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ENGINEERING REPORT

Tailings Management Areas
Verpol Plant
Florence, Vermont

Prepared for
Omya Inc.

Prepared by
Sanborn, Head & Associates, Inc.

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1.0 INTRODUCTION

This Engineering Report was prepared for the tailings management areas (TMAs) at the Omya Inc. (Omya) Verpol Plant located in Florence, Vermont. This Report is a component of the Interim Certification Application for the TMAs, and was prepared in accordance with the following requirements of Subchapter 6 (i.e., Design Standards) of the Vermont Solid Waste Management Rules (VSWMRs):

- Section (§) 6-606 (i.e., Disposal Facilities), Paragraph (a) (i.e., General Performance Standards); and
- §6-606 Paragraph (b)(2) (i.e., Standards for Specific Facilities – Discrete Disposal Facilities).

Furthermore, the design described herein was prepared based on guidance provided in the following Vermont Department of Environmental Conservation (VTDEC) Solid Waste Management Procedures (Procedures):

- Procedure Addressing Requirements for Municipal Solid Waste Landfills to Demonstrate Compliance of the Landfill Design with Water Quality Standards, revised February 8, 1999[1];
- Procedure for Incorporating Seismic Considerations Into Municipal Solid Waste Landfill Siting and Design in Vermont, adopted February 16, 1994; and
- Procedure Addressing Requirements for Run-On/Run-Off Control Systems for Municipal Solid Waste Landfills, adopted May 27, 1994.

The remainder of this Engineering Report is organized as follows:

- General site information is presented in Section 2.0;
- The regulatory siting criteria is addressed in Section 3.0;
- Demonstration that the engineering design complies with water quality standards is addressed in Section 4.0;
- The development of the TMAs is described in Section 5.0;
- The design of the stormwater management system is described in Section 6.0; and
- The design of the final cover system for the TMAs is described in Section 7.0.

2.0 GENERAL SITE INFORMATION

The Omya Verpol Plant is located in Florence, Town of Pittsford, Rutland County, Vermont on approximately 385 acres. Calcium carbonate (an amendment to products such as paint and plastics) is produced at the Verpol Plant from which a tailings product is generated. Initially the

[1] These procedures were reviewed and applied, as pertinent to the project, despite the fact that all relate to facilities for the disposal of municipal solid waste. The TMAs will not be used for the disposal of municipal solid waste, but only for the storage of tailings product produced in the mineral processing plant located on site. As noted elsewhere in the application materials, it has been Omya's intent to reclaim and recover the significant calcium carbonate content of the tailings product as technology permits.

tailings product is in a slurry form comprised of approximately 99.6 percent crushed rock that, based on grain size analyses, may be described as sandy silt, and chemical compounds utilized in the production process, most notably a flotation reagent. TMAs are located on the same property as the production facility that generates the tailings product, in former quarry areas. The quarry areas are identified as: (i) the Dolomite (aka Hard Rock) Quarry; (ii) the Kane & Drake Quarry; and (iii) the Loveland (aka Dog Leg) Quarry. The locations of the quarries are shown on Sheet 1 of the Engineering Drawings (see Part D-2 to the Interim Certification Application).

The tailings product slurry is initially dewatered in settling cells located east of the former Loveland Quarry. Periodically the tailings product in the settling cells is excavated and transported to the Kane & Drake and Dolomite TMAs. Therefore, Omya controls the handling and management of the tailings product and keeps the material separate from wastes generated at the Verpol Plant. Furthermore, only on-site roads are used to transport the tailings product to the TMAs.

For purposes of this application, only the Dolomite Quarry and the Kane & Drake Quarries, together with the settling cells utilized to dewater the tailings product, are proposed for use during the term of the Interim Certification to meet the operating needs and requirements of the Verpol Plant.

Sheet 1 presents the grading in the TMAs as of July 7, 2005. As shown on Sheet 1, placement of the tailings product in the TMAs has been performed with the objective of approximating the elevation of the immediately surrounding areas. The outer slopes of the TMAs are currently inclined no steeper than about 2.5 horizontal to 1 vertical (2.5H:1V).

It has been Omya's intention to retain control over the tailings product, with the goal to recover the significant calcium carbonate content as technology permits, to find alternative uses for the tailings product, or to use the tailings product to reclaim depleted quarry operations on site. Approval for the approach was obtained in initial, and subsequent amendments, to the Act 250 permit for the development of the Verpol Plant.

Tailings product initially was placed in the Kane & Drake Quarry starting in 1979. Prior to placing tailings product in the Kane and Drake TMA, Omya constructed a retaining embankment along the open (east) side of the quarry using shot rock. The retaining embankment also allows for vehicular access around the TMA perimeter. The retaining embankment averages between 20 and 30 feet tall, is about 20 feet wide at the top, and was constructed with exterior and interior sideslopes inclined at 2H:1V.

The Dolomite Quarry has been used as a TMA since 2000. With the exception of an area formerly used as an access way for trucks, the Dolomite Quarry TMA is bounded by rock walls developed during quarry operations. The truck access way was replaced with an engineered retaining structure also approved by the state.

The Loveland Quarry has received tailings product since 1979. The Loveland TMA currently contains the least amount of tailings product, deposited primarily as part of the dewatering process.

Visual observations indicate that the tailings product existing slopes of the TMAs are stable (i.e., no sloughing) and are capable of sustaining vegetation. The portions of the TMA slopes that have been vegetated (using a soil conservation seed mix) do not show signs of significant erosion or other distress.

For the purposes of the Interim Certification application, only the Kane & Drake and Dolomite TMAs are proposed. Omya reserves the right to apply for additional TMA capacity in the Loveland TMA and other areas in the future.

3.0 SITING

According to Subchapter 5 (i.e., Siting) of the VSWMRs, solid waste management facilities are prohibited from certain designated areas and must be located so that they comply with certain minimum isolation distances. An evaluation of the VSWMR siting criteria is presented in the Site Characterization Report, which is presented as Part C-1 to the Interim Certification Application. According the Site Characterization Report, the location of the Verpol Plant conforms to the various siting criteria except as follows:

- The TMAs are situated in former rock quarries, and hence the tailings product is in contact with both bedrock and groundwater (§6-503(b)(4)); and

- The southwest corner of the Kane & Drake TMA is approximately 120 feet from the property line, while §6-503(b)(4) requires a 300-foot setback distance.

As noted in the Facility Management Plan (see Part B to the Interim Certification Application), Omya is applying for Interim Certification for the Verpol Plant TMAs because they are unlined facilities that do not meet the above siting criteria and certain regulatory design requirements, even though they were developed and operated in accordance with Act 250 approvals initially granted in the late 1970s and confirmed in subsequent permit amendments.

With respect to other siting requirements, the design presented in this report demonstrates that the TMAs, as they currently exist and in their final condition, meet the general performance standards presented in §6-503(a) (i.e., Siting Standards) and §6-606(a) of the VSWMRs.

4.0 COMPLIANCE WITH WATER QUALITY STANDARDS

According to the VTDEC Procedure entitled “Procedure Addressing Requirements for Municipal Solid Waste Landfills to Demonstrate Compliance of the Landfill Design with Water Quality Standards”, VTDEC requires that certification application include “a predictive demonstration of

compliance with the ground water [*sic*] enforcement standards for specific chemicals. This predictive demonstration has also included an evaluation of compliance with surface water quality criteria in the Vermont Quality Standards if Waters of the State are located with the study area." The VTDEC procedure includes the following steps:

1. Characterize the leachate;
2. Assess leakage potential through the liner system;
3. Establish the Design Management Zone (DMZ) Boundary and upgradient water quality;
4. Demonstrate compliance with the Vermont Water Quality Standards for surface water;
5. Assess leachate migration in the subsurface;
6. Model leachate migration from the facility; and
7. Demonstrate groundwater quality compliance at the DMZ.

As noted in the Site Characterization Report, Omya completed Step 1 and is actively working on the remaining steps. Specifically, Omya retained Heindel & Noyes to prepare a conceptual groundwater model for the Verpol Plant that is focused on the facility site. A numerical model, based on the conceptual model, is being prepared by Sanborn, Head & Associates, Inc. The components of, and the schedule to, complete the conceptual and numerical models were discussed with representatives of VTDEC Solid Waste Program on August 2, 2005. The results of the conceptual model are included in the Site Characterization Report; the numerical groundwater model should be completed in the coming months. Please note however, previous hydrogeologic and fate and transport studies by Heindel & Noyes and Golder Associates, Inc., indicate that the discharge from the TMAs does not present a threat to public health and safety or the environment. As such, a liner system for the TMAs would not be required pursuant to §6-606(b)(2)(A) of the VSWMRs as the tailings product in the TMAs are not the source of leachate harmful to public health and safety or the environment or the creation of nuisance conditions.

5.0 TMA DEVELOPMENT

5.1 General

As noted in Section 2.0 of this report, the Verpol Plant TMAs are existing features. Therefore, the design aspects addressed in this report are related to the continued operation of the TMAs and their eventual closure. The remainder of this section addresses filling of the TMAs, final grading, and slope stability. Design of the stormwater management features and the final cover system is addressed in Sections 6.0 and 7.0, respectively.

5.2 Filling

The TMAs will be filled in accordance with the sequence plans presented on Sheets 3 through 10 of the Engineering Drawings (see Part D-2 to the Interim Certification Application). The sequence plans were developed assuming that Facility Certification is obtained in the future and that future placement of the tailings product occurs within the Dolomite, Kane & Drake, and

Loveland Quarries. As such, the tailings product in the TMAs will be graded to slopes no less than five percent and no greater than 3H:1V in accordance with §6-6-6(b)(2)(N) of the VSWMRs. Each stage in the sequence represents about one year, assuming 150,000 tons (about 110,000 cubic yards (yd^3)) of tailings product are generated each year. Specific information related to the process by which the TMAs are filled is provided in the Operations Plan (see Part E to the Interim Certification Application).

5.3 Final Grading

The proposed final grading plan for the TMAs is presented on Sheet 2 of the Engineering Drawings. As shown on Sheet 2, the maximum elevation of the TMAs will be generally consistent with the elevations in the surrounding area. As noted above, the future tailings product will be placed at a maximum slope of 3H:1V and minimum slope of 5 percent per §6-606(b)(2)(N) of the VSWMRs. As noted in Section 2.0 of this report, previously placed tailings product exhibit slopes inclined as steep as about 2.5H:1V. Regrading of existing in-place tailings product is not proposed because the TMAs are currently well vegetated and stable.

5.4 Slope Stability

Slope stability evaluations of the Verpol Plant TMAs were performed in accordance with the VTDEC Solid Waste Management Procedure for Incorporating Seismic Considerations Into Municipal Solid Waste Landfill Siting and Design in Vermont, adopted February 16, 1994. The evaluations involved analyzing two cross-sections through each of the three TMAs. The cross-sections were selected based on the slope and height of the TMAs, and are considered to represent design conditions.

The slope stability evaluations were performed using the Slide 5.0 computer program. Slide 5.0 is a two-dimensional slope stability program that uses vertical slice limit equilibrium methods to calculate factors of safety (FS). Because the tailings product is a relatively uniform material, the FS was calculated using the Bishop's simplified method of slices and material strength modeled using the Mohr-Coulomb theory. The strength and unit weight parameters used in the calculations were based on the results of geotechnical tests performed on tailings product from the Verpol Plant and on observations of the existing conditions at each TMA. Details on the selection of the engineering parameters are provided in the slope stability calculations presented in Part D-3 of the Interim Certification Application.

According to the US Geological Survey Miscellaneous Field Studies Map MF 2120, entitled "*Probabilistic Earthquake Acceleration and Velocity Maps for the United States and Puerto Rico*"[2], the Verpol Plant TMAs are located in a seismic impact zone. Accordingly, each cross-section was also evaluated considering a horizontal acceleration of 0.16 g, which represents the

[2] Algermissen, S.T., Perkins, D.M., Thenhaus, P.C., Hanson, S.L., and Bender, B.L, reprinted 1991.

maximum horizontal acceleration in lithified earth material, with a 90 percent or greater probability that the acceleration will not be exceeded in 250 years.

The slope stability calculations described above are provided as Part D-3 to the Interim Certification Application. In summary, each of the cross-sections evaluated exhibit a static slope FS of 1.5 or greater and a seismic FS of 1.0 or greater. As such, the TMAs comply with the minimum FS requirements of VTDEC Procedure for slope stability.

6.0 STORMWATER MANAGEMENT

Because the operation and closure of the TMAs essentially is an earthwork project, the design incorporates the erosion and sedimentation controls and stormwater management features necessary to comply with state requirements and the associated Construction General Permit for such a project. These features, which are shown on Sheets 11 and 12 of the Engineering Drawings, were designed in accordance with the guidance obtained from the "Vermont Handbook for Erosion Prevention and Sediment Control", released 2003. Furthermore, these features were designed to comply with §6-606(b)(2)(J) of the VSWMRs and the VTDEC Solid Waste Management Procedure entitled "Procedure Addressing Requirements for Run-On/Run-Off Control Systems for Municipal Solid Waste Landfills", dated May 27, 1994. As shown on Sheet 2, stormwater runoff from the TMAs will be discharged to the existing stormwater management system of the Verpol Plant. Calculations related to the design of the proposed stormwater management features are provided in Part D-3 of the Interim Certification Application.

7.0 FINAL COVER SYSTEM

As required by §6-702(d)(7), the final cover system is to be constructed within 90 days of attaining final grade or capacity, or from the last date of receipt of tailings product. In addition, grass or ground cover is to be established within four months of constructing the final cover system. See Part D-4 of the Interim Certification Application for detailed information regarding closure of the TMAs.

Based on the characteristics of the tailings product, it is anticipated that the material will be used for the 2.5-foot thick earthen material components of the final cover system. As noted in Section 3.0 of this Plan, the requirements of §6-606(b)(2)(M) of the VSWMRs include: a hydraulic conductivity requirement and a vegetation support requirement.

With respect to the hydraulic conductivity requirement, it is anticipated that, when placed and compacted in a controlled manner, the tailings will exhibit an in-place hydraulic conductivity of about 1×10^{-5} cm/sec or less. In order to ensure that this requirement is achieved, compaction and hydraulic conductivity testing will be performed as part of the construction quality control program. Hydraulic conductivity tests of the tailings product will be performed in accordance

with ASTM D5084, which uses a flexible wall permeameter and is the preferred test method for fine-grained materials.

As noted in Section 2.0, there is physical evidence that the tailings product is capable of supporting vegetation (i.e., conservation mix). In addition to the physical evidence, Heindel & Noyes performed a study of grass growth in the tailings product in 2005, the results of which indicate that the tailings product will sustain vegetation. A copy of the Heindel & Noyes study is provided as Part D-5 to the Interim Certification Application. These data indicate that the tailings product complies with §6-606(b)(2)(M) of the VSWMRs.