CITY OF LARKSPUR
Pavement Assessment Study
Initial Findings

Prepared by Pavement Engineering Inc.
May 2013
PRESENTATION GOALS

- Review pavement basics: Pavement 101
- Identify budget needs
PAVEMENT 101
Typical Pavement Structures

Flexible Pavements

- Asphalt Concrete Surface
- Aggregate Base
- Aggregate Subbase
- Native Subgrade

Full-Depth Asphalt Concrete

- Asphalt Concrete Surface
- Native Subgrade

Rigid Pavements

- Portland Cement Surface
- Cement-Treated Base
- Native Subgrade
Wheel Loads
Pavement Deterioration Cycle

Deterioration curve is determined by loading, pavement quality, climate, etc.
How Does Asphalt Concrete Deteriorate?

Aging (environmental effects)

Fatigue (load related)
COMPARATIVE VEHICLE PAVEMENT STRESS
(S-10 BLAZER = 1 VEHICLE UNIT)
Common Pavement Distresses

Weathering or Raveling
Transverse or Longitudinal Cracking
Block Cracking
Alligator Cracking
Evaluating Common Pavement Distresses

- Alligator cracking
- Block cracking
- Distortions
- Longitudinal / transverse cracking
- Patches
- Rutting / depressions
- Weathering / raveling
Evaluating Pavement
The Pavement Condition Index

100 – 91 = Excellent
90 – 71 = Good
70 – 51 = Fair
50 – 31 = Poor
30 – 0 = Failed
PCI = 100
PCI = 85
PCI = 60

PAVEMENT 101
PCI = 51
PCI = 38
PCI = 28
PCI = 0
PAVEMENT PRESERVATION

Applying the **RIGHT TREATMENT**

to the **RIGHT PAVEMENT**

at the **RIGHT TIME**

using the **RIGHT MATERIALS**
Pavement Maintenance & Rehabilitation Strategies

• **Best-First “Top Down” Management**: Focuses maintenance and rehabilitation on the best streets in the system. Interim procedure.

• **Worst-First “Bottom Up” Management**: Focuses maintenance and rehabilitation on the worst streets in the system. Interim procedure.

• **Critical-Point Management**: Focuses maintenance and rehabilitation on streets above rather than below a critical PCI. Most economical in the long run.
Pavement Condition vs. Maintenance / Rehabilitation Cost

- Pavement Condition Index (PCI)
  - VERY GOOD
  - GOOD
  - POOR
  - VERY POOR
Essential Testing

Deflection Testing

Core Testing

PAVEMENT INSPECTIONS
Compaction Inspection

• Accurately monitors asphalt concrete mixes to ensure mix designs meet specifications and to measure in-place HMA49 (Hot Mix Asphalt) density during the laydown phase to ensure sufficient compaction.

• Mix quality and compaction quality are essential to long-lasting pavements.
ASSESSMENT FINDINGS
City of Larkspur System Data

• 32.17 centerline miles of pavement
• 63.75 lane miles of pavement
• 4,691,960 square feet of pavement
• Systemwide average weighted PCI* of 39
• Estimated replacement value of $60,672,000

* Formula based on pavement area.
# Maintained Road System

<table>
<thead>
<tr>
<th>Functional Classification</th>
<th>Replacement Cost</th>
<th>Centerline Miles</th>
<th>Lane Miles</th>
<th>Pavement Area (square feet)</th>
<th>Average PCI</th>
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<tbody>
<tr>
<td>Arterial</td>
<td>$12,380,000</td>
<td>4.13</td>
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<td>Collector</td>
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<td>Residential</td>
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<td>38.09</td>
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<tr>
<td>Totals</td>
<td>60,672,000</td>
<td>32.17</td>
<td>63.75</td>
<td>4,691,960</td>
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Neighborhood Areas
<table>
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<tr>
<th>Classification</th>
<th>Average PCI</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>Arterial</td>
<td>58.6</td>
<td>$6,176,339</td>
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<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Average PCI</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>Industrial</td>
<td>13.9</td>
<td>$231,604</td>
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<td>South Eliseo</td>
<td>19.1</td>
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<tr>
<td>Larkspur Landing</td>
<td>19.6</td>
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<td>South Magnolia</td>
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<td>Hillview</td>
<td>30.4</td>
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<td>Riviera Circle</td>
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<td>Madrone Canyon</td>
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<td>Loop</td>
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<td>Greenbrae Hills</td>
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<td>Old Town</td>
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<td>Heatherwood Gardens</td>
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<td>Baltimore Park</td>
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Grand Total $21,608,591
Initial Recommended FY 2013-2014 Project

• Neighborhoods: Industrial & Larkspur Landing
• Estimated cost: $1,000,000
• Result: increases systemwide PCI from 39 to 42
• Staff will return with final report and request to authorize preparation of plans and specifications for initial project in June 2013
Five-Year PCI Projection

- $5.6M/Year
- $3.5M/Year
- $1.8M/Year
- $1.0M/Year
- $400K/Year
- $0/Year
Ten-Year PCI Projection

ASSESSMENT FINDINGS

10 Year Projections

- $5.6M/Year
- $3.5M/Year
- $1.8M/Year
- $1.0M/Year
- $400K/Year
- $0/Year
Ten-Year Maintained PCI

ASSESSMENT FINDINGS

Ten-Year Maintained PCI

10 Year Projection

- $5.6M/Year for the first 5 years and $3.5M/Year for the next 5 years
- $3.5M/Year for the first 5 years and $2.6M/Year for the next 5 years
PCI Comparisons for Marin County Jurisdictions

Three-year moving average from 2011 Bay Area pavement conditions summary by the Metropolitan Transportation Commission (MTC)

<table>
<thead>
<tr>
<th>Agency</th>
<th>Average PCI</th>
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<tbody>
<tr>
<td>Belvedere</td>
<td>85</td>
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<tr>
<td>San Rafael</td>
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<tr>
<td>Novato</td>
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<td>Corte Madera</td>
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<td>Tiburon</td>
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<td>Ross</td>
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<td>Fairfax</td>
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<td>Sausalito</td>
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<tr>
<td>Mill Valley</td>
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<tr>
<td>San Anselmo</td>
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<tr>
<td>County</td>
<td>52</td>
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<td>Larkspur</td>
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ACTIONS ITEMS

- Identify sustainable funding
- Develop a five-year plan
- Coordinate with other capital improvement projects:
  - MMWD
  - RVSD
QUESTIONS?