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RESEARCH UPDATE U 2002-3

TIRE CHIPS IN THE BASE COURSE OF A LOCAL ROAD (Final Report)

REFERENCES:

Initial Report: U 91-06, Interim Report: 94-2

INTRODUCTION:

This project responded to the federal demand for alternative uses of recycled tires and to the public's demand for mud free roads in the State of Vermont. Each spring many roads in the state are overwhelmed with excess runoff and high water tables. This project began in 1990, incorporated both of these problems and created a well-drained recycled section of roadway. The site was revisited on May 14, 2002, when observations were made, soil and water samples were collected and a discussion with Clarence Bocash, former Town Road Foreman of Georgia, was conducted.

LOCATION:

The tire chip base was constructed on Town Highway 4, known as Oakland Station Road, in the town of Georgia, Vermont. This class II highway begins at the intersection with Route 7 at MM 2.50, one mile north of the junction with Interstate 89 at Exit 18 and continues north 3.36 miles to an intersection with Town Highway 1, approximately 0.35 miles west of the intersection of VT Route 104. The test section starts approximately 1.3 miles north of the junction with Route 7 and extends northerly for 2500 lineal feet.

TREATMENT:

In 1990 shredded tires were placed in a 330-foot section of Town Highway 4 as the base course layer. The tire chips were designed to serve both as a drainage layer and a barrier to prevent contamination between a wet silty sand subgrade and the gravel base.

Due to the initial success of this section, two more sections were constructed, one in 1991 and another in 1993. The entire road was treated with chip seal in 1994, and in 1998 a cold mix recycled pavement was used and covered with chip seal.

OBSERVATIONS:

On May 14, 2002 this project was revisited in order to check the present condition of the road, and collect water and soil samples. Clarence Bocash was also interviewed to obtain additional information about the construction of the road.

Section 1, which was constructed first in 1990, was constructed by removing 18" of existing material, of which 8" was reused as backfill and 10" was discarded. The chips were placed in the road and then backfilled with existing material and new gravel. This process provided a well-drained interlayer that preventing the water table from rising and causing mud to form on the road. The present condition of the road can be seen in the following photos.

Section 1 constructed in 1990.

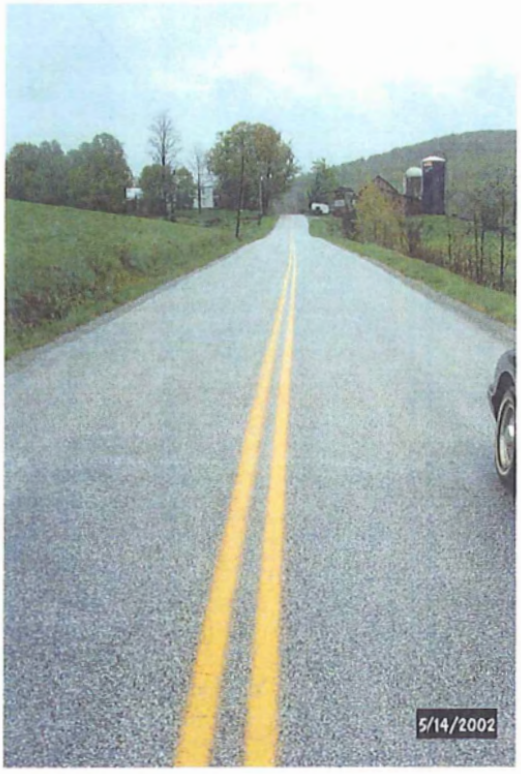
Cracking within Section 1, in the location of the test pit dug in 1993.

Section 2 was constructed in 1991 and a slightly different approach was used. Only 6-8" of material was removed and stockpiled, this material was then mixed with the tire chips and placed in the road. Using the mixture of material and tire chips did not provide enough drainage and the road was muddy again the following spring. The next summer they covered the section with an additional 6-8" of new gravel. Presently Section 2 exhibits the most rutting as seen in the following photos.

Section 2 constructed in 1991.

The ruts in Section 2.

Section 3 was constructed in the same manner as Section 1 and performed the best in terms of rutting and deformation, as shown in the following photo.



Section 3 constructed in 1993.

TESTING:

Four soil samples and two water samples were collected in Sections 1 and 2. The exact locations of the samples are displayed in the attached sheet. Both the soil and the water samples were tested for chloride and sulfate content, aluminum and manganese, and the resistivity and pH were measured.

Sample	pH	Chloride *(ppm)*	Sulfate *(ppm)*	Minimum Resistivity *(OHM/cm)*	Manganese *(ppm)*	Aluminum *(ppm)*
S1	6.57	ND	70	2960	ND	10
S2	7.17	20	660	2590	ND	10
S3	6.94	40	90	2510	ND	100
S4	7.48	20	890	3310	ND	10
W1	6.52	40	**	1163*	ND	10
W2	7.23	50	**	1667*	ND	15

*Resistivity of water sample as received.
** insufficient sample
ND- Not Detected

These results show that none of the elements tested for are present at an unusually high level. The small amounts that are present could be contributed to the intrinsic properties of the soil for example the aluminum present may be due to clay. Testing for indicator metal species that are released by competitive ion displacement support the conclusion that leaching of the metals from the tire chips is minimal. The pH levels are all normal and the conductivities are considered good.

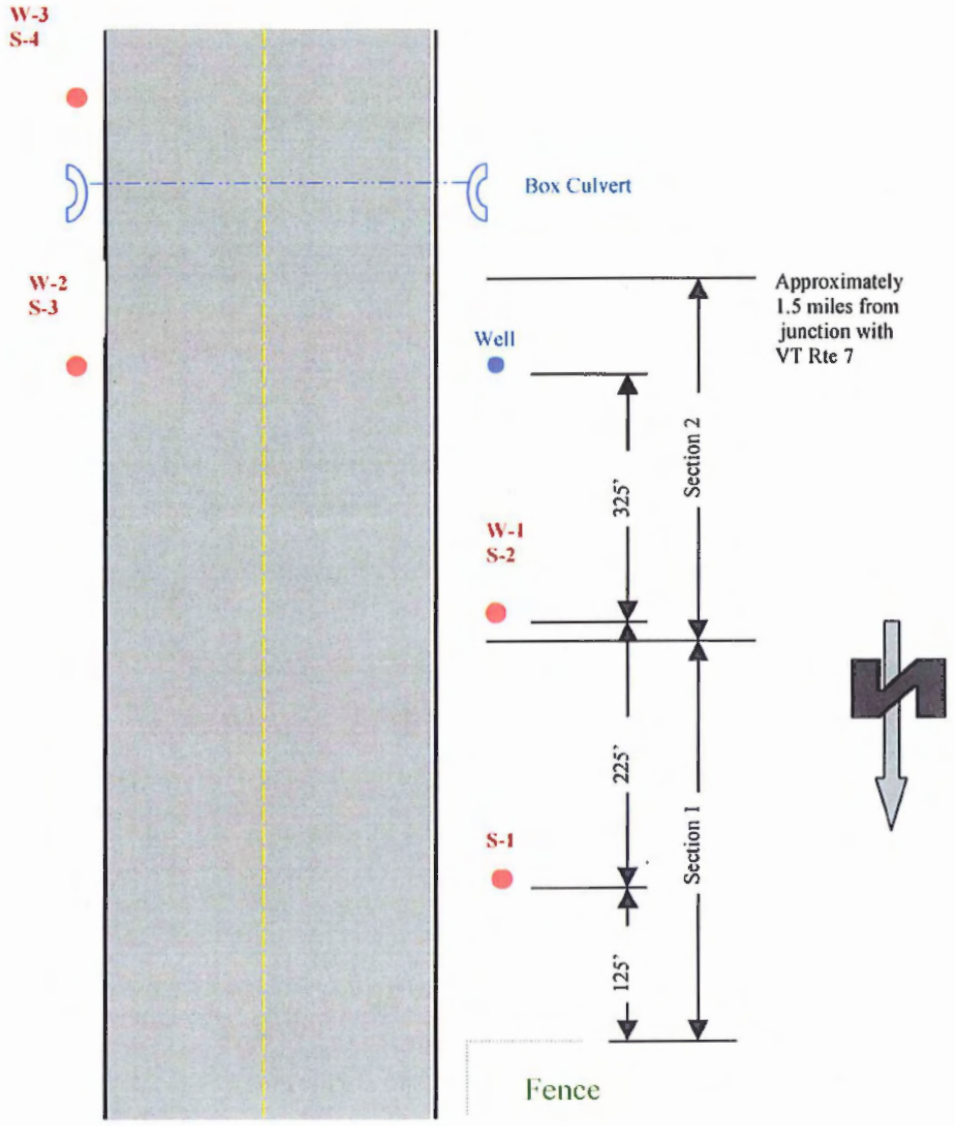
CONCLUSIONS:

This visit confirmed the conclusions drawn in the Interim Report 94-2, generally that the tire chips provided a tightly compacted layer that enhanced the poor performance of the gravel. Causes for improvement may be any or all of the following; an increased amount of drainage and creation of a capillary break in the subbase, weight reduction and increased flexibility of the matrix, and a reduced or altered frost penetration level. In addition it can be concluded that the tire chips are not leaching contaminants tested into the surrounding soil or groundwater. Pavement cracking of the section was evident, as well as rutting when bituminous pavements were applied over the modified subbase.

RECOMMENDATIONS:

The Agency of Transportation should encourage municipalities to utilize tire chip layers in town highway bases, with an emphasis on areas where moisture conditions are a problem and future paving is unlikely. Consideration should be given to the source of the tires and shredding facilities well in advance to the construction of the base course as the supply of tires is not plentiful.

Soil and Water Sample Locations
Oakland State Road
Georgia, VT



S-1: 6" deep 2' off shoulder
S-2: 16" deep 2' off shoulder
S-3: 14" deep 2' off shoulder
S-4: 16" deep 2' off shoulder
Well: Water level was 3" above ground in pipe and 2" from top of pipe. Higher than 6' from bottom of well.