<u>FINDINGS OF FACT AND DIRECTOR'S DECISION</u>
In the Matter of the Issuance of a Title V Operating Permit To
North Country Environmental Services, Inc.
Located in Bethlehem, New Hampshire
Facility Identification # 3300990255; Application # FY04-0469

The Clean Air Act Amendments of 1990 (CAAA) established a federal permit program for the nation's largest emission sources (called "major sources"). The CAAA required states to develop and implement this program consistent with federal regulations. The state rules implementing this operating permit program, commonly called "Title V," took effect in New Hampshire on June 30, 1995.

Title V Operating Permits include all air pollution related regulatory requirements that apply to the source. The program does not allow for the addition of new emission units or the establishment of new emissions control requirements[1], but rather clarifies the existing air pollution control obligations of major sources by compiling in one document all of a source's compliance requirements. The intent is that by including all applicable requirements in one permit, it will be easier for the source owner, the regulatory agency, and the public to determine if the source is in compliance. The permit contains monitoring, record keeping and reporting requirements designed to ensure that the source can demonstrate compliance with all applicable air regulations. Owners of sources with Title V Operating Permits must certify its compliance status with all applicable requirements each year, and the permits must be renewed every five years. The public is provided an opportunity to comment on each new or renewed Title V Operating Permit before it is issued.

There are typically four phases in the Title V Operating Permit process:

1. First, the permit application undergoes an initial review by the New Hampshire Department of Environmental Services, Air Resources Division (DES) to ensure that the information submitted is complete and addresses all appropriate regulatory requirements.

2. After the application has been deemed complete, DES undertakes an extensive review, including but not limited to facility site visits and an analysis of historical information. Once DES has completed this review and is confident that the application accurately reflects the facility's operations, DES develops a "draft Title V Operating Permit." The draft Title V Operating Permit contains all applicable regulatory requirements (both state and federal) that pertain to the facility.

3. Once the draft Title V Operating Permit is prepared, a notice is published as required by the New Hampshire Code of Administrative Rules, Env-A 622, *Permit Notice and Hearing Procedures: Title V Operating Permits* (under Env-A 622.02, *Public Notice*). The public, the United Stated Environmental Protection Agency (USEPA), and any other interested parties

[1] In New Hampshire, new or modified emission units or emission control requirements are required to be established using the Temporary Permit process as specified in the New Hampshire Code of Administrative Rules, Env-A 607, *Temporary Permits*.

are invited to submit comments on the draft Title V Operating Permit. An opportunity for a public hearing is also provided.

4. After all public comments have been received and evaluated by DES, a final determination regarding the permit is made by the Director of the Air Resources Division (Director). If the determination is favorable, the draft Title V Operating Permit is designated as "proposed" and sent to USEPA for further review. A draft Title V Operating Permit may be modified in response to comments received during the public comment period before it is sent to USEPA as a proposed Title V Operating Permit. A formal document is generated to address public comments and outline the changes made in response to these comments, if any. This document is called the "Findings of Fact and Director's Decision." The proposed Title V Operating Permit is reviewed by USEPA for up to 45 days. If USEPA has no objections within this timeframe, a final Title V Operating Permit is issued.

Any person aggrieved by the Director's decision can file an appeal with the Air Resources Council in accordance with the provisions of Env-A 622.09, *Appeals*.

Facility Description/Background

North Country Environmental Services, Inc. (NCES) operates a landfill which is located on a 105.15 acre aggregation of land in Bethlehem, NH. The current landfill units (four lined cells: Stages I, II, III, and IV) occupy approximately 36 acres. Stages I, II, III, and part of the permitted footprint for Stage IV have been constructed and municipal solid waste (MSW) has been placed in each of these landfill units. The landfill is designated as emission unit EU01.

An active landfill gas (LFG) collection system, consisting of a network of vertical extraction wells and horizontal gas collection trenches, has been installed in the landfill. In addition, LFG is also collected from several leachate collection pipes and tanks. Centrifugal blowers are used to extract gas from the landfill and deliver the gas to one of two open flares (designated as emission units EU02 and EU03).

In addition to the landfill and flares, the facility includes a diesel-fired emergency generator (designated as emission unit EU04) and various insignificant and exempt activities.

Facility Title V Operating Permit History

NCES is subject to the Title V Operating Permit program because it is a major source of air emissions as defined in Env-A 101.115, *Definitions* - "*Major Source*", and also because the landfill is subject to New Source Performance Standards as specified in 40 Code of Federal Regulations (CFR) Part 60, Subpart WWW, *Standards of Performance for Municipal Solid Waste Landfills*.

On June 4, 2004, DES received the initial Title V Operating Permit application #FY04-0469. For purposes of updating this application, additional information was received on January 7, 2008, April 14, 2008, May 9, 2011, May 13, 2011, June 24, 2011 and August 31, 2012.

The purpose of this permitting action is to consolidate all the permitted devices into one operating permit. Currently, NCES has two Temporary Permits, TP-0078 and TP-0125.

DES Review of Application for Title V Operating Permit

DES conducted a technical and regulatory compliance review of the Title V Operating Permit application. Once DES completed its review, it prepared a "draft Title V Operating Permit" (draft permit) and published a public notice stating that the draft permit was available for review and comment. In accordance with Env-A 622, *Permit Notice and Hearing Procedures: Title V Operating Permits*, a notice of request for public comments and opportunity for a public hearing was published in the *Union Leader* and the *Littleton Courier* on October 23, 2013. The notice invited public comment and indicated that any comments received during the public comment period would be considered by the Director in reaching a final decision. The public notice specified that the deadline for written comments or to request for a public hearing was November 22, 2013.

Requests for a public hearing were received prior to the end of the public comment period. In accordance with Env-A 622.05, *Requests for Public Hearing*, a hearing was scheduled for January 16, 2014 and a notice of the hearing was published in the *Union Leader* and the *Littleton Courier* on December 11, 2013.

The public hearing was held on January 16, 2014 at Profile High School located at 691 Profile Road, Bethlehem, NH. The purpose of the hearing was to receive public comment on the draft permit. During the hearing, DES announced that the deadline for submittal of written comments would be extended to January 31, 2014.

During the January 16 public hearing, citizens offered testimony and submitted documentation regarding operation of the landfill. Written comments were also received prior to the January 31, 2014 deadline. Pursuant to Env-A 622.07, *Opportunity for Response*, copies of all written comments received by DES were forwarded to NCES for their review and comment. NCES did not file a written response to the public comments. The public comments are addressed in the following discussion.

Response to Comments

DES reviewed and considered all comments received during the public comment period. A summary of each comment and DES' response is presented below.

Comments Relating to the Operation of the Flares

Comment: Are the current flares the most efficient models? Are there other methods for controlling the gas?

DES Response: Based on information collected by USEPA on similar flare systems, the flares at NCES are 98% efficient in destroying organic compounds in landfill gas.[2] There are other types

[2] USEPA, 1997, *Compilation of Air Pollution Emission Factors*, Report Number AP-42, 5th Ed., Office of Air Quality Planning and Statistics, USEPA, Washington, D.C.

of combustion techniques for burning landfill gas, including but not limited to using the gas in an internal combustion engine and generating electrical power, or burning the gas in an enclosed flare. But generally, all known combustion techniques for landfill gas are estimated to have destruction efficiencies between 98 to 99 percent.

DES evaluates applications for devices against all applicable requirements. If the device meets these requirements, DES does not have grounds to deny the permit. In most situations there are alternative devices or operating methods available which could accomplish the same task. However, DES does not have the authority to deny permits to applicants so long as the devices comply with the applicable air rules.

Nevertheless, in this case, since the various landfill gas control technologies all have comparable destruction efficiencies, selection of a newer flare or other type of control device would not be expected to result in further landfill gas control.

Comment: Are two flares needed for all the gas collected?

DES Response: Based on the current capacity of the landfill, and using the USEPA developed Landfill Gas Emissions Model **(**LandGEM**)** to predict landfill gas generation rates, it is projected that the maximum landfill gas generation rate will peak in the year 2018, at 2,507 standard cubic feet per minute (scfm). The larger of the two flares has a capacity to burn 2,850 scfm. It is estimated that this one flare would be adequate to burn all of the gas collected, both now and in the future. The second flare has a slightly lower capacity of 1,750 scfm. It is planned that the larger of the flares, once fully operational, will be the primary device and will combust all of the gas generated by the landfill. The second flare will serve as a back-up device to cover times when the primary flare is shut down for maintenance.

Table 5, Item 5 of the permit requires NCES to estimate, on an annual basis, landfill generation rates for the next 25 years and compare the rate to existing and planned gas control capacity. This ensures that capacity of the system is evaluated on a regular basis.

Comment: If the flares go out, what happens to the gas?

DES Response: As noted above, there are two flares located at the landfill, with one serving as a primary device and the other serving as a back-up. The flares contain temperature monitors which are connected to an alarm system. If the temperature falls below the low set point for a specified period, then valves will turn off the gas supply to the blower. The control module also causes the blower motor to be turned off to prevent LFG from being vented through the flares. Once the system is off, there is an automatic telephone dialer which contacts key NCES personnel.

In response to a question received at the public hearing, there is no system at the NCES landfill to collect gas and store it for any length of time. Based on historical data, the open flares have never shut down except for brief periods (less than an hour) for routine maintenance or power outages. Further, the facility maintains an inventory of commonly replaced parts such that any repairs can be completed promptly and the LFG collection system downtime can be minimized.

If both flares go down for a significant time period such that a 24-hour Ambient Air Limit could potentially be exceeded, then NCES is required to notify DES under the provisions of Section XXVIII, *Permit Deviation*, of the permit.

Comments Relating to Landfill Gas Collection

Comment: How are collection efficiencies determined? Will there ever be 100% collection of landfill gas?

DES Response: Collection efficiency is a measure of the ability of the gas collection system to capture generated landfill gas. It is defined as the collection rate (amount of gas sent to the flare system) divided by the generation rate (total amount of gas generated by the landfill). While rates of landfill gas collection are directly measured, it is impractical to measure the total gas generation rate. For this reason, there is some uncertainty regarding actual collection efficiencies achieved at landfills; therefore, site specific factors must be considered when estimating the collection efficiency of a given system.

The USEPA's Compilation of Air Pollutant Emission Factors, AP-42, Chapter 2.4, *Municipal Solid Waste Landfills*, contains values which are considered representative collection efficiencies for landfills that meet national design standards and have a comprehensive active gas collection system. According to the USEPA, collection efficiencies at such landfills typically range from 60% to 85%, with a default value of 75%. USEPA states that the data used to make these estimates are derived from data collected by state and local regulatory agencies, as well as industry-supplied information.

If a landfill has all of the characteristics listed below, then the collection efficiency is estimated to be 85%[3]:

- A comprehensive landfill gas collection system with vertical wells and horizontal collections providing 100% collection system coverage of all areas with waste within a few years after the waste is deposited.
- No significant off-site lateral migration of landfill gas.
- Soil cover applied over newly deposited refuse on a daily basis.
- A composite bottom liner consisting of synthetic (plastic) layer over 2 feet of clay or similar low permeability material.

The landfill gas collection system installed at the NCES landfill was designed and constructed based on criteria that meets or exceeds federal standards contained in the 40 Code of Federal Regulations (CFR) 60, Subpart WWW, *Standards of Performance for Municipal Solid Waste Landfills*. On average, vertical gas wells at NCES are more closely spaced than the 200-foot gas well separation that is typically considered good engineering practice. In addition to being fully lined, temporary inactive areas of the landfill are covered with approximately one foot of soil, or similar intermediate cover material. After closure of a section of the landfill, a final geomembrane cap is installed.

[3] USEPA, September 2008, *Background Information Document for Updating AP42 Section 2.4 for Estimating Emissions from Municipal Solid Waste Landfills*, Office of Research and Development, USEPA, Washington, D.C.

All areas of the landfill meet or exceed the design and operational criteria listed above. For conservatism, DES assigned a collection efficiency of 75% for active areas of the landfill, even though there is a soil cover applied on a daily basis (which would normally justify a higher efficiency). An 85% collection efficiency is assumed for areas that have "intermediate" cover (covered with approximately one foot of soil).

Based on data compiled from various field studies of landfills around the world, closed landfill cells containing a final geomembrane cover system with an active landfill gas collection system are expected to achieve collection efficiencies ranging from 90-99%.[4]

The geomembrane cap at the NCES landfill is a low permeability barrier made of high density polyethylene (HDPE) that hinders the escape of landfill gas as well as the infiltration of water into the landfill. The geomembrane cap is welded to the base liner at the perimeter of the landfill. The geomembrane cap aids in prohibiting ambient air from being drawn into the landfill, therefore allowing for higher vacuum to be applied to the gas collection wellheads. This greater vacuum provides an added level of confidence that the collection efficiencies of the system are higher than values estimated by USEPA. A 95% collection efficiency is used for areas with a final geomembrane cap.

The effectiveness of the collection system is evaluated on a routine basis through surface monitoring, landfill cover integrity checks and wellhead tuning, as required by the existing permits. Surface monitoring provides information on methane concentrations above the landfill surface, which is used to gauge the performance of the system. Please note that many of these monitoring requirements, which are the substantive monitoring requirements contained in the federal landfill rule, normally apply only to landfills larger than the NCES landfill, but DES has required this monitoring to provide an added level of confidence that the landfill gas collection efficiencies are representative of those achieved in practice.

In summary, based on the design of the landfill gas collection system, combined with the monitoring requirements contained in the Title V Operating Permit, DES determined that a collection efficiency of 75% is appropriate for the active portion of the landfill, a collection efficiency of 85% is appropriate for the portion of the landfill with intermediate cover, and a collection efficiency of 95% is appropriate for the portion of the landfill that is covered with a final geomembrane cap.

<u>Comment:</u> For gas that is not collected in a final capped area, how is it released?

<u>DES Response</u>: As noted above, even after a final cap is placed over a landfill cell, there is not expected to be 100% capture of the landfill gas. Landfill gas could potentially escape through fractures, gaps or defects in the cover materials. This is where an aggressive surface monitoring and landfill cover integrity inspection program is critical in identifying any leaks from final and intermediate capped areas. The Title V Operating Permit contains several routine monitoring and inspection requirements to ensure that any leak points are detected and corrected as soon as possible.

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[4] Sullivan, Patrick and EEC Research Associates, 2010, *The Importance of Landfill Gas Capture and Utilization in the U.S.*, Council for Sustainable Use Resources, Earth Engineering Center, Columbia University.

Comment: Does gas travel through the ground and get emitted fugitively off-site? Also, can contaminants in the gas enter the water and affect local aquifers?

DES Response: Landfill gas can migrate underground via natural pathways such as cavernous structures and strata of sand and gravel. Manmade structures (such as trenches associated with all types of buried utilities) can also provide a pathway for landfill gas to travel underground. The landfill liner is designed to prevent the off-site migration of landfill gas through the ground. As part of the solid waste regulations, Env-Sw 806.08(e), landfill gas concentrations inside the landfill footprint are measured on a quarterly basis.

The NCES landfill is required under New Hampshire law (RSA 485-C:13) to have a Groundwater Release Detection Permit (GRDP). The purpose of the GRDP is to monitor groundwater quality, via a robust network of wells around the facility, for early detection of possible impacts due to landfill operations. This would include any impacts that may be attributed to gas migration. There is no evidence to suggest off-site groundwater impacts.

Comments Regarding Data Reliability

Comment: There were a number of concerns raised from the public as to the reliability of data submitted by NCES to the DES. One commenter provided copies of water testing and monthly solid waste reports that NCES had submitted to DES. The commenter stated that these reports showed examples of the company submitting misleading data.

DES Response: Currently, as a requirement of their Temporary Permit, NCES is required to collect samples of the landfill gas three times a year. The permit requires the gas to be analyzed for methane, carbon dioxide, nitrogen and total reduced sulfur. Every five years additional samples of the gas must also be analyzed for non-methane organic compounds (NMOC). The samples must be analyzed using specific test methods developed by the USEPA or the American Society for Testing and Materials (ASTM). There are currently very few laboratories in the United States that have the capability of conducting the ASTM test required for total reduced sulfur. These labs are audited by the appropriate regulatory agency to maintain their certification to conduct this testing.

NCES currently contracts its sampling and testing through Sanborn, Head & Associates, Inc. (Sanborn Head). A representative from Sanborn Head collects the sample and transfers the sample to the laboratory. There is a chain of custody that details the date and time that the sample was taken, the name of the person who took the sample, and a unique identification number for each sample. There are three samples taken during a single sample event. There is also one "blank" sample sent to the laboratory. The blank sample is analyzed as a way to assure that no contamination has taken place during transportation or during testing in the laboratory. While DES personnel are not present for all sampling events, DES has at times witnessed the collection of samples to assure that all proper procedures have been followed. DES reviews the report to ensure that the sampling and analysis is consistent with the approved methodology. DES' review did not find any issues with the sampling and analysis of the landfill gas generated by NCES.

DES always maintains the authority to be present during any sampling event and will exercise that authority as warranted.

Comments Regarding Landfill Gas Quality

Comment: Why are details of landfill gas quality not in the permit?

DES Response: The Title V Operating Permit does not contain conditions stating that the landfill gas is required to meet any specific requirements (e.g. methane concentration of the gas shall be between 50% to 65%). The composition of the landfill gas is site-specific and will affect the type and amount of emissions generated by the landfill through fugitive emissions as well as from combustion of landfill gas by the flares. For this reason, the Title V Operating Permit requires NCES to conduct periodic sampling of the landfill gas (see Table 5, Item 7 of the permit). Based on historical test results of the gas, NCES has not shown that the gas make-up would cause a violation of any air quality standard. For this reason, DES does not have a regulatory basis to restrict the concentration of any constituent that is contained in the gas.

Comments Regarding Modeling

Comment: A number of questions were raised in the public hearing as to how an ambient air dispersion modeling analysis is completed and what parameters are covered in the analysis.

DES Response: Air quality dispersion models use mathematical algorithms to simulate air pollution transport in the atmosphere. The model estimates the ambient air pollutant concentration at geographic points (called receptors) based on air emissions, meteorology, topography, and aerodynamic turbulence induced by buildings and other structures. As these models are developed by USEPA, its accuracy is evaluated by comparing the modeled concentrations against actual observed concentrations at specific receptors.

The model used to analyze the impacts from the NCES facility is the American Meteorological Society/USEPA Regulatory Model (AERMOD). AERMOD is the USEPA recommended model for performing near-field (transport distances up to 50 kilometers) dispersion modeling analyses. AERMOD is part of an integrated system that includes three modules:

- A steady-state dispersion model (AERMOD) designed to simulate dispersion of air pollutant emissions from stationary sources.
- A meteorological data preprocessor (AERMET) that accepts local meteorological data. It then calculates atmospheric parameters needed by the dispersion model such as atmospheric turbulence characteristics and mixing heights. For the NCES analysis, 5 years of meteorological data from a site located in Whitefield, NH was used.
- A terrain preprocessor (AERMAP) whose purpose is to calculate terrain elevations and hill height scales. This data is used by the AERMOD model to provide a physical relationship between local terrain features and the behavior of air pollution plumes. It provides information that allows the dispersion model to simulate the effects of air flowing over hills or mountains (i.e. anabatic winds). AERMAP typically uses USGS National Elevation Dataset (NED) or Digital Elevation Model (DEM) data as input. For the NCES analysis a NED tile covering northern NH was used.

Part of the air dispersion modeling analysis requires a review of nearby sources that may be emitting the same pollutants. Using USEPA guidance, a "significant impact area" is developed surrounding the source of interest. This impact area may vary based on the pollutant and the specific air quality standard averaging period (i.e. annual or daily). Sulfur dioxide was the only pollutant that was found to have a significant impact area encompassing other pollutant sources.

For the analysis of sulfur dioxide impacts, emissions from Pinetree Power located in Bethlehem, NH, and JW Chipping Corp. located in Dalton, NH were included in the analysis.

In order to account for smaller, more widespread emission sources that may be in the area, including small industrial sources, residential fuel burning and mobile sources, background concentrations of all criteria pollutants are added to the impacts developed by the model. These background concentrations are taken from actual measured concentrations at the nearest ambient monitoring station. For further information on New Hampshire's ambient air monitoring network see the following discussion.

Comments Regarding Ambient Air Monitoring

Comment: There were questions at the public hearing as to the extent of ambient air monitoring that is conducted by DES and whether additional monitoring should be done for the emissions coming from NCES.

DES Response: New Hampshire maintains a network of ambient air monitors throughout the state that measure and track numerous air pollutants. DES uses this data to determine the status of New Hampshire's air quality, predict air pollution episodes, and enact protective public health measures and warnings. As mentioned earlier, air monitoring data is also incorporated into air dispersion modeling analyses to represent the background concentration for a particular measured pollutant. In the north country of New Hampshire, DES maintains two monitoring stations in the Mt. Washington area; one at the summit of the mountain and one at the base of the mountain. These monitors measure ground-level ozone concentrations. There is also a monitoring station maintained at the Hubbard Brook Center in Woodstock, NH. This station monitors acid deposition (sulfates and nitrates) as well as ground-level ozone.

The air monitoring stations that were used for the background concentrations included in the air dispersion modeling analysis mentioned for NCES are as follows:

- Carbon Monoxide (CO) background data was taken from Manchester. Data from the Manchester CO monitor is conservatively considered representative of background CO levels throughout the state.
- Sulfur Dioxide (SO_2), Particulate Matter less than 10 microns in diameter (PM_{10}), and Nitrogen Dioxide (NO_2) background data was taken from Portsmouth. Other SO_2 monitors in the state (e.g. Manchester and Pembroke) were specifically located to measure SO_2 associated with urban emissions and emissions from specific facilities. Data from the Portsmouth monitor is conservatively considered representative of background SO_2 levels in the remaining areas of the state. PM_{10} and NO_2 data from Portsmouth is the most current non-urban data available and is conservatively considered representative of background PM_{10} and NO_2 levels in non-urban areas of the state.

Ambient air monitoring was done in the vicinity of the landfill in 2001, in response to concerns from citizens regarding emissions from a leachate injection system within an enclosed flare at the NCES landfill. The primary focus of this monitoring study was to verify that ambient air concentrations of metals (potentially emitted by injecting leachate into the landfill gas flare) were below the health based standards. DES operated monitoring equipment over a one year period, from January 1, 2001 to January 2, 2002. The air monitoring station was located at the United States Forest Service ranger station located off Trudeau Road, approximately 3,800 feet

southwest of the flare system. The location was selected due primarily to its proximity to the flare system and the necessity for available electric power, site access and site security.

Ambient air samples were collected and analyzed for the metals cadmium, chromium, nickel, arsenic and lead. All measured values for these metals were well below the corresponding health-based 24-hour and annual Ambient Air Levels (AALs) found in New Hampshire Code of Administrative Rules, Env-A 1400, *Regulated Toxic Air Pollutants*. Measured concentrations of these metals at the Bethlehem site were in the range of those measured elsewhere in the state. DES no longer operates a monitor at this location because the data demonstrated that the air emissions were below the applicable AALs. Also, the enclosed flare with leachate injection system, which was the device of concern, has been removed from the landfill.

Comments Regarding Particulate Matter Emissions

Comment: One commenter asked how particulate matter emitted from the flares affects local waters. Another commenter requested that DES do a deposition study of the local area.

Response: Particulate Matter less than 10 microns in size (PM_{10}) is one of the pollutants evaluated under the air dispersion modeling analysis discussed above. The impacts predicted from the model have shown that emissions from the facility would not cause an exceedance of any National Ambient Air Quality Standard (NAAQS). The NAAQS are set to protect both human health and the surrounding environment. Based on this analysis, further study is not warranted.

Comments Regarding Modeling vs. Monitoring

Comment: A couple of commenters raised concerns that the permit was based on models. One commenter stated that the "emissions of the open flare have never actually been tested and the permit indicates that testing of the ambient air quality and any emissions above the actual flare will not occur." Another commenter stated, "The least expensive and least time consuming way to put this issue to rest is evidence not models."

DES Response: Testing of open flares, while technically possible, is difficult, costly, and provides limited informational value beyond that which is already known. It is extremely challenging to accurately measure the emissions from the flare because, in addition to the high temperature of the flame (which would require specialized materials and equipment), the unconfined nature of the flame does not allow for a constant and linear exhaust flow that could be directed to a sampling point. The flare would need to be equipped with a temporary enclosure in order for stream parameters such as exhaust flow rate and temperature to be recorded within the accuracy requirements for end data use. Furthermore, using any type of enclosure may affect the combustion characteristics of the flare by not allowing for appropriate inflow of air, changing the fuel-to-oxygen ratio, thus causing the generation of emissions that are not representative of the flare's normal operation. For these reasons, DES does not believe that additional testing of the open flares is necessary at this time. However, DES can always require testing in the future if there are any indications that the flares are not operating as expected.

The use of air dispersion modeling provides DES with many advantages over solely relying on monitoring. These advantages include:

- Because it is costly, monitoring is usually limited to a select number of pollutants and a limited number of sites.
- Ambient air monitors can only provide information as to current air quality at a specific location during a single point in time. The number of receptors in a model (points where concentration values are calculated) far exceeds the number of monitors one could afford to deploy in a monitoring study. That is, models provide a cost effective way to analyze impacts over a wide spatial area where factors such as meteorology, topography and emissions from nearby sources could be important.
- Models use 5 years of meteorological data (collected at one-minute intervals); therefore, a wide variety of meteorological conditions can be examined with models.
- Models also allow DES to predict the impacts that would occur in the future as landfill gas generation peaks.

Comments Regarding Odors/Health Impacts

Comment: A number of people gave testimony regarding odors related to the facility. One person stated that the odors are so strong that they do not open their windows. Another commenter stated that if air quality standards are being met yet people still complain of odors, then maybe the standards are not strict enough.

DES Response: An odor threshold is the lowest concentration of a substance in air that can be detected through smell. Odor thresholds are highly variable because of the differing ability of individuals to detect odors. The odor threshold for some chemicals is lower than the health-based standard for that chemical; therefore, many substances do not present a health risk until levels are well above their odor threshold. As an example, hydrogen sulfide can be detected by some people at concentrations as low as 0.01 parts per million (ppm). The 24-hour ambient air limit for hydrogen sulfide is 0.038 ppm, while the health effects associated with hydrogen sulfide exposure occur at much higher concentrations (eye irritation at 10 ppm and respiratory irritation at 50-100 ppm). There is no correlation between the odor threshold concentration of a chemical and the likelihood of adverse health effects.

Comment: A few commenters stated that they did not feel that it is adequate to ask them to call the facility when there are odors. They also feel that there should be a person from DES that is available 7 days a week, 24 hours a day to respond to odor complaints.

DES Response: DES notes that it does provide 24 hour on-call staffing to respond to emergency situations. DES has documented and responded to citizen's complaints regarding odors from the facility on numerous occasions. If the message is received "off hours," DES will do its best to respond the next business day.

In order to ensure that odor complaints are addressed as promptly as possible, DES recommends first contacting the facility so that they can immediately take measures to investigate and address the issue. While this certainly does not preclude anyone from contacting DES, contacting the facility first often accelerates any corrective action.

Comment: One commenter brought up a health study that was conducted for the Bethlehem area and stated that there was no evidence that the landfill was contributing to cancer clusters. The commenter questioned how that claim could be made when there were no blood tests taken of any potentially affected people. The commenter also mentioned that studies conducted in the State of New York over a ten year period have shown that there are cancer clusters near landfills.

DES Response: Since 2008, the New Hampshire Department of Environmental Services, Air Resources Division, Environmental Health Program (EHP) has been aware of local residents' health concerns related to the operation of the NCES landfill and has worked to address those concerns. In 2008, EHP determined that conducting an evaluation of surface/drinking water and ambient air exposure near the landfill was the most appropriate course of action to address the community members' concerns. Using a very conservative and protective approach, EHP reviewed available environmental data for the site and concluded that exposure to site-related contaminants was not expected to result in adverse health effects.

While EHP was evaluating environmental conditions, the New Hampshire Department of Health & Human Services, Office of Health Statistics and Data Management (HSDM) began an investigation of a suspected cancer cluster in Bethlehem. HSDM was very sensitive to community members' concerns about the number of people living in areas near the NCES landfill who had been diagnosed with cancer. HSDM conducted a study of cancer incidence and cancer mortality data in Bethlehem and a number of surrounding communities. The study, which incorporated an analysis of observed vs. expected cancer rates, found elevated rates of several different cancer types in the Bethlehem area. However, HSDM concluded that, "based on the types of cancer in the area and the incidence rates, we have not found any atypical patterns with respect to gender or diagnoses over time that suggest any common factor, either environmental or non-environmental, is related to the overall occurrence of cancer in Bethlehem."[5]

HSDM has adopted a disease cluster investigation protocol in order to evaluate potentially elevated levels of disease, particularly cancers, in a community or specific geographic area. This protocol is based on the revised U.S. Center for Disease Control and Prevention's (CDC) Guidelines for Investigating Clusters of Health Events.[6] Similar to the CDC protocol, HSDM's protocol consists of a multi-step process for responding to concerns about suspected cancer clusters. These steps (initial response, proceeding through assessment, feasibility determination, to conducting a full-scale epidemiological study) incorporate a multi-disciplinary approach and utilize multiple lines of evidence in determining and responding to the existence of an actual disease cluster.

Conducting an epidemiological study is a resource and time-intensive activity that a public health agency will undertake when there is clear indication of an association between a disease cluster and an environmental hazard or other factor that needs to be further explored. The design of an epidemiological study may include provisions for bio-monitoring of the study population (e.g. collecting and analyzing blood samples). HSDM did not find an association between the types of cancer identified in their 2009 study and exposure to chemical sources of contamination

[5] Cancer Incidence and Cancer Mortality: Bethlehem NH and Surrounding Towns Follow-up Analysis and Medical Records Review, December 14, 2009, New Hampshire Department of Health and Human Services, Division of Public Health Services, Office of Health Statistics and Data Management, State Cancer Registry

[6] Investigating Suspected Cancer Clusters and Responding to Community Concerns: Guidelines from CDC and the Council of State and Territorial Epidemiologists, September 27, 2013. MMWR 62(RR08), 1-14.

in Bethlehem. Given the lack of any evidence linking possible exposure to chemicals at the landfill and rates of cancer in the community, HSDM did not proceed along this line of investigation. Based on the information gathered and their analysis of the data, HSDM did not consider conducting additional epidemiological activities (including the collection of bio-monitoring data) to be necessary.

It should be noted that, as an added phase of the study, HSDM conducted a Medical Records Review of Bethlehem residents diagnosed with pancreatic and breast cancer at the time of the study. This exploratory investigation was conducted to address the issue of whether the elevated cancer rates in Bethlehem were related to any hereditary, behavioral, life-style, environmental, or occupational factors. Unfortunately, HSDM was not able to complete this phase of the study due to several limiting factors (missing or incomplete medical information, loss of medical charts, and unavailability of medical records outside of New Hampshire). From the data that was available to them, HSDM was not able to identify a common factor, environmental or non-environmental, related to the occurrence of pancreatic and breast cancer in Bethlehem.

Comments Regarding Greenhouse Gases

Comment: There appeared to be some confusion during the public hearing as to the emissions of greenhouse gases from the landfill. As noted during the public hearing, methane is the main component of landfill gas generated from the decomposition of organic waste matter. Methane is a greenhouse gas. When methane is burned in the flare, it is oxidized to carbon dioxide, which is also a greenhouse gas. The question asked at the hearing was, "Why is it better to burn the methane and release carbon dioxide if they are both greenhouse gases?" Another commenter stated that even though methane is a more "potent" greenhouse gas, it doesn't last as long in the air as carbon dioxide (implying that it may not be preferable to destroy methane at the expense of generating carbon dioxide).

DES Response: USEPA has developed factors called "global warming potentials" (GWP) for all known greenhouse gases. The GWP measures how much heat one molecule of a gas will trap relative to a molecule of carbon dioxide. The GWP for methane is 25, which means that methane is 25 times more effective at preventing infrared radiation from escaping the atmosphere than carbon dioxide. The GWP potential takes into account the lifetime of the gas in the atmosphere and calculates the GWP over a 100 year period. According to the Intergovernmental Panel on Climate Change, because methane has a much shorter lifespan in the atmosphere than carbon dioxide, if the GWP was looked at over just a 20-year time scale, then methane could be over 50 times more potent than carbon dioxide.

Calculations show that the GWP does decrease if landfill gas is captured and combusted. There are other benefits to burning the landfill gas, other than for the reduction in the emissions of greenhouse gases. A primary benefit to the burning of landfill gas is the destruction of components in the gas which are toxic and known to cause offensive odors, including organic compounds and sulfur compounds.

Comments Regarding Enforceability of Regulations

Comment: One commenter stated that the permit and the regulations are too complicated for ordinary people to understand and that it seems like the company has too much say in the permitting process and rule development.

DES Response: The language in the permit is taken directly from the rules when possible. This assures that permit conditions are legally enforceable. In order to assist the public in understanding the requirements which are contained in the permit, DES prepares an Application Review Summary. This document provides a summary of the regulatory requirements contained in the permit and the Department's review and analysis of the permit application. Citizens are also encouraged to contact DES if they have any questions understanding the particular provisions of a permit.

Comment: When the company does violate agreements or rules it takes DES too long to take action.

DES Response: The DES has a Compliance Assurance Response Policy (CARP) in order to identify the range of actions available to DES when addressing violations of environmental laws. The CARP also discusses the process by which DES will determine the appropriate response for any given situation. The CARP is available on the DES website at http://des.nh.gov/organization/commissioner/legal/carp/index.htm.

Comments Regarding Permit Denial

Comment: Is there anything that could happen that would be a "deal breaker" which would have DES deny or revoke the permit?

DES Response: As required by state and federal statutes, DES performs an evaluation of the application as submitted and compares it against applicable state and federal air quality requirements. If the evaluation indicates that the facility can comply with these requirements, as specified in Env-A 609.10, *Department Review of the Application*, then DES has no legal basis to deny the permit.

Condition XIX of the draft permit contained the criteria for Title V Operating Permit suspension, revocation or nullification. When reviewing this condition, DES determined that the language of the condition came from a section of the regulations that do not pertain to Title V Operating Permits. While this does not affect DES's ability to suspend, revoke or nullify a Title V Operating Permit, the language in the proposed permit has been modified to correctly reflect the applicable regulation.

Comments Regarding Environmental Justice

Comment: One commenter stated that DES is not complying with USEPA's definition of Environmental Justice.

DES Response: The USEPA defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." Environmental justice has two major parts:

- *Fair treatment: "No group of people should have to deal with an unequal share of the harmful environmental effects that happen because of policies or operations run by business or government."*

  Air quality standards and permitting requirements are the same in the Town of Bethlehem as they are in other areas of the state. The standards are in place to assure that there will be no adverse impacts to public health or the environment. DES evaluated the emissions from the NCES landfill and compared them to all applicable air quality standards, and impacts were shown to be below all standards.

- *Meaningful involvement: "Potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment or health, or both; the public's contribution can influence the regulatory agency's decision. The concerns of all participants will be considered in the decision-making process and the decision-makers will seek out and facilitate the involvement of the populations potentially affected."*

  The public comment and hearing process for the Title V Operating Permit is designed to assure that all interested parties that may be affected by a source have an opportunity to provide meaningful input. In addition to the public hearing process, DES provided a presentation and answered questions from the public regarding this permit as well as other questions related to the operations of the landfill. As a part of the public hearing DES allowed the opportunity for both written and oral comments. The public hearing was properly noticed in two newspapers (statewide circulation and local circulation) at least 30 days prior to the hearing, and the hearing was held in the Town of Bethlehem in order to best accommodate residents in presenting their concerns and to allow DES to answer questions. DES also extended the time frame for submittal of written comments to a period of two weeks after the hearing was held.

Comments Regarding Landfill Closure

Comment: If the landfill was closed tomorrow, what would be in place for that?

DES Response: Under the state solid waste regulations (Env-Sw 1106.04), NCES is required to have a written closure plan. The facility closure plan provides sufficient detail to allow a third party to implement and complete all required facility closure tasks in compliance with all applicable regulations, and without further explanation. A copy of the facility's closure plan is available from the Solid Waste Division, upon request.

NCES also has money in an insurance policy to pay for the closure of the landfill and any post-closure activities of the landfill.

Even after final closure of the landfill, landfill gas will continue to be generated. The facility will be required to operate and maintain the gas collection system in accordance with all applicable air regulations.

Comments Regarding Landfill Liner

Comment: Does the landfill liner have a "shelf-life"?

DES Response: Concern has been expressed about the long-term performance of the liner system, because all constructed systems degrade and the liner technology is only about 20 years old. It is true that the long-term performance of liners will not be definitively known until they have been around for many more years. In this case, the specific material that the liner is made of is high density polyethylene (HDPE).

Others have asked this same very important question and there has been research intended to address this. The Geosynthetics Institute (GSI) has issued a white paper which presents the results of a decade long research project, funded partly by the EPA, which studied the life expectancy of landfill liners. Through the research, they found that the liner degrades through oxidation and occurs in three stages. The first stage is the time for the depletion of antioxidants in the material; the second stage is the time for the onset of oxidative damage; and the third stage is the time for loss of 50% of the physical properties of the material, which is considered to be the end of material's service life. Another factor described in the paper is that the speed of each of these stages is highly temperature dependent.

The life expectancy given in the paper ranges from 69 years at 40° C to 446 years at 20° C. They also monitored the temperature of the liner of a landfill in Pennsylvania and estimated its life expectancy to be between 166 and 446 years. These results are consistent with other research that DES has seen. Ongoing gas well monitoring at the NCES landfill shows that well temperatures average around 27° C. Using this temperature, the life expectancy of the liners at NCES ranges between 166 and 265 years. However, it should be noted that the liners are somewhat isolated from the waste, particularly the secondary liner, which should be at the ambient temperature of the ground. The life expectancy of the secondary liner material, consistent with the GSI research, should be closer to 446 years.

Additional Request for Information

During the public hearing a request was made for the Department to respond to a February 24, 2011 information request made by Sherilyn Young of Rath, Young and Pignatelli on behalf of Commonwealth Bethlehem Energy, LLC. This request was filed as part of an official appeal of the modification to the Solid Waste Management Facility Permit (Permit Number: DES-SW-SP-03-002, Docket Number: 10-21 WMC). The appeal was withdrawn on April 12, 2011.

The questions presented in the February 24, 2011 request were an attempt to elicit expert testimony and opinion from the Department pertaining to the operation of the landfill gas collection system. The request for information also makes an assertion that the well field was not being operated within the limits of its solid waste permit. Although the Department objected to the specific questions and did not respond to them, the document in question also contains well operation data that shows that the well field was in fact being operated within acceptable parameters. This data was included in the commenter's submittal as well and proper analysis of that data will draw the same conclusion.

We note also that, as described elsewhere in this response to comments, the well field is regularly monitored pursuant to the terms and conditions in the permit.

Findings of Fact

DES has based its decision with respect to the application for the Title V Operating Permit for NCES on the following findings of fact:

1. NCES filed an application for its initial Title V Operating Permit on June 4, 2004, in accordance with the requirements of Env-A 609.06, *Application Procedures for Title V Operating Permits*.
2. DES conducted a comprehensive review of the application, including additional information submitted by NCES. In addition, DES considered comments provided during the public comment period. Based on its review and considerations, DES determined that NCES is capable of being operated in compliance with all currently applicable state and federal air regulations.
3. DES has determined that the Title V Operating Permit contains adequate operating limitations, emissions limitations, monitoring conditions, recordkeeping conditions, and reporting conditions to ensure compliance with all applicable state and federal air regulations.

Director's Decision

After consideration of the Title V Operating Permit Application and all public comments, the application is approved and a Proposed Title V Operating Permit is hereby issued.

Any person aggrieved by this decision may appeal to the N.H. Air Resources Council ("Council") by filing an appeal that meets the requirements specified in RSA 21-O:14 and the rules adopted by the Council, Env-AC 200. The appeal must be filed **directly with the Council within 30 days** of the date of this decision and must set forth fully **every ground** upon which it is claimed that the decision complained of is unlawful or unreasonable. Only those grounds set forth in the notice of appeal can be considered by the Council.

Information about the Council, including a link to the Council's rules, is available at http://nhec.nh.gov/ (or more directly at http://nhec.nh.gov/air/index.htm). Copies of the rules also are available from the DES Public Information Center at (603) 271-2975.

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Craig A. Wright Date
Director
Air Resources Division

cc: Town of Bethlehem
Public Commenters
Donald Dahl, USEPA Region I