Health Risks of A Proposed Compressor Station in Weymouth, Massachusetts

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A report by

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Summary and Recommendations:

Physicians for Social Responsibility (PSR) represents the voices of more than 50,000 physicians and health professionals on the greatest threats to human health.

In this report, Greater Boston PSR details our grave concerns about the health impact and emergency response hazards of a natural gas compressor station that Algonquin Gas Transmission, LLC (a subsidiary of Spectra Energy) proposes to construct in Weymouth, Massachusetts, in the Fore River Basin. We also specifically reject the conclusion of the January 2019 health impact assessment (HIA) released by the administration of Governor Charlie Baker, which claims that the proposed compressor station will have 'no health impact.'

The members of Greater Boston PSR who authored this report are experts in public health, cancer epidemiology, occupational medicine, environmental health, emergency medicine, disaster preparedness, and the health effects of climate change.

Our conclusions are as follows:

- The Weymouth site is too densely populated for a high-pressure compressor station that processes highly flammable gas. Compressor stations are almost never sited in densely populated, coastal areas like Weymouth. Residents living nearby, particularly children, the elderly and the disabled, could not be safely evacuated in the event of an emergency.

- The health impact assessment shows that residents of the Fore RIver Basin are already burdened with excess rates of lung disease, heart disease and cancer. These people -- nearly half of whom are considered an 'environmental justice' population as defined by the Baker administration[1] -- require greater, not lesser, environmental safeguards to protect their health.

- The health impact assessment shows that residents of the Fore River Basin are already burdened with elevated levels of hazardous air pollutants. These air pollutants are associated with human diseases, including cancer. Hazardous air pollutants will increase further with the construction of the proposed compressor station. Residents of the Fore River Basin deserve cleaner air, not more polluted air.

[1] Environmental justice communities are identified in order to address the disproportionate environmental health burdens borne by low-income and minority communities. The Massachusetts Executive Office of Energy and Environmental Affairs defines an environmental justice community as one whose annual median household income is less than 65 percent of the statewide median, where 25% or more of the residents identify as a race other than white, or where 25% or more of households have no one over the age of 14 who speaks English only or very well.

- Governor Baker, the Department of Public Health and the Department of Environmental Protection have rushed out a flawed and incomplete health impact assessment, the conclusion of which is contradicted by data presented in the body of the report. Furthermore, Governor Baker directed the health impact assessment to disregard the substantial public safety and emergency response hazards related to the proposed compressor station.

- The proposed compressor station, owned by a Houston-based company, will be used to transport natural gas extracted by hydraulic fracturing through New England for sale overseas. The air pollutants, safety hazards, and greenhouse gas emissions will stay here in Massachusetts, even as the gas will be sold and the profits accrued elsewhere. Our state's greenhouse gas emissions will be increased by this project, at a time when climate change represents an ongoing public health threat to all residents of Massachusetts.

We call on Governor Baker to protect the health and lives of the residents of Massachusetts by rescinding the air quality permit for the proposed compressor station in Weymouth.

Report:

The following report is issued by Greater Boston Physicians for Social Responsibility (PSR), an organization that represents the voice of physicians and health professionals on the greatest threats to human health. The members of Greater Boston PSR who authored this report are experts in public health, cancer epidemiology, occupational medicine, environmental health, emergency medicine, disaster preparedness and the health effects of climate change.

The report has three purposes:

Section 1: To outline our professional concerns about the safety and emergency response hazards associated with the proposed construction of a natural gas compressor station by Algonquin Gas Transmission in Weymouth, Massachusetts .

Section 2: To explain why we reject the conclusion of the health impact assessment (HIA) released January 4, 2019 by the Metropolitan Area Planning Council, the Massachusetts Department of Public Health, and the Massachusetts Department of Environmental Protection that the proposed compressor station will have 'no health impact.'

Section 3: To outline our professional concerns about the broader effects of the proposed project on climate resilience and human health in Massachusetts.

Background:

Proposed construction of a natural gas compressor station in Weymouth, Massachusetts

Algonquin Gas Transmission, LLC (a subsidiary of Spectra Energy) has proposed the construction and operation of a new interstate gas transmission compressor station at 50 Bridge Street in Weymouth, Massachusetts, in the Fore River Basin. Weymouth is a coastal town, on the shores of Hingham Bay, and the town's territory includes Grape Island, Slate Island and Sheep Island, all of which are part of the Boston Harbor Islands National Recreation Area. Four communities (Quincy, Weymouth, Braintree and Hingham) surround the site, and immediately adjacent to the site are three densely populated residential neighborhoods (Quincy Point, Germantown and North Weymouth). Two neighborhood parks (King's Cove and Lovell's Grove), which are among the only parcels of undeveloped land in the area, share a property line with the proposed site.

The residential community is surrounded by existing heavy industrial development, including gas and oil storage tanks, a hazardous waste processing facility, a biofuel processing facility, a

fertilizer processing and pelletizing plant, a municipal power plant, one of the largest gas and oil fired power generating plants in the state, and a sewage pumping station. The Fore River is also a Designated Port Area that is frequented by ocean vessels, tugs, and ferries, and provides water-dependent industrial uses. A bridge over the Fore River between Quincy and Weymouth is adjacent to the proposed site and is used for more than 30,000 vehicle crossings a day. **The proposed Weymouth compressor station would be sited on one of the smallest and most densely populated locations in the country and would be the only interstate compressor station in the country built in a coastal zone which is prone to flooding.**

The proposed compressor station supports the expansion of the Algonquin Gas Transmission pipeline system to allow transportation of natural gas, extracted by hydraulic fracturing, onto the Maritimes and Northeast Pipeline, LLC system that connects the northeastern United States and Canada. The compressor station is a central component of the Atlantic Bridge Project, which will facilitate the sale of U.S. natural gas to international markets. The compressor station would be equipped with a 7,700 horsepower natural gas-fired turbine-driven compressor unit, with an additional turbine unit planned under a subsequent pipeline expansion. Emissions from the proposed compressor station will result from the gas-fired systems, from planned and emergency gas releases ("blowdowns"), from leaks from above ground components, and from separator vessels and storage tanks. The yearlong construction process will also require diesel-powered equipment that will produce emissions.

Health concerns about natural gas infrastructure

Physicians for Social Responsibility (PSR) has raised concerns about the health risks of natural gas extraction and infrastructure.[2] The unique hazards of the proposed site in Weymouth, Massachusetts amplify these concerns. A growing body of medical and scientific literature demonstrates that natural gas compressor stations release substantial volumes of methane and hazardous air pollutants.[3] For example, a recent analysis by the University of Albany based on data reported by the gas industry, determined that the 18 natural gas compressor stations in New York State had emitted 40 million pounds of 70 different contaminants over a seven-year period, making natural gas compressor stations the seventh largest point source of air pollution in the state.[4] By volume, the largest emissions were nitrogen oxides, carbon monoxide, volatile organic compounds, formaldehyde, and particulate matter. In 2017, researchers from the University of Texas studied emissions from natural gas compressor stations in Pennsylvania

[2] Too Dirty, Too Dangerous: Why Health Professionals Reject Natural Gas. A Report from Physicians for Social Responsibility. Available at: https://www.psr.org/wp-content/uploads/2018/05/too-dirty-too-dangerous.pdf

[3] Compendium on Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking, March 2018. Concerned Health Professionals of New York and Physicians for Social Responsibility. Available at https://www.psr.org/wp-content/uploads/2018/04/Fracking_Science_Compendium_5.pdf

[4] Russo, P. N., & Carpenter, D. O. (2017, October 12). Health effects associated with stack chemical emissions from New York State natural gas compressor stations, 2008-2014. Retrieved from https://www.albany.edu/about/assets/Complete_report.pdf

and New York and determined that plumes of methane, and presumably co-emitted air pollutants, were measurable at a distance of at least one mile away, especially during temperature inversions i.e. when air is warmer at higher altitudes.[5]

Of special concern to Greater Boston PSR was the fact that a community group of citizen-scientists had demonstrated that eight volatile organic compounds, including benzene, were detectable in air samples from Weymouth.[6] Benzene is a 'hazardous air pollutant' i.e. a pollutant that is known or suspected to cause cancer or other serious health effects.[7] There are no safe levels of exposure to hazardous air pollutants like benzene. Furthermore, data in the medical literature have now established that there is also no safe level of exposure to particulate matter.[8-9] We contend that state and federal air quality regulations, under the current Clean Air Act, have fallen behind the medical literature, and do not adequately protect public health. We also note that federal and state environmental regulations are aimed at protecting large regional populations, and by necessity do not consider individuals who live closest to industrial sites and who may be exposed locally to higher concentrations of air toxins. These risks are highest for children, the elderly and those with pre-existing illnesses.

Calls for a health impact assessment for the proposed compressor station in Weymouth

In recognition of the health dangers of living near natural gas infrastructure, **the Massachusetts Medical Society and more than 90 municipal boards of health have written to Governor Baker calling for health impact assessments** (HIA) for any new natural gas infrastructure projects in the Commonwealth.[10] The Greater Boston chapter of PSR has supported this work by our state's top medical voices, and we also wrote to Governor Baker on August 1, 2017 specifically urging him to appoint a qualified team to perform a HIA regarding the proposed compressor station in Weymouth. These efforts underscore the substantial concerns that the Massachusetts medical and public health community has regarding the health impact of natural gas infrastructure.

In July 2017, Governor Baker directed the Massachusetts Department of Public Health (DPH) and Department of Environmental Protection (DEP) to perform a HIA focused on the air quality impacts of the proposed Algonquin Gas Transmission compressor station in Weymouth. Rather than have the DPH evaluate the substantial public safety and emergency response concerns related to the proposed compressor station, Governor Baker instead directed the Secretary of Public Safety and the Secretary of Energy and Environmental Affairs to 'facilitate an opportunity' for the public to raise its safety concerns to the Pipeline and Hazardous Materials Safety

[5] Payne, B. F., Ackley, R., Wickler, A. P., Hildenbrand, Z., Carlton, Jr., D. D., & Schug, K. A. (2017). Characterization of methane plumes downwind of natural gas compressor stations in Pennsylvania and New York. *Science of the Total Environment*, 580, 1214-21.
[6] https://www.nocompressor.com/news/2017/7/26/24-hour-air-quality-test-results
[7] https://www.epa.gov/haps
[8] Berger et al. Air pollution still kills. N Engl J Med 2017; 376:2591-2592
[9] Di et al. Air pollution and mortality in the Medicare population. N Engl J Med 2017; 376:2513-2522
[10] https://www.nocompressor.com/news/2017/7/26/24-hour-air-quality-test-results

Administration (PHMSA). He further directed the Massachusetts Office of Coastal Zone Management to review the safety of the proposed compressor station under coastal storm conditions, taking into account rising sea levels. Responsibility for the execution of the HIA was given to the Metropolitan Area Planning Council, and the HIA was initiated in June 2018 with a six-month timeline. This timeline is substantially shorter than the timeline suggested by DEP Secretary Matthew Beaton in a December 1, 2017 letter to Senator Patrick O'Connor, in which he asserted that the HIA should take 10-12 months.

Concerns about the HIA

Greater Boston PSR participated in the public scoping for the HIA and followed the process closely, but raised early concerns. On November 7, 2018, we wrote to Dr. Monica Bharel, the Massachusetts DPH Commissioner, to point out that the HIA had identified significantly higher levels of coronary artery disease and chronic obstructive pulmonary disease among residents of the Fore River Basin compared with the rest of the state, making them uniquely vulnerable to the health effects of additional air pollution from the proposed compressor station[11]. We also noted that insufficient air quality data had been collected to satisfy the objectives of the HIA. On December 10, 2018 we wrote to Thomas McGrath, chief of the Massachusetts DEP Air Assessment Branch, requesting that additional air quality monitoring be performed as part of the HIA, including (1) the establishment of a long-term air quality monitoring site in the Fore River basin, (2) the addition of nitrogen dioxide (NO_2) monitoring to account for maritime emissions, and (3) the specific monitoring of volatile organic compounds and aldehydes to further evaluate existing air quality problems that were identified as part of the HIA. Despite the request of GB PSR and community organizations, the Massachusetts DEP performed only two phases of limited air quality monitoring to establish baseline conditions in the Fore River Basin. The HIA also opted to rely on Algonquin Gas Transmission's air modelling and estimates of emissions, rather than pursuing an independent evaluation.

Findings of the HIA

The HIA was issued on January 11, 2019. The HIA disregarded the safety and emergency response risks of the proposed compressor station. The HIA identified statistically significant elevations in rates of cardiovascular and respiratory diseases, as well as multiple types of cancer, in the four municipalities surrounding the proposed site, compared with the rest of the state. There were particularly striking elevations of lung and bronchus cancer rates in the 'focus area' immediately adjacent to the proposed compressor station; this area is an environmental justice community.[12] Environmental justice communities are identified in order to address the

[11] GBPSR Letter to DPH Commissioner Monica Bharel, November 2018, available at https://gbpsr.org/wp-content/uploads/sites/11/2018/11/2018-11-7-gbpsr-board-letter-weymouth-compressor.pdf

[12] The Massachusetts Executive Office of Energy and Environmental Affairs defines an environmental justice community as one whose annual median household income is equal to or less than 65 percent of

disproportionate environmental health burdens borne by low-income and minority communities.[13]

The HIA identified that existing levels of the hazardous air pollutants formaldehyde, acrolein and benzene were above the Massachusetts DEP Allowable Ambient Limit in the communities of Weymouth, Quincy and Braintree, and that the levels of formaldehyde were also periodically above the Massachusetts DEP Threshold Effects Exposure Limit in Weymouth. The Threshold Effects Exposure Limit represents a 'cap' on allowed chemical concentrations and should not be exceeded in air concentrations averaged over a 24-hour period.[14] The HIA offered no quantitative investigation of whether the existing elevated levels of air toxins were related to the elevated disease rates in the communities surrounding the proposed compressor station. The HIA relied exclusively on air quality modeling provided by the project proponent, Algonquin Gas Transmission, to predict the effects of the proposed compressor station on local air quality. This modeling, in fact, demonstrated that levels of formaldehyde, acrolein and benzene would exceed Allowable Ambient Limits and Threshold Effects Exposure Limits in the area adjacent to the proposed compressor station.

In sum, the HIA found that the Fore River Basin is already afflicted by high levels of air toxins and pollution; that it is a community already struggling with an increased burden of cardiovascular and respiratory illnesses and cancers; and that the proposed compressor station is, even by data provided by the company itself, likely to worsen the health and safety of this already at-risk community. The air quality and human health data within the body of the final HIA report is curiously played down in the conclusion of the report, but it clearly demonstrates that the **the proposed compressor station poses an unacceptable health risk for the surrounding community**. This is aside from the greenhouse gas emissions from the proposed compressor station and associated infrastructure, which in an era of climate change pose a health risk to all residents of the state.

Section 1: Greater Boston PSR outlines our professional concerns about the safety, emergency management and disaster response hazards posed by the proposed compressor station and calls for a formal evaluation of the risks and results of an accidental explosion or other disaster at the site.

There are significant safety, emergency response, and disaster preparedness concerns related to the siting of the proposed compressor station in a densely populated area in Weymouth with limited vehicular access. Governor Baker inappropriately directed the HIA to ignore these health, safety and emergency response risks, when these are in fact traditionally and

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the statewide median, where 25% or more of the residents identify as a race other than white, or where 25% or more of households have no one over the age of 14 who speaks English only or very well.

[13] https://www.epa.gov/sites/production/files/2017-09/documents/epa_office_of_environmental_justice_fact sheet.pdf

[14] https://www.mass.gov/files/documents/2016/08/tc/aaltel11.pdf

appropriately included in a HIA. As physicians -- including physicians with experience in emergency medical systems and disaster preparedness -- we have deep concerns about locating a high-pressure gas compressor in a densely populated area.

Natural gas is a flammable, compressed and explosive gas that is inherently dangerous. Pressure in interstate pipelines ranges from 200 to 1,500 pounds per square inch (PSI); this pressure is built up by compressor stations, such as the station proposed for Weymouth.[15] There have been numerous documented pipeline explosion events in the United States.[16] In September 2018, a series of 80 simultaneous gas explosions in the Merrimack Valley damaged more than 130 buildings, injured 23 people (including two firefighters) badly enough to require hospital evaluations, and killed one person. According to preliminary findings by the National Transportation Safety Board[17], workers were upgrading a series of cast-iron gas pipes first installed in the early 1900s, and a low-pressure system that usually experiences about 0.5 psi of gas pressure was accidentally filled with about 6 psi.[18] **The proposed compressor station will be dealing with gas under up to 250 times more pressure than in the Merrimack Valley disaster.** The existing gas pipeline that will be transporting this pressurized gas is less than 20 feet from the southern foundation of the Fore River Bridge, which carries 30,000 cars a day.

Health risks from an emergency event at the site could include disasters of multiple types, and significant regional planning is needed to ensure preparations for an appropriate response. There are a number of sensitive facilities within a 2-kilometer (1.2-mile) radius of the proposed compressor station site, including six schools (with a combined student population of approximately 1,700 children), elderly housing, nursing homes and a mental health facility.

Compressor stations are rarely built in such densely populated areas, and the same is true for interstate transportation pipelines. This is because natural gas pipeline and compressor station disasters have catastrophic potential, as demonstrated by these recent explosions:

- Armada Township, MI, January 30, 2019 (just days ago): An equipment malfunction at a Consumers Energy natural gas compressor station in rural Michigan caused a dramatic fire and an explosion that was felt miles away.[19]
- Refugio, TX, February 2017: A natural gas pipeline explosion in a sparsely populated area about 160 miles southwest of Houston could be seen for miles and shook homes more than 20 miles away.

[15] http://naturalgas.org/naturalgas/transport/
[16] Compendium on Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking, March 2018. Concerned Health Professionals of New York and Physicians for Social Responsibility. Available at https://www.psr.org/wp-content/uploads/2018/04/Fracking_Science_Compendium_5.pdf
[17] https://www.ntsb.gov/investigations/AccidentReports/Pages/PLD18MR003-preliminary-report.aspx
[18] Letter to NiSource and Columbia Gas of Massachusetts from Senators Edward Markey and Elizabeth Warren on September 17, 2081, accessed at: https://www.markey.senate.gov/imo/media/doc/Letter%20to%20NiSource%20and%20Columbia%20Gas.pdf
[19]https://www.detroitnews.com/story/news/local/macomb-county/2019/01/30/no-injuries-after-fire-armada-natural-gas-facility/2721353002/

- Salem Township, PA, April 2016: An explosion of a Spectra pipeline in a rural area about 30 miles east of Pittsburgh was so large that it showed up on local radar as a 40-mile long weather front. It destroyed one house 200 feet away, melted the siding off of a house 0.2 miles away, charred trees and telephone poles about a mile away, and led to the hospitalization of a man in his 20s with 3rd degree burns over 75% of his body. The explosion of this pipeline, which at the time was operating at about 1,000 psi, made a crater 30 feet wide, 50 feet long and 12 feet deep. (For comparison, the proposed Weymouth compressor will be operating at more than 1,400 psi and is 20 feet from the foundation of the heavily-trafficked Fore River bridge.)
- Watford City, ND, December 2015: An explosion of a compressor station north of Watford City cracked drywall and knocked pictures off of the walls of homes about a mile away. Locals described it as "like a truck had hit the house going 75 mph" or like someone "had picked up the house and dropped it."

Placing this sort of heavy-industrial infrastructure among schools, eldercare and healthcare facilities would create tremendous challenges for disaster planning and preparedness. If an emergency situation were to occur while school is in session, 1,700 children would need to be evacuated to a safe area on short notice. Hundreds of senior citizens could also require evacuation; this presents immense logistical difficulties because these elderly individuals are located in a small geographic area, and because the evacuation process could be complicated by existing medical conditions (i.e. being wheelchair bound, etc.).

We consider it highly doubtful that enough emergency transportation will be available to make a timely evacuation of school children, senior citizens in elderly housing, mental health patients, and nursing home patients if an accident were to occur at the site of the proposed compressor station. We also question whether disaster preparedness experts in emergency medical services, at the Massachusetts Emergency Management Agency, or at the Massachusetts Executive Office of Public Safety and Security would agree with building this sort of infrastructure in a populated area.

Section 2: Greater Boston PSR rejects the conclusion of the HIA that the proposed project would have 'no health impact.' We outline our specific reasons for this below.

1. The HIA did not perform an appropriate air quality assessment

The Massachusetts DEP performed two phases of air quality monitoring for the HIA. These assessments were limited in duration, seasonality and scope:

- The first phase of monitoring was conducted from July 7, 2018 through August 12, 2018. The Massachusetts DEP placed six air sampling canisters that collected 24-hour volatile organic compound (VOC) samples at five locations around the Fore River Basin on an every 6th day schedule for 7 weeks (See Figure 45 in the HIA).

- The second phase of monitoring was conducted from August 1, 2018 through November 30, 2018. The Massachusetts DEP operated a semi-continuous monitor with a gas chromatograph at the Weymouth MWRA pump station to collect samples of benzene, toluene, ethylbenzene and xylenes. MassDEP also collected 24-hour formaldehyde and acetaldehyde samples every 6 days at the same location.

We consider this air quality assessment insufficient for the following reasons:

a. The HIA did not assess existing conditions of nitrogen oxides (NO_x) or the impact of the proposed project on nitrogen oxides. Nitrogen oxides, particularly nitrogen dioxide (NO_2), are highly reactive gases that are emitted during the burning of fuel in cars, trucks, buses, marine vessels, power plants, and other industrial sources. The Massachusetts DEP does not currently operate an NO_2 monitoring site in the Fore River Basin, nor did it perform an adequate assessment as part of the HIA. Instead, the HIA simply restated the Algonquin Gas Transmission data that were provided as part of the permitting process.

b. The HIA did not assess existing conditions of ground level ozone or the impact of the proposed project on ground level ozone. Ground level ozone is created by chemical reactions between NO_x and volatile organic compounds (VOC). This happens when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight. The HIA correctly notes that ground level ozone is the most problematic major air pollutant in Massachusetts (page 72). Massachusetts recently experienced several days in the summer during which ground level ozone concentrations exceeded the National Ambient Air Quality Standards. The HIA also correctly notes (page 72) that the compressor station will emit additional ozone precursors (NO_x and VOCs). The Massachusetts DEP does not currently operate a ground level ozone monitoring site in the Fore River Basin, nor did it perform an assessment as part of the HIA. Therefore, the true health impact of emitting more ozone precursors is unknown, as are the potential health effects of even higher ground level ozone concentrations.

c. The HIA did not perform air quality monitoring in the winter, when VOC levels are frequently highest.

d. The air quality modeling did not incorporate mobile sources of air pollutants (i.e. any pollution source moving on land or water). Emissions from mobile maritime and vehicular sources are substantial in the Fore River Basin; more than 30,000 vehicles per day cross the bridge adjacent to the proposed site. The Designated Port Area is also busy and serves ocean shipping vessels, ferries, tugs, and recreational marine vessels. Emissions that result from motor vehicle and ocean vessel exhaust include NO_x, particulate matter, and VOCs.

e. The HIA did not assess the cumulative or interactive effects of air pollutants, nor did the HIA combine meteorological data with the distribution of individuals with preexisting illness to identify downwind populations with a higher risk of exposure to air pollutants.

2. The HIA identified existing and anticipated air quality hazards in the Fore River Basin -- particularly in Weymouth -- but failed to associate these air quality hazards with their known health effects.

a. The first phase of monitoring identified that **levels of benzene and formaldehyde in the Fore River Basin were consistently above the Allowable Ambient Limit**. The l**evels of formaldehyde in Weymouth were also periodically above the Threshold Effects Exposure Limit** (Figures 41-44). According to the Massachusetts DEP definition, "chemical concentrations in air averaged over a 24-hour period should not exceed the Threshold Effect Limit, even if the concentration in air is below the Allowable Ambient Limit when averaged over a longer time period." [20]

b. The first phase of monitoring identified a spike in benzene concentrations in five of the six sampling canisters on August 6, 2018 (Figure 47-48), but this was not investigated further.

c. The second phase of monitoring identified that **levels of benzene in Weymouth were above the Allowable Ambient Limit** (Figure 49), and that **levels of formaldehyde were above the Threshold Effects Exposure Limit** (Figure 52).

d. The second phase of monitoring identified a number of tentatively identified VOCs (Figure 46). These VOCs were not further evaluated, so it remains unclear whether they are toxic.

e. **The HIA performed no independent air quality modeling.** Instead, it reports a 'qualitative assessment' of the air quality impact of the proposed compressor station using an air dispersion model (American Meteorological Society and U.S. EPA Regulatory Model (AERMOD) v18081) prepared by the applicant, Algonquin Gas Transmission. The model prepared by Algonquin Gas Transmission in fact predicts that **levels of benzene, acrolein and formaldehyde in Weymouth will be above the Allowable Ambient Limit and the Threshold Effects Exposure Limit when the modeled concentrations are added to the background levels (Figures 62-64)**. The HIA states that these values 'occur only within the site of the proposed compressor

[20] Methodology for Updating Air Quality Guidelines: Allowable Ambient Limits (AALs) and Threshold Exposure LImits (TELs). Office of Research and Standards. Massachusetts DEP. Available at https://www.mass.gov/files/documents/2016/08/tc/aaltel11.pdf

station and do not extend beyond the site boundaries.' We question the reliability of such a precise geographic conclusion.

f. The HIA repeatedly makes referential comparisons to findings of elevated air pollutants at EPA monitoring stations in Lynn and an urban area of Boston in its figures, but these are not pertinent to the interpretation of the Fore River Basin data. The presence of air pollution in other areas of Massachusetts does not negate the findings of air pollution in the Fore River Basin.

g. The HIA acknowledges that the peer-reviewed scientific literature demonstrates health effects from fine particulate matter pollution, even when concentrations do not exceed federal standards (page 66). These studies have shown that health and mortality are adversely affected by fine particulate matter at concentrations that already exist in Massachusetts. The HIA acknowledges these known health risks of fine particulate matter, while simultaneously claiming that the proposed compressor station, which will increase local concentrations of fine particulate matter, will not adversely affect health.

In summary, the HIA concludes that "estimated air emissions from the proposed station are not likely to cause health effects through direct exposure because estimated air emissions do not exceed daily or annual health-protective regulatory standards or guidelines" (Page 62). **This conclusion is not supported by the data presented within the report**, which demonstrate that existing air quality conditions already exceed regulatory guidelines, or by the air quality model, which predicts there will be sustained levels of hazardous air pollutants above the Threshold Effects Exposure Limit within the site boundaries. Furthermore, **the HIA failed to evaluate the baseline conditions of the most problematic air pollutants in the state -- NO_x and ground level ozone**.

We also reiterate that regulatory guidelines are designed to protect the general health of the overall population and **do not protect individuals who may be exposed locally to higher concentrations of toxins in the air, notably those with preexisting illness**.

3. The HIA identified elevated disease levels in the surrounding municipalities and particularly in the focus area, but failed to meaningfully explore any associated exposures that might contribute to the risk of these diseases.

The HIA used a number of statewide databases to assess disease levels in the four surrounding municipalities and in the 'focus area' -- a two-kilometer radius surrounding the proposed compressor station with a population of approximately 20,000 people, which includes two environmental justice census tracts. The HIA found statistically significant elevated levels of respiratory disease, cardiovascular disease, all-cause cancer and a variety of site-specific cancers, compared to the state overall. In particular:

(a) The average prevalence of **pediatric asthma** over the last 8 school years (2009-2010 through 2016-2017) was statistically significantly higher in Weymouth than that of the state, based on data from the Massachusetts DPH Bureau of Environmental Health. No asthma data were evaluated for infants and preschoolers.

(b) The annual average age-adjusted rate of **asthma hospital admissions** during 2000-2015 was significantly higher in Weymouth than that of the state, based on data from the Massachusetts Center for Health Information and Analysis. The annual average age-adjusted rate of **COPD hospital admissions** during 2000-2015 was also significantly higher in three of the communities compared to that of the state, as were the annual average age-adjusted rates of **COPD ED visits** in Quincy and in Weymouth during the same time period.

(c) The annual average age-adjusted rate of **heart attack hospital admissions** during 2000-2015 was significantly higher in three of the communities compared to that of the state, based on data from the Massachusetts Center for Health Information and Analysis.

(d) There were significant elevations in **10 different cancer types** in at least one community during at least one of the 5-year time periods evaluated — 2006-2010 and 2011-2015 — using data from the Massachusetts Cancer Registry (Figure 33). Cancer types that were consistently elevated during both 5-year time periods were melanoma in Hingham, lung and bronchus cancer in Weymouth, and the following four cancer types in Quincy: cancers of the colon/rectum, liver and intrahepatic bile duct (IBD), lung and bronchus, and oral cavity and pharynx.

(e) With regard to pregnancy outcomes, the HIA evaluated **only low birth weight data** (i.e. the HIA did not evaluate premature delivery or developmental outcomes in children) from the Massachusetts DPH Registry of Vital Records and Statistics and found no differences compared with statewide data.

(f) There were significant elevations of **lung and bronchus cancer** among men in census tract 4178.02 (which includes the Germantown neighborhood of Quincy) during both 5-year time periods and among males in census tract 4179.01 (which includes the Quincy Point neighborhood of Quincy) during 2011-2015. These are both environmental justice areas.

GB PSR performed our own analysis of these two environmental justice census tracts, using data in the supplemental appendices to the HIA. We concur with the HIA that there is strong evidence of excess lung and bronchus cancer that extends to the entire period of study, 2006-2015. Appendix B shows that there were 125 cases of lung and bronchus cancer in males and females in these two census tracts, compared to 90 expected cases. The Standardized Incidence Ratio (SIR) is therefore 139 (95% conf.

interval = 116-169). This excess is greater than for either Weymouth (SIR=118) or Quincy (SIR=126) for the same time period. **This indicates that people in the environmental justice census tracts are disproportionately suffering from excess lung cancer incidence compared to the surrounding communities.**

The HIA made no meaningful attempt to quantitatively evaluate exposures that might be associated with these elevated disease risks. The only attempt that the HIA makes to evaluate these elevated disease rates is to note that, for those individuals that reported smoking status, 80% of the individuals with lung and bronchus cancer in the environmental justice census tracts are current or former smokers (page 57). This is not pertinent. In the Massachusetts Cancer Registry, 83% of lung and bronchus cancer cases statewide report being former or current smokers (page 55). Consequently, the smoking rate among individuals with lung and bronchus cancer in the Fore River Basin is not elevated. The question for the residents in the Fore River Basin, which the HIA did not evaluate, is **what else they might have been exposed to that raised their lung cancer incidence 39% higher than the rest of the state**. This is also why an evaluation of the geographic distribution of individuals with pre-existing illness is critical to understanding the impacts of environmental exposures on this population; the HIA did not perform such an evaluation.

4. **The HIA used methodologically flawed data to identify 'behavioral risk factors' for disease in the four surrounding municipalities**

The HIA contends that Quincy and Weymouth are among the cities and towns with the (1) highest number of smokers in the state, (2) lowest percentages of adult physical activity in the state, and (3) highest levels of overweight in the state.

The HIA used the Behavioral Risk Factor Surveillance System (BRFSS) to evaluate the health behaviors of people living in the four surrounding municipalities. The BRFSS is an annual nationwide telephone survey that collects data on health conditions, risk factors, and behaviors. Telephone surveys are inherently problematic because relatively few individuals respond, and these individuals may not represent the characteristics of the general population. The data presented in the HIA for the municipalities of Braintree, Hingham and Quincy demonstrate this limitation, because there are wider confidence intervals than the normal limits for interpretation set by Massachusetts DPH (Figures 19, 21, 22, 23, 26) -- indicating that **the behavioral data from these communities are not reliable.** We reject the HIA's suggestion that 'behavioral risk factors' are the primary reason for the elevated disease rates observed in the Fore River Basin.

Furthermore, the HIA did not evaluate the synergistic effects of smoking and exposure to air pollution. These effects are not simply additive but multiplicative. The HIA suggests smoking cessation programs to address cancer risk for residents of the Fore River Basin (Figure 87). These programs should only be performed in concert with reducing environmental exposures; not doing so is effectively victim blaming.

5. The HIA identified multiple vulnerable communities in the surrounding area, but failed to apply established principles of environmental justice.

The HIA identified that the focus area has a high proportion of elderly, non-English speakers, poor people, and those with lower education (page 29-33). The HIA acknowledges that the focus area includes environmental justice populations (page 35, page 58), in accordance with the Massachusetts definition.[21] The Environmental Justice Policy of the Massachusetts Executive Office of Energy and Environmental Affairs[22] states that "attention must be focused on communities that are built in and around the state's oldest areas with a legacy of environmental pollution, particularly in areas with residents who have elevated rates of disease and health burdens." **The HIA disregards this mandate.** The executive summary of the HIA states (page 8) that there are 'no vulnerable populations' for the proposed project. This is contraindicated by the data in its own report.

6. The HIA disregarded the input of its own Advisory Committee.

The HIA states that its purpose was to 'encourage(s) a greater incorporation of public health and community perspectives into decision-making processes' (page 8). Fifteen individuals, including a number of public health and medical professionals, served on an Advisory Committee to the HIA. The Advisory Committee met periodically with the MAPC, the DEP, and the DPH to provide expert and community input and to review the accumulating data. This Advisory Committee was marginalized from the preparation of the final report that was issued on January 4, 2019. In a January 7, 2019 letter to Governor Baker, the Advisory Committee stated that they were not given an opportunity to review a draft of the HIA or provide comments on the final report. The HIA therefore failed in its mission of incorporating public health and community perspectives.

7. The MAPC was not qualified to perform the HIA, and the HIA was inappropriately rushed.

The Metropolitan Area Planning Council, a regional planning agency governed by representatives from each city and town in the metropolitan Boston region, was charged with conducting the HIA and authoring the final document.

We question why the MAPC was contracted to have primary responsibility for the HIA, rather than the Massachusetts DPH. The DPH has trained environmental health scientists and a long history of conducting meaningful assessments that analyze health patterns in relation to

[21] https://www.mass.gov/info-details/environmental-justice-communities-in-massachusetts
[22] https://www.mass.gov/files/documents/2017/11/29/2017-environmental-justice-policy_0.pdf

environmental exposures. These resources were not brought to bear on this HIA, which was instead a rushed evaluation of whether regulatory agency standards were met.

Our detailed concerns are as follows:

a. **The HIA was inappropriately rushed.** Governor Baker directed the DPH and DEP to perform the HIA on July 14, 2017, but the first public meeting to initiate the process was not held until June 21, 2018. The final report was slated to be issued in November 2018 and was ultimately released on January 4, 2019. The DEP's air quality permit was issued just days later, on January 11, 2019. This rushed timeline is substantially shorter than typical for a comprehensive HIA focused on environmental health and shorter than the 12 months recommended by Massachusetts DEP Secretary Beaton.

b. The MAPC did not have the experience or resources necessary to perform a comprehensive HIA. In particular, the MAPC has no expertise in environmental health, public health practice, quantitative methods, environmental epidemiology, toxicology, environmental health assessments, air quality modeling, or human health risk assessments.

c. The Society of Practitioners of Health Impact Assessment advocates for the inclusion of a peer review process in a HIA.[23] Peer review of environmental health studies has also been a historic practice at the Massachusetts DPH. Peer review provides a number of benefits, including providing input on the approach, processes, and data that were used in the HIA; ensuring the quality and soundness of the conclusions and recommendations; assisting with the communication strategy for the HIA and recommendations to decision-makers, stakeholders and community partners; and advancing fidelity to current HIA Minimum Elements and Practice Standards. **The MAPC did not solicit peer review**.

d. The MAPC has no experience with air quality assessment or modeling, and hence relied solely on data provided by Algonquin Gas Transmission for the air quality modeling. Lacking expertise, the MAPC also failed to appreciate the limitations of the air quality sampling performed by the DEP. The DEP -- as the agency working with Algonquin Gas Transmission on the air quality permitting process -- was therefore **effectively giving recommendations to itself.** Community members, Greater Boston PSR, and the HIA Advisory Committee all proposed the inclusion of academic experts on air pollution and air quality modeling, but the MAPC disregarded this suggestion.

e. According to the Society of Practitioners of Health Impact Assessments, the purpose of a HIA is to systematically consider the full range of potential impacts of a proposed project

[23] Health Impact Assessment Peer Review Brief: A Produce of the Peer Review Workgroup of the SOPHIA HIA Practitioner's Workshop. Available at: https://hiasociety.org/resources/Documents/Brief_on_HIA_Peer_Review_3_3_16_logo.pdf

on health, health determinants, and health equity; these health impacts should include but not be limited to respiratory, cardiovascular, oncologic, dermatologic, reproductive, developmental, and neurologic diseases, as well as accidents and injuries. **We assert that the HIA did not meaningfully consider the impact of the proposed project on human health.**

f. The HIA references the use of a 'snowball method collection' for evaluating the scientific and medical literature. This is a non-probability sampling method from the social sciences, and is **not an appropriate method for reviewing published health data**. As such, the HIA provides no systematic review of the published evidence, no tabulation of the data considered, and limited citations from the medical and scientific literature.

Section 3: Greater Boston PSR outlines our concerns about the broader effect of the proposed project on climate resilience and human health in Massachusetts.

There is widespread consensus in the medical and public health communities that climate change and the associated environmental degradation represent an immediate threat to public health.[24] The 2018 Fourth National Climate Assessment, published by the federal government's U.S. Global Change Research Program, determined that "the impacts of global climate change are already being felt in the United States and are projected to intensify in the future."[25] The report outlines specific current and projected health impacts, including exposures to heat waves, floods, droughts, and other extreme events; vector-, food- and waterborne infectious diseases; changes in the quality and safety of air, food, and water; and stresses to mental health and well-being. These effects are having an impact in the Northeast, and the report projects "additional deaths, emergency room visits and hospitalizations, higher risk of infectious diseases, lower quality of life, and increased costs associated with healthcare utilization" in our region.[26]

The Massachusetts Global Warming Solutions Act of 2008 mandates a 25% reduction in greenhouse gas (GHG) emissions from all sectors of the economy below the 1990 baseline emission level in 2020 and at least an 80% reduction in 2050. In May 2017, the Massachusetts Supreme Judicial Court ruled unanimously in *Kain vs. DEP* that the state was not meeting the greenhouse gas reduction requirements of the 2008 Global Warming Solutions Act and the associated mandate to protect health.[27] Governor Baker has promulgated regulations in response to this lawsuit, but as yet the state is not on track to comply with this mandate.

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[24] https://medsocietiesforclimatehealth.org/; https://www.apha.org/topics-and-issues/climate-change;
[25] Fourth National Climate Assessment. Available at https://nca2018.globalchange.gov/chapter/front-matter-about/
[26] Fourth National Climate Assessment. Chapter 18: Northeast. Available at https://nca2018.globalchange.gov/chapter/18/
[27] Ruling available at https://s3.amazonaws.com/media.wbur.org/wordpress/1/files/2016/05/05-17sjcglobalwarming.pdf

Methane is a greenhouse gas that is 84 times more potent than carbon dioxide in the first two decades after its release. Methane is responsible for an estimated 10% of greenhouse gas emissions in Massachusetts.[28] Construction of the proposed Algonquin Gas Transmission compressor station will further prevent the state from complying with its greenhouse gas reduction mandates outlined in the Global Warming Solutions Act.

[28] Phillips et al. Environ Pollut. 2013 Feb;173:1-4.