EFFECTIVE PRODUCTION RATE ESTIMATION USING CONSTRUCTION DAILY WORK REPORT DATA: PRODUCTION RATE ESTIMATION TOOL

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User's Manual

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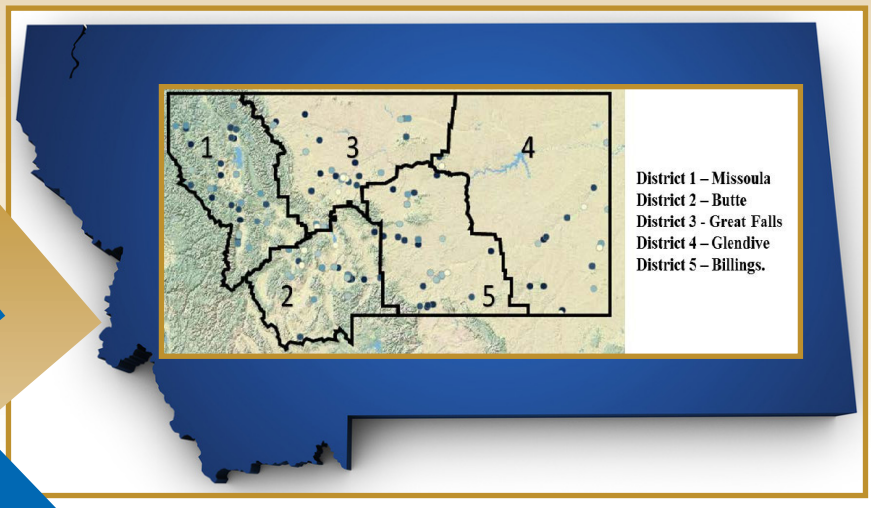

RESEARCH PROGRAMS

MDT

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Production Rate Estimation Tool

PRET

User's Manual

IOWA STATE UNIVERSITY
Institute for Transportation

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1. INTRODUCTION

The MDT Production Rate Estimation Tool (MDT-PRET) is a powerful tool to generate production rate estimates for major controlling activities of highway projects. It serves as a quick tool to estimate production rates of work items using key project parameters such as project location, project type, engineer's estimate, and quantity of work. MDT-PRET also helps determine a possible production rate range for each controlling activity based on mean, first quartile, median, and third quartile values. PRET is a Microsoft Excel-based tool that requires Excel macros to be enabled. This manual provides a step by step guide to generate production rate estimates using the MDT-PRET.

2. INITIAL SETUP

2.1 Getting Started

To use the tool, click the **Enable Content, Enable Editing, or Enable Macros** button that appears when the tool is first opened (depending on version of Windows) (Figure 1). If a user's computer is set up to enable macros automatically in advance, the user will not see the Security Warning Dialogue Box.

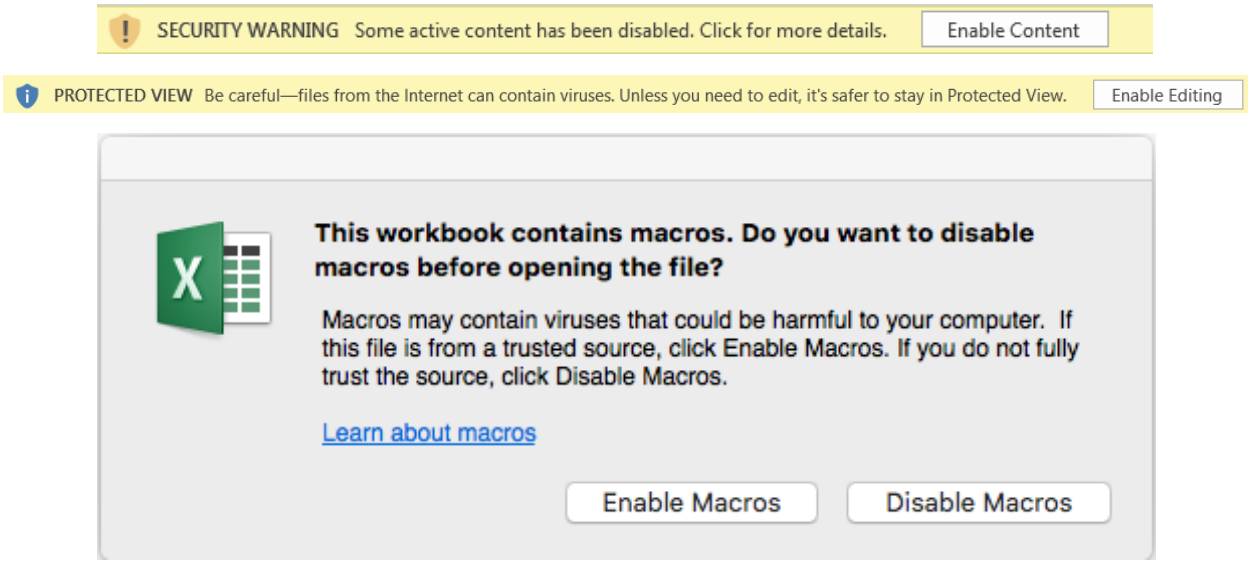

Figure 1: Security Warning Dialogue Box

2.2 Launching MDT-PRET

Once the tool is opened, users see the **Introduction** sheet as shown in Figure 2. The user is provided with basic information on how to navigate through the tool to obtain estimated production rates of controlling activities of highway projects. Then, click the **Launch Tool** button to provide project-specific parameters needed for estimation.

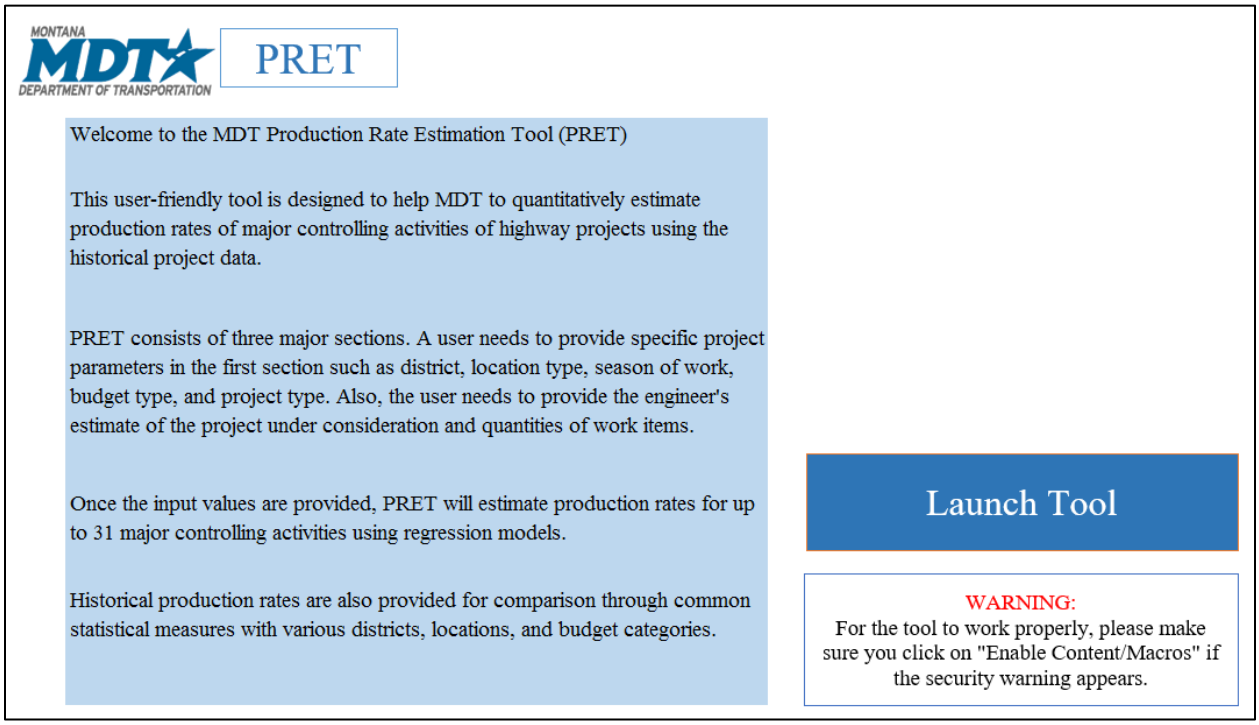

Figure 2: Introduction Sheet

3. REQUIRED INPUT

The following input values are required to estimate production rates in the MDT-PRET tool.

- ✓ Maintenance district,
- ✓ Location type (Urban/Rural area),
- ✓ Season of work (Winter/Construction seasons),
- ✓ Project work type,
- ✓ Engineer's estimate,
- ✓ Quantities of controlling activities.

After clicking **Launch Tool**, the user sees the **Input Screen** sheet as shown in Figure 3. Within this sheet, the user can choose district, location type, season of work, and project work type from corresponding drop lists. The user also needs to type in the engineer's estimate in dollar amount in the provided space.

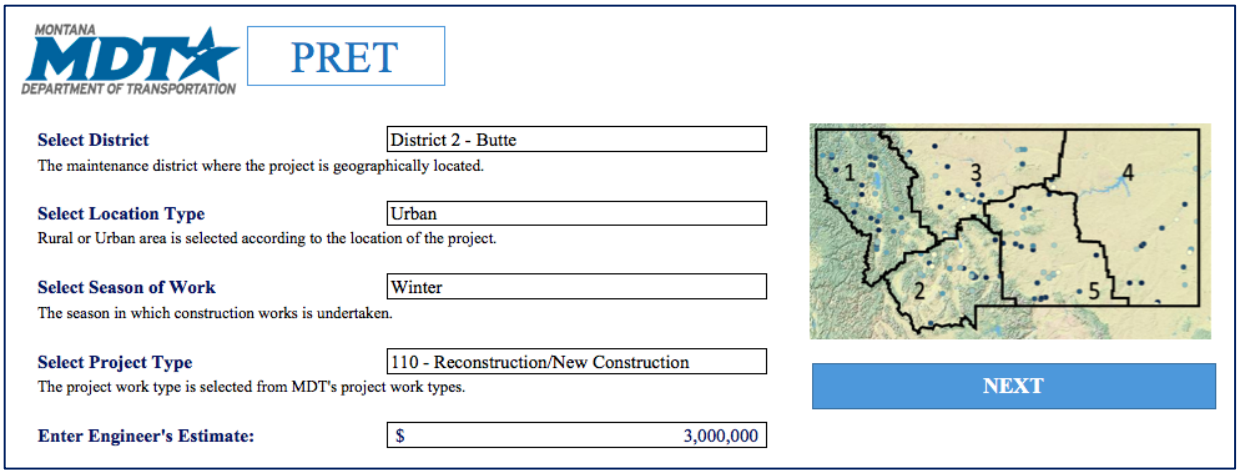

Figure 3: Input Screen Sheet

After that, click the **NEXT** button to access the **Production Rate Estimates** sheet as shown in Figure 4. Quantities of the controlling activities relevant to the project must be manually entered in column D. The quantities must correspond to the units given in column C.

PRODUCTION RATE ESTIMATES

SN	Activity Description	Unit	Quantity	Production Rates (Per day)	Statistical measures from historical data			
					Mean	Q1	Median	Q3
AA	TOPSOIL-SALVAGING AND PLACING	CUYD			2,313	306	1,267	3,071
AB	EXCAVATION-UNCLASSIFIED	CUYD			8,874	941	4,950	12,542
AC	SPECIAL BORROW	CUYD			3,640	645	1,808	3,710
AD	EXCAVATION-STREET	CUYD			1,518	518	978	2,426
AE	CRUSHED AGGREGATE COURSE	CUYD			2,088	132	636	2,654
AF	BASE-CEMENT TREATED	CUYD			3,453	1,550	3,566	5,045
AG	DRAINAGE PIPE (<= 24 IN)	LNFT			95	59	87	112
AH	DRAINAGE PIPE (> 24 IN)	LNFT			91	55	73	119
AI	RCB	LNFT			95	49	66	140
AJ	SSPP	LNFT			66	21	54	99
AK	RIPRAP	CUYD			136	24	94	203
AL	COLD MILLING	SQYD			15,077	1,911	8,220	20,472
AM	PLANT MIX SURFACING	TON			1,509	378	1,028	2,177
AN	COVER	SQYD			83,884	15,892	56,360	120,458
AO	MICROSURFACING	TON			465	408	443	525
AP	CRACK SEALING	LB			6,346	3,004	5,130	8,003
AQ	PCCP	SQYD			568	237	448	1,105
AR	CURB AND GUTTER	LNFT			408	137	261	562
AS	SIDEWALK	SQYD			246	61	131	283
AT	FARM FENCE	LNFT			2,206	540	1,423	2,422
AU	GUARDRAIL STEEL	LNFT			680	150	424	902
AV	CONCRETE BARRIER RAIL	EACH			58	12	25	84
AW	SEEDING	ACRE			12	3	7	18
AX	REINFORCING STEEL	LB			13,995	5,195	10,517	18,271
AY	DRILLED SHAFT	LNFT			103	59	88	139
AZ	CONCRETE-CLASS DECK	CUYD			73	43	61	85
BA	CLASS A BRIDGE DECK REPAIR	SQYD			14	5	8	17
BB	CONCRETE BARRIER RAIL-BRIDGE	LNFT			222	88	141	252
BC	CONCRETE-CLASS OVERLAY	CUYD			31	23	35	44
BD	BRIDGE DECK MILLING	SQYD			473	312	394	584
BE	REVISE BRIDGE CONCRETE BARRIER	LNFT			200	69	157	245

Note:

a. Provide quantities for controlling activities in column D.
b. Predicted production rates are shown in column E.
c. Mean: average production rate of historical projects.
d. Q1: 25% of historical projects have production rates lower than Q1.
e. Median: 50% of historical projects have production rates lower than Median.
f. Q3: 75% of historical projects have production rates lower than Q3.

Show the Estimated Production Rates

Reset Quantities

Return to Input Menu

View Historical Production Rates

Save As PDF

Figure 4: Production Rate Estimates Sheet

4. PRODUCTION RATE ESTIMATES

Once the quantities are provided, click **Show the Estimated Production Rates** to generate predictions in column E. Production rates are calculated from embedded regression equations and the input parameters.

The tool is sensitive to the input values. The estimated production rates can be compared with the mean production rates of the controlling activities which are calculated from the historical daily work report data. The mean production rates are provided in column F. In addition, first quartiles (Q1), second quartiles (Median), and third quartiles (Q3) are provided in columns G, H, and I. Approximately 25%, 50%, and 75% of historical projects have production rates smaller than Q1, Median, and Q3 respectively.

The **Reset Quantities** button allows the user to reset all of the quantities which are previously entered in column D.

The **Return to Input Menu** button allows the user to go back to the **Input Screen** sheet to change the input parameters as needed.

To view historical production rates, click the **View Historical Production Rates** button. The sheet as shown in Figure 5 consists of more detailed statistical measures of production rates achieved on past projects for different controlling activities with regard to different districts (District 1, 2, 3, 4, and 5), location types (urban or rural area), and budget types (less than or greater than $2 million).

HISTORICAL PRODUCTION RATES

SN	Activity Description	Unit	Mean	Rural					Urban					Budget less than $2 Million				
				Mean	Q1	Median	Q3	N	Mean	Q1	Median	Q3	N	Mean	Q1	Median	Q3	N
AA	TOPSOIL-SALVAGING AND PLACING	CUYD	2,313	2,505	392	1,389	3,324	180	1,174	153	532	2,059	13	1,015	123	352	1,248	80
AB	EXCAVATION-UNCLASSIFIED	CUYD	8,874	9,274	1,219	5,506	13,170	140	9,468	107	318	14,370	15	3,186	322	1,127	4,884	68
AC	SPECIAL BORROW	CUYD	3,640	3,920	745	1,939	3,645	110	1,646	269	694	1,842	16	1,160	236	583	1,629	37
AD	EXCAVATION-STREET	CUYD	1,518	2,004	714	1,523	2,621	12	1,174	191	909	2,426	10	994	191	509	2,158	10
AE	CRUSHED AGGREGATE COURSE	CUYD	2,088	2,467	161	794	3,159	242	686	75	452	867	36	605	61	184	557	137
AF	BASE-CEMENT TREATED	CUYD	3,453	3,453	1,358	3,566	5,281	13										
AG	DRAINAGE PIPE (<= 24 IN)	LNFT	95	97	62	88	112	173	98	45	78	123	24	73	42	64	102	74
AH	DRAINAGE PIPE (> 24 IN)	LNFT	91	89	58	73	116	100	115	29	88	190	11	86	39	63	107	23
AI	RCB	LNFT	95	99	48	69	143	26	74	18	60	144	3	97	42	56	185	8
AJ	SSPP	LNFT	66	66	19	54	124	4						54	22	54	86	2
AK	RIPRAP	CUYD	136	145	27	105	211	129	67	24	41	96	12	143	26	112	206	50
AL	COLD MILLING	SQYD	15,077	16,636	1,978	9,449	22,841	206	7,855	1,038	5,235	8,760	37	12,997	1,707	6,244	15,639	134
AM	PLANT MIX SURFACING	TON	1,509	1,701	478	1,258	2,477	350	670	161	422	750	54	1,013	141	532	1,323	218
AN	COVER	SQYD	83,884	87,219	19,663	62,966	126,712	326	45,297	7,056	14,071	34,333	38	73,085	8,802	39,143	117,433	191
AO	MICROSURFACING	TON	465	484	421	451	566	11						484	421	451	566	11
AP	CRACK SEALING	LB	6,346	6,324	3,167	5,233	8,395	35	4,158	1,051	3,625	6,875	7	6,031	2,958	5,233	7,375	37
AQ	PCCP	SQYD	568	924	482	1,130	1,162	4	432	149	395	518	7	806	149	1,096	1,172	3
AR	CURB AND GUTTER	LNFT	408	480	163	289	672	57	337	112	256	524	41	257	104	168	311	63
AS	SIDEWALK	SQYD	246	251	68	129	315	62	239	57	197	298	40	196	52	92	225	69
AT	FARM FENCE	LNFT	2,206	2,333	553	1,490	2,512	146	699	380	631	1,032	6	1,139	330	481	1,653	57
AU	GUARDRAIL STEEL	LNFT	680	681	146	450	913	199	374	155	253	534	13	648	121	475	969	92
AV	CONCRETE BARRIER RAIL	EACH	58	58	16	25	98	29	68	6	7	190	4	48	16	25	44	11
AW	SEEDING	ACRE	12	13	3	8	19	153	8	1	2	18	8	4	1	3	7	56
AX	REINFORCING STEEL	LB	13,995	14,191	5,326	10,833	18,586	67	17,633	4,125	17,322	31,296	5	7,341	1,732	4,847	8,918	18
AY	DRILLED SHAFT	LNFT	103															
AZ	CONCRETE-CLASS DECK	CUYD	73	75	43	62	87	54	56	13	54	101	4	49	38	50	59	8
BA	CLASS A BRIDGE DECK REPAIR	SQYD	14	14	5	7	16	42	20	9	13	37	3	14	5	10	19	26
BB	CONCRETE BARRIER RAIL-BRIDGE	LNFT	222	228	83	133	253	24	188	122	183	259	4	141	87	141	195	4
BC	CONCRETE-CLASS OVERLAY	CUYD	31															
BD	BRIDGE DECK MILLING	SQYD	473	489	231	462	715	6						573	262	584	872	4
BE	REVISE BRIDGE CONCRETE BARRIER	LNFT	200	203	63	157	250	39	9	3	9	16	2	139	50	135	182	18

Return to Input Menu

Return to Production Rate Estimates

NOTE:
Mean: average production rate of historical projects.
Q1: 25% of historical projects have production rates lower than Q1.
Median: 50% of historical projects have production rates lower than Median.
Q3: 75% of historical projects have production rates lower than Q3.
N: number of historical projects used to calculate statistical measures

Figure 5: Historical Production Rates Sheet

To save the production rate estimate table in a PDF file, click the **Save As PDF** button at the bottom right corner of the Production Rate Estimates Sheet (see Figure 4). A pop-up window then appears and asks the user to choose a file name and a location to store the PDF file.

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