WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

SAMPLING LOOSE ASPHALTIC MIXTURES FROM THE ROADWAY

1. PURPOSE

1.1 This procedure has been written to provide a means for sampling loose asphaltic mixtures from the roadway.

2. SCOPE

2.1 This method covers the procedure for sampling of loose asphaltic paving mixtures taken from the freshly placed paving mat. The samples are to be obtained for determination of the characteristics of the mixture for acceptance purposes. Samples shall be taken directly behind the paver from un-compacted material.

2.1.1 Similar samples may be taken by the contractor for quality control purposes if desired.

2.2 Samples obtained using this method will be collected and can be evaluated for the following:

a) Determination of liquid asphalt content.
b) Determination of aggregate gradation.
c) Determination of volumetric properties.

3. REFERENCED DOCUMENTS

3.1 *WVDOH Standard Specifications – Current Edition*

a) Section 410: Asphalt and Wearing Courses, Percent Within Limits (PWL)

3.2 *Materials Procedures*

a. MP 401.02.31, Quality Control and Acceptance of Asphalt Mixtures
b. MP 401.07.21, Sampling Compacted Asphalt Concrete Mixtures from the Roadway
c. MP 401.13.50, Determination of Percent Within Limits

3.3 *AASHTO Procedures*

a. AASHTO T30, Mechanical Analysis of Extracted Aggregate
b. AASHTO T 308, Determining the Asphalt Binder Content of Hot-Mix Asphalt by the Ignition Method

c. *AASHTO T 166, Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens*

d. *AASHTO T 168, Sampling Bituminous Paving Mixtures*

e. *AASHTO T 209, Theoretical Maximum Specific Gravity (Gmm) and Density of Hot Mix Asphalt (HMA)*

f. *AASHTO T245, Resistance to Plastic Flow of Mixtures Using Marshall Apparatus*

g. *AASHTO T 269, Percent Air Voids in Compacted Dense and Open Asphalt Mixtures*

h. *AASHTO T 312, Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor*

4. EQUIPMENT AND TOOLS

4.1 A flat-bottom, high sided scoop.

4.2 Plate sampling apparatus, sized appropriately for testing sample size with attached retrieving cables long enough to reach outside the paving width.

4.3 Sample Containers, sized appropriately for testing sample size

4.4 Putty knife(s) for scraping fines from sampling equipment

4.5 Permanent marker

4.6 Other incidental materials and equipment.

5. ROADWAY SAMPLES

5.1 At the Pre-Paving Meeting, WVDOH and Contractor personnel shall confer and agree on the sequence of the paving operation in order for a layout plan to be developed jointly by the Division and the Contractor. This layout plan will then be developed into a sampling plan by the Division. The plan shall begin at the intended starting point and progress continuously until the end of the paving operation. Following the paving plan keeps the lots running with the plant production which reduces the potential of isolated problems from effecting more than one lot. Lots for mainline travel lanes should not be extended onto outside shoulders. As paving progresses onto the outside shoulders, new lots shall be established along the shoulders.

5.2 Acceptance of the asphaltic mixture from the roadway shall be on the basis of test results from loose samples for each Lot. One random sample shall be taken from each Sublot. Samples are to be selected by means of a random sampling plan.

5.2.1 Random numbers used shall be generated from a calculator or from the Random Number Table attached to this MP. All random numbers shall be recorded and maintained in order to verify the means of sample locations.

5.3 All lots shall be calculated and laid out based on converting 2500 tons to square yardage using the project plan lift thickness and a project theoretical yield. The theoretical yield shall be based on 94% of the design maximum theoretical density from the approved JMF (Form T-400) for asphaltic mixture designs. The lots shall be laid out using the full width

of placement for each pull. Partial lots shall be laid out and either considered separate lots or combined with the previous lots as per Table 410.7.1 in the WVDOH Standard Specifications.

NOTE: *If a lot is laid out that does not end prior to the end of the project, it should wrap around to the next paved lane. If the widths of the two pulls differ, then it will be necessary to calculate the area on the side of the median where the lot is started, then use the remaining area for the lot to determine the length of the remaining portion of the lot on the other pull.*

5.3.1 The testable width shall exclude the shoulder adjacent to the median (if included in a single pull) and/or the first foot of any edge of a paving width.

5.3.2 Sample locations determined using random numbers should be rounded to the nearest foot for both length and offset

5.3.3 Samples determined to fall at the same location as a sample removed from an underlying paving lift should be recalculated using a new random number for either width or length.

5.3.4 Refer to the Illustrative Example included in this MP for examples of how to select samples using a random sampling plan for pavement courses. Loose mix acceptance samples should be cross referenced to the corresponding mat density and bond strength samples as per MP 401.07.21.

5.3.5 For purposes of identification, the sampling ID shall be consistent for projects. Along with the pertinent project identification data (as indicated in Section 410.7.1 of the WVDOH Standard Specifications) that is needed for processing test results, it will be necessary to discern all samples on the project by lot, sublot, and type of sample. Samples obtained should be labeled according to the following convention shown below.

Layer/Lot Designation	Lot #	Sub Lot #	Type of Sample	Example Sample ID
B – Base I – Intermediate S – Surface/Wearing J – Joint Density Core	2	5	M – Mat B – Bond Core D – Density Core	B2-5M J2-5

6. GENERAL SAMPLING PROCEDURE

6.1 Either by Contractor's personnel in the presence of Division Personnel, or by Division Personnel, loose asphaltic mixture samples shall be lifted at pre-determined random locations, directly from the un-compacted mixture placed by the paving equipment. Samples should be collected using one of the following methods:

6.1.1 Scoop Method: Using a flat bottom, high-sided scoop, the scoop shall pass completely through the entire depth of the lift of material being sampled. When transferring the mixture into a clean cardboard sample box, any fines sticking to the INSIDE of the scoop shall be scraped and included with the sample.

6.1.2 Plate Method: Using a single plate, placed in front of the paver, using cables to remove the sample from the uncompacted mat. Adjacent to the paving operation, remove the outer edges of the material to remove possibly disturbed mix, quarter the material on the plate

and retain opposite quarters of the sample. The contractor may retain the remainder of the sample for mirror testing. Divide any remaining fines from the tools and plates between samples.

6.2 After removing the sample material from the un-compacted mat and prior to compactive effort being performed by the rolling operation, each sample location should be immediately backfilled with loose material from the paver.

6.3 In a timely manner the Division should deliver samples to the appropriate Laboratory in which they will be tested.

Illustrative Example – Project and Lot Layout

An exactly four mile long project is to commence paving within the next couple of weeks along an interstate roadway. The division has contacted the contractor to determine the paving sequence and has confirmed that the approved JMF maximum theoretical density is 2501 kg/m3. For theoretical yield on the project, 94% of 2501 kg/m3 is 2351 kg/m3. Dividing by 1000 and then multiplying by 62.4 pcf, the corresponding density in English units is 146.7 pcf.

Table 1 - Conversion of Design Bulk Density to Theoretical Application Rate

Project Design Thickness (inches)	Conversion for Application Rate (psy)
1.00	0.750
1.25	0.938
1.50	1.125
1.75	1.313
2.00	1.500
2.25	1.688
2.50	1.875
2.75	2.063
3.00	2.250

Using the value for bulk density value, and selecting the proper conversion factor from Table 1 above, the corresponding theoretical application rate per square yard at 1.5 inches thick is determined as follows:

(Use English units) 146.7 pcf x 1.125 cf/SY = 165 psy *(nearest pound)*

The corresponding lot area for placement of the material in square yards is then calculated as follows:

(2500 tons x 2000 pounds per ton)/165 psy = 30,303 sy *(nearest sy)*

Work will begin on the inside fast lane next to the median. The first pull will be 16’ wide. The length of the lot, length per sublot and total area per sublot is calculated as follows:

30,303 SY x 9 = 272,727 sf

272,727 sf/16 = 17,045’ Total lot length *(nearest linear foot)*

17,045/5 = 3409’ length per sublot

30,303/5 = 6,061 sy per sublot *(nearest sy)*

These values will be used to lay out the station for the beginning of each sublot, and also to keep track of the breakdown of a sublot that begins on one side of median and then continues on the other side in an opposite direction. The area for each sublot is used when the situation above occurs and there is a change within the sublot to a pull of a different width.

The beginning and ending stations for each lot and sublot shall then be calculated and plotted in continuous fashion. Figure 1 shows a clean project layout using the widths for each pull, beginning and ending stations and how each lot/sublot progress for a complete project. Lots that have been interrupted as they progress from one side of the median to the other are shown with calculations for partial areas. A partial lot was addressed along the main travel lanes and a new lot was started along the shoulder. Daily stops can also be approximated and then actual stops shown on a diagram to help keep track of the entire project.

Using Lot 1 from Figure 1, the random sample locations are determined as shown below.

Lot #1- Loose Samples

Sublot	Random Numbers		Length	Width
	X (length)	Y (width)		
1	0.596	0.385	0.596 (3409') = 2,032'	0.385 (11') = 4'
2	0.168	0.805	0.168 (3409') = 573'	0.805 (11') = 9'
3	0.851	0.029	0.852 (3409') = 2,905'	0.029 (11') = 0'*
4	0.087	0.948	0.088 (3409') = 300'	0.948 (11') = 10'
5	0.415	0.342	0.415 (3409') = 1,415'	0.342 (11') = 4'

* *Sample should be taken within the first 1 foot of testable area*

Using the offsets and lengths within each sublot, the station and offsets for loose samples are determined as shown below.

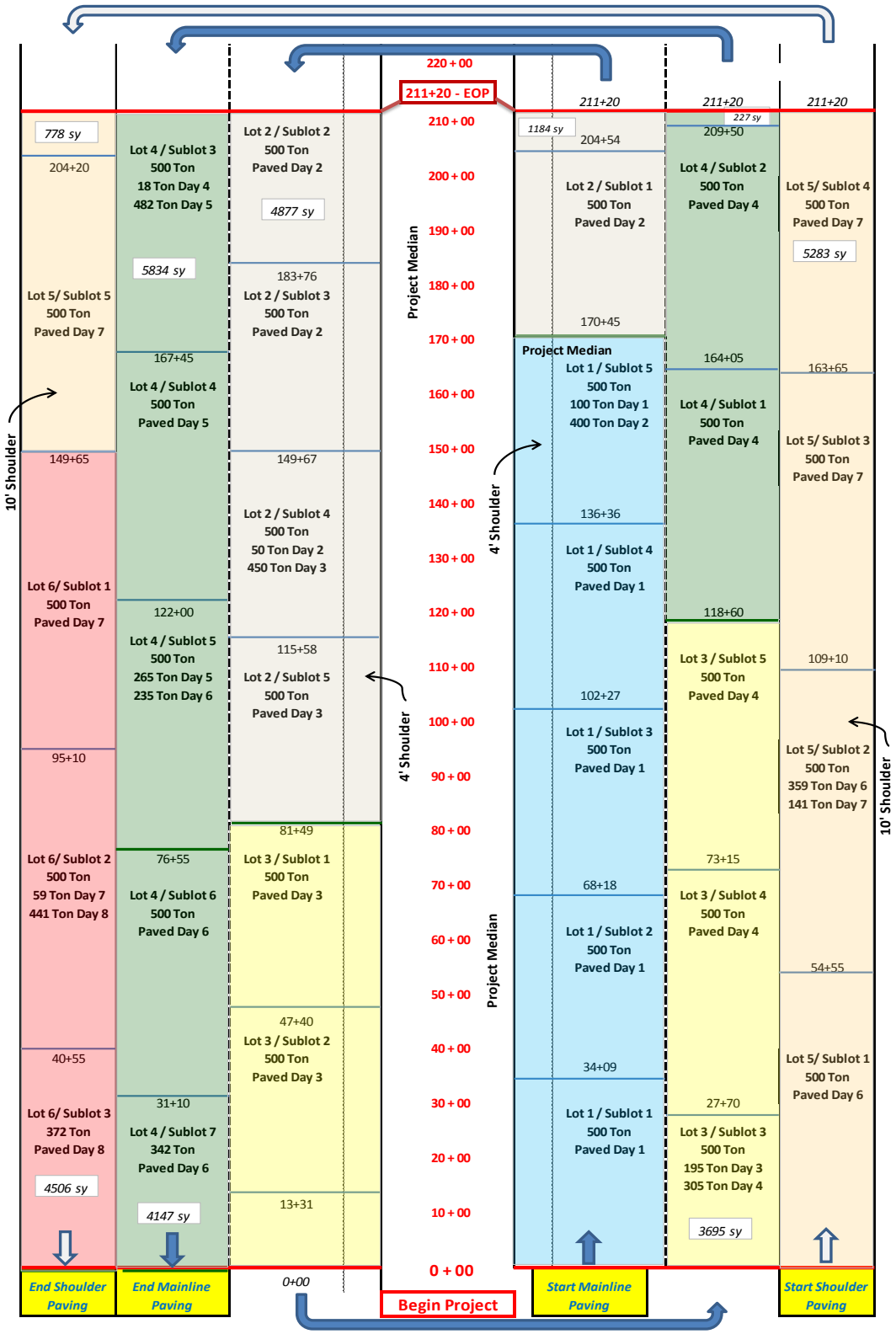
Lot #1 - Corresponding Sample Stations for Loose Samples

Sublot	Beginning Station	Length	Sample Station
1	0+00	2,032'	20+32', 4' offset
2	34+09	573'	39+82, 9' offset
3	68+18	2,905'	97+23, 0'-1' offset
4	102+27	300'	105+27, 10' offset
5	136+36	1,415'	150+51, 4' offset

For purposes of further illustration, see the sample layout for Lot #1 in Figure 2.

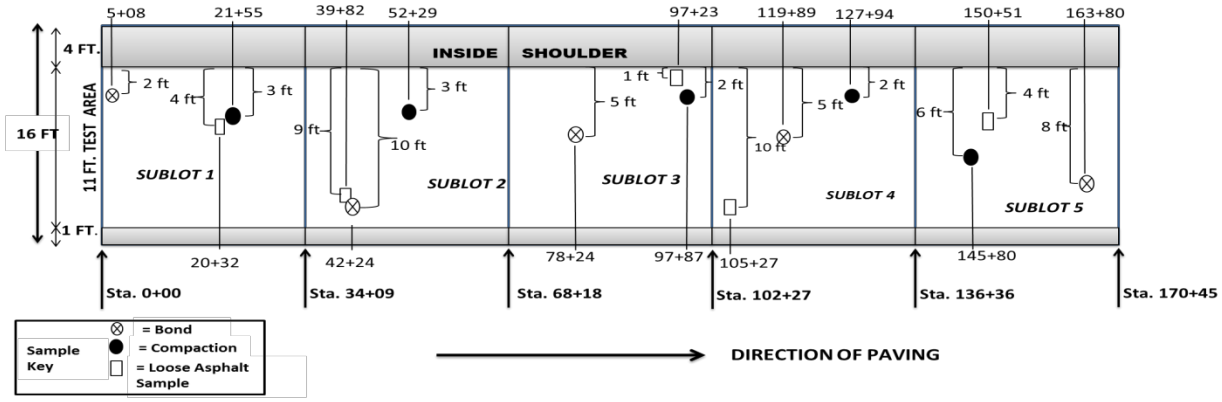
Figure 1

Project Layout By Area - With Estimated Daily Paving Stops



All locations for loose samples, mat density cores, and bond strength cores are shown in Figure 2 below. Refer to MP 401.07.21 for more information on sampling cores for density and bond strength.

Figure 2 – Lot #1 Sample Layout



Using the same methodology and following the continuous lots in correspondence to paving sequence, the entire project layout for sampling can be completed as shown in Figure 3.

After Figure 3, a summary is shown to help quantify the daily and total sampling efforts for the project.

Figure 3

Project Layout with Sampling Plan - Density and Bond Cores, Loose Mix Samples

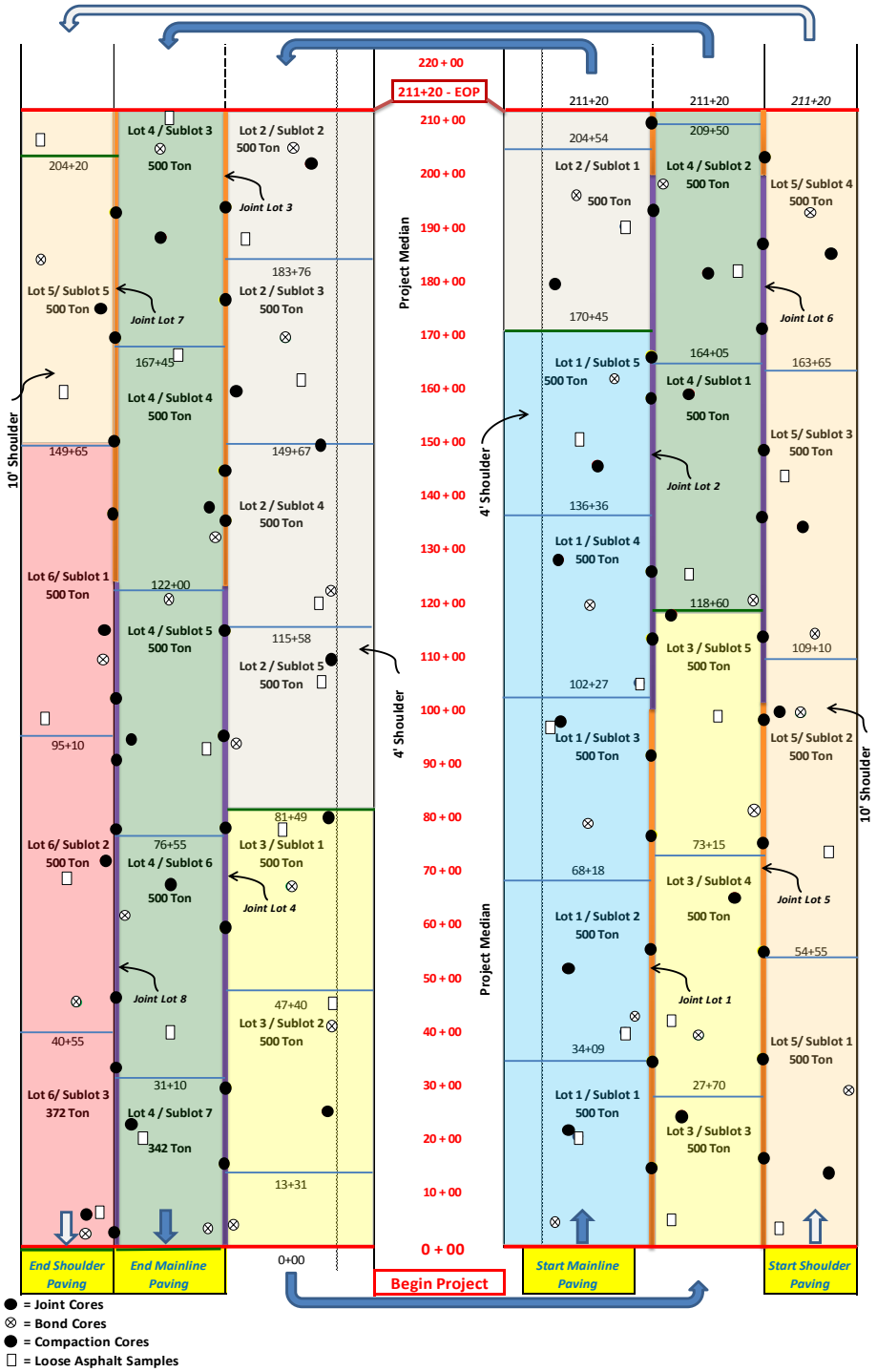


Table 2 – Testing Summaries from Daily and Total Production

	Loose Sample	Density Core *	Bond Core *	Joint Cores
Day 1	4	4	4	0
2100 Ton	4 --> Lot 1	4 --> Lot 1	4 --> Lot 1	
Day 2	4	5	4	0
1950 Ton	1 --> Lot 1	1 --> Lot 1	1 --> Lot 1	
	3 --> Lot 2	4 --> Lot 2	3 --> Lot 2	
Day 3	4	3	5	0
2145 Ton	2 --> Lot 2	1 --> Lot 2	2 --> Lot 2	
	2 --> Lot 3	2 --> Lot 3	3 --> Lot 3	
Day 4	5	5	4	11
2323 Ton	3 --> Lot 3	3 --> Lot 3	2 --> Lot 3	5 --> Lot 1
	2 --> Lot 4	2 --> Lot 4	2 --> Lot 4	5 --> Lot 2
				1 --> Lot 3
Day 5	2	2	3	5
1265 Ton	2 --> Lot 4	2 --> Lot 4	3 --> Lot 4	4 --> Lot 3
				1 --> Lot 4
Day 6	5	4	3	9
1918 Ton	3 --> Lot 4	3 --> Lot 4	2 --> Lot 4	5 --> Lot 4
	2 --> Lot 5	1 --> Lot 5	1 --> Lot 5	4 --> Lot 5
Day 7	3	5	4	13
2200 Ton	1 --> Lot 5	2 --> Lot 5	2 --> Lot 5	1 --> Lot 5
	2 --> Lot 6	3 --> Lot 6	2 --> Lot 6	5 --> Lot 6
				5 --> Lot 7
				2 --> Lot 8
Day 8	3	2	3	4
812 Ton	3 --> Lot 6	2 --> Lot 6	3 --> Lot 6	4 --> Lot 8
		* *Measured for Thickness*		
Totals :	**30**	**30**	**30**	**42**
	6 Lots	**6 Lots**	**6 Lots**	**8 Lots**
	60 Cores Measured for Thickness			

Table 3 - Random Numbers

.858	.082	.886	.125	.263	.176	.551	.711	.355	.698
.576	.417	.242	.316	.960	.819	.444	.323	.331	.179
.687	.288	.835	.636	.596	.174	.866	.685	.066	.170
.068	.391	.739	.002	.159	.423	.629	.631	.979	.399
.140	.324	.215	.358	.663	.193	.215	.667	.627	.595
.574	.601	.623	.855	.339	.486	.065	.627	.458	.137
.966	.529	.757	.308	.025	.836	.200	.055	.510	.656
.608	.910	.944	.281	.539	.371	.217	.882	.324	.284
.215	.355	.645	.460	.719	.057	.237	.146	.135	.903
.761	.883	.771	.388	.928	.654	.815	.570	.539	.600
.869	.222	.115	.447	.658	.989	.921	.924	.560	.447
.562	.036	.302	.673	.911	.512	.972	.576	.838	.014
.481	.791	.454	.731	.770	.500	.980	.183	.385	.012
.599	.966	.356	.183	.797	.503	.180	.657	.077	.165
.464	.747	.299	.530	.675	.646	.385	.109	.780	.699
.675	.654	.221	.777	.172	.738	.324	.669	.079	.587
.279	.707	.372	.486	.340	.680	.928	.397	.337	.564
.338	.917	.942	.985	.838	.805	.278	.898	.906	.939
.316	.935	.403	.629	.130	.575	.195	.887	.142	.488
.011	.283	.762	.988	.102	.068	.902	.850	.569	.977
.683	.441	.572	.486	.732	.721	.275	.023	.088	.402
.493	.155	.530	.125	.841	.171	.794	.850	.797	.367
.059	.502	.963	.055	.128	.655	.043	.293	.792	.739
.996	.729	.370	.139	.306	.858	.183	.464	.457	.863
.240	.972	.495	.696	.350	.642	.188	.135	.470	.765

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Ronald L. Stanevich, P.E.
Director
Materials Control, Soils and Testing Division

RLS:Wa