LOCAL STREETS AND ROADS PAVEMENT, NON-PAVEMENT AND BRIDGE NEEDS FINANCIAL ANALYSIS

The local street and road network represents the single largest public investment in infrastructure in the region. The cost of replacing the almost 19,000 miles of pavement would be in the neighborhood of $18 billion dollars. That says nothing of the *non-pavement* costs associated with an operational street and road network—sidewalks, storm drains, traffic signals, etc. From a functional standpoint, local streets and roads are an integral part of the Bay Area's transportation network. Every trip, whether by car, bike, bus or on foot, begins on a local street or road. The local street and road network is essential for the mobility of people and goods—not to mention emergency vehicles and utility services—throughout the 9-county San Francisco Bay Area. Therefore, proper maintenance of the local street and road network is a regional concern.

MTC's Pavement Management Program (PMP) software utilizes a pavement condition index (PCI) that rates the condition of roadways on a scale from 0 to 100, with 100 being the best. The average serviceable life of a pavement, if no treatment is applied to it, is about 20 years. By the time a roadway reaches a PCI of 60, it has already lived 75% of its serviceable life (approximately 15 years) and it will have only experienced a 40% drop in quality of pavement. However, when a roadway reaches a PCI of 60, rapid deterioration begins to take place. In only the next few years, the same roadway will experience *another 40% drop in quality*. Studies show that for every one dollar it takes to treat a roadway with a PCI of 70 or higher, it will cost approximately $5 dollars to fix the same roadway once it has deteriorated to the point where major rehabilitation or reconstruction is necessary. A recent analysis conducted by MTC on the condition of the region's streets and roads, shows the Bay Area's average local street and road network at a PCI of 65—down one PCI point from the previous year and perilously close to the steep part of the curve.

Currently, deterioration of the Bay Area's roadways has created large maintenance backlogs in a majority of jurisdictions where the cost of needed maintenance far exceeds available funds. In addition, the shortfalls projected for local streets and roads over the course of the "Transportation 2030" plan, if not met, will increase by an estimated $3 billion dollars for pavement maintenance alone. This increase represents the cost of deferring needed maintenance. Those streets that could have once been maintained at a reasonable cost, if not treated, will require more expensive repairs as they are allowed to deteriorate.

The huge shortfalls that exist on the local street and road network make it painfully clear to decision-makers and the public as a whole, that the region is not capable of maintaining the existing transportation system, without the addition of new revenues. Either new revenue sources will have to be found, or the region will have to cope with a deteriorating transportation infrastructure

Grand Vision:

The amount of maintenance required to bring the local street and road network up to an acceptable condition is often referred to as "backlog". It is the need that exists in Year One of the 25-year need projections for local streets and roads. The backlog that currently exists for maintenance of the existing local street and road network has been estimated at approximately $3 billion for pavement alone. Clearing this backlog would bring the average pavement condition in the region to a PCI within the range of 80 to 85 – the range at which roadways are most cost effective to maintain. Based on the ratio of pavement to non-pavement need established in the current shortfall projections, it is estimated that another $2.25 billion in backlog currently exists for the *non-pavement* maintenance on the local street and road network.

Even if the region had $5.25 billion dollars at its disposal to apply to the maintenance of the local street and road network, it would take years to clear the existing backlog due to other constraints on the availability of labor, equipment, and materials, and the need to keep traffic flowing smoothly. However, if funding were available to address the backlog over the next five to seven years, it would mean that a majority of revenue for local street and road maintenance in subsequent years could be spent on preventive maintenance.

It costs far less to keep roads in good condition through preventive maintenance than it costs to allow the roadways to deteriorate to a point where major rehabilitation or reconstruction is required. As with any asset—a house, car, etc.—preventive maintenance is the key to a roadway's longevity. If regular preventive maintenance is applied to roadways in good condition—with a PCI of 70 or above—deterioration of the roadways can be managed and their serviceable life can be greatly extended.

For the region, a street and road network in good condition would translate into long-term cost savings in the area of maintenance and the ability to better fund other regional transportation goals such as transit expansion, congestion management projects, and regional programs. At the local level, maintaining streets and roads in a state of good repair would mean less demand on jurisdictions' general funds for maintenance purposes, and more available revenue for those items near and dear to the hearts of their residents—parks, schools, police and fire departments to name a few. Furthermore, a local street and road network that was in good condition, would mean that Bay Area motorists would be experiencing far less in extra vehicle operation costs (EVOC)—the cost of wear and tear on vehicles from driving on poorly maintained roads—estimated to be between $300 - $600 per person, annually.

The gas tax that currently is utilized for local street and road maintenance is not indexed to inflation and therefore continues to decline in real value. In addition, cities and counties must compete on the regional, state and federal levels with a host of other transportation interests for available transportation funding. At the local level, devoting a large portion of general fund revenues to road maintenance is not a viable option—particularly during times when budgets are tight and citizens are demanding increased expenditures for

education, parks, and protective services. With less and less funding, cities and counties are forced to employ "band-aid " or "worst first" strategies in maintaining their local roads. These strategies increase the long-term expenditures required for street and road maintenance.

Dedicated revenue for the purposes of street and road maintenance coupled with a "best practices" approach is what is needed to begin addressing the maintenance backlog that exists and to improve the condition of the region's local street and road network in a cost effective manner. MTC's long-range regional transportation plan, "Transportation 2030" has identified $4.2 billion in *potential* revenue that could be applied towards the local street and road maintenance shortfall. The major sources of these potential revenues are local option sales taxes, a $20 vehicle registration fee, and a regional gas tax. If realized, this revenue should be aggressively applied towards clearing the existing backlog.

Currently, available regional funding for capital maintenance is allocated based on county shortfall levels. Those counties with the largest shortfalls receive the highest levels of regional funding. While this is beneficial to those counties that are struggling with limited funding, it also tends to reward jurisdictions that have not made sufficient investments in their local road networks. At the same time, this allocation method serves as a *dis*incentive to jurisdictions that do invest in their street and road networks, and employ best practice approaches to in their maintenance programs. If the region could employ future revenues towards bringing the street and road networks in all counties up to an acceptable level, it would allow transportation authorities to insist that jurisdictions maintain their networks in a cost-effective manner as a condition for future funding. Basing future allocations of regional funding on performance, rather than shortfall, would go a long way towards encouraging good maintenance practices, namely preventive maintenance.

Local Street and Road Shortfall Projections – Background:

MTC has been documenting the discrepancy between local streets and roads revenues and expenditures for cities and counties in the Bay Area since the early 1980s in order to understand the complete funding picture for local streets and roads.

Prior to "Transportation 2030", the last major projection effort that was undertaken was for the 2001 Regional Transportation Plan. MTC worked with private consultants to estimate the 25-year pavement, non-pavement and local bridge shortfalls that existed in the region for local street and road maintenance.

In the 2001 Regional Transportation Plan, MTC's policy decision to fund only the pavement shortfall that existed on the MTS system (approximately $129 million) resulted in a large degree of dissatisfaction among cities and counties who felt that the estimates of local street and road shortfalls had been significantly underestimated, and that local streets and roads had not been given equitable standing with other transportation interests in the allocation of the roughly $7.4 billion in discretionary regional funds.

In response to the complaints from the cities and counties, the Transit / Local Street and Road Capital Shortfall Partnership Task Force was formed in order to examine the shortfall estimation process, and examine strategies for bringing a greater degree of equity to the allocation of regional discretionary funds in "Transportation 2030".

MTC Pavement Management Staff begin working with a committee of public works directors from around the region in order to examine the methodology used to estimate the local street and road shortfall for the 2001 RTP. The committee, along with the nine county congestion management agencies, also assisted MTC in improving the shortfall projection process and in obtaining information from the 109 Bay Area jurisdictions, for the purpose of gaining accurate data on which to base the shortfall estimates being prepared for "Transportation 2030". Regular status reports and the final results of the shortfall estimation process were brought before the Partnership Task Force on a regular basis.

The following report will detail the projection process that was undertaken in order to determine the Local Street and Road maintenance shortfalls for the "Transportation 2030" plan, and the resulting estimates.

Overview of Projection Categories

Need

Local Street and Road need for the purposes of the Transportation 2030" plan consists of three categories of maintenance:

- Pavement—including major maintenance of the existing street/road network such as overlays and rehabilitation or reconstruction, as well as preventive maintenance treatments that significantly extend the life of the pavement.
- Non-Pavement—including the maintenance of such items as storm drains, traffic lights and safety, pedestrian walkways, retaining walls, storm damage, ADA compliance, etc…all of the non-pavement items that are necessary for a functioning local street and road network.
- Local Bridges—maintenance of bridges that are locally owned.

Operations or routine maintenance, new construction, and expansion projects or not included in the estimates of need.

The need was segmented into two categories—need that exists on the Metropolitan Transportation System (MTS) and non-MTS need.

Revenue

Revenues for this analysis include estimates of the major fund sources that are used to address the local street and road maintenance needs as described above. For pavement and non-pavement needs, we estimated the amount of revenues that would come from the state gas tax, local sources (general fund, assessment levies, bond sales, traffic safety funds, etc.), county sales tax measures (where applicable), and Proposition 42 funds. For the

maintenance of local bridges, we estimated the amount of federal Highway Bridge Rehab and Replacement (HBRR) funding that would be available to the region.

In prior Regional Transportation Plans, MTC had relied upon historical data from State Controller's reports in order to estimate the amount of revenue available for local streets and roads purposes. What was learned was that the State Controller's reports, in many cases, were not a reliable source of information for estimating the amount of money that is available for pavement and non-pavement maintenance. The feedback that MTC received from the region's public works directors was that estimates of revenue based on State Controller's reports were artificially high because a large portion of the reported revenue for local streets and roads went towards every-day operations including overhead and routine maintenance (pot-hole filling, street-sweeping, etc…) or other road-related expenditures—not towards capital maintenance. In order for the revenue estimates to be accurate, those funds used for non-capital maintenance expenses had to be identified and removed. The categories that are used in projecting future pavement and non-pavement revenue amounts should correlate with the categories used in determining the pavement and non-pavement *need* in order to get an accurate estimate of the existing shortfalls.

MTC worked with the committee of public works representatives to develop a survey that was structured in order to make sure that cities and counties not only provided us with the amount of money they received for local streets and roads, but also what they *spent* those funds on. Jurisdictions were asked to provide us with their annual local street and road budgets for the last five years as well as their projected budgets for the next five years. They were instructed to separate the budget amounts between expenditure categories—pavement, non-pavement, local bridges, new construction, and "operations / other". A detailed description of each category was provided within the survey instructions to assist those filling it out, in determining what types of expenditures fell into the various categories. Furthermore, jurisdictions were asked to separate their revenues by *source*. The goal in asking for that information was so that MTC could determine how much of the local street and road revenue came from gas tax, sales tax measures, or other local sources. That way MTC could apply the appropriate growth rates to each revenue source, rather than assuming a common rate of growth for the lump sum of local street and road revenues.

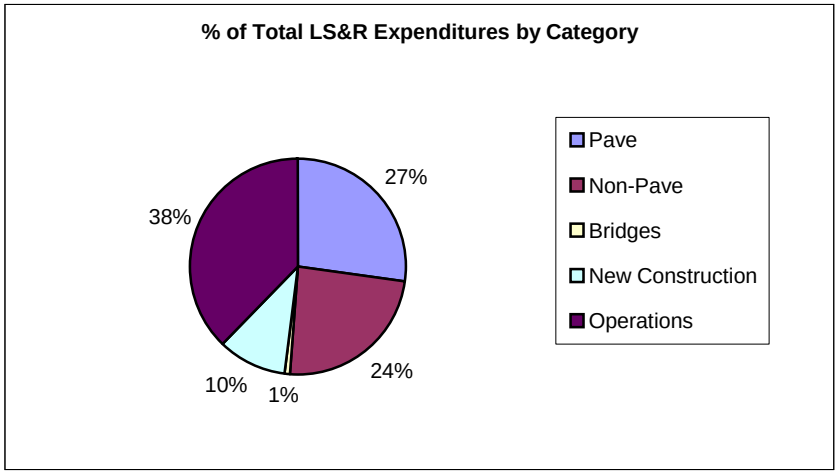
Figure 1
LS&R revenue source analysis for growth rate determination

LS&R Revenue Breakdown Summary for the Region					
Revenue Source	**% Pavement**	**% Non-Pavement**	**%Other**	**Total**	**Growth Rate**
Gas Tax	40.38%	40.65%	36.00%	48.89%	-1.42%
Sales Tax	24.08%	5.52%	8.55%	8.41%	2.61%
Other Local	35.54%	53.83%	55.76%	42.72%	1.98%
Total	100%	100%	100%	100%	0.37%

From the revenue surveys that were submitted MTC learned that approximately 38% of the region's local street and road revenues are used for non-capital maintenance expenditures.

Those expenditures consisted of operational expenses such as routine maintenance (street sweeping, changing traffic signal light bulbs, etc…) overhead, other non-maintenance road-related expense, and even non-local street and road expenditures such as transportation lobbyists, shuttles to public transit, etc. Revenues for those types of expenditures, had for the most part, been included in the amounts estimated for pavement and non-pavement maintenance for the 2001 RTP. With the surveys, MTC was able to isolate the amounts spent strictly on pavement and non-pavement maintenance, and the result was an approximate 30% decrease in available revenues, prior to the addition of Proposition 42 funds.

Figure 2
Revenue expenditure analysis



Shortfalls
Shortfalls were derived by simply subtracting the projected amount of revenue available from the local street and road maintenance needs in each of the three categories. Where a surplus existed (projected revenues were greater than need), the revenue was made to equal the need so that the resulting shortfall would be "$0", with the assumption being that any excess revenue would be diverted to other local needs.

All dollar figures were adjusted to represent 2004 values for this analysis.

PAVEMENT MAINTENANCE

25-Year Pavement Funding Shortfall Estimates
(In Millions of 2004 Dollars)

County	Pavement Needs	Pavement Revenues	Pavement Shortfall	MTS Pavement Shortfall	Non-MTS Pavement Shortfall
Alameda	$ 1,689.8	$ 1,369.9	$ 319.9	$ 45.4	$ 274.5
Contra Costa	$ 1,385.0	$ 851.5	$ 533.5	$ 70.4	$ 463.1
Marin	$ 387.2	$ 178.6	$ 208.6	$ 40.3	$ 168.3
Napa	$ 430.0	$ 146.5	$ 283.6	$ 40.2	$ 243.4
San Francisco	$ 1,278.1	$ 398.2	$ 880.0	$ 63.0	$ 817.0
San Mateo	$ 893.1	$ 605.2	$ 287.9	$ 40.4	$ 247.5
Santa Clara	$ 1,995.1	$ 1,178.4	$ 816.8	$ 116.0	$ 700.7
Solano	$ 606.0	$ 257.1	$ 348.9	$ 25.6	$ 323.3
Sonoma	$ 1,111.5	$ 352.9	$ 758.6	$ 144.5	$ 614.1
TOTAL	**$ 9,775.9**	**$ 5,338.2**	**$ 4,437.7**	**$ 585.8**	**$ 3,851.9**

MTC estimates that $9.8 billion dollars will be needed for pavement maintenance through the year 2030. Projected revenues over the same time period are expected to be only about $5.3 billion dollars, resulting in a funding shortfall of $4.4 billion dollars over the next 25 years. The MTS portion of the pavement shortfall totaled $585.8 million. The "Transportation 2030" plan gives priority to fully funding shortfalls on local roads that are a part of the MTS.

Pavement Needs Projections

106 out of 109 Bay Area jurisdictions utilize MTC's Pavement Management Program (PMP) software. The software allows jurisdictions to inventory their street network, determine the maintenance needs of that network, and devise maintenance programs based on available revenues and recommendations made by the software. The PMP model develops a list of recommended treatments, classified as either preventive maintenance or rehabilitation, and prioritizes these treatments based on a weighted effectiveness ratio. Within the constraints of the input budget, the PMP model will select the most cost-effective treatments for implementation and defer the remainder. Based on the recommended treatments and estimated costs, the PMP model calculates the amount of maintenance to be funded each year, as well as the amount of maintenance to be deferred to following years. Jurisdictions are required to submit a copy of their PMP software database to MTC on a bi-ennial basis in order to be certified to receive federal funding.

The PMP uses pavement condition, maintenance cost information, and maintenance strategies (decision trees) to estimate the amount needed to maintain the network in a "very good" condition. On a pavement condition index scale (PCI) from 0 to 100, "very good" condition consists of a score at or above 75.

The 25-year pavement need estimate was determined by running an "unconstrained (no budget was input into the model to constrain the software's recommendations) budget needs analysis" for each jurisdiction using the MTC PMP software model. For those few

jurisdictions that do not utilize the MTC PMP, their pavement need was determined by utilizing the ratio of the jurisdiction's centerline miles to the total county centerline miles, and assigning those jurisdictions a proportionate amount of need based on that ratio. The cities of San Francisco and Oakland, although currently utilizing the MTC PMP software model, are still in the early stages of implementing the program and did not have a completed database to submit to MTC. The jurisdictions of San Francisco and Oakland provided their own estimates of pavement maintenance need to MTC for this analysis.

Two of the fundamental items that impact the calculation of pavement need, are the costs of a particular maintenance treatment per square yard, or the "unit cost" of a treatment, and the "decision tree", or the maintenance strategy that is employed by the jurisdiction, depending on the type and condition of the roadway. The unit costs and decision tree set-up, are used by the software, in conjunction with the pavement condition, to determine the need for a given street or road and for the network at large. The MTC PMP affords jurisdictions the flexibility to change their unit costs and the way that their decision tree is set up to suit the realities of their individual jurisdiction.

In analyzing the pavement need estimates that were done for the 2001 RTP, it was found that the treatment unit costs that were utilized in the software model runs for each jurisdiction, had in many cases, not been updated since the software's default values were determined in 1985. Also, many jurisdictions only included the material costs in their treatment costs, rather than incorporating the cost of engineering, labor, incidental expenses, etc… that are associated with paving a roadway. As a result, the 25-year pavement need estimate for the 2001 RTP was much lower than it should have been.

The other problem that was found when analyzing the 2001 RTP pavement need estimates, was that many of the treatment decision trees that individual jurisdictions had constructed in their PMP databases, did not reflect recommended practices for maintaining streets and roads. For example, many jurisdictions selected to "Do Nothing" for all streets with a pavement condition index (PCI) above 70 (on a scale of 0 to 100). Typically, the MTC software would recommend that a jurisdiction apply preventive maintenance treatments to these streets in order to avoid far greater costs as their condition rapidly declines. Other jurisdictions did not have any reconstruction treatments in their decision tree and opted for a treatment such as a "Thick Overlay" for streets with a PCI below 25.

In an attempt to obtain a greater degree of accuracy in the estimates of pavement need for the upcoming 2005 RTP, MTC began working with the Bay Area's local jurisdictions and CMAs, in order to gather information on pavement treatment unit costs. The local street and road group met and agreed upon a standard set of elements that should be included in the calculation of the unit costs, including material, engineering, design, traffic control, etc, and helped to develop a survey that would enable MTC to get an idea of what the actual cost of pavement maintenance treatments in the Bay Area were.

Once all of the surveys were submitted and the data was compiled, it was found that the average costs of pavement maintenance treatments varied greatly from county to county

and city to city. In the end, MTC and the local streets and roads group, felt the best thing to do was to use regional average unit costs in the calculation of pavement needs for each jurisdiction, in light of the fact that we were attempting to estimate *regional* need, as opposed to the need that exists at the individual jurisdiction level, based on local policies grounded on insufficient funds.

Figure 3
Regional unit cost analysis

UNIT COST ANALYSIS
Updated treatment costs and pavement needs vs. 2001 RTP

Arterials	Alameda	Contra Costa	Marin	Napa	S.F.	San Mateo	Santa Clar	Solano	Sonoma	Adj. Avg	2001 RTP
Crack Seal	0.49	$ 0.64	$ 1.05	$ 1.00	$ 2.07	$ 0.89	N/A	$ 0.60	$ 1.38	**$ 0.93**	$ 0.41
Slurry Seal	1.15	$ 2.14	$ 1.77	$ 2.00	$ 2.07	$ 1.57	N/A	$ 3.86	$ 1.62	**$ 1.86**	$ 0.87
Restoration	10.77	$ 20.50	$ 11.87	$ 11.25	$ 2.07	$ 14.71	$ 10.50	$ 17.10	$ 12.50	**$ 12.67**	$ 6.07
Rehab	10.97	$ 20.50	$ 4.28	$ 17.10	$ 17.55	$ 3.89	$ 14.26	$ 3.77	$ 1.00	**$ 10.26**	$ 6.15
Rehab	11.63	$ 25.00	$ 18.07	$ 17.10	$ 17.55	$ 13.96	$ 13.00	$ 16.65	$ 17.50	**$ 17.35**	$ 14.78
Rehab	14.43	$ 29.05	$ 28.50	$ 34.40	$ 44.10	$ 16.68	$ 15.58	$ 25.46	$ 29.00	**$ 29.60**	$ 20.55
Reconstruct	42.04	$ 80.32	$ 71.52	$ 77.80	$ 141.30	$ 40.11	$ 68.00	$ 124.88	$ 110.00	**$ 81.53**	$ 50.75

Collectors	Alameda	Contra Costa	Marin	Napa	S.F.	San Mateo	Santa Clar	Solano	Sonoma	Adj. Avg	2001 RTP
Crack Seal	0.49	$ 0.64	$ 1.02	$ 1.00	$ 2.07	$ 0.89	N/A	$ 0.63	$ 1.33	**$ 0.92**	$ 0.41
Slurry Seal	1.16	$ 2.14	$ 1.71	$ 2.00	$ 2.07	$ 1.85	$ 1.25	$ 3.94	$ 1.69	**$ 1.91**	$ 0.87
Restoration	9.28	$ 20.50	$ 10.62	$ 11.25	$ 2.07	$ 11.22	$ 10.50	$ 19.80	$ 11.01	**$ 10.65**	$ 6.07
Rehab	9.62	$ 20.50	$ 3.59	$ 2.00	$ 16.65	$ 3.56	$ 6.67	$ 3.19	$ 1.00	**$ 4.23**	$ 6.15
Rehab	11.1	$ 25.00	$ 17.75	$ 12.20	$ 16.65	$ 13.58	$ 9.67	$ 16.43	$ 17.50	**$ 17.82**	$ 14.78
Rehab	13.17	$ 29.05	$ 27.41	$ 17.10	$ 27.63	$ 16.85	$ 14.25	$ 23.94	$ 26.50	**$ 25.23**	$ 20.55
Reconstruct	33.53	$ 80.32	$ 68.83	$ 63.20	$ 141.30	$ 40.25	$ 66.17	$ 91.25	$ 100.00	**$ 78.29**	$ 50.75

Residentials	Alameda	Contra Costa	Marin	Napa	S.F.	San Mateo	Santa Clar	Solano	Sonoma	Adj. Avg	2001 RTP
Crack Seal	0.55	$ 0.64	$ 0.99	$ 1.00	$ 2.07	$ 0.78	N/A	$ 0.63	$ 1.33	**$ 0.90**	$ 0.41
Slurry Seal	1.13	$ 2.14	$ 1.66	$ 2.00	$ 2.07	$ 1.81	$ 4.15	$ 3.94	$ 1.91	**$ 1.93**	$ 0.87
Restoration	9.37	$ 20.50	$ 9.37	$ 11.25	$ 2.07	$ 10.19	$ 14.01	$ 19.80	$ 11.30	**$ 10.91**	$ 6.07
Rehab	3.79	$ 20.50	$ 4.32	$ 2.00	$ 16.65	$ 2.70	$ 4.15	$ 5.94	$ 1.20	**$ 4.97**	$ 6.15
Rehab	10	$ 25.00	$ 17.15	$ 12.20	$ 16.65	$ 8.91	$ 7.15	$ 15.02	$ 15.00	**$ 15.45**	$ 14.78
Rehab	11.86	$ 29.05	$ 24.72	$ 34.40	$ 27.63	$ 15.21	$ 13.88	$ 25.86	$ 18.00	**$ 24.79**	$ 20.55
Reconstruct	25.74	$ 80.32	$ 66.35	$ 50.10	$ 141.30	$ 27.30	$ 64.33	$ 91.25	$ 45.00	**$ 66.23**	$ 50.75

=Treatment Cost is outside of range (+ / - 1 Standard Deviation from Average) and not included in the average

Likewise, it was agreed that MTC would use a standard "best practices" decision tree when running the pavement management model on the individual databases. A best practices strategy places a heavy emphasis on preventive maintenance, which tends to minimize long-range costs. MTC utilized a decision tree set-up modeled in part after the sample decision tree included in the PMP software and in part with the most common treatments found among the various jurisdictions

Figure 4
Standard decision tree used for pavement need projections
There are five "Condition Categories" that categorize roads within a particular range of PCI

Condition Category I – Preventative Maintenance – PCI > 70
Crack Sealing
Surface Sealing (Chip, Slurry, Cape, etc…)
Restoration – Mill and Thin Overlay
Condition Category II – PCI < 70 > 50 (Non-Load) – Thin Overlay or Surface Seal
Condition Category III – PCI < 70 > 50 (Load) – Mill and Thick Overlay
Condition Category IV – PCI < 50 > 25 – Reconstruct Surface
Condition Category V – PCI < 25 – Reconstruct Structure

When utilizing the updated average unit costs and the standard decision tree, the pavement need that was estimated for "Transportation 2030" effectively doubled what it was in the 2001 RTP, from a previous need of $4.7 billion to $9.8 billion. Also, for the current 2005 RTP, MTC staff was also able to obtain a more accurate estimate of the amount of need that can be attributed to MTS roadways. In the 2001 RTP, the MTS portion of need had been based on a simple ratio of MTS street and road mileage to total street and road mileage. For the new estimates, MTC staff flagged each MTS road in every jurisdiction's Pavement Management Program database, prior to running the model to obtain the need. What was found is that the proportion of MTS need to total need is greater than that of MTS mileage to total mileage, due to the fact that MTS routes consist of primarily arterial roadways, which require a greater degree of maintenance due to their size and traffic loads.

Pavement Revenue Projections
Pavement revenues were projected using the data that was submitted in response to the revenue survey circulated among the 109 Bay Area jurisdictions. Jurisdictions were asked to provide ten years' worth (five years past and five years future) of budget information for Local Street and Road maintenance, segmented by expenditure category and source of revenue. An average annual budget amount for Local Street and Road maintenance was calculated from the budget data provided by each jurisdiction. This average annual budget amount served as the base figure for the 25-year projection. A growth rate was applied to this annual average figure for each year covered under the "Transportation 2030" plan. The growth rate was calculated using a regional weighted average of the separate growth rates for gas tax, sales tax, and other local funds. Weighting was based on survey response data pertaining to revenue sources. The resulting weighted average growth rate was 0.37% (Refer to Figure 1).

Each jurisdiction spends a different portion of their total Local Street and Road budgets on pavement maintenance. From the revenue survey data, the percentage of total Local Street and Road funds available for pavement maintenance was calculated and applied against each jurisdiction's total Local Street and Road annual revenue figure for the 25-year "Transportation 2030" period. The resulting pavement revenue amounts were then summed in order to obtain the total 25-year pavement revenue estimate (excluding Proposition 42). An amount was deducted from each jurisdiction's estimated revenues

available for pavements, to account for the 20% match required to receive HBRR funding for local bridges (see Bridge Revenue section for further explanation.)

Approximately 70% of the jurisdictions responded with budget data. For the 30% of jurisdictions that did not submit survey data, pavement maintenance revenues were estimated by determining an average amount per centerline mile of available revenue dollars for pavement maintenance. This average dollar amount per centerline mile was calculated on a county basis, from the jurisdictions that submitted surveys. In determining the average revenue dollar figure, only those jurisdictions whose average revenue dollar amount per centerline mile figure fell within range of one standard deviation from the county average revenue dollar amount per centerline mile figure, was used. The resulting "adjusted average" revenue figure was then applied to the centerline mileage of those jurisdictions in each county that did not submit surveys.

Since Proposition 42 funding is a new revenue source that was not reflected in the survey data collected, it was projected separately. Proposition 42 funds are required by law to be used by local jurisdiction for street or road maintenance or reconstruction purposes. Proposition 42 funds were estimated for fiscal years 2005/06 through 2008/09.

Growth rates for Proposition 42 funds were determined by MTC's Programming and Allocations Section based on the gas consumptions and pricing date from Caltrans' " California Motor Vehicle Stock, Travel, and Fuel Forecast" report. The total Proposition 42 funds available for the "Transportation 2030" term were split between the pavement and non-pavement categories, using the ratio of pavement to non-pavement available revenues determined from the revenue survey data. The estimated proportion of Proposition 42 revenues for pavements was then added to the existing estimates of pavement revenues.

As a final step, the amount of revenue that would be available to meet the pavement maintenance need on the MTS system, was determined by applying the same percentage of MTS pavement *need* to total pavement *need*, to the total pavement revenue estimate.

Pavement Shortfall Projections

To arrive at the total pavement shortfall for each of the Bay Area counties, the total projected pavement revenues for each jurisdiction was subtracted from the projected needs for that jurisdiction. The resultant number represents the shortfall in pavement revenues. The county shortfall totals are then categorized into Bay Area MTS routes and non-MTS routes.

NON-PAVEMENT MAINTENANCE

25-Year Non-Pavement Funding Shortfall Estimates (In Millions – 2004 Dollars)

County	Non-Pavement Needs	Non-Pavement Revenues	Non-Pavement Shortfall	Non-Pavement MTS Shortfall	Non-Pavement Non-MTS Shortfall
Alameda	$ 1,250.1	$ 778.2	$ 471.9	$ 67.0	$ 404.9
Contra Costa	$ 804.4	$ 436.5	$ 367.9	$ 48.6	$ 319.3
Marin	$ 261.0	$ 148.1	$ 113.0	$ 21.9	$ 91.1
Napa	$ 253.0	$ 71.6	$ 181.3	$ 25.7	$ 155.7
San Francisco	$ 1,177.5	$ 599.3	$ 578.1	$ 41.4	$ 536.8
San Mateo	$ 668.4	$ 542.4	$ 126.1	$ 17.7	$ 108.4
Santa Clara	$ 1,553.1	$ 951.4	$ 601.7	$ 85.5	$ 516.2
Solano	$ 356.5	$ 110.6	$ 245.9	$ 18.0	$ 227.9
Sonoma	$ 653.8	$ 239.3	$ 414.5	$ 79.0	$ 335.5
TOTAL	**$ 6,977.8**	**$ 3,877.5**	**$ 3,100.3**	**$ 404.6**	**$ 2,695.7**

MTC estimates that non-pavement needs through the year 2030will amount to about $7 billion dollars. Revenues over the same time period are estimated to total only $3.9 billion dollars, resulting in a total shortfall of approximately $3.1 billion dollars. The MTS portion of the non-pavement need is $404.6 million. The "Transportation 2030" plan give priority to fully funding shortfalls on local roads that are a part of the MTS

Non-Pavement Needs Projections

Non-Pavement Needs are very difficult to estimate. The Non-Pavement category spans a broad range of items that are required for a functioning local street and road network. Most jurisdictions do not have the means of tracking the need for non-pavement maintenance, as they do for pavement maintenance, with a single software program.

For past RTPs, MTC has relied on determining a historical ratio of pavement to non-pavement expenditures based on State Controller's data and applying that ratio to the Pavement Need in order to estimate Non-Pavement Need. The theory behind this method was that the amount that jurisdictions spend on pavement vs. non-pavement projects is proportional to the amount "needed" for both categories.

The feedback that was received after relating this methodology to the local agency public works representatives, was that the state controller's data was largely an unreliable source for actual expenditure information, since the reports were mostly done by finance or accounting departments, unfamiliar with the categorization of local streets and roads expenditures. Public works staff in most jurisdictions would not provide input or approval to the State Controller's reports, and the State, due to budget constraints, rarely performed audits of the data that was submitted.

As an alternative to the State Controller's methodology, MTC, along with the committee of public works representatives, developed a list of categories that would be considered under non-pavement maintenance. Those categories included:

- Drainage (culvert, pipe, headwall, inlets, etc.)
- Heavy Equipment (6-yard dump truck and up)
- Traffic Safety (signal, street light, signing, striping, guard rail)
- Pedestrian (sidewalk, path)
- Bicycling Facilities (Class I only)
- ADA (ramp)
- NPDES / Permits
- Retaining Walls
- Corporation Yards
- Storm Damage (slope protection, slide repair)

After agreement was reached on the above categories, the group generated another survey to be circulated to the 109 jurisdictions in order to gather estimates of non-pavement maintenance need.

While the response from the jurisdictions in submitting updated unit cost information for pavements was excellent, only about half of the jurisdictions also submitted their 25-Year estimates for non-pavement need. Furthermore, the estimates that were submitted varied drastically from jurisdiction to jurisdiction. In many cases, the non-pavement need that was reported was only a fraction of what would have been expected given the jurisdiction's size, mileage amount, or pavement need. In other jurisdictions, it was much larger than would be expected given the same criteria. The difficulty that MTC had in determining any sort of relationship between jurisdiction size or pavement need to the non-pavement need figures that were being reported via the surveys, was cause to question their accuracy.

In order to deal with the discrepancies in the non-pavement need estimates, MTC staff developed several different projection methodologies that would help to provide a reasonable *regional* estimate of non-pavement need. These methodologies were brought before the public works representatives for their consideration and agreement on which methodology to use. With their agreement, MTC staff employed a projection methodology that helped mediate some of the variation, and provided a fair and reasonable estimate of non-pavement need.

The methodology that was used to estimate the 25-year non-pavement need involved first separating the jurisdictions into "urban" and "rural" categories based on their population densities (number of people per square mile). Within each of the two categories, an average was taken of the pavement to non-pavement need ratios for those jurisdictions that had submitted non-pavement need estimates to MTC. Any jurisdiction that had a pavement to non-pavement need ratio outside the range of plus or minus one half of a standard deviation from the average ratio for their category was considered invalid. In addition, within each of the urban and rural categories, an average "total need per centerline mile" – this is equal to the jurisdiction's pavement need plus non-pavement need, divided by the amount of centerline miles in the jurisdiction—was calculated. Any jurisdiction with a total need per centerline mile outside the range of plus or minus one standard deviation from the average for their category, was also considered invalid. A new

or "adjusted average" pavement to non-pavement ratio was then calculated with the remaining valid jurisdictions in both the urban and rural categories. The resulting ratio for each category was applied against each jurisdiction's pavement need in order to estimate the non-pavement need.

The resulting 25-year regional estimate of non-pavement need for the "Transportation 2030" plan, based on the methodology that was just described, was greater than what had been estimated in the 2001 RTP—$7 billion vs. $5.4 billion—yet it was smaller than what would have been estimated had the State Controller's reports been used to estimate non-pavement need as was done in prior RTPs. Historically, the State Controller's methodology yielded a non-pavement need that was *greater* than estimates of pavement need; however, the new methodology yielded a non-pavement need that was only about 75% of the pavement need. MTC felt that this change reflected the fact that some of the costs previously allocated to non-pavement had been incorporated into the newly determined pavement unit treatment costs. If correct, it would help explain the jump in unit treatment costs and pavement need.

Based on historical data for the last 18 years, an average percentage of the total LS&R revenues used for non-pavement expenditures is determined. This percentage is applied to the projected total LS&R revenues through the year 2025 in order to obtain the projected non-pavement revenues over the 25-year period.

The non-pavement needs projection is determined by first determining the average historical ratio of pavement to non-pavement needs. That ratio is then applied to the pavement needs in order to determine the non-pavement needs for the 25-year period by county.

The non-pavement shortfall for each county us determined by subtracting the projected revenues from the projected needs. The total shortfalls for each county are further categorized into MTS and non-MTS shortfalls.

Non-Pavement Revenue Projections

Estimates for non-pavement LS&R revenues are determined in a similar manner as are pavement revenues. Funding comes primarily from gas and sales tax revenue, other local funds, and Proposition 42 funds.

Each jurisdiction spends a different portion of their total Local Street and Road budgets on non-pavement maintenance. From the revenue survey data, the percentage of total Local Street and Road funds available for non-pavement maintenance was calculated and applied against each jurisdiction's total Local Street and Road annual revenue figure for the 25-year "Transportation 2030" period. The resulting non-pavement revenue amounts were then summed in order to obtain the total 25-year pavement revenue estimate (excluding Proposition 42).

For those jurisdictions that did not submit survey data, non-pavement maintenance revenues were estimated by determining an average amount per centerline mile of available revenue dollars for non-pavement maintenance. This average dollar amount per centerline mile was calculated on a county basis, from the jurisdictions that submitted surveys. In determining the average revenue dollar figure, only those jurisdictions whose average revenue dollar amount per centerline mile figure fell within range of one standard deviation from the county average revenue dollar amount per centerline mile figure, was used. The resulting "adjusted average" revenue figure was then applied to the centerline mileage of those jurisdictions in each county that did not submit surveys.

Proposition 42 funds were estimated for fiscal years 2005/06 through 2008/09. The total Proposition 42 funds available for the "Transportation 2030" term were split between the pavement and non-pavement categories, using the ratio of pavement to non-pavement available revenues determined from the revenue survey data. The proportion of estimated non-pavement Proposition 42 revenues were then added to the existing estimates of non-pavement revenues.

As a final step, the amount of revenue that would be available to meet the pavement maintenance need on the MTS system, was determined by applying the same percentage of MTS non-pavement *need* to total non-pavement *need*, to the total non-pavement revenue estimate.

Non-Pavement Shortfalls

To arrive at the total non-pavement shortfall for each of the Bay Area counties, the total projected non-pavement revenues for each jurisdiction was subtracted from the projected needs for that jurisdiction. The resultant number represents the shortfall in non-pavement revenues.

The county shortfall totals are then categorized into Bay Area MTS routes and non-MTS routes.

LOCAL BRIDGE MAINTENANCE

25-Year Bridge Funding Shortfall Estimates
(In Millions of 2004 Dollars)

County	Total Needs	MTS Need	Non-MTS Need
Alameda	$ 74.8	$ 48.2	$ 26.6
Contra Costa	$ 71.0	$ 27.4	$ 43.6
Marin	$ 23.5	$ 4.8	$ 18.7
Napa	$ 24.6	$ 14.2	$ 10.4
S.F.	$ 61.7	$ 37.6	$ 24.1
San Mateo	$ 31.3	$ 8.5	$ 22.8
San Francisco	$ 129.4	$ 41.0	$ 88.4
Solano	$ 29.3	$ 9.9	$ 19.4
Sonoma	$ 83.0	$ 29.6	$ 53.4
County TOTAL	**$ 528.6**	**$ 221.2**	**$ 307.4**

Between the nine Bay Area counties, there were a total of 1,831 bridges counted in the local bridge network. Of those structures, 64% are 30 years or older. Nearly 22% of the structures are 50 years or older and five percent are over 80 years old. Caltrans' Pontis Bridge Management program (BMS) was used to determine a bridge condition index on a scale of 0 to 100, with 100 being the best possible score. The Pontis program utilizes a form of this index in order to determine future bridge maintenance and replacement needs. The Bay Area's bridges scored well overall with a bridge health index of 91 based on recent surveys.

In addition to the index, Caltrans also uses a sufficiency rating that is used to determine existing bridge maintenance and replacement needs, and whether a bridge is sufficient enough to remain in service. The sufficiency rating addresses the bridges' structural adequacy and safety, serviceability and functional obsolescence and essentiality for public use. The sufficiency rating also uses a scale ranging from 0 to 100 where:

- 0 to 59 is insufficient;
- 60 to 80 is acceptable;
- Greater than 80 is sufficient.

The overall sufficiency rating for the Bay area was 80.3 with 37% of local bridges having a sufficiency rating of less than 80 and 8.7% having an insufficient rating of less than 50.

Unlike with roads, a majority of the Bay Area jurisdictions do not collect information on the condition of their local bridges. The California Department of Transportation (Caltrans) is the agency that is primarily responsible for determining the condition of the region's local bridges. The 25-Year projected maintenance and replacement needs for Bay Area

local bridges were determined through the use of the Pontis Bridge Management System (BMS) in conjunction with existing data from Caltrans.

For both the 2001RTP and "Transportation 2030", MTC employed a consultant, Cambridge Systematics, to work with Caltrans and provide a comprehensive report of local bridge needs, revenues and shortfalls.

Local Bridge Need Projections

The Local Agency Seismic Retrofit Program is a part of the California statewide Seismic Safety Retrofit Program and is designed to provide funding assistance to local agencies for retrofitting structural seismic deficiencies of public structures on local roadways. This program, which identifies necessary seismic projects, is the basis for estimating seismic needs for this study. Seismic retrofit information was provided by the Caltrans Division of Local Assistance.

The 2002/2003 seismic program includes work on 73 local bridges in the Bay Area. Seismic projects are categorized by project phase—strategy design, and construction. The seismic program provides estimates for those projects in the design and construction phases. It was assumed that seismic projects in the strategy phase will cost an average of $700,000 per project. Estimates for projects in all three phases were added in order to determine current seismic needs. There are currently approximately $57 million in seismic needs in the Bay Area. Since all existing bridges have been screened as part of the seismic program, it is assumed that 1) all seismic needs on existing bridges have been identified, 2) all future bridges will meet seismic specifications, and 3) current bridges (as long as they are maintained) will not acquire additional seismic retrofit work.

Non-seismic needs (e.g., rehabilitation, replacement, and improvement needs) were estimated using the Pontis bridge management system. Pontis is a comprehensive bridge management system currently licensed by 40 state DOTs, including Caltrans. The system was originally developed in 1989 for the FHWA and has since been enhanced on a regular basis by the American Association of State Highway and Transportation Officials (AASHTO). Pontis stores bridge inventory and inspection data; formulates network-wide preservation and improvement policies for use in evaluating the needs of each bridge in a network; and makes recommendations for what projects to include in an agency's capital plan in order to derive the maximum benefit from limited funds. Pontis provides a systematic procedure for the allocation of resources to the preservation and improvement of bridges in a network. Pontis accomplishes this by considering both the costs and benefits of maintenance policies versus investments in improvements and replacements.

There are four types of bridge needs – 1) replacement, 2) maintenance, repair, and rehabilitation (MR&R), 3) improvement (e.g., strengthening, widening, and raising a structure), and 4) seismic. Seismic needs have been calculated based on the Seismic Program described above. All other needs are based on Pontis projections. The overall need for local bridge maintenance in the Bay Area is estimated to be $528.6 million, with

$221.2 million of that need, falling on bridges that are on the MTS portion of the local road network.

Bridge Revenue Projections

In order to perform the local bridge revenue projection for the "Transportation 2030" plan, it was essential to establish how revenues are generated. Unlike pavement, where there are a myriad of federal, state and local sources, local jurisdictions predominantly rely on federal Highway Bridge Replacement and Rehabilitation (HBRR) funds for bridge repair, rehabilitation, and maintenance. Since HBRR funds are competitive on a statewide basis, any local agency in California can apply. As such there is no set amount in any given year of the HBRR funds coming to the Bay Area. It depends on the aggressiveness of local jurisdictions on pursuing these funds, availability of local matching funds and agencies' staff support.

To gain a better knowledge of the level of HBRR funds the Bay Area receives, historical data from Caltrans was examined. The Master Project Status (MPS), a working database from District 4, Office of Local Assistance, was used to extract project costs for bridge and seismic projects. Projects related to BART, Golden Gate Bridge, railroads, or other transit agencies are excluded.

Estimated total project costs were not used to establish the "spending" pattern. Instead, federal authorizations (E-76s) were used to accurately track the project costs related to preliminary engineering (PE), right of way (R/W) and construction (CN). The federal authorization establishes the reimbursement date of all eligible work, and also obligates the federal funds. From MPS, PE, RW, and CN costs were tabulated for each federal fiscal year from 1991 to 2002 for both completed and on-going projects.

The historical data provides a trend for revenue projection. MTC assumed the Bay Area would receive a constant share of 15.9%[1] of the HBRR funds and a 3% growth rate. The 25-year revenue projection for HBRR funds is then established. Local jurisdictions must supply a 20% match in order to obtain the HBRR funds for any given project. The estimated dollar amount of the match portion of the bridge revenues was deducted from the available revenues for pavement maintenance, in order to avoid the double counting of available revenues.

Bridge Shortfall Projections

It is estimated that over the course of the "Transportation 2030" plan sufficient funding will be available through the HBRR program to meet the maintenance needs of the region's local bridges. Therefore, no shortfall is projected. Estimates provided by Cambridge Systematics, show that available funding for bridge maintenance would surpass bridge need by the year 2027. In other words, all bridge maintenance needs could be met

[1] The percent of Bay Area share of the statewide HBRR funds is derived from taking the total federal authorization of bridge projects from 1991 to 2002 in nine-county Bay Area divided by the total federal apportionment of local agencies' portion of HBRR funds allocated to California. The split of the statewide HBRR funds is 45% to State DOT and 55% to cities and counties.

by that year. *This finding is based on the assumption that local agencies will aggressively apply for available HBRR funding, and will be able to provide the local match portion that is required to receive those funds.*