

# Aggregate Optimization Chart

MIX ID'S: DDD0K7E7, DDD0K7E8 and DDD0K7E9

Production Gradation Report

**PLANT #:** **P-102**

Sample Date: 9/3/18

Concrete Grade: **DM**

Contractor: \_\_\_\_\_

Dates Test Represents: 9/4/2018 through 9/10/2018

MDOT No.: \_\_\_\_\_

| Agg. Class      | Pit #  | Source  | Weight (SSD) | ft <sup>3</sup> | Specific Gravity | % Contribution |
|-----------------|--------|---------|--------------|-----------------|------------------|----------------|
| 6AA             | 58-003 | Stoneco | 1375         | 8.19            | 2.69             | 45.9           |
| 26A             | 58-003 | Stoneco | 470          | 2.80            | 2.69             | 15.7           |
| 2NS             | 38-046 | Chelsea | 1150         | 6.95            | 2.65             | 38.4           |
| <b>Total Wt</b> |        |         | <b>2995</b>  | <b>17.95</b>    |                  | <b>100.0</b>   |

<----- Verify this number is 100%

| Sieve | 6AA   | 26A   | 2NS   | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|-------|-------|-------|----------------------|------------|-----------------------|
| 2"    | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1"    | 99.8  | 100.0 | 100.0 | 99.9                 | 0.1        | 0.1                   |
| 3/4"  | 81.0  | 100.0 | 100.0 | 91.3                 | 8.6        | 8.7                   |
| 1/2"  | 40.0  | 99.8  | 100.0 | 72.4                 | 18.9       | 27.6                  |
| 3/8"  | 19.9  | 86.0  | 100.0 | 61.0                 | 11.4       | 39.0                  |
| #4    | 3.0   | 18.4  | 100.0 | 42.7                 | 18.4       | 57.3                  |
| #8    | 1.3   | 5.6   | 88.0  | 35.3                 | 7.4        | 64.7                  |
| #16   | 1.2   | 2.9   | 64.0  | 25.6                 | 9.7        | 74.4                  |
| #30   | 1.0   | 2.0   | 42.0  | 16.9                 | 8.7        | 83.1                  |
| #50   | 0.9   | 1.8   | 24.0  | 9.9                  | 7.0        | 90.1                  |
| #100  | 0.8   | 1.7   | 5.0   | 2.6                  | 7.4        | 97.4                  |
| LBW   | 0.6   | 1.6   | 0.6   | 0.8                  | 1.8        | 99.2                  |



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 Suite 500  
 Farmington Hills, MI 48336

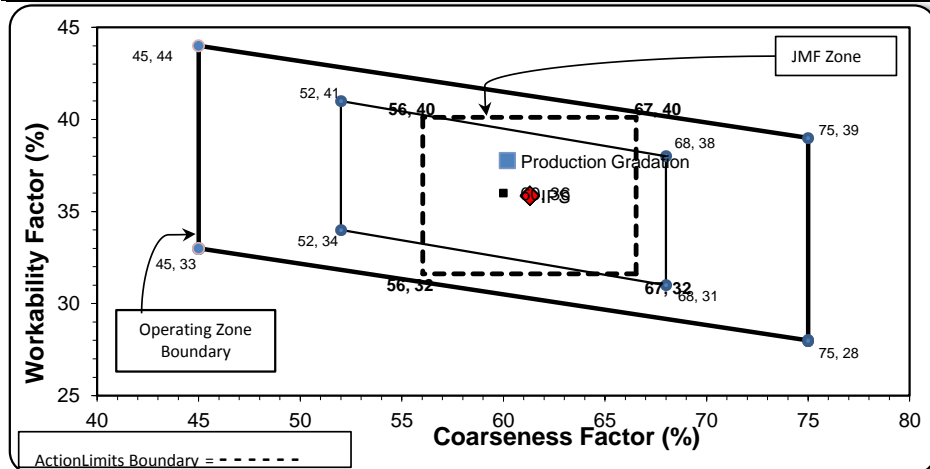
\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 8% for the 1" sieve when a 2" max. size (nom. Max. 1.5") aggregate is used.

Production Gradation  Batch Plant Gradations  Aggregate Supplier Gradations

Adjusted WF Initial Production Sample (IPS)

|                           |           |                            |           |                    |             |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|
| <b>Coarseness Factor:</b> | <b>60</b> | <b>Workability Factor:</b> | <b>35</b> | <b>Adjusted WF</b> | <b>37.8</b> |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|

|                            |           |
|----------------------------|-----------|
| <b>Coarseness Factor:</b>  | <b>61</b> |
| <b>Workability Factor:</b> | <b>36</b> |



| Sieve | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|----------------------|------------|-----------------------|
| 2"    | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0                | 0.0        | 0.0                   |
| 1"    | 99.3                 | 0.7        | 0.7                   |
| 3/4"  | 89.2                 | 10.1       | 10.8                  |
| 1/2"  | 70.7                 | 18.5       | 29.3                  |
| 3/8"  | 60.7                 | 10.0       | 39.3                  |
| #4    | 44.4                 | 16.3       | 55.6                  |
| #8    | 35.9                 | 8.5        | 64.1                  |
| #16   | 27.3                 | 8.6        | 72.7                  |
| #30   | 19.1                 | 8.2        | 80.9                  |
| #50   | 7.4                  | 11.7       | 92.6                  |
| #100  | 1.9                  | 5.6        | 98.1                  |
| LBW   | 0.7                  | 1.2        | 99.3                  |

PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

MIX ID'S: DDD0K7E7, DDD0K7E8 and DDD0K7E9

Production Gradation Report

**PLANT #:** **P-32**

Sample Date: 9/3/18

Concrete Grade: **DM**

Contractor: \_\_\_\_\_

Dates Test Represents: 9/4/2018 through 9/10/2018

MDOT No.: \_\_\_\_\_

| Agg. Class      | Pit # | Source       | Weight (SSD) | ft <sup>3</sup> | Specific Gravity | % Contribution |
|-----------------|-------|--------------|--------------|-----------------|------------------|----------------|
| 6AA             | 71-47 | Presque Isle | 1600         | 9.79            | 2.62             | 54.2           |
| 26A             | 71-47 | Presque Isle | 200          | 1.22            | 2.62             | 6.8            |
| 2NS             | 95-13 | Smelter Bay  | 1150         | 6.95            | 2.65             | 39.0           |
| <b>Total Wt</b> |       |              | <b>2950</b>  | <b>17.96</b>    |                  | <b>100.0</b>   |

<----- Verify this number is 100%

| Sieve | 6AA   | 26A   | 2NS   | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|-------|-------|-------|----------------------|------------|-----------------------|
| 2"    | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1"    | 96.7  | 100.0 | 100.0 | 98.2                 | 1.8        | 1.8                   |
| 3/4"  | 77.6  | 100.0 | 100.0 | 87.9                 | 10.4       | 12.1                  |
| 1/2"  | 40.7  | 95.8  | 100.0 | 67.6                 | 20.3       | 32.4                  |
| 3/8"  | 23.0  | 80.3  | 100.0 | 56.9                 | 10.7       | 43.1                  |
| #4    | 3.0   | 19.4  | 96.2  | 40.4                 | 16.5       | 59.6                  |
| #8    | 1.5   | 6.5   | 82.5  | 33.4                 | 7.0        | 66.6                  |
| #16   | 1.3   | 3.7   | 64.3  | 26.0                 | 7.4        | 74.0                  |
| #30   | 1.2   | 3.1   | 42.4  | 17.4                 | 8.6        | 82.6                  |
| #50   | 1.2   | 2.8   | 16.2  | 7.2                  | 10.2       | 92.8                  |
| #100  | 1.1   | 2.5   | 3.2   | 2.0                  | 5.1        | 98.0                  |
| LBW   | 0.9   | 2.0   | 0.6   | 0.9                  | 1.2        | 99.1                  |



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 Farmington Hills, MI 48336

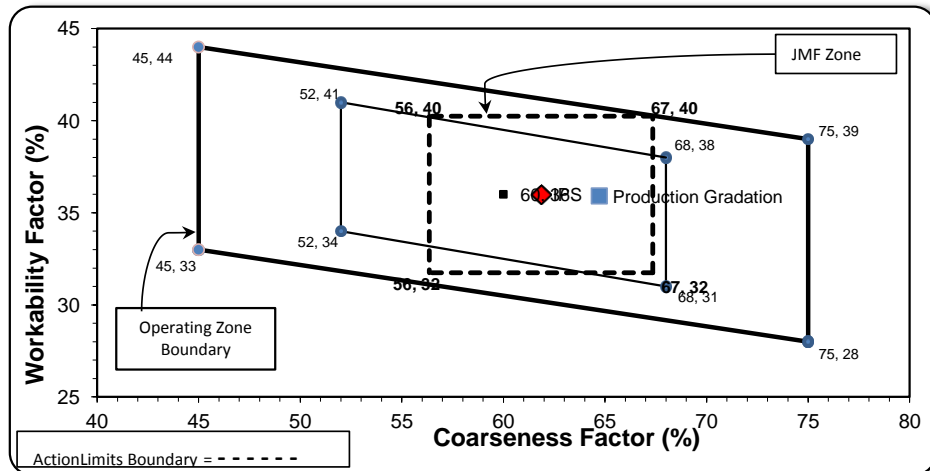
\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 8% for the 1" sieve when a 2" max. size (nom. Max. 1.5") aggregate is used.

Production Gradation  Batch Plant Gradations  Aggregate Supplier Gradations

Adjusted WF Initial Production Sample (IPS)

|                           |           |                            |           |                    |             |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|
| <b>Coarseness Factor:</b> | <b>65</b> | <b>Workability Factor:</b> | <b>33</b> | <b>Adjusted WF</b> | <b>35.9</b> |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|

|                            |           |
|----------------------------|-----------|
| <b>Coarseness Factor:</b>  | <b>62</b> |
| <b>Workability Factor:</b> | <b>36</b> |



| Sieve | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|----------------------|------------|-----------------------|
| 2"    | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0                | 0.0        | 0.0                   |
| 1"    | 100.0                | 0.0        | 0.0                   |
| 3/4"  | 95.0                 | 5.0        | 5.0                   |
| 1/2"  | 72.3                 | 22.8       | 27.7                  |
| 3/8"  | 60.4                 | 11.8       | 39.6                  |
| #4    | 42.6                 | 17.8       | 57.4                  |
| #8    | 36.0                 | 6.6        | 64.0                  |
| #16   | 29.5                 | 6.5        | 70.5                  |
| #30   | 20.3                 | 9.2        | 79.7                  |
| #50   | 9.5                  | 10.8       | 90.5                  |
| #100  | 3.4                  | 6.1        | 96.6                  |
| LBW   | 1.3                  | 2.1        | 98.7                  |

PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

MIX ID'S: DDD0K7E7, DDD0K7E8 and DDD0K7E9

Production Gradation Report

**PLANT #:** **P-35**

Sample Date: 9/3/18

Concrete Grade: **DM**

Contractor: \_\_\_\_\_

Dates Test Represents: 9/4/2018 through 9/10/2018

MDOT No.: \_\_\_\_\_

| Agg. Class      | Pit #  | Source     | Weight (SSD) | ft <sup>3</sup> | Specific Gravity | % Contribution |
|-----------------|--------|------------|--------------|-----------------|------------------|----------------|
| 6AA             | 58-003 | Stoneco    | 1390         | 8.28            | 2.69             | 46.5           |
| 26A             | 58-003 | Stoneco    | 350          | 2.09            | 2.69             | 11.7           |
| 2NS             | 81-93  | Burmeister | 1250         | 7.59            | 2.64             | 41.8           |
| <b>Total Wt</b> |        |            | <b>2990</b>  | <b>17.95</b>    |                  | <b>100.0</b>   |

<----- Verify this number is 100%

| Sieve | 6AA   | 26A   | 2NS   | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|-------|-------|-------|----------------------|------------|-----------------------|
| 2"    | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1"    | 99.8  | 100.0 | 100.0 | 99.9                 | 0.1        | 0.1                   |
| 3/4"  | 81.0  | 100.0 | 100.0 | 91.2                 | 8.7        | 8.8                   |
| 1/2"  | 40.0  | 99.8  | 100.0 | 72.1                 | 19.1       | 27.9                  |
| 3/8"  | 19.9  | 86.0  | 100.0 | 61.1                 | 11.0       | 38.9                  |
| #4    | 3.0   | 18.4  | 98.3  | 44.6                 | 16.5       | 55.4                  |
| #8    | 1.3   | 5.6   | 82.9  | 35.9                 | 8.7        | 64.1                  |
| #16   | 1.2   | 2.9   | 64.2  | 27.7                 | 8.2        | 72.3                  |
| #30   | 1.0   | 2.0   | 43.6  | 18.9                 | 8.8        | 81.1                  |
| #50   | 0.9   | 1.8   | 18.0  | 8.2                  | 10.8       | 91.8                  |
| #100  | 0.8   | 1.7   | 3.3   | 2.0                  | 6.2        | 98.0                  |
| LBW   | 0.6   | 1.6   | 0.9   | 0.8                  | 1.1        | 99.2                  |

\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 8% for the 1" sieve when a 2" max. size (nom. Max. 1.5") aggregate is used.



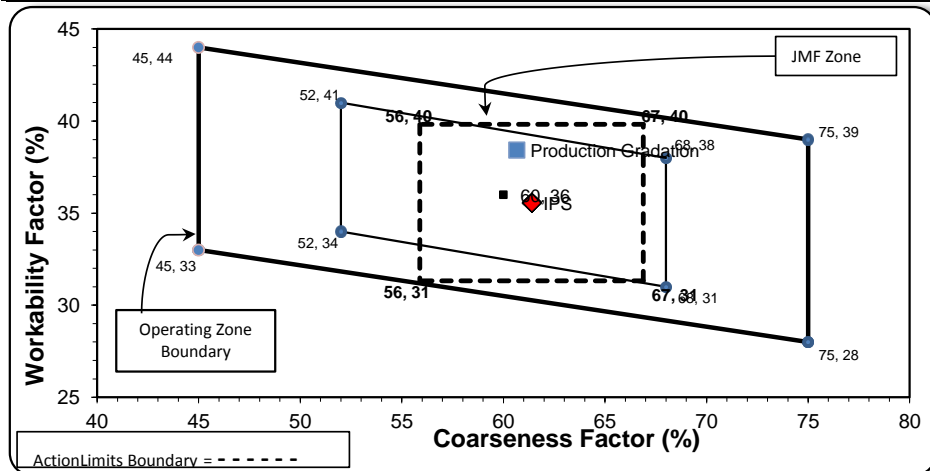
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 Suite 500  
 Farmington Hills, MI 48336

Production Gradation  Batch Plant Gradations  Aggregate Supplier Gradations

Adjusted WF Initial Production Sample (IPS)

|                           |           |                            |           |                    |             |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|
| <b>Coarseness Factor:</b> | <b>61</b> | <b>Workability Factor:</b> | <b>36</b> | <b>Adjusted WF</b> | <b>38.4</b> |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|

| Sieve | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|----------------------|------------|-----------------------|
| 2"    | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0                | 0.0        | 0.0                   |
| 1"    | 99.3                 | 0.7        | 0.7                   |
| 3/4"  | 89.1                 | 10.2       | 10.9                  |
| 1/2"  | 70.5                 | 18.6       | 29.5                  |
| 3/8"  | 60.5                 | 10.0       | 39.5                  |
| #4    | 44.1                 | 16.4       | 55.9                  |
| #8    | 35.6                 | 8.5        | 64.4                  |
| #16   | 27.7                 | 7.9        | 72.3                  |
| #30   | 20.6                 | 7.1        | 79.4                  |
| #50   | 8.7                  | 11.8       | 91.3                  |
| #100  | 1.6                  | 7.1        | 98.4                  |
| LBW   | 1.1                  | 0.6        | 98.9                  |



PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

MIX ID'S: DDD0K7E7, DDD0K7E8 and DDD0K7E9

Production Gradation Report

**PLANT #:** **P-36**

Sample Date: 9/3/18

Concrete Grade: DM

Contractor: \_\_\_\_\_

Dates Test Represents: 9/4/2018 through 9/10/2018

MDOT No.: \_\_\_\_\_

| Agg. Class      | Pit # | Source         | Weight (SSD) | ft <sup>3</sup> | Specific Gravity | % Contribution |
|-----------------|-------|----------------|--------------|-----------------|------------------|----------------|
| 6AA             | 71-47 | Presque Isle   | 1600         | 9.79            | 2.62             | 54.2           |
| 26A             | 71-47 | Presque Isle   | 200          | 1.22            | 2.62             | 6.8            |
| 2NS             | 63-92 | AA Grange Hall | 1150         | 6.95            | 2.65             | 39.0           |
| <b>Total Wt</b> |       |                | <b>2950</b>  | <b>17.96</b>    |                  | <b>100.0</b>   |

<----- Verify this number is 100%

| Sieve | 6AA   | 26A   | 2NS   | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|-------|-------|-------|----------------------|------------|-----------------------|
| 2"    | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1"    | 99.5  | 100.0 | 100.0 | 99.7                 | 0.3        | 0.3                   |
| 3/4"  | 85.0  | 100.0 | 100.0 | 91.9                 | 7.9        | 8.1                   |
| 1/2"  | 46.8  | 95.8  | 100.0 | 70.9                 | 21.0       | 29.1                  |
| 3/8"  | 24.3  | 80.3  | 100.0 | 57.6                 | 13.3       | 42.4                  |
| #4    | 2.7   | 19.4  | 96.8  | 40.5                 | 17.1       | 59.5                  |
| #8    | 1.4   | 6.5   | 83.0  | 33.6                 | 7.0        | 66.4                  |
| #16   | 1.2   | 3.7   | 66.9  | 27.0                 | 6.6        | 73.0                  |
| #30   | 1.2   | 3.1   | 48.6  | 19.8                 | 7.2        | 80.2                  |
| #50   | 1.2   | 2.8   | 23.3  | 9.9                  | 9.9        | 90.1                  |
| #100  | 1.1   | 2.5   | 4.5   | 2.5                  | 7.4        | 97.5                  |
| LBW   | 0.9   | 2.0   | 0.4   | 0.8                  | 1.7        | 99.2                  |



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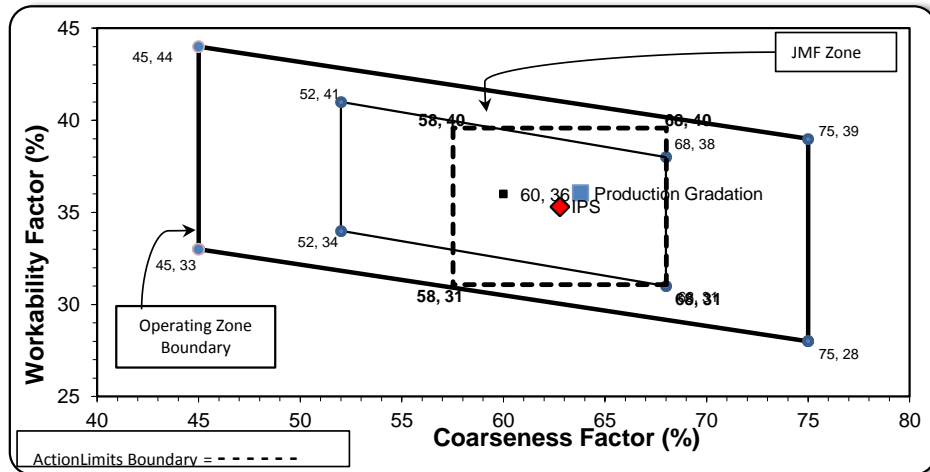
\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 8% for the 1" sieve when a 2" max. size (nom. Max. 1.5") aggregate is used.

Production Gradation  Batch Plant Gradations  Aggregate Supplier Gradations

Adjusted WF Initial Production Sample (IPS)

|                           |           |                            |           |
|---------------------------|-----------|----------------------------|-----------|
| <b>Coarseness Factor:</b> | <b>64</b> | <b>Workability Factor:</b> | <b>34</b> |
|---------------------------|-----------|----------------------------|-----------|

|                            |           |
|----------------------------|-----------|
| <b>Coarseness Factor:</b>  | <b>63</b> |
| <b>Workability Factor:</b> | <b>35</b> |



| Sieve | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|----------------------|------------|-----------------------|
| 2"    | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0                | 0.0        | 0.0                   |
| 1"    | 99.9                 | 0.1        | 0.1                   |
| 3/4"  | 89.1                 | 10.8       | 10.9                  |
| 1/2"  | 71.3                 | 17.8       | 28.7                  |
| 3/8"  | 59.4                 | 11.9       | 40.6                  |
| #4    | 42.6                 | 16.8       | 57.4                  |
| #8    | 35.3                 | 7.3        | 64.7                  |
| #16   | 28.5                 | 6.8        | 71.5                  |
| #30   | 20.9                 | 7.6        | 79.1                  |
| #50   | 9.0                  | 12.0       | 91.0                  |
| #100  | 1.7                  | 7.3        | 98.3                  |
| LBW   | 0.7                  | 1.0        | 99.3                  |

PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

MIX ID'S: DDD0K7E7, DDD0K7E8 and DDD0K7E9

Production Gradation Report

**PLANT #:** P-02

Sample Date: 9/3/18

Concrete Grade: DM

Contractor: \_\_\_\_\_

Dates Test Represents: 9/4/2018 through 9/10/2018

MDOT No.: \_\_\_\_\_

| Agg. Class      | Pit # | Source         | Weight (SSD) | ft <sup>3</sup> | Specific Gravity | % Contribution |
|-----------------|-------|----------------|--------------|-----------------|------------------|----------------|
| 6AA             | 71-47 | Presque Isle   | 1600         | 9.79            | 2.62             | 54.2           |
| 26A             | 71-47 | Presque Isle   | 200          | 1.22            | 2.62             | 6.8            |
| 2NS             | 63-92 | AA Grange Hall | 1150         | 6.95            | 2.65             | 39.0           |
| <b>Total Wt</b> |       |                | <b>2950</b>  | <b>17.96</b>    |                  | <b>100.0</b>   |

<----- Verify this number is 100%

| Sieve | 6AA   | 26A   | 2NS   | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|-------|-------|-------|----------------------|------------|-----------------------|
| 2"    | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1"    | 99.5  | 100.0 | 100.0 | 99.7                 | 0.3        | 0.3                   |
| 3/4"  | 85.0  | 100.0 | 100.0 | 91.9                 | 7.9        | 8.1                   |
| 1/2"  | 46.8  | 95.8  | 100.0 | 70.9                 | 21.0       | 29.1                  |
| 3/8"  | 24.3  | 80.3  | 100.0 | 57.6                 | 13.3       | 42.4                  |
| #4    | 2.7   | 19.4  | 96.8  | 40.5                 | 17.1       | 59.5                  |
| #8    | 1.4   | 6.5   | 83.0  | 33.6                 | 7.0        | 66.4                  |
| #16   | 1.2   | 3.7   | 66.9  | 27.0                 | 6.6        | 73.0                  |
| #30   | 1.2   | 3.1   | 48.6  | 19.8                 | 7.2        | 80.2                  |
| #50   | 1.2   | 2.8   | 23.3  | 9.9                  | 9.9        | 90.1                  |
| #100  | 1.1   | 2.5   | 4.5   | 2.5                  | 7.4        | 97.5                  |
| LBW   | 0.9   | 2.0   | 0.4   | 0.8                  | 1.7        | 99.2                  |



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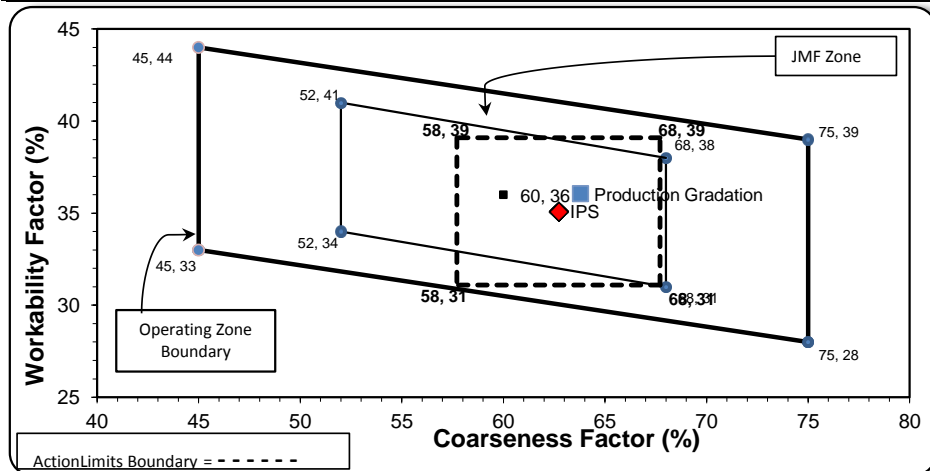
\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 8% for the 1" sieve when a 2" max. size (nom. Max. 1.5") aggregate is used.

Production Gradation  Batch Plant Gradations  Aggregate Supplier Gradations

Adjusted WF Initial Production Sample (IPS)

|                           |           |                            |           |                    |             |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|
| <b>Coarseness Factor:</b> | <b>64</b> | <b>Workability Factor:</b> | <b>34</b> | <b>Adjusted WF</b> | <b>36.1</b> |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|

|                            |           |
|----------------------------|-----------|
| <b>Coarseness Factor:</b>  | <b>63</b> |
| <b>Workability Factor:</b> | <b>35</b> |



| Sieve | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|----------------------|------------|-----------------------|
| 2"    | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0                | 0.0        | 0.0                   |
| 1"    | 100.0                | 0.0        | 0.0                   |
| 3/4"  | 95.1                 | 4.9        | 4.9                   |
| 1/2"  | 74.6                 | 20.5       | 25.4                  |
| 3/8"  | 59.3                 | 15.3       | 40.7                  |
| #4    | 42.1                 | 17.2       | 57.9                  |
| #8    | 35.1                 | 7.1        | 64.9                  |
| #16   | 29.2                 | 5.9        | 70.8                  |
| #30   | 21.9                 | 7.3        | 78.1                  |
| #50   | 9.6                  | 12.4       | 90.4                  |
| #100  | 2.4                  | 7.2        | 97.6                  |
| LBW   | 0.9                  | 1.5        | 99.1                  |

PREPARED BY:  
 SM, LLC Technical Service

Approved By: