

Town of Chichester

2015 Report of the Road Advisory Committee

December 14, 2015

Road Advisory Committee

Allen Mayville, Jr. (Chairman), Brian Eldredge, Guy Goodwin, Doug Hall, Tom Jameson, Mike Paveglio (Selectman ex-officio), Jim Plunkett (Road Agent)

Chichester Road Network

(showing road reconstruction done 2013-2015 and planned for 2016)

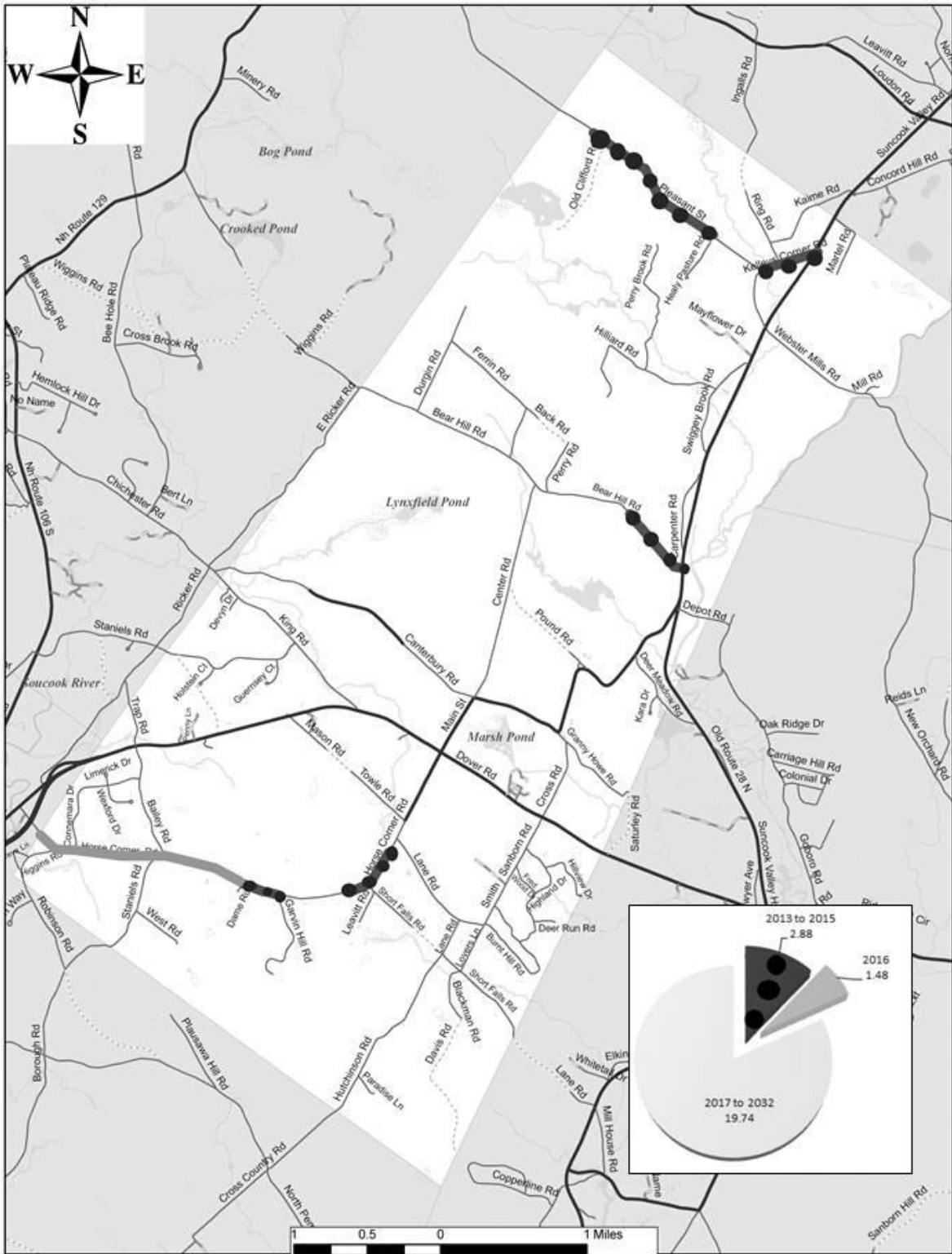


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Executive Summary

The Chichester Road Advisory Committee has worked hard in 2015 to update its comprehensive Road Management Plan for the town.

The committee's charter currently states that its primary responsibility *"shall be to develop a written Road Management Plan, or update annually any existing Road Management Plan, for the Town of Chichester. The Road Management Plan shall include short-term and long-term repair goals, and shall also identify, develop "best estimate" project costs, prioritize, and establish a schedule for any future roadway reconstruction projects or major repair/upgrading projects."*

The committee of seven members has met often and has worked with the Road Agent assessing road conditions throughout town. This information was then entered into a Road Surface Management System (RSMS), which allowed the Committee to further assess the immediate and long-term needs for road repair.

There are 38.4 miles of roads in Chichester that the town is responsible for maintaining. There are 68 paved road segments totaling 24.5 miles and there are 31 gravel road segments totaling 13.9 miles. The average segment is slightly more than 1/3 mile.

Maintaining paved roads is a complicated process. With an estimated average life of a paved road being 20 years, the town needs to reconstruct 1.2 miles per year to maintain existing conditions on average. At Town Meeting in March 2015 the voters agreed to the third year of such a plan based on the work of this committee. Prior to 2013 the town unfortunately had been doing much less. Existing paved roads had been on a 60-70 year repaving cycle. The result was that our paved roads had been deteriorating. In 2013, 2014, and 2015 the town's voters agreed with this committee and committed significant tax dollars to improve the many paved roads in Chichester that had fallen into disrepair. This report contains our recommendation for continuing this process.

The goal of this Committee's plan is to bring all the roads in town to an average or better condition and keep them in this condition for the average 20 year life span. To do this the town will need to significantly improve 1.2 miles of paved roads every year. When a road deteriorates beyond needing preventative maintenance during a 20 year life span it becomes more costly to bring it back to an average condition.

At current costs, the committee estimates that the work to reconstruct and pave 1.2 miles per year is approximately \$375,000. However this can vary significantly from year to year, primarily because of fluctuating asphalt costs.

The committee and Road Agent have created a detailed inventory of roads, road segments, their conditions, importance, and traffic counts. The Road Agent uses a computer database (RSMS) to maintain this information. The committee has prepared a plan to maintain and improve the conditions of our paved roads that includes reconstruction of the highest priority segments during the next 2 years.

2016: The committee recommends one road reconstruction project for completion. This includes two adjoining segments of Horse Corner Road that total 1.475 miles. The committee estimated the cost to be \$439,000. The good news is that some bids from contractors already received are below that estimate while others are above it.

2017: The committee recommends two road reconstruction projects for completion. One is a segment of Bear Hill Road that is 0.789 miles in length. The committee estimated the cost to be \$225,700. The good news is that some bids from contractors already received for this project are below that estimate while others are above it. The second is a segment to be determined next year that will allow the total to be about 1.2 miles.

2018 to 2032: The committee recommends that 1.2 miles of paved road reconstruction be completed in each of the subsequent years of the 20 year plan. The committee will make recommendations for specific segments only after completing surveys of road conditions within 12 months of the time work is to be done. Costs in future years will be dependent primarily on the cost of asphalt which can fluctuate considerably. We suggest that our cost estimate of \$375,000 per mile be adjusted by 3% annually to make long-term projections.

It is now up to the citizens of Chichester to decide. Will the town continue to implement our 20 year plan as it has for the past three years? With guidance from this committee, the Capital Improvement Program Committee, the Budget Committee, and the Board of Selectmen, ultimately the voters at town meeting will be asked to decide how much money will be invested in our paved roads. The Road Advisory Committee urges all voters to understand the tradeoff we face between deteriorating road conditions and a willingness to pay for system-wide repair and upgrading.

Details can be found in the following sections of this report.

1. Introduction

1.A: Legal Basis

The Road Advisory Committee was originally established by a vote of the townspeople at the Chichester Town Meeting held on March 19, 2005. The original warrant article read as follows; *“To see if the town will vote to direct the Selectmen to establish a committee of not less than 7 citizens plus the road agent to prepare a written long term proposal for roads to be delivered to the Selectmen at a public meeting no later than the last week in October 2005”.*

By virtue of the specific language of the warrant article, the article did not call for an annual report or for a continuing committee. Subsequently, the Committee’s charter was amended and updated on February 15, 2011, under the authority of the Board of Selectmen. The changes made to the original charter were; 1) to make this Committee a permanent ‘standing’ committee, 2) minor changes in the membership structure of the Committee, 3) to require an annual ‘Road Management Plan’, and 4) updating the Mission Statement of the original Charter to more accurately define the Committee’s responsibilities so as to work more in concert with the Town’s Capital Improvement Committee.

1.B: Mission of the Committee

The mission statement of the Committee currently states that its primary responsibility *“shall be to develop a written Road Management Plan, or update annually any existing Road Management Plan, for the Town of Chichester. The Road Management Plan shall include short-term and long-term repair goals, and shall also identify, develop “best estimate” project costs, prioritize, and establish a schedule for any future roadway reconstruction projects or major repair/upgrading projects.”*

“The Committee is established to cooperatively promote better road repairs by assisting the Road Agent, Selectmen, Budget Committee, and Capital Improvement Program Committee (CIP) with the evaluation, planning, and scheduling of road work.”

It should be noted that the committee’s charter does not include the oversight and planning of roadway maintenance work. The Road Agent will be reporting on the yearly maintenance accomplishments in the Road Agent’s report which is included in the annual Town Report.

1.C: Committee Membership

The Committee’s Charter establishes its membership as consisting of “a minimum of seven (7) members, the Road Agent and one Selectman who shall serve as an ex-officio member of the Committee. The five appointed members shall be appointed by the Board of Selectmen. All appointed members of the Committee shall be residents of the Town of Chichester. It is expected that at least one of the appointed members would have either engineering experience in roadway design/construction or field experience in roadway construction and/or project management.”

The current members of the Committee are: Allen Mayville, Jr. (Chairman), Brian Eldredge, Guy Goodwin, Doug Hall, Tom Jameson, Mike Paveglio (Selectman ex-officio), Jim Plunkett (Road Agent)

2. Road Surface Management System

2.A: Establishment of Road Segments

The Road Surface Management System (RSMS) software from the Maine Local Roads Center is in daily use by the Road Agent and helps organize information about Chichester's town roads and budget money for their rehabilitation and maintenance.

For evaluation and planning purposes, longer roads have been divided into segments based on road condition and/or logical locations. This is necessary to ensure that conditions and needs of one segment of road are not implied to be the same over the entire length of that road. Endpoints of segments may be shifted in one direction or another as conditions change. Longer segments may be further subdivided. Short adjoining segments with similar conditions may be combined. These changes may be made during the year as required.

2.B: Inventory of Roads

Table 1 on the following pages contains the inventory of town-maintained road segments in Chichester as of November 12, 2015. This inventory shows a total length of 38.4 miles, broken into 99 town maintained road segments.

68 segments are paved and total 24.5 miles while 31 segments are gravel and total 13.9 miles.

This inventory does not include roads in Chichester that are owned and maintained by the State or roads that are privately owned and maintained.

This table contains important information about each road segment. Each segment has an importance ranking from low to high and also has a traffic ranking from low to high. Based on field inspection of actual roadway conditions, a computation in the RSMS software suggests the type of work required to correct deficiencies in that segment's surface.

Each entry in the Surface and Drainage columns of Table 2 also contains a number from 2 through 10. This number represents a calculated combination of the "Traffic" and "Importance" characteristics. A "-10" designates a road segment that is most urgent because it has high traffic and importance ratings. On the other hand, a "-2" designates a road segment with the lowest possible traffic and importance ratings. Numbers 3 through 9 are intermediate.

Segments are not fixed. Road segment numbers and lengths may change from year to year as work proceeds and conditions change. They are used to identify logical units for evaluation, consideration in priority setting, and work planning. For example, 3 previously listed segments of Bear Hill Road have been combined into one this year because needed work is being planned to be done in unison.

Table 1

Inventory of Chichester Maintained Road Segments from RSMS								11/12/2015	
Road Name	Seg	From	To	Surface	Length	Importance	Traffic	Surface	Drainage
Back Rd	1	Ferrin Rd	Mailbox#15	Gravel	0.140	low	low	Routine-2	Good-2
Bailey Rd	1	US Route 4	Connemara Dr	Paved	0.230	medium	low-med	Routine-5	Good-5
Bailey Rd	2	Connemara Dr	Horse Corner Rd	Gravel	0.520	medium	low	Routine-4	Poor-4
Bear Hill Rd	1	NH Route 28	West PL # 66	Paved	0.686	high	med-high	No Maint-9	Good-9
Bear Hill Rd	2	#66 Bear Hill	Ferrin Road	Paved	0.789	high	med-high	Rehabilitate-9	Good-9
Bear Hill Rd	5	Ferrin Rd	Brown cemetery	Paved	0.388	med-high	medium	Preventive-7	Good-7
Bear Hill Rd	6	Brown cemetery	#255 Bear hill	Paved	0.450	med-high	medium	Preventive-7	Good-7
Bear Hill Rd	7	#255 Bear hill	Loudon Town Line	Paved	0.208	med-high	medium	No Maint-7	Good-7
Blackman Rd	1	Short Falls Rd	To end of roadway	Gravel	0.400	low	low	Routine-2	Good-2
Burnt Hill Rd	1	Lovers Ln	# 68 Burnt Hill	Paved	0.430	medium	low-med	Rehabilitate-5	Good-5
Burnt Hill Rd	2	#68 Burnt hill	Highland Drive	Paved	0.330	medium	low-med	Routine-5	Good-5
Burnt Hill Rd	3	Highland Dr	Smith Sanborn Rd	Paved	0.310	medium	low-med	No Maint-5	Good-5
Canterbury Rd	1	Main St	House # 66	Paved	0.635	high	medium	No Maint-8	Good-8
Canterbury Rd	3	House # 142	Loudon TL	Paved	0.580	high	high	Reconstruct-10	Good-10
Carpenter Rd	1	Route 28	#49 Carpenter rd	Paved	0.260	low	low	Preventive-2	Good-2
Carpenter Rd	2	#49 Carpenter rd	Route 28	Paved	0.260	low	low	Preventive-2	Good-2
Center Rd	1	Bear Hill Rd	Canterbury Rd	Paved	1.520	high	medium	Preventive-8	Good-8
Chichester Ln	1	US Route 4	End Chichester Ln	Gravel	0.090	low	low	Routine-2	Poor-2
Connemara Dr	1	Bailey Rd	#40 Connamara	Paved	0.450	low-med	low	Preventive-3	Good-3
Connemara Dr	2	#40 Connamara	Horse Corner Rd	Paved	0.378	low-med	medium	Rehabilitate-5	Good-5
Cross Rd	1	US Route 4	House #50	Paved	0.085	medium	low	No Maint-4	Good-4
Cross Rd	2	House #50	Granny Howe Rd	Gravel	0.472	medium	medium	Routine-6	Good-6
Deer Meadow Rd	1	Main St	Epsom TL	Paved	0.434	medium	low-med	Rehabilitate-5	Good-5
Deer Run Rd	1	Highland Dr	End of Deer Run Rd	Gravel	0.155	low	low	Routine-2	Good-2
Depot St	1	Route 28	Epsom TL	Paved	0.214	low-med	high	Preventive-7	Good-7
Devyn Dr	1	King Rd	End Devyn Dr	Gravel	0.136	low	low	Routine-2	Poor-2
Durgin Rd	1	Bear Hill Rd	End of Durgin Rd	Gravel	0.757	medium	low	Routine-4	Good-4
East Ricker Rd	1	Bear Hill Rd	#256	Paved	0.410	med-high	medium	Rehabilitate-7	Good-7
East Ricker Rd	2	House #256	Loudon TL	Paved	0.270	med-high	medium	No Maint-7	Good-7
Ferrin Rd	1	Durgin Rd	Bear Hill Rd	Gravel	1.050	low-med	low-med	Routine-4	Good-4
Fred Wood Dr	1	Highland Dr	Smith Sanbord Rd	Paved	0.226	low	low	Reconstruct-2	Good-2
Garvin Hill Rd	1	Horse Corner Rd	End Garvin Hill Rd	Gravel	0.720	low	low	Routine-2	Poor-2
Granny Howe Rd	1	Main St	Epsom TL	Gravel	0.691	low	low	Routine-2	Good-2
Guernsey Ct	1	Harvest Rd	End Guernsey Ct	Paved	0.243	low	low	Preventive-2	Good-2
Harvest Rd	1	King Rd	Guernsey Ct	Paved	0.170	low-med	med-high	Preventive-6	Good-6
Harvest Rd	2	Guernsey Ct	Holstein Ct	Paved	0.450	low-med	med-high	Preventive-6	Good-6
Harvest Rd	3	Holstein Ct	Loudon TL	Paved	0.340	low-med	med-high	Preventive-6	Good-6
Healy Pasture Rd	1	Pleasant Rd	End of Healy Past.	Paved	0.380	low	low	Rehabilitate-2	Good-2
Higgins Rd	1	Horse Corner Rd	Pembroke TL	Paved	0.389	medium	medium	No Maint-6	Good-6
Highland Dr	1	Smith Sanbord Rd	Fredwood drive	Paved	0.432	medium	medium	Preventive-6	Good-6
Highland Dr	2	Fredwood drive	Burnt Hill Rd	Paved	0.426	medium	medium	No Maint-6	Good-6
Hilliard Rd	1	Swiggey Brook Rd	End of Hilliard Rd	Gravel	1.206	low	low-med	Routine-3	Good-3
Hillview Dr	1	Smith Sanborn Rd	Epsom TL	Paved	0.419	low	low	Rehabilitate-2	Good-2
Holstein Ct	1	Harvest Rd	End Holstein Ct	Paved	0.194	low	low	Preventive-2	Good-2
Horse Corner Rd	1	Higgins Road	Pembroke town Line	Paved	0.140	low	low	Preventive-2	Good-2
Horse Corner Rd	2	Higgins Rd	Dame Farm Road	Paved	1.341	high	high	Rehabilitate-10	Good-10
Horse Corner Rd	6	Dame Rd	Garvin Hill Rd	Paved	0.251	high	high	No Maint-10	Good-10
Horse Corner Rd	8	#125 Horse Corner	Garvin Hill Rd	Paved	0.450	high	high	No Maint-10	Good-10
Horse Corner Rd	9	#79 Horse corner	#125 Horse Corner	Paved	0.463	high	high	No Maint-10	Good-10
Horse Corner Rd	10	#79 Horse corner	Towle Rd	Paved	0.220	high	high	Rehabilitate-10	Good-10

Table 1 (continued)

Inventory of Chichester Maintained Road Segments from RSMS								11/12/2015	
Road Name	Seg	From	To	Surface	Length	Importance	Traffic	Surface	Drainage
Hutchinson Rd	1	Short Falls Rd	House #48	Gravel	0.490	med-high	medium	Reconstruct-7	Good-7
Hutchinson Rd	2	House #48	House #91	Paved	0.368	med-high	med-high	No Maint-8	Good-8
Hutchinson Rd	3	House #91	Pembroke TL	Gravel	0.468	med-high	low-med	Reconstruct-6	Good-6
Kaime Rd	1	Ring Rd	Pittsfield TL	Gravel	0.570	low	low	Reconstruct-2	Good-2
Kara Dr	1	Deer Meadow Rd	End of Kara Dr	Paved	0.174	low	low	No Maint-2	Good-2
Kellys Corner Rd	1	NH Route 28	House #13	Paved	0.220	medium	medium	Rehabilitate-6	Good-6
Kellys Corner Rd	2	House #13	Pleasant St	Paved	0.130	medium	medium	No Maint-6	Good-6
Kellys Corner Rd	3	Pleasant St	Ring Rd	Paved	0.160	medium	medium	No Maint-6	Good-6
Kellys Corner Rd	4	Ring Rd	NH Route 28	Paved	0.241	medium	medium	No Maint-6	Good-6
King Rd	1	Loudon TL	House #114	Paved	0.250	high	high	Preventive-10	Good-10
King Rd	2	House #114	Harvest Rd	Paved	0.435	high	high	Preventive-10	Good-10
King Rd	3	Harvest Rd	Culvert at#26	Paved	0.404	high	high	Rehabilitate-10	Good-10
King Rd	4	#26 culvert	Route 4	Paved	0.200	high	high	Rehabilitate-10	Good-10
Lane Rd	1	Horse Corner Rd	House #32	Paved	0.300	medium	high	Routine-8	Good-8
Lane Rd	2	House #32	Smith sanborn Rd	Paved	0.490	medium	med-high	Routine-7	Good-7
Lane Rd	3	Smith Sanborn Rd	Hutchinson Rd	Paved	0.250	med-high	low-med	Routine-6	Good-6
Leavitt Rd	1	Horse Corner Rd	End of Leavitt Rd	Gravel	0.302	low	low	Reconstruct-2	Good-2
Limerick Dr	1	Connemara Dr	End of Limerick Dr	Paved	0.100	low	low	No Maint-2	Good-2
Lovers Ln	1	Short Falls Rd	Smith Sanborn Rd	Gravel	0.350	low-med	low	Reconstruct-3	Good-3
Martel Rd	1	Route 28	End of Martel Rd	Gravel	0.480	low	low	Routine-2	Good-2
Mason Rd	1	US Route 4	End of Mason Rd	Paved	0.340	low	low	No Maint-2	Good-2
Meeting House Rd	1	Main St	Pound Rd	Paved	0.060	low	low	No Maint-2	Good-2
Mill Rd	1	Webster Mills Rd	End of Mill Rd	Gravel	0.100	low	low	Routine-2	Good-2
Paradise Ln	1	Hutchinson Rd	End of Paradise	Gravel	0.170	low	low	Routine-2	Good-2
Perry Brook Rd	1	Hillard Rd	End of Perry Brook	Gravel	0.430	low	low	Routine-2	Good-2
Perry Rd	1	Bear Hill Rd	End of Perry Rd	Gravel	0.340	low	low	Routine-2	Good-2
Pleasant St	1	Kellys Corner Rd	Healy Pasture Rd	Paved	0.400	high	med-high	No Maint-9	Good-9
Pleasant St	2	Healy Pasture Rd	Berry Rd	Paved	0.450	high	med-high	No Maint-9	Good-9
Pleasant St	3	Berry Rd	#117 Trailer Park	Paved	0.240	high	med-high	No Maint-9	Good-9
Pleasant St	4	#117 Trailer Park	#161 Pleasant St	Paved	0.390	high	med-high	No Maint-9	Good-9
Pleasant St	5	#161 Pleasant St	Loudon TL	Paved	0.250	high	med-high	Rehabilitate-9	Good-9
Pound Rd	1	Main St	End non-maintained	Gravel	0.220	low	low	Routine-2	Good-2
Ring Rd	1	Kellys Corner Rd	Kaime Rd	Paved	0.168	low	low	Rehabilitate-2	Good-2
Ring Rd	2	Kaime Rd	End of Ring Rd	Gravel	0.357	low	low	Routine-2	Good-2
Robinson Rd	1	US Route 4	End of Robinson Rd	Paved	0.104	low	low	Routine-2	Good-2
Short Falls Rd	1	Leavitt Rd	House #61	Gravel	0.345	low	low	Routine-2	Good-2
Short Falls Rd	2	Lane Rd	Epsom TL	Gravel	0.770	low-med	low	Routine-3	Good-3
Smith Sanborn Rd	1	Lane Rd Int	Highland Dr	Gravel	0.668	medium	medium	Routine-6	Good-6
Smith Sanborn Rd	2	Highland Dr	US Route 4	Paved	0.230	medium	medium	Preventive-6	Good-6
Staniels Rd	1	Horse Corner Rd	West Rd	Paved	0.370	med-high	low-med	No Maint-6	Good-6
Staniels Rd	2	West Rd	Pembroke TL	Gravel	0.320	med-high	low-med	Reconstruct-6	Good-6
Swiggy Brook Rd	1	South of Stream	NH Route 28	Paved	0.330	medium	low-med	No Maint-5	Good-5
Swiggy Brook Rd	2	North of Stream	NH Route 28	Paved	0.420	medium	low-med	No Maint-5	Good-5
Towle Rd	1	Horse Corner Rd	End Towle Rd	Gravel	0.450	low	low	Reconstruct-2	Good-2
Trap Rd	1	US Route 4	Loudon TL	Gravel	0.314	low	low	Routine-2	Good-2
Webster Mills Rd	1	NH Route 28	House # 131	Paved	0.280	medium	med-high	Routine-7	Good-7
Webster Mills Rd	2	House #131	Pittsfield TL	Paved	0.604	medium	med-high	Routine-7	Good-7
West Rd	1	Staniels Rd	End West Rd	Gravel	0.380	low	low	Routine-2	Good-2
Wexford Dr	1	Connemara Dr	End Wexford Dr	Paved	0.290	low	low	No Maint-2	Good-2

2.C: Road Conditions

There are seven types of observable conditions that are recorded during onsite inspection: (1) rutting, (2) potholes and patching (3) roughness, (4) alligator cracking, (5) edge cracking, (6) transverse and longitudinal cracking, and (7) roadside drainage. If any condition exists at all it is then rated for both its severity and its extent. Severity can be rated low, medium, or high. Extent is also rated low, medium, or high.

For example, a particular road segment might be categorized this way:

- 1) Rutting: low severity and low extent
- 2) Potholes and patching: none
- 3) Roughness: low severity and low extent
- 4) Alligator cracking: high severity and medium extent
- 5) Edge cracking: medium severity and high extent
- 6) Transverse and longitudinal cracking: low severity and low extent
- 7) Road side drainage: medium severity and low extent

The RSMS software has a built-in computation that combines all of the information on observable conditions and produces two recommendations for consideration. One is a simple statement of roadside drainage as either “poor” or “good.” The more complicated recommendation is the type of maintenance or repair that would most benefit the road segment. There are five such categories.

1. No Maintenance:

No action required. The road segment is in very good condition.

2. Routine Maintenance:

For paved roads, sealing cracks and patching potholes for specific small areas. For unpaved roads, filling small areas and grading the roadway. For both road surface types, routine maintenance should include cleaning ditches and culverts. Crack sealing, patching, spot re- grading, ditch and culvert cleaning, and mowing of shoulders and adjacent areas are essential to get the intended service life from a section of pavement.

3. Preventive Maintenance:

For paved roads, shimming and or coating of the surface and chip seals of thin (1 ½ inch) overlays are used to prevent or slow further deterioration. For unpaved roads this includes shaping and grading the road surface, as well as adding minor amounts of material as necessary.

4. Rehabilitation:

Major repairs of the road surface: usually an asphalt overlay after surface preparation for a paved road, adding major amounts of gravel to unpaved roads, or regrading, reshaping, and compacting them.

5. Reconstruction:

Excavation of the road base, the replacement and often the addition of aggregate, and new paved surface or new wearing surface gravel. The road including its sub base has deteriorated to such an extent that the base must be replaced or stabilized. Such conditions are usually caused by too long a period of

inadequate maintenance, and by poor subsurface drainage. In the latter conditions, appropriate repair and/or new construction of ditches and culverts should be included in the project.

It is important to understand the life cycle of a road surface. When a paved road has been well designed and constructed it has a life of approximately 20-25 years. Figures 1 and 2 show the deterioration of a theoretical road segment over time.

Figure 1
(Source: Road Surface Management Software,
Bob Strobel, University of New Hampshire Technology Transfer Center, December 2011)

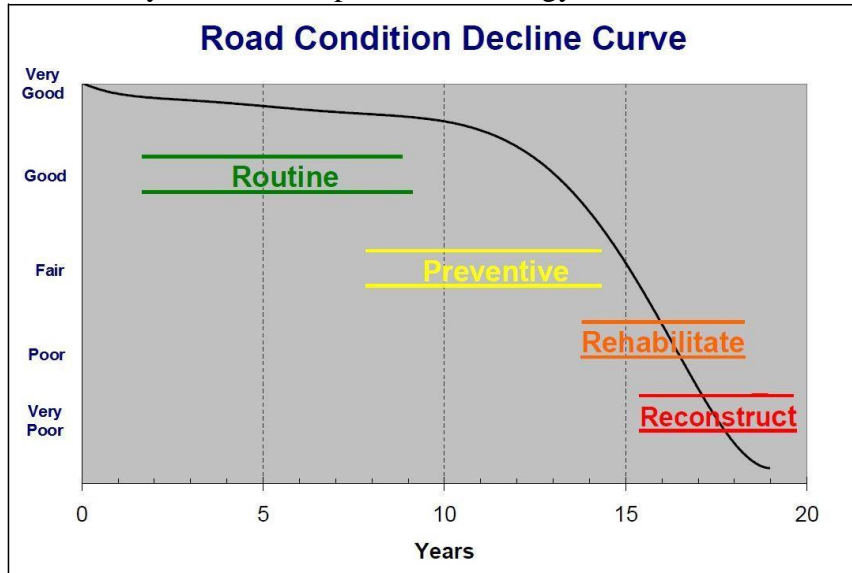
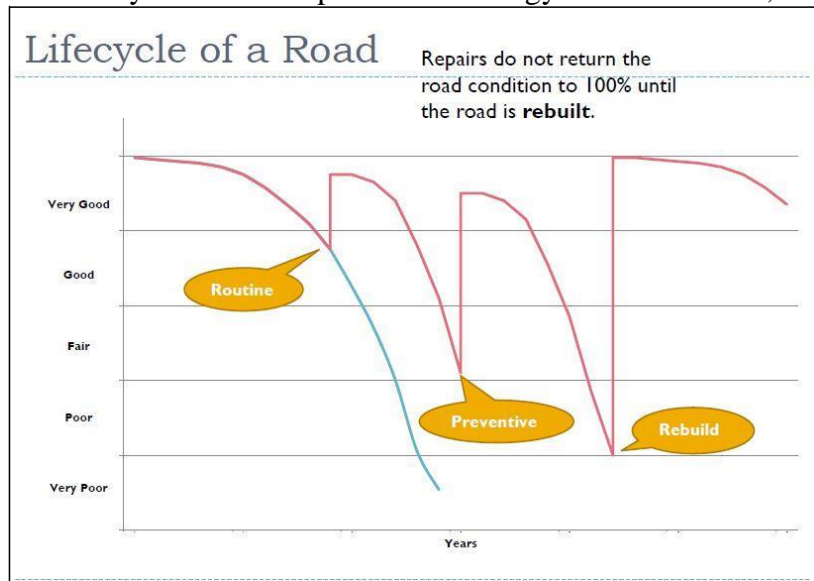


Figure 2
(Source: Road Surface Management Using PWS RSMS Software,
Bob Strobel, University of New Hampshire Technology Transfer Center, December 2011)



If the original construction of a road segment did not include adequate sub-base work, removal of ledge and rocks, crushed stone base, provision for adequate drainage including culverts and crown, then the life may be much shorter. Many of Chichester's oldest paved roads were created by simply laying asphalt on top of old dirt and gravel surfaces. For this reason, many miles of roads show considerable deterioration after only a few years.

For each of the town's road segments, Table 1 displays the suggested need for maintenance or repair as determined by the RSMS computation. This is based on surface observations only and does not take into consideration knowledge of what lies below the surface. The Committee then considered these results, traffic volume, segment importance to the town, and knowledge of subsurface conditions to prioritize which road segments most needed attention and what kind of work should be done. Specific recommendations for the years 2016-2017 are included in Section 6 of this report.

2.D: Use for Budgeting and Reporting

The RSMS software allows the Road Agent to record Highway Department expenses for maintenance and repair of each road segment. Over time, a history of work on each segment will be built up. This will allow recognition of deteriorating conditions as more maintenance is required from year to year. Until adoption of the RSMS system in 2012, the Department's records of the history of its work was spotty at best and often limited to the tenure of a particular Road Agent. Other than major rehabilitation and reconstruction projects, there was no allocation of maintenance costs to particular roadways.

The software also allows the Road Agent to build an operating budget based on projected maintenance costs of each road segment. The Road Agent has begun to use the system for this purpose and, with the Board of Selectmen, will be able to compare budgeted maintenance against actual costs, not just for the department as a whole, but for maintenance of each road segment.

Table 2 is an example page from a lengthy RSMS report that illustrates the entries for 2014-2015. This will assist the Highway Department plan, budget, and monitor its work. It will also assist the Budget Committee in annual budget preparation and the Board of Selectmen in budgeting and fiscal analysis. Table 2

Table 2

<u>Year From</u>	<u>To</u>	<u>Recommended Repair</u>	<u>Other</u>	<u>Budget</u>	<u>Actual</u>	
Garvin Hill Rd - 1 (Gravel)						
2015	Horse Corner Rd	End Garvin Hill Rd	Spot grading/blading	\$0	\$1,000	
2015			Culverts	clean culverts and basin	\$0	\$750
				\$0	\$1,750	
Granny Howe Rd - 1 (Gravel)						
2014	Main St	Epsom TL	Add gravel (up to 4")	\$0	\$121	
2015			Spot grading/blading	\$0	\$300	
				\$0	\$421	
Guernsey Ct - 1 (Paved)						
2014	Harvest Rd	End Guernsey Ct		Crack Seal	\$400	\$0
				\$400	\$0	
Harvest Rd - 1 (Paved)						
2014	King Rd	Guernsey Ct		Crack Seak	\$800	\$0
				\$800	\$0	
Harvest Rd - 2 (Paved)						
2014	Guernsey Ct	Holstein Ct		Crack Seal	\$800	\$0
				\$800	\$0	
Harvest Rd - 3 (Paved)						
2014	Holstein Ct	Loudon TL		Crack Seal	\$800	\$0
				\$800	\$0	
Higgins Rd - 1 (Paved)						
2015	Horse Corner Rd	Pembroke TL		overlay to horse corner	\$0	\$12,000
				\$0	\$12,000	
Hilliard Rd - 1 (Gravel)						
2014	Swiggey Brook Rd	End of Hilliard Rd	Spot grading/blading	\$1,600	\$1,467	
2014			Add gravel (up to 4")	\$0	\$303	
2015			Routine grading	\$0	\$800	
				\$1,600	\$2,570	
Hillview Dr - 1 (Paved)						
2014	Smith Sanborn Rd	Epsom TL		replacement of first	\$475	\$560
2014			Shim with 1" overlay		\$0	
				\$475	\$560	
Holstein Ct - 1 (Paved)						
2014	Harvest Rd	End Holstein Ct		Crack Seal	\$400	\$0
				\$400	\$0	
Horse Corner Rd - 1 (Paved)						
2015	Higgins Road	Pembroke town Line		road side mowing	\$0	\$0
				\$0	\$0	
Horse Corner Rd - 6 (Paved)						
2014	Dame Rd	Garvin Hill Rd	Reclaim pavement, revert to	\$147,000	\$147,000	
				\$147,000	\$147,000	
Horse Corner Rd - 9 (Paved)						
2014	#79 Horse corner	#125 Horse Corner		\$236,000	\$236,000	
				\$236,000	\$236,000	
Hutchinson Rd - 1 (Gravel)						
2014	Short Falls Rd	House #48		\$1,700	\$2,300	
2014				\$0	\$0	
2014				add spot gravels	\$0	\$871
2014				\$0	\$0	
2014			Add 12" gravel to base, 3" to	\$0	\$267	
2015				\$300	\$275	
2015			spot grading	\$0	\$0	
2015			4" reclaim to half of	\$2,387	\$2,560	
				\$4,387	\$6,273	
Hutchinson Rd - 2 (Paved)						
2015	House #48	House #91	Thin (3/4 - 1") overlay	\$6,992	\$23,288	
				\$6,992	\$23,288	

3. Reconstruction Projects Completed 2013-2015

The town began the 20 year plan to reconstruct paved roads that this committee first proposed in 2013. Table 3 contains the road segments that have been completed in the first three years of this plan.

Table 3

2013	
Segment	Length (miles)
Kelley Corner Road #3 & #4	0.401
Pleasant Street #2	0.450
Pleasant Street #4	0.390
Total	1.241
2014	
Segment	Length (miles)
Horse Corner Road #6	0.251
Horse Corner Road #9	0.463
Total	0.714
2015	
Segment	Length (miles)
Bear Hill Road #1	0.686
Pleasant Street #3	0.240
Total	0.926

4. Traffic on Chichester Roads

Traffic is an important consideration in planning and prioritizing major highway projects. The Committee has asked the Road Agent and the Central New Hampshire Regional Planning Commission to increase the number of traffic counts being conducted on town roads. During 2015 counters were placed at several locations in town.

Average daily traffic volume is an important measure for understanding how a road segment is being used. Simple counts have been collected for many years. Those allow the Committee to understand whether volume has been generally increasing, decreasing, or remaining constant. Table 3 displays the history of average daily traffic volume at different locations in town.

It is important to realize that counts can vary greatly from day to day and from season to season. The Committee has asked that counters be in place for a full 24 hours/7 days and that an average daily count be calculated. Even this averaging can be affected by singular events such as a major road race at Loudon Speedway, diversion of Route 4 traffic onto Horse Corner Road, and temporary problems on feeder roads. For this reason, sometimes subjective understanding leads one to ignore a particular count.

Table 4

History of traffic counts on Chichester road segments

All counts on this sheet are average vehicles per day

Road Name	Location of counter	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bailey Road	Horse Corner intersection												165		
Bailey Rd	Route 4 intersection	191			1,105		570						209	298	
Bailey Rd	At # 28 Bailey rd											58			
Bear Hill Rd	Loudon town line					539					454	650	458	411	418
Bear Hill Rd	Route 28 intersection				643	685	593					797		645	
Burnt Hill Road													76		
Canterbury Rd	Loudon town line	627				520					529		525		480
Canterbury Rd	Main St intersection									809		1,262	614		
Canterbury Rd	East of Center Rd										442				
Center Rd	Bear Hill Rd intersection										433			396	479
Center Rd	North of Main St	544	1,046		431	445						638			
Connemara Dr	Bailey Rd intersection											197			
Cross Rd	Route 4 intersection	149					165					146	215		
Cross Rd	Main St intersection														
Deer Meadow Road													367		
Depot St	At the bridge	462		590			420			501		993		480	
Fredwood Dr	Smith Sanborn Rd intersection											64			
Fredwood Dr	Highland Dr intersection											19			
Harvest Road													168		
Horse Corner Rd	Route 4 intersection	1,170				1,076				703	1,329	1,189			
Horse Corner Rd	Lane Rd intersection	937										1,060			
Horse Corner Rd	Above Lane Rd											592	906		
Horse Corner Rd	Staniels Rd intersection														
Horse Corner Rd	East of Bailey Road											955			616
Horse Corner Rd	Pembroke town line	784				937				1,230	1,130	1,212	1,126	1,146	1,447
Hutchinson Rd	Pembroke town line											238		220	252
Hutchinson Rd	Lane Rd Intersection	268					238				407				
Kelly's Comer Rd	Over Sanborn Brook	629		620			521			488			458		
King Rd	Loudon town line										1,165	1,072			1,467
King Rd	Route 4 intersection	1,140				531	978					1,164			1,210
King Rd	At # 26 King Rd										1,231				
Lane Rd	Horse Comer Rd intersection											1,350		480	
Lane Rd	Hutchinson Rd intersection											407			
Pleasant St.	Loudon town line												567		559
Pleasant St	Kelly's Comer Rd intersection	786			454	824	734				833	756	882	771	
Smith Sanborn Rd	Route 4 intersection		466		441	496	373				434	267		450	
Smith Sanborn Rd	Lane Rd Intersection		261								407				
Staniels Rd	Pembroke town line										262				
Staniels Rd	Horse Comer Rd intersection										241	603	209		
Swiggy Brook Rd	Over Perry Brook		200	240			240			237				210	
Webster Mills Rd	Route 28 Intersection				595		619				669		691		
Webster Mills Rd	Over Suncook River	520		550			600			606	676		560		619
State maintained roads in Chichester															
NH Route 28	North of Bear Hill Rd	13,564	13,845	13,895	14,000	13,975	13,800	13,269	13,263	13,678	13,307	13,137	13,180	13,291	
NH Route 28	Epsom town line			7,414											
NH Route 28	Pittsfield town line			26,233											
NH Route 28	South of Main St	9,725													
NH Route 28	North of Main St	16,106									26,096				
US Route 4	East of Chichester Rd	17,832	18,000	17,717	17,605	17,775	17,000	16,776	17,251	17,325	16,792	16,509	16,695	16,721	
US Route 4	Pembroke town line			24,000			22,000			17,954	15,000		14,000		
US Route 4	Weathervane restaurant		13,351												
US Route 4	Mason Rd intersection		13,175												
Main St	East of Canterbury Rd	6,400		7,000			7,100			8,111			6,700	6,499	
Main St	At Sander's Brook	6,200		6,600			9,000			7,422	6,500		6,000		
Main St	US Route 4 intersection		7,581								8,569				

The Committee has used five categories for summarizing traffic counts in RSMS.

Table 5

Traffic Category in RSMS	Average daily vehicle count
Low	0-199
Low-Medium	200-399
Medium	400-599
Medium-High	600-799
High	800 or more

Chichester has 5.1 miles of high traffic road segments, 5.9 miles of medium-high, 8.1 of medium, 6.1 of medium-low, and 13.1 of low traffic road segments.

The count of vehicles is not the only traffic measure that is important in considering road use. Type of traffic and speed are also important. Beginning in 2012, the Committee asked the Central New Hampshire Regional Planning Commission to collect data that includes vehicle type and speed. For example, over a full week in 2013 (May 29-June 4), the counter on Horse Corner Road north of the intersection with Lane Road recorded the following number of vehicles by type:

Table 6

Vehicle Type	Count
Motorcycles	419
Cars	3,641
Pickups and vans	1,492
Buses	32
3-6 axle trucks	255
Unable to determine	505
TOTAL	6,344

The speed of each vehicle in each direction was also recorded.

Table 7

Speed	Northbound	Southbound
0-20 mph	51	33
21-30 mph	1,370	1,076
31-40 mph	1,445	1,693
41-50 mph	318	330
51+ mph	20	8
TOTAL	3,204	3,140

These summary tables are provided only as examples. The raw data includes a count for each hour of each day by type, speed, and direction.

This is only the third year of Chichester’s collection of this more detailed information. The Committee expects it will be helpful in future years and will supplement the raw traffic counts in significant ways. The Committee also expects to conduct vehicle counts in 2016 on road segments for which even basic counts have not previously been made.

4. Two Year Plan: Recommended Projects and Budgets

To determine which of the 68 paved road segments in Chichester are most in need of reconstruction and major repair, the committee has taken three general factors into consideration in setting priorities among road segments (1) observable conditions, (2) road importance, and (3) traffic. Traffic includes not just a measure of average daily traffic volume, but also an understanding of the type of vehicles using the segment. Importance includes whether the road connects to other towns and whether poor conditions could impact public safety vehicles. As described above, the committee assesses seven observable conditions: rutting, potholes and patching, roughness, alligator cracking, edge cracking, transverse and longitudinal cracking, and roadside drainage. Each observable condition is rated for both severity and extent.

Combining the various factors is a mixture of science and art. Not everyone will agree with how to weigh traffic against current conditions, etc. Different people viewing the same information will create different sets of suggested priorities. That is why the committee believes it is important for a group of townspeople to review current information and recommend priorities. Seven individuals participated in the Committee’s process this year. The members represent different experiences and skills. Some have technical qualifications related to highway work or construction. As a group committee members have discussed many road segments and have come to the conclusion presented here.

The committee recommends that two paved road segments be reconstructed in 2016 and another two segments be reconstructed in 2017, one of which is not yet designated. The designated segments total 2.26 miles (of the town’s 24.5 miles of paved roads). The committee estimated that the Horse Corner Road project could be completed for \$439,000 in 2016 and the Bear Hill Road project for \$225,700 in 2017. As shown in Table 7, bids from potential contractors have already been received for those two projects showing a wide range of prices. The lowest bids for each designated project are \$298, 298 for 2016 and \$191,712 for 2017.

These numbers compare to the \$373,000 that was approved by voters for road reconstruction at Town Meeting in 2013. \$373,000 in 2014, and \$250,000 in 2015.

Table 8

2016			
Segment	Length (miles)	Estimated Cost	Range of Bids
Horse Corner Road #1 & #2	1.475	\$439,000	\$298,298 to \$515,920.
2017			
Segment	Length (miles)	Estimated Cost	Range of Bids
Bear Hill Road #2	0.789	\$225,700	\$191,712 to \$353,903
Undesignated segment	undesignated	undetermined	not yet bid

5.A: Recommended Project for 2016

Horse Corner Road – Segments 1 & 2

These segments contain the road surface between Higgins Road intersection and the Dame Farm Road. They total 7,010 feet (1.48) miles in length. The most recent traffic counts are over 1,000 vehicles per day. The road handles all types of large commercial vehicles and cars along with the occasional traffic detour from Route 4. Previous work that has been performed on this section of roadway includes ditching and patching with overlays in numerous years. Pothole repair and crack sealing have taken place where needed. The old culvert pipe dating back to the 1950s has all been replaced in anticipation of reconstruction.

Because Horse Corner Road is 2.6 miles in length and annual budgets are limited, it has been approached as a multi-year project. Some segments were completed last year. Two smaller segments remain after this project is completed.

The roadway survey which was taken in the fall of 2014 showed that these segments of roadway were badly deteriorated. Rutting of the roadway surface (collapsing of the base due to water infiltration/poor soils), cracking (material failure) and pot holes account for the majority of distresses. Medium sized rocks have begun to show through the asphalt surface as well as ledge and even the culverts themselves. The inclusion of these road segments for immediate reconstruction is based on their importance, the high volume of daily traffic they receive, and their poor condition. In addition, this will complete the needed reconstruction on nearly all of Horse Corner Road.

Work assigned:

The work to be performed will include but not be limited to removal of ledge (to a level so that proper base material can be added) and removal of the existing hot top by means of grinding. These grinding materials will be incorporated into the sub base and a Geo textile membrane will be laid. (This increases the ability of a poor sub base to hold a load). A new 4" crushed gravel layer will be installed and compacted. Pavement will then be placed for the entire section, ditch lines will be restored, driveways and intersections (both paved and gravel) will be blended.

The 400 feet of this segment ending at Higgins Road was rebuilt by the state of New Hampshire in 1986 while building the Route 393 project. This is why the committee recommends less work, only grinding and resurfacing this sub-section.

Estimated cost using measurements and computer formula: \$439,000.

Bids received in November 2015 range from \$298,298 to \$515,920.

Table 9

Road Name:	Horse Corner Road #1 & #2				
Project starting point:	Higgins Road				
Project ending point:	Dame Farm Road				
Work Last Done:	Paved	Shim	Seal	Other	(Circle one)
If 'Other', describe:					
Year work was done:					
Length to be repaired, upgraded or	ft.	7,010			
Width of road base	ft.	22			
Thickness of base pavement:	in.	2.00			
Thickness of finish pavement:	in.	1.00			
Tons of pavement (Base):		1,928			
Tons of pavement (Finish):		964			
Asphalt Cost per ton (Base):	estimate	\$75.00			
Asphalt Cost per ton (Finish):	estimate	\$77.00			
Total cost for paving:					\$218,799.63
		Qty	Cost Per	Cost	
Number of intersections:				\$0.00	
Number of gravel drives:		20	\$125.00	\$2,500.00	
Number of paved drives:		22	\$175.00	\$3,850.00	
Grind/replace sub-base:	sq yds	17,136	\$1.85	\$31,700.78	
Culverts				\$0.00	
Driveway:	ft.		\$7.00	\$0.00	
Road:	ft.		\$8.00	\$0.00	
Headwalls Driveway and Road	Cy				
Ditching:	ft.		\$3.25	\$0.00	
Ditch re-seeding:	SqYrd		\$1.75	\$0.00	
Shoulder leveling:	ft.	14,020	\$0.57	\$7,991.40	
Underdrain:	ft.		\$18.75	\$0.00	
Gravel for subbase upgrades:	ton		\$4.27	\$0.00	
Gravel base upgrades:	ton	8,568	\$16.50	\$141,368.33	
Comspans:	per			\$0.00	
Box Culverts:	sqft.		\$150.00	\$0.00	
Guard rails:	ft.		\$50.00	\$0.00	
Equipment rental:	per wk.			\$0.00	
Geotextile fabric n/n woven):	SqYrd	17,136	\$1.90	\$32,557.56	
Blasting/Hammer :	per hr.		\$200.00	\$0.00	
Total Project Cost (Today)					\$438,767.69

5.B: Recommended Projects for 2017

1. Bear Hill Road – Segment 2

This section contains the road surface between, mail box #66 and Ferrin Road. This section of roadway is approximately 4,050 feet long. In many spots the saturated sub base has lost integrity. Along this stretch numerous springs and ledge outcroppings weep water and lead to many of the problems. This section of Bear Hill Handles 650+ cars per day and is one of the busiest roads in town. The previous work that has been performed on this section of roadway includes an overlay in 1997, culvert repair and shimming, pothole repair and patching.

The roadway survey which was taken in the fall of 2011 showed that this section of roadway was starting to deteriorate with rutting (collapsing of the base due to water infiltration/poor soils), cracking (material failure), and pot holes (ledge under the roadway base). This section was at the higher end of the survey spectrum for poor drainage. The inclusion of this road segment for reconstruction is based on the importance of this road, the high volume of daily traffic it receives, and the poor condition of this section of roadway.

Work assigned:

The Work to be performed would include but not be limited to, 1,500ft of ditch line establishment, removal of ledge (to a level so that proper base material can be added), regrading of the ledge cut for improved sight distance, raising of catch basins, removal of the existing hot top by means of grinding. These grinding materials shall be incorporated into the sub base and a Geogrid membrane will be laid. (This increases the ability of a poor sub-base to hold a load). A new 4"crushed gravel layer will be installed, and compacted. Pavement will then be placed for the entire road segment. Both paved and gravel driveways will be blended in

Estimated cost using measurements and computer formula: \$225,700

Bids received in November 2015 range from \$191,712 to \$353,903.

2. Undetermined Segment

A paved road segment to be designated in next year's Road Advisory Committee plan that will bring the total for 2017 to approximately 1.2 mile.

Table 10

Road Name:		Bear Hill Road #2			
Project starting point:		#66 Bear Hill Road			
Project ending point:		Ferrin Road			
Work Last Done:	Paved	Shim	Seal	Other	(Circle one)
If 'Other', describe:		1997			
Year work was done:					
Length to be repaired, upgraded or	ft.	4,050			
Width of road base	ft.	22			
Thickness of base pavement:	in.	2.00			
Thickness of finish pavement:	in.	1.00			
Tons of pavement (Base):		1,114			
Tons of pavement (Finish):		557			
Asphalt Cost per ton (Base):	estimate	\$75.00			
Asphalt Cost per ton (Finish):	estimate	\$77.00			
Total cost for paving:					\$126,410.63
		Qty	Cost Per	Cost	
Number of intersections:		2		\$700.00	
Number of gravel drives:		2	\$125.00	\$250.00	
Number of paved drives:		5	\$175.00	\$875.00	
Grind/replace sub-base:	sq yds	9,900	\$1.75	\$17,325.00	
Culverts				\$0.00	
Driveway:	ft.		\$14.00	\$0.00	
Road:	ft.		\$14.00	\$0.00	
Headwalls Driveway and Road	Cy				
Ditching:	ft.	1,500	\$3.25	\$4,875.00	
Ditch re-seeding:	SqYrd		\$1.75	\$0.00	
Shoulder leveling:	ft.	8,100	\$0.57	\$4,617.00	
Underdrain:	ft.		\$18.75	\$0.00	
Gravel for subbase upgrades:	ton	400	\$12.00	\$4,800.00	
Gravel base upgrades:	cuyrds	2,730	\$16.00	\$43,680.00	
Comspans:	per			\$0.00	
Box Culverts:	sqft.		\$150.00	\$0.00	
Guard rails:	ft.			\$0.00	
Equipment rental:		2	\$700.00	\$1,400.00	
Geotextile fabric nn woven):	SqYrd	9,900	\$1.45	\$14,355.00	
Blasting/Hammer :	per hr.	32	\$200.00	\$6,400.00	
Total Project Cost (Today)					\$225,687.63

6. Long Range Planning

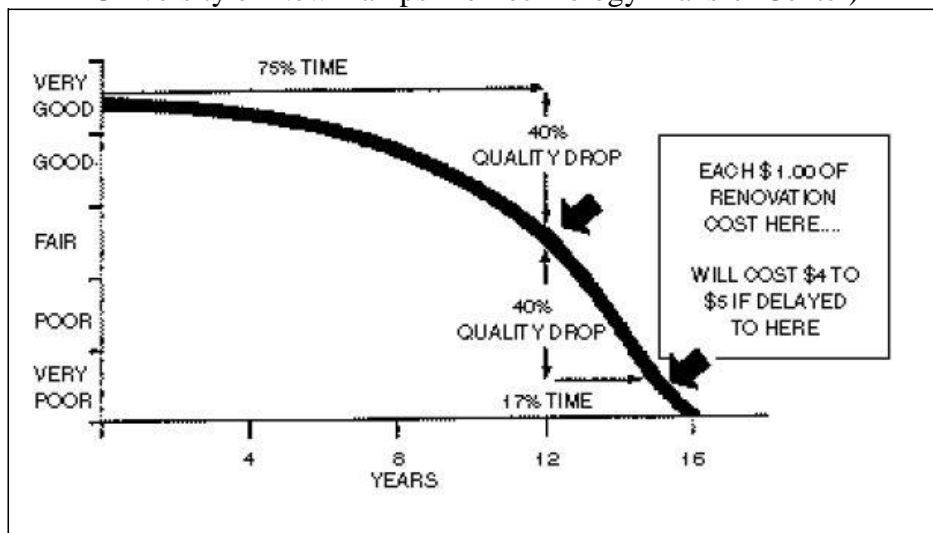
6.A: Lifespan of a Road and Its Maintenance

The Committee estimates that the average life span of a paved road in Chichester is 20 years. This estimate is based on input from the Maine Local Roads Center, the developer of the Road Surface Management System (RSMS), and other sources, including committee members own experiences, Factors used in developing the average life span included traffic volume, types of traffic, drainage of water, and structure of the road. The lifespan of some paved roads may exceed 20 years while others may be less depending on these characteristics. The Committee emphasizes that 20 years is the average, not a prediction of the lifespan of any given road.

In order for a road to attain the average 20 year lifespan, there is a need for regular maintenance and repair. This will include crack sealing, pothole patching, culvert replacement, repaving of limited sections, and other work. Without this regular maintenance, the average lifespan may be much less than 20 years. Figure 3 (see below) shows how the condition of a road deteriorates over time and how early intervention and rehabilitation can cost less and extend the life of a road. The Committee supports the strategy of annual maintenance on the paved roads. However, maintenance activities are outside the purview of the Committee. Unfortunately, many paved roads in Chichester are already beyond the state where simple maintenance will be cost effective.

The goal of this Committee is to bring all the roads in town to an average or better condition and keep them in this condition for the average 20 year life span. To do this the town will need to reconstruct 1.2 miles of paved roads every year.

Figure 3
 (Source: Road Surface Management System Workshop Notebook and Reference, University of New Hampshire Technology Transfer Center)



6.B: Recommendations for 2018-2032

The committee’s plan to reconstruct approximately 1.2 miles of paved roads per year was accepted at the 2013, 2014, and 2015 town meetings. Approximately 1.24 miles of roads were successfully reconstructed during 2013, 0.71 miles in 2014 and 0.93 miles in 2015. This has been less than the needed 1.2 miles per year.

Section 5 of this document contains the specific recommendations for additional miles to be completed over the next two years (2016 and 2017).

If our recommendations are accepted, the town will have successfully reconstructed a little more than 5.1 miles of paved roads by the end of 2017. This will leave approximately 19.4 miles of paved roads to be considered in the next 15 years (2018 – 2032) to complete a 20 year cycle. This is approximately 1.3 miles per year.

The Committee does not yet propose any specific road segments for these later years. The Road Agent and the Committee will use the scientific criteria of RSMS and onsite evaluation to identify the roads that need major improvements to keep them in average or better condition over their 20 year average life span. Regardless of which remaining segments are assessed to be most in need of work beginning in 2018, the principle remains that an average of 1.2 miles must be reconstructed per year in order to continue to improve the condition of all the paved roads in Chichester.

While the committee is not making specific recommendations at this time, the following paved road segments will be considered strongly for reconstruction in 2018 and 2019:

Horse Corner Road – segment 8

Bear Hill Road – segments 5, 6, 7

Kelley Corner Road – segments 1 and 2

Of course this is subject to change as every year we re-evaluate all roads and possible projects. Road conditions change and priorities must also inevitably change to meet the new realities.

The Committee has estimated an approximate annual cost of \$375,000 to reconstruct 1.2 miles of paved road. The Committee also feels that an inflation factor of 3% per year should be added for budgeting purposes.