RAPID HEALTH IMPACT ASSESSMENT

The Potential Health Impacts of Incinerators and Power Plant Byproducts on Communities in Brandywine, MD

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- Toxins, Health Impacts & Data Gaps
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- Zoning Modifications
- Zero waste and Anaerobic Digestion
- Promoting Salutogenesis in Prince George's County
- Cumulative Health Impact Bill
- Other Related Successful HIAs

5 **SUMMARY**

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1 SCREENING

- Brandywine, Maryland
  - One gas-fired power plant
  - Two additional gas-fired power plants under construction.
  - Neighboring towns
    - One gas-fired power plant
    - Another one under construction
  - In the future, the area will hold five gas-fired power plants
- Neighboring town of Upper Marlboro
  - A landfill is scheduled to fill up by 2021
- Sewage treatment plant with a sewage sludge incinerator southeast of Upper Marlboro
  - The sludge incinerator site is likely site of new trash incinerator the county is proposing to solve the landfill issue

"Can tell air quality is bad – Air is hard to breathe, a lot of asthma in area… Woman who grows herbs says that on bad days, plants begin to die. Traffic is horrendous on little road already."

- Stakeholder Interview

"As usual, the county tried to use southern Prince George's County as a dumping ground for facilities that no county residents want in their neighborhood. Even then, our county council member did not side with us or even let us know about it."

- Stakeholder Interview

2

SCOPING

- Health Effects Considered
- Affected Populations
- Methods

Health Effects Considered

- **Research of the literature** to determine health impacts to evaluate
- Input was collected from **stakeholders** who identified air quality, traffic density, mercury, and methane as their main concerns.
- **Potential health effects** are divided into the following categories:
  - Power plants
  - Landfills
  - Incinerators

Affected Populations

- **Individuals who live near these locally unwanted land uses (LULUs)**
  - **Identified through the literature :**
    - **Infants and Toddlers** (approximate ages 0-3)
    - **Children** (approximate ages 4-11)
    - **Elderly** (65 years and older)
    - **Pregnant** Women
    - Economically Disadvantaged
    - Racial and Ethnic **Minorities** (ex. African American, Hispanics)
    - The **Uninsured**
    - People with **Chronic Health Conditions** (ex. **Diabetes, Hypertension, Asthma, Cardiovascular Disease**)

Methods

- **Literature review**
  - **Summary of available data on existing baseline conditions at the smallest unit of data available (ex. Census tract or zip code)**
    - When unable to do so, county level data was used and when possible, compared to statewide statistics.
- **Stakeholder Interviews**
- **Population and Sociodemographic Data**
- **Baseline Health Data**
- **Air Quality Data**
- **Traffic Data**

3

ASSESSMENT

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  - A. Power Plants
  - B. Landfills
  - C. Incinerators

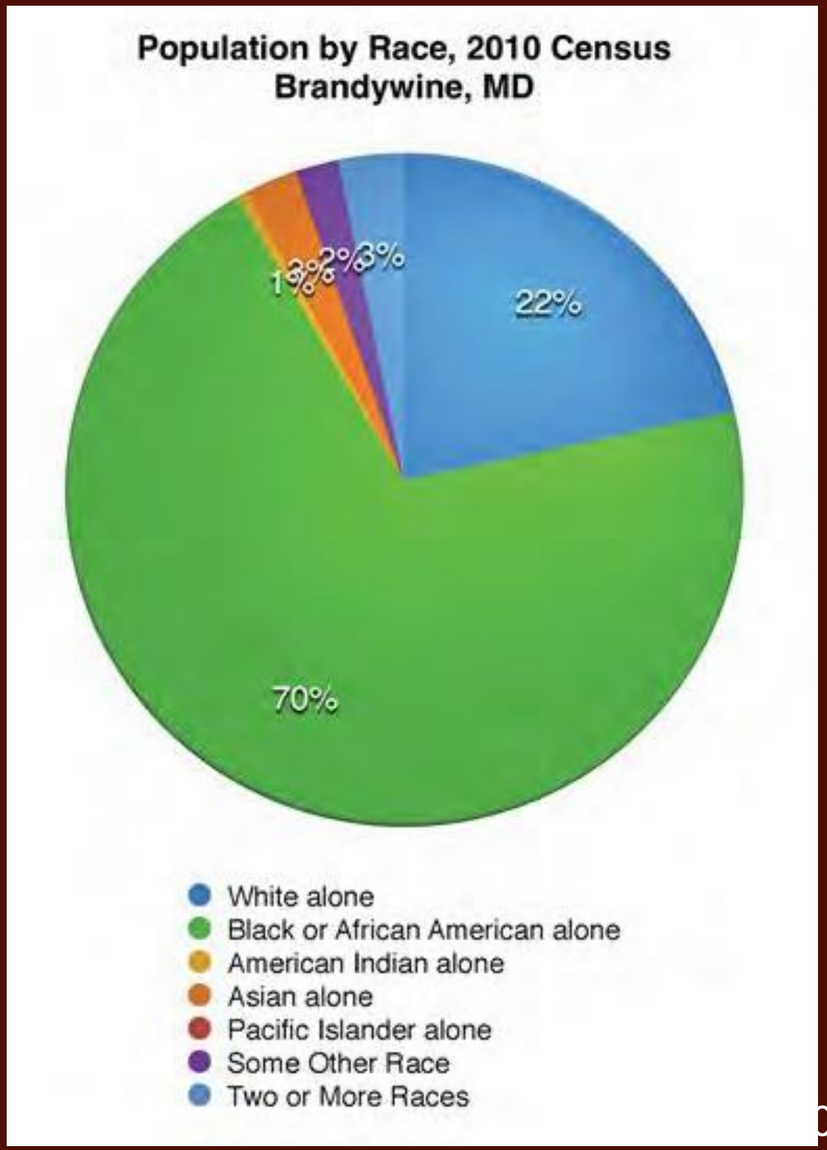
Population & Sociodemographic Status

Brandywine = 80% minority population
Maryland = 45% minority population

Most residents have only received **high school education**

Average income for Brandywine residents = $38,000/year

⅓ of Brandywine population is children



Baseline Health Status (PG County)

- Prince George's County ranked, 16th of 24 counties for general outcomes.

- 15th of 24 counties for health factors.

Compared to Maryland: higher rates of obesity, poorer birth outcomes (low birth weight, infant mortality)

- Over 60% of deaths in PG County related to chronic diseases.

Racial disparities in cancer mortality rates.

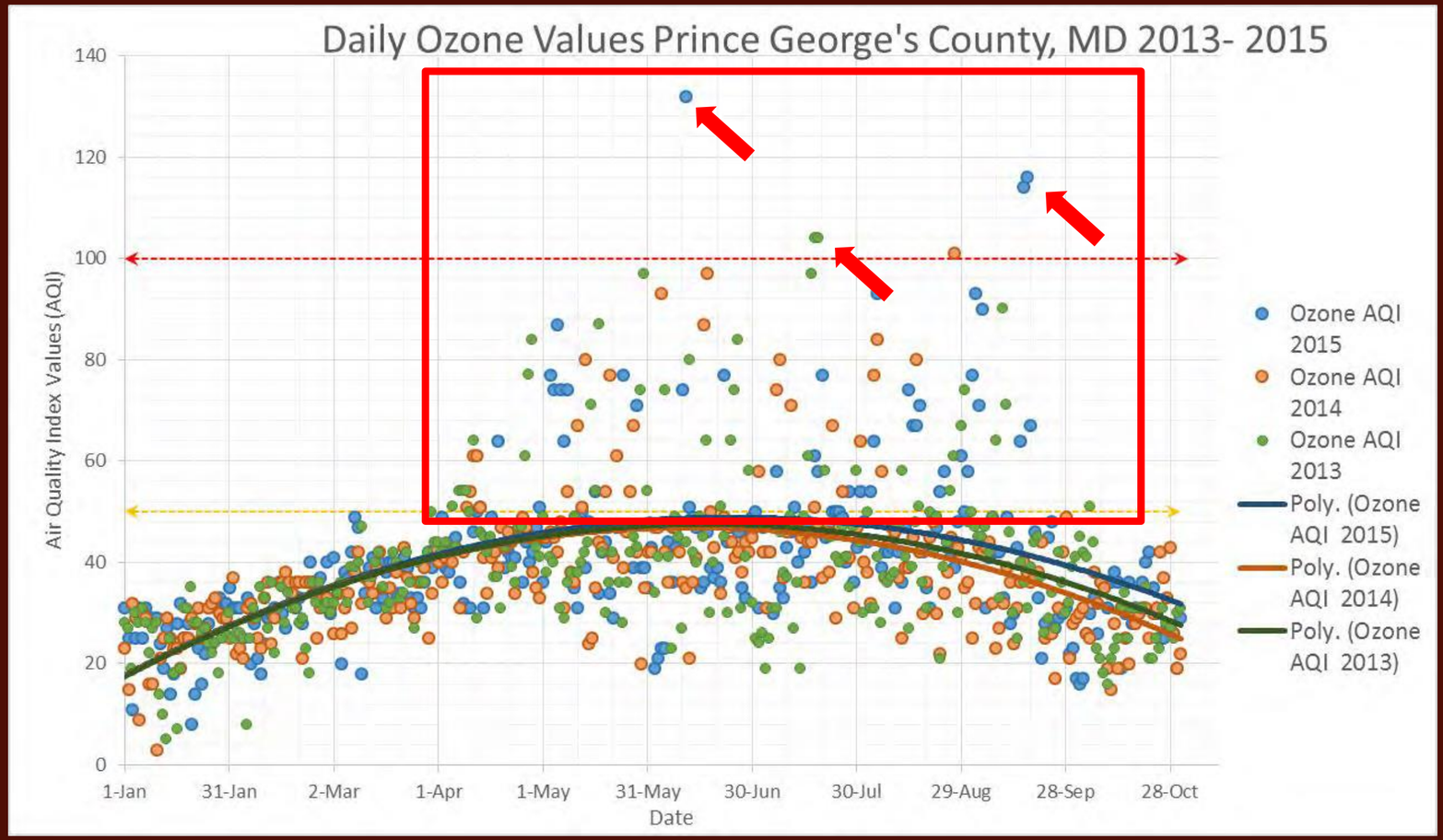
- Access to Health Care: Higher rates of Uninsured residents compared to Maryland. Brandywine, MD is HRSA designated Medically Underserved Area (MUA).

Air Quality Data 2013-2015

Prince George's county has been nonattainment for 8 hour ozone since 1994

12% of all days measured (2013-2015) were at least moderate for air pollution

3 days reported air quality as unhealthy for sensitive groups in 2015 as opposed to 2 & 1 days 2013, 2014



Daily PM 2.5 readings in Prince George's county 2013-2015 1 January – 28 September. Data points above yellow dashed arrow indicate moderate PM 2.5 pollution days/. Trendlines (Blue: 2015, Orange: 2014, Green: 2013) indicate no increasing trend in daily PM 2.5. Data adapted from http://www3.epa.gov/airquality/airdata/ad_viz_plotaqi.html

Traffic and Particulate Matter

33% of all days measured PM 2.5 2013- 2015 are moderate air quality

PM 2.5 measurements taken during morning rush hour show highest concentration at elementary school

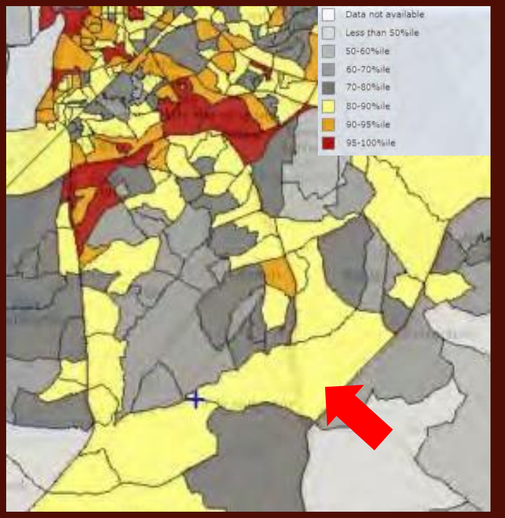
Studies have shown correlation between PM 2.5 and diesel truck flow, corroborated by our data

Table 4: Airbeam Air Monitoring Data 11-06-2015 (in ug/m³)

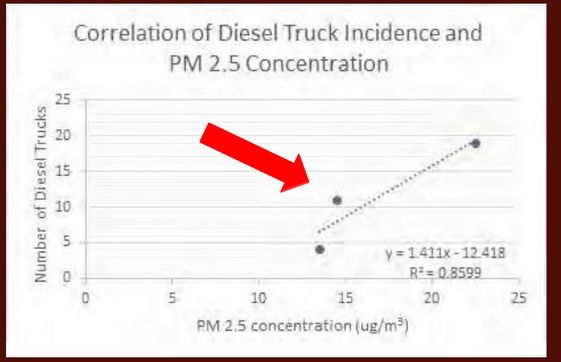
Time Stamp	Facility	Katrina	Vivenie	Overall Average
9:25-9:40 am	Brandywine elementary school average	23	22	22.5
	Brandywine elementary school peak	**37**	38	37.5
10:10-10:25 am	Panda Brandywine power plant average	14	15	14.5
	Panda Brandywine power plant peak	19	22	20.5
10:55-11:10 am	Proposed incinerator site average	12	15	13.5
	Proposed incinerator site peak	19	22	20.5

Table 5: Diesel Truck Counts in 15 min interval

Facility	Number of diesel trucks	Diesel trucks per minute
Brandywine elementary school	19	1.27
Panda Brandywine power plant	11	0.73
Proposed incinerator site	4	0.27



Traffic proximity of Brandywine, MD and surrounding communities. **Note** Brandywine community is in the 80-90th percentile and is delineated by an arrow



Installing new infrastructure would further exacerbate Prince George's county air quality issues

A

Power Plants

Power Plant: Toxic Outputs

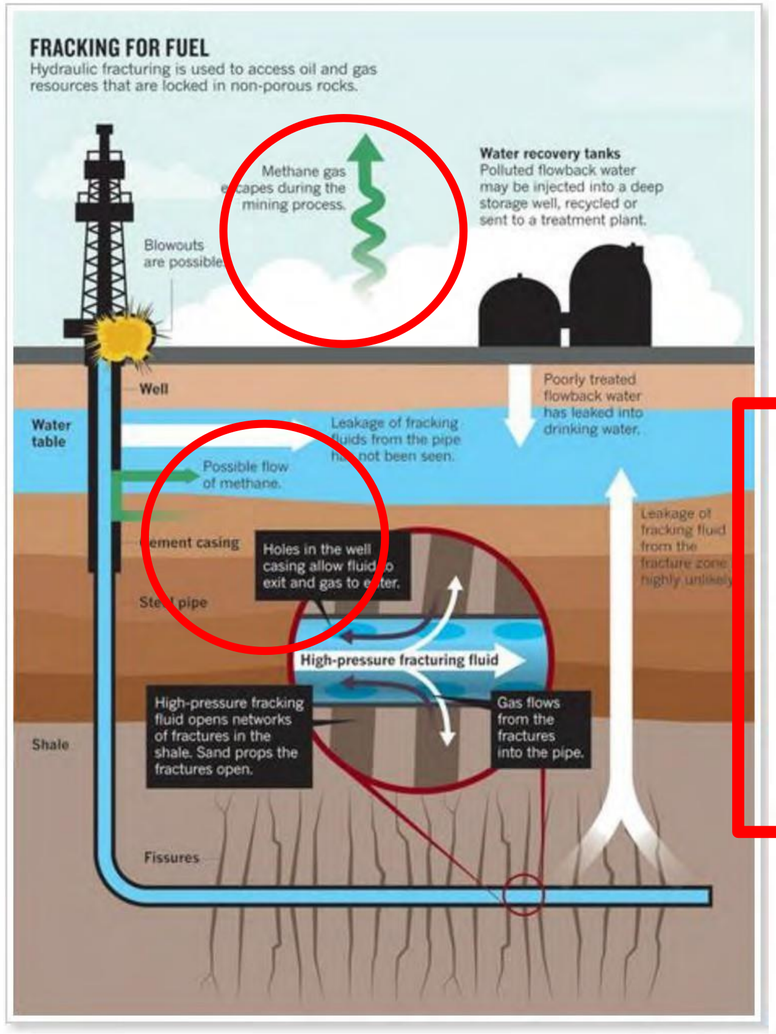
Toxins

- **Natural gas fired power plants:**
  - ~ 50-60% less carbon dioxide emissions than coal fired plants
  - **Emit all 6 EPA criteria air pllutants:** ozone, PM, CO, NO_x, SO_2, Pb
  - **Biggest concern: Methane emissions and leakage**
  - Nitric oxide emissions + VOCs + heat + sunlight and other pollutants= **ground level ozone and particulate matter ($PM_{2.5}$)**
  - High levels of **natural gas inhalation** from leakage are **toxic**.
  - Hydrogen sulfide, **silica**, noise pollution, **PM**, temperature extremes, natural occurring **radioactive material** (NORM) and a number of other hazardous chemicals.

Power Plant: Potential Impacts

Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources: Progress Report

December 2012



Water Use in Hydraulic Fracturing Operations	Potential Drinking Water Issues
Water Acquisition	• Water availability • Impact of water withdrawal on water quality
Chemical Mixing	• Release to surface and ground water (e.g., onsite spills and/or leaks) • Chemical transportation accidents
Well Injection	• Accidental release to ground or surface water (e.g., well malfunction) • Fracturing fluid migration into drinking water aquifers • Formation fluid displacement into aquifers • Mobilization of subsurface formation materials into aquifers
Flowback and Produced Water	• Release to surface and ground water • Leakage from onsite storage into drinking water resources • Improper pit construction, maintenance, and/or closure
Wastewater Treatment and Waste Disposal	• Surface and/or subsurface discharge into surface and ground water • Incomplete treatment of wastewater and solid residuals • Wastewater transportation accidents

Howarth, Robert, Anthony Ingraffea and Terry Engelder. Natural gas: Should fracking stop? *Nature* **477**, 271–275 (15 September 2011) doi:10.1038/477271a

Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources: Progress Report. United States EPA. December 2012.

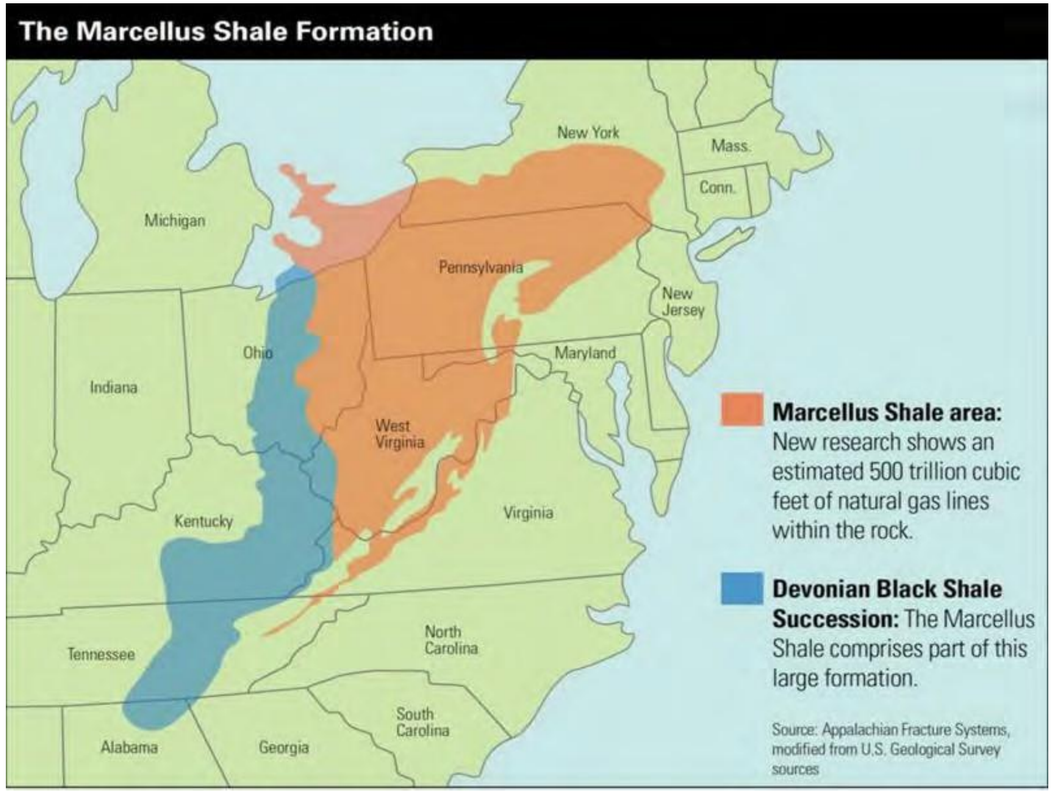
Power Plant: Potential Impacts

Health Effects:

- **Air pollution:** nitric oxides, VOCs and PM:
  - **Chronic Obstructive Pulmonary Disease (COPD)**
  - Nasal passage complications (loss of smell, irritation, nosebleeds)
  - **Respiratory irritation, increased asthma, bronchitis,** sinus issues
  - Neurological (headaches)
  - **Skin and eye irritation**
  - Painful joints and stress
- Over 30% of samples collected from 11 sites nationwide, crystalline silica levels
  - **exceeded NIOSH exposure limit** by ten fold
  - inhalation= **silicosis**, an **incurable lung disease**
- Collectively, 25% of chemicals associated with drilling are **carcinogenic**, over 35% effect the **endocrine system** and up to 50% of them affect the **nervous, immune, cardiovascular and renal systems**.

Limitations and Gaps

- **52 members** of the Pennsylvania Governor's Marcellus Shale Advisory Commission, the Maryland Marcellus Shale Safe Drilling Initiative Advisory Commission, and SEAB Natural Gas Subcommittee
  - Study found no individuals with **health expertise**
  - **Over 60%** involved in the public health hearing held by the SEAB Natural Gas Subcommittee **opposed natural drilling due to health issues.**
- "**Deep fracking**" process is **less than 20 years old**
  - **Limited data** is available to extensively assess long term & **definitive** health effects



Landfills

Landfills

Largest route for disposal of waste throughout Europe and North America.

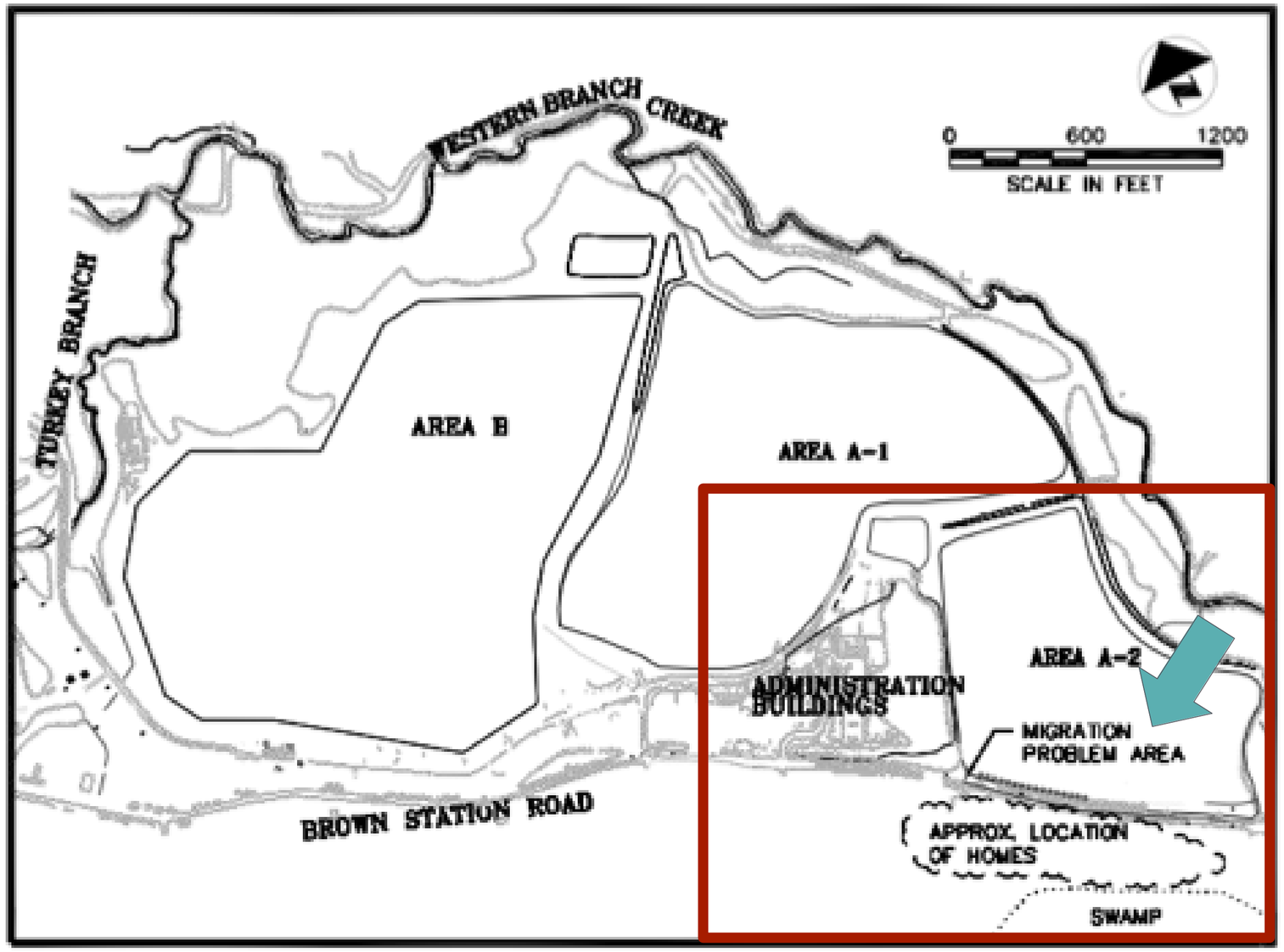
Landfill gas (LFG)

- Primarily contains 45% to 60% **methane**, 40% to 60% **carbon dioxide** and less than 1% of trace gases such as **hydrogen sulfide**.
- Many **trace** elements.

Liquid (Leachate)

- Highly **variable**. Large amounts of organic matter, ammonia-nitrogen, heavy metals (zinc, copper, cadmium, lead, nickel, chromium and mercury), chlorinated organic compounds, and inorganic salts.

Description of Existing Site



Landfill: Potential Impacts

Adverse Birth Outcomes

- Most **consistently** linked to landfills.
- Most commonly reported in epidemiological studies:
  - **Low birth weight**
  - **Small for gestational age**
  - **Congenital malformations**
    - **Anterior abdominal wall defects (gastroschisis)**

Landfill: Potential Impacts

Adverse Birth Outcomes

- Multi-site study of **21 landfills** in **5 European countries** found a **33% increase** in risk in **infants born** to mothers **within 2 miles** of a **landfill** site.
  - **Neural tube defects**
  - **Malformation of the cardiac septa**
  - **Anomalies of the great arteries and veins.**

- Multi-site study of **9,565 landfill** sites in England, Wales and Scotland:
  - Same congenital malformations as above, including:
  - **Hypospadias and Epispadias.**

Landfill: Potential Impacts

Cancer Incidence

- Only consistent finding was **bladder cancer** in both males and females.

Limitations and Gaps

- **Information** regarding potential **human exposure** to landfill sites is **lacking**.
- **Types** of **chemicals** contained in landfills and extent of **release**.
- Further complicated by **exposure** to **low doses** of **mixture of chemicals** over **long** periods of **time**.
- **Small sample size**.
- **Cancer** studies may have been conducted during an **inadequate period** of time, not allowing enough time for the **disease** to **manifest itself** in the exposed population.

Incinerators

Incinerator: Toxic Emissions

Toxicants

- Municipal waste incineration releases a wide variety of toxic chemical byproducts, including **polychlorinated dibenzo-p-dioxins,** and **dibenzofurans (PCDD/Fs)** and **heavy metals.**
- Incinerator residues include:

1. Bottom ash
2. Grate siftings
3. Boiler and economizer ash
4. Fly ash
5. Air pollution control (APC) residues

Incinerator: Potential Impacts

Pulmonary Function

- Individuals in communities near incinerators have **poorer overall respiratory function**

- **Vulnerable individuals** (with existing respiratory conditions) in incinerator communities had poorer pulmonary outcomes

- Increased **wheezing / headaches** in children at schools close to incinerator.

Incinerator: Potential Impacts

Reproductive Health / Birth Outcomes

- Increased frequency of **twinning** in areas with higher exposure

- Increase in infants born with **congenital anomalies** and **infant deaths** with close proximity to incinerator

- **Severe preterm births** (<32 weeks) and **low birth weight** for mothers exposed to incinerator pollutants

Incinerator: Potential Impacts

Cancer

- Exposure to incinerator emissions linked to increased risk for **all cancers** (stomach, colorectal, lung, liver, bladder, lymphomas, non-Hodgkin's lymphoma, soft tissue sarcomas)

Mortality

- Increased risk for **mortality from multiple causes** (in employers at incinerator)
- Employment of at least one year at incinerator linked to increased rates of **lung/esophageal cancer** and **ischemic heart diseases**.
- Increase in **deaths** from ischemic heart disease and gastric cancer.

Incinerator: Potential Impacts

Build-up of Chemicals in Blood System

- Exposure to incinerator linked to increased **body levels of heavy metals** (especially hair mercury levels and organic chemicals)

- Higher **blood lead levels**, blood concentrations of **dioxins**

Limitations and Gaps

- Follow residents living near incinerator for a longer period to assess **long-term health outcomes.**

- Examine **dosage effect** to determine if **length of exposure** impacts health outcomes.

- Examine **other health outcomes** beyond what has already been studied.

4

RECOMMENDATIONS

- Changes to county zoning
- Adoption of “zero waste hierarchy” and anaerobic digestion
- Cumulative Health Impacts Bill
- Promoting salutogenesis in Prince George’s county

Recommendations: Changes to Prince George's County Zoning

We recommend changes to Prince George's county zoning regulations around industrial facilities and residential areas, specifically in Brandywine.

Current Standards

- Incompatible land uses seen adjacent to one another
- Buffer zones
  - must maintain 10% green space inside the property
  - provide green buffers between residential uses and streets
- Setback distances = 60 feet with 50 feet landscaped

Proposed Recommendations

- Revise setback distances, green buffers
- Restrict incompatible adjacent land uses
- Employ health ordinances in overlay zones around heavily burdened /at risk zones
- Mandate green open space O-S surrounding Industrial zones
- Opportunity: Prince George's county zoning re-write (October 2015)
  - main aims: promote economic growth via mixed land use, streamline zones, discourage incompatible adjacent land uses

Recommendations: Zero Waste and Anaerobic digestion

Municipal Solid Waste (MSW) can contain up to **60% organic materials**.

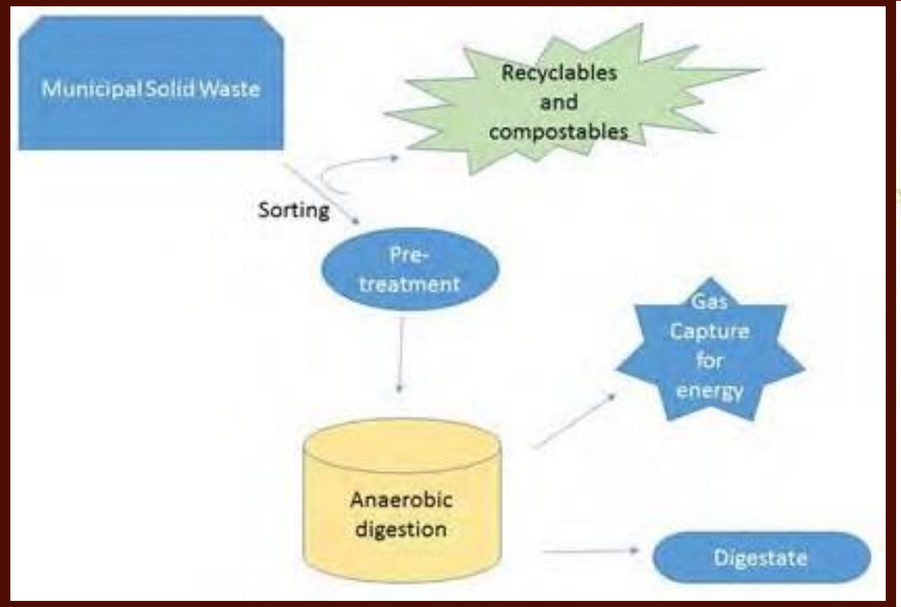
Instead of using Incineration, the adoption of a **“zero waste”** scheme with **anaerobic digestion** may be an attractive option.

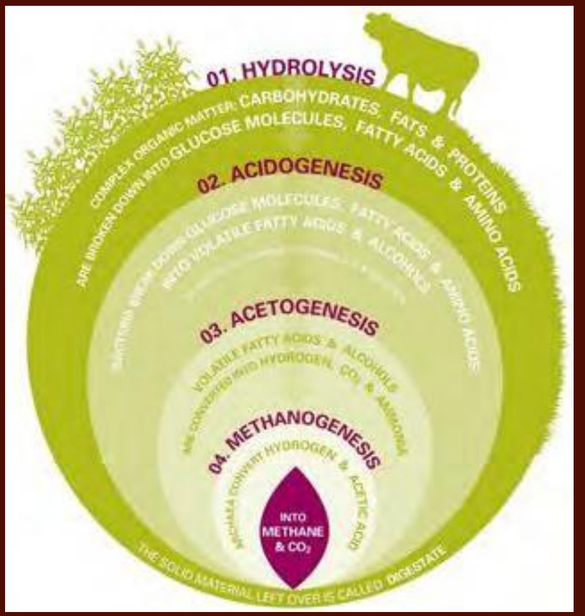
Zero waste hierarchy system adopted by Zero waste Europe to which anaerobic digestion plays a part in “recycle.” http://www.zerowasteeurope.eu/

Recommendations: Implementing Anaerobic digestion

Counties can implement **Anaerobic digestion** by:

- Establishing **streamlined** program for **recycling non-digestables**
- Utilizing already sited **landfills**
- Creating **public incentives**





Left – proposed schematic of handling MSW through the AD process and main products. Right- The four main processing in anaerobic digestion to convert complex sugars, proteins, and fats into methane, carbon dioxide, and water. http://adbioresources.org/about-ad/what-is-ad/

Cumulative Health Impact Bill

Senate Bill 693/House Bill 0987 "Environment - Ambient Air Quality Control- Cumulative Impact Assessments"

- Brought to legislatures February 2015
- Identify protected communities:
  - economically disadvantaged (Medicaid, supplemental support)
  - life expectancies below median for zip code versus rest of state
  - low birth weight % above median for specific zip code in state
- Other communities to consider:
  - vulnerable groups that could be negatively impacted within 0.25 of a non major source and 1 mile of a major source
- If source surpasses threshold for PM2.5, SO2 NOx, VOCs, collect air quality data for 12 consecutive months prior to construction

Cumulative Health Impact Bill

Senate Bill 693/House Bill 0987 “Environment - Ambient Air Quality Control- Cumulative Impact Assessments” cont’d:

- **Identify pollutants of concern and impact**
  - **Applicant must categorize impact: none, low, significant**
- **Create a plan to mitigate impact on air quality**
- **Currently in the Senate**

- **This Bill sanctions precisely what we have done for this Rapid HIA**

- **It is our utmost recommendation that this bill is passed**

- **Main goal: address impacts of incinerators, landfills and related infrastructures impacting air and health outcomes in Maryland**

Recommendations

In the event the incinerator is built, we can recommend continuing actions for the community stakeholders to promote salutogenesis in Brandywine, Maryland.

- **Zoning: negotiate setback distances, designate Open Space buffer zones**
- **Call for monitoring of emissions under the Clean Air Act**
- **Citizen science and local government**
  - **collection of air quality data**
  - **formation of strong community group**
- **Develop a health ordinance to monitor and regulate area criteria pollutants**
- **Conduct a more extensive Health Impact Assessment of this issue**

Other Successful HIAs

- **California**
  - San Francisco city planning with use of a **traffic mapping tool**
  - Identifying **exposures of air pollutants** due to traffic
  - Heat wave preparedness
- **New York**
  - Air Pollution and the Health of New Yorkers: **The Impact of Fine Particles and Ozone**
  - Public health response in regard to **climate change**
  - **Informing local laws** to reduce health problems caused by air pollution
- **Maryland**
  - **Potential Health Impact of Fracking in Western Maryland***
  - Baltimore City Health Department: **Health Equity** & Lexington Market
  - Zoning for a **Healthy Baltimore**

SUMMARY

- The Brandywine community consists of many **vulnerable** populations. Community residents are **burdened** by poor health outcomes and are part of an underserved population.
- They are already burdened by the existing **power plants** and **landfill**, as well as associated health outcomes, partly due to it being in a non-attainment zone.
- Many negative health outcomes can be predicted if the proposed **incinerator** is built.
- There are a number of solutions to replace the need for the incinerator, recommendations to counter its implications if constructed and a bill which has been brought to legislatures.

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