

ASSET MANAGEMENT PLAN FOR STREET NETWORK



April 2024

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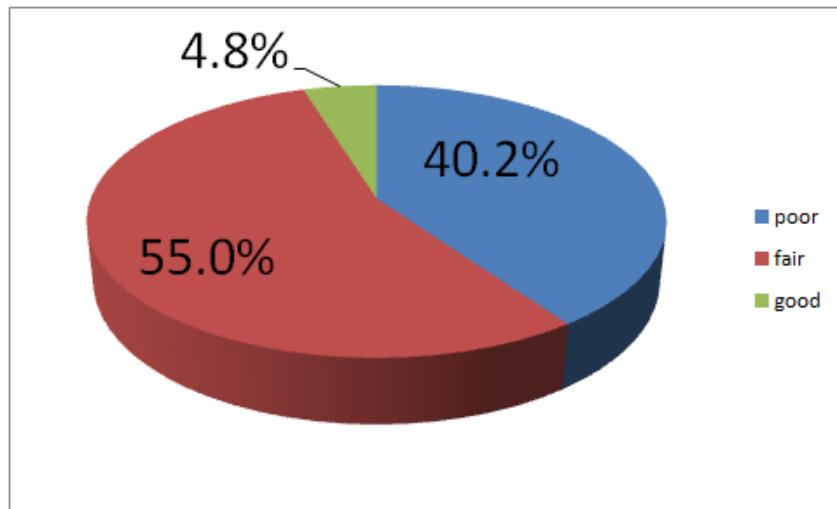
Executive Summary

The City of Montrose has completed an asset management plan for the streets throughout the city. The City of Montrose has a total of 8.84 miles of roadway. Ratings were completed in Spring of 2024. The purpose of this analysis is to provide the city with a tool for planning future street improvements; the asset management plan will provide a guide for city officials to select the right treatment at the right time, maximizing the life of the street system.

Ratings were completed using the Pavement Surface Evaluation and Rating (PASER) scale for each pavement type. The PASER system is a visual survey method for evaluating the condition of streets. It was adopted by Michigan's Transportation Asset Management Council (TAMC) as an efficient and consistent method for evaluating the street condition. Streets are rated on a scale of 1-10, with 10 being the highest rating based on the surface conditions. A definition of the rating scale is included in the report. City DPW employees received PASER training in the winter of 2020 through the Center for Technology and Training (CTT) at Michigan Technology University.

The analysis for city streets shows currently 4.8% percent (0.40 mile) are in good condition (rating 8- 10); 55 percent (4.64 miles) of the streets are in fair condition (rating 5-7); and 40.2 percent of the streets (3.43 miles) are in poor condition (rating 1-4). A breakdown of the condition of the streets can be seen in the chart below.

Chart 1:
Percentage of Streets in Poor, Fair, and Good Condition, 2020



If there is no action taken to maintain these roadways, they will continue to deteriorate until 100 percent of the roadways are in poor condition by year 2038, as shown in the following chart.

Chart 2:**Percentage of Good, Fair, Poor Streets in Year 2038; Do Nothing Scenario**

A model was developed to analyze various investment levels and the impact to the overall street network for a 20-year period. The charts below summarize the results of a \$150,000, \$300.000, and \$450,000 annual investments.

An annual investment of \$150,000 will result in a 16 percent increase in the overall average condition of the street network, compared to the do nothing scenario over 20 years with an average rating of 2. A \$300,000 annual contribution improves the street condition by 34 percent, compared to the do nothing scenario over 20 years with an average rating of 3. By increasing the annual investment to \$450,000. the result is an overall increase of 80 percent as compared to the do nothing scenario over 20 years.

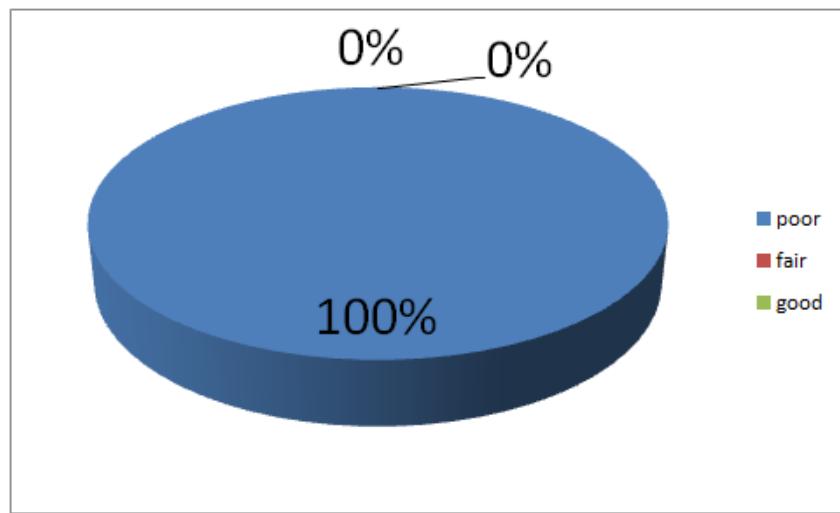
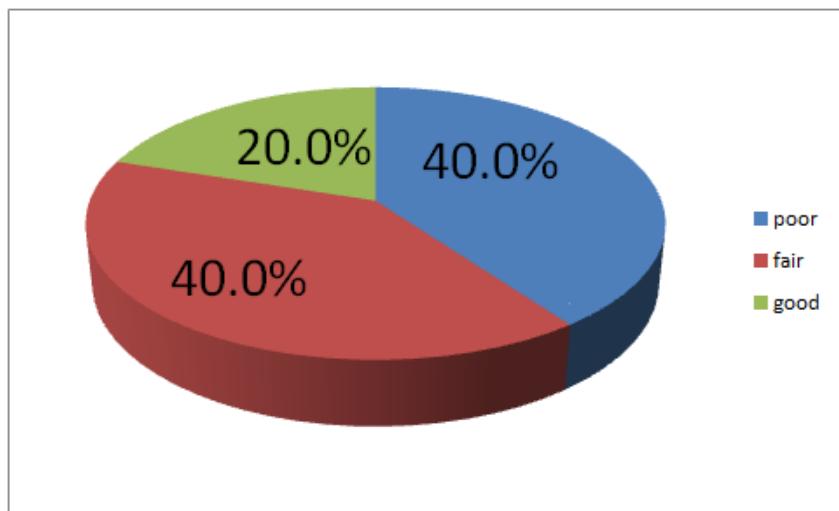
**Chart 3:****Percentage of Good, Fair, Poor Streets in Year 2038; \$150,000 Spent Annually**

Chart 4:
Percentage of Good, Fair, Poor Streets in Year 2038; \$300,000 Spent Annually

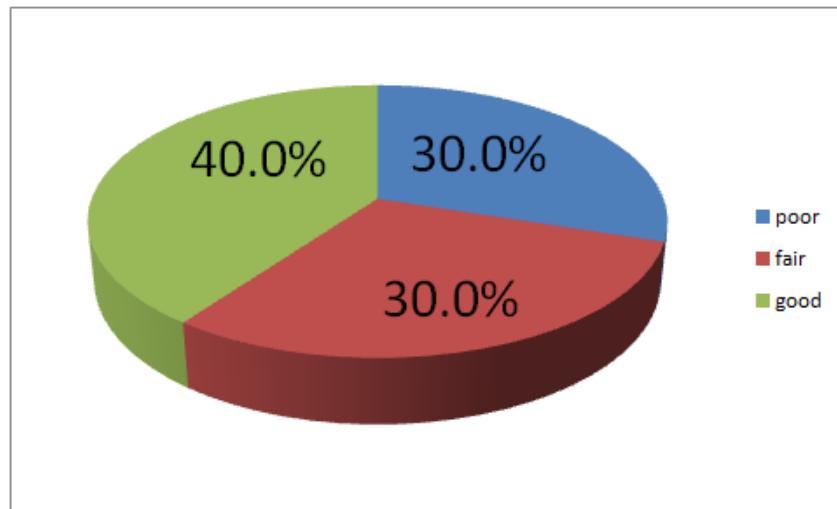
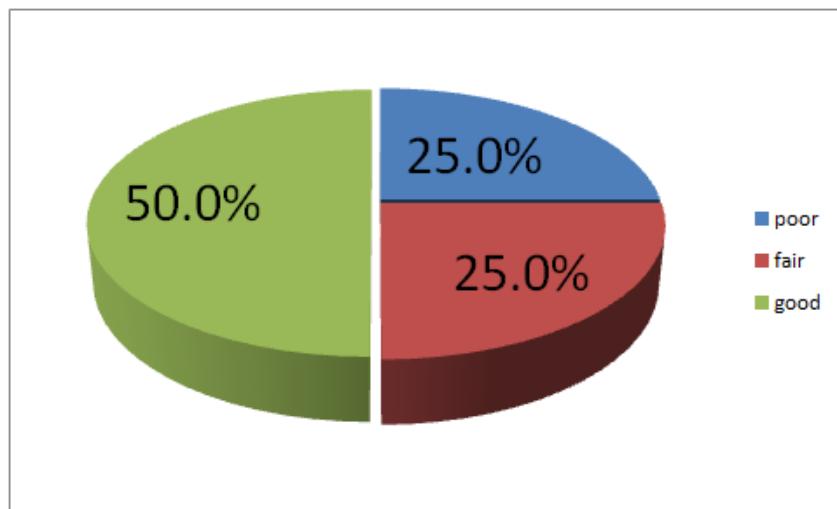


Chart 5:
Percentage of Good, Fair, Poor Streets in Year 2038; \$450,000 Spent Annually



The results of the scenarios optimized show that the optimal dollar amount to be spent maintaining streets is approximately \$450,000 annually. This will maintain the roadways at an average level of service of 7, which is considered in good condition.

Street Inventory

The analysis included rating 8.49 miles of streets. Ratings were completed in April of 2020. The purpose of this analysis is to provide the city with a tool to assist in planning for future road projects and maintenance that will provide fair to good streets throughout the city. There are .48 miles of roadway eligible for federal funding. The work completed on the federal eligible roads is typically split with 80 percent of the costs paid for with federal funding and a 20 percent city match.

STP-Rural and TEDF Category D money can only be spent on "construction costs" and "contingencies" for highway projects. Right-of-way (ROW), construction engineering (CE), and preliminary engineering (PE) costs are a local responsibility. STP-Rural funded projects require at least a 20 percent non-federal match.

Roads eligible for TEDF Category D money must be classified as rural primary or higher. If a road is not, application must be made to MDOT and the classification changed before TEDF Category D money can be used to improve the road. The road also must be designated as a "D" route by the Rural Task Force. TEDF-Category D projects must be funded with at least 20 percent of the cost coming from a non-TEDF source.

Currently, the city has 8.47 miles of asphalt paved streets; 0 miles of concrete paved streets; .33 miles of gravel streets; and 0.03 mile of undefined roadway. Each type of pavement deteriorates differently and requires different maintenance techniques. The rating for each surface type differs based on the condition of the roadway when observed in the field. The gravel and undefined roads were not rated but indicated as such for the overall roadway framework.

Ratings were completed using the Pavement Surface Evaluation and Rating (PASER) scale for each pavement type. The PASER system is a visual survey method for evaluating the condition of streets. It was adopted by Michigan's Transportation Asset Management Council (TAMC) as an efficient and consistent method for evaluating the street condition. Listed below is the scale for each pavement type.

PASER Ratings and Definitions

<u>Asphalt Rating</u>	<u>Description and Treatment</u>
9 & 10	Newly constructed or recently overlaid streets are in excellent condition. Recommendations: No maintenance required.
8	This category includes streets which have been recently sealcoated or overlaid with new cold mix. It also includes recently constructed or overlaid streets, which may show longitudinal or transverse cracks. All cracks are tight or sealed. Recommendations: little or no maintenance required.
7	Streets show first signs of aging and they may have very slight raveling. Any longitudinal cracks are along paving joint. Transverse cracks may be approximately 10 feet or more apart. All cracks are $\frac{1}{4}$ -inch or less, with little or no crack erosion. There are few, if any, patches all in very good condition. Recommendations: maintain a crack sealing program.

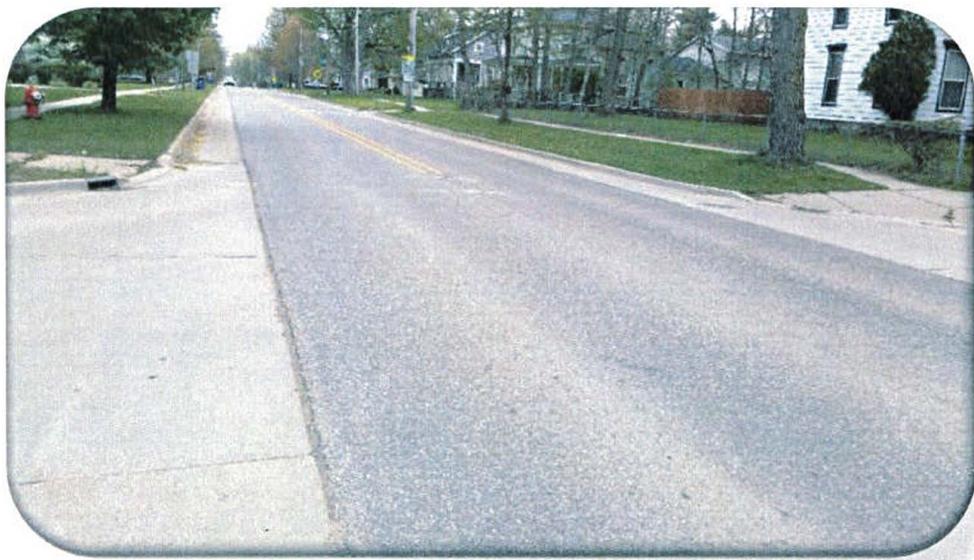


Figure 1:
An Example of a Street with a Rating of 7

6

Streets are in sound structural condition but show definite signs of aging. Sealcoating could extend their useful life. There may be slight surface raveling. Transverse cracks can be frequent, less than 10 feet apart. Cracks may be $\frac{1}{4}$ -inch to $\frac{1}{2}$ -inch and sealed or open. Pavement is generally sound, adjacent to cracks. First signs of block cracking may be evident. Pavement may have slight or moderate bleeding or polishing. Patches are in good condition. **Recommendations:** consider preservation treatment.



Figure 2:
An Example of a Roadway with a Rating of 6

5 Streets are still in good structural condition, but clearly need sealcoating or overlay. They may have moderate to severe surface raveling with significant loss of aggregate. First signs of longitudinal cracks near the edge. The pavement has first signs of raveling along cracks. Block cracking up to 50 percent of surface. The pavement surface has extensive to severe flushing or polishing. Any patches or edge wedges are in good condition. **Recommendations: preservation maintenance treatment required.**

4 Streets show first signs of needing strengthening by overlay. They have very severe surface raveling, which should no longer be sealed. The pavement will have the first longitudinal cracking in wheel path. The surface will have many transverse cracks and some may be raveling slightly. Over 50 percent of the surface may have block cracking. Patches are in fair condition. They may have rutting $\frac{1}{2}$ -inch deep or less, or slight distortion. **Recommendations: structural improvement required.**

3 Streets must be strengthened with a structural overlay (2-inch or more). The pavement will benefit from milling and very likely will require pavement patching and repair beforehand. Cracking will likely be extensive. Raveling and erosion in cracks may be common. Surface may have severe block cracking and show first signs of alligator cracking. Patches are in fair to poor condition. There is moderate distortion or rutting (more than $\frac{1}{2}$ -inch and less than 2 inches in depth), and occasional potholes. **Recommendations: structural improvement required.**

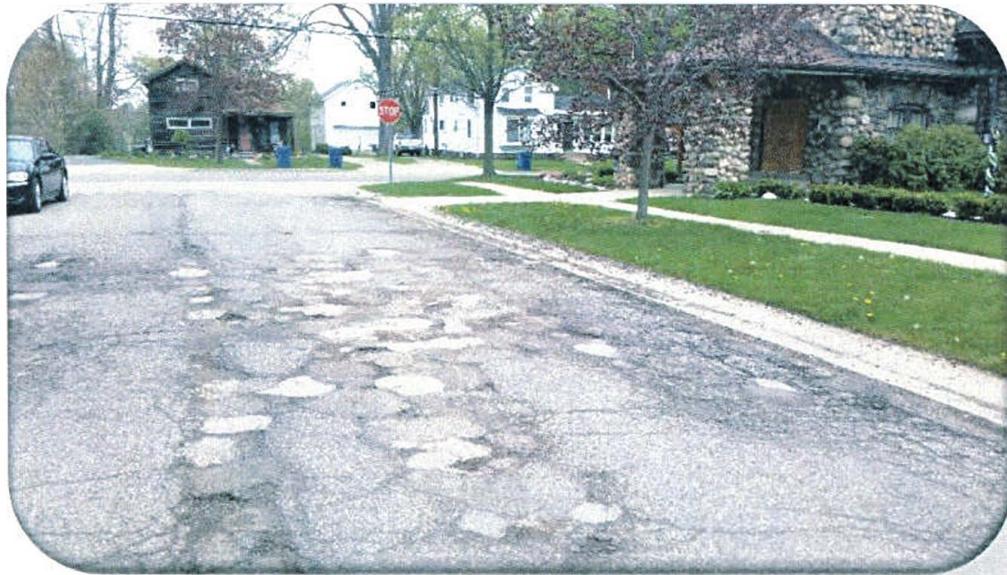


Figure 3:
An Example of a Roadway with a Rating of 2

2 Streets are severely deteriorated and need reconstruction. Surface pulverization and additional base may be cost-effective. These streets have more than 25 percent alligator cracking, distortion or rutting 2 inches or more in depth, as well as potholes or extensive patches in poor condition. **Recommendations: reconstruction required.**

1 Streets have failed, showing severe distress and extensive loss of surface integrity.
Recommendations: reconstruction required.

Concrete

Rating **Description and Treatment**

9 & 10	New pavement or recent concrete rehabilitation. Pavement is in excellent condition. Recommendations: no maintenance required.
8	More surface wear, or slight defects showing in lanes. Surface shows pop-outs, slight surface scaling, partial loss of joint sealant, or isolated meander crack. Isolated manhole distress. Recommendations: little or no maintenance required.
7	First signs of transverse cracking, patching or repair; more extensive pop-outs or scaling; some manhole displacement, isolated heave or settlement. Recommendations: may need some sealing or routine maintenance.
6	First signs of corner cracking or shallow reinforcement. More frequent transverse cracks. Open ($\frac{1}{4}$ -inch) joints and cracks and moderate scaling. Joint and crack sealing needed.
5	First signs of joint or crack spalling, or faulting. Surface has multiple cracking at corners with broken pieces. Patching is in fair condition. Surface texturing repairs may be necessary. Some partial depth patching and joint repairs may be needed. Recommendations: partial depth patching and joint repairs may be needed.
4	Severe surface distress requires asphalt overlay or extensive surface texturing. Multiple transverse cracks with appalling and broken pieces. Pavement has corner cracking with potholes or patches and blowups. Recommendations: some full depth joint or crack repair required.

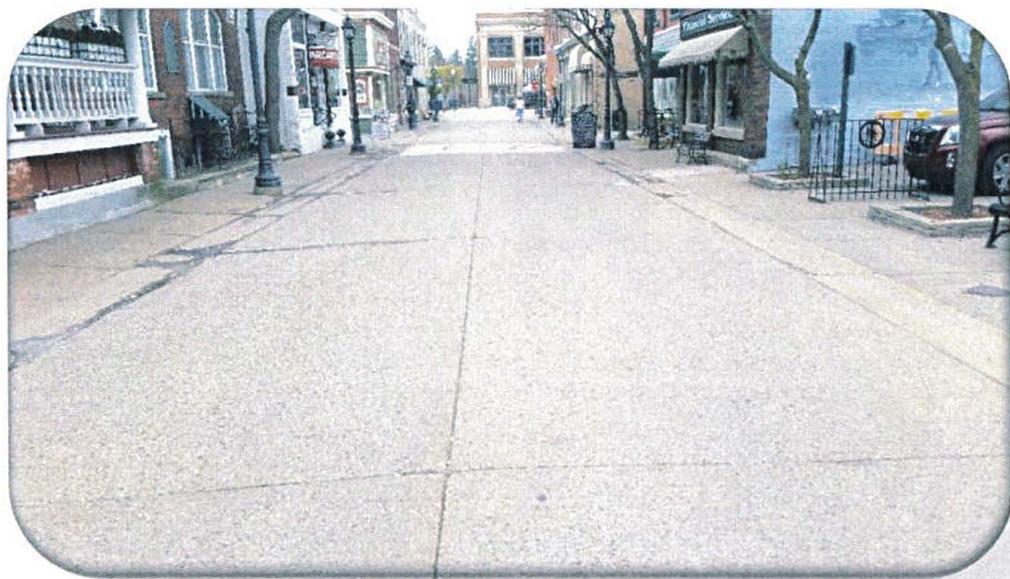


Figure 4:
An Example of a Roadway with a Rating of 4

3 Most joints and cracks are open (1-inch), spalled or patched. D-cracking is evident. Severe (1-inch) faulting. **Recommendations:** **extensive full depth patching required plus some full slab replacement.**

1 & 2 Pavement failure. **Recommendations:** **requires reconstruction.**

Pavement Treatments and Definitions

There are several roadway treatments which are proposed as a part of the City of Montrose asset management program. A description of these treatments is given below. This Pavement Management System should be considered a working document and updates made every five years to reflect changes in the treatments used by the City of Montrose.

Asphalt Treatments

A. Preventative Maintenance

a. Crack Sealing

Application of rubberized asphalt material to all longitudinal and transverse cracks to prevent water from seeping into the roadway base.



Figure 5:
An Example of a Roadway Treated with Crack Sealing

b. Slurry and Chip Seal

Thin application of emulsified aggregate across entire roadway. Application breaks down very top of asphalt surface and replaces fine aggregate, which may have worn out. Effective for sealing cracks in roadway but does not increase structural capacity of roadway.

c. Microsurfacing

Application of a $\frac{3}{4}$ -inch thick asphalt pavement over the existing surface. It is recommended that this treatment be applied after the application of crack sealing to better

prevent the reflective cracking from the existing surface to the top of the new surface. This treatment works best on low volume streets.

B. Preservation

a. Mill and Resurface

Milling off a portion (usually between 2 and 3 inches) of the roadway's deteriorated asphalt pavement surface and then resurfacing the roadway with the same or greater thickness of asphalt pavement due to structural requirements. A mill and resurface project generally provides between 10 to 15 years of serviceable life if crack sealing operations are continued.



Figure 6:
An Example of a Roadway Being Treated with a Mill and Resurface

b. Major Repair/Resurface

This is essentially one step beyond a mill and resurface project. Significant areas of pavement failure are removed and replaced. Underdrain can be added to provide enhanced drainage. Once the pavement and base are repaired in the bad areas, the entire pavement is milled and resurfaced as above. Typically, the reason these projects are necessary is that the roadway base is deteriorated in some areas. Because of this deterioration, the expected life for a fix of this nature is also between 10 and 15 years if crack sealing operations are continued.

C. Reconstruction

a. Reconstruction

Reconstruction is as it implies; a complete removal and replacement of the existing pavement and base along with the base drainage system. Because the drainage system

must be replaced, the curb and gutter must also be replaced in most situations. This goes back to having a new street and the expected life of this street varies widely due to design and pavement maintenance programs.



Figure 7:
An Example of a Roadway Being Reconstructed

Lifespan of an Asphalt Pavement

Asphalt pavement has proven over the years to be a successful alternative to concrete pavement due to its adaptability to its surroundings, its relative ease of construction and its cost advantages for both new construction and for maintenance. The figure below shows the lifecycle of asphalt pavement.

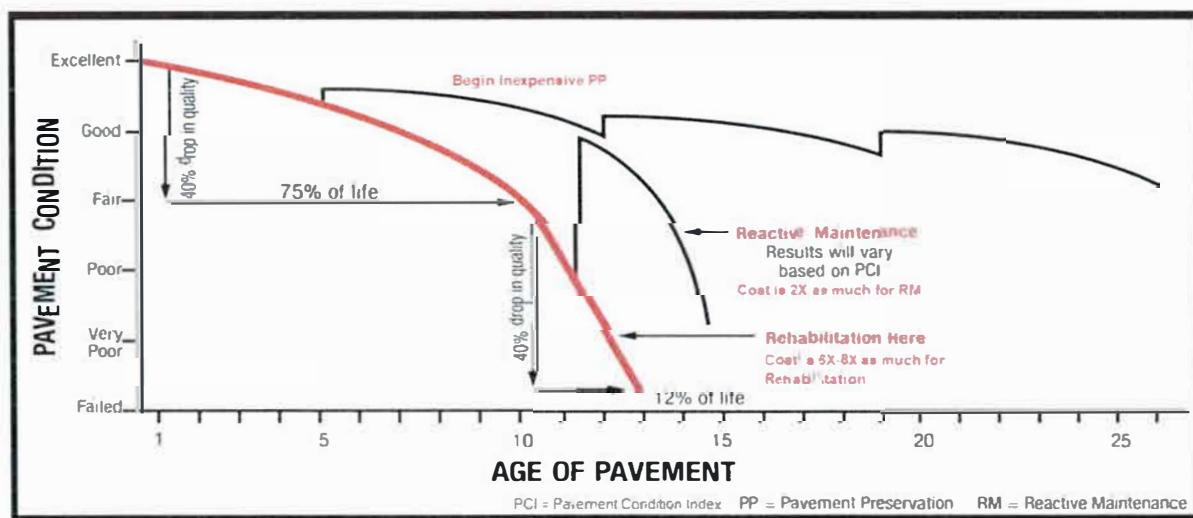


Figure 8:
Pavement Life Cycle

Asphalt pavements are typically designed for a 10- to 20-year design life. This life can be extended through regular pavement maintenance operations; however, the pavement will eventually require major reconstruction which is referred to as rehabilitation in the chart above.

In Figure 8, the red line depicts the deterioration of asphalt pavement over time if no preventative maintenance occurs in the lifetime of the pavement. The top black line depicts how inexpensive pavement preservation methods, such as crack sealing and slurry seals, can help to extend the life of the pavement with less expense. The pavement will continue to deteriorate over time but at a much slower rate.

The lower black line shows the point where a pavement has not had a routine pavement preservation completed and reaches a point where a more costly treatment is necessary. This is considered reactive maintenance. Reactive maintenance refers to waiting until the pavement is at a point where structural improvements are required and a slurry seal or microsurface treatment is more appropriate. This cost

is twice as much as the pavement preservation and does not extend the life of the pavement the way a planned pavement preservation treatment will. The length of time before another treatment is needed will depend on the condition of the pavement when the first treatment is applied and if underlying problems exist.

If no preventative maintenance treatments are applied, then the pavement will get to the point where a costly rehabilitation treatment is necessary, such as a mill and resurface treatments with full depth pavement repairs or total reconstruction of the roadway. Every roadway will eventually reach the point where one of these treatments is needed, but the cost is 6 to 8 times the cost of doing routine pavement preservation, and performing routine preventative maintenance will help to delay deterioration of the pavement.

To illustrate this point, the following describes the normal deterioration of asphalt pavement with routine maintenance.

1. New Pavement

For the first five years of the asphalt pavement's life, the surface is in excellent to good condition. For the most part, the flexibility of the pavement will allow it to self-seal most cracks so that additional crack sealing operations required will be minimal. Close monitoring of the pavement during this phase will also show any structural deficiencies based on additional traffic not originally intended for this street, and/or subgrade problems not noticed during construction. If additional structural capacity is required at this point, corrections can be made with minimal cost.

2. 5 Years

At five years' time, normal crack sealing operations should begin. The intent is to seal the surface so that water cannot enter the pavement base. A slurry seal or chip seal treatment can also be applied at this time in order to seal smaller cracks. Ground water and/or water entering the grade from the back of curb can be handled by the base drainage provided during construction. Fine material contamination of the road base, the process of sand and clay rising up into the voids in the aggregate base, will be minimized.

3. 10 to 25 Years

Normal crack sealing operations should be continued every 5 years, dependent on the deterioration of surface cracks, and should alleviate most of the problems for the next 15 to 20 years. Over this period, the major street deterioration should be seen on the surface itself. The constant pounding of traffic will eventually degrade the surface; however, the pavement structural capacity should remain intact. Because of this and the deterioration of the surface, normal crack sealing operations may not be sufficient to seal the pavement surface and microsurfacing should be considered. Due to the fact that the roadway base has been protected to this point and beyond, this microsurface should provide approximately five to ten years of additional serviceable life, provided the crack sealing operations continue.

4. 25 to 35 Years

It is impossible to completely prevent the degradation of the roadway base and the deterioration of the asphalt pavement itself, though the roadway base degradation can be constrained to point locations. Because of this, at approximately 35 years, the city should expect that the asphalt pavement will have deteriorated considerably so that it no longer provides the required structural capacity. This, coupled with gradual settling and increased traffic volume, will require some sort

of structural upgrade. At this point, the city has the option of upgrading the cross section of the roadway due to traffic requirements and would do a complete reconstruction. If the pavement width is adequate, the city could consider a milling and resurfacing project to increase the structural capacity. Most resurfacing projects are designed, again, for a 10- to 15-year life, which takes us well beyond the 40-year life analyzed.

Pavement Analysis

A roadway inventory was completed on all City of Montrose streets. The results of this assessment can be found in Appendix A and a map of all the ratings completed can be found in Appendix C. Currently 4.8 percent (0.4 mile) are in good condition (rating 8-10); 54.7 percent (4.64 miles) of the streets are in fair condition (rating 5-7); and 40.5 percent of the streets (.11 miles) are in poor condition (rating 1-4). With this level of degradation in the street system, multiple scenarios are possible for funding roadway reconstruction, rehabilitation, and preventative maintenance.

As a part of the PASER pavement evaluation, a pavement management analysis tool was created that will allow the city to more easily budget necessary resources, reducing expenditures for immediate need and emergency situations. This analysis takes a look at the condition of each street and assigns recommendations and costs to rehabilitate each street segment. In the chart below, the cost per square yard for each treatment is listed. These costs are based on current costs for projects of each type. The routine crack seal, slurry seal, and microsurfacing are based on material and application costs. The mill and resurface and reconstruct costs include preliminary engineering, bidding, construction, and construction engineering. The per square yard cost for a reconstruction does not include water main or sanitary sewer work but does include storm sewer work. A full list of all roadway ratings, treatments and costs can be found in Appendix B.

Routine Crack Seal	\$2/Syd
Slurry Seal	\$5/Syd
Microsurfacing	\$25/Syd
Mill/Resurface	\$60/Syd
Reconstruct	\$85/Syd

Chart 6:
Treatment Cost per Square Yard

The streets were rated and a proposed maintenance treatment plan and corresponding cost were assigned. An annual 3 percent rate of inflation was utilized. Currently, the average rating for streets is a 5, which is considered fair. The streets were also evaluated in the Roadsoft software to determine a funding amount that will lead to an average rating of 7 for all streets over the next 20 years.

Conclusion

The 2022 PASER ratings for the city streets were an average rating of 5, which is fair condition. Moving forward, it is recommended that a method for funding be determined for city street maintenance that will provide annual monies to perform roadway maintenance that raises the average street rating to good condition.

There are limited means by which a community can fund street maintenance projects for local streets. They can assign a special assessment district on a project-by-project basis, or they can try to pass a street millage to generate an annual allocation for roadwork. From time to time, grants may come available for local roadway work. As these types of funding sources present themselves, the city can apply for funds but grants cannot be relied upon every year as programs are not always available. For federal-aid eligible roadways, 80 percent of the cost of roadway repair is covered and it is the responsibility of the municipality to cover the remaining 20 percent.

For the best return on investment, underground infrastructure (water main and sanitary sewer) improvements should be considered along with roadway maintenance. When completing roadway work in areas where water and sewer utilities need upgrades, a portion of the roadway rehabilitation can be funded by the water and sewer funds. The water and sewer funds are limited to just the area disturbed by utility construction.

Appendix

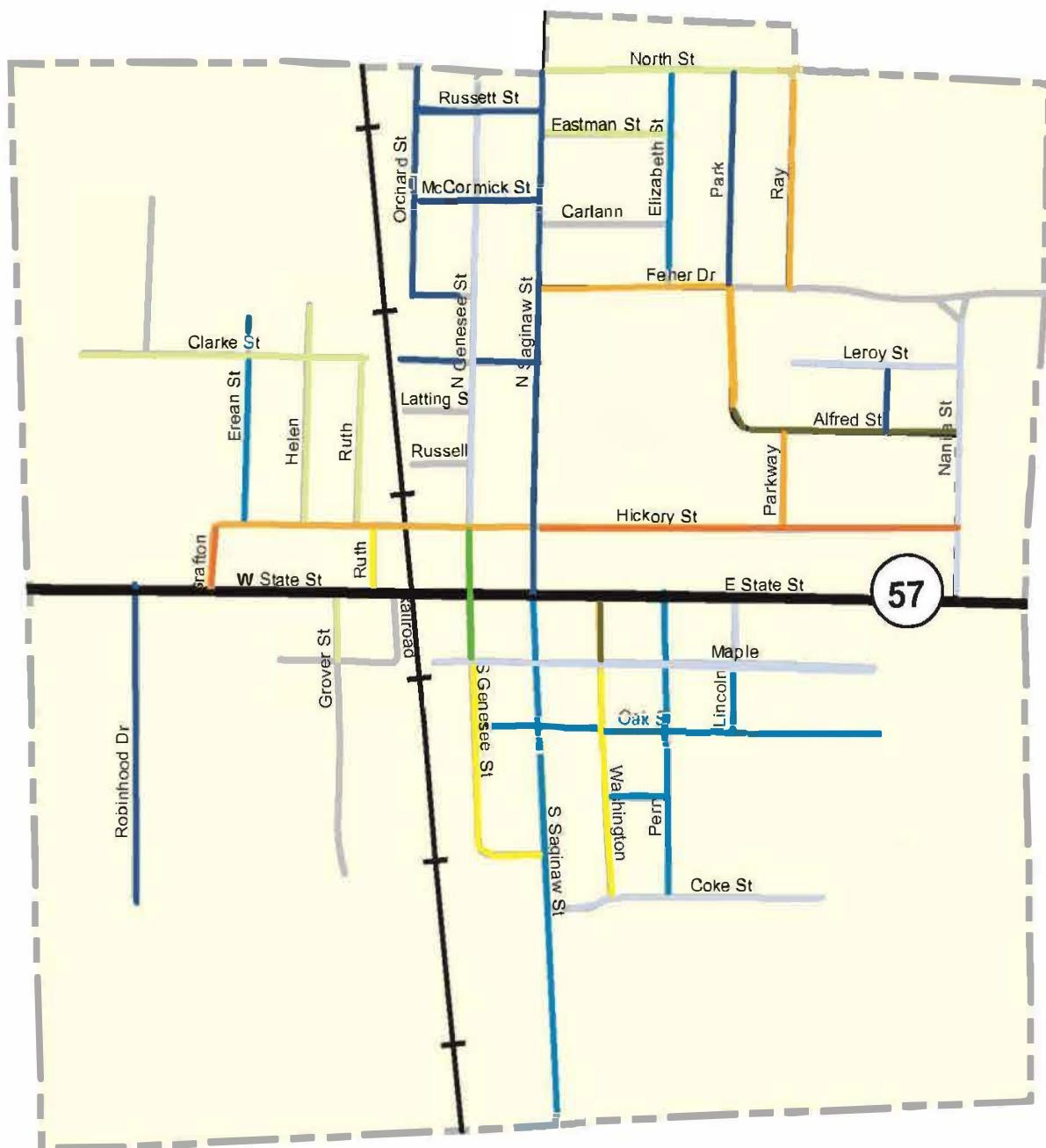
- A. 2022 Roadway Inventory
- B. 2022 PASER Rating Maps

A. 2022 Roadway Inventory

	paser rating	distance	ft	width	Square Yd.	Crack Seal	Chip seal	Mill and Fill	Reconstruction	Local/Major
North Street	6	0.24	1256	28	3908	\$7,815	\$8,792	\$234,451	\$332,139	Major
Eastman Street	6	0.12	650	24	1733	\$3,467	\$3,900	\$103,999	\$147,332	Local
Carlann Street	0	0.12	654	24	1744	\$3,488	\$3,924	\$104,639	\$148,239	Local
Park Drive	7	0.33	1724	30	5747	\$11,493	\$12,930	\$344,797	\$488,462	Major
Feher Drive	10	0.38	2018	30	6727	\$13,453	\$15,135	\$403,596	\$571,761	Major
Ray Street	3	0.20	1066	30	3553	\$7,107	\$7,995	\$213,198	\$302,030	Major
Elizabeth Street	6	0.20	1060	24	2827	\$5,653	\$6,360	\$169,598	\$240,264	Local
Leroy Street	5	0.16	852	30	2840	\$5,680	\$6,390	\$170,398	\$241,398	Local
Douglas Street	7	0.06	328	24	875	\$1,749	\$1,968	\$52,479	\$74,346	Local
Nanita Drive	5	0.29	1506	24	4016	\$8,032	\$9,036	\$240,958	\$341,357	Major
E. Hickory Street	2	0.41	2160	24	5760	\$11,520	\$12,960	\$345,597	\$489,595	Major
Russell Street	0	0.05	275	24	733	\$1,467	\$1,650	\$44,000	\$62,333	Local
Latting Street	0	0.06	336	24	896	\$1,792	\$2,016	\$53,759	\$76,159	Local
Baldwin Street	7	0.06	314	28	977	\$1,954	\$2,198	\$58,613	\$83,035	Local
McCormick Street	7	0.06	312	28	971	\$1,941	\$2,184	\$58,239	\$82,506	Local
E. Clarke Street	8	0.13	693	24	1848	\$3,696	\$4,158	\$110,879	\$157,078	Local
Oak Street	6	0.37	1977	24	5272	\$10,544	\$11,862	\$316,317	\$448,116	Local
Parkway	2	0.09	486	30	1620	\$3,240	\$3,645	\$97,199	\$137,699	Major
Perry Street	6	0.28	1470	24	3920	\$7,840	\$8,820	\$235,198	\$333,197	Local
Lincoln Street	6	0.12	653	30	2177	\$4,353	\$4,897	\$130,599	\$185,015	Local
Coke Drive	5	0.24	1258	30	4193	\$8,387	\$9,435	\$251,597	\$356,430	Local
Washington Street	4	0.28	1492	28	4642	\$9,283	\$10,444	\$278,504	\$394,547	Major/Local
Ash Street	7	0.06	320	24	853	\$1,707	\$1,920	\$51,199	\$72,533	Local
S. Saginaw Street	5	0.50	2641	28	8216	\$16,433	\$18,487	\$492,982	\$698,391	Major
N. Saginaw Street	7	0.50	2618	28	8145	\$16,290	\$18,326	\$488,688	\$692,309	Major
W. Maple Street	0	0.10	550	24	1467	\$2,933	\$3,300	\$87,999	\$124,665	Local
E. Maple Street	5	0.42	2206	24	5883	\$11,765	\$13,236	\$352,956	\$500,022	Major/Local
S. Genesee Street	6	0.24	1270	30	4233	\$8,467	\$9,525	\$253,997	\$359,830	Major/Local
N. Genesee Street	7	0.49	2600	30	8667	\$17,333	\$19,500	\$519,995	\$736,659	Major/Local
Grover Street	8	0.06	330	28	1027	\$2,053	\$2,310	\$61,599	\$87,266	Local
Ruth Street	4	0.22	1160	28	3609	\$7,218	\$8,120	\$216,531	\$306,752	Local
Helen Street	7	0.16	825	24	2200	\$4,400	\$4,950	\$131,999	\$186,998	Local
Eeran Street	6	0.16	820	24	2187	\$4,373	\$4,920	\$131,199	\$185,865	Local

Clarke Street	7	0.22	1145	24	3053	\$6,107	\$6,870	\$183,198	\$259,531	Local
Alfred Street	9	0.22	1160	28	3609	\$7,218	\$8,120	\$216,531	\$306,752	Major
Grafton Street	3	0.06	318	30	1060	\$2,120	\$2,385	\$63,599	\$90,099	Major
W. Hickory Street	3	0.31	1622	30	5407	\$10,813	\$12,165	\$324,397	\$459,562	Major/Local
Robinhood Dr.	6	0.24	1290	28	4013	\$8,027	\$9,030	\$240,798	\$341,130	Local
Russett Drive	7	0.06	309	28	961	\$1,923	\$2,163	\$57,679	\$81,713	Local
Orchard Street	6	0.21	1115	28	3469	\$6,938	\$7,805	\$208,131	\$294,853	Local
	5.075	8.49				\$270,070	\$303,828	\$8,102,092	\$11,477,964	

B. 2020 PASER MAP



City of Montrose

— Interstate/Freeway — Collectors — Railroads
 — Arterials — Local Roads — Rivers and Streams



2022 PASER Survey Ratings



Sources: Michigan Geographic Framework V5.5a
 Date: September 2008
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