ICF International Technical Memorandum
Air Quality Modeling and Health Impacts Assessment
For Southeastern North Carolina
Frequently Asked Questions

Who prepared the analysis?

ICF International (www.icfi.com) ("ICF") prepared the report. ICF partners with government and commercial clients to deliver consulting services and technology solutions in environment, energy, transportation, economics, social programs, and homeland security. For more than 35 years, ICF's Air Quality Modeling (AQM) group has been a leader in the development and use of advanced analysis and modeling tools to support air quality assessments of primary and secondary pollutants, including ozone, carbon monoxide, toxics, mercury, $PM_{2.5}$, and regional haze and visibility. Funding for ICF's analysis was provided by the Education Foundation of America through a grant to the Stop Titan Action Network, and through citizens' fundraising and donations.

How is this analysis different than DAQ's analysis for the Draft Air Permit?

ICF's analysis is fundamentally different than DAQ's. In preparing the Draft Air Permit, DAQ evaluated ambient air concentrations of certain pollutants at the boundary of Titan's proposed project. Using a more advanced pair of models, ICF analyzed the effect of Titan's proposal on ambient air concentrations throughout southeastern North Carolina and the health effects of that pollution on residents of New Hanover, Pender, and Brunswick counties. ICF's analysis is the only publicly released analysis that estimates the potential health effects of Titan's proposed facility.

How does the analysis calculate health effects?

The study evaluates health effects of Titan's proposed cement plant in a two step process. First, ICF used the Community Multiscale Air Quality Modeling System ("CMAQ") to determine the effect of Titan's facility on ambient air quality in southeastern North Carolina. ICF's analysis compared air quality with and without the proposed facility. ICF then applied Environmental Benefits Mapping & Analysis Program ("BenMAP") to the air quality estimates produced by CMAQ. BenMAP applies information from epidemiological studies evaluating the health effects of air pollution to estimate the health effects of specific changes in air quality for a given location. Both CMAQ and BenMAP are widely used to evaluate air quality impacts.

What did the analysis find?

ICF's analysis estimates that pollution from Titan's facility increase ozone and fine particle levels and estimates significant health effects from that pollution. The results of the analysis are displayed in the tables below.

Table-2. BenMAP Results for Ozone-Related Morbidity Based on a Five-Month Analysis Period: Increase in the Incidence of Various Morbidity Endpoints Associated with Emissions from the CCC Facility.

Epidemiology Literature	No. of Cases (3-County Area)
Emergency room visits, respiratory (all ages)	0
Hospital admissions, respiratory (all ages)	1
Acute ozone-related respiratory symptoms (& minor restricted-activity days) (age 18-65)	530
School or activity loss days (age 5-17)	160
Reduced worker productivity days (age 18-65)	320

Table-6. BenMAP Results for $PM_{2.5}$-Related Morbidity Based on a Five-Month Analysis Period: Increase in the Incidence of Various Morbidity Endpoints Associated with Emissions from the CCC Facility.

Epidemiology Literature	No. of Cases (3-County Area)
Chronic bronchitis (age >=25)	<1
Emergency room visits for asthma (age <17)	<1
Acute bronchitis (age <17)	1
Asthma exacerbation (age <17)	13
Lower respiratory symptoms (age <17)	8
Upper respiratory symptoms (age <17)	6
Acute PM-related respiratory symptoms (& minor restricted-activity days) (age 18-65)	320
Work loss days (age 18-65)	54
Nonfatal myocardial infarction (age >17)	<1
Hospital admissions - respiratory (all ages)	<1
Hospital admissions - cardiovascular (age >17)	<1

The results also estimate approximately one premature death will occur each May through September due to $PM_{2.5}$.

Why does the analysis only cover May through September?

The analysis focuses on two key pollutants, ground-level ozone and fine particles. Ozone is formed when nitrogen oxides ("NO_x") and volatile organic compounds ("VOCs") react with sunlight. Ozone levels are highest, and pose the most significant health risk, during the summer months when hot weather and sunlight contribute to ozone formation. According to the EPA, ozone can cause a variety of respiratory problems and may aggravate bronchitis, emphysema, and asthma as well as permanent lung damage. Fine particle pollution ("$PM_{2.5}$") is a year-round health risk, which EPA states can cause asthma attacks, breathing difficulties, irregular heartbeats, nonfatal heart attacks, and premature death in individuals with heart or lung disease. The study was designed to evaluate impacts from May through September to capture peak ozone levels and to allow the study to be completed before DAQ takes final action on the Draft Air

Permit. The study sponsors are considering extending the $PM_{2.5}$ analysis an entire calendar year to evaluate the full impacts of the proposed facility.