMONT
GENERAL HIGHWAY MAP
Town of Essex
CHITTENDEN COUNTY

Transportation District #5

Prepared by the
Vermont Agency of Transportation
Division of Policy, Planning and Intermodal Development
In cooperation with
U.S. Department of Transportation
Federal Highway Administration

Mileage as of February 10, 2012
Map prepared September 28, 2012

SCALE 1:31,680

0.5 0 0.5 1 1.5 2
Miles

0.5 0 0.5 1 1.5 2
Kilometers

DISCLAIMER:
The untraveled highways (laid-out town highways), discontinued highways, and legal trails hereon are those of which the Agency of Transportation has record; others may exist.

Highway and bridge data by the Agency of Transportation. All other data from the Vermont Center for Geographic Information. Only named streams are shown.

Vermont State Plane Coordinate System
North American Datum of 1983
SPCS_Zone_Identifier: 4400
Geodetic Reference System 80
4,000-meter grid, Easting - Northing

This map was funded in part through grants from the Federal Highway Administration, U.S. Department of Transportation. The representation of the authors expressed herein do not necessarily state or reflect those of the U.S. Department of Transportation.

legend

ramps

2 columns

TOWN HWY. No.	LENGTH IN MILES CLASS 3	LENGTH IN MILES CLASS 4
2	0.21	
3	0.25	
4	0.29	
5	0.15	
6	0.17	
9	0.21	
10	0.33	
11	0.43	
12	0.09	
13	0.15	
14	0.12	
15	0.15	
17	0.34	
18	0.07	
20	0.50	
21	0.50	
23	1.22	
24	0.91	
26	0.20	
27	3.00	
29	0.08	(0.20)
30	1.25	
32	0.23	
33	1.25	(0.15)
35	2.95	
36	0.55	
39	0.11	
41	1.34	
42	3.53	
44	0.76	
46	0.43	
50	1.10	
51	2.46	
53	0.30	(0.55)
54	0.10	
56	0.85	
57	0.39	
59	1.04	
60	1.20	(1.95)
62	0.47	
63	1.50	
65	0.35	
66	0.73	
85	0.13	
86	0.12	
87	0.29	
89	0.04	
105	0.23	
106	0.12	
107	0.11	
108	0.16	
109	0.09	
110	0.17	
120	0.10	
121	0.80	
122	0.08	
123	0.13	
132	0.47	
136	0.18	
136	0.47	
137	0.10	
138	0.08	
700	0.85	
701	0.22	
702	0.20	
703	0.27	
704	0.07	
705	0.18	
706	0.21	
707	0.10	
708	0.08	
709	0.05	
710	0.48	
711	0.14	
712	0.07	
713	0.10	
714	0.68	
715	0.08	
716		(0.20)
717	0.70	
718	0.15	
719	0.35	
720	0.19	
TOTAL	64.31	3.10

TOWN HWY. No.	LENGTH IN MILES CLASS 3	LENGTH IN MILES CLASS 4
721	0.82	
722	0.39	
723	0.06	
724	0.10	
725	0.22	
726	0.05	
727	0.31	
728	0.11	
729	0.18	
730	0.27	
731	0.55	
732	0.11	
733	0.57	
734	0.31	
735	0.37	
736	0.06	
737	0.07	
738	0.13	
739	0.18	
740	0.38	
741	0.39	
742	0.55	
743	0.15	
744	0.72	
745	0.34	
746	0.30	
747	0.24	
748	0.04	(0.05)
749	0.27	
750	0.28	
751	0.29	
752	0.09	
753	0.31	
754	0.57	
755	0.41	
756	0.42	
757	0.44	
758	0.19	
759	0.19	
760	0.19	
761	0.35	
762	0.14	
763	0.43	
764	0.34	
765	0.65	
766	0.54	
767	0.33	
768	0.65	
769	0.49	
770	0.22	
771	0.28	
772	0.07	
773	0.27	
774	0.13	
775	0.10	
776	0.72	
777	0.29	
778	0.21	
779	0.05	
780	0.26	
781	0.17	
782	0.08	
783	0.13	
784	0.29	
785	0.27	
786	0.26	
787	0.36	
788	0.07	
789	0.12	
790	0.04	
791	0.13	
792	0.76	
793	0.13	
794	0.14	
795	0.23	
796	0.26	
797	0.04	
798	0.43	
799	0.22	
800	0.34	
801	0.21	
802	0.13	
803	0.31	
TOTAL	64.31	3.10

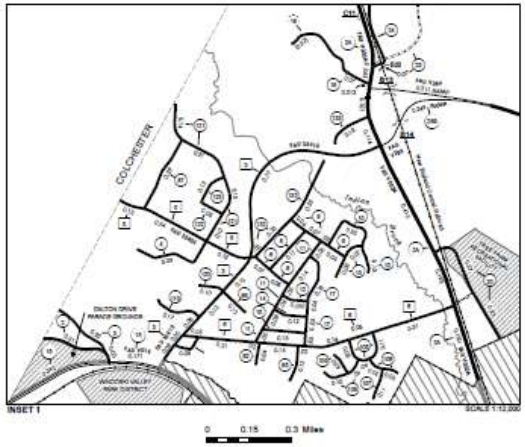
TOWN HWY. No.	LENGTH IN MILES "NOT UP TO STANDARD"
15	(0.20)
65	(0.05)
TOTAL	0.30

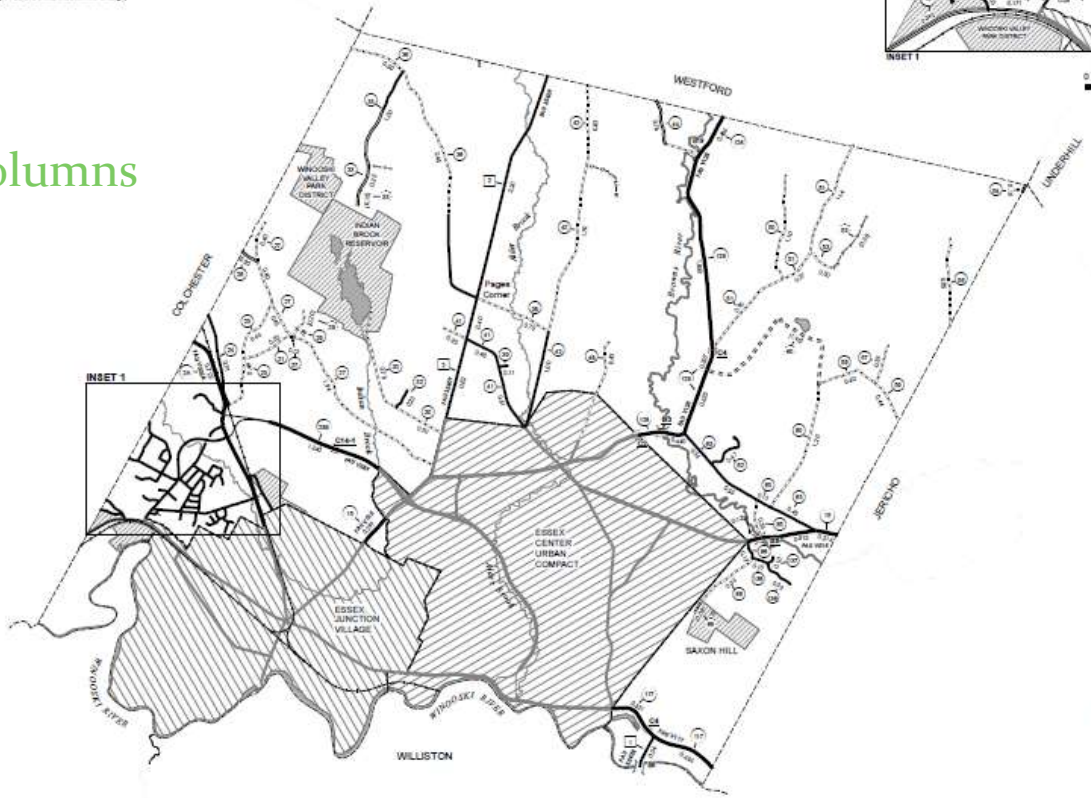
* The sections of the town highways listed above are legally Class 3, but have been deemed "Not Up To Standard" and are functionally Class 4 Town Highways

MILEAGE SUMMARY

CLASS 2	
TH-1	0.340
TH-2	4.000
TH-3	1.260
TH-4	2.250
TH-5	0.880
TH-6	1.000
TH-7	0.460
TH-8	0.930
TOTAL CLASS 2	10.790
CLASS 2- Ramps	
TH-4	0.040
TOTAL CLASS 2 - Ramps	0.040
TOTAL CLASS 3	64.32
TOTAL TOWN	75.150
STATE HIGHWAY	
VT-2A	1.807
VT-15	5.436
VT-117	3.204
VT-128	4.402
VT-289	3.940
TOTAL STATE HIGHWAY	18.789
STATE HIGHWAY - Ramps	
VT-289	3.523
TOTAL STATE HIGHWAY - Ramps	3.523
TOTAL STATE	22.312

TOTAL, TRAVELED HIGHWAYS, FEB. 10, 2012: 97.462
(Excludes Class 4, Legal Trail, and Unidentified Corridor Mileage)





VERMONT GENERAL HIGHWAY MAP

Town of Essex

CHITTENDEN COUNTY

Transportation District #5

Prepared by the
Vermont Agency of Transportation
Division of Policy, Planning and Intermodal Development
In cooperation with
U.S. Department of Transportation
Federal Highway Administration

Mileage as of February 10, 2012
Map prepared September 28, 2012

SCALE 1:31,680

0.5 0 0.5 1 1.5 2
Miles
0.5 0 0.5 1 1.5 2
Kilometers

DISCLAIMER:
The untraveled highways (laid-out town highways), discontinued highways, and legal trails hereon are those of which the Agency of Transportation has record; others may exist.

Highway and bridge data by the Agency of Transportation. All other data from the Vermont Center for Geographic Information. Only named streams are shown.

Vermont State Plane Coordinate System
North American Datum of 1983
SPCS_Zone_Identifier: 4400
Geodetic Reference System 80
4,000-meter grid, Easting - Northing

For more information contact: Vermont Agency of Transportation, Division of Policy, Planning & Intermodal Development - Mapping Unit, 1 National Life Drive, Montpelier, VT 05633-5001 Telephone: 802-828-2600

This map was funded in part through grants from the Federal Highway Administration, U.S. Department of Transportation. The representation of the authors expressed herein do not necessarily state or reflect those of the U.S. Department of Transportation.

County-Town Code: 1416

ROYALTON, WINDSOR COUNTY - 2012

three columns

TOWN HWY. No.	LENGTH IN MILES CLASS 3	LENGTH IN MILES CLASS 4	TOWN HWY. No.	LENGTH IN MILES CLASS 3	LENGTH IN MILES CLASS 4	TOWN HWY. No.	LENGTH IN MILES CLASS 3	LENGTH IN MILES CLASS 4
5	3.61		41	0.71		73	0.10	
7	2.98		42	1.05		74	0.07	
8	0.40		43	0.41	(0.49)	75	0.20	
9	1.32		44	0.15		76	0.17	
10	0.46		45	0.80		77		(0.07)
11	1.29		46	0.65	(1.30)	78	0.21	
12	2.33		47	2.33		80	0.11	
13	3.22		48	1.19		81	0.16	
14	1.28		49	2.40		82	0.38	
15	0.38	(1.31)	50	0.10		83	0.12	
16	0.88	(0.60)	51	0.42		84	0.08	
17	2.36		52	0.20		85	0.32	
18	0.60		53	0.20	(0.59)	86	0.21	
20	0.50		54	0.31		87	0.23	
21		(0.70)	55	0.28		88	0.11	
22	1.94		56	0.60		89	0.25	
23	1.45		57	0.04		92	0.04	
24	0.14		58	0.03		93	0.07	
25	0.83		59	0.11		94	0.05	
26	0.10		60	0.08		95	0.28	
27	0.15		61	0.07		96	0.10	
28	0.15		62	0.41		97	0.11	
29	0.51		63	0.09		98	0.20	
30	0.30		64	0.05		99	0.13	
32	0.44		65	0.10		100	0.18	
33	0.15		66	0.12		101	0.16	
34	0.24		67	0.61		102		(0.44)
35	3.03		68	0.21		103		(0.05)
36	2.36		69	0.08		104		(0.58)
37	0.68	(1.31)	70	0.05		105		(1.21)
38	3.57		71	0.04		106		(0.14)
39		(0.70)	72	0.05		TOTAL	55.79	9.01

MILEAGE SUMMARY

CLASS 2		
TH-1	2.590	
TH-2	2.540	
TH-3	1.840	
TH-4	2.220	
TH-5	2.050	
TH-6	4.130	
TH-7	0.040	
TOTAL CLASS 2		15.410
CLASS 3		
TOTAL CLASS 3		55.79
TOTAL TOWN		**71.200**
STATE HIGHWAY		
VT-14	9.121	
VT-107	2.530	
VT-110	2.320	
TOTAL STATE HIGHWAY		13.971
TOTAL STATE		**13.971**
INTERSTATE		
I-89	7.720	
TOTAL INTERSTATE		7.720
INTERSTATE - Ramps		
I-89	1.266	
TOTAL INTERSTATE - Ramps		1.266
TOTAL INTERSTATE		**8.986**

TOTAL, TRAVELED HIGHWAYS, FEB. 10, 2012: 94.167

(Excluded Class 4, Legal Trail, and Unidentified Corridor Mileage)

no ramps

TOWN HWY. No.	LENGTH IN MILES "NOT UP TO STANDARD"
37	(0.07)
46	(0.18)
TOTAL	0.25

* The sections of the town highways listed above are legally Class 3, but have been deemed "Not Up To Standard" and are functionally Class 4 Town Highways

legend

HIGHWAYS
- INTERSTATE
- U.S. ROUTE
- STATE ROUTE
- CLASS 1
- CLASS 2
- CLASS 3
- CLASS 4
- LEGAL TRAIL
- INTERSTATE OR DIVIDED HIGHWAY
- STATE - HARD SURFACE OR PAVED
- TOWN - HARD SURFACE OR PAVED
- GRAVEL
- SOIL OR GRADED AND DRAINED EARTH
- UNIMPROVED OR PRIMITIVE
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- DISCONTINUED
- HIGHWAY CLASS CHANGE
- RAILROAD
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- PUBLIC LAND - STATE/MUNICIPAL

POLITICAL SUBDIVISIONS
- STATE BOUNDARY
- COUNTY BOUNDARY
- TOWN BOUNDARY
- VILLAGE BOUNDARY
- URBAN COMPACT BOUNDARY
- WATER BODY
- STREAM OR BROOK

BRIDGE OR CULVERT
- BRIDGE OR CULVERT GREATER THAN 20'
- BRIDGE OR CULVERT 8' - 20'
- B34 / C34 STATE BRIDGE OR CULVERT IDENTIFIER
- B34 / C34 TOWN BRIDGE OR CULVERT IDENTIFIER

FEDERAL CLASSIFICATION IDENTIFIER
- PAI URBAN ARTERIAL OR COLLECTOR
- MA MINOR ARTERIAL
- MJC MAJOR COLLECTOR
- MNC MINOR COLLECTOR
- PA PRINCIPAL ARTERIAL

DISCLAIMER:
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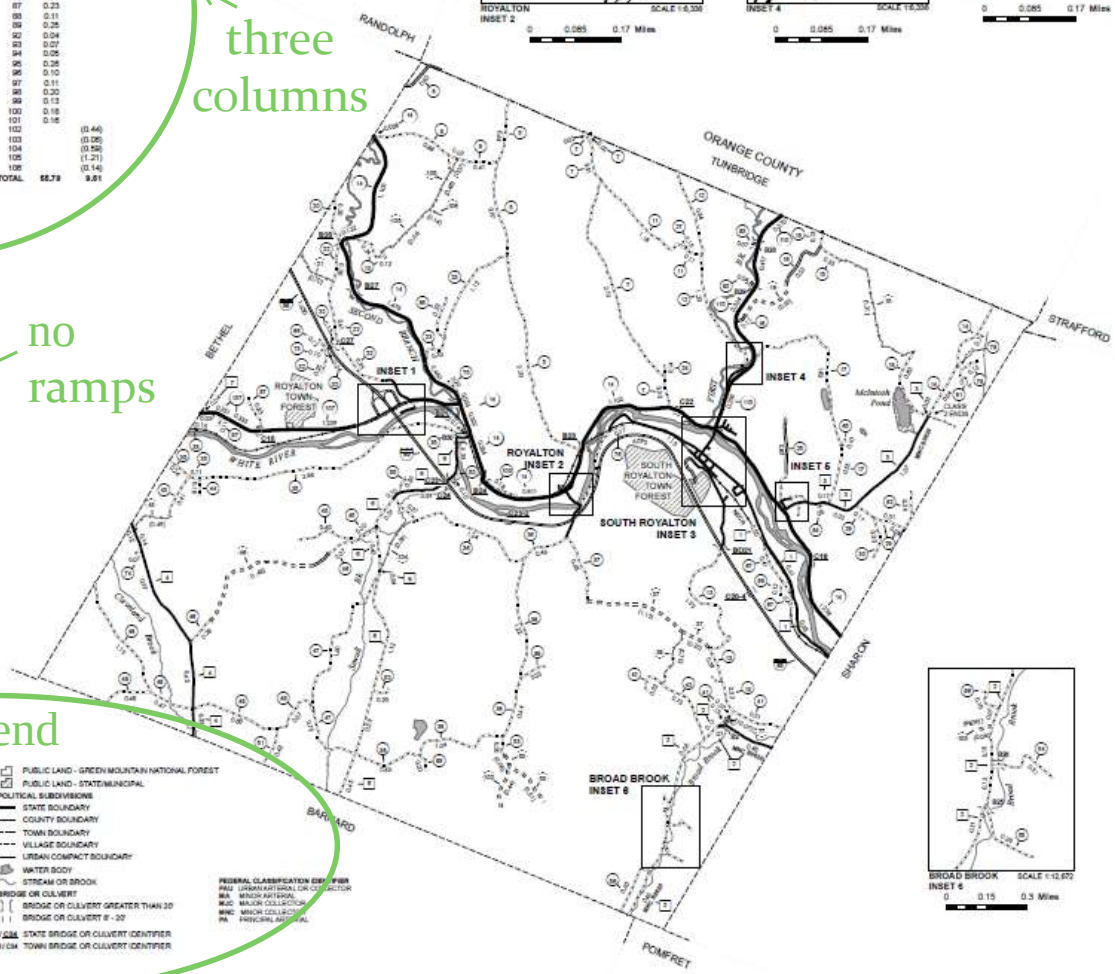
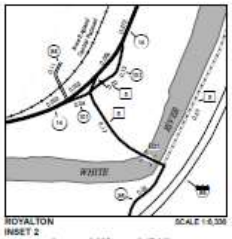
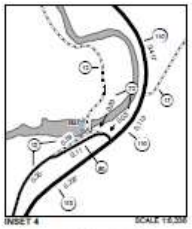
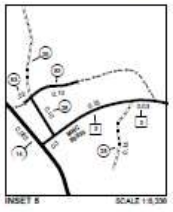
Highway and bridge data by the Agency of Transportation. All other data from the Vermont Center for Geographic Information. Only named streams are shown.

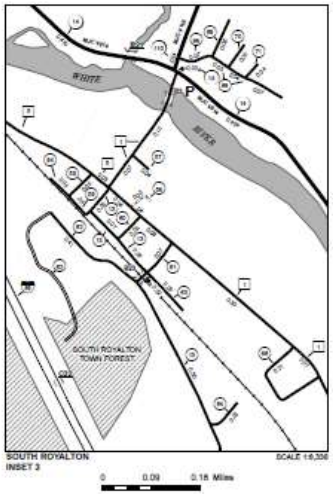
Vermont State Plane Coordinate System
North American Datum of 1983
SPCS_Zone_Identifier: 4400
Geodetic Reference System 80
4,000-meter grid, Easting - Northing

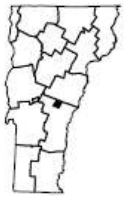












VERMONT
GENERAL HIGHWAY MAP

Town of Royalton

WINDSOR COUNTY

Transportation District #4

Prepared by the
Vermont Agency of Transportation
Division of Policy, Planning and Intermodal Development
in cooperation with
U.S. Department of Transportation
Federal Highway Administration

Mileage as of February 10, 2012
Map prepared October 01, 2012

SCALE 1:31,680

0.5 0 0.5 1 1.5 2
Miles

0.5 0 0.5 1 1.5 2
Kilometers

For more information contact: Vermont Agency of Transportation, Division of Policy, Planning & Intermodal Development - Mapping Unit, 1 National Life Drive, Montpelier, VT 05633-5001 Telephone: 802-828-2600.

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Other HMS Templates/Scripts

Eleven templates:

- Paper size (27 x 36, 36 x 27, 36 x 30, 36 x 36, 36 x 48, 48 x 36)
- Town, Village/Urban Compact/City

Requires Additional Templates

Two (slightly different) versions of scripts:

- Town, Village/Urban Compact/City

Different templates/scripts facilitated:

- Maps with different page sizes
- Maps with different summary tables

Additional Variations

Class 3 & 4 Town Highway Mileage Summaries:

Village

TOWN HWY. No.	LENGTH IN MILES CLASS 3	CLASS 4	TOWN ROAD NAME
30	0.07		NORTHRIDGE RD
32	0.43		SCHOOL ST
33	0.10		BRIDGE ST
34	0.20		CHURCH ST
35	0.13		HIGH ST
36	0.16		DEPOT ST
53	0.05		POST OFFICE RD
54	0.03		TH 32
54		(0.12)	CHASE HILL RD

Summarized by Town Highway Number *and* Road Name

Town

TOWN HWY. No.	LENGTH IN MILES CLASS 3	CLASS 4	TOWN HWY. No.	LENGTH IN MILES CLASS 3	CLASS 4
2	0.21		721	0.82	
3	0.25		722	0.39	
4	0.29		723	0.06	
6	0.15		724	0.10	
8	0.17		725	0.22	
9	0.21		726	0.05	
10	0.33		727	0.31	
11	0.43		728	0.11	
12	0.09		729	0.18	
13	0.15		730	0.27	
14	0.12		731	0.55	
15	0.15		732	0.11	
17	0.34		733	0.57	
18	0.07		734	0.31	
20	0.50		735	0.37	
21	0.50		736	0.06	
23	1.22		737	0.07	
24	0.91		738	0.13	
26	0.20		739	0.18	
27	3.20		740	0.38	
29	0.08	(0.20)	741	0.39	
30	1.25		742	0.55	
32	0.23		743	0.15	
33	1.25	(0.15)	744	0.72	
36	2.95		745	0.34	

The Transition – Building New Maps

Two approaches used to upgrade to the new system:

Extract size, position, and extent of the Main Map and Inset data frames from the mxds of recent editions of Maps:

- Python script opens mxd, obtains desired parameters, and provides a string output that can be copied and pasted into PageLayoutElements table

Start from scratch to develop layout:

- Open template, select town, and run HMS script to create a default layout
- Manually set Data Frame extents and move elements to desired layout positions
- Run a script that dumps updated layout parameters into PageLayoutElements Table

Benefits of the New HMS

One Core MXD Structure and Scripts

Data driven reports – if Data is correct, Report is correct

Significant efficiencies and cutting 2 months out of the process

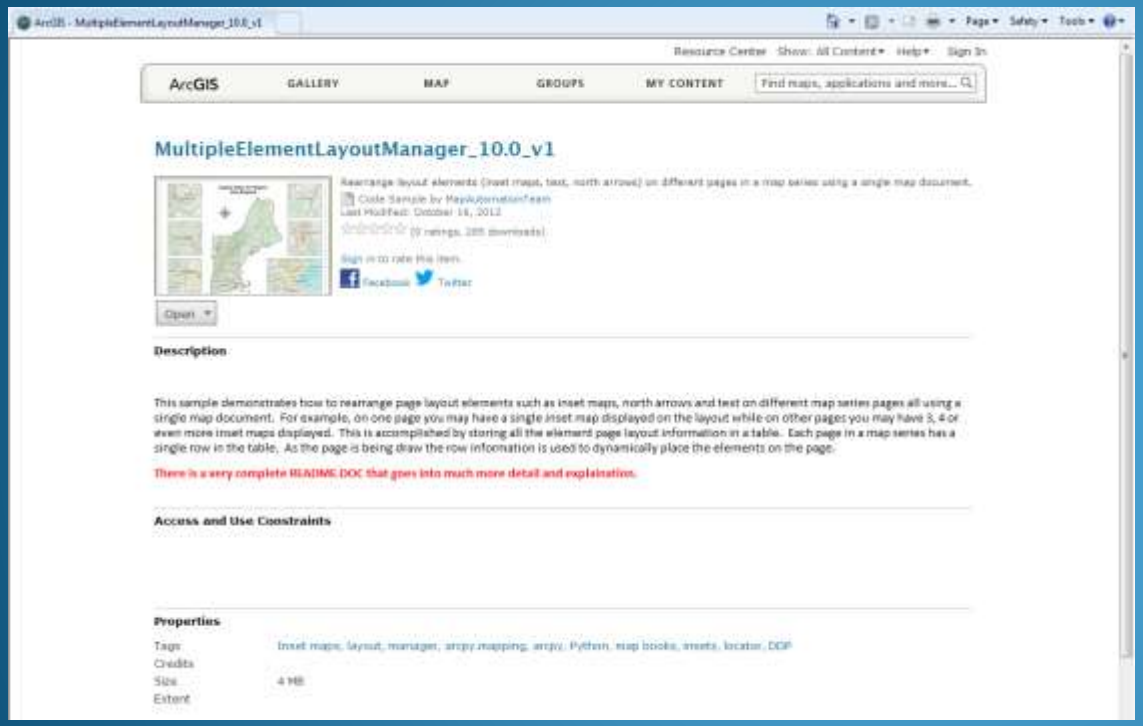
More Rigorous QA/QC on data and full use of data

Resolution of issues in data that we didn't know existed

System should be compatible with the next version of ArcGIS and works at the ArcView level (ArcGIS Basic)

Implemented the new system and produced the maps faster in 2012, than in a standard year with the old process

Multiple Element Layout Manager 10.0 v1



The ESRI Map Automation Team has posted a developer sample on the Resource Center. So, you too can leverage Python to generate a custom map series.

The Multiple Element Layout Manager 10.0 v1 provides the same Python functionality that is used to generate the Town Highway Map Series.

http://esriurl.com/5907

Questions???

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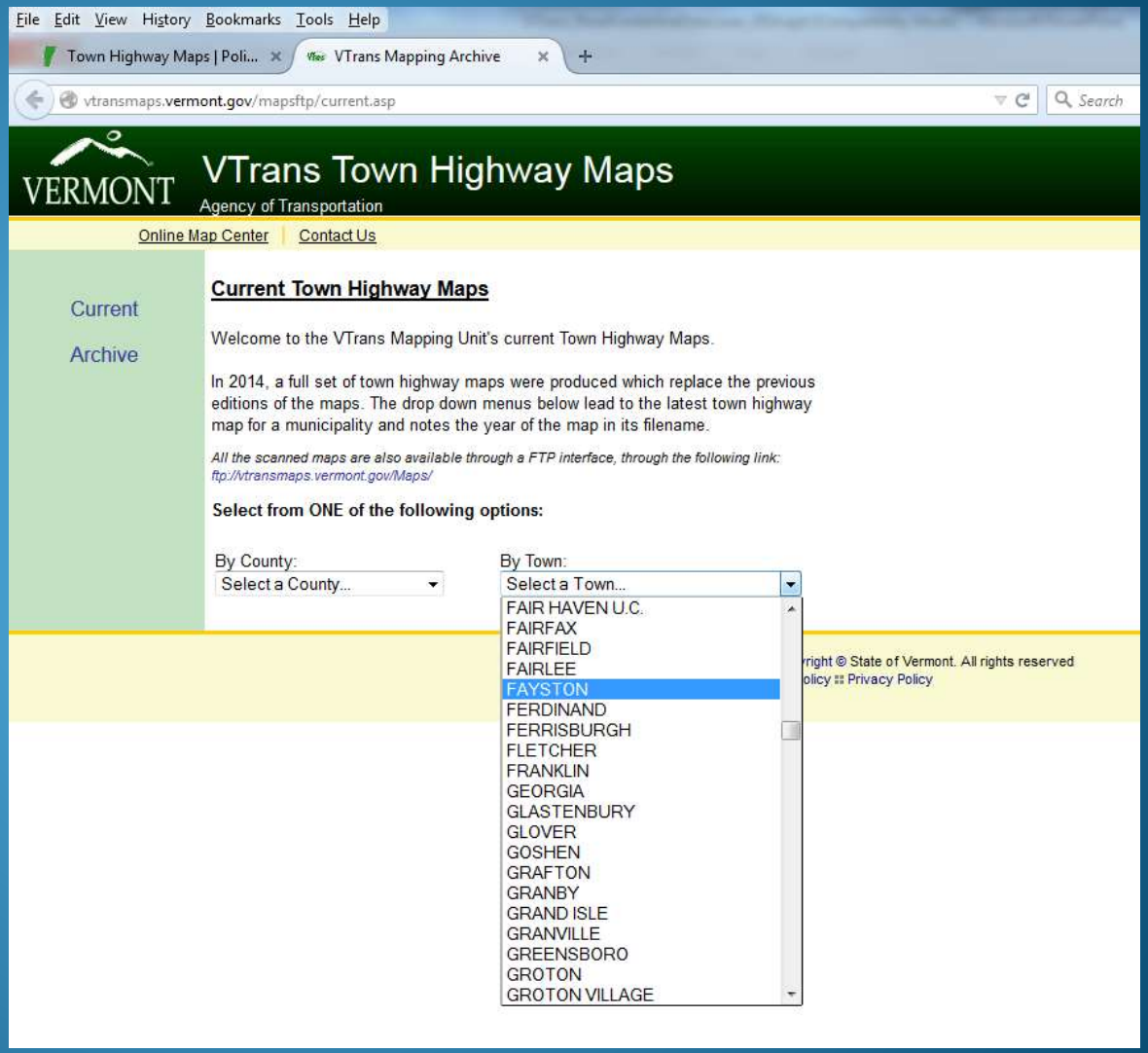

Town Highway Maps on-line at the following link:
http://vtransplanning.vermont.gov/maps/town_maps