Executive Summary/ Introduction

Sustainable Methods for Pavement Preservation

The City of Eugene has specified a variety of construction methods to maximize its sustainability practices in pavement preservation. The three primary construction technologies used to reduce environmental impacts from its projects are warm mix asphalt pavement, increased use of reclaimed asphalt binder in asphalt pavements, and in-place recycling vs. traditional street reconstruction. These methods have shown positive results in environmental, economic, social, and health benefits to the community. The projects create jobs, leverage City funds, and address a pavement preservation backlog while also providing public education opportunities, creating safe public facilities, and improving the overall community livability.

Description of Project/ Service/ Initiative/ Activity

The City of Eugene Public Works Department manages 1,257 lane miles of improved streets. In 2013, the Eugene Pavement Preservation Program let contracts rehabilitating 21.2 lane miles on 13 streets. The rehabilitation techniques varied from 2” deep inlay, to in-place recycling of the existing base or subgrade, to full depth reconstruction. Construction contracts for pavement preservation and related capital improvements totaled approximately $15 million in 2013.

Warm Mix Asphalt

- Pollution Prevention
- Natural Resources Conservation
- Energy Efficiency

Warm mix asphalt pavement is identical to conventional hot mix asphalt pavement, except that through a special mixing process it is produced at a temperature approximately 50 to 100 degrees cooler than conventional hot mix asphalt. In Eugene, all asphalt concrete producers have retrofitted their plants to produce warm mix asphalt using a water foaming process. The foaming process allows temperature reductions of approximately 50 degrees. This reduction in temperature has several advantages:

1. Reduces energy consumption to produce asphalt concrete, lowering costs and greenhouse gas emissions.
2. Reduces off-gassing (smoke) of asphalt concrete by keeping temperature under the boiling point of “light oils” in the liquid asphalt, benefiting construction workers and the public.
3. Because the light oils are not boiled off, the liquid asphalt coating the rock particles is slightly thicker, which slows the aging process of the asphalt.
4. Reduces the oxidation caused during high temperature production that causes premature aging of the asphalt, which should provide a longer life product.

The use of warm mix asphalt pavement was first made optional for City of Eugene projects in 2009 and became a standard specified material in 2010. Warm mix asphalt has continued to be specified for all the paving projects in place of conventional hot mix asphalt - approximately 42,000 tons of warm mix asphalt was placed in 2013. Warm mix asphalt provides environmental and human health benefits as well as a potentially longer lasting product. The National Cooperative Highway Research Program (NCHRP) estimates that there is a CO2 savings of 12 pounds per ton of pavement using warm mix as compared to hot mix asphalt. The NCHRP also estimates that the use of warm mix asphalt reduces the energy used in the asphalt batch plant by about 30% compared to hot mix asphalt.
Asphalt Binder Replacement with Reclaimed Materials

- Pollution Prevention
- Natural Resources Conservation

The use of reclaimed asphalt pavement, or “RAP”, has been used for more than 20 years in Eugene. In 2013, approximately 13,000 tons of RAP material was incorporated into the pavement preservation projects. It has been standard practice to specify up to 30% RAP in asphalt pavements in Eugene for many years. Using typical materials properties, the 30% by weight RAP content replaces approximately 25% of the virgin binder content of a typical asphalt pavement.

In 2013, the City of Eugene began to move beyond 30% RAP content by increasing the overall asphalt binder replacement in the pavement on a test project. After reviewing materials from various agencies studying this concept, staff met with the three major asphalt pavement producers in Lane County to discuss the possibilities and plant capabilities. Because each producer had different plant capabilities, the City decided to revise the 30% RAP content specification to call for 35% binder replacement. The contractors were allowed to use any combination of reclaimed shingles or reclaimed asphalt pavement to meet this 35% binder replacement requirement, except no more 5% shingles could be used as there has not been enough study of higher percentage shingle use to date. Adjustments were made to the grade of cement used to compensate for the stiffer mix. Not only did this mix design decrease the use of virgin asphalt binder and increase the use of reclaimed materials in the pavement mix, but there is a potential cost savings to the City. Between the two street projects using Level 2 dense graded asphalt pavements this year, the project with the 35% binder replacement had average bid prices approximately 17% less per ton than the “conventional” mix. While these are only two projects and generalizations would be premature, it would intuitively seem that the less virgin asphalt cement a contractor needs to purchase, the less expense the pavement should be.

In-Place Recycling

- Pollution Prevention
- Natural Resources Conservation

In-place recycling is a process in which a large piece of equipment called a “reclaimer” mixes the existing base rock and a portion of subgrade soils with dry cement and water to create a cement-treated base. This process greatly reduces the use of virgin materials and trucking that are needed using conventional remove-and-replace construction techniques.

The City of Eugene started using the in-place recycling process in 2008 to realize the environmental, economic and social benefits to the community that can come from this type of process. The reduction in land filling, material mining, and truck hauling all have direct environmental benefits; the reduction in excavating existing roadway materials and importing virgin construction materials have direct economic benefits; and the reduction in construction time has a direct social benefit.

In-place recycling was used on three pavement preservation projects in 2013. It is estimated that using the in-place recycling process for these streets eliminated the need to excavate and haul away 9,700 cubic yards of material and eliminated hauling 17,000 tons of new base rock to the site, saving over 1,300 truck trips for the three streets.
Lessons Learned

Economic Benefits

- Financial Stability

Financial stability is achieved through the efficient use of public funds – rehabilitating streets before they need more expensive repairs, reducing expensive maintenance costs resulting from streets in poor condition and leveraging other funding sources to maximize the value of the work performed.

The City uses a Pavement Management System to track the condition of the City’s streets. All streets age and gradually decline in Overall Condition Index (OCI) until, reaching some range of OCI value, every road needs rehabilitation. An important program goal is to keep streets from falling into the more expensive reconstruction category and to expend resources early on to preserve the condition of the street. It costs more to rebuild the streets than to maintain them. In 2013, 8.3 lane miles of streets were rehabilitated to keep them from falling into the reconstruction category. The remainder of the streets that had fallen into the reconstruction category were chosen for repair in order to significantly reduce the maintenance costs that were required to be expended to keep the street drivable.

The use of Pavement Preservation Program funds is limited to the rehabilitation of the driving surface of streets as well as to preserve existing integral elements of the street such as curbs, gutters, sidewalks, on-street bike lanes, traffic signals, street lights, medians, traffic calming devices, and other integral parts of a street preservation project. However, there is often a need or an opportunity to complete additional work as part of the construction contracts for street preservation. The additional work may be funded by wastewater and stormwater utility funds, local gas taxes, transportation system development charges, or state and federal grants.

For example, wastewater and stormwater utility funds are often used to repair and rehabilitate the respective systems that underlie much of the city’s street system as part of the pavement preservation project contract. Making these repairs in coordination with the pavement preservation project is a cost-effective way to accomplish the work and precludes emergency repairs in the future that would require cutting new pavement.

- Economic Development

Based on the 2011 Oregon Department of Transportation Financial & Economics Analysis Section regional economic impact modeling tool, the City estimates that construction for the 2013 Pavement Preservation Program sustained approximately 120 full-time equivalent jobs during the period of construction.

Community Benefits

Several community benefits are realized from Eugene’s Pavement Preservation Program, such as community education, safety, enjoyment and livability. Community support of the PPP through the successful passage of a second 5-year bond measure for street repairs is evidence of the program achieving this goal of benefitting the community.

- Education

In order to educate and apprise the community about the City’s Pavement Preservation Program, the City maintains a website focused on the Pavement Preservation Program. This website provides program information on funding, annual reporting on the overall condition index of the transportation system and explanations of different rehabilitation techniques.

Workers paving a Eugene street

Eugene’s Pavement Preservation Program website at www.eugene-or.gov
There is an in-place recycling video posted on the City’s website as well as content on slurry seals. In addition, through our partnership with Metro TV, a local access station, a “Working City” video episode about the Pavement Preservation Program was produced and broadcast to the community in 2013. The City also works with a 12-person citizen review panel pursuant to the Street Repair Bond Measure. This panel reviews the work completed each year and makes recommendations to the Public Works Department about the program.

- **Safety**

In addition to the smoother surface of the roadway, one of the biggest contributions to safety from the Pavement Preservation Program is upgrading and adding accessible sidewalk ramps as part of these projects. The Americans with Disability Act (ADA) requires the upgrading of street crossings to comply with ADA law in the modification of the street crossing as part of a paving project. In 2013, 183 sidewalk ramps were upgraded, 72 ramps were added, and 2 railroad pedestrian crossings were upgraded as part of the PPP projects. There were also 6 major intersections that were upgraded with audible pedestrian signals as part of these projects with companion funding.

Through the use of warm-mix asphalt pavement, these Eugene projects have improved the safety of workers paving the streets with reduced temperatures and gas burn-off (fumes) from the asphalt pavement.

- **Enjoyment and Livability**

The PPP projects have made many contributions to the livability of these streets repaired. In addition to the smoother driving surface, through the bond measure and leveraging of gas tax funds from other sources, the Pavement Preservation Program has allowed meaningful progress toward enacting elements of the City’s Pedestrian and Bicycle Master Plan. Thanks to conscientious staff efforts, preservation projects have incorporated new or wider bicycle lanes, shared lane markings, and improvements in pedestrian facilities.

In addition to the safety improvements mentioned above, there were also several locations that were upgraded with median islands for pedestrian refuge.

Through the use of in-place recycling construction techniques, projects are being completed quicker and with less congestion due to reduced truck trips than if the road had been reconstructed in a traditional method.

**Additional Resources**

Eugene Pavement Preservation Program

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