

A 20 Year Needs Assessment of Local Jurisdiction Highways and Bridges in New York State

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Under contract to the NYS Association of Town Superintendents of Highways, Inc.

December, 2007

This report was authored by John J. Shufon. John has almost 35 years of experience with the New York State Department of Transportation in the collection, analysis, and forecasting of infrastructure data. He is published in pavement management, congestion management and asset management, and for the past 15 years served as the Department's chief technical analyst in conducting a variety of needs studies for use in budget requests and capital program development. John retired from the Department in 2006 as the Director of the Data Analysis and Forecasting Bureau.

INTRODUCTION AND PURPOSE OF STUDY

The network of New York's local highways owned by over 1600 towns, villages, cities, and counties is a massive system consisting of 97,000 centerline miles of roadways and over 8600 highway bridges. These facilities are vital to the mobility and the economic well being of New York State. Local jurisdiction roads accommodate hundreds of thousands of work trips each day and are essential to the trucking, farming, and the tourist industry. Approximately 48% of the total vehicle miles of travel in New York occur on local highways. This means that over 67 billion vehicle miles are traveled annually on the local road network and this travel is increasing at a rate of almost 2.5% per year placing ever more stress on the pavement and bridge infrastructure. The system is also growing to accommodate demands for access to commercial, industrial and housing developments. In 2005, nearly 700 miles were added to the local highway system, while mileage under State jurisdiction actually decreased.

The problem is that the local highway infrastructure is deteriorating and funding for repair is woefully inadequate. This problem is exacerbated by skyrocketing construction inflation which eats into existing resources dedicated to road and bridge repair. According to the New York State Department of Transportation (NYSDOT), the Bid Price Index (BPI) increased 19 percent from 2004 to 2005 and then another 21 percent in 2006. Over the past 12 months, costs for construction commodities continue to increase with concrete up 10.8%, steel up 14.3% and asphalt up 7.7%. With oil approaching $100 per barrel, asphalt prices are sure to soar even higher.

The purpose of this report is to provide a needs estimate for the local jurisdiction pavement and bridge infrastructure for the period 2010-2030. The study will complement the recent transportation needs analysis conducted by NYSDOT and presented by Commissioner Astrid Glynn at the October 30, 2007 Capitol Budget Hearing held in Albany. The study will describe the magnitude of the local highway system, provide condition data where available, and estimate needs for the pavement and bridge infrastructure. The study results will be reported by NYSDOT Region.

The geographic location of each region is as follows:

Region 1: Capital District

Counties: Albany, Essex, Greene, Rensselaer, Saratoga, Schenectady, Warren, Washington

Region 2: Mohawk Valley

Counties: Fulton, Hamilton, Herkimer, Madison, Montgomery, Oneida

Region 3: Central New York

Counties: Cayuga, Cortland, Onondaga, Oswego, Seneca, Tompkins

Region 4: Genesee Valley

Counties: Genesee, Livingston, Monroe, Ontario, Orleans, Wayne, Wyoming

Region 5: Western New York

Counties: Cattaraugus, Chautauqua, Erie, Niagara

Region 6: Southern Tier/ Central New York

Counties: Allegany, Chemung, Schuyler, Steuben, Tioga, Yates

Region 7: North Country

Counties: Clinton, Franklin, Jefferson, Lewis, St. Lawrence

Region 8: Hudson Valley

Counties: Columbia, Dutchess, Orange, Putnam, Rockland, Ulster, Westchester

Region 9: Southern tier

Counties: Broome, Chenango, Delaware, Otsego, Schoharie, Sullivan

Region10: Long Island

Counties: Nassau, Suffolk

Region11: New York City

Counties: Bronx, Kings, New York, Queens, Richmond

It is important to note that in order to be consistent with previously published data, the descriptive material presented throughout this report will include all local jurisdiction roads, but the needs estimates will **exclude** New York City (Region11).

THE LOCAL JURISDICTION HIGHWAY NETWORK

New York's State and Local System.

Table 1 and Figures 1and 2 demonstrate the sheer size of the local highway network. Centerline mileage and number of bridges are provided by region for both local jurisdiction and State DOT highways. As can be seen from the table, local highway mileage dwarfs State highways in all regions and local bridges outnumber their State counterparts by almost 1000.

Table 1
Local and State Jurisdiction Centerline Mileage and Number of Highway Bridges

NYSDOT Region	Local Highway Mileage	State Highway Mileage	Local Bridges	State Bridges
1	10223	1978	795	816
2	6750	1365	692	488
3	8111	1525	622	598
4	9044	1758	637	763
5	9157	1454	1126	842
6	7759	1085	1029	620
7	7927	1662	762	393
8	11952	2086	1107	1121
9	9681	1615	1086	839
10	10708	839	154	531
11	5800	181	602	606
Total	97112	15548	8612	7617

Figure1
Local and State Jurisdiction Centerline Mileage

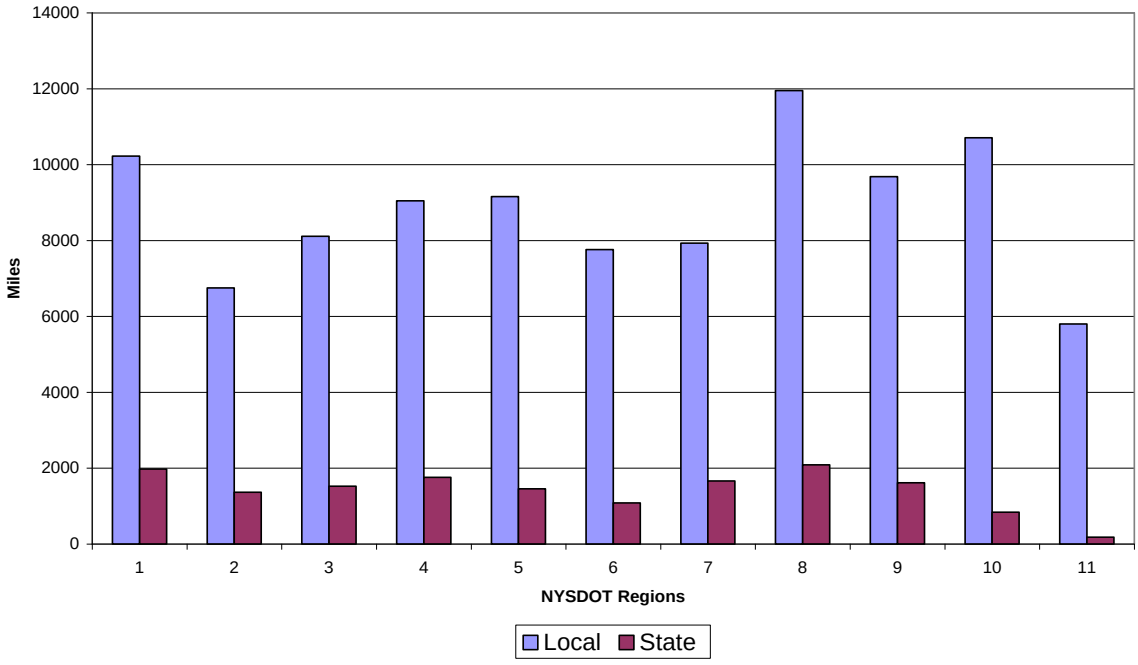
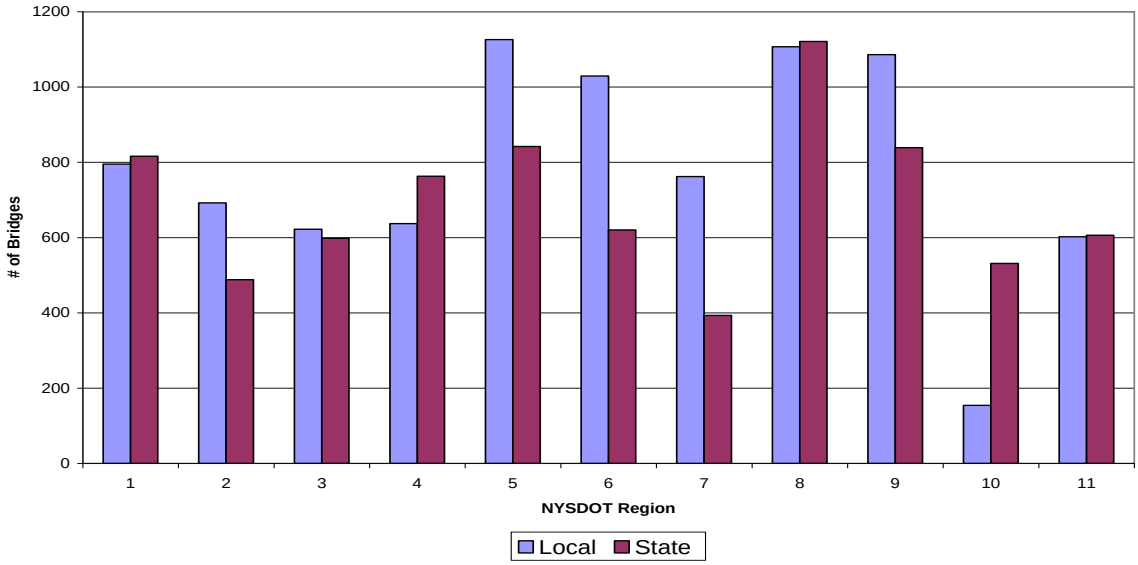


Figure 2
Local and State Jurisdiction Highway Bridges



*** Sources: NYSDOT 2007 Highway Performance Monitoring System (HPMS) submission to FHWA, NYSDOT 2007 Official Bridge Data

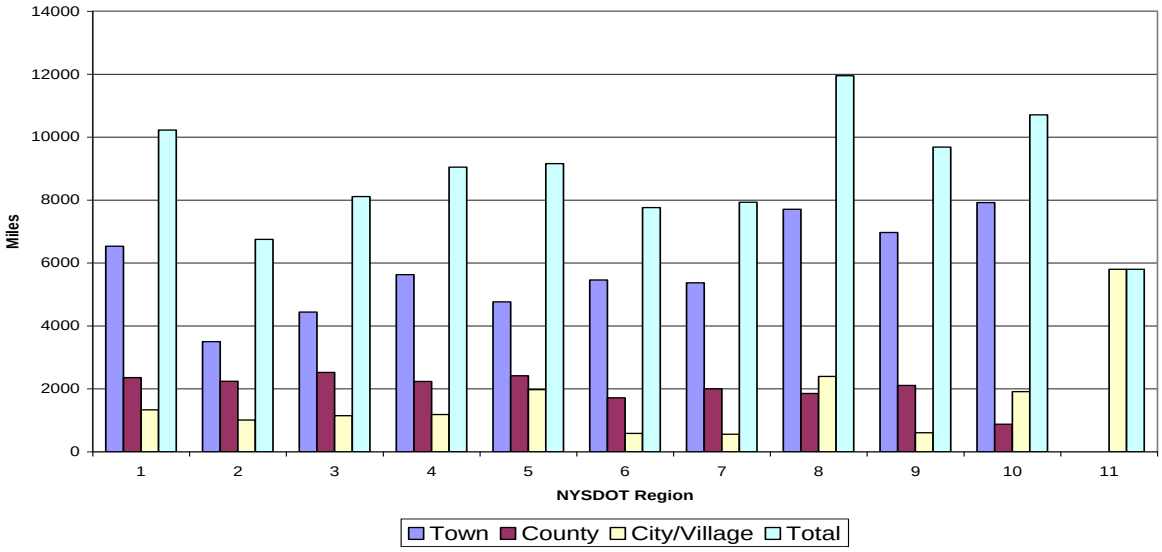
Local Roads by Jurisdiction

Table 2 and Figure 3 provide a regional breakdown of local jurisdiction centerline mileage by municipality type. The table shows town owned highways comprise 60% of total local mileage.

Table 2
Local Jurisdiction Centerline Mileage by Municipality Type and Region

NYSDOT Region	Town	County	City/Village	Total
1	6531	2360	1332	10223
2	3498	2242	1010	6750
3	4441	2523	1147	8111
4	5628	2234	1182	9044
5	4762	2418	1977	9157
6	5461	1713	585	7759
7	5367	2002	558	7927
8	7706	1853	2393	11952
9	6966	2111	604	9681
10	7919	876	1913	10708
11	-----	-----	5800	5800
Total	58279	20332	18501	97112

Figure 3
Local Jurisdiction Centerline Mileage by Municipality Type and Region



*** Source: NYSDOT 2007 HPMS submission to FHWA

Serving All Levels of Traffic Volume

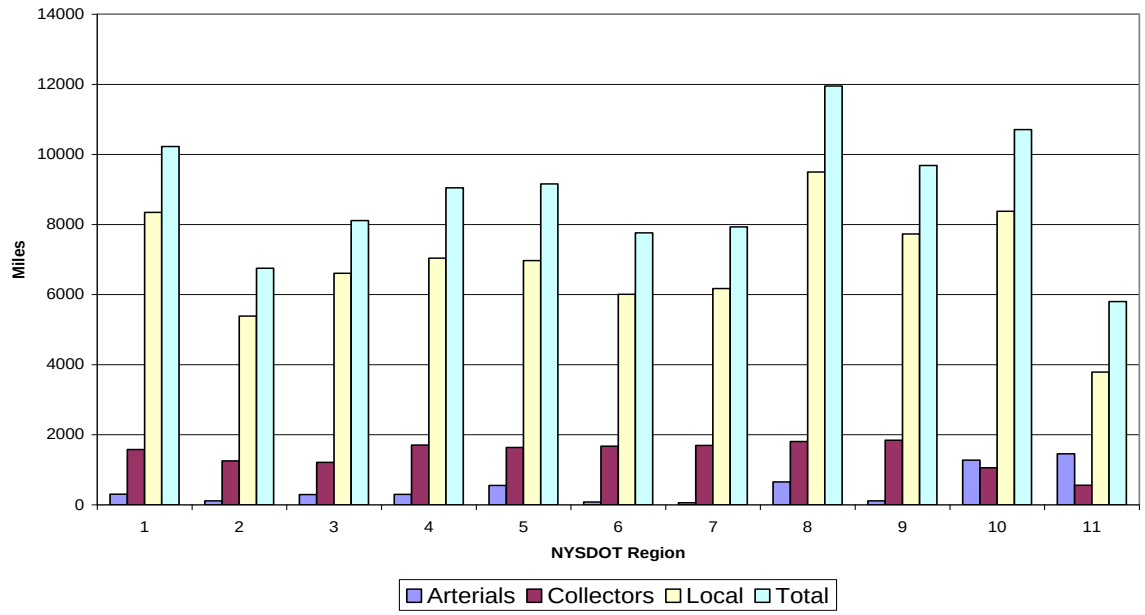
Table 3 and Figure 4 provide a summary of local highway centerline mileage by functional classification. Functional classification is a process used by the Federal Highway Administration (FHWA) to group streets and highways into classes or systems according to the character of service they are intended to provide. The highest functional class called "arterials" generally provides for mobility service (e.g. longer trips on major roadways such as the Interstate System) while the lowest level system called "locals" provides mostly accessibility service. The intermediate category, "collectors", collects traffic from locals and connects these facilities to the arterial network. There are several subcategories of functional classes for both urban and rural roads. For the sake of simplicity, all categories have been grouped into the three major functional classes as described above. It should be noted that functional classification is independent of ownership, thus the term "local", in this case, does not imply jurisdiction.

As seen on the table, almost 5200 miles of local jurisdiction highways are classified as arterials and as such, by definition, are among the most important and heavily traveled roads in the state.

Table 3
Local Jurisdiction Centerline Mileage by Functional Classification and Region

NYSDOT Region	Arterials	Collectors	Local	Total
1	305	1576	8342	10223
2	111	1251	5388	6750
3	292	1212	6607	8111
4	300	1707	7037	9044
5	555	1634	6968	9157
6	80	1672	6007	7759
7	61	1696	6170	7927
8	651	1807	9494	11952
9	112	1842	7727	9681
10	1275	1058	8375	10708
11	1455	556	3789	5800
Total	5197	16011	75904	97112

Figure 4
Local Jurisdiction Centerline Mileage by Functional Classification and Region



*** Source: NYSDOT 2007 HPMS submission to FHWA

PAVEMENT CONDITIONS

Local Roads are in Worse Condition than State Roads.

Condition surveys are essential to transportation asset management. NYSDOT annually collects pavement condition data on the entire universe of State maintained highways. The survey is conducted by regional staff trained in the use of carefully developed photographic scales of pavement condition where each scale point was originally selected to represent a pavement in

need of a specific repair strategy (i.e. do nothing, major rehabilitation, minor rehabilitation, corrective maintenance or preventive maintenance). Each scale point represents a surface condition rating of "1" (very poor) to "10" (newly constructed pavement). Survey results are generally reported in terms of the percentage of pavements rated poor (surface condition rating of 1 through 5), fair (rating of 6), good (rating of 7 or 8) or excellent (rating of 9 or 10). Pavements rated poor and fair are candidates for improvement.

Unfortunately, a similar survey has never been systematically conducted on local highways. Pavement condition data, however, is available on segments of the local highway network which are evaluated as part of the NYSDOT annual condition survey. These highways, called State Touring Routes, are the 600 centerline miles of local jurisdiction roads signed with route shields for the convenience of the motoring public. Table 4 provides pavement condition for Touring Routes and compares this data to the condition of State owned highways. It is important to understand that the Touring Route data is not a statistically valid sample and only includes local roads on the higher functional classes. Therefore, the data should not be viewed as an absolute, but should only be viewed as a general indication of local system condition for higher volume roads**.** The table does suggest that **local highways are in significantly worse condition than the State highway system. The NYSDOT needs study estimates that these local roads alone will require an investment of $3.9 billion dollars over the 20 year analysis period.**

Table 4
Comparison of Pavement Condition for State Touring Routes Owned by Local Government to State System Condition

NYSDOT Region	Local Highways % Poor and Fair	State Highways % Poor and Fair
1	66.7	53.0
2	29.4	26.6
3	44.2	40.6
4	55.4	41.1
5	48.5	23.5
6	76.0	66.6
7	72.7	62.2
8	39.4	26.9
9	22.3	25.3
10	22.1	12.6
11	46.4	32.7
Statewide	45.9	37.6

*** Source: Pavement Condition of New York's Highways: 2006, NYSDOT

BRIDGE CONDITIONS

Without Increased Funding an Additional 1,300 Local Bridges Will Become Deficient by 2030.

NYSDOT collects comprehensive condition data for the entire population of bridges on the State's public highway network. Over 17,000 bridges are inspected biennially or more often if conditions warrant. Various components or elements of each bridge span are rated on an integer scale of "1" (poor condition) to "7" (new condition) which reflects the component's ability to function structurally relative to when it was originally constructed. Individual element ratings are combined by formula to compute an overall or "average" bridge condition rating. If a bridge has multiple spans, the lowest individual span element rating is used in the formula. Bridges with average condition ratings less than "5" are considered deficient, while bridges with condition ratings less than "3" are considered critically deficient. Table 5 provides a condition comparison by region of highway bridges on the local and State highway networks. The table shows **local bridges are in worse condition than bridges on the State highway system. Further, the NYDOT needs study indicates an additional 1300 local jurisdiction bridges will become deficient over the next ten years and that at current funding levels (unadjusted for inflation), the percentage of deficient local bridges will grow to 45% by 2030.**

Table 5
Condition Summary for Local and State Jurisdiction Highway Bridges

NYSDOT Region	% Deficient Local Bridges	% Deficient State Bridges
1	31.3	33.1
2	37.4	24.4
3	48.9	31.8
4	41.6	25.7
5	38.2	15.2
6	27.4	30.7
7	44.0	23.7
8	39.3	31.0
9	28.4	30.2
10	48.1	20.0
11	57.1	54.0
Statewide	38.1	29.1

***Source: 2007 Official Bridge Data, NYSDOT

NEEDS ESTIMATE: PAVEMENTS

$40 Billion to Restore Local Roads.

As already stated, pavement condition data is not available for the universe of local jurisdiction roads. Unfortunately, without this data, an analysis similar to NYSDOT's is not possible since the backlog of needed work is unknown. It was decided therefore to apply the NYSDOT goal of a 12 year treatment or "paving cycle" (the industry standard) to the local highway network, and to estimate the cost to attain this goal. By definition, a paving cycle is the time it takes, in years, to resurface or improve an entire highway network.

The key to the needs assessment process is to realistically estimate repair strategies and costs for local highways. This is not a simple process due to the diversity of the local network from high volume county roads on Long Island to the unpaved local functionally classified roads throughout rural New York State. In order to determine repair strategies, costs, and ultimately "needs" the following steps were undertaken:

1) Working with both local officials and representatives from the construction industry, and with input from the NYSDOT Pavement Needs Assessment Model (PNAM), baseline repair costs were determined by region for four general treatment types--major rehabilitation, minor rehabilitation, corrective maintenance, and surface treatment. It should be noted that consistent with the DOT analysis, these costs are contract costs and include repair of roadside furniture (guide rail, drainage structures, etc.) at the project site.

2) The mix of repair strategies to be applied to the mileage necessary to reach the 12 year paving cycle goal was based on region and the distribution of functionally classified roads within that region. For example, local roads in a region with a high proportion of urban principal arterials are assumed to receive a more rigorous mix of treatments (major rehab vs. minor rehab vs. maintenance) than local roads in a region with a high proportion of rural collectors and roads functionally classified as local. Table 6 provides an example treatment mix matrix for local roads in a typical region.

Table 6
Example Treatment Mix Material for Local Roads in a Typical NYSDOT Region

Functional Class	Major Rehab % Mileage	Minor Rehab % Mileage	Corrective Maintenance % Mileage	Surface Treatment % Mileage
Arterials	40	60		
Collectors		40	60	
Local			20	80

3) Pavement capital needs were calculated by multiplying the mileage in each cell by the appropriate costs as determined in steps 1 and 2 above. One preventive maintenance treatment (e.g. crack sealing) per 12 year paving cycle is included for roads receiving a major or minor rehabilitation.

The resultant annual and 20 year needs estimates (excluding NYC) are given in Table 7. This table shows the **annual pavement need for local highways is $2.014 billion or $40.280 billion over the 20 year analysis period.**

Table 7
Estimated Pavement Needs for Local Jurisdiction Highways ($ Millions)

NYSDOT Region	Annual Need	20 Year Need
1	210.0	4200
2	77.2	1544
3	153.5	3070
4	134.9	2698
5	164.6	3292
6	91.3	1826
7	80.1	1602
8	392.9	7858
9	122.0	2440
10	588.4	11768
Total	2014.9	40298

NEEDS ESTIMATE: BRIDGES

$5.4 Billion Needed for Local Bridges.

The New York State Department of Transportation utilizes sophisticated computer models to forecast future bridge conditions at various funding levels. These models consider a multitude of variables including bridge type, materials, geometrics, repair costs and deterioration rates. The NYSDOT modeled local bridges and estimated an investment level of $13.2 billion (including

New York City) is required to improve conditions at a rate comparable to State bridges. According to Commissioner Glynn's testimony, this will reduce local bridge deficiencies by 5 percentage points over the 20 year period. It should be noted that in order to remove New York City from the analysis, needs were allocated across all regions based on square footage of deficient deck area. Table 8 shows the results of the apportionment process. **The annual capital bridge need for local highways (excluding NYC) is $270 million or $5.4 billion over the 20 year period.**

Table 8

Estimated Bridge Needs for Local Jurisdiction Bridges ($ Millions)

NYSDOT Region	Annual Need	20 Year Need
1	21.8	435
2	16.2	325
3	21.2	425
4	40.7	815
5	44.3	885
6	20.0	400
7	19.8	395
8	44.0	880
9	24.5	490
10	17.5	350
Total	270.0	5400

ANNUAL EXPENDITURES ON LOCAL ROADS

Local Governments are Funding Over One $Billion Annually.

Estimating local government expenditures on highway and bridge capital improvements is a far from straightforward endeavor. Perhaps the best data source is the FHWA report entitled Highway Statistics:2005. In a table called Local Government Disbursements for Highways, the report provides the total annual capital outlay by local governments for "road and street construction and system preservation." Source data for this table is provided by the State and local governments on a biennial basis. For New York State, the table shows an annual capital outlay of $2.125 billion. The problem with this estimate is that it includes expenditures by New York City, which was not included in the needs analysis.

In order to remove New York City expenditures, several sources were consulted. A report entitled "The State of the City's Economy and Finances 2006" prepared by the NYC Comptroller shows capital expenditures at approximately $1.5 billion annually for highways and transit . The 2005-2009 Metropolitan Transportation Authority (MTA) Capital Plan cites approximately $500 million per year is received from New York City for capital improvements. This data suggests that highway capital expenditure by New York City is approximately $1.0 billion per year.

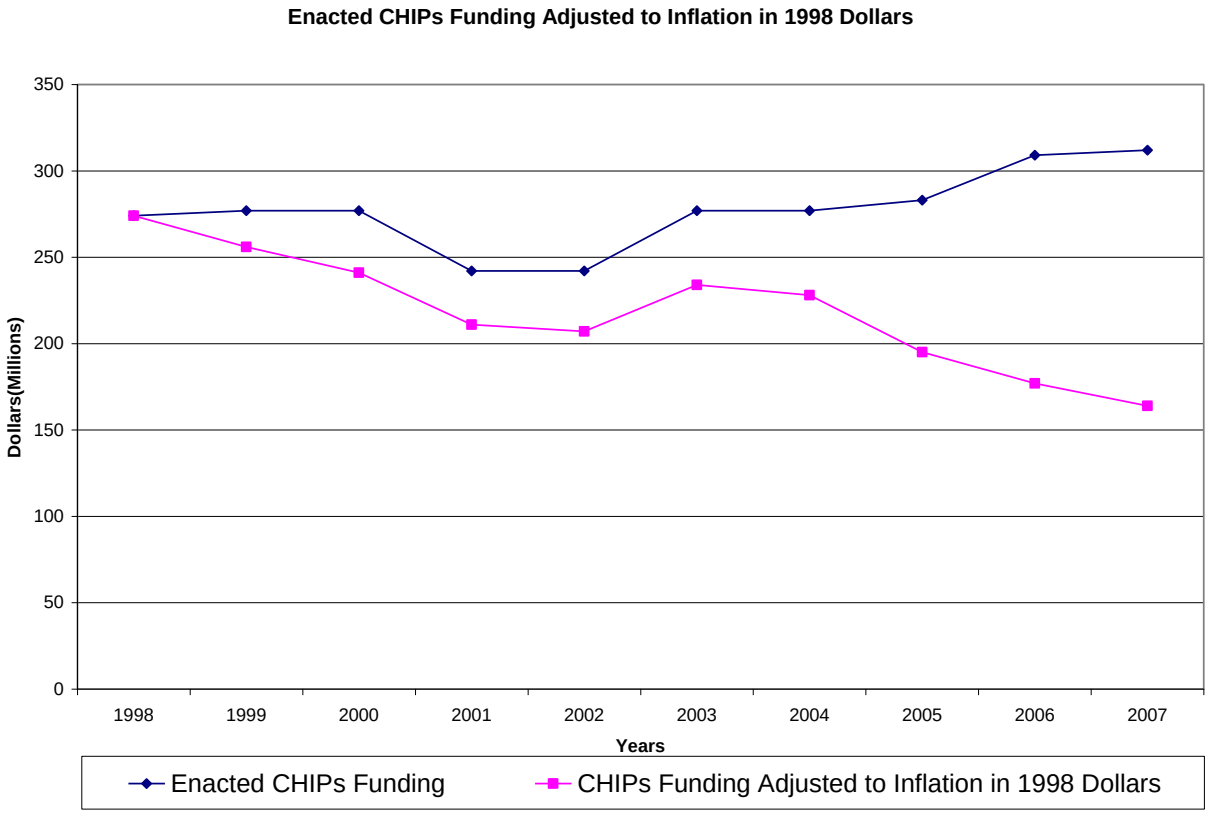
Once New York City expenditures are subtracted from total disbursements, **the annual highway capital expenditure by local governments is estimated at $1.125 billion or $22.5 billion over a 20 year period.**

CHIPS AND MARCHISELLI FUNDING

The above local government expenditures include funding from the state Consolidated Local Street and Highway Improvement Program (CHIPs) and the Municipal Streets and Highway Program(Marchiselli). Combined the two programs deliver approximately $270 million annually to local governments, excluding New York City.

From 1998 to 2004 the amount of CHIPs and Marchiselli funds available was held flat. Since 2005 there has been about 5% growth annually in the CHIPs program. This marginal growth in funding is exacerbated by rapid increases in the cost of construction materials. In 2005 and 2006 the cost of materials increased by 19% and 21% respectively. Inflation is eating up what little money there is to spend on local transportation systems. The $274 million the state provided in 1998 CHIPs money would be only worth $144 million today. It costs local communities nearly twice as much to do road and bridge repairs today as it did ten years ago but funding levels have remained the same.

Figure 5



TOTAL NEEDS AND THE FUNDING GAP

At Least $1.2 Billion Needed Annually in Additional Local Highway Aid.

Table 9 provides total 20 year capital needs for local jurisdiction pavements and bridges excluding NYC. The table shows the **total need at approximately $45.7 billion. With expenditures estimated at $22.5 billion, this means the funding gap over the 20 year period is $23.2 billion or about $1.2 billion annually.** It is important to recognize that this shortfall is a very conservative estimate for the following reasons:

1. The needs estimate addresses capital construction for the repair of pavements and bridges only and does not include highway maintenance/operations conducted by municipal employees, expenditures for vehicle fleets and facilities or any contract add-ons for preliminary engineering, construction inspection, etc.

2. Consistent with the NYSDOT analysis, the needs presented do not eliminate all infrastructure deficiencies. For example, the percentage of deficient local bridges will only improve by 5 percentage points over the 20 year period.

3. The needs estimate does not include capital construction for highway safety improvements such as intersection reconfiguration, traffic signal installation/upgrades, or curve removal.

4. The needs estimate does not include congestion/mobility improvements or the installation and maintenance of Intelligent Transportation System (ITS) equipment.

5. The needs estimate does not address other transportation responsibilities borne by local governments such as transit systems or airports.

6. Consistent with the NYSDOT assessment, the needs estimate does not include the effects of construction inflation over time. **Inflation alone could double or even triple the funding gap over the 20 year period.**

Table 9
Total 20 Year Pavement and Bridge Needs for Local Jurisdiction Highways ($ Millions)

NYSDOT Region	Pavements	Bridges	Total
1	4200	435	4635
2	1544	325	1869
3	3070	425	3495
4	2698	815	3513
5	3292	885	4177
6	1826	400	2226
7	1602	395	1997
8	7858	880	8738
9	2440	490	2930
10	11768	350	12118
Total	40298	5400	45698

***excludes New York City

SUMMARY AND CONCLUSION

The local jurisdiction pavement and bridge infrastructure is an integral part of the State's total transportation system. Approximately 48% of total vehicle travel in New York State occurs over local roads and this massive network of pavements and bridges is deteriorating.

Expenditures on local roads are not even close to keeping pace with the deterioration process. Bridge conditions are also slipping. Forecasts show local bridge deficiencies will grow to 45% by 2030 and this forecast does not consider the debilitating effects of construction inflation brought on by soaring oil and steel prices. Pavement conditions even on the most important and best maintained local roads are significantly worse than conditions for other State maintained highways. Approximately $1.2 billion is needed annually in additional pavement and bridge investment to reverse the deterioration process.

The problem is that due to competing priorities and limited tax dollars, local governments simply do not have the resources necessary to finance the funding shortfall. The 2006 Annual Report on Local Government prepared by the State Comptroller warns "local governments across the state continue to operate amid a barrage of fiscal pressure that shows no sign of letting up." Local governments need a larger infusion of highway funding from both State and Federal sources, and they need it now. Without additional resources, the deterioration of the pavement and bridge infrastructure will accelerate and will adversely impact the motoring public and the economic vitality of New York State.

REFERENCES

1. Local Roads Matter, brochure prepared by the NYS County Highway Superintendents Association and the NYS Association of Town Superintendents of Highways, released in 2007.
2. Testimony on 20 Year Needs Assessment by Commissioner Astrid Glynn, NYSDOT, Capitol Budget Hearing, October 30, 2007.
3. Highway Mileage Report, NYSDOT, 2006.
4. Functional Classification Guidelines, FHWA website.
5. Shufon J. J., and L.H. Adams. Conceptual Framework for Defining and Developing an Integrated Asset Management System, Transportation Research Record 1848, 2003.
6. Pavement Condition of New York's Highways, NYSDOT, 2006.
7. Highway Performance Monitoring System (HPMS), FHWA website.
8. Official Bridge Data, NYSDOT, 2007.
9. Delisle, R.D., J.J.Shufon, and L.H.Adams.Development of Network-Level Bridge Deterioration Curves for Use in NYSDOT's Asset Management Process, NYSDOT,2003.
10. Pavement Needs Assessment Model (PNAM) Documentation, NYSDOT.
11. 2006Annual Report on Local Governments, Office of the New York State Comptroller website.
12. Highway Statistics: 2005, Table entitled Local Government Disbursements for Highways, FHWA website.
13. 2005-2009 Metropolitan Transportation Authority (MTA) Capital Plan, MTA website.
14. The State of the City's Economy and Finances 2006, New York City Comptroller website.