Potential Benefits of Using Carbon Dioxide Mineralization Concrete for Future Austin Infrastructure Projects Utilizing Concrete

There is a growing awareness that climate change, whether caused by human activity, natural climatic cycles, or a combination of both is occurring and that action is necessary to increase resilience in our community to climate change impacts; and

The Intergovernmental Panel on Climate Change, an intergovernmental body of the United Nations that is dedicated to providing the world with an objective, scientific view of climate change, reported in 2013 that the last 30 years were the warmest since 1850 and likely the warmest in the past 1,400 years; that carbon dioxide, methane, and nitrous oxide levels are at their highest levels in 800,000 years; and that global mean sea level rose 0.62 feet from 1901 to 2010; and

In 2007, the City of Austin's Mayor and Council approved a resolution to make Austin a leading city in the fight against climate change by establishing the goal of carbon neutral municipal operations by 2020. According to the Carbon Disclosure Project, at the time this was the most aggressive greenhouse gas reduction goal for municipal operations in the United States; and

In June of 2015, Council adopted the Austin Community Climate Plan to achieve community-wide net-zero greenhouse gas emissions by 2050. The plan contains over 130 actions that will reduce emissions from energy, transportation, and materials and waste sources, and sets interim reduction targets for 2020, 200, and 2040; and

Concrete is the most widely used construction material in the world because of its low cost, strength, and durability, among other factors, and is a major component of many types of civil construction projects, such as buildings, wastewater treatment facilities, stormwater, and transportation infrastructure; and

However, cement, the critical ingredient that gives concrete its strength, is responsible for up to seven percent of the world's carbon dioxide (CO2) emissions, largely through a chemical process called calcination, as well as through the use of energy derived from the combustion of fossil fuels; and

Carbon dioxide mineralization in concrete is when the concrete that has undergone active carbonation treatment during mixing such that carbon dioxide is injected during mixing and is mineralized within the concrete. Carbon dioxide mineralization reacts with calcium ions from cement to form a nano-sized calcium carbonate mineral that becomes permanently embedded in the concrete. Utilization of carbon dioxide in concrete results in carbon dioxide that is chemically transformed into a mineral form, which means it will not be released into the atmosphere as a greenhouse gas. This process has been used in other parts of the United States at little or no additional cost; and

The annual benefits of the use of this concrete in Central Texas, if universally utilized, would be equivalent to the carbon sequestration for tens of thousands of acres of preserved forest.

The piloting, evaluation, and utilization of this process could provide significant benefits to the City and the support of the Environmental Commission and the Austin City Council could accelerate the potential adoption of post-industrial carbon dioxide mineralized concrete for use in all City of Austin capital improvement projects utilizing concrete where the utilization of carbon dioxide mineralized concrete does not significantly increase the costs of or significantly delay the project.