

Micro Surfacing in the City of Gresham

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The rallying cry of Gresham's Public Works has long been, "Preservation maintenance is more cost effective than rehabilitation or replacement." The first line of defense in these maintenance practices has been the reduction or elimination of water intrusion into the base of the street. To achieve this goal, the primary maintenances, used for more than 20 years, have been crack, slurry and chip seals.

Surface seals are traditionally best suited for residential streets. These streets usually fail due to oxidation, hardening and deterioration of the asphalt. The result is cracks that allow water intrusion, saturation and contamination of the base with fines, until it can no longer support loading. The brittle pavement begins to break apart, thereby accelerating the cycle of disintegration by allowing even more water into the base. Consequently, it is imperative to protect the integrity of the load-carrying base by preserving the waterproof asphalt covering.

In 2007, Gresham received ownership and responsibility of the arterials and collectors located within our city limits. Past maintenance practices on the majority of these streets was usually limited to mill/fill and overlays. Due to a lack of sufficient revenue, optional maintenance practices were sought out. Because slurry seals are relatively thin and are prone to premature raveling and stripping, they are usually not suited for high-volume roads. These types of roads will usually have wheel-path wear and will need a material that can be stacked or used for leveling, as well.

Several practices were tried, however the most successful, was micro surfacing. Micro surfacing is a mixture of polymer-modified emulsion, crushed aggregate, mineral filler, additives and water. This unique combination provides a consistent and stable mixture; permits rapid set times, allow thick and multiple layers and have good durability. The main difference between slurry seal and micro surfacing is that slurry seal uses a standard asphalt emulsion, which requires evaporation to occur, and sets in several hours. Micro surfacing uses a polymer-modified asphalt emulsion that produces a chemical reaction to force the moisture out and can set in less than an hour allowing traffic to return quickly

Project background and candidate selection

In early September 2009, Gresham contracted with Intermountain Slurry Seal, Inc. for the application of 125,374 sq yds (18 lane miles) of micro-surfacing on arterial streets. The project was performed at night on three major arterials, including State Hwy 26 (named Powell Blvd. within the city limits).

Powell was recently improved with multiple boulevard treatments, such as bike lanes, curb extensions, islands and trees. All of these impediments posed challenging problems for staging operations and an increased of handwork for the contractors. Many businesses, normally open during the day, are located on this street. Restricting the flow of customers by closing portions of the street during the day was not an option. Night work provided the least amount of disruption to the businesses. Some of the

businesses were car dealerships, therefore the maintenance needed to be fairly clean and without a lot of dust or aggregate kick-off.

Hogan Road, the major link between Hwy 26 and I-84, has less impediments, however, it does have a relatively high traffic count. It was structurally sound but had wheel path wear as deep as 1.5 inches. This street required applying a scratch course prior to laying the finish course. The result was that the risk of hydroplaning due to excessive water pooling in the wheel path has been nearly eliminated.

Another four-lane arterial, Glisan Street., was designated as a new bicycle route. Bicycle lanes were added, travel lanes realigned and pavement markings/stripping repositioned. Micro surfacing effectively filled the milling scuff left from removing the old lines and any wheel path wear of the old alignment. It was home to numerous apartments as well as businesses, thereby requiring many driveways and approaches to remain open. Flaggers denied traffic access over the new layer for about 5 to 10 minutes if traveling straight over without turning and up to 15 minutes if turning was required. In extreme situations, lightly spread sand was used to minimize surface distortion and tracking.

Application

Prep (patching and crack seal) was performed by Gresham crews a few months prior to this project. Intermountain worked for six nights. Traffic control, sweeping, masking and other street preparation began at 7:30 p.m. and construction at around 9 p.m. Most of the 5 o'clock rush-hour traffic had past, making it easier to channel traffic into single lanes. The application continued until about 2 to 3 o'clock in the morning. Flaggers continued traffic control until about 4 to 5 a.m. Traffic was usually allowed on the new mat within one hour.

Temperatures ranged from 80°F in the evening to the mid-60s by the end of the shift. There were light sprinkles during two of the nights, with heavy rainfall within one hour of pulling traffic control on another. On the night that it rained, the wheel paths stripped within hours. The lane where this occurred was corrected with a remedial coat two days later.

The application rate of this Type III micro surfacing (3/8") averaged 28 pounds per square yard.

There was small amount of initial raveling during the first two weeks, which required several sweepings. The original surface was fairly rough due the 3/8" aggregate used, however the mat was deep enough to allow some traffic kneading and compaction of this aggregate, resulting in semi-smooth surfaces. Skid resistance tests results were;

<u>Location</u>	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Powell	56.4	65.1	50.8
Glisan	53.8	57.7	50.4
Hogan	52.3	44.9	44.9

The numbers indicated good friction properties and were in line or better than what we see with new HMAC overlay projects.

Temporary raised pavement markers (stick-n-stomps) were applied during micro application and washed off with a backpack sprayer immediately after the micro was laid. Striping was applied within a week. The streets striped with thermoplastic look very good however; the streets striped with paint will need another coat, as there was some asphalt bleeding.

Equipment

Water, cement, asphalt emulsion and additives ratios are regulated as they are pumped into a pugmill, where they are mixed with the aggregate.

"Mobil" mixer machine (similar to slurry seal trucks)

- More maneuverable therefore used on streets with many obstacles, intersections etc.
- Uses a micro surfacing spreader box rather than a slurry box. This type of box utilizes a strike-off screed rather than the traditional drag as used on a slurry box. This factor makes increased depths possible.

"Continuous" paver – fed with mobile support units, "nurse" trucks.

- Square yards per hour laid down is much higher than with mobil mixer machines due to a constant supply of material being fed into the mixer/application machine while it is working without stopping.
- A reduction of the number of construction joints due to the elimination of having to stop the operation for the change-out of trucks and spreader box for each load.

Traffic control

Traffic control was supplied by both the contractor and a third party traffic control company. Portable light plants were used at intersections and other locations where flaggers were positioned.

Cost and life expectancy

This project averaged around \$3.00 per square yard. Because Gresham participated with a large group of other cities and counties, the cost per sq yd was probably lower than normal. The life expectancy is 6 to 8 years.

Advantages

Thicker than slurry seal.

- Micro surfacing, while similar to a slurry seal operation, can be placed in a thicker layer than a slurry seal. From one half inch (.5") thick to as much as one and one half inch (1.5") thick, in multiple layers to fill raveled wheel ruts and correct minor leveling problems.
- It is a water/oil emulsified compound installed cold, with a temperature as low as 50 F and rising. This allows many micro surfacing operations to be done at night.

It has a quicker cure time so traffic can be allowed on the road sooner than a slurry seal.

- Good candidates are streets with businesses that are primarily open during the day and high volume streets that are difficult to restrict traffic flow.
- Pavement marking can be applied within hours of application.

Disadvantages

Micro surfacing requires special equipment and experienced operators and installers. The cost is higher than a slurry or chip seal treatment.

Observations/Suggestions

We are very pleased with the overall project. The application rate met or exceeded the desired specifications. The construction was of high quality and was finished within anticipated time lines. The equipment was newer and well maintained. Breakdowns were insignificant and were remedied quickly. The operatives were well qualified and accommodating. The workers were proficient and displayed professional public behavior. Cleanup, punch-list attention and billing was quick and complete.

The finish is very dark and closely resembles newly laid HMA. Consequently, it provides a good contrast for pavement marking and is well accepted by the motoring public.

This product is very resilient to traffic but can be negatively affected by adverse weather conditions. The weather limitations in Gresham's contract were: "Micro-surfacing shall only be placed when the ambient and pavement surface temperature is 55°F minimum and rising. Micro-surfacing shall not be placed if rain is falling or is imminent or if there is the possibility that the finished product will freeze within 24 hours." In retrospect, a more conservative approach in regards to rain should have been followed.

Because it's only been two months since the project completion, the durability has not been proven. Early indications are that the micro is very hardy and expectations are that it will last for at least 6 years.

Micro surface provides yet another tool for the pavement manager's virtual pavement maintenance toolbox.

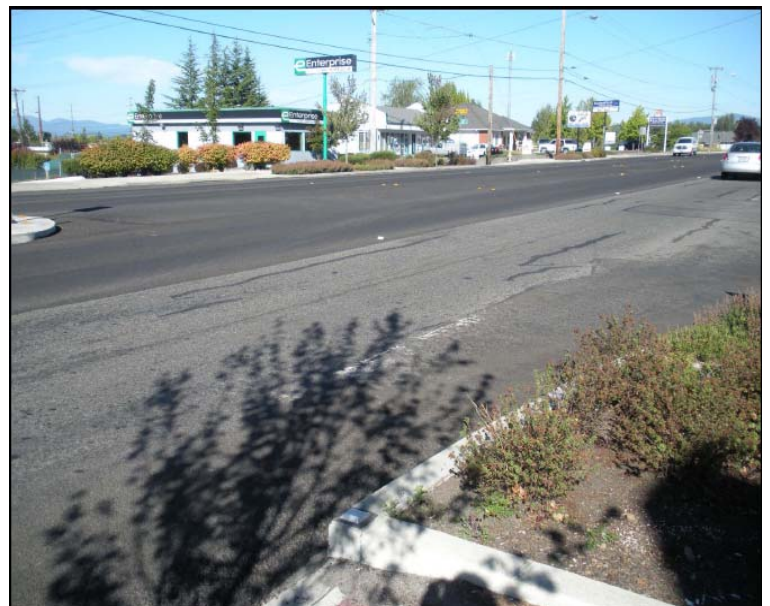
Photos



Northeast Glisan Street, before and after microsealing treatment



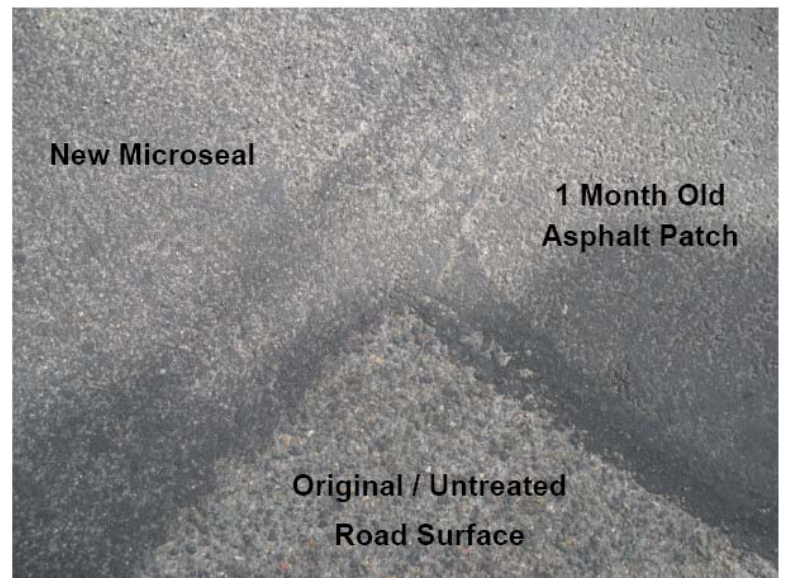
Power Prior to micro surfacing treatment



Powell Street with partially completed microseal treatment



SE Powell Blvd looking east, after micro surfacing



Side-by-side examples