

DIVISION OF RESEARCH, INNOVATION & SYSTEM INFORMATION

Research Initial Scope of Work

SUBMITTAL FORM - FY 2022/23

- I. Project Number: P1690
Project Title: Address Microplastics from Thermoplastic Stripe and Markings
- II. Task Number: 4052
Task Title: Address Microplastics from Thermoplastic Stripe and Markings
- III. Project Problem Statement:
This research project is intended Address microplastic pollutant created from the weathering and abrasion of the state highway thermoplastic stripe and markings. A significant portion of microplastics in the ocean come from roads with some studies showing up to 7% from roadway markings (thermoplastic pavement stripe and markings). Microplastic is a major source of harm to marine life, affecting ocean plankton, a significant carbon sink, producing up to 80% of the earth oxygen, loss of which could significantly increase greenhouse gas and cause entire food webs to collapse. While larger plastic and trash can be picked up or intercepted with trash capture devices, microplastic abraded from thermoplastic is too small to capture. Trash capture devices only capture particles 5 mm and larger, to try to trap smaller particles would clog drainage. Bio-filtration treatment best management practices (BMPs) are also in-effective with microplastics, because the plastic doesn't break down for hundreds of years and will be discharged into waters from with the first larger than water quality design event, unchanged.
- IV. Objective:
 1. Quantify the amounts and their associated impacts of microplastic pollutants from Caltrans sources in the state highway system
 2. Test and develop actionable and effective treatment control plans to remove microplastics pollutants before they discharge to waters and/or develop new materials to reduce or remove the source of microplastic pollutants from roadways
 3. Develop a BMP that will reduce microplastic pollutants for containment and removable of microplastics and/or development of new bio-degradable materials to replace existing materials used for thermoplastic stripe and markings
- V. Task Description of Work and Expected Deliverables:
 1. A scientifically defensible research design to estimate the quantity and impacts of microplastic pollutants from Caltrans thermoplastic stripe and markings in the state highway system
 2. Conduct a field or experimental study or studies where the results will inform the development of a BMP guidance manual

3. Develop a BMP's guidance manual that will help Caltrans practitioners be able to remove microplastic pollutants and/or test new pavement stripe and marking materials that are bio-degradable
4. Write a final technical report with findings of research results and recommendations

VI. Background:

A significant portion of microplastics in the ocean come from roads, a large percent from tires, but also from roadway thermoplastic pavement stripe, markings, and pavement markers. Current full trash capture devices do not intercept microplastics. These only capture all particles 5 mm and larger. Microplastics take hundreds of years to decompose making them untreatable with bio-infiltration BMP's. Caltrans currently has no effective treatment technology for control of microplastic pollutions. Some concepts for removal of microplastics are use of pervious shoulders that trap the particles, followed with high efficiency sweepers. This would be costly and maintenance intensive. Due to difficulty in removing microplastics from the environment, control of the source is often the preferred method, requiring the development of new bio-degradable materials for durable traffic stripe and markings. It is anticipated future legislation will require control of microplastics from Caltrans sources.

VII. Estimate of Duration:

2 years.

VIII. Related Research:

No related research is identified yet.

IX. Deployment Potential:

The proposed research would result in development of a new BMP that could be used by Caltrans practitioners to mitigate the impact of microplastics pollution. To ensure the implementation and deployment of the study results, the panel that will oversee this research project will include Caltrans staff from Division of Environmental Analysis, Office of Stormwater Design, Office of Roadside Maintenance, and Office of Pavement. An attempt will also be made to include staff from State or Regional Water Resources Control Board in the oversight panel.