

# Legislative Report on Life-Cycle Cost Analyses

January 2012









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### Legislative Report on Life-Cycle Cost Analyses

#### Introduction

This report is in response to Minn. Stat. 174.185, which requires a life-cycle cost analysis (LCCA) for every project in the reconditioning, resurfacing and road repair funding categories. The LCCA is a comparison of life-cycle costs among competing paving materials using equal design lives and equal comparison periods. An LCCA is required for all projects constructed after July 1, 2011.

Documentation required by the statute includes:

- Lowest life-cycle cost
- · All alternatives considered
- Chosen strategy
- Documentation justifying the chosen strategy if it isn't the low-cost strategy

#### Report Development Cost

As required in Minn. Stat. 3.197, this document must contain the cost of preparing the report, including any costs incurred by another agency or another level of government.

MnDOT staff costs were less than \$2,000 to produce this report.

To request this document in an alternative format, please contact MnDOT's Affirmative Action Office at 651-366-4718 or 1-800-657-3774 (Greater Minnesota); 711 or 1-800-627-3529 (Minnesota Relay). You may also send an e-mail to ADArequest.dot@state.mn.us.

















#### Implementation

The Minnesota Department of Transportation has had a process for performing LCCA on roadway rehabilitation projects since 1999. The existing LCCA process, presented in Technical Memorandum 07-17-MAT-01, was modified to meet the detailed requirements of the legislation and presented in Technical Memorandum 10-04-MAT-01.

This memorandum requires that an LCCA consistent with Federal Highway Administration guidelines is performed on all projects in the reconditioning, resurfacing and road repair funding categories. The memorandum limits the LCCA requirement to projects greater than two miles in length or more than 30,000 square yards. The memorandum also limits the requirement for an LCCA to projects that include placing more than 2" thickness of pavement material. Thin overlays (2" or less) are considered short-term preventive maintenance and do not have a viable concrete alternative with an equal design life.

The memorandum requires that the LCCA includes at least one Portland cement concrete (PCC) and one hot-mix asphalt (HMA) alternate with equal design lives. To best determine the most cost-effective design, the memorandum also allows the LCCA to include additional alternatives with other design lives.

#### Results

There were a total of 30 projects in the reconditioning, resurfacing and road repair funding categories with construction beginning after July 1, 2011, that required an LCCA according to Technical Memorandum 10-04-MAT-01.

An HMA option was the low-cost option in all of the submitted LCCAs. For four projects the chosen option was not the low-cost option. In each of these instances the low-cost option was HMA, and the chosen option was also HMA but with a longer design life. When the low-cost option was not chosen a signed exception form documenting the justification was provided. Four projects did not select an option because the selected option will be determined in the alternate bidding process.

Attached is a table of LCCA results, copies of the LCCAs submitted by the districts, and the signed exception forms.

















#### Discussion

HMA options are the low-cost option of all these projects, primarily for two reasons:

- 1. It is difficult for concrete options to be competitive with bituminous options for many projects in these funding categories. PCC options typically have a greater initial cost than HMA options but become competitive by typically having lower maintenance costs. The relatively short design lives of these rehabilitation-type projects don't allow the PCC options to exploit its relative advantage with HMA options. PCC options that have longer design lives than HMA alternates are more competitive than PCC options with the equal design lives as required by the statute.
- 2. MnDOT has substantial experience with the design and performance of HMA options. However, MnDOT has limited experience with PCC options and, presently, there is a lack of design tools and maintenance history for PCC rehabilitation options. To respond to these challenges, MnDOT has begun a pooled-fund study to develop a tool for the design of thin PCC overlays, with expected completion in spring 2012. MnDOT has also developed standardized maintenance schedules for PCC.

Four projects did not have a final option selected because they are following the alternate bidding process. The alternate bidding process is used on projects with pavement ≥4" to <7", which are likely to have competitive bituminous and concrete options.

The alternate bidding process is similar to using an LCCA to determine the low-cost option. However, instead of using an estimate for the initial cost of an option, alternate bidding uses actual bid prices. Steps in the alternate bidding process are:

- 1. A project is bid with two options, one HMA and one PCC.
- 2. An adjustment factor is calculated. This is the difference between the maintenance costs of the two options.
- 3. Bids are received and the low-cost bidder is determined after adding the adjustment factor to the alternate with the greatest maintenance costs.

#### Conclusion

MnDOT has implemented the requirements of the law with a technical memorandum. MnDOT will work to ensure that all future projects meet the requirements of the technical memorandum. In addition, MnDOT has introduced the alternate bidding process to create competition to get the most cost-effective pavement design and materials.

MnDOT will continue to provide this report on an annual basis as required by law.

















#### **Attachments**

- Technical Memorandum 10-04-MAT-01 (Implements requirements of legislation)
- Technical Memorandum 07-17-MAT-01 (LCCA procedure prior to legislation)
- Memorandum on Pavement Rehabilitation Selection (Sept. 28, 1999)
- LCCA Summary: A summary of all the LCCAs in the required funding categories for projects constructed after July 1, 2011
- Individual LCCAs (Attachments A & B)
- Signed exception forms



















## MINNESOTA DEPARTMENT OF TRANSPORTATION Policy, Safety, and Strategic Initiatives Division Technical Memorandum No. 10-04-MAT-01

January 28, 2010

**To:** Distribution 57, 612, 618, 650

From: Khani Sahebjam

Deputy Commissioner and Chief Engineer

Subject: Life Cycle Cost Analysis (LCCA) of Pavement Preservation Projects

#### **Expiration**

This Technical Memorandum supersedes Technical Memorandum No. 07-17-MAT-01. It will remain in effect until January 28, 2015 unless it is superseded.

#### Implementation

This technical memorandum applies to all *pavement* preservation projects in the reconditioning, resurfacing, and road repair funding categories. Projects that meet the criteria of the Pavement Selection Process will continue to follow that process.

#### Introduction

To comply with the requirements of legislation and Mn/DOT policy; a Life Cycle Cost Analysis (LCCA) must be submitted with the project Materials Design Recommendation (MDR). The submitted LCCA must include at least one PCC and one HMA option with equal pavement design lives (in years) and analysis periods.

#### **Purpose**

This Technical Memorandum implements the requirements of Minnesota state legislation for LCCA of alternate pavement materials and updates LCCA procedures required by Mn/DOT policy.

In 2008, the Minnesota State Legislature passed bill HF 3486 (Chapter 287). This legislation requires a life cycle cost analysis (LCCA) be performed for all pavement projects in the reconditioning, resurfacing, and road repair funding categories that are to be constructed after July 1, 2011. The LCCA are to use equal design lives and equal comparison periods to compare competing paving materials. If the chosen option does not have the lowest life cycle cost, the justification is required to be documented. The legislation requires that the commissioner report annually to members of the Senate and House of Representatives the results of the analyses. The full text of the legislation that applies to the requirement for LCCA is attached in Appendix A.

#### Guidelines

A LCCA is not required for preventive maintenance projects or for short projects. Preventive maintenance projects include projects that place 2" or less of paving material. Short projects meet the following criteria:

Two-Lane Roadways: Projects less than 2 miles long

Multi-Lane Roadways: Projects less than 30,000 square yards

Technical Memorandum No. 10-04-MAT-01 Life Cycle Cost Analysis (LCCA) of Pavement Preservation Projects January 28, 2010 Page 2 of 4

The project length/size listed above is determined using only the driving lanes, no turn lanes, parking lanes or ancillary lanes.

Follow sections I and II to develop a LCCA to submit with the MDR. However, to make the best use of LCCA, perform the LCCA early in the project development process.

#### I. Procedure

#### 1. Establish Design Life and Pavement Design Alternatives

For all LCCA, develop at least one HMA and one PCC pavement design alternative with equal design lives. The alternatives should be pavement designs that are capable of meeting the design life required by the scope of the project and meet Mn/DOT pavement design policy and procedures. However, the design life that best meets the scope of the project may have only one available pavement material alternate that conforms to Mn/DOT pavement design policies and procedures. In such a case, compare the alternate design with the selected design life to at least one HMA and one PCC pavement alternate developed using the closest available design life that provides both a HMA and a PCC alternate.

#### 2. Determine Activity Timing

- Use District experience, Pavement Manual – Appendix E, and/or HPMA data.

#### 3. Estimate Costs

- Only costs that demonstrate the differences between alternatives need to be explored.
- The District will develop the initial and activity costs based on their data and experience.
- Do not include user costs.

#### 4. Compute Life Cycle Costs

- Calculate the present worth, of the initial construction and maintenance activities, of each of the pavement alternatives on a cost per mile basis.
- The present worth will be calculated using a discount rate equal to the real interest rate on 30-year treasury bonds as published each year by the federal Office of Management and Budget (OMB). The value to be used each year will be determined by the Mn/DOT Office of Investment Management and kept on file in the Mn/DOT Estimating Unit.
- Include any remaining life value of the pavement alternative that remains at the end of the analysis period. Remaining life value is calculated as the prorated share of the cost of the last activity based on the service life that extends past the analysis period.
- Do not include an inflation rate.

#### 5. Analyze Results

- Unless there is justification for an exception, choose the low cost alternative. If the chosen alternative does not have the lowest life cycle cost, the District Engineer or designee shall sign off on the supporting justification.

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#### **II. Pavement Alternatives**

#### **HMA Overlay**

#### Description

HMA overlay (or mill and overlay) of existing HMA or PCC pavement that will restore ride
and reduce pavement distresses. The thickness of a HMA overlay may be designed to
improve the load carrying capacity of an existing roadway so that it does not require a
seasonal load restriction.

#### Design

To remove the requirements for spring load restrictions on a roadway, Mn/DOT has a thickness design procedure based on FWD pavement deflections. A design life is not part of this design procedure. For design life, there is no formal design procedure as the performance of the overlay is very dependent on the condition of the existing pavement. Instead of a design life, HMA overlays have an expected life. Base the expected life on HPMA data and engineering judgment. The expected life of a HMA overlay is typically from 7 to 19 years.

#### **LCCA**

- Schedule the 1<sup>st</sup> overlay or reconstruction at the end of the overlay's functional life.
- Each successive overlay has 1 year less life then the previous overlay.
- Minimum of a 35 year analysis period.

#### HMA on Base (No Work on Subgrade)

#### Description

- These projects place HMA on new or existing material that behaves as base in the pavement section. These types of projects include CIR, FDR, crack and seat, full mill and repave, or new base without working the subgrade. Typically, very specific engineering requirements need to be met to make these options practical. Only consider the options that are practical in the LCCA.

#### Design

- Design these pavements with the Mn/DOT procedures used for new HMA pavement. Some adjustments may need to be made for the properties of the base.
- Design these projects to carry 20 years of accumulated traffic loading.

#### **LCCA**

- Use the maintenance schedule provided in the pavement selection memo.
- Minimum of a 35 year analysis period.

#### **PCC Overlay**

#### Description

- These projects place PCC on existing HMA (whitetopping) or existing PCC with a stress relief layer (unbonded overlay). A PCC overlay will functionally and structurally improve an existing pavement.

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#### Design

- Follow Mn/DOT design procedures for either whitetopping or unbonded overlays.
- The design life of these projects may be from 15-35 years.

#### LCCA

- If the Mn/DOT design procedure results in a thickness less than the minimum PCC thickness allowed by Mn/DOT policy, contact the Pavement Design Unit.
- An intermediate minor CPR project may add an additional 5 years until major CPR or replacement is required.
- For PCC overlay projects, the pavement should receive its first major CPR or reconstruction at the end of its design life.
- Use a life expectancy of about half the pavement design life for major CPR.
- Minimum of a 35 year analysis period.

#### PCC Pavement (No Work on Subgrade)

#### Description

- These projects place new PCC pavement on new or existing base and do not involve working the subgrade.

#### Design

- Follow Mn/DOT design procedures for PCC pavement.
- The preferred design life is 35 years for these projects.

#### **LCCA**

- For 35 year designs, use the maintenance schedule provided in the pavement selection memo
- For designs for less than 35 years, follow the same maintenance schedule guidelines as for PCC overlays.
- Use a 50 year analysis period.

#### Questions

Contact Jerry Geib, **Pavement Design Engineer**, at (651) 366-5496, for information on the technical contents of this memorandum.

Any questions regarding publication of this Technical Memorandum should be referred to the Design Standards unit, <a href="mailto:designstandards@dot.state.mn.us">designstandards@dot.state.mn.us</a>. A link to all active and historical Technical Memoranda can be found at <a href="mailto:http://www.dot.state.mn.us/design/tech-memos/index.html">http://www.dot.state.mn.us/design/tech-memos/index.html</a>.

To add, remove, or change your name and/or address on the Technical Memoranda mailing list, write or call the Mn/DOT Central Office Mail Room G-18 Transportation Building, 395 John Ireland Blvd., St. Paul, MN 55155, phone number (651) 366-3051.

#### Appendix A

#### Sec. 71. [174.185] PAVEMENT LIFE-CYCLE COST ANALYSIS.

Subdivision 1. **Definitions.** For the purposes of this section, the following definitions apply:

- (a) "Life-cycle cost" is the sum of the cost of the initial pavement project and all anticipated costs for maintenance, repair, and resurfacing over the life of the pavement. Anticipated costs must be based on Minnesota's actual or reasonably projected maintenance, repair, and resurfacing schedules, and costs determined by the Department of Transportation district personnel based upon recently awarded local projects and experience with local material costs.
- (b) "Life-cycle cost analysis" is a comparison of life-cycle costs among competing paving materials using equal design lives and equal comparison periods.

#### Subd. 2. Required analysis.

For each project in the reconditioning, resurfacing, and road repair funding categories, the commissioner shall perform a life-cycle cost analysis and shall document the lowest life-cycle costs and all alternatives considered. The commissioner shall document the chosen pavement strategy and, if the lowest life cycle is not selected, document the justification for the chosen strategy. A life-cycle cost analysis is required for projects to be constructed after July 1, 2011. For projects to be constructed prior to July 1, 2011, when feasible, the department will use its best efforts to perform life-cycle cost analyses.

#### Subd. 3. Report.

The commissioner shall report annually to the chairs and ranking minority members of the Senate and House of Representatives' committees with jurisdiction over transportation finance beginning on January 1, 2012, the results of the analyses required in subdivision 2.



## MINNESOTA DEPARTMENT OF TRANSPORTATION Engineering Services Division Technical Memorandum No. 07-17-MAT-01

December 11, 2007

To:

Distribution 57, 612, 618 and 650

From:

Rick Arnebeck

Director, Technical Services Division

Subject:

Life Cycle Cost Analysis for Trunk Highway Preservation Projects

#### Expiration

This is a new Technical Memorandum. It will remain in effect until January 1, 2011 unless it is superseded or the information contained herein is placed in the Mn/DOT Pavement Manual.

#### Implementation

The criteria for computing a Life Cycle Cost Analysis (LCCA) for Preservation type projects will be effective immediately.

This Technical Memorandum applies to all pavement projects with the following exceptions:

- Projects covered under the Pavement Selection Technical Memorandum.
- Preventive Maintenance Projects defined as low cost strategies performed on a pavement
  while it is still in relatively good condition to retard deterioration, reduce the need for more costly
  rehabilitation and prolong pavement life. Examples include crack/joint sealing, surface
  treatments, thin overlays and minor concrete rehabilitation.
- Reactive Maintenance defined as work done to keep a rapidly deteriorating poor pavement in a safe drivable condition.
- Projects less than 2 miles in length or less than 30,000 square yards.

#### Introduction

It is the responsibility of Mn/DOT to invest wisely in the infrastructure of the Trunk Highway system. Not all investments are equal, and because pavements are rehabilitated and/or constructed with public funds, the economics of alternative type repairs should be examined carefully and be part of the pavement analysis process.

All projects should undergo a rehabilitation selection process. For new construction and reconstruction, this process is as described currently in Technical Memorandum No. 04-19-MAT-02. There is no formal statewide selection process for proposed Preservation repairs. District Materials Engineers consider total cost, local roadway past performance, aggregate availability and quality, total funding availability, and traffic impacts amongst other factors when determining the appropriate repair strategy for a highway. Individual Districts have internal processes to select their list of candidate projects, but there is no uniformity across the State.

Technical Memorandum No. 07-17-MAT-01 Life Cycle Cost Analysis for Trunk Highway Preservation Projects December 11, 2007 Page 2

A Life Cycle Cost Analysis was previously required on Federal funded roadway rehabilitation projects under TEA-21. When TEA-21 expired and the current Federal funding legislation, SAFETEA-LU was enacted, the requirement for LCCA on roadway Preservation type construction was not perpetuated. In 1999, the Director of the Office of Materials and Road Research (OMRR), Gerald Rohrbach, issued a memo to the Districts requiring a LCCA be included in every Materials Design Recommendation Letter (MDR). After Mn/DOT's Change Management process in 2002, Districts were delegated MDR approval authority. Subsequent to that, LCCA become an option for the Districts to include in the MDR. As a minimum, it makes good engineering sense to conduct an economic analysis by means of a LCCA.

Through this Technical Memorandum, a LCCA will be required on all future Preservation candidates.

#### **Purpose**

The purpose of this Technical Memorandum is to provide direction on the application of LCCA for proposed Preservation roadway repairs.

#### Guidelines

A Life Cycle Cost Analysis shall be conducted on Preservation type roadway projects under the following guidelines:

- Both concrete and bituminous surfacing materials should be considered as alternative repairs.
- LCCA should be analyzed for a minimum 30 year period from the time of construction.
- Initial construction cost as well as subsequent preventive maintenance costs should be included in analysis.
- Project initial and preventive maintenance costs will be based upon District experience.
- Discount rate used to calculate LCCA will be supplied by the OIM annually.
- The LCCA should originate in the District.
- The low cost alternative need not be selected as the appropriate repair with supporting justification.
- User costs will not be formally evaluated in the LCCA.
- The LCCA will be included with the Materials Design Recommendation.
- LCCA should include any repair strategy salvage value in calculations when applicable.

Upon completion of each LCCA, a copy will be sent to the Pavement Design Engineer for compilation into periodic reports as needed.

The LCCA is a required item in a complete Materials Design Recommendation. When lowest life cycle cost is not the selected fix, the District Engineer or designee shall sign off on the supporting justification documentation.

#### Questions

For information on the technical contents of this memorandum, please contact **Jerry Geib, Pavement Design Engineer**, at (651) 366–5496.

Any questions regarding publication or distribution of this Technical Memorandum should be referred to the Design Standards unit, designstandards@dot.state.mn.us. A link to all active Memoranda and a list of historical Technical Memoranda can be found at http://www.dot.state.mn.us/atoz.html.

#### Minnesota Department of Transportation



**MEMO** 

Office of Materials & Road Research Mailstop 645

1400 Gervais Avenue Maplewood, MN 55109-2044

DATE:

September 28, 1999

TO:

Transportation District Engineers/Metro Division Engineer

FROM:

Gerald J. Rohrbach, Director

Office of Materials & Road Research

PHONE:

651-779-5590

SUBJECT:

Pavement Rehabilitation Selection

Under the current Mn/DOT programming process, Districts and Metro Division have a great deal of flexibility in the methods used to select construction projects and pavement rehabilitation types. However, regardless of the methods used, a life cycle cost analysis (LCCA) is necessary to insure that the alternate selected is cost effective.

This construction season we became aware of some concrete pavement restoration (CPR) projects that have relatively high construction costs and relatively short service lives compared to other types of typical pavement rehabilitations. An LCCA of the CPR and other rehabilitation alternatives were not included in the Design Recommendation Memo for these projects. We recognize that Districts may develop economic evaluations of alternates at different times in the project development process. However, the economic analysis of the rehabilitation alternatives must be documented in the Design Recommendations Memo as required by Mn/DOT Geotechnical & Pavement Manual. Appendix E of the Geotechnical & Pavement Manual provides excellent guidance for selecting service lives and performing appropriate economic analyses for rehabilitation alternatives.

Although the Mn/DOT requirements for documenting rehabilitation selections have not changed since 1994, we are seeing less and less or no discussion of alternatives in Design Recommendations Memos.

Therefore, effective October 15, 1999, all Design Recommendation Memos must include an economic analysis of rehabilitation alternatives in accordance with the Geotechnical & Pavement Manual. Omission of the economic analysis will result in a delay of the review and approval of the Design Recommendations Memo until the analysis is submitted.

District Engineers Materials Engineers Soils Engineers September 28, 1999 Page - 2

Determining the appropriate rehabilitation fixes for pavements typically requires a thorough evaluation of the inplace pavement, including coring of the pavement and joints/cracks and developing an understanding of the deterioration causes and remedies.

As in the past, our Maplewood Specialty Offices are eager and willing to provide assistance in selecting the most appropriate rehabilitation strategy. Please contact the Bituminous, Concrete, Grading & Base, or Pavement Design Offices to utilize their experience and expertise.

Thanks for your cooperation. With a team effort, we will obtain better performing and more cost effective pavements.

cc: J.N. Meade
P. Hughes
District/Division Materials Engineers
District/Division Soils Engineers
Assistant District Engineers
Maplewood Specialty Offices
File

JNM3509,WPD

### **LCCA SUMMARY**

SP#	Existing Pavement	Low Cost Option Selected	Design Life	Option Description	Present Worth	Selected Option	Option Material	Options for Alternate Bid
1212-30	НМА	Alternate Bid	20	7" PCC Overlay	\$1,137,306.00		PCC	
00		7 internate Bia	20	8" HMA w/Agg Base	\$719,756.00		HMA	$\checkmark$
			35	8" PCC Overlay	\$1,098,922.00		PCC	✓
1305-23	НМА	Yes	15	3" HMA Overlay	\$390,112.00	✓	НМА	
			15	6" PCC Overlay	\$525,451.00		PCC	
1403-24	НМА	Alternate Bid	15	5" PCC Overlay	\$522,713.00		PCC	✓
			20	5" HMA Overlay	\$335,455.00		HMA	_
			20	7" PCC Overlay	\$569,362.00		PCC	✓
			25	FDR w/8" HMA	\$400,576.00		HMA	
			25	5.5" HMA Reconstruction	\$450,698.00		HMA	
			35	7.5" PCC Reconstruction	\$505,968.00		PCC	
1802-48	HMA	Yes	15	3.5" HMA Overlay	\$359,440.00	✓	НМА	
			20	FDR w/4" HMA	\$376,989.00		HMA	
			20	5" PCC Overlay	\$499,364.00		PCC	
1020 / 4								
1928-64	HMA	Yes	20	12" PCC Overlay	\$864,635.00	✓	PCC	
			20	4"HMA Overlay	\$436,564.00	<u> </u>	HMA	
1000 150						✓		
1982-150	A. HMA	Yes	10	A. 3.5" HMA Overlay	\$788,954.00	<b>√</b>	HMA	
	B. PCC		10	B. 4" HMA Overlay	\$625,235.00	•	HMA	
			20	A. FDR w/ 10" HMA	\$1,265,361.00		HMA	
			20	B. Rubblize w/8" HMA	\$1,083,722.00		HMA	
			20	A. 10.5" PCC Overlay	\$1,173,806.00		PCC	
			20	B. 7" PCC Overlay	\$889,209.00		PCC	
2006-27	HMA	Alternate Bid	15	3.5" HMA Overlay	\$272,631.00		HMA	
			20	SFDR w/4" HMA	\$273,553.00		НМА	$\checkmark$
			20	FDR w/ 5" HMA	\$315,441.00		HMA	
			20	6" PCC Overlay	\$421,183.00		PCC	$\checkmark$
2304-47	HMA	Yes	15	3" HMA Overlay	\$240,535.00	$\checkmark$	HMA	
			20	6" PCC Overlay	\$458,072.00		PCC	
			20	4.5" HMA Overlay	\$271,557.00		HMA	
2312-14	НМА	Yes	15	3.5" HMA Overlay	\$270,454.00	$\checkmark$	НМА	
			20	4.5" HMA Overlay	\$280,340.00		HMA	
			20	7" PCC Overlay	\$427,103.00		PCC	

SP #	Existing Pavement	Low Cost Option Selected	Design Life	Option Description	Present Worth	Selected Option	Option Material	Options for Alternate Bid
2503-30	HMA	Exception*	10	1.5" HMA Overlay	\$226,356.00		НМА	
			15	3" HMA Overlay	\$244,572.00		НМА	
			20	5" PCC Overlay	\$398,608.00		PCC	
			20	FDR w/ 5" HMA	\$312,638.00		HMA	
			20	SFDR w/ 4" HMA	\$358,746.00	✓	HMA	
			30	6" PCC Overlay	\$421,183.00		PCC	
2509-22		Yes	16	4" HMA Overlay	\$263,156.00	✓	НМА	
			20	5.5" PCC Overlay	\$402,377.00		PCC	
			20	FDR w/ 4.5" HMA	\$272,690.00		HMA	
			20	SFDR / 7.5" HMA	\$300,825.00		HMA	
3612-21	НМА	Yes	15	5" HMA Overlay	\$464,793.00	✓	НМА	
			20	7" PCC Overlay	\$469,211.00		PCC	
			20	FDR w/7" HMA	\$557,947.00		HMA	
3706-39	11044	Altarnata Did	20	7" DCC Overley	¢1.071.274.00		DCC	
3700-37	HMA	Alternate Bid	20 20	7" PCC Overlay 8" HMA w/ Agg Base	\$1,071,274.00 \$636,968.00		PCC HMA	✓
			35	8" PCC Overlay	\$912,789.00		PCC	$\checkmark$
				o i de evenay	ψ71 <u>Σ</u> γ107100			
4306-15	PCC	Yes	15	4" HMA Overlay	\$523,803.00	$\checkmark$	HMA	
			20	6" PCC Reconstruction	\$1,258,660.00		PCC	
			35	7" PCC Reconstruction	\$1,148,297.00		PCC	
			20	Rubblize w/ 6" HMA	\$632,301.00		HMA	
5008-30	НМА	Yes	17	4" HMA Overlay	\$268,871.00	$\checkmark$	НМА	
			20	5" HMA Overlay	\$279,411.00		HMA	
			20	7.5" PCC Overaly	\$436,883.00		PCC	
5580-86	PCC	Yes	15	3" HMA overlay	\$236,914.00	✓	НМА	
			20	4.5" HMA Overlay	\$255,448.00		PCC	
			20	8.5" PCC overlay	\$486,286.00		PCC	
5609-09	НМА	Yes	15	6" PCC Overlay	\$501,530.00	✓	PCC	
			15	3" HMA Overlay	\$229,523.00	•	HMA	
			22	7.5" PCC Reconstruction	\$544,823.00		PCC	
			23	FDR w/ 5" HMA	\$393,433.00		HMA	
			25	5.5" HMA Reconstruction	\$393,433.00		HMA	
5680-126	PCC	Exception*	8	3" HMA Overlay	\$434,367.00	✓	НМА	
			9	3.5" HMA Overlay	\$406,459.00	•	HMA	
			9	1.5" HMA Overlay	\$175,964.00		HMA	
			20	7" PCC Overlay	\$453,924.00		PCC	
			20	5" HMA Overlay	\$491,744.00		HMA	
			25	8" HMA Reconstruction	\$582,977.00		HMA	

SP#	Existing Pavement	Low Cost Option Selected	Design Life	Option Description	Present Worth	Selected Option	Option Material	Options for Alternate Bid
6012-44	PCC	Yes	17	3" HMA Overlay	\$476,011.00	✓	НМА	
			17	5" PCC Overlay	\$548,898.00		PCC	
			20	6" HMA Reconstruction	\$748,567.00		HMA	
			35	7" PCC Reconstruction	\$711,587.00		PCC	
6614-26	НМА	Yes	15	3.0" HMA Overlay	\$242,203.00	✓	НМА	
			20	5.5" PCC Overlay	\$382,055.00		PCC	
			20	FDR w/ 8" HMA	\$436,344.00		HMA	
6802-28	НМА	Yes	15	3" HMA Overlay	\$419,345.00		НМА	
			18	4.5" HMA Overlay	\$446,685.00	./	HMA	
			20	FDR/ 4.5" HMA	\$401,211.00	V	HMA	
			20	6" PCC Reconstruction	\$640,986.00		PCC	
			35	6.5" Reconstruction	\$677,628.00		PCC	
7305-118	НМА	Yes	14	3" HMA Overaly	\$361,979.00		НМА	
			15	5" PCC Overlay	\$494,825.00	✓	PCC	
			15	3" HMA Overlay	\$329,745.00	·	HMA	
			17	5" PCC Overlay	\$447,748.00		PCC	
7380-222	НМА	Yes	15	4" HMA Overlay	\$551,296.00	$\checkmark$	НМА	
			15	10.5"PCC Overlay	\$992,703.00		PCC	
7403-29	НМА	Yes	15	3" HMA Overlay	\$240,535.00	$\checkmark$	НМА	
			20	4.5" HMA Overlay	\$269,445.00		HMA	
			20	5.5" PCC Overlay	\$420,248.00		PCC	
7404-09	НМА	Yes	15	3" HMA Overlay	\$257,517.00	✓	НМА	
			20	5.5" PCC Overlay	\$383,173.00		PCC	
			20	4.5" HMA Overlay	\$284,872.00		HMA	
7501-30	PCC	Exception*	14	3" HMA Overlay	\$210,297.00		НМА	
			17	4.5" HMA Overlay	\$240,357.00	✓	HMA	
			20	4.5" HMA Overlay	\$224,002.00	•	HMA	
			20	5' PCC Overlay	\$408,750.00		PCC	
			23	6" HMA Overlay	\$270,844.00		HMA	
			28	5.5" HMA Reconstruction	\$359,199.00		HMA	
			35	7" PCC Reconstruction	\$579,651.00		PCC	
7505-21	HMA	Yes	20	6.5" PCC Overlay	\$430,232.00		PCC	
			20	CIR w/3" HMA Overlay	\$246,995.00	✓	НМА	
7908-29	НМА	Yes	17	3" HMA Overlay	\$263,476.00	✓	НМА	
			17	5" Whitetopping	\$412,599.00		PCC	
			22	FDR w/ 5" HMA	\$332,601.00		НМА	

	Existing	<b>Low Cost Option</b>	Design	Option	Present Worth	Selected	Option	Options for
SP #	Pavement	Selected	Life	Description	per Rdway mile	Option	Material	Alternate Bid
						,		
8001-38	HMA	Yes	12	2" HMA overlay	\$533,085.00	$\checkmark$	HMA	
			20	5" PCC Overlay	\$747,842.00		PCC	
			20	5" HMA Overlay	\$594,962.00		HMA	
8707-51	HMA	Exception*	15	4" HMA Overlay	\$402,528.00		HMA	
			20	6" PCC Overlay	\$475,075.00	_	PCC	
			20	CIR w/4" HMA	\$408,157.00	✓	HMA	

<sup>\*</sup> Exception: A signed exception form is attached to the report stating the reason that the low cost option wasn't selected.

#### **Definitions:**

HMA = Hot-Mix Asphalt

PCC = Portland Cement Concrete

FDR = Full-Depth Reclamation (recycle existing HMA and Base as new base)

SFDR = Stabilized Full-Depth Reclamation (recycle existing HMA and Base as new base w/ a stabilizer)

CIR = Cold-in-Place Recycling (Recycle a layer of existing HMA with Cold-Mix Asphalt)

District	8
Performed By	S. Pedersen
Analysis Period	35
Discount Rate	2.84

Project Number	1212-30
Date	4/12/2011
Funding Category	2
Low Cost Option #	1
Chosen Option #	0

	OPTION #1				OPTION #2				OPTION #3		
	DESCRIPTION				DESCRIPTION				DESCRIPTION		
	Stabilized Full Deph Reclam	natio	n		Whitetopping				Whitetopping		
	DESIGN LIFE		TYPE		DESIGN LIFE	TYI	PE		DESIGN LIFE	TY	PE
	20		1		20		2		35	1	2
Year	Description	(	Cost/Mile	Year	Description		Cost/Mile	Year		-	Cost/Mile
=	BAB	\$	594,128		7.5" UBOL (20 yr)	\$	986,574		8" UBOL (35 yr)	\$	1,007,034
1		\$	-	1	(== )-/	\$	-	1	(50 ).)	\$	-
2		\$	-	2		\$	-	2		\$	-
3		\$	-	3		\$	-	3		\$	-
4		\$	-	4		\$	-	4	I .	\$	-
5	Crack Treatment	\$	5,000	5 6		\$	-	5 6		\$	-
	Surface Treatment	\$	25,000	7		\$	-	7		\$	
8	Curaco Fraumoni	\$	-	8		\$	-	8		\$	-
9		\$	-	9		\$	-	9		\$	-
10		\$	-	10		\$	-	10		\$	-
11		\$	-	11		\$	-	11		\$	-
12 13		\$	-	12	Minor CPR + Seal	\$	54,000	12 13		\$	-
14		\$	-	14	Millor CPR + Seal	\$	54,000	14		\$	
15		\$	-	15		\$	-	15		\$	
16		\$	-	16		\$	-	16		\$	-
17		\$	-	17		\$	-	17	Minor CPR	\$	119,500
18		\$	-	18		\$	-	18		\$	-
19		\$	-	19		\$	-	19		\$	-
	2"Mill & 2" Overlay + chip shlds	\$	149,626	20		\$	-	20 21		\$	-
21 22		\$	-	21 22		\$	-	22		\$	-
	Crack Treatment	\$	5,000	23		\$	-	23		\$	-
	Surface Treatment	\$	25,000	24		\$	-	24		\$	-
25		\$	-	25	Major CPR + Grind	\$	228,000	25		\$	-
26		\$	-	26		\$	-	26		\$	-
27		\$	-	27		\$	-		Minor CPR + Seal	\$	54,000
28 29		\$	-	28 29		\$	-	28 29		\$	-
30		\$		30		\$	-	30		\$	-
31		\$	-	31		\$	-	31		\$	-
32		\$	-	32		\$	-	32		\$	-
33		\$	-	33		\$	-	33		\$	-
34		\$	-	34		\$	-	34		\$	-
35	End of Analysis	\$	-	35	End of Analysis	\$	-	35	Remaining Service Life Value**	\$	(20,520)
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г	Total Present Worth  Eq. Annual Cost*	\$	719,756 \$32,719		Total Present Worth  Eq. Annual Cost*	\$	1,137,306 \$51,700		Total Present Worth Eg. Annual Cost		1,098,922 \$49,955
<sup> </sup>	% of Low Cost		100%	'	% of Low Cost		158%		% of Low Cos		153%
	* Equivalent Appual Cost is inclu	<u>—</u>				<u> </u>	10070		/0 OI LOW COS	١	100/0

<sup>\*</sup> Equivalent Annual Cost is included for information only.

\*\*Remaining Service Life Value is reported as a negative value.

AT LEAST ONE BITUMINOUS 8	RONE PCC OPT	ION WITH EC	UAL DESIGN LIVES IS REQUIR	ED	
District	Metro		Project Number	S.P. 130	5-23
Performed By	D.Palmquist		Date	3/17/20	11
Analysis Period	35		Funding Category	RS .	•
Discount Rate	2.84		Low Cost Option #	1	
			Chosen Option #	1	

			OPTION #1						OPTION #2						OPTION #3		
			DESCRIPTION						DESCRIPTION						DESCRIPTION		
			Bituminous 2" mill, 3.5" overlay	,					Concrete - 4" mill, 6" whitetoppin	na					DESCRIPTION		
		T	DESIGN LIFE	Ι	TYPE				DESIGN LIFE	TYF	)E				DESIGN LIFE	TYPE	
				віт					DESIGN LIFE	PCC					DESIGN LIFE	BIT	-
V	1 11	1 :4 -	15	_	Cost/Mile	V	ш	1 :4	Description		Cost/Mile	Vaar	- 4 1	1 :6 -	Description		
Year 0		Life	Description	\$		Year 0	#	LIIE	Description  4" mill and 6' whitetopping	\$	300,000	Year 0	#	LIIE	Description	Cost/N	/IIIe
1			2" mill, 3.5" overlay	\$	123,527	1			4 mili and 6 whitetopping	\$	300,000	1				\$	-
2				\$	-	2				\$	-	2	H			\$	-
	aa		Crack Treatment	\$	5,526	3				\$	-	3				\$	-
4				\$	-	4				\$	-	4				\$	-
5				\$	-	5				\$	-	5				\$	-
6				\$	-	6				\$	-	6				\$	-
7		$\square$	Surface Treatment	\$	39,735	7				\$	-	7	Н			\$	-
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11				\$		11				\$	-	11				\$	-
12				\$	-	12	ар		Minor CPR (6'X6')	\$	100,000	12				\$	-
13				\$	-	13			V/	\$	-	13				\$	-
14				\$	-	14				\$	-	14				\$	-
15	al		2" Mill & 4.5" Overlay	\$	220,000	15				\$	-	15				\$	-
16				\$	-	16				\$	-	16				\$	-
17			One of Toronto and	\$	-	17				\$	-	17				\$	-
18	aa	$\vdash$	Crack Treatment	\$	5,526	18 19				\$	-	18 19	Н			\$	-
19 20		$\vdash$		\$	-	20	or		Major CPR (6'X6')	\$	158,400	20	Н			\$	-
21		$\vdash$		\$		21	aı		Major CFR (0 A0)	\$	-	21	Н			\$	-
22	ab		Surface Treatment	\$	39,735	22				\$	-	22	П			\$	-
23	-			\$	-	23				\$	-	23				\$	-
24				\$	-	24				\$	-	24				\$	-
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26				\$	-	26				\$	-	26				\$	-
27				\$	-	27				\$	-	27				\$	-
28	al		2" Mill & 4.5" Overlay	\$	220,000	28 29				\$	-	28 29	$\vdash$			\$	-
29 30	al		2 Mili & 4.5 Overlay	\$	220,000	30	214/		New Concrete Structure	\$	350,000	30	$\vdash$			\$	-
31	H	Н		\$		31	avv		New Concrete Structure	\$	-	31	Н			\$	-
32	aa		Crack Treatment	\$	5,526	32				\$	-	32				\$	-
33				\$	-	33				\$	-	33				\$	-
34				\$	-	34				\$	-	34				\$	-
35			Remaining Service Life Value**	\$	(107,692)	35			Remaining Service Life Value**	\$	(233,333)	35			Remaining Service Life Value**	\$	
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<sup>\*</sup> Equivalent Annual Cost is included for information only.

\*\*Remaining Service Life Value is reported as a negative value.

District	Metro
Performed By	D.Palmquist
	35
Analysis Period Discount Rate	2.84

Project Number	S.P. 1305-23
Date	3/17/2011
Funding Category	RS ▼
Low Cost Option #	1/1/1900
Chosen Option #	1/1/1900

			OPTION #4					OPTION #5						OPTION #6	
			DESCRIPTION					DESCRIPTION						DESCRIPTION	
			DESIGN LIFE	TYPE				DESIGN LIFE	TY	DE				DESIGN LIFE	TYPE
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		T	Total Present Worth					Total Present Worth	Π					Total Present Worth	
			Eq. Annual Cost*					Eq. Annual Cost*						Eq. Annual Cost*	
l		- 1	% of Low Cost					% of Low Cost						% of Low Cost	

<sup>\*</sup> Equivalent Annual Cost is included for information only.

### Appendix 4

					Scoping	g Cost Analysis	T.H.	32			
						(SP 1403-24)		4/8/2010	SKM		
								9/15/2010	SKM		
	Givens:							11/2/2010	SKM		
	Length =	18.526	miles			INPUTS					
	Width of Road =		feet			*Note: Aggregate should	or alla	ntities were n	at included	Lin each option	
	1" Bituminous =		lbs/SY			Calculations are I				in cach option.	
	Discount Rate =	2.84				Unit Prices are ba			•	Rid Prices and	
	Concrete Recon width=		feet			the 2009 District					
Thicknes		21	ieet			the 2009 District	4 COIII	iaci Fiices, a	з арріісар	ie.	
		- 47									
(in.)	Bituminous Reclam										
	Item	Course	Unit	Price/Unit	Total Cost	Description	Year	Cost/Mile	P/F	Present Worth	Annual Cost
	10" Bit. Reclamation		SY	0.82	\$249,542.75	Initial Cost	0	\$327,439	1.000	\$327,439	\$14,885
	Mill Bituminous 3.5"		SY	1.08	\$328,666.06	rout & seal	3	\$2,000	0.919	\$1,839	\$84
2	SPWEB340C	Wear	TON	44.97	\$1,505,381.85	chip seal	6	\$20,000	0.845	\$16,907	\$769
2	SPWEB340C	Wear	TON	44.97	\$1,505,381.85	mill & 3" Overlay	25	\$120,000	0.497	\$59,584	\$2,709
4	SPNWB330B	NonWear	TON	37.00	\$2,477,168.27	rout & seal	27	\$2,000	0.469	\$939	\$43
		To	otal Cost:		\$6,066,140.79	chip seal	29	\$20,000	0.444	\$8,878	\$404
		С	ost/Mile:		\$327,439.32	RSL	35	(\$40,000)	0.375	(\$15,010)	(\$682)
							Т	otal Present	Worth:	\$400,576	\$18,210
								valent Annu		\$18,210	ψ10,210
	MILL O. E.II. D. Commission	o Overel				+	-qui	valent Amil	u. 003t.	ψ10,210	
	Mill & 5" Bituminous		*			1					
	Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year		P/F	Present Worth	Annual Cost
	Mill Bituminous 3"		SY	1.08	\$328,666.06	Initial Cost	0	\$220,885	1.000	\$220,885	\$10,041
1.5	SPWEB340C	Wear	TON	44.97	\$1,129,036.39	rout & seal	3	\$2,000	0.919	\$1,839	\$84
1.5	SPWEB340C	Wear	TON	44.97	\$1,129,036.39	chip seal	6	\$20,000	0.845	\$16,907	\$769
2	SPWEB340C	Wear	TON	44.97	\$1,505,381.85	2" mill & 4" overlay	20	\$148,000	0.571	\$84,532	\$3,843
		To	tal Cost:		\$4,092,121	rout & seal	22	\$2,000	0.540	\$1,080	\$49
			ost/Mile:		\$220,885	chip seal	24	\$20,000	0.511	\$10,213	\$464
					<b>4220,000</b>	RSL	35	\$0	0.375	\$0	\$0
						INCL		otal Present		\$335,455	\$15,249
								valent Annu		\$15,249	\$10,249
							Equi	valent Annu	ai Cost.	\$13,249	
	7" Whitetopping										
	Item	Type	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
	Mill Bituminous 3"	Type	SY	1.08	\$328,666.06	Initial Cost	0	\$404,784	1.000	\$404,784	\$18,401
			SY							· '	
7	Conc Pvmt Std Width			4.50	\$1,369,441.92	Major CPR & plane	20	\$200,000	0.571	\$114,232	\$5,193
- /	Structural Concrete		CY	76.08	\$4,501,913.51	Bituminous Reconstruct	30	\$383,000	0.432	\$165,324	\$7,515
	Dowel Bars	Epoxy	each	8.3	\$1,299,013.48	RSL	35	(\$306,400)		(\$114,978)	(\$5,227)
		To	tal Cost:		\$7,499,035			otal Present		\$569,362	\$25,882
		С	ost/Mile:		\$404,784		Equi	valent Annu	al Cost:	\$25,882	
	<b>Bituminous Recons</b>	struct									
	Item	Type	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
1.5	SPWEB340C	Wear	TON	44.97	\$1,129,036.39	Initial Cost	0	\$382,565	1.000	\$382,565	\$17,391
2	SPWEB340C	Wear	TON	44.97	\$1,505,381.85	rout & seal	3	\$2,000	0.919	\$1,839	\$84
2	SPWEB340C	NonWear		44.97	\$1,505,381.85	chip seal	6	\$2,000	0.845	\$1,639	\$769
14		Nonveal	CY	17.34	\$2.052.134.08		25		0.645	\$59,584	\$2,709
	Agg Base Class 5				+ , ,	mill & 3" Overlay		\$120,000			
11	Select Granular		CY	9.63	\$895,462.86	rout & seal	27	\$2,000	0.469	\$939	\$43
			tal Cost:		\$7,087,397	chip seal	29	\$20,000	0.444	\$8,878	\$404
		С	ost/Mile:		\$382,565	RSL	35	(\$53,333)	=	(\$20,014)	(\$910)
							T	otal Present	Worth:	\$450,698	\$20,488
							Equi	valent Annu	al Cost:	\$20,488	
	7.5" Concrete Reco	nstruct									
			lini4	Drice/Ulmit	Total Cart	Ctrata	Vaar	Cost/Mile	P/F	Drocont Month	Applied Cart
	Cons Dimt Std Width	Туре	Unit	Price/Unit	Total Cost	Strategy				Present Worth	Annual Cost
	Conc Pvmt Std Width		SY	4.50	\$1,320,533.28	Initial Cost	0	\$481,457	1.000	\$481,457	\$21,886
	Structural Concrete	_	CY	76.08	\$4,651,211.66	Minor CPR & plane	25	\$100,000	0.497	\$49,653	\$2,257
7.5	Dowel Bars	Epoxy	each	8.3	\$1,299,013.48	RSL		(\$67,000)		(\$25,142)	(\$1,143)
			CY	17.34	\$706,729.85			otal Present		\$505,968	\$23,001
5	Agg Base Class 5					1.1	Equi	valent Annu	al Cocts	\$23,001	1
	Agg Base Class 5 Select Granular		CY	9.63	\$941,980.41		Lqui	valent Annu	ai Cost.	\$23,001	
5				9.63	\$941,980.41		Lqui	valent Annu	ai Cost.	\$23,001	
5		To		9.63	\$941,980.41 \$8,919,469		Equi	valent Annu	ai Cost.	\$23,00 I	
5			CY	9.63			Equi	valent Annu	ar cost.	\$23,00 I	

## Design Recommendation S.P. 1403-24

Page 21

Ū	5" Whitetopping										
	Item	Type	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
	Mill Bituminous 3"		SY	1.08	\$328,666.06	Initial Cost	0	\$265,236	1.000	\$265,236	\$12,057
	Conc Pvmt Std Width		SY	4.50	\$1,369,441.92	Major CPR & plane	15	\$200,000	0.657	\$131,401	\$5,973
5	Structural Concrete		CY	76.08	\$3,215,652.51	Bituminous Reconstruct	23	\$383,000	0.525	\$201,127	\$9,143
		Tot	al Cost:		\$4,913,760	RSL	35	(\$200,000)	0.375	(\$75,051)	(\$3,412)
		Co	st/Mile:		\$265,236		Т	otal Present	Worth:	\$522,713	\$23,762
							Equi	valent Annu	al Cost:	\$23,762	

 	_	1 1
District	3	Draft
Performed By	C. DeMenge	Draft
Analysis Period	35	Draft
Discount Rate	2.84	Draft
		Draft
Option #1		

Project Number	1802	-48
Date	2/7/2	011
Funding Category	Other	▼
Low Cost Option #	1	
Chosen Option #	1	

	Option #1					Option #	2			
	Description	2.0" Mill and 3.5	" Bit	t Overlay		Description	5" V	Vhitetopping	1	
	Design Life (Years)	15		JMINOUS -		Design Life (Years)			PCC	-
Year	Description	Cost/Mile	ı	PW/Mile	Year	Description	1 /	Cost/Mile	1	PW/Mile
	Mill 2.0" and Overlay 3.5"	\$ 162,747	\$	162,747		Whitetopping	\$	397,090	\$	397,090
1	Willi 2.0 and Overlay 5.5	Ψ 102,141	\$	102,747	1	vvilletopping	Ψ	337,030	\$	-
2			\$	-	2				\$	-
3			\$	-	3				\$	-
4	Seal Coat	\$ 25,000	\$ \$	21,733	4 5		+		\$	-
6	Sear Coat	\$ 25,000	\$	21,733	6				\$	-
7			\$	-	7				\$	-
8			\$	-	8				\$	-
9			\$	-	9				\$	-
10 11			\$	-	10 11				\$	-
12			\$	-	12				\$	-
13			\$	-		Minor CPR	\$	40,000	\$	27,794
14			\$	-	14				\$	-
	3.0" Mill and 3.0" Overlay	\$ 183,005	\$	120,235	15				\$	-
16 17			\$	-	16 17				\$	-
18			\$	-	18				\$	-
19			\$	-	19				\$	-
	Seal Coat	\$ 25,000	\$	14,279	20				\$	-
21			\$	-	21				\$	-
22			\$	-	22				\$	-
23 24			\$	-	23 24				\$	-
25			\$	-		Major CPR	\$	150,000	\$	74,480
26			\$	-	26		Ť		\$	-
27			\$	-	27				\$	-
28	0.011.84711	<b>A</b> 400 500	\$	-	28				\$	-
30	2.0" Mill and 2.0" Overlay	\$ 126,509	\$	56,159	29 30				\$	-
31			\$		31				\$	-
32			\$	-	32				\$	-
	Seal Coat	\$ 25,000	\$	9,922	33				\$	-
34	Demoisis a Life	ф (00 04 <del>т</del> )	\$	(05.000)	34	Demoisis a Life	•		\$	-
35	Remaining Life	\$ (68,315)	\$	(25,636)	35	Remaining Life	\$	-	\$	-
			\$	-					\$	-
			\$	-					\$	-
			\$	-					\$	-
			\$	-					\$	-
<u> </u>			\$ \$	-	-				\$	-
<u> </u>			\$	-					\$	-
			\$	-					\$	-
			\$	-					\$	-
			\$	-					\$	-
<u> </u>			\$	-					\$	-
<u> </u>			\$	-					\$	-
			\$	-					\$	-
	Tota	al Present Worth	\$	359,440		Tot	al Pre	sent Worth	\$	499,364
		% of Low Cost		100%				of Low Cost		139%

Draft Draft Draft Draft Draft

	Option #3					Option #4		
	Description	Reclaim and Pa	ve 4.	0"	-	Description		
	Design Life (Years)			NINOUS ▼		Design Life (Years)		BITUMINOUS -
Year	Description	Cost/Mile		PW/Mile	Year	Description	Cost/Mile	PW/Mile
	Reclaim and Pave 4.0"	\$ 253,229	\$	253,229	0			\$ -
1			\$	-	1			\$ -
2			\$	-	2			\$ -
3			\$	-	3			\$ - \$ -
<u>4</u> 5	Seal Coat	\$ 25,000	\$	21,733	4 5			\$ -
6	Seal Coal	\$ 25,000	\$	-	6			\$ -
7			\$	_	7			\$ -
8			\$	-	8			\$ -
9			\$	-	9			\$ -
10			\$	-	10			\$ -
11			\$	-	11			\$ -
12			\$	-	12			\$ -
13			\$	-	13			\$ -
14			\$	-	14			\$ -
15 16			\$	-	15 16			\$ - \$ -
17			\$	-	17			\$ -
18			\$	-	18			\$ -
19			\$	-	19			\$ -
	Mill 2.5" and Overlay 2.5"	\$ 156,896	\$	89,613	20			\$ -
21	····· 2.0 and overlay 2.0	ψ .σσ,σσσ	\$	-	21			\$ -
22			\$	-	22			\$ -
23			\$	-	23			\$ -
24			\$	-	24			\$ -
	Seal Coat	\$ 25,000	\$	12,413	25			\$ -
26			\$	-	26			\$ -
27			\$	-	27			\$ -
28			\$	-	28			\$ -
29 30			\$	-	29 30			\$ - \$ -
31			\$	-	31			\$ -
32			\$	-	32			\$ -
33			\$	-	33			\$ -
34			\$	-	34			\$ -
	Remaining Life	\$ -	\$	-	35			\$ -
			\$	-				\$ -
			\$	-				\$ -
			\$	-				\$ -
			\$	-	$\vdash$			\$ -
$\vdash$			\$	-	$\vdash$			\$ -
$\vdash$			\$	-	$\vdash$			\$ - \$ -
$\vdash$			\$	-	$\vdash$			\$ -
$\vdash$			\$	-	$\vdash$			\$ -
$\vdash$			\$	-				\$ -
			\$	-				\$ -
			\$	-				\$ -
			\$	-				\$ -
			\$	-				\$ -
			\$	-				\$ -
	Tota	I Present Worth	\$	376,989		Tota	l Present Worth	
		% of Low Cost		105%			% of Low Cost	t

Draft Draft
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	Option #5					Option #6	<b>i</b>		
	Description					Description			
	Design Life (Years)		PCC	-		Design Life (Years)		PCC	•
Voor	Description	Cost/Mile	Г	W/Mile	Year	Description	Cost/Mile	I DW	//Mile
Year	Description	Cost/iville				Description	Cost/iville		
1			\$		0 1			\$	-
2			\$		2			\$	-
3			\$		3			\$	-
4			\$	-	4			\$	-
5			\$	-	5			\$	-
6			\$	-	6			\$	-
7			\$	-	7			\$	-
8			\$	-	8			\$	-
9			\$	-	9 10			\$	-
10 11			\$	-	11			\$	-
12			\$	-	12			\$	-
13			\$		13			\$	-
14			\$	-	14			\$	-
15			\$	-	15			\$	-
16			\$	-	16			\$	-
17			\$	-	17			\$	-
18			\$	-	18			\$	-
19			\$	-	19			\$	-
20			\$	-	20			\$	-
21 22			\$	-	21 22			\$	-
23			\$	<u> </u>	23			\$	-
24			\$		24			\$	-
25			\$		25			\$	-
26			\$	-	26			\$	-
27			\$	-	27			\$	-
28			\$	-	28			\$	-
29			\$	-	29			\$	-
30			\$	-	30			\$	-
31 32			\$	-	31 32			\$	-
33			\$	-	33			\$	-
34			\$	-	34			\$	-
35			\$	-	35			\$	-
			\$	-	1			\$	-
			\$	-				\$	-
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			\$	-				\$	-
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$\vdash$			\$	-	<b> </b>			\$	-
$\vdash$			\$		<b> </b>			\$	-
$\vdash$			\$					\$	-
			\$	-				\$	-
			\$	-				\$	-
			\$	-				\$	-
			\$	-				\$	-
			\$	-				\$	-
	Total	Present Worth				Tota	al Present Worth		
		% of Low Cost	t				% of Low Cos	t	

District	Metro
Performed By	DFN
Analysis Period	35
Discount Rate	2.84

Project Number	1928	3-64
Date	5/18/	2011
Funding Category	RS	•
Low Cost Option #	1	
Chosen Option #	1	

			OPTION #1						OPTION #2		
			DESCRIPTION						DESCRIPTION		
			4 in mill & overlay						mill & whitetopping		
			DESIGN LIFE		TYPE				DESIGN LIFE	TYPI	<b>=</b>
			20	BIT	▼				20	PCC	▼
Year	#	Life	Description		Cost/Mile	Year	#	Life			ost/Mile
0			4 in mill & overlay	\$	267,699	0			5 in mill / 12 in WT	\$	643,113
1			· ··· · · · · · · · · · · · · · · · ·	\$	-	1				\$	-
2				\$	-	2				\$	-
3	AA		Crack Treatment	\$	11,052	3				\$	-
4				\$	-	4				\$	-
5				\$	-	5				\$	-
6				\$	-	6 7				\$	-
7 8				\$	-	8				\$	-
9				\$	-	9				\$	-
10				\$	-	10				\$	-
11				\$	-	11				\$	-
12				\$	-	12				\$	-
13				\$	-	13				\$	-
14				\$	-	14				\$	-
15 16				\$	-	15 16				\$	-
17				\$	-		BF		Minor CPR (24')	\$	126,720
18				\$	-	18	ы		INITION OF IX (24)	\$	-
19				\$	-	19				\$	-
20	BI		4" Mill & 4" Overlay (24')	\$	267,699	20				\$	-
21				\$	-	21				\$	-
22				\$	-	22				\$	-
23	AA		Crack Treatment	\$	11,052	23				\$	-
24				\$	-	24 25				\$	-
25 26				\$	-	26				\$	-
27				\$			ВН		Major CPR+DG+shld (24')	\$	362,038
28				\$	-	28	D		major or responding (21)	\$	-
29				\$	-	29				\$	-
30				\$	-	30				\$	-
31				\$	-	31				\$	-
32				\$	-	32				\$	-
33 34				\$	-	33 34				\$	-
35			Remaining Service Life Value**	\$	-	35			Remaining Service Life Value**	\$	(72,408)
33			Remaining Service Life value	Ψ	-	- 33			Remaining Service Life value	Ψ	(72,400)
		Ш									
		$\vdash$						_		-	
$\vdash$		Н								-	
		$\vdash$								<del>                                     </del>	
		$\vdash$									
			Total Present Worth	\$	436,564				Total Present Worth	\$	864,635
			Eq. Annual Cost*		\$19,846				Eq. Annual Cost*	-	\$39,305
			% of Low Cost		100%	<u> </u>			% of Low Cost	<u> </u>	198%

<sup>\*</sup> Equivalent Annual Cost is included for information only.
\*\*Remaining Service Life Value is reported as a negative value.

			ICH WI	▶ DCC	Cost/Mile	\$ 797,296								\$ 190,080								\$															\$ 1,173,806 \$53,360
	OPTION #6	DESCRIPTION	TH 110 to LOR: 4 in mill / 10.5 inch WI DESIGN LIFE TYPE	20	Description	4 in mill / 10.5 in WT								Minor CPR (36')								Major CDD+DG+child (36)	Major CENTEGESIIII (30)						Remaining Service Life Value**	0							Total Present Worth Eq. Annual Cost*
			(0)		rear # Life	0 -	2	3	2 4	9	8	9	11	12 13 BE	14	16	17	19	20	21	23	24 25 BG	2	27	28	30	31	33	35							Ŧ	
1982-150 4/6/2011 RS 1 & 2 1 & 2			TYPE	▶ CC	Cost/Mile	\$ 621,393								\$ 126,720								362 038	+														\$ 889,209 \$40,422
Project Number Date Funding Category Low Cost Option #	OPTION #5	DESCRIPTION	(C) TH 13 to TH 110: 7 in UBO			7 in UBOL								Minor CPR (24')								Major CDD+DG+ehld (241)	Major of N+DG+Sind (z+)						Remaining Service Life Value**	B							Total Present Worth Eq. Annual Cost*
					'ear # Life	0 +	2	8	1 10	9	8	9	11	12 13 BF	14	16	17	19	20	21	23	24 25 RH	26	27	29	30	31	33	35	1						H	
Metro DAV 35 2.84			10 in overlay	▶ T18		\$ 955,908					\$ 11,052			\$ 79,470					\$ 351,419		\$ 11,052			\$ 79,470													\$ 1,265,361
District Performed By Analysis Period Discount Rate	OPTION #4		(B) TH 110 to LOR: 4 in mill 8 in FDR / 1		Description	4 in mill / 8 in FDR / 10 in overlay					Crack Treatment			Surface Treatment					2" Mill & 4" Overlay (36")		Crack Treatment			Surface Treatment					Remaining Service Life Value**	0							Total Present Worth Eq. Annual Cost*
			(B) TH 110		ear # Life	0 4	2	8 9	1 40	9	8 AA Cr	9		12 AB Su	14	9		19 18	BA	- 0	23 AA Cr	24	26	AB	28	0	- 0	33	34 35							$\pm$	
			l	Þ		774,269					11,052		Ш	79,470					351,419		11,052			0,							<u> </u>		I			Ħ	1,083,722
			/ 8 in overlay	ВТТ	Š	S	e e	S	o vo	S	o so	s s	S	s s	S	n so	so c	so so	8	ss s	s s	s s	9 69	S	so so	S	S	S	S								S
	OPTION#3	DESCRIPTION	TH 13 to TH 110: Rubblize / 8 in overlay DESIGN LIFE TYPE	20	Description	Rubblize / 8 in overlay					Crack Treatment			Surface Treatment					2" Mill & 4" Overlay (36")		Crack Treatment			Surface Treatment					Remaining Service Life Value**	0							Total Present Worth Eq. Annual Cost*
			(B)		ear # Life	0 -	2	3	2 1	9	8 AA	9 01		12 AB	14	16	17	19	20 BA 2	21	AA	24	26	AB	28	30	31	33	35							Ħ	
1982-150 4/6/2011 1			rlay F	•	≻	318,545		11,052				143.754		11,052				351,419	Н	11,052				Ц	351,419		11,052		(105 426)							Ħ	\$35,865
8			III / 3.5 in overlay			ay S	S	S	n vn	S	S	s s		s s	S	n vo		(a) (v)	S	s v	S	ss u	9 69		so so	S	ss u	S	Value**								tal Present Worth \$ Eq. Annual Cost*
Project Number Date Lunding Category Low Cost Option # Chosen Option #	OPTION #2	DESCRIPTION	DESIGN LIFE	10	Description	.5 in mill / 3,5 in overlay		Crack Treatment				2" Mill & 2" Overlav (36")		Crack Treatment				2" Mill & 4" Overlay (36"		Crack Treatment					2" Mill & 4" Overlay (36')		Crack Treatment		Remaining Service Life Value**								Total Present Worth Eq. Annual Cost*
Project Number Date Funding Categor Low Cost Option Chosen Option #			(A) TH 1101			1.5 in m							П																Remain							$\perp$	
				Þ	Pear # Life	1 0	. 2	3 AA	1 10	9 1	- 80	. 9 83 10 BB	Н	- 12 052 13 AA	14	91	_	. 19 BA	20	22 21 AA	. 23	24	52	+	728 28 BA	Ш	31 AA	33	34	щ						#	235
DAV 35 35 2.84			lay TYPE	ВІТ	8	\$ 284,152		\$ 11,052	9 69	s	9 69	\$ 97.683	s	\$ 11,052	s	 o so		\$ 251,728		\$ 11,052	· ·	s v	9 69		\$ 251,728		\$ 11,052		\$ (75.518)								\$ 625,235
	N #1	NOLL	110:4 in over	0	iption			_				lav (24')						lay (24')							lay (24')				relife Value**								Total Present Worth 5 Eq. Annual Cost*
District Performed By Analysis Period Discount Rate	OPTION #1	DESCRIPTION	(A) TH 13 to TH 110. 4 in overlay DESIGN LIFE	10	Description	4 in overlay		Crack Treatment				2" Mill & 2" Overlay (24")		Crack Treatment				2" Mill & 4" Overlay (24)		Crack Treatment					2" Mill & 4" Overlay (24")		Crack Treatment		Remaining Service Life Value**	0							Tota
			ľ		Year # Life	0 1	2	3 AA C	1 40	9	8	10 BD 2'		12 13 AA C	14	16		18 BC		21 AA C	23	24	26		28 BC 27		31 AA C	33	34 35		ļ					+	
		Ш			ž		Ш		<u> </u>		Ш		Ш			<u> </u>		<u></u>	Ш	<u> </u>	Ш			<u> </u>	1	Ш		<u> </u>		<u> </u>	<u> </u>	Ш		<u> </u>	<u> </u>		Ш

73%

#### Cost Analysis/ TH 56(West Concord to Kenyon)

Givens:

Length = 9.149 miles

Width of Road = 24 feet(Conc.)

1" Bituminous = 115 lbs/SY Interest Rate = 2.84 % Inflation Rate = 0 % 24 feet(Bit.) 1/13/11 - TRM

MILL & 3.5" min. Bitu	ıminous	Overlay		<u> </u>						
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS		SY	0.80	\$103,054.34	Initial Cost	0	\$159,760	1.000	\$159,760	\$7,262
PATCH		Ton	100.00	\$36,596.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
TACK COAT		GAL	1	\$25,763.58	Chipseal	4	\$20,000	0.894	\$17,881	\$813
3.5" SPWEB340B	Wear	TON	50.00	\$1,296,230.32	Mill & 3" Overlay	17	\$116,640	0.621	\$72,459	\$3,294
		Total Cost:		\$1,461,644	Rout & seal	19	\$2,000	0.587	\$1,175	\$53
		Cost/Mile:		\$159,760	Chipseal	21	\$20,000	0.555	\$11,108	\$505
				<b>v</b> ,	Mill & 3" Overlay	33	\$116,640	0.397	\$46,291	\$2,104
					Salvage Value	35	(\$101,088)	0.375	-\$37,934	-\$1,724
						Total P	resent Worth:		\$272,631	\$12,393
						Equivalent	Annual Cost:		\$12,393	\$12,393
6" WHITETOPPING										
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS		SY	1.00	\$128,817.92	Initial Cost	0	\$300,567	1.000	\$300,567	\$13,663
Conc Std Width 6		SY	5.00	\$644,089.60	Minor CPR, plane	17	\$150,000	0.621	\$93,183	\$4,236
Structural Concrete		CY	65.77	\$1,412,059.10	4.5" Bit. Overlay	30	\$164,499	0.432	\$71,007	\$3,228
Reinforcement Bars	Epoxy	lb	0.80	\$45,525.42	Salvage Value	35	(\$116,117)	0.375	-\$43,574	-\$1,981
Dowel Bars	Epoxy	each	6.72	\$519,393.85		Total P	resent Worth:		\$421,183	\$19,146
		Total Cost:		\$2,749,886		Equivalent	Annual Cost:		\$19,146	\$19,146
		Cost/Mile:		\$300,567						
RECLAMATION W/ 5	" BITUM	INOUS								
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS		SY	0.80	\$103,054.34	Initial Cost	0	\$233,376	1.000	\$233,376	\$10,609
RECLAMATION		SY	1.10	\$141,699.71	Rout & seal	4	\$2,000	0.894	\$1,788	\$81
Tack Coats		GAL	1.00	\$38,645.38	Chipseal	6	\$20,000	0.845	\$16,907	\$769
5" SPWEB340C	Wear	TON	50.00	\$1,851,757.60	Mill & 3" Overlay	22	\$116,640	0.540	\$62,992	\$2,864
		Total Cost:		\$2,135,157	Rout & seal	24	\$2,000	0.511	\$1,021	\$46
		Cost/Mile:		\$233,376	Chipseal	26	\$20,000	0.483	\$9,656	\$439
					Salvage Value	35	(\$27,445)	0.375	-\$10,299	-\$468
						Total P	resent Worth:		\$315,441	\$14,340
						Equivalent	Annual Cost:		\$14,340	\$14,340
STABILIZED RECLA	MATION									
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS		SY	0.80	\$103,054.34	Initial Cost	0	\$191,488	1.000	\$191,488	\$8,705
RECLAMATION		SY	1.10	\$141,699.71	Rout & seal	4	\$2,000	0.894	\$1,788	\$81
Tack Coats		GAL	1.00	\$25,763.58	Chipseal	6	\$20,000	0.845	\$16,907	\$769
4" SPWEB340C	Wear	TON	50.00	\$1,481,406.08	Mill & 3" Overlay	22	\$116,640	0.540	\$62,992	\$2,864
Emulsion		TON	470.00	\$626,634.77	Rout & seal	24	\$2,000	0.511	\$1,021	\$46
					1					

#### Assumptions

- 1. Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium overlays and Reclaimed pavements
- 2. Each successive overlay has 1 year less life than previous one on a section.

**Total Cost:** 

Cost/Mile:

3. Reclaim design calls for milling 3" of existing bituminous-reclaim 6" of existing bituminous with 6" existing aggregate base-overlay with 5" of new bituminous.

\$191,488

Chipseal

Salvage Value

26

35

\$20,000

(\$27,445)

**Total Present Worth:** 

**Equivalent Annual Cost:** 

0.483

0.375

\$9,656

-\$10,299

\$273,553

\$12,435

\$439

-\$468

\$12,435 \$12,435

- 4. Thin overlay -10 years life, medium overlay-15 years, heavy bit. overlay-17 years, reclamation overlay-20 years, whitetopping-30 years.
- 5. Aggregate and shoulder quantities were not included in each option.
- 6. Calculations are based on 35 year life cycle.
- 7. Costs are based upon recent district project costs.

#### Cost Analysis/ TH 16(Houston to Rushford)

2/17/10-TRM

Givens:

Length = 10.252 miles

24 feet(Conc.) 115 lbs/SY Width of Road = 24 feet(Bit.)

1" Bituminous = 2.84 % Interest Rate = Inflation Rate = 0 %

Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	<b>Annual Cost</b>
1.5" MILL BITUMINOUS		SY	0.50	\$72,174.08	Initial Cost	0	\$123,152	1.000	\$123,152	\$5,598
PATCH		Ton	100.00	\$41.008.00	Rout & seal	2	\$2.000	0.946	\$1,891	\$86
TACK COAT		GAL	\$1.00	\$28,869.63	Chipseal	4	\$20,000	0.894	\$17,881	\$813
3" SPWEB340B	Wear	TON	45.00	\$1,120,502.59	Mill & 3" Overlay	17	\$123,152	0.621	\$76,504	\$3,478
		Total Cost:		\$1,262,554	Rout & seal	19	\$2.000	0.587	\$1,175	\$53
		Cost/Mile:		\$123,152	Chipseal	21	\$20,000	0.555	\$11,108	\$505
				,	Mill & 3" Overlay	33	\$123,152	0.397	\$48,876	\$2,222
					Salvage Value	35	(\$106,732)	0.375	-\$40,052	-\$1,821
					•	Total F	Present Worth:		\$240,535	\$10,934
						Equivalen	t Annual Cost:		\$10,934	\$10,934
										_
6" WHITETOPPING(2	20 Year I Course	Fix) Unit	Price/Unit	Total Cost	Stratami	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS	Course	SY			Strategy					
			1.12	\$161,669.94	Initial Cost	0	\$339,233	1.000	\$339,233	\$15,421
Conc Std Width 6		SY	7.00	\$1,010,437.12	Minor CPR	17	\$150,000	0.621	\$93,183	\$4,236
Structural Concrete	_	CY	71.31	\$1,715,577.88	3.5" Bit. Overlay	30	\$141,368	0.432	\$61,022	\$2,774
Reinforcement Bars	Ероху	lb	0.82	\$52,289.30	Salvage Value	35	(\$94,245.33)	0.375	-\$35,366	-\$1,608
Dowel Bars	Epoxy	each	6.21	\$537,841.24			Present Worth:		\$458,072	\$20,823
		Total Cost:		\$3,477,815		Equivalen	t Annual Cost:		\$20,823	\$20,823
		Cost/Mile:		\$339,233						
MILL 3" & 4.5" min.	Bitumino	ous Overla								
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS		SY	1.25	\$180,435.20	Initial Cost	0	\$185,768	1.000	\$185,768	\$8,445
PATCH		Ton	100.00	\$0.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
TACK COAT		GAL	\$1.00	\$43,304.45	Chipseal	4	\$20,000	0.894	\$17,881	\$813
4.5" SPWEB340B	Wear	TON	45.00	\$1,680,753.89	Mill & 3" Overlay	22	\$123,152	0.540	\$66,508	\$3,023
		Total Cost:		\$1,904,494	Rout & seal	25	\$2,000	0.497	\$993	\$45
		Cost/Mile:		\$185,768	Chipseal	27	\$20,000	0.469	\$9,390	\$427
					Salvage Value	35	(\$28,977)	0.375	-\$10,874	-\$494
					1	Total F	Present Worth:		\$271,557	\$12,345

#### Assumptions-

- 1. Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium overlays and Reclaimed pavements
- 2. Each successive overlay has 1 year less life than previous one on a section.

  3. Thin overlay-10 years life, medium overlay-15 years, heavy bit. overlay-20 years, reclamation overlay-20 years, whitetopping-20 years.

  4. Aggregate and shoulder quantities were not included in each option.

  5. Calculations are based on 35 year life cycle.

  6. Costs are based upon recent district project costs.

#### Cost Analysis/ TH 56(T.H. 63 to Leroy E. CL)

Givens: Length = Width of Road = 1" Bituminous = Interest Rate = Inflation Rate =

6.368 miles 24 feet(Conc.) 113 lbs/SY 2.84 % 0 %

24 feet(Bit.)

6/07/11-TRM

"	MILL	&	3.5"	min.	Bituminous	Overlay

2" MILL & 3.5" min.	Bitumino	ous Overla	y							
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS		SY	\$0.50	\$44,830.72	Initial Cost	0	\$153,072	1.000	\$153,072	\$6,958
PATCH		Ton	\$100.00	\$25,472.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
TACK COAT		GAL	\$1.00	\$17,932.29	Chipseal	4	\$20,000	0.894	\$17,881	\$813
3.5" SPWEB340B	Wear	TON	\$50.00	\$886,527.49	Mill & 3" Overlay	17	\$123,152	0.621	\$76,504	\$3,478
		Total Cost:		\$974,762	Rout & seal	19	\$2,000	0.587	\$1,175	\$53
		Cost/Mile:		\$153,072	Chipseal	21	\$20,000	0.555	\$11,108	\$505
					Mill & 3" Overlay	33	\$123,152	0.397	\$48,876	\$2,222
					Remaining Life Value	35	(\$106,732)	0.375	-\$40,052	-\$1,821
					-	Total Pr	resent Worth:		\$270,454	\$12,294
						Equivalent	Annual Cost:		\$12,294	\$12,294
7" WHITETOPPING-	doweled									
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS		SY	\$1.12	\$100,420.81	Initial Cost	0	\$314,110	1.000	\$314,110	\$14,279
Conc Std Width 7		SY	\$5.00	\$448,307.20	Major CPR	20	\$150,000	0.571	\$85,674	\$3,895
Dowel Bars	Epoxy	each	\$5.20	\$279,743.69	3.5" Bit. Overlay	30	\$146,032	0.432	\$63,036	\$2,866
Structural Concrete		CY	\$65.77	\$1,140,093.03	Rout & seal	32	\$2,000	0.408	\$816	\$37
Reinforcement Bars	Epoxy	lb	\$0.80	\$31,687.17	Remaining Life Value	35	(\$97,355)	0.375	-\$36,533	-\$1,661
		Total Cost:		\$2,000,252		Total Pr	resent Worth:		\$427,103	\$19,416
		Cost/Mile:		\$314,110		Equivalent	Annual Cost:		\$19,416	\$19,416
MILL & 4.5" min. Bit	uminous	Overlay								
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
1.5" MILL BITUMINOUS		SY	\$0.50	\$44,830.72	Initial Cost	0	\$194,256	1.000	\$194,256	\$8,831
PATCH		Ton	\$100.00	\$25,472.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
TACK COAT		GAL	\$1.00	\$26,898.43	Chipseal	4	\$20,000	0.894	\$17,881	\$813
4.5" SPWEB340B	Wear	TON	\$50.00	\$1,139,821.06	Mill & 3" Overlay	22	\$123,152	0.540	\$66,508	\$3,023
		Total Cost:		\$1,237,022	Rout & seal	24	\$2,000	0.511	\$1,021	\$46
		Cost/Mile:		\$194,256	Chipseal	26	\$20,000	0.483	\$9,656	\$439
					Remaining Life Value	35	(\$28,977)	0.375	-\$10,874	-\$494
					1		resent Worth:		\$280,340	\$12,744
					1	Equivalent	Annual Cost:		\$12,744	\$12,744
					1					

<sup>1.</sup> Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium overlays and Reclaimed pavements
2. Each successive overlay has 1 year less life than previous one on a section.
3. Thin overlay -10 years life, medium overlay-15 years, heavy bit, overlay over bituminous-20 years, reclamation -20 years, whitetopping-20 years.
4. Aggregate and shoulder quantities were not included in each option.
5. Calculations are based on 35 year life cycle.
6. Costs are based upon recent district project costs.

#### Cost Analysis/ TH 19(Cannon Falls to T.H. 61)-S.P. 2503-30

Givens:

15.554 miles

24 feet(Conc.) 113 lbs/SY Width of Road =

1" Bituminous = Interest Rate = 2.84 % 3/17/11-TRM

24 feet(Bit.)

Inflation Rate =	0 %									
MILL & 3" min. Bitur		•	ce/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
1.5" MILL BITUMINOUS PATCH TACK COAT 3" SPWEB340B	Wear Tota	SY ( Ton 10 GAL	0.57 00.00 1 00.00 =	\$124,830.18 \$62,216.00 \$43,800.06 \$1,856,027.71 \$2,086,874 \$134,170	Initial Cost Rout & seal Chipseal Mill & 3" Overlay Rout & seal Chipseal Mill & 3" Overlay Rout & seal Salvage Value	0 2 4 17 19 21 33 35 35 Total Pr	\$134,170 \$2,000 \$20,000 \$111,994 \$2,000 \$111,994 \$2,000 \$111,994 \$2,000 \$197,061) resent Worth: Annual Cost:	1.000 0.946 0.894 0.621 0.587 0.555 0.397 0.375	\$134,170 \$1,891 \$17,881 \$69,573 \$1,175 \$11,108 \$44,447 \$751 -\$36,423 \$244,572	\$6,099 \$86 \$813 \$3,163 \$53 \$505 \$2,021 \$34 -\$1,656 \$11,118
6" WHITETOPPING										
Item 3* MILL BITUMINOUS Conc Std Width 6 Structural Concrete Reinforcement Bars Dowel Bars	Epoxy Epoxy 6 <b>Tot</b> a	SY S	5.00 5.77 0.80 6.72	Total Cost \$219,000.32 \$1,095,001.60 \$2,400,608.51 \$77,396.70 \$883,009.29 \$4,675,016 \$300,567	Strategy Initial Cost Minor CPR, plane 4.5" Bit. Overlay Salvage Value		Cost/Mile \$300,567 \$150,000 \$164,499 (\$116,117) resent Worth: Annual Cost:	P/F 1.000 0.621 0.432 0.375	\$300,567 \$93,183 \$71,007 -\$43,574 \$421,183 \$19,146	\$13,663 \$4,236 \$3,228 -\$1,981 \$19,146
RECLAMATION W/ 5				Total Octob	24	W	0 1/8/11-	D/F	Donord Worth	Assessed October
Item 3" MILL BITUMINOUS RECLAMATION Tack Coats 5" SPWEB340C	Wear Tota	SY SY GAL	ce/Unit 1.00 1.10 1.00 1.00 0.00	Total Cost \$219,000.32 \$240,900.35 \$65,700.10 \$3,093,379.52 \$3,618,980 \$232,672	Strategy Initial Cost Rout & seal Chipseal Mill & 3" Overlay Rout & seal Chipseal Salvage Value		Cost/Mile \$232,672 \$2,000 \$20,000 \$111,994 \$2,000 \$20,000 (\$26,352) resent Worth: Annual Cost:	P/F 1.000 0.894 0.845 0.540 0.511 0.483 0.375	Present Worth \$232,672 \$1,788 \$16,907 \$60,482 \$1,021 \$9,656 -\$9,889 \$312,638 \$14,212	\$10,577 \$81 \$769 \$2,749 \$46 \$439 -\$450 \$14,212
MILL & 1.5" Bitumine		Unit Prid	ce/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
1.5" MILL BITUMINOUS PATCH TACK COAT 1.5" SPWEB340B	Wear <b>Tot</b> a	SY ( Ton 10 GAL	0.58 00.00 1 10.000 =	\$127,020.19 \$62,216.00 \$21,900.03 \$928,013.86 \$1,139,150 \$73,238	Initial Cost Clean & seal Chipseal Mill & 3" Overlay Rout & seal Chipseal Mill & 3" Overlay Rout & seal Chipseal Mill & 3" Overlay Rout & seal Chipseal Salvage Value	0 2 4 11 13 15 28 30 32 35 Total Pr	\$73,238 \$2,000 \$20,000 \$111,994 \$2,000 \$20,000 \$111,994 \$2,000 \$20,000 \$20,000 \$20,000 \$20,000 \$20,000 \$20,000 \$20,000 \$20,000	1.000 0.946 0.894 0.735 0.695 0.657 0.457 0.432 0.408 0.375	\$73,238 \$1,891 \$17,881 \$82,302 \$1,390 \$13,140 \$51,128 \$863 \$8,163 -\$23,640 \$226,356 \$10,290	\$3,329 \$86 \$813 \$3,741 \$63 \$597 \$2,324 \$39 \$371 -\$1,075 \$10,290
STABILIZED RECLA			IOUS ce/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS RECLAMATION EMULSION(3.8%) Tack Coats 4" SPWEB340C	Wear Tota	SY TON 4: GAL	0.50 1.28 70.00 1.00 0.00	\$109,500.16 \$280,320.41 \$1,349,414.27 \$43,800.06 \$2,474,703.62 \$4,257,739 \$273,739	Initial Cost Rout & seal Chipseal Mill & 3" Overlay Rout & seal Chipseal Salvage Value		\$273,739 \$2,000 \$20,000 \$123,152 \$2,000 \$20,000 (\$28,977) resent Worth: Annual Cost:	1.000 0.894 0.845 0.540 0.511 0.483 0.375	\$273,739 \$1,788 \$16,907 \$66,508 \$1,021 \$9,656 -\$10,874 \$358,746	\$12,444 \$81 \$769 \$3,023 \$46 \$439 -\$494 \$16,308
5" WHITETOPPING-I	Course	Unit Prid	ce/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS Conc Std Width 5 Structural Concrete Reinforcement Bars	Epoxy <b>Tot</b> a	SY 5	1.00 5.00 55.77 0.80	\$219,000.32 \$1,095,001.60 \$2,400,608.51 \$77,396.70 \$3,792,007 \$243,796	Initial Cost Minor CPR, plane 4.5" Bit. Overlay Salvage Value		\$243,796 \$150,000 \$164,499 (\$67,735) resent Worth: Annual Cost:	1.000 0.657 0.497 0.375	\$243,796 \$98,551 \$81,679 -\$25,418 <b>\$398,608</b> \$18,120	\$11,083 \$4,480 \$3,713 -\$1,155 \$18,120 \$18,120

- Assumptions
  1. Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium overlays and Reclaimed pavements.

  2. Each successive overlay has 1 year less life than previous one on a section.

  3. Reclaim design calls for milling 3" of existing bituminous-reclaim 6" of existing bituminous with 6" existing aggregate base-overlay with 5" of new bituminous.

  4. Thin overlay -10 years life, medium overlay-15 years, heavy bit. overlay-17 years, reclamation overlay-20 years, 6"whitetopping-30 years,5"whitetopping-20 years, unbondeds-35 years.

  5. Aggregate and shoulder quantities were not included in each option.

  6. Calculations are based on 35 year life cycle.

  7. Costo see based upon years of thirties project exists.

- 7. Costs are based upon recent district project costs.

#### Cost Analysis/ TH 57(Wanamingo to T.H. 52)

Givens: Length = Width of Road = 1" Bituminous = 3.959 miles

24 feet(Conc.) 113 lbs/SY Interest Rate = 2.84 % Inflation Rate = 0 %

5.5" WHITETOPPING

6/07/11-TRM 24 feet(Bit.)

Item         Course         Unit         Price/Unit         Total Cost         Strategy         Year         Cost/Mile         P/F         Present Worth           1.5* MILL BITUMINOUS         SY         \$0.50         \$27,871.36         Initial Cost         0         \$15,050         1.00         \$157,050           PATCH         Ton         \$100.00         \$15,836.00         Rout & seal         2         \$2,000         0.946         \$1,891           TACK COAT         GAL         \$1.00         \$11,148.54         Chipseal         4         \$20,000         0.894         \$17,881           4* SPWEB340B         Wear         TON         \$45.00         \$60,903.46         Mills & 3* Overlay         18         \$123,152         0.604         \$74,392           Total Cost:         **Se21,759         Rout & seal         20         \$2,000         0.571         \$1,142           Chipseal         22         \$20,000         0.540         \$10,801           Remaining Life Value         25         \$20,000         0.540         \$10,801           **Cost/Mile**         **Se3,3156         **Se3,3156         **Se3,3156         **Se3,3156		MILL & 4" min. Bituminous Overlay(To increase to 10 ton)								
PATCH Ton \$100.00 \$15,836.00 Rout & seal 2 \$2,000 0.946 \$1,891 Chipseal 4 \$20,000 0.894 \$17,881 Chipseal 20 \$2,000 0.571 \$1,142 Chipseal 20 \$2,000 0.571 \$1,142 Chipseal 22 \$20,000 0.540 \$10,801 Remaining Life Value 35 \$0 0.375 \$0	rice/Unit Total Cost Strategy Year Cost/Mile P/F Present Worth Annual Cost	Total Cost	Price/Unit	Unit	Course	Item				
TACK COAT GAL \$1.00 \$11,148.54 \$1.00 \$11,148.54 \$20,000 0.894 \$17,881 \$4 \$9WEB340B Wear TON \$45.00 \$566,903.46 Mill & 3" Overlay 18 \$123,152 0.604 \$74,392 \$1.00 \$	\$0.50 \$27,871.36 Initial Cost 0 \$157,050 1.000 \$157,050 \$7,139	\$27,871.36	\$0.50	SY		1.5" MILL BITUMINOUS				
4* SPWEB340B Wear TON \$45.00 \$\frac{\$566,903.46}{\$70tal Cost:} \frac{\$566,903.46}{\$621,759} \text{Rout & seal} 20 \$\frac{\$20,000}{\$20,000} 0.571 \$\frac{\$1,142}{\$1,142} \text{Chipseal} 22 \$\frac{\$20,000}{\$20,000} 0.540 \$\frac{\$10,801}{\$801} \text{Remaining Life Value} 35 \$\frac{\$0}{\$0} 0.375 \$\frac{\$0}{\$0}\$	\$100.00 \$15,836.00 Rout & seal 2 \$2,000 0.946 \$1,891 \$86	\$15,836.00	\$100.00	Ton		PATCH				
Total Cost: \$621,759 Cost/Mile: \$157,050 Rout & seal 20 \$2,000 0.571 \$1,142 Chipseal 22 \$20,000 0.540 \$10,801 Remaining Life Value 35 \$0 0.375 \$0	\$1.00 \$11,148.54 Chipseal 4 \$20,000 0.894 \$17,881 \$813	\$11,148.54	\$1.00	GAL		TACK COAT				
Cost/Mile:         \$157,050         Chipseal Remaining Life Value         22         \$20,000         0.540         \$10,801           80         0.375         \$0	\$45.00 <u>\$566,903.46</u> Mill & 3" Overlay 18 \$123,152 0.604 \$74,392 \$3,382	\$566,903.46	\$45.00	TON	Wear	4" SPWEB340B				
Remaining Life Value 35 \$0 0.375 \$0	\$621,759 Rout & seal 20 \$2,000 0.571 \$1,142 \$52	\$621,759								
	<b>\$157,050</b> Chipseal 22 \$20,000 0.540 \$10,801 \$491	\$157,050		Cost/Mile:						
Total Present Worth: \$263,156	Remaining Life Value 35 \$0 0.375 \$0 \$0									
	Total Present Worth: \$263,156 \$11,963									
Equivalent Annual Cost: \$11,963	Equivalent Annual Cost: \$11,963 \$11,963									

3.5 WHITETOFFING	3									
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS		SY	\$1.12	\$62,431.85	Initial Cost	0	\$289,384	1.000	\$289,384	\$13,155
Conc Std Width 5.5		SY	\$5.00	\$278,713.60	Major CPR	20	\$150,000	0.571	\$85,674	\$3,895
Structural Concrete		CY	\$65.77	\$560,072.95	3.5" Bit. Overlay	30	\$146,032	0.432	\$63,036	\$2,866
Reinforcement Bars	Epoxy	lb	\$0.80	\$19,699.98	Rout & seal	32	\$2,000	0.408	\$816	\$37
Dowel Bars	p-://		\$224,754.65	Remaining Life Value	35	(\$97,355)	0.375	-\$36,533	-\$1,661	
		Total Cost:		\$1,145,673	_	Total P	\$402,377	\$18,292		
		Cost/Mile:		\$289,384		Equivalent	Annual Cost:		\$18,292	\$18,292
STABILIZED RECLA	MATION	W/3.5" BI	TUMINOUS							
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS		SY	\$0.50	\$27,871.36	Initial Cost	0	\$215,818	1.000	\$215,818	\$9,811
RECLAMATION		SY	\$1.28	\$71,350.68	Rout & seal	4	\$2,000	0.894	\$1,788	\$81
EMULSION		TON	\$470.00	\$225,967.05	Chipseal	6	\$20,000	0.845	\$16,907	\$769
Tack Coats		GAL	\$1.00	\$11,148.54	Mill & 3" Overlay	22	\$123,152	0.540	\$66,508	\$3,023
3.5" SPWEB340C	SPWEB340C Wear TON \$47.00		\$518,086.78	Rout & seal	24	\$2,000	0.511	\$1,021	\$46	
		Total Cost:		\$854,424	Chipseal	26	\$20,000	0.483	\$9,656	\$439
		Cost/Mile:		\$215,818	Remaining Life Value	35	(\$28,977)	0.375	-\$10,874	-\$494
						Total P	resent Worth:		\$300,825	\$13,675
						Equivalent	Annual Cost:		\$13,675	\$13,675
RECLAMATION W/	4.5" BITU	MINOUS								
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS		SY	\$0.50	\$27,871.36	Initial Cost	0	\$187,683	1.000	\$187,683	\$8,532
RECLAMATION		SY	\$0.68	\$37,905.05	Rout & seal	4	\$2,000	0.894	\$1,788	\$81
Tack Coats		GAL	\$1.00	\$11,148.54	Chipseal	6	\$20,000	0.845	\$16,907	\$769
4.5" SPWEB340C	Wear	TON	\$47.00	\$666,111.57	Mill & 3" Overlay	22	\$123,152	0.540	\$66,508	\$3,023
		Total Cost:		\$743,037	Rout & seal	24	\$2,000	0.511	\$1,021	\$46
		Cost/Mile:		\$187,683	Chipseal	26	\$20,000	0.483	\$9,656	\$439
					Remaining Life Value	35	(\$28,977)	0.375	-\$10,874	-\$494
							resent Worth:		\$272,690	\$12,396
						Equivalent	Annual Cost:		\$12,396	\$12,396
					1					_

<sup>1.</sup> Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium overlays and Reclaimed pavements
2. Each successive overlay has 1 year less life than previous one on a section.
3. Thin overlay-10 years life, medium overlay-15 years, reclamation-20 years, whitetopping-20 years, mill and 4" overlay-18 years.
4. Aggregate and shoulder quantities were not included in each option.
5. Calculations are based on 35 year life cycle.
6. Costs are based upon recent district project costs.

District	1
Performed By	D. Fredrickson
Analysis Period	35
Discount Rate	2.84

Project Number	361	12-21							
Date	3/16	5/2011							
Funding Category	RS	~							
Low Cost Option #		1							
Chosen Option #									

			OPTION #1						OPTION #2						OPTION #3					
			DESCRIPTION			DESCRIPTION								DESCRIPTION						
			3" mill and 5" bituminous paveme	ent			3'	' mill	, 12" reclaim and 7" bituminous p	ave	ment				3" mill and 7" whitetopping					
			DESIGN LIFE		TYPE				DESIGN LIFE		PE				DESIGN LIFE	TYPE				
			15	BIT					20	BI		1			20	PCC	▼			
Year	#	Life		(	Cost/Mile	Year	#	Life	Description		Cost/Mile	Year	#	Life	Description	С	ost/Mile			
0				\$	292,160	0		_		\$	421,274	0				\$	320,655			
1				\$	-	1				\$	-	1				\$	-			
2				\$	-	2				\$	-	2				\$	-			
3				\$	-	3				\$	-	3				\$	-			
4				\$	-	4				\$	-	4				\$	-			
5				\$	-	5				\$	-	5				\$	-			
6	AA		Crack Treatment	\$	2,200	6	AA		Crack Treatment	\$	2,200	6				\$	-			
7				\$	-	7				\$	-	7				\$	-			
8				\$	-	8				\$	-	8				\$	-			
9				\$	-	9				\$	-	9				\$	-			
10	ΑB		Surface Treatment	\$	54,600	10	ΑB		Surface Treatment	\$	54,600	10				\$	-			
11				\$	-	11				\$	-	11				\$	-			
12				\$	-	12				\$	-	12				\$	-			
13				\$	-	13				\$	-	13				\$	-			
14				\$	-	14				\$	-	14				\$	-			
15	ΑН		2" Mill & 2" Overlay	\$	120,666	15				\$	-	15				\$	-			
16				\$	-	16				\$	-	16				\$	-			
17				\$	-	17				\$	-	17	AQ		Minor CPR (15')	\$	125,136			
18				\$	-	18				\$	-	18				\$	-			
19				\$	-	19				\$	-	19				\$	-			
20				\$	-	20	ΑН		2" Mill & 2" Overlay	\$	120,666	20				\$	-			
21	AA		Crack Treatment	\$	2,200	21			•	\$	-	21				\$	-			
22				\$	-	22				\$	-	22				\$	-			
23				\$	-	23				\$	-	23				\$	-			
24				\$	-	24				\$	-	24				\$	-			
25	AB		Surface Treatment	\$	54,600	25				\$	-	25				\$	-			
26				\$	-		AΑ		Crack Treatment	\$	2,200	26				\$	-			
27				\$	-	27				\$	-	27	AS		Minor CPR (15')	\$	217,800			
28				\$	-	28				\$	-	28				\$	-			
29				\$	-	29				\$	-	29				\$	-			
	ΑН		2" Mill & 2" Overlay	\$	120,666		ΑB		Surface Treatment	\$	54,600	30				\$	-			
31				\$	-	31				\$	-	31				\$	-			
32				\$	-	32				\$	-	32				\$	-			
33				\$	-	33				\$	-	33				\$	-			
34		Ш		\$	-	34				\$	-	34		_		\$	-			
35			Remaining Service Life Value**	\$	(80,444)	35			Remaining Service Life Value**	\$	(1)	35			Remaining Service Life Value**	\$	(83,769)			
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		ļ	Total Present Worth	\$	464,793				Total Present Worth	\$	557,947				Total Present Worth	\$	469,211			
		ļ	Eq. Annual Cost*		\$21,129				Eq. Annual Cost*	1	\$25,364				Eq. Annual Cost*		\$21,330			
l			% of Low Cost		100%				% of Low Cost		120%				% of Low Cost		101%			

- \* Equivalent Annual Cost is included for information only.
  \*\*Remaining Service Life Value is reported as a negative value.

8
S. Pedersen
35
2.84

Project Number	1212-30
Date	4/12/2011
Funding Category	2
Low Cost Option #	1
Chosen Option #	0

	OPTION #1				OPTION #2				OPTION #3				
	DESCRIPTION				DESCRIPTION			DESCRIPTION					
	BAB Reconstruction				Whitetopping				Whitetopping				
	DESIGN LIFE		TYPE		DESIGN LIFE	ΤY	PE		DESIGN LIFE	TYPE			
	20		1		20		2		35		2		
Year	Description	С	Cost/Mile	Year	Description		Cost/Mile	Year	Description	Co	ost/Mile		
	BAB Construction	\$	525,618		7" Whitetopping (20 yr)	\$	986,574		8" Whitetopping (35 yr)	\$	889,953		
1	D, ID Collection	\$	-	1	· ····································	\$	-	1	o windspinig (ob y.)	\$	-		
2		\$	-	2		\$	-	2		\$	-		
3		\$	-	3		\$	-	3		\$	-		
4		\$		4		\$	-	4		\$	-		
5	Crack Treatment	\$	5,000	5 6		\$	-	5 6		\$	-		
	Crack Treatment Surface Treatment	\$	25,000	7		\$	-	7		\$			
8	Currace Treatment	\$	-	8		\$	-	8		\$	-		
9		\$	-	9		\$	-	9		\$	-		
10		\$	-	10		\$	-	10		\$	-		
11		\$	-	11		\$	-	11		\$	-		
12		\$	-	12	Minar ODD - Oa I	\$	-	12		\$	-		
13		\$	-	13	Minor CPR + Seal	\$	29,000	13 14		\$	-		
14 15		\$	-	15		\$	-	15		\$			
16		\$	_	16		\$	-	16		\$			
17		\$	-	17		\$	-		Minor CPR	\$	21,500		
18		\$	-	18		\$	-	18		\$	-		
19		\$	-	19		\$	-	19		\$	-		
	2"Mill & 2" Overlay	\$	124,626	20		\$	-	20		\$	-		
21		\$	-	21		\$	-	21		\$	-		
22	Crack Treatment	\$	5,000	22 23		\$	-	22 23		\$	-		
	Surface Treatment	\$	25,000	24		\$	-	24		\$			
25	Curiado Fraumoni	\$	-		Major CPR + Grind	\$	130,000	25		\$	-		
26		\$	-	26	.,	\$	-	26		\$	-		
27		\$	-	27		\$	-	27	Minor CPR + Seal	\$	29,000		
28		\$	-	28		\$	-	28		\$	-		
29		\$	-	29		\$	-	29		\$	-		
30		\$	-	30 31		\$	-	30 31		\$	-		
32		\$		32		\$		32		\$			
33		\$	-	33		\$	-	33		\$	-		
34		\$	-	34		\$	-	34		\$	-		
35	End of Analysis	\$	-	35	End of Analysis	\$	-	35	Remaining Service Life Value**	\$	(11,020)		
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<u> </u>	Total Present Worth	\$	636,968		Total Present Worth	\$	1,071,274		Total Present Worth	\$	912,789		
	Eq. Annual Cost*		\$28,956		Eq. Annual Cost*		\$48,699		Eq. Annual Cost*		\$41,494		
	% of Low Cost		100%		% of Low Cost		168%		% of Low Cost		143%		

<sup>\*</sup> Equivalent Annual Cost is included for information only.

\*\*Remaining Service Life Value is reported as a negative value.

2	C. Bower	50	2.7
District	Performed By	Analysis Period	Discount Rate

TYPE ВІТ

DESCRIPTION uminous Mill and **DESIGN LIFE** 

**OPTION #1** 

7 C. Bower 20

TYPE ВІТ

DESCRIPTION crete, then 6" Bitumi **DESIGN LIFE** 

**OPTION #4** 

	District Performed By	Analysis Period Discount Rate		OPTIO	DESCRI	Rubblize Concrete, then	DESIG	20	e Descri	Initial Construction						Crack Treatment				Chip Seal						2" Mill & 3" Overl		Crack Treatment			Chip Seal						3.5" Mill and 4" C		T 1000	Olack Healingin		::10
						Rubbli			# Life							AA			- 1	BD		Н	ł			PΥ		AA			BD	ł	t			t	ВН		<	Į.	Н	0
									Year	0	- 0	3	4	5	9	~ 00	6	10	11	12	14	15	16	18	19	20	21	23	24	25	27	28	30	31	32	34	35	36	37	39	40	4.7
						- O/L not possible)	TYPE	PCC •	Cost/Mile	1,070,565				-				1					10 640						-		5 72,000				-			-	1		\$ 120,115	
				OPTION #3	DESCRIPTION	20	DESIGN LIFE T	35	Description	nitial Construction													10+ ODD (25 vir docion)								2nd CPR (35 yr design)										Major CPR (15')	
						struct			Life																																	Ī
						Secon			ar #	0	- 0	ع اد 1	4	2	9 1	- 00	0	10	1	12	1 4	15	16	18 18	19	20	21	23	24	25	27 BG	788	83 08	31	32	34 83	35	36	37	9 69	40 AS	41
r		П		L	-	Ľ.		•	Year	4	$\downarrow$	+			+	+	L	_		$\perp$	L	_	,		_	.4	. 4	1 (1				.,.	4 (0)	(,)	(,)	.,		(+)	., .	, (,)	7	+
	4306-15	RD 1	<b>←</b>			- O/L not possible)	TYPE	PCC	Cost/Mile	\$ 1,070,564	· ·		· •	\$	ا د	- I	ا ب	\$	٠ <del>ده</del>	\$ 26.355	24	· •		n 65		9	· ·	. &		\$ 128,266	· <del>S</del>				· •	, , Э <del>С</del>	\$ 396,367	- \$	↔ e	9 69		→ <del>U</del>
	Project Number Date	Funding Category Low Cost Option #	Chosen Option #	OPTION #2	DESCRIPTION	2	DESIGN LIFE	20	Description	Initial Construction										1st CPR (20 vr design)	(20) (20)									2nd CPR (20 yr design)							Unbonded Concrete Overlay					
						onstru			# Life		+	+	H	+	+	Ŧ	H	H	+	ű	3	H	+	Ŧ	H	H	+	$\vdash$	-	ပ္က	H	+	+	H	H	+	≿	4	+	H	H	+

159,719

4" Mill and 4" Overlay

Crack Treatment

20,000

Chip Seal

20,000

125,632

2" Mill & 3" Overlay

164,224

3.5" Mill and 4" Overlay

33 34 35 36 37 41 40

20,000

Chip Seal

159.719

4" Mill and 4" Overlay

Crack Treatment

42

26,355

1st CPR (20 yr design)

BB

20,000 (305,200) 525,803 \$19,287

Service Life Value\*\*
Total Present Worth
Eq. Annual Cost\*

Chip Seal

42 44 44 45 46 47 48 48 48 50

654,000

Reconstruct BAB

Equivalent Annual Cost is included for informatic

g Service Life Value\*\* \$

Total Present Worth \$

Eq. Annual Cost\*

% of Low Cost

(40,038.33) 1,148,297 \$42,121 218%

g Service Life Value\*\*
Total Present Worth
Eq. Annual Cost\*

(226,495.43) 1,258,660 \$46,169 239%

3 Service Life Value\*\*
Total Present Worth
Eq. Annual Cost\*
% of Low Cost

42 BD 44 44 45 BD 46 44 47 47 50

\* Equivalent Annual Cost is included for information only.

\*\*Remaining Service Life Value is reported as a negative value.

Original LCCA dated 1/24/08 was revised to meet state statutes.

#### Cost Analysis/ TH 218(Iowa to I-90)

2/05/10-TRM

24 feet(Bit.)

12.195 miles

Givens: Length = Width of Road = 1" Bituminous = 24 feet(Conc.) 111 lbs/SY

Interest Rate = 2.84 % 0 % Inflation Rate =

MILL 2" & 4" min. Bi	ituminou	s Overlay/	17 Voar Fiv	\						
Item	Course		Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS		SY	0.68	\$116,759.81	Initial Cost	0	\$157,050	1.000	\$157,050	\$7,139
PATCH		Ton	100.00	\$48,780.00	Rout & seal	2	\$2,000	0.946	\$1.891	\$86
TACK COAT		GAL	1.00	\$34,341,12	Chipseal	4	\$20,000	0.894	\$17.881	\$813
4" SPWEB340B	Wear	TON	45.00	\$1,715,338.94	Mill & 3" Overlay	19	\$123,152	0.587	\$72,337	\$3,288
		Total Cost:		\$1,915,220	Rout & seal	21	\$2,000	0.555	\$1.111	\$50
		Cost/Mile:		\$157,050	Chipseal	23	\$20,000	0.525	\$10,503	\$477
		0000,,,,,,		<b>\$101,000</b>	Mill & 3" Overlay	33	\$123,152	0.397	\$48,876	\$2,222
					Remaining Life Value	35	(\$108,664)	0.375	-\$40,777	-\$1,854
							resent Worth:		\$268,871	\$12,223
						Equivalent	Annual Cost:		\$12,223	\$12,223
										_
7.5" Unbonded Over			Price/Unit	T-1-1 01	044	V	Cost/Mile	P/F	Barrer March	A
	Course			Total Cost	Strategy	Year			Present Worth	Annual Cost
6" MILL BITUMINOUS		SY	2.00	\$343,411.20	Initial Cost	0	\$340,391	1.000	\$340,391	\$15,474
PASSRC		Ton	58.54	\$0.00	Minor CPR	20	\$150,000	0.571	\$85,674	\$3,895
Conc Std Width 7.5		SY	5.00	\$858,528.00	4.5" Bit. Overlay	33	\$164,499	0.397	\$65,285	\$2,968
Structural Concrete	_	CY	65.77	\$2,352,724.44	Remaining Life Value	35	(\$145,146)	0.375	-\$54,467	-\$2,476
Reinforcement Bars	Epoxy	lb .	0.80	\$60,682.32			resent Worth:		\$436,883	\$19,860
Dowel Bars	Epoxy	each	5.20	\$535,721.47		Equivalent	Annual Cost:		\$19,860	\$19,860
		Total Cost:		\$4,151,067						
		Cost/Mile:		\$340,391						
MILL 2" & 5" min. Bi	ituminou	s Overlay(2	20 Year Fix	)						
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS		SY	0.68	\$116,759.81	Initial Cost	0	\$193,622	1.000	\$193,622	\$8,802
PATCH		Ton	100.00	\$48,780.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
TACK COAT		GAL	1.00	\$51,511.68	Chipseal	4	\$20,000	0.894	\$17,881	\$813
5" SPWEB340B	Wear	TON	45.00	\$2,144,173.68	Mill & 3" Overlay	22	\$123,152	0.540	\$66,508	\$3,023
		Total Cost:		\$2,361,225	Rout & seal	25	\$2,000	0.497	\$993	\$45
		Cost/Mile:		\$193,622	Chipseal	27	\$20,000	0.469	\$9,390	\$427
					Remaining Life Value	35	(\$28,977)	0.375	-\$10,874	-\$494
						Total P	resent Worth:		\$279,411	\$12,702
						Equivalent	Annual Cost:		\$12,702	\$12,702
					1					

Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium and heavy BOB's and Reclaimed pavements
 Each successive overlay has 1 year less life than previous one on a section.
 Thin overlay -10 years life, medium overlay-15 years, heavy bit. overlay-17 years & 20 years, reclamation overlay-20 years, unbonded-20 years.
 Aggregate and shoulder quantities were not included in each option.
 Calculations are based on 35 year life cycle.
 Costs are based upon recent district project costs.

#### Cost Analysis I-90 WB(Marion to Stewartville)

Givens: Length =

Width of Road = 1" Bituminous =

13.52 miles

24 feet(Conc.) 115 lbs/SY

24 feet(Bit.)

01/26/10-TRM

REVISED TO MEET STATE STATUTES

\*Note: Aggregate and shoulder quantities were not included in each option. Interest Rate = Inflation Rate = 2.84 % 0 %

MILL & 3" min. Bitu	Course		Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
1.5" MILL BITUMINOUS		SY	0.50	\$95,180.80	Initial Cost	0	\$123,152	1.000	\$123,152	\$5,598
PATCH		Ton	100.00	\$54,080.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
TACK COAT		GAL	1	\$38,072.32	Mill & 3" Overlay	15	\$123,152	0.657	\$80,912	\$3,678
3" SPWEB440B	Wear	TON	45.00	\$1,477,681.92	Rout & seal	19	\$2,000	0.587	\$1,175	\$53
		Total Cost:		\$1,665,015	Mill & 3" Overlay	29	\$123,152	0.444	\$54,669	\$2,485
		Cost/Mile:		\$123,152	Remaining Life Value	35	(\$66,313)	0.375	-\$24,884	-\$1,131
						Total Pr	resent Worth:		\$236,914	\$10,770
						Equivalent	Annual Cost:		\$10,770	\$10,770
										-
MILL 3" & 4.5" min.	Bitumino	ous Overlav	/(20 Year F	ix)						
Item	Course		Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS		SY	1.10	\$209,397.76	Initial Cost	0	\$182,248	1.000	\$182,248	\$8,285
PATCH		Ton	100.00	\$0.00	Rout & seal	3	\$2,000	0.919	\$1,839	\$84
TACK COAT		GAL	1	\$38,072.32	Mill & 3" Overlay	20	\$123,152	0.571	\$70,340	\$3,198
4.5" SPWEB440B	Wear	TON	45.00	\$2,216,522.88	Rout & seal	24	\$2,000	0.511	\$1,021	\$46
		Total Cost:		\$2,463,993	Remaining Life Value	35	\$0	0.375	\$0	\$0
		Cost/Mile:		\$182,248		Total Pr	resent Worth:		\$255,448	\$11.612
				, , ,		Equivalent	Annual Cost:		\$11,612	\$11,612
						•				_
8.5" Unbonded Con Item	crete Ove Course		ar Fix) Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS	000.00	SY	0.58	\$110,409.73	Initial Cost	0	\$405,279	1,000	\$405.279	\$18,423
PASSRC		Ton	46.42	\$626,343.20	Minor CPR, plane	22	\$150,000	0.540	\$81,008	\$3,682
Conc Std Width 8		SY	5.00	\$951,808.00	Remaining Life Value	35	\$0	0.375	\$0	\$0
Conc Sta Wiatin 6		CY	65.77	\$2,955,991.46		Total Pr	resent Worth:		\$486,286	\$22,106
	_	lb	0.80	\$67,275.52		Equivalent	Annual Cost:		\$22,106	\$22,106
Structural Concrete	Epoxy			A-0	1					
Structural Concrete Reinforcement Bars	Epoxy Epoxy	each	6.72	\$767,537.97						
Structural Concrete Reinforcement Bars Dowel Bars	Ероху	each Total Cost:	6.72	\$5,479,366						

Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium overlays and Reclaimed pavements
 Each successive overlay has 1 year less life than previous one on a section.
 Thin overlay -10 years life, medium overlay-15 years, heavy bit. overlay-20 years, reclamation overlay-20 years, unbonded-20 years.
 Aggregate and shoulder quantities were not included in each option.
 Calculations are based on 35 year life cycle.
 Costs are based upon recent district project costs.

#### **APPENDIX 2**

					So	coping Cost Analy	/sis	T.H. 29			
						(SP 5609-09)					
						(6. 6666 66)					
	Givens:										
		14.197	miles			INPUTS	1				
	Length =									12 1 2	
	Width of Road =		feet			*Note: Aggregate and shou				d in each option.	
	1" Bituminous =		Ibs/SY			Calculations are bas					
	Discount Rate =	2.84	%			Unit Prices are base				d Prices and	
						the 2009 District 4 0	Contrac	t Prices, as a	applicable.		
icknes											
(in.)	<b>Bituminous Recl</b>	amation									
	Item	Course	Unit	Price/Unit	Total Cost	Description	Year	Cost/Mile	P/F	Present Worth	Annual Cost
	Mill Bituminous 4"		SY	1.42	\$283,849.14	Initial Cost	0	\$240,960	1.000	\$240,960	\$10,954
	12" Bit. Reclamation		SY	0.82	\$163,912.88	rout & seal	3	\$2,000	0.919	\$1,839	\$84
2	SPWEB340C	Wear	TON	49.45	\$1,087,322.11	chip seal	6	\$20,000	0.845	\$16,907	\$769
2	SPWEB340C	Wear	TON	49.45	\$1,087,322.11	mill & 3" Overlay	23	\$103,000	0.525	\$54,089	\$2,459
1.5	SPNWB330B	NonWear	TON	48.42	\$798,505.61	rout & seal	25	\$2,000	0.497	\$993	\$45
			Total:		\$3,420,912	chip seal	27	\$20,000	0.469	\$9,390	\$427
			Cost/Mile:		\$240,960	RSL	35	(\$20,600)	0.403	(\$7,730)	(\$351)
			5554 HITE.		Ψ <u>Σ</u> -10,000		00				
							-	Total Prese		\$316,447	\$14,385
							Eq	uivalent An	nuar COSt:	\$14,385	
	MULO D. O.										
	Mill & Pave 3"										
	Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
	Mill Bituminous 3"		SY	1.08	\$215,885.26	Initial Cost	0	\$102,443	1.000	\$102,443	\$4,657
1.5	SPWEB340B	Wear	TON	37.55	\$619,245.88	rout & seal	3	\$2,000	0.919	\$1,839	\$84
1.5	SPWEB340B	Wear	TON	37.55	\$619,245.88	chip seal	6	\$20,000	0.845	\$16,907	\$769
			Total Cost:		\$1,454,377	mill & 3" Overlay	15	\$103,000	0.657	\$67,672	\$3,076
			Cost/Mile:		\$102,443	rout & seal	17	\$2,000	0.621	\$1,242	\$56
					<b>4</b> 10 <b>2,</b> 110	chip seal	19	\$20,000	0.587	\$11,748	\$534
						mill & 3" Overlay	29	\$103,000	0.444	\$45,723	\$2,079
						RSL	35	(\$48,100)	0.375	(\$18,050)	(\$821)
						NOE	55	Total Prese		\$229,523	
							-				\$10,434
							Eq	uivalent An	nuai Cost:	\$10,434	
	OH MAN Market and the										
	6" Whitetopping			<b>.</b>			.,				
	Item	Туре	Unit	Price/Unit	Total Cost	Strategy	Year		P/F	Present Worth	Annual Cost
	Mill Bituminous 4"		SY	1.42	\$283,849.14	Initial Cost	0	\$261,888	1.000	\$261,888	\$11,905
	Conc Pvmt Std Width		SY	4.50	\$899,521.92	Major CPR & plane	15	\$200,000	0.657	\$131,401	\$5,973
6	Structural Concrete		CY	76.08	\$2,534,652.88	Bituminous Reconstruct	23	\$328,000	0.525	\$172,245	\$7,830
						RSL	35	(\$170,560)	0.375	(\$64,004)	(\$2,910)
			Total Cost:		\$3,718,024			Total Prese	ent Worth:	\$501,530	\$22,799
			Cost/Mile:		\$261,888		Eq	uivalent An	nual Cost:	\$22,799	
	<b>Bituminous Reco</b>	onstruct									
	Item	Type	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2	SPWEB340C	Wear	TON	49.45	\$1,087,322.11	Initial Cost	0	\$327,705	1.000	\$327,705	\$14,897
2	SPWEB340C	Wear	TON	49.45	\$1,087,322.11	rout & seal	6	\$2,000	0.845	\$1,691	\$77
1.5	SPNWB330B	NonWear		48.42	\$798,505.61	chip seal	8	\$20,000	0.799	\$15,986	\$727
8	Agg Base Class 5		CY	17.34	\$770,257.29	mill & 3" Overlay	25	\$103,000	0.497	\$51,143	\$2,325
17	Select Granular		CY	9.63	\$909,016.87	rout & seal	27	\$2,000	0.469	\$939	\$43
.,	Colour Charlulai		01	3.03	ψυσυ, στο. στ	chip seal	29	\$2,000	0.444	\$8,878	\$404
			Total Cost:		\$4,652,424	RSL	35	(\$34,400)	0.375	(\$12,909)	(\$587)
						1.02	33				
			Cost/Mile:		\$327,705		-	Total Prese		\$393,433	\$17,885
							Eq	uivalent An	nuai Cost:	\$17,885	
	7.5" Concrete Re										
	Item	Туре	Unit	Price/Unit		Strategy	-	Cost/Mile	P/F	Present Worth	Annual Cost
	Conc Pvmt Std Width		SY	4.50	\$899,521.92	Initial Cost	0	\$435,753	1.000	\$435,753	\$19,809
	Structural Concrete		CY	76.08	\$3,168,316.10	Joint Reseal & Minor CPR	17	\$100,000	0.621	\$62,122	\$2,824
7.5	Dawal Bara	Epoxy	each	8.30	\$995,470.92	Minor CPR	27	\$100,000	0.469	\$46,949	\$2,134
7.5	Dowel Bars		CY	17.34	\$481,410.81	RSL	35	\$0	0.375	\$0	\$0
7.5 5	Agg Base Class 5							Total Prese		\$544,823	\$24,767
5	Agg Base Class 5		CY	9,63	\$641,658.97						
5			CY	9.63	\$641,658.97		Fa				Q2 1,1 O1
	Agg Base Class 5				,		Eq	uivalent An		\$24,767	<b>\$2.1,1.0.</b>
5	Agg Base Class 5		CY Total Cost: Cost/Mile:		\$6,186,379 \$435,753		Eq				ŲZ 1,1 O

# Amended Scoping Cost Analysis TH 94 S.P. 5680-126

Length = Width of Road = 1" Bituminous = Discount Rate =	13.408 miles 24 feet 110 lbs/S' 2.84 %	408 miles 24 feet 110 lbs/SY 2.84 %			INPUTS SUBJECT SHAPE SHA	d should re basec based e	5/7/2010 5/7/2010 er quantities v fon 35 yr. life off the 2009 N tract Prices, s	skm were not inclu cycle. //n/DOT Avg. as applicable	NPUTS  Aggregate and shoulder quantities were not included in each option. Calculations are based on 35 yr. life cycle. Unit Prices are based off the 2009 Mn/DOT Avg. Bid Prices and the 2009 District 4 Contract Prices, as applicable.	
mill 3.5" /fill 3.5" Item	Course	Unit	Price/Unit	Total Cost	Description	Year	Cost/Mile	P/F	Present Worth	Annual Cost
mill pavement SPWEB540E	Wear	SY TON	1.25	\$235,980.80 \$1,915,172.98	Initial Cost 2" mill and overlay 1.5" overlay	0 6 4	\$160,438 \$93,000 \$62,000	1.000	\$160,438 \$72,281 \$40,734	\$7,293 \$3,286 \$1,852
	8	Total: Cost/Mile:		\$2,151,153,78 \$160,438.08	4.5" mill and overlay 1.5" mill and fill RSL	32 35 35 T	20 \$206,000 0.571 32 \$70,000 0.408 35 (\$35,000) 0.375 Total Present Worth: Equivalent Annual Cost:	0.571 0.408 0.375 I Worth:	\$117,659 \$28,570 (\$13,134) \$406,549 \$18,481	\$5,349 \$1,299 (\$597) \$18,481
mill 5" /fill 5" Item	Course	Unit	Price/Unit	Total Cost	Description	Year	Cost/Mile	P/F	Present Worth	Annual Cost
mill pavement SPWEB540E	Wear	SY TON	1.75	\$330,373.12 \$2,735,961.40	Initial Cost patch patch	0 9 7	\$228,694 \$20,000 \$20,000	1.000 0.845 0.735	\$228,694 \$16,907 \$14,698	\$10,396 \$769 \$668
	8	Total: Cost/Mile:		\$3,066,334,52 \$228,694.40	unbonded minor cpr RSL	20 33 35 <b>T</b>	20 \$397,000 0.571 33 \$100,000 0.397 35 (\$93,250) 0.375 Total Present Worth: Equivalent Annual Cost:	0.571 0.397 0.375 t Worth:	\$226,751 \$39,687 (\$34,993) \$491,744 \$22,354	\$10,308 \$1,804 (\$1,591) \$22,354
mill 1.5" and overlay 3" Item Co	lay 3" Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
mill bituminous SPWEB540E	Wear	SY	0.58 52.70	\$109,495.09 \$1,641,576.84	Initial Cost 3" mill and overlay 1.5" overlay 6" mill and overlay	0 8 15 21	\$130,599 \$138,000 \$62,000 \$275,000	1.000 0.799 0.657 0.555	\$130,599 \$110,302 \$40,734 \$152,732	\$5,937 \$5,014 \$1,852 \$6,943
	20	Total Cost: Cost/Mile:		\$1,751,072 \$130,599	1.5" mill and fill RSL	35 35	35 \$70,000 0.375 36 (\$70,000) 0.375 Total Present Worth: Equivalent Annual Cost:	0.375 0.375 t Worth:	\$26,268 (\$26,268) \$434,367 \$19,746	\$1,194 (\$1,194) \$19,746
7" UBOL Item	Туре	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
mill bituminous 5" PASSRC Conc Pvmt Std Width		S TO YS	1.75 28.25 4.50	\$330,373.12 \$407,598.33 \$849,530.88	Initial Cost Major CPR & plane RSL	0 35 35	\$396,808 \$200,000 \$0	1.000 0.571 0.375	\$396,808 \$114,232 \$0	\$18,038 \$5,193 \$0
Structural Concrete Dowel Bars	Epoxy	CY each	76.08	\$2,792,754.11 \$940,147.51 \$5.320.404		Eg	Total Present Worth: Equivalent Annual Cost:	t Worth:	\$511,040 \$23,231	\$23,231

	Bituminous Reconstruct	nstruct									
	ltem	Type	Unit	Price/Unit	Total Cost	Strategy	Year	Year Cost/Mile	P/F	Present Worth	Annual Cost
7	SPWEB540F	Wear	TON	57.00	\$1,183,679.69	Initial Cost	0	\$494,771	1.000	\$494,771	\$22,492
7	SPWEB540F	Wear	TON NO	57.00	\$1,183,679.69	rout & seal	က	\$2,000	0.919	\$1,839	\$84
4	SPNWB540B	NonWear	TON NO	57.00	\$2,367,359.39	chip seal	9	\$20,000	0.845	\$16,907	\$769
12	Agg Base Class 5		C	17.34	\$1,091,175.22	mill & 3" Overlay	25	\$138,000	0.497	\$68,522	\$3,115
16	Select Granular		ζ	9.63	\$807,998.26	rout & seal	27	\$2,000	0.469	\$939	\$43
						RSL	35	\$0	0.375	\$0	\$0
		Tot	Total Cost:		\$6,633,892		_	Total Present Worth:	Worth:	\$582,977	\$26,501
		ŏ	Cost/Mile:		\$494,771		Equ	Equivalent Annual Cost:	al Cost:	\$26,501	
	Thin Overlay										
	ltem	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
						Initial Cost	0	\$61,216	1.000	\$61,216	\$2,783
						thin overlay	6	\$62,000	0.777	\$48,187	\$2,191
1.5	SPWEB540E	Wear	TON NO	52.70	\$820,788.42	thin overlay	18	\$62,000	0.604	\$37,452	\$1,703
						thin overlay	27	\$62,000	0.469	\$29,108	\$1,323
		Tot	Fotal Cost:	!	\$820,788	RSL	35	\$0	0.375	\$0	\$0
		ŏ	Cost/Mile:		\$61,216		_	Total Present Worth:	Worth:	\$175,964	\$7,999
							Equi	Equivalent Annual Cost:	al Cost:	\$7,999	
											Ĭ

# Mn/DOT DISTRICT 2 REHABILITATION WORKSHEET (General Pre-Scoping / Planning Estimate)

#### TH **75** State Project 6012-44

		11	1	75 State FF	ojec	1 0012-44			
Funding category	RS			Alternate #1		Alternate #2		Alternate #3	Alternate #4
	Descript	ion>		3" MILL & OVERLAY		NEW CONC.		NEW BIT	
		YR							
Fi	rst Cost \$ / Mile			\$149,626		\$589,625		\$647,236	
R	ehab Life in Yrs			35		35		35	35
	Interest %			2.84%		2.84%		2.84%	3.10%
		1		\$0		\$0		\$0	\$0
Notes:		2		\$0		\$0		\$0	\$0
Last Revised 11/25/08 (A, F, G, H		3		\$0		\$0		\$0	\$0
Last Revised 3/31/10 (B, C, D, E)		4		\$0		\$0		\$0	\$0
2-Lane Highway		5		\$0		\$0		\$0	\$0
Improvements	Cost / mile	6		\$0		\$0		\$0	\$0
A Reclaim B 1 1/2" Overlay	\$287,589	7		\$0 \$0		\$0 \$0		\$0 \$0	\$0 \$0
B 1 1/2" Overlay C 1 1/2" Mill & 1 1/2" Overlay	\$60,000 \$68,000	8		\$0		\$0		\$0	\$0
D 2" Mill & Overlay	\$100,000		G	\$45,500			G	\$45,500	\$0
E 3" Mill & 3" Overlay	\$141,200	11		\$0		\$0		\$0	\$0
F Route and Seal	\$7,000	12		\$0		\$0		\$0	\$0
G Chip seal	\$45,500	13		\$0		\$0		\$0	\$0
H Joint seal & minor CPR	\$91,120	14		\$0		\$0		\$0	\$0
I Minor CPR w/ full depth repair	\$201,000	15		\$0		\$0		\$0	\$0
J Major CPR & griding	\$284,750	16		\$0		\$0		\$0	\$0
K Microsurface	\$45,500	17		\$0	Н	\$91,120		\$0	\$0
L New Concrete	\$589,625	18		\$0		\$0		\$0	\$0
M 5.5" mill, conc rehab, 5" new	\$425,510	19		\$0		\$0		\$0	\$0
			M	\$425,510		T -	D	\$100,000	\$0
		21 22		\$0 \$0		\$0 \$0		\$0 \$0	\$0 \$0
		23		\$0		\$0 \$0		\$0 \$0	\$0
		24		\$0		\$0		\$0	\$0
		25		\$0		\$0		\$0	\$0
		26		\$0		\$0		\$0	\$0
		27		\$0	ı	\$201,000	G	\$45,500	\$0
		28		\$0		\$0		\$0	\$0
		29		\$0		\$0		\$0	\$0
		30	С	\$68,000		\$0		\$0	\$0
		31		\$0		\$0		\$0	\$0
		32		\$0		\$0	_	\$0	\$0
		33		\$0		\$0	E	\$141,200	\$0
		34 35		\$0 \$0		\$0 \$0		\$0 \$0	\$0 \$0
		36		\$0		\$0		\$0	\$0
		37		\$0		\$0		\$0	\$0
		38		\$0		\$0		\$0	\$0
		39		\$0		\$0		\$0	\$0
		40		\$0		\$0		\$0	\$0
		41		\$0		\$0		\$0	\$0
		42		\$0		\$0		\$0	\$0
		43		\$0		\$0		\$0	\$0
		44		\$0		\$0		\$0	\$0
		45		\$0		\$0		\$0	\$0
		46		\$0 \$0		\$0 \$0		\$0 \$0	\$0 \$0
		47 48		\$0 \$0	-	\$0 \$0		\$0 \$0	\$0 \$0
		49		\$0		\$0 \$0		\$0	\$0
To:	ا tal Cost (Present	_		\$456,400		\$740,597		\$816,139	\$0
	ial Cost (Present			\$20,747		\$33,667		\$37,101	\$1,000,000
Ailliu	% Above Low			100%		162%		179%	4820%
	, , , , , , , , , , , , , , , , , , , ,			10070	ا ر	10270		11070	+02070

KO

Data Furnished By: Completed By: Date: 6/7/2010

#### Cost Analysis/ TH 246(T.H. 3 to CSAH 26)

12.232 miles

Givens: Length = Width of Road = 1" Bituminous = 24 feet(Conc.) 115 lbs/SY Interest Rate = 2.84 % 0 % Inflation Rate =

24 feet(Bit.) 2/01/10-TRM

Item	MILL & 3" min. Bitun	ninous C	verlay(15	Year Fix)							
PATCH	Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
TACK COAT	1.5" MILL BITUMINOUS		SY	0.57	\$98,169.14	Initial Cost	0	\$124,138	1.000	\$124,138	\$5,643
3° SPWEB340B	PATCH		Ton	100.00	\$48,928.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
Total Cost:	TACK COAT		GAL	1	\$34,445.31	Chipseal	4	\$20,000	0.894	\$17,881	\$813
Cost/Mile   Cost/Mile   Freel/Unit   Freel/Unit   Total Cost   Strategy   Freel/Unit   Total Cost   Strategy   Freel/Unit   Total Cost   Strategy   Freel/Unit   Total Cost   Strategy   Freel/Unit   Strategy	3" SPWEB340B	Wear	TON	45.00	\$1,336,908.67	Mill & 3" Overlay	17	\$124,138	0.621	\$77,117	\$3,506
Mill & 3° Overlay			Total Cost:		\$1,518,451	Rout & seal	19	\$2,000	0.587	\$1,175	\$53
Remaining Life Value			Cost/Mile:		\$124,138	Chipseal	21	\$20,000	0.555	\$11,108	\$505
S.5" WHITETOPPING(20 Year Fix)   Item						Mill & 3" Overlay	33	\$124,138	0.397	\$49,267	\$2,240
Strategy						Remaining Life Value			0.375		-\$1,835
S.5" WHITETOPPING(20 Year Fix)   Item							Total Pr	esent Worth:		\$242,203	\$11,010
Item							Equivalent	Annual Cost:		\$11,010	\$11,010
Item											
3" MILL BITUMINOUS		•	,				.,				
Conc Std Width 5.5   SY   5.00   \$861,132.80   \$1,730,440.10   \$1,730,440.10   \$3.5° BIT. Overlay   \$3.5° BIT. O		Course									
Structural Concrete   Reinforcement Bars   Epoxy   Ib   0.80   \$60,866.43   \$60,8							-				
Reinforcement Bars   Epoxy   Ib   0.80   \$60,866.43   \$60,866.43   \$50,4477.49   \$50,866   \$417.49   \$17,368   \$17											
Dowel Bars   Epoxy		_									
RECLAMATION W/ 8.5" BITUMINOUS(20 Year Fix)   tem   Course   Unit   Price/Unit   Total Cost   Strategy   Year   Cost/Mile   P/F   Present Worth   Annual Cost   Strategy   Str						Remaining Life Value			0.375		
RECLAMATION W/ 8.5" BITUMINOUS(20 Year Fix)   Item   Course   Unit   Price/Unit   Total Cost   Strategy   Year   Cost/Mile   P/F   Present Worth   Annual Cost	Dowel Bars	Epoxy		6.72							
RECLAMATION W/ 8.5" BITUMINOUS(20 Year Fix)   Item   Course   Unit   Price/Unit   Total Cost   Strategy   Year   Cost/Mile   P/F   Present Worth   Annual Cost   2.5" MILL BITUMINOUS   SY   0.65   \$111,947.26   Initial Cost   0   \$350,891   1.000   \$350,891   \$15,951   RECLAMATION   SY   1.10   \$189,449.22   Rout & seal   4   \$2,000   0.894   \$1,788   \$81   \$8.5" SPWEB340C   Wear   TON   47.00   \$39,962,529.37   Mill & 3" Overlay   22   \$124,138   0.540   \$67,041   \$3,048   \$8.5" SPWEB340C   Total Cost:   \$4,292,101   Cost/Mile:   \$4350,891   \$1,021   \$46   Chipseal   26   \$20,000   0.483   \$9,656   \$439   Remaining Life Value   \$350,891   Total Present Worth:   \$436,344   \$19,836   \$439,836							Equivalent	Annual Cost:		\$17,368	\$17,368
Total Cost			Cost/Mile:		\$289,384						
2.5" MILL BITUMINOUS         SY         0.65         \$111,947.26         Initial Cost         0         \$350,891         1.00         \$350,891         \$15,951           RECLAMATION         SY         1.10         \$189,449.22         Rout & seal         4         \$2,000         0.845         \$16,907         \$769           Rout & SPWEB340C         Wear         TON         47.00         \$3,956,259.37         Mill & 3" Overlay         22         \$124,138         0.540         \$67,041         \$3,048           Total Cost:         Cost/Mile:         \$350,891         Rout & seal         24         \$2,000         0.511         \$1,021         \$46           Chipseal         26         \$20,000         0.483         \$9,656         \$439           Remaining Life Value         35         (\$29,209)         0.375         \$40,934         \$46,344           Total Present Worth:         \$436,344         \$19,836					Total Cost	Stratogy	Voor	Cost/Mile	D/E	Present Worth	Annual Cost
RECLAMATION SY 1.10 \$189,449.22   Rout & seal 4 \$2,000 0.894 \$1,788 \$81		Course									
Tack Coats											
8.5" SPWEB340C Wear TON 47.00 \$3,956,259.37   Mill & 3" Overlay 22 \$124,138 0.540 \$67,041 \$3,048    Total Cost: \$4,292,101											
Total Cost:         \$4,292,101         Rout & seal         24         \$2,000         0.511         \$1,021         \$46           Cost/Mile:         \$350,891         Chipseal         26         \$20,000         0.483         \$9,656         \$439           Remaining Life Value         35         (\$29,209)         0.375         -\$10,961         -\$498           Total Present Worth:         \$436,344         \$19,836		Wear									
Cost/Mile:         \$350,891         Chipseal Remaining Life Value         26         \$20,000         0.483         \$9,656         \$439           Total Present Worth:         \$436,344         \$19,836			Total Cost:			,	24				
Remaining Life Value 35 (\$29,209) 0.375 -\$10,961 -\$498  Total Present Worth: \$436,344 \$19,836											
Total Present Worth: \$436,344 \$19,836					4000,00.						
						Tromaining Ello Valdo			0.010		
										\$19,836	\$19,836

- Assumptions1. Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium overlays and Reclaimed pavements
- 1. Preventive Maintenance adors 1 year or life to finin overlays and 2 years to medium overlays and Reciaimed pavements
  2. Each successive overlay has 1 year less life than previous one on a section.
  3. Reclaim design calls for milling 2.5" of existing bituminous-reclaim 5" of existing bituminous with 5" existing aggregate base-overlay with 8.5" of new bituminous.
  4. Thin overlay -10 years life, medium overlay-15 years, heavy bit. overlay-17 years, reclamation overlay-20 years, whitetopping-20 years.
  5. Aggregate and shoulder quantities were not included in each option.
  6. Calculations are based on 35 year life cycle.
  7. Costs are based upon recent district project costs.

7.84	3 2 5	Funding Category Low Cost Option # Chosen Option #	<i>S</i> 3 ►					Performed By Analysis Period Discount Rate	J Bittmann 35 2.84		Project number Date Funding Category Low Cost Option # Chosen Option #	5/24/2011 RS 🔻
		OPTION #2			OPTION #3			OPTION #4			OPTION #5	
		DESCRIPTION			DESCRIPTION			DESCRIPTION	-	Ц	DESCRIPTION	
	۲	DESIGN LIFE	TYPE			TYPE		DESIGNLIFE	TYPE		DESIGNLIFE	TYPE
- 1	- 15	35 years	▶ DCC		20 years	PCC •		18 years	▶ BIT ►	_	15 years	BIT ▼
	# Lre	Description New Concrete Structure 6.5"	Cost/Mile \$ 622,400	Year 0	Life Description New Concrete Structure 6.0"	Cost/Mile \$ 567,700	Year 0	Life Description 3" Mill & 4.5" Overlay	Cost/Mile \$ 251,900	Year #	Lite Description 1.5" Mill & 3" Overlay	Cost/Mile \$ 190,900
				1	П	Ш	-		Ш	1		- &
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1			' \$	9		· •>	9		٠ <del>ده</del> د		O Troops	- cc
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14			- \$	14		-	14		- ↔	14		- \$
15			· •	15		· •	15		· •>	15 au	FDR w/New Structure	\$ 293,700
17			, ,	15 17 ha	1st CPB 20 vr	- 38 63 A	15		e e	17		, ,
- 80			, 9	_			18 au	FDR w/New Structure	\$ 293,700	18		, 9
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		4 of OD 25 vm r aboundance	9	20		· •> •	20		٠ <del>ده</del> د	20		· •> •
22		OFF 30 yr + shoulders		22		· ·	22		9 <del>69</del>	22		9 69
23			· <del>ω</del>	23		- \$	23		φ	23 <mark>aa</mark>	Crack Treatment	\$ 4,000
24			· •	24		· •>	24		٠ <del>ده</del> د	24		· •> •
92			 О	52 29			26 92	Crack Treatment	\$ 4.000	52		- I
27			· •	27 bb	2nd CPR 20 Yr + shoulders	\$ 116,166	27		φ	27 ab	Surface Treatment	\$ 23,000
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29			- ب	29		·	50		- 00 - 00	4		· •
30			· ·	30		· ·	30 ap	Surface Treatment	\$ 23,000	30		· •> 6
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33			- &	33		- &	33		\$	33		- \$
34	ď		- \$	34		- 5	34		↔ (	Ц	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	- \$
35	Re	Remaining Service Life Value**	- <del>9</del>	32	Remaining Service Life Value**	\$ (14,002)	32	Remaining Service Life Value**	Value** \$ (44,100	35	Remaining Service Life Value**	- <del>•</del>
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+	Ł			L			<u> </u>					
Н	H			Н								
+	#			1			<u> </u>			1		
+	$\downarrow$			1			<u> </u>			1		
H	H			H								
H	H			H								
+	ŧ			l			t			L		
Total Present Worth \$ 401,211	H	Total Present Worth	\$ 677,628		Total Present Worth	\$ 640,986		Total Prese	Total Present Worth \$ 446,685	ıol	Total Present Worth	\$ 419,345
		Eq. Annual Cost*			Eq. Annual Cost			Eq. Ann	ual Cost* \$20,30	9	Eq. Annual Cost	
2	$\parallel$	/0 OI EUw Cool			/0 OI FOW SOOI	10070		* Farrivalent Annual Co.	et is included for informa	vion only	70 UI FOW COST	100.70

District Performed By Analysis Period	3 - Baxter D. Nelson 35
Discount Rate	2.84

Project Number	7305-118 TH 2
Date	5/16/2011
Funding Category	RS •
Low Cost Option #	3
Chosen Option #	3

3 - Baxter D. Nelson 35

Analysis Period Discount Rate District Performed By

3" Mill & Fill ML, 1.5" Mill & Fill Shidr DESIGN LIEF TYPE		DESCRIPTION			DESCRIPTION			DESCRIPTION	
	5"	5" Concrete Whitetopping ML, 3" Bit Shldrs	it Shidrs		3" Mill & Fill ML, 1.5" Mill & Fill Shidr	hldr	5"	Concrete	Bit Shldrs
		DESIGN LIFE	TYPE		DESIGN LIFE	TYPE		DESIGN LIFE	TYPE
BIT	7	17 Years	PCC •		15 Years	BIT ▼		15 Years	<b>▶</b> DCC
Cost/Mile	Year # Life	De	Cost/Mile	Year # Life		Cost/Mile	Year # Life		Cost/Mile
\$ 163,398	3 0 AX	Concrete Whitetopping	\$ 275,194	0 BB	3" Mill & Fill ML, 1.5" Mill & Fill \$	\$ 163,398	0 AX	Concrete Whitetopping	\$ 275,194
- ↔	1		- \$	1		-	1		· \$
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	2		·	5 AA	Crack Treatment	\$ 4,000	2		٠ <del>ده</del>
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•	_		- ج	_		- ج	8		٠ ج
4,000	0			9 AB	Surface Treatment	\$ 25,000	6		- ↔
•	10 AP	Minor CPR (6'X6')	\$ 40,000	10		٠	10		· \$
-	11		- \$	11			11		· \$
	12		· \$	12		· \$	12		· ج
	13		ج	13		· \$	13		ج
135,194	L		- -	14		- \$	14		9
	L		- 49	15 BC	3.0" Mill & Fill - ML Only	\$ 135.194	15 AR	Major CPR (6'X6')	\$ 150,000
•	16		- ج	16	,	- 9	16	,	
. 65	17		· 65	17		· <del>•</del>	17		. €.
25,000	L		· <del>· · ·</del>	18		· <del>6.</del>	18		· + + + + + + + + + + + + + + + + + + +
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4,000	4		, A	23	H		23		, Р е
·	74		·	24 AD	Sulface Healment	000,62	74	0	
·	52		-	97		·	25 BF	Kem and Kep Conc Surf	196,625 \$
2			·	97		·	97		·
\$ 157,027			·	27		٠ <del>ن</del>	27		٠ <del>ئ</del>
- S	28		٠	28		s	28		· &
- \$	29		. \$	29 BD	1.5" ML Mill & Fill, 1.5" OL Full W	157,027	29		
- ج	30		· \$	30		- ج	30		· ↔
25,000	31		- 9	31		- \$	31		\$
	L	Minor CPR (6'X6')	40 000	32			32		. 4
	30	(200)	9	20 44	Crock Troops	4 000	20		÷ 6
	2 2		→ €		Clack Healingh		5 5		→ €
·	34			45		·			Ð,
(52,342)		Remaining Service Life Value**	* \$ (133,350)	32	Remaining Service Life Value**	\$ (84,553)	32	Remaining Service Life Value**	$\neg$
\$ 361,979	രി	Total Present Worth	\$		Total Present Worth	\$		Total Present Worth	\$
\$16,455	2	Eq. Annual Cost*	\$20		Eq. Annual Cost*	\$14,990		Eq. Annual Cost*	\$2
110	%	% of Low Cost	st 136%		% of Low Cost	100%		% of Low Cos	ost 150%

<sup>%</sup> of Low Cost 110%

\* Equivalent Annual Cost is included for information only.

\*\*Remaining Service Life Value is reported as a negative value.

District	3
Performed By	CD
Analysis Period	35
Discount Rate	2.84
Biocount read	2.01

Project Number	7380	)-222
Date	6/15	/2011
Funding Category	RS	-
Low Cost Option #		1
Chosen Option #		1

			OPTION #1						OPTION #2		
			DESCRIPTION						DESCRIPTION		
			2.5" Mill and 4.0" Overlay						10.5" Concrete Whitetopping		
			DESIGN LIFE		TYPE				DESIGN LIFE	TYF	PE
			15	BIT	-				15	PCC	
Year	#	Life	Description	C	cost/Mile	Year	#	Life		(	Cost/Mile
0			2.5" Mill and 4.0" Overlay	\$	272,870	0			10.5" Concrete Whitetopping	\$	738,026
1				\$	-	1				\$	-
2				\$	-	2				\$	-
3			Crack Treatment	\$	4,000	3 4				\$	-
4 5				\$	-	5				\$	<u> </u>
6				\$	_	6				\$	-
7				\$	-	7				\$	-
8				\$	-	8				\$	-
9				\$	-	9				\$	-
10				\$	-	10				\$	<u>-</u>
11 12				\$	-	11 12			Reseal Joints and Part. Depth	\$	40,000
13				\$	-	13			ncocai Jointo and Fait. Deptil	\$	
14				\$	-	14				\$	-
15			2.0" Mill and 4.0" Overlay	\$	268,412	15				\$	-
16				\$	-	16				\$	-
17			0 17 1	\$	-	17				\$	-
18			Crack Treatment	\$	4,000	18				\$	-
19 20				\$	-	19 20			Major CPR	\$	150,000
21				\$	_	21			Major Of IX	\$	-
22				\$	-	22				\$	-
23				\$	-	23				\$	-
24				\$	-	24				\$	-
25				\$	-	25				\$	-
26 27			2.5" Mill and 3.0" Overlay	\$	211,564	26 27				\$	-
28				\$	-	28				\$	-
29			Crack Treatment	\$	4,000	29				\$	
30				\$	-	30			Remove and Replace Concrete	\$	779,093
31				\$	-	31			•	\$	-
32				\$	-	32				\$	-
33				\$	-	33				\$	-
34			Descriping Coming Life Value**	\$	(04.450)	34			Demoisium Comice Life Value**	\$	(504,000)
35			Remaining Service Life Value**	\$	(21,156)	35			Remaining Service Life Value**	\$	(521,992)
		$\neg$								1	
<b> </b>	[	]									
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		_	Total Duscout Manual	Φ.	EE4 000			<u> </u>	Total Descent Month	6	000 700
		-	Total Present Worth Eq. Annual Cost*	Ф	551,296 \$25,061				Total Present Worth Eq. Annual Cost*		992,703 \$45,127
		-	% of Low Cost		100%				% of Low Cost		180%
<u> </u>			* Equivalent Annual Cost is include			Щ.			70 OI LOW COS	<u>. I</u>	100 /0

<sup>\*</sup> Equivalent Annual Cost is included for information only.
\*\*Remaining Service Life Value is reported as a negative value.

#### Cost Analysis/ TH 30/S.P. 7403-29(T.H. 13 to Ellendale)

Givens:

Length = 8.959 miles

24 feet(Conc.) 115 lbs/SY Width of Road = 24 feet(Bit.) 3/02/10-TRM

1" Bituminous = **REVISED TO MEET MN STATE STATUTE 174.185** 2.84 % Interest Rate =

Inflation Rate = 0 %

Item  1.5" MILL BITUMINOUS PATCH TACK COAT 3" SPWEB340B	Wear	Unit SY Ton GAL TON Total Cost: Cost/Mile:	0.50 100.00 \$1.00 45.00	Total Cost \$63,071.36 \$35,836.00 \$25,228.54 \$979,182.86 \$1,103,319 \$123,152	Strategy Initial Cost Rout & seal Chipseal Mill & 3" Overlay Rout & seal Chipseal Mill & 3" Overlay	Year 0 2 4 17 19 21	\$123,152 \$2,000 \$20,000 \$123,152 \$2,000	P/F 1.000 0.946 0.894 0.621 0.587	\$123,152 \$1,891 \$17,881 \$76,504 \$1,175	\$5,598 \$86 \$813 \$3,478 \$53
PATCH TACK COAT	Wear	Ton GAL TON Total Cost:	100.00 \$1.00	\$35,836.00 \$25,228.54 \$979,182.86 \$1,103,319	Rout & seal Chipseal Mill & 3" Overlay Rout & seal Chipseal	2 4 17 19	\$2,000 \$20,000 \$123,152	0.946 0.894 0.621	\$1,891 \$17,881 \$76,504	\$86 \$813 \$3,478
TACK COAT	Wear	GAL TON Total Cost:	\$1.00	\$25,228.54 \$979,182.86 <b>\$1,103,319</b>	Chipseal Mill & 3" Overlay Rout & seal Chipseal	4 17 19	\$20,000 \$123,152	0.894 0.621	\$17,881 \$76,504	\$813 \$3,478
	Wear	TON Total Cost:		\$979,182.86 <b>\$1,103,319</b>	Mill & 3" Overlay Rout & seal Chipseal	17 19	\$123,152	0.621	\$76,504	\$3,478
3 SPWLB340B	vveai	Total Cost:	43.00	\$1,103,319	Rout & seal Chipseal	19				
					Chipseal		\$2,000	0.587		
		Cost/wille.		\$123,132			\$20,000	0.555	\$1,173	\$505
						33	\$20,000 \$123.152	0.333	\$48,876	\$2,222
					Remaining Life Value	35	(\$106.732)	0.375	-\$40,052	عد,222 -\$1,821
					Remaining Life value		resent Worth:	0.373	\$240,535	\$10,934
									\$10,934	\$10.934
						Equivalent	Annual Cost:		\$10,934	\$10,934
5.5" WHITETOPPING(		,	Dele a Alleria	T-1-1-01	011	V	0 1/04!! -	D/E	Day a seed Wester	A
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS		SY	1.12	\$141,279.85	Initial Cost	0	\$325,277	1.000	\$325,277	\$14,787
Conc Std Width 5.5		SY	7.00	\$882,999.04	Minor CPR	20	\$150,000	0.571	\$85,674	\$3,895
Structural Concrete		CY	71.31	\$1,374,172.43	3.5" Bit. Overlay	33	\$141,368	0.397	\$56,105	\$2,550
Reinforcement Bars	Epoxy	lb	0.82	\$45,694.48	Remaining Life Value	35	(\$124,736)	0.375	-\$46,808	-\$2,128
Dowel Bars	Epoxy	each	6.21	\$470,007.77			resent Worth:		\$420,248	\$19,104
		Total Cost:		\$2,914,154		Equivalent	Annual Cost:		\$19,104	\$19,104
		Cost/Mile:		\$325,277						
MILL 3" & 4.5" Bitumi			,							
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS		SY	1.10	\$138,756.99	Initial Cost	0	\$183,656	1.000	\$183,656	\$8,349
PATCH		Ton	100.00	\$0.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
TACK COAT	10/	GAL	\$1.00	\$37,842.82	Chipseal	4	\$20,000	0.894	\$17,881	\$813
4" SPWEB340B	Wear	TON	45.00	\$1,468,774.30	Mill & 3" Overlay	22	\$123,152	0.540	\$66,508	\$3,023
		Total Cost:		\$1,645,374	Rout & seal	25	\$2,000	0.497	\$993	\$45
		Cost/Mile:		\$183,656	Chipseal	27	\$20,000	0.469	\$9,390	\$427
					Remaining Life Value	35	(\$28,977)	0.375	-\$10,874	-\$494
					1		resent Worth: Annual Cost:		\$269,445 \$12,249	\$12,249 \$12,249

- 1. Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium overlays and Reclaimed pavements
- 1. Preventive maintenance adds 1 year of file to time overlays and 2 years to medium overlays and Reclaimed pavements
  2. Each successive overlay has 1 year less life than previous one on a section.
  3. Thin overlay -10 years life, medium overlay-15 years, heavy bit. overlay-20 years, reclamation overlay-20 years, whitetopping-20 years.
  4. Aggregate and shoulder quantities were not included in each option.
  5. Calculations are based on 35 year life cycle.

- 6. Costs are based upon recent district project costs.

#### Cost Analysis/ TH 30 From N. Jct. T.H. 218 to 1 Mi. E. CSAH 45-S.P. 7404-09

24 feet(Conc.) 113 lbs/SY

24 feet(Bit.)

6/07/11-TRM

Givens: Length = Width of Road = 1" Bituminous = 2.84 % Interest Rate = Inflation Rate =

1.5" MILL & 3" min. E	Bitumino	us Overlay	,							
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
1.5" MILL BITUMINOUS		SY	\$0.50	\$53,306.88	Initial Cost	0	\$133,184	1.000	\$133,184	\$6,054
PATCH		Ton	\$100.00	\$30,288.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
TACK COAT		GAL	\$1.00	\$21,322.75	Chipseal	4	\$20,000	0.894	\$17,881	\$813
3" SPWEB340B	Wear	TON	\$50.00	\$903,551.62	Mill & 3" Overlay	17	\$133,184	0.621	\$82,736	\$3,761
		Total Cost:		\$1,008,469	Rout & seal	19	\$2,000	0.587	\$1,175	\$53
		Cost/Mile:		\$133,184	Chipseal	21	\$20,000	0.555	\$11,108	\$505
					Mill & 3" Overlay	33	\$133,184	0.397	\$52,857	\$2,403
					Remaining Life Value	35	(\$115,426)	0.375	-\$43,314	-\$1,969
					_	Total P	resent Worth:		\$257,517	\$11,706
						Equivalent	Annual Cost:		\$11,706	\$11,706
5.5" WHITETOPPING Item	-undowe Course	eled Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS		SY	\$1.12	\$119,407.41	Initial Cost	0	\$270.180	1.000	\$270,180	\$12,282
Conc Std Width 5.5		SY	\$5.00	\$533.068.80	Major CPR	20	\$150,000	0.571	\$85.674	\$3,895
Structural Concrete		CY	\$65.77	\$1,355,650.82	3.5" Bit. Overlay	30	\$146.032	0.432	\$63,036	\$2,866
Reinforcement Bars	Epoxy	lb	\$0.80	\$37,678.27	Rout & seal	32	\$2,000	0.408	\$816	\$37
		Total Cost:		\$2,045,805	Remaining Life Value	35	(\$97.355)	0.375	-\$36,533	-\$1,661
		Cost/Mile:		\$270,180		Total P	resent Worth:		\$383,173	\$17,419
						Equivalent	Annual Cost:		\$17,419	\$17,419
MILL & 4.5" min. Bitu										
Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
1.5" MILL BITUMINOUS		SY	\$0.50	\$53,306.88	Initial Cost	0	\$194,256	1.000	\$194,256	\$8,831
PATCH		Ton	\$100.00	\$30,288.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
TACK COAT		GAL	\$1.00	\$31,984.13	Chipseal	4	\$20,000	0.894	\$17,881	\$813
4.5" SPWEB340B	Wear	TON	\$50.00	\$1,355,327.42	Mill & 3" Overlay	22	\$133,184	0.540	\$71,926	\$3,270
		Total Cost:		\$1,470,906	Rout & seal	24	\$2,000	0.511	\$1,021	\$46
		Cost/Mile:		\$194,256	Chipseal	26	\$20,000	0.483	\$9,656	\$439
					Remaining Life Value	35	(\$31,337)	0.375	-\$11,759	-\$535
						Total P	resent Worth:		\$284,872	\$12,950
							Annual Cost:		\$12,950	\$12,950

Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium overlays and Reclaimed pavements
 Each successive overlay has 1 year less life than previous one on a section.
 Thin overlay -10 years life, medium overlay-15 years, heavy bit. overlay-20 years, reclamation -20 years, whitetopping-20 years.
 Aggregate and shoulder quantities were not included in each option.
 Calculations are based on 35 year life cycle.

10.	Ale .	Ame		ing Cost Ana	lysis TH	9			-
Givens: Length = Width of Road =	11.16 miles 24 feet	2/	feet	7301-30)				3/31/2010	)
1" Bituminous = Interest Rate = Inflation Rate =	110 lbs/SY 2.84 % 0 %	-	7 1000	Unit Prices are	re based on 35 based off the 2		/g. Bid Pri		i e i
1.5" MILL AND 3" O	VERLAY								
ltem	Course Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
1.5" MILL BITUMINOUS	SY	0.58	\$91,137.02	Initial Cost	0	\$95,403	1.000	\$95,403	\$4,337
3" SPWEB340B	Wear TON	37.55	\$973,555.55	Route & seal	2	\$2,000	0.946	\$1,891	\$86
	Total Cost:		\$1,064,693	chip seal	5	\$20,000	0.869	\$17,387	\$790
	Cost/Mile:		\$95,403	Mill & 2" Overlay	14	\$69,000	0.676	\$46,621	\$2,119
	o o o o mino.		400,100	Route & seal	16	\$2,000	0.639	\$1,278	\$58
				chip seal	18	\$20,000	0.604	\$12,081	\$549
				Mill & 1.5" Overlay	25	\$52,000	0.497	\$25,820	\$1,174
				Route & seal	27	\$2,000	0.469	\$939	\$43
				chip seal	29	\$20,000	0.444	\$8,878	\$404
			Œ	Salvage Value	35	\$0	0.375	\$0	\$0
				7	Total F	resent Worth:		\$210,297	\$9,560
					Equivalen	t Annual Cost:		\$9,560	
.5" MILL AND 4.5" (	OVERLAY					1.77			
Item	Course Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
5"MILL BITUMINOUS	SY	0.58	\$91,137.02	Initial Cost	0	\$139,021	1.000	\$139,021	\$6,320
5" SPWEB340B	Wear TON	37.55	\$1,460,333.32	Route & seal	2	\$2,000	0.946	\$1,891	\$86
	Total Cost:		\$1,551,470	Chip seal	5	\$20,000	0.869	\$17,387	\$790
	Cost/Mile:		\$139,021	Mill & 2" Overlay	17	\$69,000	0.621	\$42,864	\$1,949
				Route & seal	19	\$2,000	0.587	\$1,175	\$53
				Chip seal	21	\$20,000	0.555	\$11,108	\$505
				Mill & 1.5" Overlay	28	\$52,000	0.457	\$23,739	\$1,079
				Route & seal	30	\$2,000	0.432	\$863	\$39
				Chip seal	32	\$20,000	0,408	\$8,163	\$371
				Salvage Value	35	(\$15,600)	0.375	-\$5,854	-\$266
					Total P	resent Worth:		\$240,357	\$10,926
					Equivalent	t Annual Cost:		\$10,926	
		<u> </u>							
VIILL to concrete & 4				2		¥			
ltem	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	
.5" MILL BITUMINOUS	SY	1.58	\$248,269.82	Initial Cost	0	\$153,101	1,000	\$153,101	\$6,960
5" SPWEB340B	TON	37.55	\$1,460,333.32	rout & seal	2	\$2,000	0.946	\$1,891	\$86
	Total Cost		\$1,708,603	chip seal	5	\$20,000	0.869	\$17,387	\$790
	Cost/Mile:		\$153,101	Mill & 2" Overlay	20	\$52,000	0.571	\$29,700	\$1,350
				rout & seal	22	\$2,000	0.540	\$1,080	\$49
			á	chip seal	25	\$20,000	0.497	\$9,931	\$451
				Mill & 1.5" Overlay	31	\$52,000	0.420	\$21,826	\$992
				Route & seal	33	\$2,000	0.397	\$794	\$36
				Salvage Value	35	(\$31,200)	0.375	-\$11,708	-\$532
					Total P	resent Worth:		\$224,002	\$10,183
								\$10,183	

ltem		Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Amilual Cost
4.5" MILL BITUMINOUS		SY	1.58	\$248,269.82	Initial Cost	0	\$196,719	1.000	\$196,719	\$8,943
6" SP (3,B)		TON	37.55	\$1,947,111.09	rout & seal	3	\$2,000	0.919	\$1,839	\$84
	Tota	al Cost:		\$2,195,381	chip seal	9	\$20,000	0.777	\$15,544	\$707
	Co	st/Mile:		\$196,719	Mill & 3" Overlay	23	\$103,000	0.525	\$54,089	\$2,459
					rout & seal	25	\$2,000	0.497	\$993	\$45
					chip seal	27	\$20,000	0.469	\$9,390	\$427
					Salvage Value	35	(\$20,600)	0.375	-\$7,730	-\$351
				(*)		Total F	resent Worth:		\$270,844	\$12,312
						Equivalen	t Annual Cost:		\$12,312	
5" Unbonded Concre	ete Over				***			NAME OF TAXABLE PARTY.		
	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	
4.5" MILL BITUMINOUS	11.152	SY	1.58	\$248,269.82	Initial Cost	O	\$358,488	1.000	\$358,488	\$16,296
PASSRC		Ton	28.25	\$274,663.22	3" overlay	20	\$88,000	0.571	\$50,262	\$2,285
Conc Pvmt Std Width 5"		SY	4.5	\$795,484.80	Salvage Value	35	\$0	0.375	\$0	\$0
Structural Concrete		CY	76,08	\$1,869,410.49			resent Worth:		\$408,750	\$18,581
Reinforcement Bars	Epoxy	lb	0.96	\$62,978.83	}	Equivalent	Annual Cost:		\$18,581	J
Dowel Bars	Epoxy	each	8.3	\$749,916.29	1					
	100000	I Cost:	-	\$4,000,723					•	
	CO	st/Mile:		\$358,488						
¥				de manifestation						
Regrade with Concre	ete		Price/Unit		Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
Regrade with Concre	-	Unit SY	Price/Unit 4.15	Total Cost \$597,759,36	Strategy	Year 0	Cost/Mile \$528,499	P/F 1.000	Present Worth \$528,499	Annual Cost \$24,025
Item	ete	Unit		Total Cost			A Designation of the last of t			\$24,025
Item Conc. Removal	ete	Unit SY	4.15	Total Cost \$597,759,36	Initial Cost	0	\$528,499	1.000	\$528,499	
Item Conc. Removal 6" Class 5	ete	Unit SY CY	4.15 17.34	Total Cost \$597,759,36 \$510,878.02	Initial Cost Minor CPR & plane	0 28 35	\$528,499 \$100,000	1.000 0.457	\$528,499 \$45,652	\$24,025 \$2,075
Item Conc. Removal 6" Class 5 12" Select Granular	ete	Unit SY CY CY	4.15 17.34 9.63	Total Cost \$597,759.36 \$510,878.02 \$567,445.82	Initial Cost Minor CPR & plane	0 28 35 Total P	\$528,499 \$100,000 (\$54,000)	1.000 0.457	\$528,499 \$45,652 -\$20,264	\$24,025 \$2,075 -\$921
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pvmt Std Width 7"	ete	Unit SY CY CY SY	4.15 17.34 9.63 4.5	Total Cost \$597,759.36 \$510,878.02 \$567,445.82 \$795,484.80	Initial Cost Minor CPR & plane	0 28 35 Total P	\$528,499 \$100,000 (\$54,000) resent Worth:	1.000 0.457	\$528,499 \$45,652 -\$20,264 \$553,888	\$24,025 \$2,075 -\$921
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pymt Std Width 7" Structural Concrete	ete Course	Unit SY CY CY SY CY	4.15 17.34 9.63 4.5 76.08	Total Cost \$597,759.36 \$510,878.02 \$567,445.82 \$795,484.80 \$2,613,588.29	Initial Cost Minor CPR & plane	0 28 35 Total P	\$528,499 \$100,000 (\$54,000) resent Worth:	1.000 0.457	\$528,499 \$45,652 -\$20,264 \$553,888	\$24,025 \$2,075 -\$921
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pymt Std Width 7" Structural Concrete Reinforcement Bars	ete Course Epoxy Epoxy Tota	Unit SY CY CY SY CY Ib each	4.15 17.34 9.63 4.5 76.08 0.96	Total Cost \$597,759.36 \$510,878.02 \$567,445.82 \$795,484.80 \$2,613,588.29 \$62,978.83 \$749,916.29 \$5,898,051	Initial Cost Minor CPR & plane	0 28 35 Total P	\$528,499 \$100,000 (\$54,000) resent Worth:	1.000 0.457	\$528,499 \$45,652 -\$20,264 \$553,888	\$24,025 \$2,075 -\$921
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pymt Std Width 7" Structural Concrete Reinforcement Bars	ete Course Epoxy Epoxy Tota	Unit SY CY CY SY CY Ib	4.15 17.34 9.63 4.5 76.08 0.96	Total Cost \$597,759.36 \$510,878.02 \$567,445.82 \$795,484.80 \$2,613,588.29 \$62,978.83 \$749,916.29	Initial Cost Minor CPR & plane	0 28 35 Total P	\$528,499 \$100,000 (\$54,000) resent Worth:	1.000 0.457	\$528,499 \$45,652 -\$20,264 \$553,888	\$24,025 \$2,075 -\$921
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pvmt Std Width 7" Structural Concrete Reinforcement Bars Dowel Bars  Regrade with Bitumi	Epoxy Epoxy Epoxy Tota Cos	Unit SY CY CY SY CY Ib each Il Cost:	4.15 17.34 9.63 4.5 76.08 0.96 8.3	Total Cost \$597,759.36 \$510,878.02 \$567,445.82 \$795,484.80 \$2,613,588.29 \$62,978.83 \$749,916.29 \$5,898,051 \$528,499	Initial Cost Minor CPR & plane Salvage Value	0 28 35 Total P Equivalent	\$528,499 \$100,000 (\$54,000) resent Worth: Annual Cost:	1.000 0.457 0.375	\$528,499 \$45,652 -\$20,264 \$553,888 \$25,179	\$24,025 \$2,075 -\$921 \$25,179
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pymt Std Width 7" Structural Concrete Reinforcement Bars Dowel Bars  Regrade with Bitumi Item	Epoxy Epoxy Epoxy Tota Cos	Unit SY CY CY SY CY Ib each Il Cost: st/Mile:	4.15 17.34 9.63 4.5 76.08 0.96 8.3	Total Cost \$597,759.36 \$510,878.02 \$567,445.82 \$795,484.80 \$2,613,588.29 \$62,978.83 \$749,916.29 \$5,898,051 \$528,499	Initial Cost Minor CPR & plane Salvage Value Strategy	0 28 35 Total P Equivalent	\$528,499 \$100,000 (\$54,000) resent Worth: Annual Cost:	1.000 0.457 0.375	\$528,499 \$45,652 -\$20,264 \$553,888 \$25,179	\$24,025 \$2,075 -\$921 \$25,179
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pymt Std Width 7" Structural Concrete Reinforcement Bars Dowel Bars  Regrade with Bitumi Item Conc. Removal	Epoxy Epoxy Tota Cos Inous Course	Unit SY CY CY SY CY Ib each Il Cost: st/Mile:	4.15 17.34 9.63 4.5 76.08 0.96 8.3 Price/Unit	Total Cost \$597,759.36 \$510,878.02 \$567,445.82 \$795,484.80 \$2,613,588.29 \$62,978.83 \$749,916.29 \$5,898,051 \$528,499 Total Cost \$597,759.36	Initial Cost Minor CPR & plane Salvage Value  Strategy Initial Cost	0 28 35 Total P Equivalent	\$528,499 \$100,000 (\$54,000) resent Worth: Annual Cost: Cost/Mile \$321,729	1.000 0.457 0.375 P/F 1.000	\$528,499 \$45,652 -\$20,264 \$553,888 \$25,179 Present Worth \$321,729	\$24,025 \$2,075 -\$921 \$25,179 ]
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pymt Std Width 7" Structural Concrete Reinforcement Bars Dowel Bars  Regrade with Bitumi Item Conc. Removal 4" SPWEB340C	Epoxy Epoxy Tota Cos Course Wear	Unit SY CY SY CY SY CY lb la Cost: st/Mile:	4.15 17.34 9.63 4.5 76.08 0.96 8.3 Price/Unit 4.15 44.97	Total Cost \$597,759,36 \$510,878.02 \$567,445.82 \$795,484.80 \$2,613,588.29 \$62,978.83 \$749,916.29 \$5,898,051 \$528,499 Total Cost \$597,759,36 \$1,554,577.64	Initial Cost Minor CPR & plane Salvage Value  Strategy Initial Cost Route & seal	0 28 35 Total P Equivalent	\$528,499 \$100,000 (\$54,000) resent Worth: Annual Cost: Cost/Mile \$321,729 \$2,000	1.000 0.457 0.375 P/F 1.000 0.919	\$528,499 \$45,652 -\$20,264 \$553,888 \$25,179 Present Worth \$321,729 \$1,839	\$24,025 \$2,075 -\$921 \$25,179 ] Annual Cost \$14,625 \$84
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pymt Std Width 7" Structural Concrete Reinforcement Bars Dowel Bars  Regrade with Bitumi Item Conc. Removal 4" SPWEB340C 1.5" SPNWB330B	Epoxy Epoxy Tota Cos Inous Course	Unit SY CY SY CY lb each il Cost: st/Mile:	4.15 17.34 9.63 4.5 76.08 0.96 8.3 Price/Unit 4.15 44.97 37	Total Cost \$597,759,36 \$510,878.02 \$587,445.82 \$795,484.80 \$2,613,588.29 \$62,978.83 \$749,916.29 \$5,898,051 \$528,499 Total Cost \$597,759,36 \$1,554,577.64 \$479,647.87	Initial Cost Minor CPR & plane Salvage Value  Strategy Initial Cost Route & seal chip seal	0 28 35 Total P Equivalent	\$528,499 \$100,000 (\$54,000) resent Worth: Annual Cost: Cost/Mile \$321,729 \$2,000 \$20,000	1.000 0.457 0.375 P/F 1.000 0.919 0.777	\$528,499 \$45,652 -\$20,264 \$553,888 \$25,179 Present Worth \$321,729 \$1,839 \$15,544	\$24,025 \$2,075 -\$921 \$25,179 ] Annual Cost \$14,625 \$84 \$707
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pymt Std Width 7" Structural Concrete Reinforcement Bars Dowel Bars  Regrade with Bitumi Item Conc. Removal 4" SPWEB340C 1.5" SPNWB330B 5" Class 5	Epoxy Epoxy Tota Cos Course Wear	Unit SY CY CY SY CY Ib each Il Cost: st/Mile: Unit SY TON CY	4.15 17.34 9.63 4.5 76.08 0.96 8.3 Price/Unit 4.15 44.97 37 17.34	Total Cost \$597,759.36 \$510,878.02 \$567,445.82 \$795,484.80 \$2,613,588.29 \$62,978.83 \$749,916.29 \$5,898,051 \$528,499 Total Cost \$597,759.36 \$1,554,577.64 \$479,647.87 \$454,113.79	Initial Cost Minor CPR & plane Salvage Value  Strategy Initial Cost Route & seal chip seal 1.5" Overlay	O 28 35 Total P Equivalent	\$528,499 \$100,000 (\$54,000) resent Worth: Annual Cost: Cost/Mile \$321,729 \$2,000 \$44,000	P/F 1.000 0.457 0.375	\$528,499 \$45,652 -\$20,264 \$553,888 \$25,179 Present Worth \$321,729 \$1,839 \$15,544 \$20,087	\$24,025 \$2,075 -\$921 \$25,179 Annual Cost \$14,625 \$84 \$707 \$913
Item Conc. Removal 6" Class 5 12" Select Granular Conc Pymt Std Width 7" Structural Concrete Reinforcement Bars Dowel Bars  Regrade with Bitumi Item Conc. Removal 4" SPWEB340C 1.5" SPNWB330B	Epoxy Epoxy Tota Cos Course Wear NW	Unit SY CY CY SY CY Ib each Il Cost: st/Mile: Unit SY TON CY CY CY	4.15 17.34 9.63 4.5 76.08 0.96 8.3 Price/Unit 4.15 44.97 37	Total Cost \$597,759.36 \$510,878.02 \$567,445.82 \$795,484.80 \$2,613,588.29 \$62,978.83 \$749,916.29 \$5,898,051 \$528,499 Total Cost \$597,759.36 \$1,554,577.64 \$479,647.87 \$484,113.79 \$504,396.29	Initial Cost Minor CPR & plane Salvage Value  Strategy Initial Cost Route & seal chip seal	O 28 35 Total P Equivalent  Year  O 3 9 28 35	\$528,499 \$100,000 (\$54,000) resent Worth: Annual Cost: Cost/Mile \$321,729 \$2,000 \$20,000 \$44,000 \$0	1.000 0.457 0.375 P/F 1.000 0.919 0.777	\$528,499 \$45,652 -\$20,264 \$553,888 \$25,179 Present Worth \$321,729 \$1,839 \$15,544 \$20,087 \$0	\$24,025 \$2,075 -\$921 \$25,179 ] Annual Cost \$14,625 \$84 \$707 \$913 \$0
Item Conc. Removal 5" Class 5 12" Select Granular Conc Pymt Std Width 7" Structural Concrete Reinforcement Bars Dowel Bars  Regrade with Bitumi Item Conc. Removal 4" SPWEB340C 1.5" SPNWB330B 5" Class 5	Epoxy Epoxy Tota Cos  Course  Wear NW	Unit SY CY CY SY CY Ib each Il Cost: st/Mile: Unit SY TON CY	4.15 17.34 9.63 4.5 76.08 0.96 8.3 Price/Unit 4.15 44.97 37 17.34	Total Cost \$597,759.36 \$510,878.02 \$567,445.82 \$795,484.80 \$2,613,588.29 \$62,978.83 \$749,916.29 \$5,898,051 \$528,499 Total Cost \$597,759.36 \$1,554,577.64 \$479,647.87 \$454,113.79	Initial Cost Minor CPR & plane Salvage Value  Strategy Initial Cost Route & seal chip seal 1.5" Overlay	O 28 35 Total P Equivalent Year 0 3 9 28 35 Total P	\$528,499 \$100,000 (\$54,000) resent Worth: Annual Cost: Cost/Mile \$321,729 \$2,000 \$44,000	P/F 1.000 0.457 0.375	\$528,499 \$45,652 -\$20,264 \$553,888 \$25,179 Present Worth \$321,729 \$1,839 \$15,544 \$20,087	\$24,025 \$2,075 -\$921 \$25,179 Annual Cost \$14,625 \$84 \$707 \$913

#### **APPENDIX 2**

			District		4				Project Number	7!	505-21
			Performed By		SM				Date		22/2011
			Analysis Period		35				Funding Category	RS	₩
			Discount Rate		2.84				Low Cost Option #	110	1
			Discount Nate		2.04				Chosen Option #		1
			OPTION #1						OPTION #2		
			DESCRIPTION						DESCRIPTION		
		Mi	II 1.5", CIR 3", Pave 3"(SPWEB3	340C)	)				6.5" Whitetopping		
			DESIGN LIFE		TYPE				DESIGN LIFE	TYPE	
			20	BIT					20	PCC	
ear	#	Life			ost/Mile	Year	#	Life			st/Mile
0		_	Initial Cost	\$	157,000	0			Initial Cost	\$	316,000
1				\$	-	1				\$	-
2				\$	-	2				\$	-
3	AA	3	Crack Treatment	\$	2,000	3				\$	-
4				\$	-	4				\$	-
5			0 /	\$	-	5				\$	-
	AB	14	Surface Treatment	\$	20,000	6				\$	-
				\$	-	7 8				\$	-
9				\$	-	9				\$	-
10				\$		10				\$	
11				\$	-	11				\$	-
12				\$	-	12				\$	-
13				\$	-	13				\$	-
14				\$	-	14				\$	-
15				\$	-	15				\$	-
16				\$	-	16				\$	-
17				\$	-	17				\$	-
18				\$	-	18				\$	-
19	AK	15	3" Mill & 3" Overlay	\$	100,000	19	AR	-	Major CDD (CIVCI)	\$	200,000
21	AN	15	3 Willi & 3 Overlay	\$	106,000	21	AK	5	Major CPR (6'X6')	\$	200,000
22				\$		22				\$	
_	AA	3	Crack Treatment	\$	2,000	23				\$	-
24				\$	-	24				\$	-
25				\$	-	25				\$	-
_	AB	9	Surface Treatment	\$	20,000	26				\$	-
27				\$	-	27				\$	-
28				\$	-	28				\$	-
29				\$	-	29				\$	-
30				\$	-	30 31				\$	-
32				\$	_	32				\$	
33				\$	-	33				\$	-
34				\$	-	34				\$	-
35			Remaining Service Life Value**	\$	-	35			Remaining Service Life Value**	\$	-
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			Total Present Worth	\$	246,995				Total Present Worth	\$	430,232
			Eq. Annual Cost*	*	\$11,228				Eq. Annual Cost*	Ť	\$19,55
			% of Low Cost		100%				% of Low Cost		1749

#### Cost Analysis/ US 63(JCT CR-78 to US 61 in Lake City)

6.655 miles 24 feet(Conc.) 115 lbs/SY 2.84 %

24 feet(Bit.)

8/12/10 - TRM

Givens: Length = Width of Road = 1" Bituminous = Interest Rate = Inflation Rate =

		Overlay	D-1 // I It	T-1-1 01	C11	V	0	D/E	D	A
Item	Course		Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
1.5" MILL BITUMINOUS		SY	0.60	\$56,221.44	Initial Cost	0	\$136,704	1.000	\$136,704	\$6,214
PATCH		Ton	100.00	\$26,620.00	Rout & seal	2	\$2,000	0.946	\$1,891	\$86
TACK COAT		GAL	1	\$18,740.48	Chipseal	4	\$20,000	0.894	\$17,881	\$813
3" SPWEB340B	Wear	TON	50.00	\$808,183.20	Mill & 3" Overlay	17	\$136,704	0.621	\$84,923	\$3,860
		Total Cost:		\$909,765	Rout & seal	19	\$2,000	0.587	\$1,175	\$53
		Cost/Mile:		\$136,704	Chipseal	21	\$20,000	0.555	\$11,108	\$505
					Mill & 3" Overlay	33	\$136,704	0.397	\$54,254	\$2,466
					Salvage Value	35	(\$118,477)	0.375	-\$44,459	-\$2,021
						Total Pr	esent Worth:		\$263,476	\$11,977
						Equivalent	Annual Cost:		\$11,977	\$11,977
5" undoweled WHITI	Course		Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS		SY	1.00	\$93,702,40	Initial Cost	0	\$243,796	1.000	\$243,796	\$11.083
Conc Std Width 6		SY	5.00	\$468.512.00	Minor CPR, plane	17	\$150,000	0.621	\$93,183	\$4,236
Structural Concrete		CY	65.77	\$1,027,134.47	4.5" Bit. Overlay	22	\$161,000	0.540	\$86,948	\$3,953
Reinforcement Bars	Ероху	lb	0.80	\$33.115.28	Salvage Value	35	(\$30,188)	0.375	-\$11,328	-\$515
rtoimoroomont Baro		Total Cost:	0.00	\$1,622,464	Carrago valuo		esent Worth:	0.010	\$412,599	\$18,756
		Cost/Mile:		\$243,796		Fauivalent	Annual Cost:		\$18,756	\$18,756
			Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
Item	" BITUM Course		Price/Unit	Total Cost \$74.961.92	Strategy Initial Cost	<b>Year</b> 0	Cost/Mile \$241,472	<b>P/F</b> 1.000	Present Worth \$241,472	Annual Cost \$10.977
RECLAMATION W/ 5  Item 2" MILL BITUMINOUS RECLAMATION		Unit					Cost/Mile \$241,472 \$2,000			Annual Cost \$10,977 \$81
Item 2" MILL BITUMINOUS RECLAMATION		Unit SY	0.80	\$74,961.92	Initial Cost	0	\$241,472	1.000	\$241,472	\$10,977
Item 2" MILL BITUMINOUS RECLAMATION Tack Coats		Unit SY SY	0.80 1.10	\$74,961.92 \$103,072.64	Initial Cost Rout & seal	0 4	\$241,472 \$2,000	1.000 0.894	\$241,472 \$1,788	\$10,977 \$81
Item " MILL BITUMINOUS RECLAMATION Fack Coats	Course	Unit SY SY GAL TON	0.80 1.10 1.00	\$74,961.92 \$103,072.64 \$28,110.72 \$1,400,850.88	Initial Cost Rout & seal Chipseal Mill & 3" Overlay	0 4 6 22	\$241,472 \$2,000 \$20,000 \$136,704	1.000 0.894 0.845 0.540	\$241,472 \$1,788 \$16,907 \$73,827	\$10,977 \$81 \$769 \$3,356
Item 2" MILL BITUMINOUS RECLAMATION Tack Coats	Course	Unit SY SY GAL	0.80 1.10 1.00	\$74,961.92 \$103,072.64 \$28,110.72 \$1,400,850.88 <b>\$1,606,996</b>	Initial Cost Rout & seal Chipseal Mill & 3" Overlay Rout & seal	0 4 6	\$241,472 \$2,000 \$20,000 \$136,704 \$2,000	1.000 0.894 0.845 0.540 0.511	\$241,472 \$1,788 \$16,907 \$73,827 \$1,021	\$10,977 \$81 \$769
Item 2" MILL BITUMINOUS RECLAMATION Tack Coats	Course	Unit SY SY GAL TON Total Cost:	0.80 1.10 1.00	\$74,961.92 \$103,072.64 \$28,110.72 \$1,400,850.88	Initial Cost Rout & seal Chipseal Mill & 3" Overlay Rout & seal Chipseal	0 4 6 22 24	\$241,472 \$2,000 \$20,000 \$136,704	1.000 0.894 0.845 0.540	\$241,472 \$1,788 \$16,907 \$73,827 \$1,021 \$9,656	\$10,977 \$81 \$769 \$3,356 \$46
Item 2" MILL BITUMINOUS	Course	Unit SY SY GAL TON Total Cost:	0.80 1.10 1.00	\$74,961.92 \$103,072.64 \$28,110.72 \$1,400,850.88 <b>\$1,606,996</b>	Initial Cost Rout & seal Chipseal Mill & 3" Overlay Rout & seal	0 4 6 22 24 26 35	\$241,472 \$2,000 \$20,000 \$136,704 \$2,000 \$20,000	1.000 0.894 0.845 0.540 0.511 0.483	\$241,472 \$1,788 \$16,907 \$73,827 \$1,021	\$10,977 \$81 \$769 \$3,356 \$46 \$439

- Assumptions
  1. Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium overlays and Reclaimed pavements

  2. Each successive overlay has 1 year less life than previous one on a section.

  3. Reclaim design calls for milling 3" of existing bituminous-reclaim 4.5" of existing bituminous with 6" existing aggregate base-overlay with 5" of new bituminous.

  4. Thin overlay -10 years life, medium overlay-15 years, heavy bit. overlay-17 years, reclamation overlay-20 years, whitetopping-30 years.

  5. Aggregate and shoulder quantities were not included in each option.

  6. Calculations are based on 35 year life cycle.

  7. Costs are based upon recent district project costs.

Life Cycle Cost Analysis - Rehabilitation (Cost/Mile)
S.P. 8001-38 Interest Rate: 2.84
T.H. 10 Inflation Rate: 0.00
Date 7/1/10 Discount Rate 2.84

Major Fixes are greater than \$25,000.00

Soils Engineer: Chad DeMenge

Future Present Annualiz Option 3 2.0" Bit Mill, 3.0" Conc Mill and 5.0" Description of Work \$883,264 \$594,962 Annualized \$31,379.67 Annual Cost 104% Present Annualized Future 2.0" Bit Mill, 3.0" Conc Mill, 5.0" Description of Work \$775,452 \$533,085 Annualized \$30,070,76 Annual Cost Future Present Annualized
Value Value Option 1 2.0" Mill and 2.0" Overlay Description of Work Year

20		Annual	\$17,846															\$ 1,493										\$ 2,257											\$21,596	\$21,596
Design Life =		Present	73	-														\$ 32,850										\$ 49,653											475,077	\$ 21,596
- 1	$\sim$	P/F		0.972	0.946	0.919	0.894	0.869	0.845	0.822	0.799	0.777	0.756	0.735	0.715	0.695	9/90	Н	0.639	0.621	0.604	0.587	0.571	0.555	0.540	0.525	$\dashv$	+	0.483	0.469	0.457	0.444	0.432	0.420	0.408	0.397	0.386	0.375		
	Mill & 6" CONC	Cost/Mile	\$ 392,573	-														20,000									$\dashv$	100,000											otal Present Worth:	Equivalent Annual Cost:
Option 3	-	Proposed Fixes C																Minor CPR (no di \$										Major CPR (no dl \$										NO RESIDUAL V	Tota	Edulval
		Year	-	1	2	3	4	2	9	7	8	6	10	11	12	13	14	15 N	16	17	18	19	20	21	22	23	T	市	97.	27	78	53	30	31	32	33	34	35 N		=
20	_ _	<u>a</u>	<u>-</u>					7		3								ပ					80				=	9			1							z	74 :	<b>4</b>
		Annual	0,	-				\$ 277		\$ 673												-	\$3,378			\$ 167	,	\$ 406												\$18,554
Design Life =	BITOL	Present Worth	\$ 300,362					\$ 6,085		\$ 14,796													\$ 74,301			\$ 3,676		\$ 8,938												\$ 18,554
	4" BI	P/F	1.000	0.972	0.946	0.919	0.894	0.869	0.845	0.822	0.799	0.777	0.756	0.735	0.715	0.695	0.676	0.657	0.639	0.621	0.604	0.587	0.571	0.555	0.540	0.525	0.511	0.497	0.483	0.469	0.457	0.444	0.432	0.420	0.408	0.397	0.386	0.375	Worth:	Cost
2	4"Mill, 4"CIR,	Cost/Mile	\$ 300,362					\$ 7,000		\$ 18,000													\$ 130,087			\$ 7,000		\$ 18,000											otal Present Worth:	Equivalent Annual Cost:
Option 2	-	Proposed Fixes	R, 4					Route & Seal		Seal Coat													2" BIT M&OL		7	Route & Seal		Seal Coat										NO RESIDUAL	į ·	Edni
×		Year		-	2	3	4	5	9	7	8	6	10	11	12	13	14	15	16	17	18	19		21	Ŧ	T	$\overline{}$	T	97	27	28	59	30	31	32	33	34	35		_
12	<u> </u>	<u></u>	H 9					7 A		3 b								6			2	<del>-</del> i	0 2			Ø		<mark>о</mark>	+	ı	ဂ္	-	n					<b>Z</b> 0	ω σ	<u></u>
		Annual	\$ 9,856					\$ 277		\$ 673								\$ 2,659			\$ 192		\$ 467				,	\$ 2,936			\$ 145		\$ 353					\$ 740	\$18,298	\$18,298
Design Life =		Present Worth	\$ 216,820					\$ 6,085		\$ 14,796								\$ 58,487			\$ 4,228		\$ 10,281					\$ 64,593			\$ 3,196		2,7,7					\$ 16,272		\$ 18,298
	BIT M&OL	P/F	1.000	0.972	0.946	0.919	0.894	0.869	0.845	0.822	0.799	0.777	0.756	0.735	0.715	0.695	9.676	0.657	0.639	0.621	0.604	0.587	0.571	0.555	0.540	0.525	0.511	0.497	0.483	0.469	0.457	0.444	0.432	0.420	0.408	0.397	0.386	0.375	: Worth:	al Cost:
_	4" BIT I	Cost/Mile	\$ 216,820					\$ 7,000		\$ 18,000								\$ 89,021			\$ 7,000		\$ 18,000					\$ 130,087			000,7		\$ 18,000					\$ 43,362	Total Present Worth:	Equivalent Annual Cost:
Option	•	Proposed Fixes	_					Route & Seal		Seal Coat								1.5" BIT OL			Route & Seal		Seal Coat					2" BIT M&OL		-	Koute & Seal		Seal Coat					SALVAGE VALUE	ı	Ę
		Year	1	_	2	3	4	2	9	7	8	6	10	11	12	13	14	15	16	17	18	T		21	22	23			70	77.	87.	$\overline{}$	T	31	32	33	34	32		

# SOUTH BUTTON

#### Minnesota Department of Transportation

### Memo

	TO:	Lee Berget
		District Engineer
	FROM:	Graig Gilbertson
		Materials Engineer
	DATE:	Nov. 21, 2011
	SUBJECT:	LCCA Exception for Pavement Preservation Project In reconditioning (RD), resurfacing (RS), or road repair (RX) funding categories
S.P.	7501-30	
	Cycle Cost Analysi Memo No. 10-04-M	s was performed in accordance with AT-01.
		natives were considered.
The a	ilternative with the lo	owest Total Present Worth was: 1.5" mill and 3" overlay
The a	ilternative selected b	by the District is: 4.5" mill and 4.5" overlay
The ju	ustification for not se	electing the lowest cost alternative is:
District	wanted longer term fix.	The short term repair also left
more s	ubjectivity to the LCCA	because it is possible that once pavement is removed problem not
acccou	inted for will rquire supp	lemental agreement.
*		
I cond	cur with the selected	d alternative,
<u> </u>	t Engineer	

# Minnesota Department of Transportation

то:	Lee Berget	
	District Engineer	
FROM:	Graig Gilbertson  Materials Engineer	
N		
DATE:	Nov. 21, 2011	
SUBJECT:	LCCA Exception for Pavement Preservation Project In reconditioning (RD), resurfacing (RS), or road repair (RX) funding categories	
S.P. 5680-126		
O.F. 0000 120		
A Life Cycle Cost Analysis Tech Memo No. 10-04-M	s was performed in accordance with AT-01.	
Both PCC and HMA alternatives were considered.		
The alternative with the lowest Total Present Worth was: 1.5" overlay		
The alternative selected by the District is: 3.5" mill and 3.5" overlay		
The justification for not selecting the lowest cost alternative is:		
District preferred alternative that would more efficiently address maintenace concerns by milling off		
areas of where pavement is de	teriorating as opposed to coverering up the deterioration. The thin	
pavement will give shorter life than mill and fill option We try to keep our maintenance people off the		
interstate as much as possible.	3	
interstate as much as possible.		
I concur with the selected	alternative,	
35 V 3		
- Shelder	(1-23-11	
Called District Engineer Date		

## LCCA EXCEPTION

A I : G. Carala Coast Amalaraia arras manfarma ad in accomdance arriva
A Life Cycle Cost Analysis was performed in accordance with Tech Memo No. 07-17-MAT-01.
Both PCC and HMA alternatives were considered.
The lowest LCCA fix is Mill & 1.5" Bituminous Overlay
The Preservation fix selected by our District is <u>Stabilized Full Depth Reclamation</u>
LCCA is a project specific tool used in selecting preservation treatments. The District program is selected based on: Total project costs, preservation performance material availability, available funding, traffic impacts, safety needs and other considerations.
Factors considered in this Preservation Project selection include:
The bituminous pavement condition on this section is poor with a low structural rating. The section has a RQI rating of 2.2 and SR rating of 2.1. The road has a good layer of aggregate base beneath it and is a good candidate to reclaim.
This choice will also provide a fix with a large RSL (Remaining Service Life). The District is attempting to do a variety of fixes with staggered or various RSL and this project will contribute to this.
I concur with the selected Preservation Project:
Migan Stanlon

## Minnesota Department of Transportation



	MOINE		
	TO:	Jon Huseby  District Engineer	
	FROM:	Materials Engineer	
		11-21-2011	
	DATE:	11-21-2011	
	SUBJECT:	LCCA Exception for Pavement Preservation Project In reconditioning (RD), resurfacing (RS), or road repair (RX) funding categories	
S.P.	8707-51		
A Life Cycle Cost Analysis was performed in accordance with Tech Memo No. 10-04-MAT-01.			
Both PCC and HMA alternatives were considered.			
The alternative with the lowest Total Present Worth was: 4" Bituminous Mill & Overlay			
The alternative selected by the District is: 4" Mill, 4" CIR, & 4" Bituminous Overlay			
The justification for not selecting the lowest cost alternative is:			
This project was funded by the Upper Sioux Community who obtained funding thru the federal Indian			
Reservation Road (IRR) & ARRA programs. The project was let and awarded by the Upper Sioux			
Community. In consultation with MnDOT, the Upper Sioux decided on the fix that would meet their long			
erm vision of TH-67. That vision was a pavement fix that was both long lasting and environmental			
conscie	nce. This Cold in-Place	(CIR) meets both those requirements.	
-			
concur with the selected alternative,			
Jon Huselry District Engineer  11/22/2011 Date			