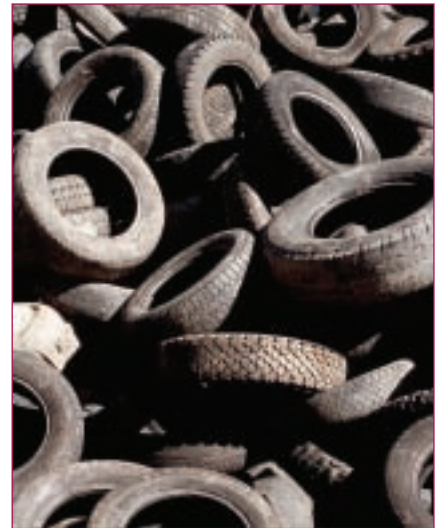

I. INTRODUCTION

This report is designed to place health and environmental exposures to ground-up recycled tires (“tire crumbs”) and mulch in a scientifically based qualitative and quantitative context. In the spring of 2007, Environment and Human Health, Inc. received numerous inquiries about health concerns with respect to children’s exposures to ground-up rubber tires that are the in-fill material in the new synthetic turf fields. Such fields have been installed, or are being proposed, in towns all over Connecticut and many other states.

The safety information about the new synthetic fields has mainly focused on the health benefits from the reduction of joint injuries due to the use of the rubber tire crumbs in the new fields. Public health analysis of the health risks from human exposures to the rubber tire crumbs has not been adequately addressed up to this point.

Research shows that the new synthetic fields are surfaced with a product called “in-fill” that is made from recycled rubber tires. This material, referred to as tire crumbs, constitutes the primary playing surface. We estimate these crumbs to be as much as 90% by weight of the fields. The tire crumbs are roughly the size of grains of course sand. They are made by shredding and grinding used tires. Tire crumb materials are spread two to three inches thick over the field surface and packed between ribbons of green plastic used to simulate green grass.



Review of the immediately available literature about these new fields found that similar health concerns had been raised in other states, as well as in other countries. In addition to athletic fields, shredded tires are being used on playgrounds and as gardening mulch.

There have been some studies done on the health effects from exposures to the rubber crumb material, but many of these studies present only partial assessments of the human health risk potential. In addition, many studies have major data gaps with respect to the chemicals released, as well as the actual levels of exposures in humans and the environment.

From the available information, it was found that tire crumbs contained volatile organic hydrocarbons (VOCs) with carcinogenic potential, which could be extracted from the crumbs in the laboratory. Health reports from workers in the rubber fabrication industry and in the rubber reclamation industry describe the presence of multiple volatile organic hydrocarbons, semi-volatile hydrocarbons, and other toxic elements in the air. Studies at tire reclamation sites report the leaching of similar sets of chemicals into the ground water. Occupational studies document a spectrum of health effects, ranging from severe skin, eye, and respiratory irritation to three forms of cancer.¹

The relationship between exposures affecting the rubber workers and those experienced by people using athletic fields, or children in playgrounds covered with ground-up rubber tire material is not known, but we do know that many of the same chemicals that rubber workers are exposed to are being released from the ground-up rubber tire crumbs.

Based on the uncertainty with respect to what these exposures mean for children's health, as well as the environmental leaching of the materials into the ground water, EHHI decided to initiate an exploratory study with the Connecticut Agricultural Experiment Station to determine the chemicals released into the air and water under ambient conditions.



Samples of ground-up rubber tire gardening mulch and tire crumbs used in the new synthetic fields were obtained for laboratory evaluation at the Connecticut Agricultural Experiment Station (see Appendix I). One set of experiments tested the *leaching potential* of the metals from samples of tire crumbs and one sample from commercial rubber mulch.

The second set of experiments tested the *chemicals released* from the tire crumbs used for “in-fill” and commercial rubber mulch. Ten metals were leached from the samples of tire crumbs and the tire mulch in the first experiment. Twenty-five chemical species were identified with 72% to 99% certainty in the mass spectrometry and gas chromatography analysis in the second experiment. Nineteen were identified with over 90% certainty and five with over 98% certainty. Confirmatory studies provided a definitive identification of four of the major chemicals released.