Fredericksburg District
2014 Subdivision Project
Resurfacing with SM- 4.75 Thin Lift Asphalt

Gary Murphy
Pavement Management
Fredericksburg District
Challenges With Secondary System (Subdivisions)

- **Challenges**
  - Statewide - Pavement Managers and Residency Staff members are tasked to maintain and improve nearly 100,000 lane miles in the secondary network.
  
  - If the pavement sections are in good to excellent condition, the choices are easier and less risky. Most situations (subdivisions) we are addressing roads that fall in all categories (good to poor) within the same subdivision.
  
  - Thin existing subdivision pavement structures:
    - 1” to 3” of asphalt (S4 and S5 mixes)
    - 8” to 10” of Aggregate
  
  - Mix of engineering, economic and policy decisions.
  
  - Determining the right treatment to preserve and extend the pavement life is a difficult task. Application of thin layers (SM-4.75) allow pavement managers to overlay more lane miles with less tonnage.
  
  - Degree to which thin asphalt overlays are successful depend in large part on the project selection and amount of distress in the existing pavement.
Objective, Network and Expectations

• **Objective**
  • Maintenance and rehabilitation of our roadways is a never ending process, particularly in the subdivisions as part of the ageing secondary route system.
  • Restore ride quality, level surface defects with economical, durable and smooth maintenance treatment to preserve and extend the pavement life.

• **Secondary Network System**
  • Statewide VDOT has approx. 98,950 lane miles identified in the secondary system approx. 25,550 (26%) lane miles are plant mix.
  • Plant mix lane miles range from 9% to 77% in the districts.
  • Fredericksburg district contains 9,228 lane miles approx. 2,498 (27%) are plant mix.

• **Ageing network, multiple pavement designs, thinner pavement structures**
  • The three adjoining subdivisions in this project are 25, 35, and 45 years old, each could take 10 years to be built out.

• **Expectations**
  • Service life of 7 to 11 years, realistically depending on funding could be 15+ years
Prime Contractor & Consultant Inspection Staff

- Prime Asphalt Contractor
  - Superior Paving Corp., Inc
  - Established in 1976

- Consultant Inspection Staff
  - A. Morton Thomas and Associates, Inc. (AMT)
  - Established in 1990

- Virginia Asphalt Association
  - Serving The Needs Of Virginia’s Asphalt Community Since 1952
  - Trenton Clark, Director Of Engineering
Preliminary Work In Advance Of Construction

• Planning And Execution
  • Research performed in Virginia and Nationally
    • Virginia Center For Transportation Innovation and Research (VCTIR) Published 2014
    • Transportation Research Board (TRB) NCHRP 464 Published 2014
    • National Center For Asphalt Technology (NCAT) Published 2013
  • Activities performed in advance of the project
    • Sent 700 notification letters to each residence/business within the project limits
    • Notified the homeowners, door hangers & local newspaper
    • Performed patching to correct any base failures
    • Performed two culvert replacements
    • Applied herbicide treatment to vegetation in pavement
    • Frequent meetings and open communication
      – Prime contractor, construction staff, residency staff
      – Final site review with VAA, Superior Paving staff, and residency staff
      – Open house at Superior Paving Powell Lane plant, invited paving industry members and VDOT staff from across the state.
Specification, Construction and Placement

• **Special Provision (SP) Dense Graded Asphalt Mix Type SM-4.75**
  • Located in Volume II, Plant Mix Schedules – Statewide
    • Notable (SP) Highlights
      • Asphalt Cement (Binder) PG 64-22 (A); 70-22 (D); or 76-22(E)
      • Recycled Asphalt (RAP) is permitted

• **Construction and Placement**
  • Application rate of 110 LBS/Sq. YD. final compacted pavement surface is 1.0”
    • NOTE: For locations with irregular site conditions such as existing patching the application rate should be increased so that there are sufficient quantities to prevent over runs
  • Typical paving equipment used (no special equipment needed)
  • Existing Concrete and Asphalt driveway connections, not a problem
  • Hand work is a little more challenging
Subdivision Information

• **Waverly Village**
  • Original Construction Early 1970’s through Mid 1970’s (45 years old)
  • Last known resurfacing (1999 SM-2A) & (2002 SM-9.5A)
  • Mainline lane miles 6.72 average width 22’; With 6 Cul-De-Sac’s

• **Maple Grove**
  • Original Construction Early 1970’s through Mid 1980’s (35 years old)
  • Last known resurfacing (No defined resurfacing schedule work)
  • Mainline lane miles 7.80 average width 21’; With 9 Cul-De-Sac’s

• **Governors Green**
  • Original Construction Early 1990’s through Mid 1990’s (25 years old)
  • Last known resurfacing (No defined resurfacing schedule work)
  • Mainline lane miles 3.86 average width 21’; With 3 Cul-De-Sac’s
SM-4.75 Subdivision Project Locations
Maple Grove, Governors Green & Waverly Village
Pavement Conditions
From The 2011 Assessments

Maple Grove Subdivision

Waverly Village Subdivision

Governors Green Subdivision
2011 Pavement Rating Assessment Details
All Three Subdivisions Combined

% Lane Mile Distribution of All Subdivisions by 2011 Condition Ratings

<table>
<thead>
<tr>
<th>Rating</th>
<th>Lane Miles</th>
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<tbody>
<tr>
<td>Very Poor</td>
<td>0.72</td>
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<tr>
<td>Poor</td>
<td>3.96</td>
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<tr>
<td>Fair</td>
<td>2.02</td>
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<tr>
<td>Good</td>
<td>9.94</td>
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<tr>
<td>Excellent</td>
<td>0.52</td>
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2011 Pavement Rating Assessment Details By Subdivision

Waverly Village

<table>
<thead>
<tr>
<th>Rating</th>
<th>Lane Miles</th>
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<tbody>
<tr>
<td>Very Poor</td>
<td>0.1</td>
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<tr>
<td>Poor</td>
<td>0.18</td>
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<tr>
<td>Fair</td>
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<tr>
<td>Good</td>
<td>5.98</td>
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<tr>
<td>Excellent</td>
<td>0.46</td>
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Maple Grove

<table>
<thead>
<tr>
<th>Rating</th>
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<tbody>
<tr>
<td>Very Poor</td>
<td>0.62</td>
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<tr>
<td>Poor</td>
<td>1.14</td>
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<tr>
<td>Fair</td>
<td>2.6</td>
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<td>Good</td>
<td>3.38</td>
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<tr>
<td>Excellent</td>
<td>0.06</td>
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Governors Green

<table>
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<tr>
<th>Rating</th>
<th>Lane Miles</th>
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<tbody>
<tr>
<td>Very Poor</td>
<td>0</td>
</tr>
<tr>
<td>Poor</td>
<td>2.64</td>
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<tr>
<td>Fair</td>
<td>0.5</td>
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<tr>
<td>Good</td>
<td>0.72</td>
</tr>
<tr>
<td>Excellent</td>
<td>0</td>
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</table>
## Project Cost Comparison
(Ashphalt Material Only $180,790 Difference)

<table>
<thead>
<tr>
<th>Asphalt Type</th>
<th>Resurfacing Method</th>
<th>Application Rate</th>
<th>Total Material Required For All Three Subdivisions</th>
<th>Unit Cost Asphalt /Ton</th>
<th>Project Cost For Asphalt Material</th>
<th>Total Project Cost Asphalt Quantities With Required Contract Items CEI &amp; Cont.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM-4.75</td>
<td>1.0&quot; Straight Overlay</td>
<td>110 Lbs./Sq. Yd.</td>
<td>6,840 (Ton)</td>
<td>$78.50 Ton</td>
<td>$536,940</td>
<td>$606,750</td>
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<tr>
<td>SM-12.5</td>
<td>1.5&quot; Straight Overlay</td>
<td>165 Lbs./Sq. Yd.</td>
<td>10,174 (Ton)</td>
<td>$68.50 Ton</td>
<td>$696,919</td>
<td>$787,540</td>
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<tr>
<td>Slurry</td>
<td>Slurry B or C</td>
<td>16 to 20 Lbs./Sq. Yd.</td>
<td>123,324 (SY)</td>
<td>$1.91 SY</td>
<td>$235,550</td>
<td>$266,170</td>
</tr>
<tr>
<td>FDR</td>
<td>10&quot; to 12&quot;</td>
<td>1.5&quot; Surface</td>
<td>Varies</td>
<td>Varies</td>
<td>Varies</td>
<td>Approx. 2.0M to 2.5M+</td>
</tr>
</tbody>
</table>

Example: 22’ Wide Roadway, 1 Mile In Length
- $10.00/Ton price difference (13%)
- 1.0” overlay would require 710/Ton per mile compared to 1,065/Ton per mile for the 1.5” overlay (355 less tons per mile or 33% less asphalt)
Waverly Village Rte. 1133 (Waverly Dr.)

Before Overlay
September 2014

After Overlay
February 2015

Typical existing transverse and longitudinal cracks
Maple Grove Rte. 1123 (Douglas St.)

Existing Condition
September 2014

After Overlay
February 2015

Worst case existing transverse cracks 1/4” wide
Maple Grove Rte. 1563 (Hazel Ct.)

Existing Condition
September 2014

Typical Cul-De-Sac

After Overlay
February 2015
Governors Green Rte. 1568 (Inverarry Dr.)

Existing Condition
September 2014

After Overlay
February 2015
Governors Green Rte. 1566 (Hogan Ct.)

Existing Condition
September 2014

After Overlay
February 2015
Typical Utility Covers Water and Sewer

1.0” Utility Riser Need To Be Ordered In Advance
2015 VAA SEMINAR
THINLAY FOR PREVENTATIVE MAINTENANCE
Tom Eckler- Superior Paving
Objectives

• Preparations before paving operations
• Equipment needed
• Lessons learned
• Density requirements
Manhole/Water Valve Risers

- County Water Authorities do not stock 1” risers.
- Extra time is needed in advance for them to be ordered.
1” Manhole Riser
Strike-off Adjustment

- Strike-off- ¼” above screed
Mix Designs
• EEO Board
Use of Shuttle Buggy Recommended
Rollers

- Ingersoll-Rand DD 90HF (10 Ton Roller)
• Caterpillar CB54B (10 Ton Roller)
Plant Temperature

315
Compacted Mat
Minimal Fanning
Working Around Utilities
Driveways
(Use Plate Tamp)
Cul-de-sac

- “Small” roller necessary
Density

- Roller Pattern/Control Strip **required**.
- No cores
Where Do We Go From Here…..

• **Lessons Learned**
  - Identification of binder in the contract
  - Increase quantities slightly to accommodate out of profile/rough sections/patching
  - Secure 1.0” manhole risers well in advance

• **Recent Review (February 2015)**
  - Overall extremely pleased. We knew from the beginning we were expecting a lot given the existing age and surface conditions.
  - No failures of the mix
  - Experiencing some reflective transverse crack
  - Noticed some raveling at the driveway connections, depending on the grade from the driveway connection to the mainline

• **Options, additional research and considerations for future projects**
  - Crack seal wide cracks prior to or after overlay, expecting that some may reappear
  - Scratch over wider transverse cracks
  - Change the SM-4.75 specification to require more virgin AC (7%)
  - Use of high-polymer or softer binder perhaps (58-28) where existing surfaces are cracked
Driveway Scam....
Superior’s Volunteer Crew
With The Happy And Relieved Resident