Integrated Report
Human Health and Environmental Effects
Omya Verpol Facility — Florence, Vermont
Appendix A: Overview of Project

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A. Overview of project

A.1. Statute

The Legislation calling for this study is as follows:

NO. 65. AN ACT RELATING TO SOLID WASTE FACILITY FEES, TAXES, AND CERTIFICATION. (H.532)

Sec. 5. STUDY OF CALCIUM CARBONATE

In order to review and consider fully the need to retain the tax exemption under 32 V.S.A. 5953(7), the secretary of natural resources shall require Omya as part of its certification under 10 V.S.A. §§ 6605 or 6605b to finance and complete a study of the human health and environmental effects of Omya's mineral processing of calcium carbonate in Vermont. The secretary of natural resources shall require Omya to submit a report of the results of the study on or before January 15, 2008 to the house and senate committees on natural resources and energy, the house committee on ways and means, and the senate committee on finance. The secretary of natural resources shall require the independent, third-party research study to be conducted by one or more qualified laboratories certified by the National Environmental Laboratory Accreditation Program (NELAP).

In completing the study, the secretary of natural resources may authorize Omya to utilize previously compiled data subject to verification and validation of that data by an independent, third-party university or laboratory. The study shall include:

(1) Appropriate site-specific bedrock, aquifer, and groundwater mapping of Omya's mineral processing facilities, waste disposal facilities, and surrounding area, such as three dimensional groundwater mapping;

(2) Results from and laboratory testing of groundwater sampling from monitoring wells currently in use at Omya's mineral processing facilities, waste disposal facilities and surrounding area and any new wells identified as needed by subdivision (1) of this section;

(3) A complete data packet of the laboratory testing, including methodologies, of the tailings or other waste produced from mineral processing of calcium carbonate at Omya's mineral processing facilities, waste disposal facilities, and surrounding area in Vermont;

(4) A toxicological analysis of the tailings or other waste produced from the mineral processing of calcium carbonate at Omya's facilities in Vermont, including a specific toxicological analysis of tall oil hydroxyethyl imidazoline, other flotation reagents, their constituent compounds, and acetone present in the waste and an analysis of all chemicals present in the waste in accordance with U.S. Food and Drug Administration guidelines;

(5) Study of dust to determine if Omya is the source of the dust in the area and if so to determine possible health and environmental effects;

(6) Proof of compliance with any and all applicable quality control and quality assurance measures and protocols including those relating to data validation; and

(7) Other research or data relevant to the human health and environmental effects of mineral processing of calcium carbonate.

A.2. Section 5 study process

Omya contracted with Conservation Law Foundation Ventures (CLFV) to provide independent management of the Section 5 Study. CLFV assembled an Oversight Team (OT) comprising stakeholder representatives, the job of which was to produce a Request for Proposals, agree on the project team to be hired, assist the project team in establishing the goals and methods of the Study, and monitor the progress of the study.

The project team was headed by Cambridge Environmental Inc., which is not itself a laboratory, and therefore not part of the National Environmental Laboratory Accreditation Program (NELAP). To the extent possible, as called for the by legislation, all analytical chemical data were generated by NELAP-certified laboratories. However, since the analytical methods used to detect components of flotation agent (FA) have been developed specifically for investigation of the Verpol Site and are not part of any national program (let alone part of any U.S. EPA program), no accreditation for FA analysis exists.

CLFV and the OT held regular meetings from January 2006 to February 2008; starting in May 2006, various members of our Project Team participated and/or presented interim findings.

Members of the Oversight Team and their affiliations are:

Table 1 Members of the Oversight Team

Senator Claire Ayer	Vermont legislature
Ernest Brod	Residents Concerned about Omya (alternate)
Anthony Colak	Omya
Emerson Frost	Pittsford resident (alternate)
Julie Hackbarth	Agency for Natural Resources/DEC
Nancy Hayden	University of Vermont; *ex officio*, technical resource
Michael Laurent	Omya (alternate)
Matthew Levin	Vermonters for a Clean Environment (alternate)
Donald Nickless	Town of Pittsford
Beverly Peterson	Residents Concerned about Omya
Lynn Silloway	Florence resident
Annette Smith	Vermonters for a Clean Environment

The Study was conducted in two phases. Phase I entailed a detailed review of all existing data pertaining to the study questions, identification of data gaps, and preliminary assessments of data. Data were gathered from Omya, neighbors, state government files, personal observations,

and scientific literature. In Phase II, additional data critical to completing the Section 5 Study in a timely fashion were gathered.

Omya and CLFV together mounted a public web site, Omya in Vermont (http://www.omyainvermont.net/index.htm), at which were posted meeting agendas, meeting notes, and Project Team reports.

A.3. Milestones of technical work

Our work began in May 2006. Since then, we have had many meetings with the Oversight Team (OT): prepared monthly progress reports, technical memoranda, and a Phase I report; conducted field sampling (and worked with others who were conducting sampling); presented interim findings at the ANR; and prepared a January 14, 2008 Draft of the Integrated Report. Written materials, including this final report with appendices and attachments, are posted on the web, at http://www.omyainvermont.net/lib_sect5.htm. Selected milestones are listed below.

- Phase-I visits to Verpol and/or Florence to gather data in July (two meetings), August (five), September, October 2006
- Regulatory file reviews in August and September 2006
- Audit of laboratory used by Omya in September 2006
- Release of Phase-I report in January 2007
- Meeting with ANR Secretary Crombie and DEC Commissioner Wennberg in March 2007
- Meetings with legislators in April 2007
- Development of Phase-II work plans in March and April 2007
- Installation and testing of new groundwater wells at Omya in May and June 2007
- Groundwater sampling in July and August 2007 (and oversight of sampling by others in 2007)
- Surface water sampling in July and August 2007 (and oversight of sampling by others in 2007)
- Testing of water entering and/or leaving the Pittsford-Florence Municipal Supply in August and September 2007
- Ecological assessments of Smith Pond and its tributaries in July and August 2007
- Public meetings regarding the dust monitoring study in May and June 2007
- Airborne dust sampling July-October 2007
- Bulk dust sampling in September 2007
- Excavation of test pits on-site in August 2007 to investigate reports of dumping
- Meetings with Omya staff, Omya's noise consultant, and/or neighbors affected by noise in August 2006, and June, August, and October 2007
- Meeting with ANR Secretary Crombie and ANR Staff in October 2007 and January 2008

Cambridge Environmental Inc
58 Charles Street Cambridge, MA 02141
www.CambridgeEnvironmental.com
Geosyntec consultants
289 Great Road, Suite 105, Acton, MA 01720
www.geosyntec.com

A.4. About the authors

A.4.1. Cambridge Environmental Inc.

Cambridge Environmental Inc. is a woman-owned small business based in Cambridge, Massachusetts, with a 19-year history of assessing and helping to minimize risks to health and the environment. The firm assists both public and private clients, local and national, providing research and consulting services in health risk assessment, risk management, assessment of environmental fate and transport of contaminants, air quality modeling, toxicology, data evaluation, epidemiology, and related fields. Cambridge Environmental specializes in quantitative assessment of risks to health and the environment posed by chemical, physical, and microbiological agents in environmental media, food, consumer products, and other settings. Its Maryland office performs technical work for U.S. EPA's Office of Pesticide Programs.

Cambridge Environmental was the prime contractor and project manager for the Section 5 Study, with responsibilities for air contaminant evaluations, toxicology, analytical chemical interpretations, and health risk assessment.

A.4.2. Geosyntec Consultants

Geosyntec has a 23-year history of providing private and public sector clients with earth and environmental sciences consulting services; environmental, geotechnical, and hydrological engineering consulting and design services; and construction management and quality assurance services for projects involving these practices. Geosyntec has some 540 employees in offices throughout the U.S. and internationally: its office in Acton, Massachusetts led its efforts for this project.

Of note, Geosyntec staff have designed and participated in hundreds of investigations of fractured bedrock (such as exists at the Omya site) for the purpose of developing water supplies, investigating the nature and extent of contamination, assessing transport of contaminants in groundwater, and designing remedial systems. Geosyntec further provides a full range of groundwater assessment services including detailed site assessment, remedial investigations, hydrogeologic mapping, aquifer testing and groundwater flow and transport analysis and modeling. Geosyntec project teams incorporate staff with expertise in the design and installation of complex groundwater monitoring systems to collect detailed chemical and hydraulic data.

Geosyntec was the subcontractor responsible for geologic, hydrogeologic, stormwater, ecological, and quality assessment and quality control evaluations.

A.4.3. Other consultants

Dr. Lawrence Copley has more than 30 years of experience in mechanical noise control, construction noise control, environmental noise assessment, and communications and outreach. L.G. Copley Associates has performed numerous design assignments for abating exterior noise from mechanical systems in industrial, commercial, and institutional buildings, including metallurgical processing, engine manufacture, generator facilities, cement terminal, telephone company buildings, hospitals, and colleges. L.G. Copley was the subcontractor responsible for noise evaluations.

Prof. Britt Holmén, University of Vermont, was the subcontractor participating in dust monitoring study. Prof. Holmén is an Associate Professor in the Civil and Environmental Engineering Programs in UVM's School of Engineering, where her research focuses on atmospheric particulate matter. For the Section 5 Study, Prof. Holmén and her laboratory assisted in the development of the dust monitoring network and collected and analyzed the dust samples.

Prof. John Durant, an Associate Professor of Civil & Environmental Engineering at Tufts University, was a peer reviewer for Phase-II scopes of work and hydrogeological data and interpretation. Prof. Durant has more than 20 years of experience working in the environmental field. He holds a Ph.D. in Civil & Environmental Engineering from MIT (1993) and is a registered Professional Engineer.

A.5. Study Questions

To guide the Phase-I review of data and limit Phase-II work to a defined set of issues, the Project Team and OT agreed on a list of Study Questions and Data Needs. That list, created in June 2006, is as follows:

Omya Verpol Facility
H. 532, Section 5 Study Questions and Data Needs
July 12, 2006

Cambridge Environmental Inc. and GeoSyntec Consultants, Inc. have developed a list of specific questions to be addressed and data needs for the Omya Verpol Facility environmental study required by Vermont legislation (H.532, Section 5). The list of study questions and data needs is based on discussions during the kickoff meeting with the Oversight Team in Pittsford, Vermont on June 19, 2006, subsequent interviews and meetings with Oversight Team members and others to identify the key concerns of all parties, and our professional judgment. Specific questions and data needs typically depend on the potential for releases and exposures, as outlined by our conceptual exposure model (CEM). As our work progresses to include review of site-specific data, this CEM will become increasingly refined and site-specific.

Specific questions and data needs relevant to each the seven study areas outlined in H.532 are presented below. Because study areas 1 (hydrogeology), 2 (groundwater samples), and 3 (analyses of waste/tailings data) are so closely related, questions and data needs related to these study areas are presented together. Because study area 7 (other concerns) includes several very different issues such as ambient air pollutants, health impacts, noise, odors, and stormwater impacts, questions and data needs related to each of these issues are addressed separately. We have organized specific questions within the framework of the CEM where relevant and appropriate.

Hydrogeology, groundwater samples, and analyses of waste/tailings data
H.532 Section 5 (Study areas 1, 2, and 3)

(1) APPROPRIATE OMYA PROPERTY-SPECIFIC BEDROCK, AQUIFER, AND GROUNDWATER MAPPING.
(2) RESULTS FROM LABORATORY TESTING OF GROUNDWATER FROM MONITORING WELLS CURRENTLY IN USE.
(3) A COMPLETE DATA PACKET OF THE LABORATORY TESTING, INCLUDING METHODOLOGIES, OF THE TAILINGS OR OTHER WASTE PRODUCED FROM MINERAL PROCESSING OF CALCIUM CARBONATE.

SOURCE

1. **What are the plausible Contaminants of Concern (COCs) that may be present in the tailings piles or other potential source areas on the Omya property consistent with the CEM?** Types of data that may be found acceptable and relevant for addressing this question include:
   1.1. Inventories of chemical constituents of flotation agents and other chemicals used in production:
      1.1.1. MSDS's.

1.1.2. Purchasing records.
1.1.3. Process descriptions.
1.1.4. Production inventories.
1.1.5. RCRA and other databases for hazardous waste generation/storage and release inventories.
1.1.6. Chemical analyses (using acceptable standards and appropriate guidance) of products, tailings, or other waste, surface soils, or other affected media.
1.1.7. Other information on historical and current chemical usage at the plant.

1.2. Identification of potential sources of COCs at the Omya property such as chemical/fuel storage and use areas (including but not limited to diesel fuel, heating oil, and biocide), as well as the former asphalt plant area, identifiable through:
1.2.1. Interviews with long-time plant employees.
1.2.2. Operational records.
1.2.3. Process information identifying storage and transfer operations and other potential release points.
1.2.4. Aerial photos.
1.2.5. Historic and current chemical storage permits.

1.3. Inventories of other potential sources of COCs at the Omya property, based on documented and undocumented releases or potentially harmful disposal practices:
1.3.1. Vermont ANR records.
1.3.2. Plant records.
1.3.3. Employee interviews.

2. Are there any persistent degradation products of these chemicals?
2.1. Literature information.
2.2. Experience and professional judgment.

3. **Is it plausible that any of the COCs identified in Section 1 above have contacted, or are likely to contact, groundwater?** Types of data that may be found acceptable and relevant for addressing this question include:
3.1. Depth of TMAs and depth to groundwater.
3.2. Concentration of plausible COCs in the tailings waste with depth.
3.3. Quantity and type of other releases.
3.4. Chemical analysis (using acceptable standards and appropriate guidance) for chemicals in soil and/or groundwater in the potential release area.
3.5. Chemical properties of COCs (*i.e.*, solubility, partitioning coefficients).
3.6. Properties of surficial soils and tailings, where relevant to the CEM (*i.e.*, grain size, permeability, organic carbon content, clay and iron content).

PATHWAY

4. **Is it plausible that COCs in contact with groundwater now or in the future could migrate in groundwater? If so, how quickly and how far? If chemicals have limited mobility in groundwater, what is the reason/mechanism?** Types of data that may be found acceptable and relevant for addressing this question include:
4.1. Concentrations and masses of COCs in soil or groundwater.

4.2. Chemical properties of COCs (solubility, partitioning behavior).
4.3. Properties of soils and bedrock (organic, clay, and iron content).
4.4. Groundwater flow direction and velocity.
4.5. Fracture patterns and fabric of bedrock.
4.6. Omya development plans for future water use.

5. **What is the approximate water balance for the plant?** Types of data that may be found acceptable and relevant for addressing this question include:
   5.1. Pumping records for production wells.
   5.2. Use/billing records for municipal water from Florence wells.
   5.3. Plant process documentation.
   5.4. Rates of discharge to, and extraction from, quarries.
   5.5. Other water uses (washing and water recovery).
   5.6. Other sources and sinks of surface water (please see stormwater questions).

6. **What is the likely impact of water withdrawal from the Plant's production wells?** Types of data that may be found acceptable and relevant for addressing this question include:
   6.1. Pumping well characteristics.
   6.2. Pumping records.
   6.3. Pumping test results.
   6.4. Transmissivity and hydraulic gradient estimates for the local aquifer.
   6.5. Rainfall and surface water recharge estimates.
   6.6. Water levels in nearby monitoring or residential supply wells.

7. **What are the horizontal and vertical components of groundwater flow across and downgradient from the Omya property, including the eastern border of the Omya property, and particularly in areas where COCs may have come into contact with groundwater and where groundwater discharges to surface water or is pumped from supply wells?** Types of data that may be found acceptable and relevant for addressing these questions include:
   7.1. The size and location of the contributing watershed to the property, including quantification of recharge to Omya property groundwater.
   7.2. Water level data from a monitoring well network in the bedrock and saturated overburden to evaluate potentiometric levels spatially across the Omya property and vertically with depth.
   7.3. Estimates of the dewatering rate for the Hogback Quarry and the contributing area to the quarry.
   7.4. Evaluation of groundwater pumping locations on and off the Omya Property (*i.e.*, residential, industrial, and municipal wells) and their likely hydraulic areas of influence relative to the Omya property.
   7.5. An assessment of the hydraulic connection, if any, between groundwater and surface water including seeps and streams, and estimates of the rate of discharge to streams, seeps, and springs.
   7.6. Hydraulic conductivity data for the overburden, bedrock, and tailings.
   7.7. Identification of the major fracture fabric of the bedrock that is expected to have a significant influence on groundwater flow direction.

Cambridge Environmental Inc
58 Charles Street Cambridge, MA 02141
www.CambridgeEnvironmental.com
Geosyntec consultants
289 Great Road, Suite 105, Acton, MA 01720
www.geosyntec.com

7.8. Chemical analysis of groundwater samples from monitoring wells, and plausible receptors such as springs, stream, and water supply wells for COCs released at the Site.

RECEPTOR

8. **What are the plausible current and future receptors of groundwater migrating from potential source areas at the Omya property consistent with the CEM?** Types of data that may be found acceptable and relevant for addressing this question include:
   8.1. Locations of springs
   8.2. Locations and construction of private supply wells
   8.3. Locations, construction, and pumping rates of public supply wells
   8.4. Locations of surface water discharge areas

9. **What is the current distribution of site-related chemicals in groundwater near the Site?** Types of data that may be found acceptable and relevant for addressing this question include:
   9.1. Analysis for COCs in groundwater samples collected from representative depths in monitoring wells located along likely flow paths from identified source areas.

Toxicology of tailings/waste/process chemicals/stationary source emissions/dust
H. 532 Section 5 (Study area 4)

(4) A TOXICOLOGICAL ANALYSIS OF THE TAILINGS OR OTHER WASTES PRODUCED AT THE VERPOL PLANT INCLUDING A SPECIFIC TOXICOLOGICAL ANALYSIS OF TOHI, OTHER FLOTATION REAGENTS, THEIR CONSTITUENT COMPOUNDS, ACETONE AND OTHER CHEMICALS PRESENT IN THE WASTE.

1. **Is there information in the scientific literature to support calculation of a chronic reference dose[1] (or similar toxicity benchmark) for chemicals/substances that may be contacted by Omya neighbors, according to the CEM[2]?** Types of data that may be found acceptable and relevant for addressing this question include:
   1.1. Existing estimates of daily intake thought unlikely to pose risk. Examples: (a) estimates by U.S. FDA or U.S. EPA of minerals in daily diet; (b) recommended daily doses from the Institute of Medicine for minerals or metals; (c) chronic reference doses or reference concentrations[3] from EPA; (d) minimal-risk-level values from ATSDR; (e) analogous estimates of acceptable daily exposure from state agencies; (f) maximum contaminant level goals for contaminants in drinking water, as derived by EPA; (g) Vermont Hazardous Ambient Air Standards; (h) measurements of compounds of interest in typical

[1] A reference dose is an estimate of daily exposure to humans, including sensitive populations, that is likely to be without appreciable risk of adverse, non-cancer health effects during a lifetime. Reference doses are typically expressed in terms of milligrams of the substance per kilogram body weight of a consumer (mg/kg).
[2] Please note that detailed toxicological reviews in the Section 5 study will be limited to chemicals or materials to which Omya neighbors are likely (or may likely be) exposed, as determined by the detailed Conceptual Exposure Model.
[3] Analogous to a reference dose, a reference *concentration* is an estimate of an airborne level [typically expressed as milligrams of the substance per cubic meter of ambient air (mg/m^3)] that is likely to be without appreciable risk of adverse, non-cancer health effects during a lifetime of exposure.

Cambridge Environmental Inc
58 Charles Street Cambridge, MA 02141
www.CambridgeEnvironmental.com
Geosyntec consultants
289 Great Road, Suite 105, Acton, MA 01720
www.geosyntec.com

rural air, water, and/or soil (that is, expected background values); (i) medically appropriate doses.

1.2. Regulatory standards or guidance for acceptable exposure to compounds in air. Examples: OSHA, NIOSH, or ACGIH positions regarding occupational exposure to chemicals in air.

1.3. OSHA, NIOSH, or MSHA studies of worker health in the calcium carbonate industry.

1.4. Primary scientific studies (or reviews of primary studies) describing the toxicity and/or hormonal activity of compounds of interest to humans or laboratory animals. Examples: (a) long-term study of the effects of acetone in drinking water on the health of rats; (b) study of the short-term toxicity of stearic acid in food to people; (c) occupational epidemiology describing the health of workers in the calcium carbonate industry.

1.5. Existing standards or guidelines for acceptable exposure might require modification so as to apply to a diverse population with continuous exposure.

1.6. Other data pertaining to the compounds of interest that, with appropriate modification, support estimates of acceptable exposure. Examples: (a) studies using exposure regimes (manner and duration of dosing) different from those indicated by the CEM; (b) studies using non-standard methods or laboratory species.

2. **Is there information in the scientific literature to indicate whether chemicals that may be contacted by Omya neighbors, according to the CEM, are likely to cause cancer? And if chemicals are likely to cause cancer, are there quantitative estimates of carcinogenic potency?** Types of data that may be found acceptable include:

2.1. Judgments of scientific and regulatory agencies, such as U.S. EPA, IARC, and NTP.

2.2. Primary scientific studies of the ability of chemicals of interest to cause cancer in laboratory animals ("cancer bioassays").

2.3. Epidemiologic studies of cancer in people exposed to chemicals of interest.

2.4. Published estimates of cancer potency, for example by the U.S. EPA.

2.5. Our own estimates of cancer potency, using standard statistical methods and cancer bioassay data.

3. **If there is not adequate information in the scientific literature to support calculation of a chronic reference dose (or similar toxicity benchmark) and/or to determine carcinogenicity for chemicals that may be contacted by Omya neighbors, according to the CEM, is there *other* information upon which a reasoned professional judgment can be made about the likely toxicity of such exposure?** Types of data that might support a judgment include:

3.1. Analogous data for closely related chemicals.

3.2. Structure-activity information.

3.3. Likely exposure in the absence of Omya activities or site-related chemicals.

3.4. Worker health studies.

Dust
H.532 Section 5 (Study area 5)

(5) STUDY OF DUST TO DETERMINE IF OMYA IS THE SOURCE OF DUST IN THE AREA AND IF SO TO DETERMINE POSSIBLE HEALTH EFFECTS;

1. **What types of dust have been observed in the area? What are the physical characteristics of the dust (color, fineness)? Where have higher levels of dust been observed? Does dust appear to be related to specific sources? Are there seasonal patterns or other factors that seem to correlate with dust?** Data that may be relevant and acceptable for answering these questions include:
   1.1. Recollections and photographs of past observations.
   1.2. Current observations, reconnaissance, and interviews.
   1.3. Dust complaint records.

2. **What are the potential sources of dust from the Omya facility and its operations?** Data that may be relevant and acceptable for answering this question include:
   2.1. Information contained in Clean Air Act Title V permits and supporting documents.
   2.2. Information/calculations that may have been developed by Omya for internal use (*e.g.*, an inventory of sources).
   2.3. Physical layout of Omya's facility and locations of activities including truck traffic that can generate dust (open areas, material transfer points, etc.).
   2.4. U.S. EPA and other regulatory guidance identifying dust emissions.
   2.5. Current observations and interviews.

3. **What efforts have been taken by Omya to reduce dust emissions? Have dust mitigation efforts been effective? Are Best Management Practices (BMPs) consistent with methods generally used to control dust emissions?** Data that may be relevant and acceptable for answering this question include:
   3.1. Standard operating procedures (SOPs) and/or Best Management Practices (BMPs) in place at Omya including dust generated by truck traffic.
   3.2. Methods recommended by regulatory agencies and used at other facilities.
   3.3. Dust control equipment in use.
   3.4. Evidence that BMPs and SOPs are in fact implemented as designed.
   3.5. Observations of dust control efforts.

4. **How significant in magnitude are potential dust emission sources at Omya?** Data that may be relevant and acceptable for answering this question include:
   4.1. Emissions measurements (from stacks and vents).
   4.2. U.S. EPA AP42 emission estimation methods and equations.
   4.3. Permit emission limits and actual operating data.
   4.4. Measurements and/or relevant estimates of silt content and moisture content of dusts.
   4.5. Relevant meteorological data.
   4.6. Particle size distributions of dust sources.

Cambridge Environmental Inc
58 Charles Street Cambridge, MA 02141
www.CambridgeEnvironmental.com
Geosyntec consultants
289 Great Road, Suite 105, Acton, MA 01720
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5. **What concentrations of dust in air result from Omya sources?** Data that may be relevant and acceptable for answering this question include:
   5.1. Standard U.S. EPA-style modeling to estimate the dispersion of emissions and predict ambient concentrations.
      5.1.1. Meteorological data/terrain information.
      5.1.2. Emission source configurations / inventories / parameters.
      5.1.3. Locations of relevant receptors (*e.g.*, residences).
   5.2. Ambient air monitoring data.
   5.3. Analyses supporting Clean Air Act Title V permits.

6. **What fraction of total dust in the air is due to Omya activities?** Data that may be relevant and acceptable for answering this question include:
   6.1. Estimates or measurements of background air quality.
   6.2. Analyses supporting Clean Air Act Title V permits.

7. **What chemicals are contained in Omya dusts leaving the site[4]?** Data that may be relevant and acceptable for answering this question include:
   7.1. Chemical analyses of tailings.
   7.2. Chemical analyses of aggregate materials.
   7.3. Understanding of mineral processing methods, additives, and chemistry.

8. **Are there health risks associated with dust?** This topic is covered in the "Toxicology" and "Health Impact Analysis" sections.

Analytical data analysis and acceptable quality control and quality assurance
H. 532 Section 5 (Study area 6)

(6) PROOF OF COMPLIANCE WITH ANY AND ALL APPLICABLE QUALITY CONTROL AND QUALITY ASSURANCE MEASURES AND PROTOCOLS INCLUDING DATA VALIDATION;

1. **Are historical site analytical data for air, soil, and groundwater samples representative of site conditions?** Types of data that may be found acceptable and relevant for addressing this question include:
   1.1. Historical analytical methods for determination of the contaminants of concern (COCs) such as Tall Oil, biocides, etc.
   1.2. Quantitation limits for the COCs to aid in environmental and human health impact assessment.
   1.3. Sample collection methods used including handling, preservation, and volume collected.

[4] Chemical constituents of particulate matter emissions from stacks are discussed in the "Ambient Air Pollutants due to Omya's Operations" section.

Cambridge Environmental Inc
58 Charles Street Cambridge, MA 02141
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Geosyntec consultants
289 Great Road, Suite 105, Acton, MA 01720
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2. **Are historical site analytical data compliant with regard to quality control and quality assurance measures, including the following?** Types of data that may be found acceptable and relevant for addressing this question include:
   2.1. Proof of laboratory capabilities, *i.e.,* a Laboratory Quality Assurance Manual, training records, standard operating procedures (SOPs), etc.
   2.2. Laboratory Minimum Detection Limit (MDL) studies performed on an annual basis.
   2.3. Quality checks including calibrations, calibration checks, QC samples, etc. as prescribed by the method and good laboratory practices.
   2.4. Lab report documentation for assessment of data transparency, defensibility, and validation.
   2.5. Engineering Reports compared to laboratory data reports.

3. **Are comprehensive historical data sets available for review?** Types of data that may be found acceptable and relevant for addressing this question include:
   3.1. Laboratory SOPs.
   3.2. Data results.
   3.3. Raw sample data.
   3.4. Raw QC data.
   3.5. Records for standard preparation, sample preparation, analytical sequence logs, and instrument maintenance.
   3.6. Field collection records including time and location of sample collection and by whom.
   3.7. Chain of custody records.

4. **What are the most accurate and appropriate analytical methods for quantification and identification of the COCs on site?** Types of data that may be found acceptable and relevant for addressing this question include:
   4.1. Spectrophotometric – non-standard method.
   4.2. Gas chromatography/Mass spectrometry EPA Method 8270.
   4.3. High Performance Liquid Chromatography/Mass Spectrometry - non-standard method.
   4.4. Other analytical methods.

5. **What sample collection methods are appropriate for collection of site samples that will preserve the integrity of the chemicals of concern in each matrix?**
   5.1. SOPs and sampling plans for groundwater, surface water, soil, and air sampling.

Other

H.532 Section 5 (Study Area 7)

(7) OTHER RESEARCH/DATA RELEVANT TO THE HUMAN HEALTH AND ENVIRONMENTAL EFFECTS OF MINERAL PROCESSING OF CALCIUM CARBONATE.

7a. Ambient air pollutants due to Omya's operations

1. **What chemicals are released to the atmosphere from Omya's operations[5]?** Data that may be relevant and acceptable for answering these questions include:
   1.1. Stack and effluent measurements (*e.g.*, data generated in recent odor studies).
   1.2. U.S. EPA's AP42 emissions database.
   1.3. Mass balance calculations (*e.g.*, sulfur in fuel).
   1.4. Clean Air Act Title V permit and supporting analyses.
   1.5. Operating records (relevant to actual emissions *v.* potential emissions).
   1.6. Professional judgment, based on operating conditions and processes.

2. **What concentrations in ambient air result from Omya emissions?** Data that may be relevant and acceptable for answering these questions include:
   2.1. Modeling studies.
      2.1.1. Emissions estimates and inventories.
      2.1.2. Emission source configurations, inventories, and parameters.
      2.1.3. Meteorological data and terrain information.
      2.1.4. Clean Air Act Title V permit and supporting analyses.
      2.1.5. Locations of relevant receptors (*e.g.*, residences).
   2.2. Ambient measurements.

3. **Are there (or are there likely to be) any exceedances of Vermont Hazardous Ambient Air Standards (based on both actual and potential rates of production at the facility)?** Data that may be relevant and acceptable for answering these questions include:
   3.1. Modeled and projected estimates of air pollutant concentrations from sources in which relevant chemicals have been identified.
   3.2. Emission sources of relevant chemicals not considered in existing modeling.
   3.3. Ambient measurements of relevant chemicals.

4. **How do Omya-related impacts compare to typical background air quality?** Data that may be relevant and acceptable for answering these questions include:
   4.1. Ambient monitoring data.
   4.2. Comprehensive modeling studies (*e.g.*, the U.S. EPA's National Air Toxics Assessment).

[5] Ambient air pollutants here include chemicals released from operations, including stacks, vents, dryers, etc., but exclude dust, which is considered separately.

5. **Are there health risks associated with ambient air pollutants due to Omya's operations?** This topic is covered in the "Toxicology" and "Health Impact Analysis" sections.

7b. Health impact analysis

1. **Is drinking water safe for consumption and bathing, with regard to chemicals of concern indicated by the CEM?** Relevant and acceptable data may include:
   1.1. Chemical analyses of drinking water.
   1.2. Quantitative or semi-quantitative estimates of potential contamination from hydrogeological investigation or modeling efforts.
   1.3. Estimates of dermal absorption of chemicals.
   1.4. Toxicity profiles for chemicals found in drinking water.

2. **Are local chicken eggs and dairy products safe for consumption, with respect to materials that may reach chickens or cows, according to the CEM?** Relevant and acceptable data may include:
   2.1. Measured or modeled concentrations of Omya-related chemicals in air, soil, grass, or water near chickens and cows.
   2.2. Likely uptake of such chemicals into chicken eggs or milk.
   2.3. Toxicity profiles for such chemicals.
   2.4. Normal levels of such chemicals (if any) in chicken eggs and milk.

3. **Are locally grown vegetable, fruit, and nut products safe for consumption, with respect to materials that may reach them according to the CEM?** Relevant and acceptable data may include:
   3.1. Measured or modeled concentrations of Omya-related chemicals in air, soil, or water near crops.
   3.2. Likely uptake of such chemicals into vegetables, fruits, and nuts.
   3.3. Toxicity profiles for such chemicals.
   3.4. Normal levels of such chemicals (if any) in vegetables, fruits, and nuts.

4. **Based on traditional dose-response assessment, what Omya-specific chemicals and exposures, if any, would be predicted to harm health?** Relevant and acceptable data may include:
   4.1. Toxicity benchmarks, described above (in "Toxicology of tailings/waste/process chemicals/stationary source emissions/dust"). Example: (a) daily intake of acetone not likely to be harmful to people, even if taken for a lifetime; (b) excess cancer risk from a lifetime of exposure to 1 part per billion of formaldehyde in air.
   4.2. Estimates of exposure for Omya neighbors. Example: maximum and average daily exposure to acetone; (b) lifetime average daily exposure to formaldehyde in air, from measurements/models of air emissions/air quality (such as from studies being conducted by TRC).

Cambridge Environmental Inc
58 Charles Street Cambridge, MA 02141
www.CambridgeEnvironmental.com
Geosyntec consultants
289 Great Road, Suite 105, Acton, MA 01720
www.geosyntec.com

4.3. Evidence from scientific literature regarding synergistic or antagonistic effects at exposure levels/doses of interest.
4.4. Comparison of exposure levels to toxicity benchmarks.
4.5. Estimates of "background" exposure to chemicals of interest, as indicated by the CEM.
4.6. OSHA, NIOSH, or MSHA studies of worker health in the calcium carbonate industry.
4.7. FDA tolerances for pesticides.

5. **Is there any reasonable expectation that Omya-related chemicals to which neighbors may be exposed, as indicated by the CEM, could cause diabetes, gallstones, kidney stones, uterine fibroids, chronic diarrhea, adrenal or thyroid damage, or the specific cancers suffered by neighbors to Omya?** Relevant and acceptable data may include:
   5.1. Review of risk factors for these diseases, as documented in the scientific and medical literature.
   5.2. Toxicity profiles for the chemicals of interest.
   5.3. Health risk estimates.

6. **Is it plausible to determine whether there is (or has been) an excess of cancer in the Florence area, and whether any such excess is due to Omya operations?** Relevant and acceptable data may include (subject to privacy laws):
   6.1. State cancer registry data.
   6.2. Population size and structure.
   6.3. Collected data on cancer incidence and/or mortality.
   6.4. Information on cancer risks.

7c. Noise

1. **What types of noise have been observed in the area? What are the characteristics? Where heard? When heard, does noise have a constant (24/7), daytime only, occasional, seasonal, or weather-related pattern? Is there temporal variation – steady while occurring; pulsating? What is the quality of sound – tonal/hum; tonal/squeal; etc.? What are the apparent or suspected sources of noise?** Data that may be relevant and acceptable for answering these questions include:
   1.1. Current observations, reconnaissance, and interviews.
   1.2. Noise complaint records.
   1.3. Noise monitoring or investigation reports prepared on behalf of Omya.

2. **What are the potential sources of noise from the Omya facility and its operations?** Data that may be relevant and acceptable for answering this question include:
   2.1. Information/calculations that may have been developed by Omya for internal use (*e.g.*, an inventory of sources).
   2.2. Physical layout of Omya's facility and locations of activities that can generate noise (fixed equipment such as baghouse blowers; mobile equipment, such as for managing tailings; quarrying activities; transportation - over-the-road trucks, railroad, etc.).
   2.3. Current observations and interviews.

3. **What efforts have been taken by Omya to reduce noise emissions? Have noise mitigation efforts been effective?** Data that may be relevant and acceptable for answering this question include:
   3.1. Standard operating procedures (SOPs) to reduce noise.
   3.2. Engineering controls to reduce noise that have been implemented or are planned.
   3.3. Data showing noise level trends over time.

4. **How significant are noise emissions from specific Omya operations, broken down by location and category, and which receptor locations are affected?** Data that may be relevant and acceptable for answering this question include:
   4.1. Computer modeling, such as using SoundPlan®, to determine the decibel contributions of individual items of equipment and activities at critical receptor locations, including propagation effects of terrain.
   4.2. Comparison of Omya decibel contributions to background ambient sound levels.
   4.3. Rank ordering of noise sources by exceedance over ambient and numbers of receptors affected.
   4.4. Identification of specific source/receptor combinations where exceedance of Omya decibel contribution over ambient may reasonably be considered to represent a noise nuisance.

7d. Odors

1. **Where have odors been observed in the area? What are the characteristics of odors? How frequent/persistent/severe are these odors? Do odors appear to be associated with specific sources at Omya? Have odors changed over time?** Data that may be relevant and acceptable for answering these questions include:
   1.1. Recollections of past observations.
   1.2. Current observations of odors.
   1.3. Odor complaint records.
   1.4. Odor monitoring studies.

2. **What have the recent odor studies sponsored by Omya found? Are these studies technically correct and conducted according to standard methods and procedures?** Data that may be relevant and acceptable for answering this question include:
   2.1. Odor studies and supporting technical information.
      2.1.1. Identification of odor sources.
      2.1.2. Chemical composition of odorous effluents.
      2.1.3. Odor panel testing.
      2.1.4. Odor thresholds for individual chemicals.
      2.1.5. Dilution to threshold (D/T) studies.
      2.1.6. Dispersion modeling analyses.
         2.1.6.1. Meteorological data/terrain information.
         2.1.6.2. Emissions calculations.

2.1.6.3. Physical source parameters (*e.g.*, locations/heights of stacks, effluent flow velocities, and temperatures).

2.1.6.4. Locations of relevant receptors (*e.g.*, residences).

2.2. Notes of/conversations with TRC (Omya's odor consultant).

3. **Are plans to mitigate odors likely to be effective? Are there other odor issues not covered by the odor studies?** Data that may be relevant and acceptable for answering this question include:
   3.1. Professional judgment.
   3.2. Recent observations.

4. **Are there health risks associated with odors?** This topic is covered in the "Toxicology" and "Health Impact Analysis" sections.

7e. Stormwater

1. **How is stormwater managed and used on the Verpol plant property and what is the potential for release of stormwater and non-stormwater (*i.e.*, process water) from the property?** Relevant and acceptable data may include:
   1.1. VT Department of Environmental Conservation General Permit 3-9010. The Verpol property currently operates under state stormwater permit number 3512-9010.
   1.2. Current NPDES permit for facility.
   1.3. Sampling records. Determine if analysis of Omya process chemicals in stormwater is necessary.
   1.4. Stormwater pollution prevention plan and Spill Prevention Control and Counter Measure Plan.
   1.5. Engineering design documents for the sizing and design of stormwater containment, conveyance, and treatment areas.
   1.6. Process flow diagrams of how stormwater is captured, used, co-mingled with process waters, and reused or released.
   1.7. Historical records of stormwater use and releases. What are the conditions that cause a release?
   1.8. Mass balance calculation of stormwater and make up water for production (water from on-site wells and from the public water supply – pumping and purchase records from Pittsford/Florence well) to determine amount lost due to evaporation, process losses, discharge to groundwater, or release to Otter Creek. (See question 5 of the questions for Study areas 1, 2, and 3).

2. **What information is relevant to determine the hydraulic connection between the settling cells, and groundwater?** Relevant and acceptable data may include:
   2.1. Surface water and groundwater elevation measurements near settling ponds.
   2.2. Hydraulic conductivity of tailings and soils/bedrock underlying the settling ponds

3. **What are the conditions when stormwater is released from the site?** How frequently does it occur? Relevant and acceptable data may include:
   3.1. Current stormwater management system design and operating parameters.

4. **Do the chemistry, biology, and environmental conditions of Otter Creek/Smith Pond demonstrate impacts from stormwater releases from the Omya Verpol facility?** Relevant and acceptable data may include:
   4.1. Field survey data on the fish, biota, aquatic vegetation, and chemistry for signs of impacts.
   4.2. Receiving water quality standards (from VTDEC) and an evaluation of actual conditions relative to standards.
   4.3. Background surface water quality in vicinity.
   4.4. Water quality conditions upstream and downstream of input areas from the facility.

5. **How is stormwater managed and used at the Hogback Quarry property, and what is the potential for release off site and impacts to nearby Smith Pond and Otter Creek?** Relevant and acceptable data may include:
   5.1. Engineering design documents for the sizing and design of stormwater containment, conveyance, and treatment areas.
   5.2. Pumping records.
   5.3. Sampling records. Determine if quarry related chemicals (oils, fuels, perchlorate from blasting, etc.) should be included in the analysis.
   5.4. VT Department of Environmental Conservation General Permit 3-9010. Determine if the Hogback Quarry has a state stormwater permit.
   5.5. Current NPDES permit for facility.

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Cambridge Environmental Inc
58 Charles Street Cambridge, MA 02141
www.CambridgeEnvironmental.com

Geosyntec consultants
289 Great Road, Suite 105, Acton, MA 01720
www.geosyntec.com