Oklahoma Long Range TRANSPORTATION PLAN

Moving Oklahoma FORWARD

Technical Memorandum

MULTIMODAL NEEDS Appendices

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Oklahoma Department of Transportation

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The Technical Memos were written to document early research for the 2015 2040 Oklahoma Long Range Transportation Plan (LRTP). Most of these memos were written in 2014; all precede the writing of the 2015-2040 Oklahoma LRTP *Document* and 2015-2040 Oklahoma LRTP *Executive Summary*.

The 2015-2040 Oklahoma LRTP *Document* and 2015-2040 Oklahoma LRTP *Executive Summary* were composed in Spring 2015*.*

If there is an inconsistency between the Tech Memos and the 2015-2040 Oklahoma LRTP *Document* or 2015-2040 Oklahoma LRTP *Executive Summary*, the reader should assume that the *Document* and *Executive Summary* contain the most current and accurate information.

Table of Contents

List of Tables

List of Figures

APPENDIX A:

Sources for Developing Estimated Costs and Projected Revenue

A.1 OKLAHOMA TRANSPORTATION ASSETS – ODOT AS RESPONSIBLE AGENCY

A.1.1 Source for Estimated Costs

- Span Bridges
  - ODOT 2013 National Bridge Inventory (NBI)
  - Bridge Needs Analysis using National Bridge Investment Analysis System (NBIAS)

- Bridge Boxes (Culverts)
  - Life-cycle analysis and input from ODOT Bridge Division staff

- Highways
  - ODOT 2013 Highway Performance Measurement System (HPMS)
  - Highway Needs Analysis using Highway Economics Requirements System, State Version (HERS-ST)

- Interchanges
  - ODOT staff based on historical records of ODOT's programming of improvements

- Transportation Appurtenances
  - Safety: ODOT safety engineers and consistent with the Oklahoma Strategic Highway Safety Plan
  - Maintenance: ODOT maintenance budget from 2009 to 2013 was used and a trend analysis was conducted to forecast maintenance needs and related costs for 2015-2040
  - Ports of Entry: ODOT Facilities Management staff
  - Weigh stations and rest areas: ODOT Facilities Management staff
  - Intelligent Transportation Systems (ITS): ODOT's Statewide ITS Implementation Plan (2004)
  - State owned freight rail: Oklahoma Statewide Rail and Passenger Rail Plan, 2012
  - Preliminary Engineering: ODOT

A.1.2 Source for Projected Revenue

- Projected revenues for ODOT Assets were obtained from the Revenue Forecast Technical Memorandum.

A.2 OKLAHOMA TRANSPORTATION ASSETS – PARTNER ENTITIES

A.2.1 Source for Estimated Costs

- Private Freight Rail
  - Oklahoma Statewide Rail and Passenger Rail Plan, 2012
  - Additional Projects Updated from UPRR and BNSF

- Passenger Rail
  - Oklahoma Statewide Rail and Passenger Rail Plan, 2012
  - ODOT also provided updates on the ongoing studies
  - The AMTRAK subsidies are calculated based on the historical records from ODOT and AMTRAK.

- Intermodal Facility
  - ODOT staff

- Public Transportation
  - Urban transit: Utilized the latest long range plan to identify the fiscally constrained needs
  - Rural Transit – ODOT staff provided historical trends which were used to calculate future needs
  - Tribal Needs - ODOT staff provided historical trends which were used to calculate future needs

- Ports and Waterways
  - Cost of maintenance needs was provided by US Army Corps
  - The channel deepening cost was provided by US Army Corps and the total cost was spilt to per mile cost to calculate the Oklahoma portion.

- Bicycle and Pedestrian facilities
  - Urban Areas: Utilized the latest long range plan to identify the fiscally constrained needs
  - Small Town and Other Counties: ODOT staff provided historical trends of the needs application which were received from the smaller towns and counties. This trend was utilized to estimate future needs.

A.2.2 Source for Projected Revenue

- Projected revenues for Partner Assets were obtained from the Revenue Forecast Technical Memoranda unless otherwise specified.

APPENDIX B:

Assumptions and Inputs for ODOT Bridge Needs Analysis Using the National Bridge Inventory Analysis Software (NBIAS)

B.1 INTRODUCTION TO BRIDGE NEEDS ANALYSIS

Bridge needs for Oklahoma were determined using National Bridge Investment Analysis System (NBIAS) software. NBIAS is an analysis tool used to predict bridge rehabilitation, reconstruction, and replacement needs. The NBIAS model forecasts bridge performance and offers recommendations for improvements based on economic concepts. The system supports analysis of different funding levels and policy assumptions for over 200 measures of effectiveness. The software uses the state's NBI File (National Bridge Inventory), deficiency levels, design standards, and unit cost estimates as inputs to assess structurally deficient and/or functionally obsolete structures in order to achieve scenario specific objectives.

B.1.1 Types of Analysis

NBIAS analyzes bridge structures only and excludes bridge box (culvert) records from the NBI dataset. NBIAS can only predict and maintain needs for existing bridges. New location analysis had to be performed outside of NBIAS and added to the totals. New Bridges can be queried out of the State Transportation Improvement Program (STIP) database and reviewed by the DOT personnel for inclusion.

B.1.2 Results

Reporting of needs from the NBIAS analysis will show number of bridges needing improvement and the cost of the improvements by three categories: *rehabilitation*, *reconstruction*, and *replacement*. For the purposes of the 2015-2040 LRTP, bridges needing to be raised, widened and/or strengthened were grouped into the category or bridge *reconstruction*.

NBIAS also reports a maintenance figure which estimates the preservation and *rehabilitation* costs across the study period for all the structures in order to minimize user and agency costs. Functional improvements such as widening existing bridge lanes, raising bridges to increase vertical clearances, and strengthening bridges to increase load- carrying capacity are identified by comparing with ODOT standards.

The *replacement* category identifies structures that are beyond a simple rehabilitation or improvement because they may be structurally deficient or functionally obsolete. All categories are evaluated and compared in the model scenario for optimal benefit and cost.

B.2 UNIT COSTS (SPAN BRIDGES)

Bridge unit costs are used to determine the improvement cost total for each action taken (or potentially taken) by NBIAS. Values are stored in the "Matrix_cost" table. The table contains user cost information required for the improvement models. These values include activities such as widening, raising, strengthening, and replacing a bridge. Unit costs can vary by functional class, national highway system status, and/or traffic volume range. An improvement cost within NBIAS is determined by multiplying the unit cost for the improvement type by deck area that will be improved, considering the change in dimensions that may result from the improvement for widening or replacing a bridge.

These costs do not necessarily include sub-structure improvements, utility relocation, or right-of-way acquisition.

Table B-1 shows the unit cost information used in NBIAS, as provided by Oklahoma DOT.

Table B-1: Unit Cost per Square Foot of Deck ($2013)

Replace	Widen	Raise	Strengthen
$105.00	$95.00	$50.00	$50.00

B.3 IMPROVEMENT CRITERIA

The "Matrix_policy" table deals with the improvement policy criteria for when a bridge should be: Widened, Raised, Strengthened. The criteria, also referred to as Minimum Tolerable Conditions (MTC), are specific to each state and contain the legal standards for each bridge type, as separated by functional class, NHS status, and AADT class. The deficiency (MTC) values trigger NBIAS to take an improvement action when a bridge falls below the respective structural standard, while design values are the new bridge dimensions NBIAS will use for a replacement bridge. Design standards are the engineering specifications for a new bridge.

Values addressed in the table include design and legal standards for lane and shoulder widths, as well as the swell factor which is a cost- increase coefficient. **Table B-2** presents the values used for the bridge needs analysis for Oklahoma.

Table B-2: Policy Values

		Deficiency					Design				Ratings in Metric Tons	
		right		left		Vert Clear					Legal Operating	Legal Inventory
		Lane Width	Shlder Width	Lane Width	Shlder Width		Lane Width	Shlder Width	Vert Clear	Swell		
Rural	Interstates	11.2	3.0	11.2	3.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Rural	Principal Arterials	11.2	3.0	11.2	3.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Rural	Minor Arterials	11.2	3.0	9.8	2.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Rural	Major Collectors	11.2	0.0	9.8	0.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Rural	Minor Collectors	11.2	3.0	9.8	1.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Rural	Local Roads	11.2	3.0	9.8	1.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Urban	Interstates	11.2	3.0	9.8	0.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Urban	Expressways	11.2	3.0	11.2	3.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Urban	Principal Arterials	11.2	3.0	11.2	3.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Urban	Minor Arterials	11.2	3.0	9.8	2.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Urban	Collectors	11.2	0.0	9.8	0.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Urban	Local Roads	11.2	3.0	9.8	1.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66
Undefined FC		11.2	3.0	9.8	1.0	14.1	12.0	8.0	16.75	4.90	32.66	32.66

B.4 BRIDGE REPLACEMENT RULE

A state can establish rules as to when a bridge should be replaced based on Structural deficiency status, Functional obsolescence status, Sufficiency rating, Health index, and Age. Rules will override recommendations that are based on improvement models. The rule will replace any record which meets the specified criteria.

The State of Oklahoma instituted a funding plan in 2012 to reduce the number of structurally deficient bridges on the state highway system to nearly zero by the end of the year 2019. In order to match this policy, a replacement rule was created to indicate a need to replace the structurally deficient bridges. Ratings for structural deficiency range from 100 (best) to 0 (worst).

APPENDIX C:

Assumptions and Inputs for ODOT Highway Needs Analysis Using Highway Economic Requirements System – State Version (HERS-ST)

C.1 INTRODUCTION TO HIGHWAY NEEDS ANALYSIS

To determine the future needs and performance of roads for Oklahoma, the Highway Economic Requirements System - State Version (HERS-ST) software is used. HERS-ST is a highway investment analysis tool provided and supported by the Federal Highway Administration (FHWA). HERS-ST considers engineering principles when determining deficiencies and economic criteria when determining improvements for implementation on a statewide level. The model will estimate future needs utilizing a state's HPMS data, design standards, minimum tolerable conditions, improvement costs, and other parameters that were customized to the state.

C.1.1 Types of Analysis

In any given computer program execution, HERS-ST is designed to perform one of four types of analysis as specified in the user input field "Objective." The user- specified objective may be in any of four possible forms:

- Maximize the net present value of all benefits of highway improvements subject to specified constraints on funds available during the period;
- Minimize the cost of improvements necessary to achieve a specified goal for the performance of the highway system at the end of the funding period;
- Implement all improvements with a benefit-cost ratio (BCR) greater than some specified threshold value; and
- Perform a full engineering analysis to highlight deficiencies within each funding period and implement improvements within the same funding period without a limiting variable.

C.1.2 Input Files

There are four main categories of files required for analyzing the highway needs to Oklahoma requirements. They are:

- The roadway section file found within the HMPS dataset with adequate sample records present.
- **Parameter** file (PARAMS.DAT) contains parameters covering the breadth of the HERS modeling process: the pavement model, operating cost components, the speed model, and the safety model, to name but a few.
- **Improvement cost** file (IMPRCOST.DAT) contains data items which define the costs of improving highway sections.
- **Deficiency level tables** file (DLTBLS.DAT) defines the various condition levels which will prompt HERS to analyze a section for possible improvement.

C.1.3 Results

Results from HERS- ST model analysis will be grouped and discussed by improvement categories for reporting purposes. Those categories are preservation, reconstruction and expansion.

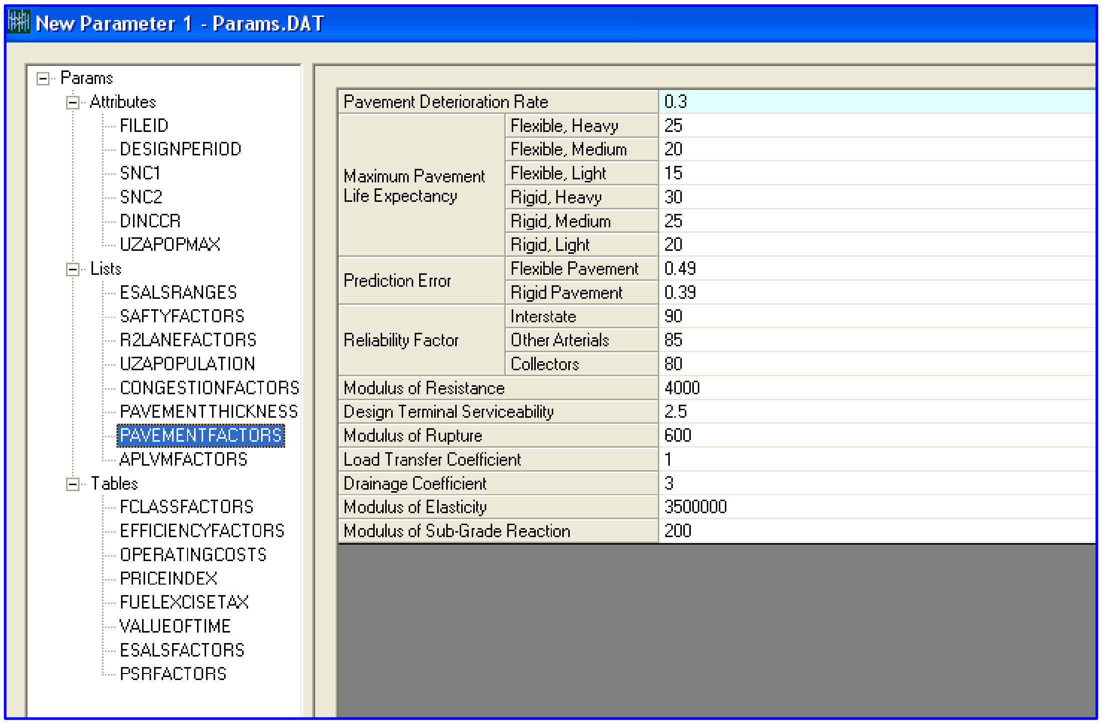
- **Preservation** is simply the regular maintenance and resurfacing of a road. When a road has pavement deteriorating to unacceptable levels, resurfacing is the improvement choice to maintain the integrity of the roadway. Preservation is the most common improvement type.
- **Reconstruction** is the improvement of an existing roadway by upgrading the geometrics and functionality of the segment. Improvements such as widening lanes and shoulders are examples of reconstruction. Reconstruction identifies roadways that are so structurally deficient that it cannot be repaired by resurfacing alone and must be rebuilt.
- **Expansion** deals with the need to provide additional capacity in order to address congestion issues. When future volumes exceed a minimum threshold levels, the HERS-ST model looks to add new lanes and to alleviate the congestion and maintain an acceptable level of service. It is the most costly improvement type on average. Thus it will most likely be a more beneficial solution for roadways with heavy traffic volumes, like interstates and freeways.

The following outlines some of the more important variable that should be addressed at the beginning of the analysis process. These are by no means the extent of the variable inputs and there will be other inputs of varying degree to determine within the HERS- ST model.

C.2 PARAMETERS

The pavement factors are very important for determining the highway preservation needs over time. Pavement Factor table from HERS- ST used for Oklahoma highway needs analysis is shown in **Figure C-1**.

Figure C-1: Pavement Factors - Key Determinant of Resurfacing Needs



Pavement Deterioration Rate		0.3
Maximum Pavement Life Expectancy	Flexible, Heavy	25
	Flexible, Medium	20
	Flexible, Light	15
	Rigid, Heavy	30
	Rigid, Medium	25
	Rigid, Light	20
Prediction Error	Flexible Pavement	0.49
	Rigid Pavement	0.39
Reliability Factor	Interstate	90
	Other Arterials	85
	Collectors	80
Modulus of Resistance		4000
Design Terminal Serviceability		2.5
Modulus of Rupture		600
Load Transfer Coefficient		1
Drainage Coefficient		3
Modulus of Elasticity		3500000
Modulus of Sub-Grade Reaction		200

Two important pavement factors that will impact the highway needs are:

- **Pavement Deterioration Rate** is the maximum deterioration rate that HERS-ST will assume for any pavement. The higher this rate, the more preservation needs will be found.

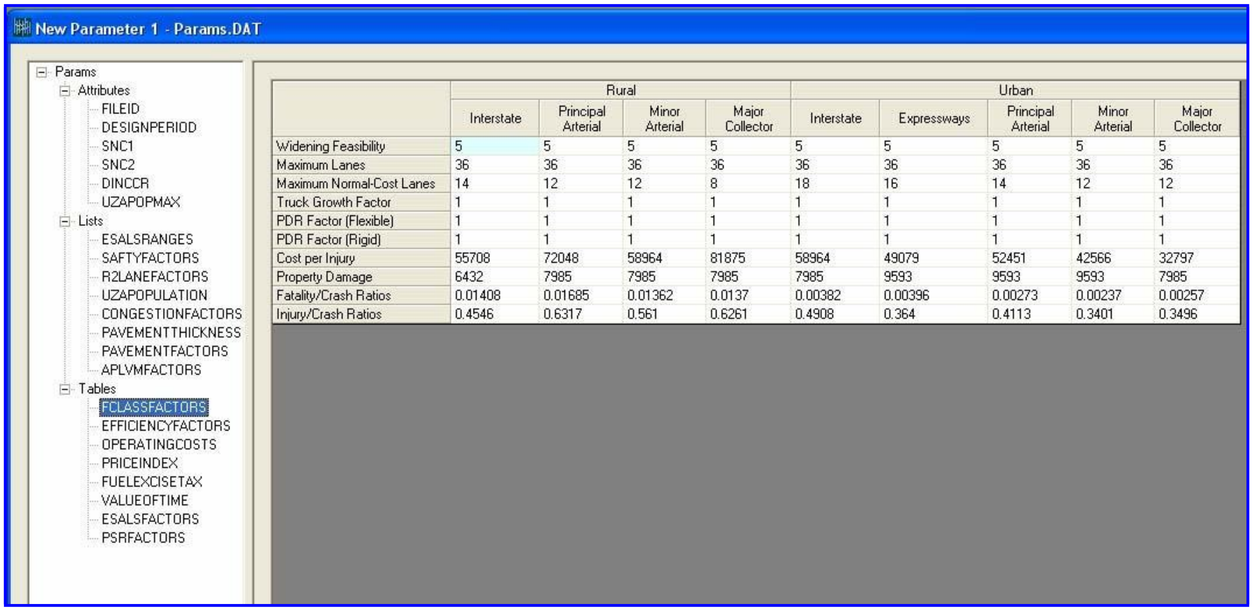
- **Maximum Pavement Life Expectancy** is also critically important for determining preservation needs over time. The longer the maximum pavement life expectancy the more preservation needs will be found.

Many important determinants of highway needs vary by functional classification. Few key parameters that impact the highway needs are discussed below.

- **Maximum Lanes** – If the "Maximum Lanes" parameter is set too high, HERS-ST will assume Oklahoma needs to continue widening a facility as traffic grows regardless of its number of existing lanes. An unrealistically high "Maximum Lanes" parameter is often a reason for analyses showing exceptionally high highway expansion requirements. The higher the "Maximum Number of Lanes", the greater the expansion needs found in the analysis.

- **Maximum Number of Normal Cost Lanes** – If a highway requires a capacity improvement for a number of lanes beyond the “Maximum Number of Normal Cost Lanes”, HERS-ST will assume that these improvements will be made at a higher cost. In **Figure C-2** example, maximum number of “Normal Cost Lanes” assumes that any lanes more than fourteen on rural interstates will require a higher cost than adding lanes up to 14 lanes (7 in each direction). The higher the maximum number of normal cost lanes, the lower the overall cost of expansion needs in the analysis.

Figure C-2: Functional Class Factors - Key Determinants of Major Widening and High Cost



	Rural				Urban				
	Interstate	Principal Arterial	Minor Arterial	Major Collector	Interstate	Expressways	Principal Arterial	Minor Arterial	Major Collector
Widening Feasibility	5	5	5	5	5	5	5	5	5
Maximum Lanes	36	36	36	36	36	36	36	36	36
Maximum Normal-Cost Lanes	14	12	12	8	18	16	14	12	12
Truck Growth Factor	1	1	1	1	1	1	1	1	1
PDR Factor (Flexible)	1	1	1	1	1	1	1	1	1
PDR Factor (Rigid)	1	1	1	1	1	1	1	1	1
Cost per Injury	55708	72048	58964	81875	58964	49079	52451	42566	32797
Property Damage	6432	7985	7985	7985	7985	9593	9593	9593	7985
Fatality/Crash Ratios	0.01408	0.01685	0.01362	0.0137	0.00382	0.00396	0.00273	0.00237	0.00257
Injury/Crash Ratios	0.4546	0.6317	0.561	0.6261	0.4908	0.364	0.4113	0.3401	0.3496

- **Normal and High Cost** – The HERS-ST model differentiates between lanes added at “Normal” and “High” cost. New lanes are added at normal cost when they do not violate the state-supplied Widening Feasibility code (WDFEAS) for the section, as found in the HPMS data. The user has the option of allowing lanes beyond those permitted by the state code if the benefit outweighs the increased cost of ROW acquisition. This is identified by the maximum lane limit (MAXLNS). These lanes are added at high cost. It is possible for a section to be improved by the addition of lanes at both cost levels: HERS reports these improvements as high cost lanes in the output statistics.

C.2.1 Lanes Needed

- **Widening Feasibility** is another value that influences the ability to expand the system. These values specify a system widening feasibility that overrides the widening feasibility of individual sections coded within the HPMS data. When the override code allows for more widening than a section’s HPMS code, HERS-ST may consider additional widening options. Lanes that are added up to the level of the sections HPMS code are treated as normal-cost lanes (up to the aforementioned limit) while lanes added beyond the sections code are treated as high-cost lanes.

Widening codes are as follows:

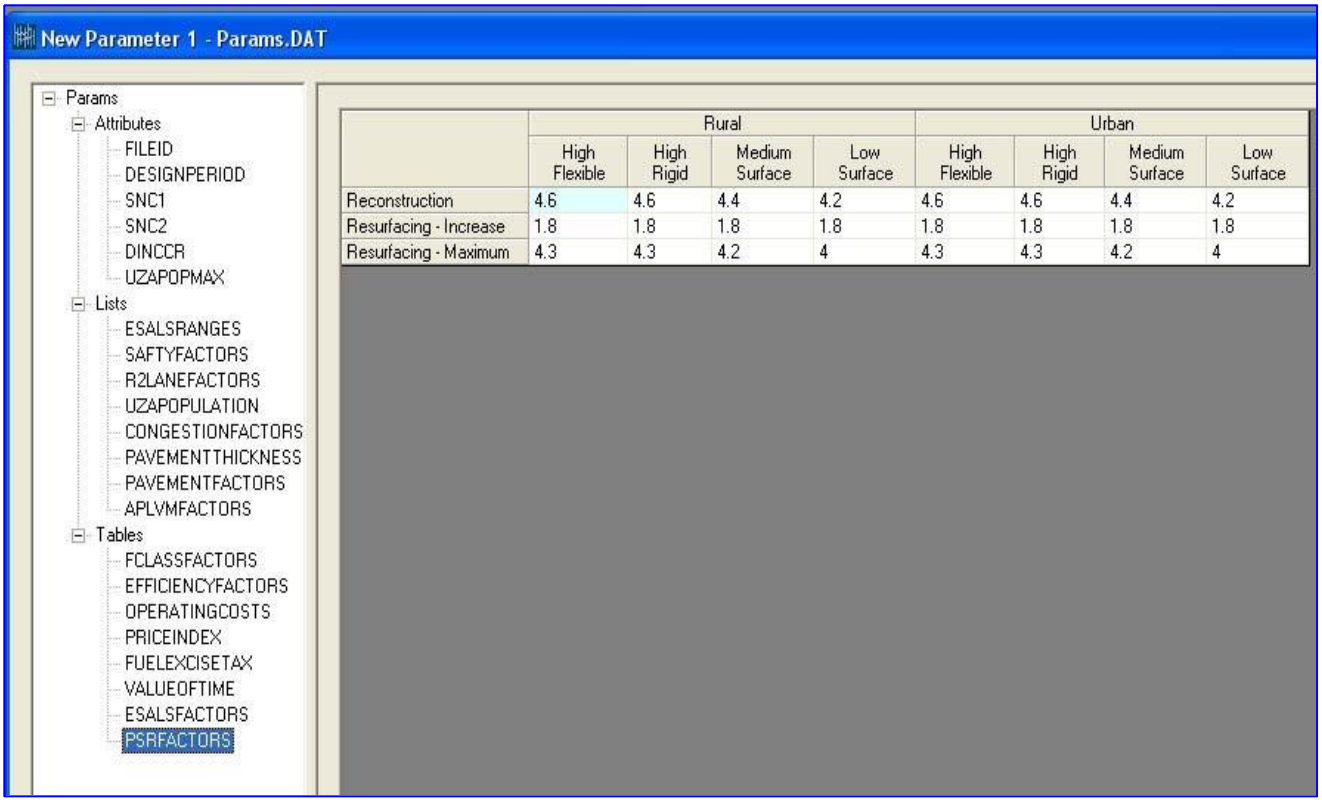
1	None
2	Partial Lane
3	One Lane
4	Two Lanes
5	Three + Lanes

- **Present Serviceability Rating (PSR) Factors** are important for HERS-ST to determine Full Engineering Needs. The Reconstruction level gives the maximum PSR that can be expected after a lane-mile of highway with a given pavement type is reconstructed. Present Serviceability Rating Factors are directly related to international Roughness Index (IRI) and Pavement Quality Index (PQI) regarding pavement condition. The IRI is a scale for roughness based on the simulated response of a generic motor vehicle to the roughness in a single wheel path of the road surface. PQI is a value that represents roadway pavement condition. PQI is based on several factors such as smoothness, rutting, and cracking. It is assumed for example, that when a High- Flexible Rural pavement is reconstructed, it is restored to a PSR level of 5.0. This affects the number of years (or funding periods) before the segment will require resurfacing. The higher the reconstruction PSR level, the less preservation need will be found on the system.

As shown in **Figure C-3**, the Resurfacing Increase gives the assumed increase in PSR that is expected when a lane-mile of highway is resurfaced. For example, for Oklahoma, it is assumed that a rural High Flexible pavement will recover 1.8 PSR points after it is resurfaced, affecting the frequency with which this segment will require preservation investment over the analysis period. The higher the resurfacing increase, the less preservation need will be found on the system.

The Resurfacing Maximum gives the assumed maximum PSR that a segment can have after it is resurfaced. For example, for Oklahoma, it is assumed that a rural High Flexible pavement may be improved up to a PSR of 4.3, but no higher by resurfacing. The higher the maximum PSR after resurfacing, the less preservation need will be found on the system.

Figure C-3: Present Serviceability Factors - Key Determinants of Resurfacing and Reconstruction Needs



	Rural				Urban			
	High Flexible	High Rigid	Medium Surface	Low Surface	High Flexible	High Rigid	Medium Surface	Low Surface
Reconstruction	4.6	4.6	4.4	4.2	4.6	4.6	4.4	4.2
Resurfacing - Increase	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Resurfacing - Maximum	4.3	4.3	4.2	4	4.3	4.3	4.2	4

C.3 IMPROVEMENT COSTS

Improvement Costs are the average costs assumed to make different types of improvements to a lane- mile of highway. They may vary by functional classification, area type and terrain. Improvement costs are typically input to HERS- ST in thousands of dollars. HERS- ST requires that average improvement costs are provided per- lane mile for functional classification, area- type, terrain type and improvement type.

The HERS-ST unit costs include both improvement and right-of-way (ROW) costs, but do not include costs such as unusual cut and fill operations, excessive number of structures, or non-construction costs. For example, the HERS-ST unit costs include costs for right-of-way, grading, drainage, shoulder, utility, curb and gutter. The unit costs do not include costs for engineering, maintenance and other non-construction related work.

A description of the improvement types used in HERS-ST is as follows:

- **Reconstruction with Wider Lanes** – Complete reconstruction with wider lanes than the existing section. No additional lanes are added. Shoulder and drainage deficiencies are corrected.

- **Pavement Reconstruction** – Complete reconstruction without adding or widening lanes. Any other shoulder or drainage deficiencies are corrected.
- **Resurface with Wider Lanes** – This improvement includes resurfacing the existing lanes and other minor work such as shoulder and drainage work. The added width yields wider lanes or shoulders, but no additional lanes.
- **Resurfacing** – The overlay of existing pavement.
- **Resurfacing with Shoulder Improvements** – The overlay of existing pavement plus the widening of shoulders to design standards. A minor amount of additional right-of-way may be acquired.
- **Add Lanes** – The addition of lanes to an existing facility. Lanes added in excess of the state- coded widening feasibility code are added at high cost – otherwise, lanes are added at normal cost. This improvement includes resurfacing the existing lanes and other minor work such as shoulder and drainage work.
- **Alignment** – Complete reconstruction with the addition of lanes to the existing section. Lanes added in excess of the state-coded widening feasibility code are added at high cost – otherwise, lanes are added at normal cost. Shoulder and drainage deficiencies are corrected.

Figure C-4 summarizes the unit costs for the various improvement types used for Oklahoma. Improvement costs for certain categories were provided by Oklahoma DOT. These were used to compare against the national averages and cost estimates of other improvement categories were determined. It is important to note that the unit costs are in 2013 dollars.

Figure C-4: Improvement Cost Table - Cost in Thousands per Lane Mile

$$ in Thousands Per Lane Mile			Reconstruction		Resurface		Shoulder Improvements	Add Lanes		Alignment	
2013$			Lane Widening	Pavement	Lane Widening	Pavement		Normal Cost	High Cost	Normal Cost	High Cost
Rural	Interstate	Flat	1,536	1,060	814	275	80	2,362	2,789	2,789	2,789
		Rolling	1,669	1,152	904	306	109	2,453	3,229	3,229	3,229
		Mountainous	2,226	1,536	1,130	382	156	4,543	4,893	4,893	4,893
	Principal Arterials	Flat	1,255	887	751	212	30	2,038	2,461	2,461	2,461
		Rolling	1,345	950	827	233	50	2,119	2,763	2,763	2,763
		Mountainous	1,793	1,267	1,089	307	67	4,075	4,317	4,317	4,317
	Minor Arterials	Flat	975	639	621	146	46	1,479	1,823	1,823	1,823
		Rolling	1,125	738	740	174	70	1,651	2,203	2,203	2,203
		Mountainous	1,500	983	1,089	255	118	3,440	3,798	3,798	3,798
	Major Collectors	Flat	902	559	545	179	43	1,211	1,509	1,509	1,509
		Rolling	981	607	607	199	56	1,234	1,800	1,800	1,800
		Mountainous	1,308	810	779	255	75	2,203	2,647	2,647	2,647
Urban	Interstates/ Expressways	Small Urban	2,079	1,386	1,611	341	85	2,635	5,379	3,627	7,676
		Small Urbanized	2,188	1,459	1,665	352	101	2,831	5,785	4,622	9,783
		Large Urbanized	3,647	2,432	2,686	568	327	4,880	10,149	7,111	15,051
	Principal Arterials	Small Urban	1,488	1,005	1,231	241	53	1,821	3,688	2,277	4,817
		Small Urbanized	1,592	1,017	1,287	284	71	1,973	4,011	2,808	5,943
		Large Urbanized	2,275	1,490	1,884	358	229	2,887	5,981	3,855	8,158
	Arterials/ Collectors	Small Urban	1,097	759	931	176	39	1,345	2,701	1,642	3,476
		Small Urbanized	1,149	767	940	200	47	1,417	2,854	2,015	4,265
		Large Urbanized	1,547	1,026	1,285	246	129	1,964	4,044	2,623	5,550

The units costs used in HERS-ST were compared with data from 2013 ODOT Roadway Condition data and the 2035 Oklahoma City Regional Transportation Study (OCARTS) Area, developed by ACOG, the Oklahoma City Area MPO.

Figure C-5 indicates that the data from the 2013 ODOT Roadway Condition data and 2035 OCARTS Plan fall within the range of unit costs used in HERS-ST.

Figure C-5: Comparison of HERS-ST Improvement Costs to Cost Estimates from ODOT Improvement and MPO Plan Data

	Improvement Type	Estimated Cost	HERS-ST Input	
			Rural	Urban
2013 ODOT Roadway Condition Data	Non-Interstate reconstruct: remove one lane, one shoulder, add one lane, add one shoulder	$1,100,000	$481,000 - $1,267,000	$759,000- $1,490,000
2013 ODOT Roadway Condition Data	Interstate reconstruct: remove one lane, one shoulder, add one lane, add one shoulder	$1,250,000	$684,000 - $1,536,000	$1,182,000 - $2,432,000
2013 ODOT Roadway Condition Data	Rural (Construct two lanes with two shoulders on new alignment)	$1,150,000*	$980,000 - $1,459,000	
2013 ODOT Roadway Condition Data	Interstate: Remove existing structure, construct six lanes, four shoulders	$1,030,000*	$684,000 - $701,000	$1,182,000 - $1,193,000
2013 ODOT Roadway Condition Data	Interstate: Remove two shoulders, add two lanes, add two shoulders	$1,100,000*	$1,346,000 - $1,459,000	$2,142,000 - $2,341,000
2035 OCARTS Plan	Improvement Type	Estimated Cost	HERS-ST Input	
2035 OCARTS Plan			Rural	Urban
2035 OCARTS Plan	Urban - New construction on new alignment	$6,270,000**		$4,880,000 - $7,111,000
2035 OCARTS Plan	Urban - Reconstruction	$1,307,000**		$1,182,000 - $2,432,000
2035 OCARTS Plan	Rural - New construction on new alignment	$3,080,000**	$1,346,000 - $5,318,000	
2035 OCARTS Plan	Rural - Reconstruction	$835,000**	$684,000 - $1,536,000	

** Costs prorated to per lane mile*
*** Costs converted from 2005 $ to 2013 $*

C.4 DEFICIENCY LEVELS

Deficiencies in HERS- ST refers to roadway characteristics based on the traffic level and terrain and whether it meets the Minimum Tolerable Conditions standards. If the record is identified as deficient, then HERS- ST triggers an improvement action. **Figure C-6** illustrates the deficiency levels while **Figure C-7** illustrates the reconstruction levels used for Oklahoma highway needs analysis.

Figure C-6: Deficiency Levels

			PQI	Surface Type	V/C Ratio	Lane Width (ft)	Rt Shoulder Width (ft)	Shoulder Type	Horizontal Alignment	Vertical Alignment
RURAL	Interstate	Flat	81.0	2-High	0.7	12	10	2-Stabilized	1-All Crv Appropriate	1-All Grd Appropriate
		Rolling	81.0	2-High	0.8	12	9	2-Stabilized	1-All Crv Appropriate	1-All Grd Appropriate
		Mountainous	81.0	2-High	0.8	12	7	2-Stabilized	1-All Crv Appropriate	1-All Grd Appropriate
	Principal Arterials AADT > 6000	Flat	81.0	2-High	0.7	12	9	2-Stabilized	1-All Crv Appropriate	1-All Grd Appropriate
		Rolling	81.0	2-High	0.8	12	9	2-Stabilized	1-All Crv Appropriate	1-All Grd Appropriate
		Mountainous	81.0	2-High	0.8	12	7	2-Stabilized	1-All Crv Appropriate	1-All Grd Appropriate
	Principal Arterials AADT < 6000	Flat	81.0	2-High	0.7	12	9	2-Stabilized	2-All Curves Accept	2-All Grades Accept
		Rolling	81.0	2-High	0.8	12	9	2-Stabilized	2-All Curves Accept	2-All Grades Accept
		Mountainous	81.0	2-High	0.8	12	7	2-Stabilized	2-All Curves Accept	2-All Grades Accept
	Minor Arterials AADT > 2000	Flat	81.0	3-Intermediate	0.7	12	7	2-Stabilized	2-All Curves Accept	2-All Grades Accept
		Rolling	81.0	3-Intermediate	0.8	12	7	2-Stabilized	2-All Curves Accept	2-All Grades Accept
		Mountainous	81.0	3-Intermediate	0.8	12	6	2-Stabilized	2-All Curves Accept	2-All Grades Accept
	Minor Arterials AADT < 2000	Flat	76.0	3-Intermediate	0.7	12	7	3-Earth	2-All Curves Accept	2-All Grades Accept
		Rolling	76.0	3-Intermediate	0.8	12	7	3-Earth	2-All Curves Accept	2-All Grades Accept
		Mountainous	76.0	3-Intermediate	0.8	12	6	3-Earth	2-All Curves Accept	2-All Grades Accept
	Major Collectors AADT > 1000	Flat	76.0	3-Intermediate	0.7	12	6	3-Earth	2-All Curves Accept	2-All Grades Accept
		Rolling	76.0	3-Intermediate	0.8	12	6	3-Earth	2-All Curves Accept	2-All Grades Accept
		Mountainous	76.0	3-Intermediate	0.8	12	6	3-Earth	2-All Curves Accept	2-All Grades Accept
	Major Collectors AADT > 400	Flat	76.0	4-Low	0.80	11	4	3-Earth	2-All Curves Accept	2-All Grades Accept
		Rolling	76.0	4-Low	0.80	11	4	3-Earth	2-All Curves Accept	2-All Grades Accept
		Mountainous	76.0	4-Low	0.80	11	4	3-Earth	2-All Curves Accept	2-All Grades Accept
	Major Collectors AADT < 400	Flat	76.0	5-Unpaved	0.80	10	2	3-Earth	2-All Curves Accept	2-All Grades Accept
		Rolling	76.0	5-Unpaved	0.80	10	2	3-Earth	2-All Curves Accept	2-All Grades Accept
		Mountainous	76.0	5-Unpaved	0.80	10	2	3-Earth	2-All Curves Accept	2-All Grades Accept
URBAN		Interstate	85.0	2-High	0.80	12	9	1-Surfaced	2-All Curves Accept	
		Expressway	85.0	2-High	0.80	12	9	1-Surfaced	2-All Curves Accept	
		Princ. Arterial	85.0	2-High	0.80	12	8	2-Stabilized	1-All Crv Appropriate	
		Minor Arterial	85.0	3-Intermediate	0.80	12	8	3-Earth	1-All Crv Appropriate	
		Collector	80.0	4-Low	0.8	12	6	3-Earth	1-All Crv Appropriate	

Figure C-7: Reconstruction Levels

			PQI
RURAL	Interstate	Flat	66.0
		Rolling	66.0
		Mountainous	66.0
	Principal Arterials AADT > 6000	Flat	61.0
		Rolling	61.0
		Mountainous	61.0
	Principal Arterials AADT < 6000	Flat	61.0
		Rolling	61.0
		Mountainous	61.0
	Minor Arterials AADT > 2000	Flat	61.0
		Rolling	61.0
		Mountainous	61.0
	Minor Arterials AADT < 2000	Flat	59.0
		Rolling	59.0
		Mountainous	59.0
	Major Collectors AADT > 1000	Flat	59.0
		Rolling	59.0
		Mountainous	59.0
	Major Collectors AADT > 400	Flat	59.0
		Rolling	59.0
		Mountainous	59.0
	Major Collectors AADT < 400	Flat	59.0
		Rolling	59.0
		Mountainous	59.0
URBAN		Interstate	75.0
		Expressway	75.0
		Princ. Arterial	70.0
		Minor Arterial	70.0
		Collector	65.0

C.4.1 Deficiency Level for Pavement Condition

The “DLTbls” parameter in HERS-ST defines a “Deficiency Level” for pavement condition. This is the level at which a pavement on a given functional classification of road will be assumed to require a resurfacing project. For Oklahoma, flat rural interstate pavements are assumed to be “deficient” and require resurfacing at a PQI of 81 or less. When PQI reaches the “reconstruction level” of 66, as shown in Figure B-7, it is assumed that the segment is so deficient that it cannot be repaired by resurfacing and will require reconstruction.

The higher the deficiency and reconstruction levels for pavement conditions, the greater the overall need for resurfacing and reconstruction will be required to maintain these levels.

C.4.2 Deficiency Level for Volume to Capacity Ratio

The “DLTbls” parameter in HERS-ST also defines a “Deficiency Level” for Volume to Capacity Ratio. This is the volume to capacity (V/C) ratio at which it is assumed that a roadway must be widened to accommodate its anticipated traffic level. When a segment is forecast to reach a deficient V/C ratio (as defined by the Highway Capacity Manual), it is assumed there is a need to add lanes to the segment, driving up the expansion “Need” found by the HERS-ST analysis.

The higher the deficiency level for V/C ratio, the lower the overall expansion need. For Oklahoma, a flat interstate is assumed to be deficient at a V/C ratio of 0.7. Any segment with a V/C ratio of 0.7 or more is considered to represent an expansion need. However, if the deficiency level were raised to 0.9, then fewer segments would be deficient and overall expansion needs would be less.

The “deficient” V/C can be best understood as the highest V/C ratio the state is willing to accommodate before recognizing a need to add lanes.

C.4.3 Deficiency Level for Lane Width

HERS-ST also defines a “Deficiency Level” for Lane Width. This is the lane width that Oklahoma seeks to maintain for all roadways with given traffic levels for each functional classification. As volumes increase, the required lane width is also expected to increase.

Therefore, the greater the deficiency level for lane width, the more reconstruction improvement need will be found by the HERS-ST model. For example, a Major Collector on flat terrain with a volume of 350 is considered deficient if its lane width is less than 8 feet. However, if in a future funding period, the traffic on this segment rises to 500 it would then be considered deficient with a lane width any less than 10 feet. The increase in traffic is assumed to result in a deficiency, which HERS-ST then recognizes as a reconstruction need.

The higher the deficiency level (or the lane-width requirement), and the more sensitive lane-width requirements are to increases in traffic volumes, the more reconstruction needs will be found on the system in the HERS-ST analysis.

C.4.4 Deficiency Level for Shoulder Width and Type

HERS-ST also defines a “Deficiency Level” for Shoulder Width and Shoulder Type. As with lane width, this is the shoulder width that Oklahoma seeks to maintain for all roadways with given traffic levels for each functional classification. As volumes increase, the required shoulder width is also expected to increase. Therefore, the greater the deficiency level for shoulder width, the more shoulder improvement need will be found by the HERS-ST model.

However, unlike lane width, deficient shoulders do not alone constitute an improvement need in HERS-ST. Instead, when reconstruction needs are found in HERS-ST, shoulder widths are checked against the specified deficiency levels, with shoulder improvements and their costs added to the project cost in a separate “shoulder” category.

As with shoulder width, there is a shoulder type that Oklahoma seeks to maintain for all roadways with given traffic levels for each functional classification. As volumes increase, the required shoulder type is also expected to change. Therefore, the higher the volumes, the higher (will be) the standard for shoulder type.

As with shoulder width, deficient shoulder types do not alone constitute an improvement need in HERS-ST. Instead, when reconstruction needs are found in HERS-ST, shoulder widths are checked against the specified deficiency levels. Then, necessary shoulder improvements and their costs added to the project cost in a separate “shoulder” category.

C.5 DESIGN STANDARDS (DS)

Design standards specify the engineering level to which a segment will be rebuilt within the model analysis. These standards address items such as: surface type, lane, shoulder, & median width; curve, and grade. A segment will **not** be targeted for improvement simply because it does not meet the design standards laid out in the table, but will be modified during a reconstruction improvement when a segment is highlighted with a deficiency. Once a segment improvement is implemented with these predetermined designs, the segment will retain the characteristics within the software only. **Figure C-8** shows the default design standards.

Figure C-8: Design Standards

			Surface Type	Lane Width (ft)	Rt Shoulder Width (ft)	Curve Categories	Grade Categories	Median Width
RURAL	Interstate	Flat	2	12	12	1	3	64
		Rolling	2	12	10	1	3	64
		Mountainous	2	12	8	3	5	46
	Principal Arterials AADT > 6000	Flat	2	12	10	1	3	46
		Rolling	2	12	10	1	3	46
		Mountainous	2	12	8	3	5	46
	Principal Arterials AADT < 6000	Flat	2	12	10	1	3	46
		Rolling	2	12	10	1	3	46
		Mountainous	2	12	8	3	5	46
	Minor Arterials AADT > 2000	Flat	2	12	8	1	3	46
		Rolling	2	12	8	2	3	46
		Mountainous	2	12	8	3	5	46
	Minor Arterials AADT < 2000	Flat	3	12	8	1	3	0
		Rolling	3	12	8	2	3	0
		Mountainous	3	12	6	3	5	0
	Major Collectors AADT > 1000	Flat	3	12	8	2	4	46
		Rolling	3	12	8	3	5	46
		Mountainous	3	12	6	4	6	46
	Major Collectors AADT > 400	Flat	4	12	4	2	4	0
		Rolling	4	12	4	3	5	0
		Mountainous	4	12	4	4	6	0
	Major Collectors AADT < 400	Flat	4	12	4	2	4	0
		Rolling	4	12	4	3	5	0
		Mountainous	4	12	4	4	6	0

		Surface Type	Lane Width (ft)	Rt Shoulder Width (ft)	Shoulder Type	Curve Categories	Median Width
Urban	F/E by design	2	12	10	3	3	20
	Other divided	2	12	10	3	3	-
	Undivided arterials	2	12	9	3	3	-
	Undivided collectors	3	12	8	3	3	-

Curve Category	Grade Category	Surface Type	Shlder Type
1-All Crv Appropriate	1-All Grd Appropriate	2-High	1-Surfaced
2-All Curves Accept	2-All Grades Accept	3-Intermediate	2-Stabilized
3-Some Reduce Speed	3-Some Reduce Speed	4-Low	3-Earth
4-Significant Curves	4-Significant Grades	5-Unpaved	4-Curbed

C.6 FACTORS SPECIFIC TO COST/BENEFIT ANALYSIS

The following are other important factors to address when preparing for a cost/benefit analysis.

C.6.1 User Criteria

6.1.1 Serious Deficiency Levels (SDL)

The SDLs are criteria for deficiencies that must be corrected if any improvement is made to the section, but they will not be corrected if no improvement is found to be worthwhile.

6.2.1 Unacceptable Levels (UL)

If requested by the user, ULs must be corrected, whether the best improvement is cost-effective or not. If the section is also deficient in pavement or capacity, this UL is voided.

C.6.2 Discount Rates

Discount Rate represents the diminishing buying power of the dollar over time from the base year. A rate of 3 percent is used for Oklahoma highway needs analysis. Although HERS discounts future benefits and costs using the user-supplied discount rate (DRATE), HERS does not support fluctuations in the value of the dollar and conducts all evaluations using constant dollars.

APPENDIX D:
Interchange Assumptions and Inputs

Table D-1: Highway Interchange Needs and Estimated Costs

Category	Number	Unit Cost (Millions)	Subtotal (Millions)	ROW/Utilities	Estimated Cost (Millions)
Simple Interchange	50	$15	$750	10%	$825
Complex Interchange	7	$250	$1,750	20%	$2,100
Total					**$2,925**

APPENDIX E:
Transportation Appurtenances

E.1 SAFETY NEEDS

Table E-1 provides details of the quantities and unit costs for various categories used to determine the safety needs.

Table E-1: State Highway System Safety Needs – 25-years

Category	Quantity and Unit Costs			Estimated Cost
Median Cable Barrier	545 mi	@	$175,000 per mile	$95,375,000
Centerline Rumble Strip	5,032 mi	@	$11,000 per mile	$55,352,000
Clear Zone	250 mi	@	$600,000 per mile	$150,000,000
Guardrail Updates	2,220 mi	@	$34,000 per mile	$75,480,000
J Turns	24 ea	@	$2,000,000 per ea	$48,000,000
Roundabouts at intersections	155 ea	@	$2,000,000 per ea	$310,000,000
Selected safety improvements at freeway ramps	35 ea	@	$4,000,000 per ea	$140,000,000
Total				**$874,207,000**

Source: Oklahoma Department of Transportation

E.2 MAINTENANCE NEEDS

Table E-2 summarizes the historic maintenance cost of ODOT state highway system. Trend analysis was used to forecast maintenance needs and related costs for 2015-2040.

Table E-2: Table D-2: State Highway System Maintenance Cost

Fiscal Year	Routine Expended	Special Expended	Special Budgeted	Total Routine and Special Expended
2009	$100,246,393	$17,563,520	$19,000,000	$117,809,913
2010	$104,580,981	$13,759,336	$14,000,334	$118,340,317
2011	$100,956,600	$10,588,672	$11,001,036	$111,545,272
2012	$104,384,775	$12,698,208	$12,990,449	$117,082,983
2013	$110,624,380	$15,468,782	$16,221,682	$126,093,162
2014	$125,900,128	$18,285,404	$18,410,732	$144,185,532

Source: Oklahoma Department of Transportation

E.3 INTELLIGENT TRANSPORTATION SYSTEM (ITS)

Table E-3 summarizes the ITS needs and estimated costs. The long term costs have been identified as the estimated costs for the 2015-2040 LRTP.

Table E-3: Intelligent Transportation System Needs – 25-years

Fiscal Year	Special Budgeted	Total Routine and Special Expended
Statewide Fiber Optic Cable Expansion	$700,000	$12,500,000
Implement/ Expand RTMC Field Devices	$12,000,000	$20,000,000
Statewide Transportation Information Ctr Implementation	$3,500,000	$500,000
ITS Central Software	$750,000	$5,000,000
ITS Data Archives	-	$500,000
Statewide RWIS Deployment	-	$750,000
5-1-1 Traveler Information System	-	$3,000,000
Total 2004 $	**$16,950,000**	**$42,250,000**
Total 2013 $	**$20,903,000**	**$52,104,000**

Source: Oklahoma Statewide ITS Implementation Plan, 2004
CPI used to convert 2004 $ to 2013 $. http://data.bls.gov/cgi-bin/cpicalc.pl

E.4 STATE FREIGHT RAIL NEEDS

Table E-4 summarizes the planned Class III state owned freight rail road improvements.

Table E-4: Planned State Owned Rail Road Improvements

ID	Sponsors/ Advocates	Railroad(s) Operating or Owning Lines	Project Name/Description	Estimated Cost (thousands)
1	AT&L	AT&L	Tie project	$268
2	AT&L	AT&L	Tie projects	$300
3	BNGR	BNGR	Grain shuttle facility site	$750
4	BNGR	BNGR	Grain shuttle mainline improvement	$1,000
5	BNGR	BNGR	Fertilizer distribution site	$250
6	SLWC	SLWC	Spot ties for gauge and curves, 20 miles	$671
7	SLWC	SLWC	Resurface, ballast, 20 miles	$207
8	SLWC	SLWC	Ballast, 600 tons, 20 miles	$218
9	SLWC	SLWC	Cross ties, resurface, 100 miles	$588
10	SLWC	SLWC	Cross ties, surface, ballast, 38 miles of track	$517
11	FMRC	FMRC	Sayre yard rehabilitation	$175
12	FMRC	FMRC	Weatherford yard track	$150
13	FMRC	FMRC	Sayre to Clinton upgrade tracks	
14	BNGR	BNGR	Rail improvements, 36 miles Wellington, Kansas, to Blackwell (17 miles in Oklahoma)	$25,000

Source: Oklahoma Statewide Rail and Passenger Rail Plan, 2012

APPENDIX F:

Background and Inputs for Private Freight and Passenger Rail

F.1 PRIVATE FREIGHT RAIL

Table F-1, summarizes the list of planned Class 1 private rail road improvements. The projects listed are private rail partner projects and ODOT is not responsible for execution of these projects.

Table F-1: Planned Class 1 Railroad Capacity Improvements

ID	Sponsors/ Advocates	Railroad(s) Operating or Owning Lines	Project Name/Description	Estimated Cost (thousands)
1	UP	UP	Jacks siding extension	$6,000
2	UP	UP	Tank farm—new siding	$8,000
3	UP	UP	El Reno—power switches and south leg of wye	$12,000
4	UP	UP	CTC—Enid/Duncan subs	$40,000
5	UP	UP	Washita/Chickasha run through terminal	$40,000
7	UP	UP	Sunray—siding extension	$6,000
8	UP	UP	Waurika—siding extension	$6,000
9	UP	UP	Rush Springs—siding extension	$6,000
11	UP	UP	Ryan—siding extension	$6,000
12	ODOT	UP/BNSF	Grade separation of UP and BNSF	$59,000
13	City of Tulsa	BNSF	Downtown Tulsa sealed corridor (BNSF railway) extension	$400
14	ODOT	BNSF	BNSF bridge at boulevard—I-40	$6,700
15	ODOT	UP	Reconstruct Harter yard	$1,300
16	ODOT	UP	Relocate up wye track	$5,400
17	ODOT	BNSF	BNSF Riverside connecting track to new permanent interchange site	Not Available
18	ODOT	BNSF	Bridge/SH 33/over cottonwood creek	$13,600
19	ODOT	BNSF	I-235/BNSF bridges and NW 50th	Not Available
20	ODOT	BNSF	BNSF rail bridges over I-240 north of Flynn Yard	Not Available
21	Oklahoma City	BNSF	Multimodal HUB	$26,000
22	City of Perry	BNSF	Grade separation	Not Available
23	BNSF	BNSF	DT sections of Panhandle sub	Not Available
24	BNSF	BNSF	Siding extensions along Avard sub	Not Available
25	BNSF	BNSF	DT sections of Cherokee Sub	Not Available
26	BNSF	BNSF	New sidings along Cherokee sub	Not Available
27	BNSF	BNSF	Siding extensions along Cherokee sub	Not Available

ID	Sponsors/ Advocates	Railroad(s) Operating or Owning Lines	Project Name/Description	Estimated Cost (thousands)
28	BNSF	BNSF	Siding extensions along Red Rock sub	Not Available
29	BNSF	BNSF	Track improvements at Scullin	Not Available
30	BNSF	BNSF	East leg of wye Avard to Panhandle subs	Not Available
31	BNSF	BNSF	East leg of wye, Port of Catoosa	Not Available
32	UPRR	UPRR	Choctaw Sub Double Track	$100,000
33	UPRR	UPRR	Caramel Siding on Choctaw Sub	$800
34	UPRR	UPRR	Checotah Siding on Cherokee Sub	$800
35	UPRR	UPRR	El Reno Yard Expansion	$900
36	UPRR	UPRR	Enid Interlocker	$400
37	UPRR	UPRR	Harter Yard Extension	$300
38	BNSF	BNSF	AVARD sub Capacity improvements	$132,300
39	BNSF	BNSF	CHEROKEE Sub capacity improvements	$73,430
40	BNSF	BNSF	REDROCK Sub S, OKC SOUTH to Ok/Tx Border double track	$481,250
41	BNSF	BNSF	RED ROCK Sub N, OKC NORTH to Ok/Kansas double track	$487,500

Source: UPRR, BNSF, Oklahoma Statewide Rail and Passenger Rail Plan, 2012

F.2 PASSENGER RAIL

Table F-2 summarizes the historic Amtrak Heartland Flyer ridership, cost, revenue, and subsidy provided by Oklahoma and Texas. Public Transport

Table F-2: Heartland Flyer Ridership / Revenue History

Year	Total Contract Cost	Oklahoma Contract Cost	Texas Contract Cost	Total Revenues^	Total Ridership	Average Farebox	Oklahoma Subsidy Per Passenger	Texas Subsidy per passenger
1999*	$1,309,462	$1,309,462	$0	$570,083	26,862	$21.25	$27.56	$0.00
2000*	$5,237,846	$5,237,846	$0	$1,384,637	65,529	$21.13	$58.80	$0.00
2001*	$5,237,846	$5,237,846	$0	$1,187,670	57,799	$20.55	$70.07	$0.00
2002*	$5,237,846	$5,237,846	$0	$1,014,422	52,584	$19.29	$80.32	$0.00
2003**	$4,700,000	$4,700,000	$0	$880,808	46,592	$18.90	$100.88	$0.00
2004**	$4,700,000	$4,700,000	$0	$1,012,013	54,223	$18.66	$86.68	$0.00
2005	$3,900,000	$3,900,000	$0	$1,322,664	66,968	$19.75	$58.24	$0.00
2006	$3,900,000	$3,900,000	$0	$1,303,138	64,078	$20.34	$60.86	$0.00
2007	$4,000,000	$2,000,000	$2,000,000	$1,320,790	68,245	$19.35	$29.31	$29.31
2008	$4,000,000	$2,000,000	$2,000,000	$1,880,832	80,892	$23.25	$24.72	$24.72
2009	$4,000,000	$2,000,000	$2,000,000	$1,744,746	73,564	$23.72	$27.19	$27.19
2010	$4,122,502	$2,211,251	$1,911,251	$1,972,544	81,749	$24.13	$27.05	$23.38
2011	$4,400,000	$2,325,000	$2,075,000	$2,101,750	84,039	$25.01	$27.67	$24.69
2012	$4,550,000	$2,325,000	$2,225,000	$2,257,672	87,873	$25.69	$26.46	$25.32
2013	$4,200,000	$2,100,000	$2,100,000	$2,201,774	81,226	$27.11	$25.85	$25.85
2014	$5,900,000	$2,950,000	$2,950,000	$2,135,475	77,881	$27.42	$37.88	$37.88
2015***	$5,700,000	$3,200,000	$2,500,000					

^ - Oklahoma received farebox revenue for the initial contract period from 1999 to 2003
** - Contract # 1 - Multiyear with a total cost of $17,023,000 and Oklahoma received farebox revenues*
*** - Contract # 2 - Multiyear with a total cost of $9,400,000 and Amtrak began receiving farebox revenues*
**** - 2015 costs estimated at $5,700,000 pending final negotiation*
Source: AMTRAK, Oklahoma Department Of Transportation Rail Programs Division

Oklahoma Long Range
TRANSPORTATION PLAN

APPENDIX G:
Background and Inputs for Public Transportation

G.1 LIST OF RURAL TRANSPORTATION PROVIDERS

- Beaver City Transit
- Call A Ride Public Transit
- Central Oklahoma Transit System
- Cherokee Strip Transit
- Cimarron Public Transit System
- Delta Public Transit
- Enid Public Transportation -The Transit
- First Capital Transit
- Guymon Transit - The Ride
- Jamm Transit
- KI BOIS Area Transit
- Little Dixie Transit
- Muskogee County Transit Authority
- OSU/Stillwater Community Transit System
- Pelivan Transit
- Red River Public Transportation Service
- Southern Oklahoma Rural Transportation System
- Southwest Transit
- Washita Valley Transit System

G.2 LIST OF TRIBAL TRANSPORTATION PROVIDERS

- Grand Gateway EDA/ Pelivan
- KiBois Community Action Foundation, Inc.
- Muskogee County Transit Authority
- The Chickasaw Nation
- Choctaw Nation Transit
- Citizen Potawatomi Nation
- Comanche Nation
- Kiowa Tribe of Oklahoma
- Muscogee (Creek) Nation
- Ponca Tribe of Oklahoma
- Seminole Nation of Oklahoma
- United Keetoowah Band of Cherokee Indians in Oklahoma
- Cheyenne and Arapaho Tribes
- Delaware Nation

G.3 TRIBAL TRANSIT: HISTORY OF 5311C FUNDS

Table G-1 provides the historic details of the funds allocated by federal transit agency for tribal transit in Oklahoma State.

Table G-1: Historic Tribal Transit Funds Allocation

Year	Section 5311(c)(1) Indian Reserve. Formula	Tribal Transit
2009	-	$3,190,907
2010	-	$2,602,540
2011	-	$2,634,867
2012	-	$3,077,363
2013	$6,543,737	-
2014	$7,799,238	-

Source: Federal Transit Administration

G.4 RURAL TRANSIT: CAPITAL COST ASSUMPTIONS,

Table G-2 summarizes the cost assumptions assumed for the capital cost needs development for the rural transit system.

Table G-2: Capital Cost Assumptions

Type of Improvement	Unit Cost
Large urban transit bus	$300,000
Rural transit bus	$70,000
Rural transit van	$40,000

Source: Oklahoma Department of Transportation

G.5 URBAN TRANSIT: FEDERAL, STATE, LOCAL FUNDS

G.5.1 Tulsa Transit

- Fed = 5.94 M (33%)
- State = 0.9 M (5%)
- Local (City of Tulsa) = 7.38 M (41%)
- Local (Operations/Fare box) = 3.42 M (19%)
- Local (local operator) = 0.36 M (2%)

Fed = 33%; State = 5%; Local/other =62%

Source: Manager, Tulsa Transit; March 2015

G.5.2 Oklahoma City Area

Urban part of Oklahoma City Area

- Fed = 349,232.3 (36%)
- State = 29,770.5 (3%)
- Local = 600,954.5 (61%)

Fed = 36%; State = 3%; Local = 61%

Source: ACOG, 2005 - 2035 Oklahoma City Regional Transportation (OCARTS) Area Long Range Transportation Plan Adopted April 2011
Rural Transit funds not included in calculations
Financial Element of the 2005 - 2035 Oklahoma City Regional Transportation (OCARTS) Area Long Range Transportation Plan; April 2012

G.5.3 Lawton Transit

Lawton is a Metropolitan Planning Organization (MPO) area; and is considered a small urban transit area for FTA transit purposes, because of population between 50,000 and 200,000.

- Fed= 1,379,673 (50%)
- State= 116,639 (4%)
- Local= 1,278,013 (46%)

Fed = 50%; State = 4%; Local/other =46%

Source: Manager, Lawton Area Transit System, March 2015 [rlanders@ridelats.com]

APPENDIX H:

Background for Bicycle and Pedestrian Transportation

H.1 BICYCLE AND PEDESTRIAN FACILITIES: CAPITAL COST ASSUMPTIONS

Table H-1 summarizes the cost assumptions assumed for the capital cost needs development for the bicycle and pedestrian needs.

Table H-1: Capital Cost Assumptions

Type of Improvement	Unit Cost
New sidewalk	$250,000- $500,000/mile
New multi-use bike/ped trail	$500,000-$1,000,000/mile

Source: Oklahoma Department of Transportation Local Government Division

APPENDIX I:
Background for Airport Access

I.1 AIRPORT ACCESS IMPROVEMENTS

Table I-1 summarizes the list of planned highway, bridge, and rail improvements that are needed to improve airport access, within a five-mile radius of the three major airports in the state.

Table I-1: Access Improvements Anticipated Within Five Miles of Major Airports

Improvement	No. of Projects	Length (miles)
Grade and Drain	1	2.55
Interchange	1	0.83
Grade, Drain, and Surface	6	7.5
Widen and Resurface	1	3
Railroad Rehabilitation	1	4.69
Pavement Rehabilitation	2	6.8
Reconstruction - Added lanes	2	0.75
Right of Way	8	4.75
Utilities	8	4.55
Total		**35.42**

Source: 2015-2022 ODOT Eight Year Construction Work Plan