Permit No.	Date	DIN
9401	**November 8, 2010**	**12125**

RMT

• ENVIRONMENT • ENERGY • ENGINEERING

Phase 3 and Phase 4 - Operations Plan

On-site Industrial Waste Landfill No. 3

Domtar Paper Company, LLC (Formerly Weyerhaeuser Company), Plymouth, North Carolina

June 2008, Revised August 2009, August 2010, November 2010

© 2008 RMT, Inc.
All Rights Reserved

I:\WPMSN\PJT1\05794\46\001\R0579446001-002.DOC

30 Patewood Drive, Suite 100 • Greenville, SC 29615-3535 • (864) 281-0030 • (864) 281-0288 FAX • www.rmtinc.com

CREATING BALANCE℠

Table of Contents

1. Overview 1-1

2. General Operating Requirements 2-1

3. Operating Equipment 3-1

4. Pumps 4-1

5. Dust Control 5-1

6. Litter Control 6-1

7. Stormwater Controls 7-1

8. Site Facilities 8-1

9. Final Cover 9-1

10. Inspections 10-1

11. Leachate Collection System Management Plan 11-1

List of Tables

Table 10-1 Sample Landfill Inspection Checklist 10-2

Section 1
Overview

Landfill No. 3 will be operated as an area fill. An operating area will be established on the waste surface where loads of waste will be dumped from transport and conveyor equipment. Landfill operating equipment will spread and compact waste materials into a working face that will slope downward from the operating area into the open cell bottom. The landfill operations described in the following sections will be conducted to accomplish the following objectives:

- Compact waste materials into a stable fill mass.
- Cover paper wastes that might present a blowing litter problem with soil-like waste materials such as dewatered wastewater treatment solids (fiber sludge), boiler ash, and woodyard waste (bark, grit, and reject wood chips).
- Cover any asbestos waste immediately.
- Grade all waste surfaces to promote drainage to the leachate collection drainage layer on the bottom and sides of the landfill.
- Maintain as small an operating area as possible.
- Minimize the area of operation generating leachate by using stormwater diversion berms and redirecting non-contact stormwater directly to surface drainage systems.

In addition, operations will be conducted in compliance with the provisions of NC DENR regulations Section .1626. Asbestos waste will be placed in the asbestos landfill located east of Landfill No. 2 and west of Phase 1 of Landfill No. 3.

Section 2
General Operating Requirements

Landfill operations will be conducted by a Domtar employee or a contract operator to Domtar.

Site control will be maintained at all times by a security fence and a manned guard station at the entrance to the Domtar mill. The landfill area will be accessible only to landfill operations personnel, Domtar supervisory personnel, and authorized visitors. The following activities are prohibited:

- Scavenging of waste materials
- Feeding of farm or domestic animals
- Waste fill in standing water
- Open burning

Access to the disposal area of the landfill will be established using temporary culverts and soil, ash waste or gravel as appropriate to construct ramps off the perimeter dike road into the lined fill area. Runon and runoff from waste-filled areas will be controlled at all times by the leachate collection system and the perimeter berm. Stormwater within open areas of the cell will be controlled by means of temporary stormwater diversion berms, which will allow stormwater to be discharged to the perimeter ditching rather than treated as leachate. Waste will be placed from the perimeter inward so that the side slopes may be capped as they reach final grades.

Salvage operations will not occur on a routine basis. Infrequently, the interior of the landfill might be used to store materials for recovery and use at a later date. Such materials include bark and wood waste, waste lime to be used for agricultural purposes, or dewatered fiber wastewater solids to be used as a soil amendment or other application. No hazardous wastes will be stored in the landfill. Recoverable materials will be segregated from the active waste disposal operation to the extent possible and stored temporarily in an area immediately west of Phase 2 and south of existing dewatering facility.

Daily inspections will be documented in a log, and will include actions taken or to be taken. Daily inspections should also be performed to evaluate leachate levels within the landfill. Impermeable waste streams, such as ash, should be concentrated within the cell as much as possible to allow direct runoff into the leachate collection layer. Care should be taken to place various waste streams in appropriate locations that assist the operation of the leachate system as well as the evolution of the cell. This includes leaving some freeboard along the edge of the perimeter berms. Waste should not be placed in such a manner as to spill on to the tops of these berms. The free board will leave access to the drainage layer against the wall of the berm allowing leachate runoff access to the collection system below.

Working faces should be kept as small as possible, and areas should be capped as they are completed to the designed grades. Placing waste from the edge of the cell inward will afford the opportunity to cap sections sooner. Stormwater that flows off the capped sections will be diverted to the perimeter drainage ditches and will not be collected as leachate. These common landfill operational practices will compliment a stormwater control berm.

The design features and operating procedures described in this application have been developed to minimize the potential for slope failure. However, the slope stability analysis has revealed that the potential for slope failure at this site increases under the following conditions:

- Steeper slopes than planned
- Waste placed much looser or wetter than in the existing landfill or that which was tested.
- Soil or waste not compacted as recommended
- A rise in the groundwater table
- Leachate not able to adequately drain
- Shear strength parameters less than those used in the analysis
- Subgrade soils destabilized due to poor drainage or construction equipment traffic

To minimize the potential occurrence of these conditions, the following operational procedures are recommended:

- Have the subgrade soils observed by a qualified geotechnical engineer immediately prior to construction of the liner to confirm that the subgrades are suitable for construction of the landfill.
- Have qualified geotechnical personnel monitor placement and test compaction of all controlled fill soil used to construct the landfill and sediment basins to verify that the recommended compaction has been attained.
- Control the equipment traffic and drainage throughout construction (especially during rainy weather) to prevent destabilization of the subgrade soils.
- Place soil used in construction of the sediment basins, perimeter dikes, or grading of the site in lifts no more than 8 inches thick (loose). Compact the soil to at least 95 percent of the Standard Proctor (ASTM D 698) maximum dry density at ±3 percent of the optimum moisture content.
- Dewater all dredge wastewater solids by plate and frame press immediately prior to placement in landfill.
- Place and compact the waste material in lifts no more than 3 feet thick. Waste material placed in the facility should be compacted by repeated passes of the bulldozer until firm.

- Keep all waste material well drained by sloping the surface of the waste material to allow for stormwater drainage.
- Conduct additional testing and slope stability analyses if there is a change in the waste material placed or the quality of waste material placed in the landfill.
- Maintain adequate drainage of any leachate generated during waste placement operations. RMT recommends that no more than 1 foot of head be allowed to build up within the solid waste facility.
- Construct side slopes no steeper than 3 horizontal to 1 vertical to a height not greater than 214 feet. Bench exterior side slopes inward 15 feet for every 20 feet rise in height.

In the event dewatered wastewater solids are subjected to precipitation prior to placement, blend it with ash to improve its shear strength and compaction. The shear strength of 60/40 dewatered wastewater solids to ash blend is significantly higher than for dewatered wastewater solids alone.

Section 3
Operating Equipment

Landfill No. 3 will be operated with a mid-size bulldozer. Support equipment will consist of over-the-road transport vehicles, including standard dump trucks and rolloff container trucks. A motor-grader will be used for road maintenance, but will not necessarily be dedicated to the landfill operations.

In general, a bulldozer will be used to spread waste and compact the working face. The bulldozer will be used to maintain access from the perimeter road to the operating area, and to spread soil-like waste materials over blowing waste.

Hauling equipment operating outside the landfill area will be washed in a wash down area located at the dewatering press building. Wash water will be collected and treated with the landfill leachate and the dewatering press filtrate.

Operating equipment will be included in Domtar's preventative maintenance program. Routine maintenance, such as oil and filter changes, as well as sampling and analysis of lubricating and hydraulic oils will be conducted on schedules set in the program. Spare parts will be carried in inventory. If extended service should be required on the landfill bulldozer, a substitute bulldozer will be provided by other operations at the Domtar mill or leased from a local contractor to ensure continuous operations.

Section 4
Pumps

Redundant submersible pump systems remove leachate from the bottom of the landfill and transfer it by force main to the storage tank/sump of the leachate transfer station, then to the mill wastewater treatment system. Maintenance of the pumps will be conducted in accordance with manufacturer's recommendations. Refer to Section 11 for a leachate system operational discussion and Appendix Q for pump information.

Maintaining a strict set of operational checks and balances is crucial to the success of all landfill operations. A daily record of flow rates and total volumes will be used in troubleshooting the system. If flow is lower than anticipated, the system should be thoroughly inspected and any problems should be repaired - a pump may be down, the line may be clogged, or the leachate collection layer may be impeded by an impermeable waste stream. The flow meter should be routinely monitored and placed on a preventative maintenance (PM) schedule. The pumps should also be placed on a PM schedule. This will allow water to be removed as designed and the overall storage capacity of the cell for the major storm events to be maintained.

Section 5
Dust Control

Due to the frequent use of ash as daily cover and the potential for dusting, dust control equipment will be used at the Landfill. This equipment will consist of a pump and piping system tied to the leachate transfer station storage tank or wet well. Leachate will be pumped from the storage tank or wet well to mobile sprinkler units located within the landfill. The ash will be sprayed as needed to control dust, and as frequently as on a daily basis.

Section 6
Litter Control

A portion of the waste disposed of in the landfill will be compacted and uncompacted paper from the Domtar Complex paper manufacturing operations. This waste type will be dumped at the edge of the operating area. The waste material will be compacted by repeated passes of the compactor or bulldozer. Each day, or more frequently if required by weather conditions, blowing waste will be covered with soil-like waste materials or soil if suitable wastes are unavailable. Cover material will be available from a stockpile area. If necessary, litter-control fencing will be used to prevent litter from blowing beyond the landfill area.

Section 7
Stormwater Controls

Landfill operations will be conducted in a manner to minimize infiltration into the waste fill for two reasons:

- Excess moisture will reduce the stability of the fill by lowering the shear strength of the waste materials.
- Excess moisture will result in the generation of unnecessary quantities of leachate and increase the hydraulic head on the landfill liner.

Surface water runon will be prevented by the perimeter ditch and berm around the landfill, and by the cell delineation berms at the south end of each construction stage. The waste fill will be graded to minimize infiltration of contact rainwater. The operating area must be nearly level to function as a turnaround and dumping area for waste transport vehicles. The working face and operating area will be kept as small as practical, and will be sloped or crowned so that water drains from the surface to the leachate collection sand layer at the toe of the waste fill. Ponding of water will not be allowed. Depressions in the operating area will be filled with waste materials to promote runoff. The working face of the fill will be maintained at a slope of 3 horizontal to 1 vertical up to 5 horizontal to 1 vertical to promote runoff to the leachate collection sand layer at the toe of the slope.

Temporary stormwater control berms will be constructed in unfilled areas of the active cell to divert clean stormwater away from the leachate collection system. The berm will be located to provide adequate storage space for waste as well as temporary storage of runoff from the working face. It will also be sited to maximize segregation of stormwater and leachate.

Leachate will be collected in a series of sumps equipped with both primary and secondary submersible pumps. It is anticipated that during normal landfill operations the pumps will cycle to minimize pump burnout. In the event of an extraordinary rainfall event, primary and secondary pumps will be active thereby minimizing the amount and holding time of leachate within the landfill.

The following stormwater and leachate management practices will be maintained at the landfill:

- Diversion of non-contact stormwater away from the leachate system and removal of surface water discharge outside the landfill boundary. This can be accomplished via temporary internal diversion berms within the landfill and the use of portable pumps, if necessary. Internal berms are most important in the initial time period after the landfill is opened

because extreme leachate generation rates are more likely. Although, the landfill system with internal stormwater diversion berms will allow for temporary storage/handling of the leachate generated from a 25-year, 24-hour storm event, it is crucial to separate and discharge non-contact stormwater before it is considered leachate. The pumps are sized to take up to 6 days to discharge leachate generated from the 25-year, 24-hour storm event.

- Limitation of the active filling area of the landfill to a small area to minimize the volume of leachate generated. This area is typically 5 acres or less depending on specific site conditions.
- Maintenance of a filling sequence that reaches final waste grades as soon as possible so that final cover soils can be placed to further divert surface water.
- Proper maintenance, operation, and monitoring of the leachate pumps, pump controls, discharge piping, leachate collection piping, and clean-outs.

Section 8
Site Facilities

Telephone, potable water, and toilets will be available in the dewatering press building. Back-up communication to and from the site will be provided by radio or cellular telephone. Since the dewatering press building is located in the area set aside for asbestos waste disposal, it will ultimately be demolished at closure of the landfill when it is no longer needed.

Section 9
Final Cover

Final cover will be progressively placed on areas of the landfill that have been graded to final contours. Cap construction will typically be performed in areas of 5 acres or less. Final grading and cap construction will proceed from north to south and west, as the fill reaches final grades. The cap for the Landfill includes GCL and a VFPE liner. These materials will be protected from the elements and operating equipment by a vegetative soil layer. Maintenance of the vegetative layer is critical to protect the integrity of the landfill cap system.

The cap will be sown according to approved seeding specifications for perennial vegetation. Vegetated cap areas will be mowed at least annually using equipment that will not damage the integrity of the soil cover layer. Vegetated areas will be inspected during the course of landfill operations. Conditions that may require repair include the following:

- Sparse or unhealthy vegetation
- Improper vegetation, such as trees or woody shrubs
- Erosion of the soil cover layer
- Slope failures, such as soil creep and sloughing
- Rutting from vehicular traffic or equipment operation

Damaged areas will be repaired as weather permits.

Section 10
Inspections

The landfill operator or designated inspector will conduct inspections of all landfill operating systems on a routine basis. Inspections will be conducted and documented using an inspection log. A typical example is included as Table 10-1.

Table 10-1
Sample Landfill Inspection Checklist

INSPECTION CHECKLIST	INSPECTION	INITIAL AND DATE THE APPROPRIATE BOX									
		S	M	T	W	T	F	S	STORMS	MONTHLY	QUARTERLY
Pumps											
1	Daily - check flashing light and standing water. Weekly - switch on and check current.										
2											
3											
4											
Ditches	Inspect monthly and after storms.										
Sediment Basin	Inspect monthly and after storms.										
Dikes and Berms	Inspect monthly and after storms.										
Fence and Gates											

Comments:

Work Orders Placed:

DATE	ORDER NUMBER	DESCRIPTION OF REQUEST

Section 11
Leachate Collection System Management Plan

The leachate collection and removal system (LCRS) will be comprised of the following components:

- A granular drainage layer
- Perforated leachate collection lines
- Dual submersible pumps in each leachate collection sump
- Leachate pump station manhole at each sump location
- A force main header pipe
- Wastewater solids dewatering facility

The lined area inside the landfill will be covered with an 18-inch thick drainage layer. The drainage layer will consist of a graded filter composed of a 6-inch thick layer of select clean sand above a 12-inch thick layer of select gravel. The select sand layer will contain less than 5 percent passing No. 200 sieve and will serve to filter out fines within the waste minimizing clogging of the select gravel layer. The select gravel layer will be sized to provide a lateral hydraulic conductivity of at least 0.3 cm/sec. The select gravel will also serve to provide bedding for the leachate collection piping and protection of the liner. The composite liner system below the drainage layer will be protected from the gravel layer, construction activities, and from operation activities with a 32-ounce geocushion.

The leachate collection lines within the landfill will consist of 6-inch diameter HDPE perforated pipes that provide chemical resistance and flexibility, and will be placed in v-notched trenches at a minimum slope of 0.5 percent. The base of the landfill will have a herringbone design consisting of a series of ridges and valleys with the maximum distance from a ridge to a valley of 100-feet. This design will direct the flow of leachate collected in the drainage layer towards collection pipes that will be located in each valley. The collection pipes will have a maximum spacing of 200 feet. The base of the landfill will slope from one side to the opposite side so leachate collected in the pipes will flow to sumps located in each phase at the low side of the landfill. This design is capable of maintaining leachate heads of less than 12-inches above the liner system. The leachate line hydraulic calculations for determining leachate head on the liner are provided in Appendix H of the *Construction Plan Application for On-Site Industrial Waste, Landfill No. 3* (RMT, 1999). To provide protection of pipes from being crushed during construction activities, operation activities, and under the anticipated waste loads in the landfill,

collection piping with a maximum Standard Dimension Ratio (SDR) of 17 will be used. Pipe strength calculations are presented in Appendix I in the *Construction Plan Application for On-Site Industrial Waste, Landfill No. 3* (RMT, 1999). The ends of the leachate collection lines will be fitted with 6-inch diameter SDR 17 solid wall cleanout pipe that will provide access for inspections and periodic cleaning. Remote camera inspections of the leachate collection lines will be performed after construction, after the removal of any blockage from a pipe, and at a minimum frequency of once every five years. Cleaning of the leachate collection lines will be performed if a blockage is discovered and at a minimum of once every year.

In each phase of the landfill, leachate will be collected through perforations in the collection pipes and will flow by gravity from the high end of the liner to the low end where it discharges into one or more collection sumps. Each sump will have 18-inch diameter perforated HDPE inclined riser pipes that will lay across the sump and perpendicular to the landfill perimeter berm. The pipes will run from the bottom of the sump and up the inside slope of the landfill perimeter berm where it will connect to a 6-foot diameter pumping station manhole located at the top of the perimeter berm. Leachate collected in the sump will be removed by using submersible pumps placed inside the 18-inch diameter pipes at the bottom of the sump. A level switch in the sump will automatically activate the dual submersible pump system that will pump the collected leachate up to the pumping station manhole through a 3-inch flexible hose. Inside the manhole the hose will connect to a 3-inch diameter solid wall HDPE force main pipe. Each wheeled submersible leachate collection pump will have a cable attached to allow for retrieval and maintenance of the pumps. See Drawing No. 510101-C17 of the *Construction Plan Application for On-Site Industrial Waste, Landfill No. 3* (RMT, 1999) for leachate collection system details. Maintenance of the submersible pumps will be conducted in accordance with the manufacturer's recommendations. Pump maintenance is also described in Section 4 of this document (Operations Plan).

Leachate in the 3-inch diameter HDPE force main pipe inside the pumping station manhole will exit the manhole through 3-inch diameter double wall pipe. The 3-inch diameter double -wall pipe runs for a short distance where it will connect to a 6-inch diameter double-wall force main header pipe. Leachate pipes located outside the manholes will consist of double-wall pipes and will be buried a minimum of 3-feet below the ground surface. The header pipe is buried inside the landfill perimeter berm and transports collected leachate around the outside perimeter of the landfill where it will discharge the leachate into a wet well located at the wastewater solids dewatering building located on the western side of the landfill. At this building the leachate will be mixed with filtrate from the wastewater solids press building The mixed leachate will either be taken to the landfill and used for dust control as needed or will be to transferred through another force main pipe to the mill's permitted wastewater treatment system located on Domtar's property.

Calculations for the design of the pumps and force main pipes are included in Appendix H of the *Construction Plan Application for On-Site Industrial Waste, Landfill No. 3* (RMT, 1999). Water balance modeling, including the Hydrologic Evaluation of Landfill Performance (HELP) model, was used for various landfill operational scenarios to determine leachate flow into the collection layers. The flow rate used for sizing the pumps and force main pipes includes the peak daily flow collected in the leachate collection layer.

Stormwater run-on and runoff will be controlled by means of the landfill's exterior perimeter berms and temporary interior stormwater control berms. The exterior berms are designed to contain, if necessary, precipitation falling within the landfill during a 24-hour, 25-year storm. The interior berms (shown on Drawing No. 510101-C19 of the *Construction Plan Application for On-Site Industrial Waste, Landfill No. 3* (RMT, 1999)) will allow segregation of stormwater and leachate within the landfill so that precipitation that has not come in contact with the waste will not require treatment as leachate. The temporary berms will be placed to allow for an adequate area for disposal of waste, while maximizing the area where noncontact precipitation can be diverted as stormwater. For Landfill No. 3, if temporary interior berms are not used, the leachate pumps have been sized to effectively pump collected precipitation as leachate within a period of 6 days.

Appendix N
Closure/Post-closure Plan

RMT

• ENVIRONMENT • ENERGY • ENGINEERING

Phase 3 and Phase 4 - Closure/Post-closure Plan

On-site Industrial Waste Landfill No. 3

Domtar Paper Company, LLC (Formerly Weyerhaeuser Company), Plymouth, North Carolina

June 2008, Revised August 2009, November 2010

© 2008 RMT, Inc.
All Rights Reserved

I:\WPMSN\PJT1\05794\46\001\R0579446001-004.DOC

30 Patewood Drive, Suite 100 • Greenville, SC 29615-3535 • (864) 281-0030 • (864) 281-0288 FAX • www.rmtinc.com

CREATING BALANCE℠

Table of Contents

1. Introduction 1-1
   1.1 Related Documents 1-1

2. Background and Location 2-1

3. Final Cover Design and Construction 3-1
   3.1 Permitted Final Cover Design 3-1
      3.1.1 Installation of Intermediate Cover 3-1
      3.1.2 Installation of the Cap System 3-1
   3.2 Construction Specifications 3-3
   3.3 Quality Assurance/Quality Control 3-3
   3.4 Erosion Control Measures 3-3

4. Closure Scenarios 4-1
   4.1 Routine and Premature Closure 4-1
   4.2 Closure Cost Estimate 4-1
      4.2.1 Control Grading 4-2
      4.2.2 Geosynthetic Clay Liner 4-2
      4.2.3 40-mil Textured Very Flexible Polyethylene Geomembrane 4-2
      4.2.4 Geonet Drainage Composite 4-2
      4.2.5 Vegetative Support Layer 4-2
      4.2.6 Topsoil 4-2
      4.2.7 Vegetation 4-2
      4.2.8 Closure Survey 4-3
      4.2.9 Administrative Costs 4-3
   4.3 Maximum Waste Inventory 4-3

5. Closure Schedule 5-1

6. Closure Certification and Deed Notation 6-1

7. Post-closure Monitoring and Maintenance 7-1
7.1 Final Cover Maintenance/Inspection Schedule 7-1
7.2 Leachate Collection System/Miscellaneous Maintenance 7-1
7.3 Groundwater Monitoring System 7-1
7.4 Gas Monitoring 7-2

8. Post-closure Cost Estimate 8-1
8.1 Routine Inspection 8-1
8.2 Maintenance of On-site Improvements 8-1
8.3 Maintaining Vegetation 8-1
8.4 Repair of Final Cover 8-1
8.5 Maintaining Surface Drainage Features 8-1
8.6 Groundwater Monitoring Well Sampling 8-2
8.7 Leachate Collection System Maintenance 8-2
8.8 Administrative Costs 8-2
8.9 Post-Closure Costs Not Included 8-2

9. Contact Persons 9-1

10. Landfill Property Use 10-1

11. Post-closure Certification 11-1

List of Attachments

Attachment 1 Opinion of Probable Costs Landfill No. 3 Closure, Phase 1a, 1b, 2, 3, and 4 Cost Estimate
Attachment 2 Opinion of Probable Costs Landfill No. 3 Post-closure, Phase 1a, 1b, 2, 3, and 4 Cost Estimate

Section 1
Introduction

This technical narrative addresses the closure and post-closure care requirements as identified in the NC DENR Solid Waste Management Rules, Section .1629 as related to closure/ post-closure activities for the Domtar Landfill No. 3 in Plymouth, North Carolina. The requirements have been addressed in the format suggested in Section .1629.

1.1 Related Documents

This closure plan and cost estimate are included as an appendix to the construction plan application for on-site industrial process waste Landfill No. 3. It is to be used in conjunction with the following:

- CQA plan (Appendix Q)
- Sheet No. 11 FINAL GRADING PLAN – PHASE 1A AND 1B
- Sheet No. 12 FINAL GRADING PLAN - OVERALL
- Sheet No. 13 PHASE PROGRESSION PLAN
- Sheet No. 16 LEACHATE COLLECTION AND REMOVAL SYSTEM DETAILS
- Sheet No. 20 EROSION CONTROL DETAILS
- Construction specifications (to be issued immediately prior to cap construction)

Section 2
Background and Location

Industrial solid waste generated from manufacturing operations at the Domtar Plymouth Complex will be disposed of in the landfill. The waste streams include, but are not limited to, boiler ash, grits, liquor dregs, lime mud, wood wastes, paper wastes, pulp rejects, general mill trash, and dewatered wastewater treatment plant solids. Off-site waste material will likely be accepted from other Domtar mills only. Waste streams from these mills will be limited to those listed above.

The proposed 96-acre site is located approximately 2 miles south of the Domtar Complex as shown on Sheet No. 1. The site is generally located west of Ken Trowbridge Road; south of the Domtar Complex and the Roanoke River; east of Welch Creek; and north of Highway 64.

Section 3
Final Cover Design and Construction

Closure activities for the Domtar landfill will include the following items:

- Installation of intermediate cover
- Installation of the cap system
- Establishment of the vegetative cover

3.1 Permitted Final Cover Design

3.1.1 Installation of Intermediate Cover

Intermediate cover will consist of 12 inches of select waste (ash). This layer will serve as a smooth support layer for the GCL. The intermediate cover will be placed at Domtar's discretion on the waste in areas that have reached final grade elevations, and may be removed and stockpiled for future use before capping activities begin.

3.1.2 Installation of the Cap System

The largest area of the landfill requiring cover at any time during the life of the landfill is for a premature closure condition and is estimated to be approximately 19 acres. The estimated total volume of the landfill is 10.7 million cy. Prior to beginning closure of the landfill, a notice of intent to close the unit will be submitted to NC DENR and placed in the site operating record.

The proposed cap system for final cover will consist of the following components (top to bottom) as shown on Sheet No. 17:

- 6-inch vegetative layer
- 12-inch vegetative support layer
- Geotextile/geonet/geotextile composite (drainage layer)
- 40-mil VFPE geomembrane
- GCL

The minimum slope of the final cap will be 5 percent with the exception of a small area at 3 percent. The maximum slope of the final cap will be 33 percent. Benches, 15 feet in width, will be graded into the final cap slope at vertical intervals of 20 feet. The benches will have a minimum slope of 0.5 percent to collect storm water from the cap and to provide equipment access along the face of the landfill for maintenance and inspections.

Prior to beginning capping activities, any remaining fine grading of the intermediate cover will be conducted. Gas collection trenches and vents will be placed at the crest of the landfill. Next, the GCL will be placed to provide an impermeable layer that will reduce storm water infiltration into the waste and thereby reduce leachate production.

A 40-mil, VFPE-textured liner will be placed on the GCL to enhance the barrier layer. Refer to the CQA plan for VFPE acceptance specifications (see Appendix Q). A drainage composite consisting of a geotextile/geonet/geotextile will be placed over the textured membrane. Refer to the CQA Plan for geonet and geotextile acceptance specifications. This drainage layer will collect infiltration and divert water to the drainage terraces.

The final component of the cover system will consist of general fill and topsoil. The general fill layer will consist of 12 inches of soil or a mixture of dewatered wastewater solids and ash, as previously approved by NC DENR. The topsoil will consist of 6 inches of soil capable of sustaining vegetative growth. The sedimentation pond will be cleaned of sediment build-up and the sediment, consisting of material eroded from the existing cover, may be blended into the vegetative layer. Final grading of this layer will be accomplished with tracked equipment.

Within 90 days after completion of final grading requirements of the landfill unit, a seed bed will be prepared in the vegetative layer prior to applying seed and mulch. The seed bed will be prepared with a disc harrow penetrating to a minimum depth of 2 inches. Large clods, rocks, or other foreign material brought to the surface during preparation of the seed bed will be removed prior to the application of fertilizer, seed, and mulch. Fertilizer will be evenly spread over the surface of the prepared seed bed and worked into the soil with one final light pass with a disk harrow or a chain harrow. Lime will be applied, if necessary, to enhance growth.

Permanent vegetation will be established by spreading seed with a mechanical device that ensures an even application rate of the seed mixture. The vegetative components may be applied simultaneously with a hydroseeder.

The following method is suggested for establishing the permanent vegetation:

1. Apply liming agent at recommended rate.
2. Apply fertilizer (10-10-10) at recommended rate.

3. Work lime and fertilizer into the soil.
4. Apply seed mixture at recommended rates.
5. Apply mulch to the seeded surface.
6. If final grading and surface preparation are delayed due to inclement weather, appropriate measures will be taken to remedy any effects of erosion.
7. Maintenance measures will be performed as necessary to achieve a thorough coverage of vegetation.

3.2 Construction Specifications

Prior to the commencement of closure activities, applicable construction specifications will be issued for NC DENR review. In the interim, the CQA plan located in Appendix Q of the permit application will provide any necessary information regarding the cap components and their required properties.

3.3 Quality Assurance/Quality Control

Construction quality assurance (QA) and quality control (QC) during all landfill closure activities will be performed according to the CQA plan (Appendix Q of the permit application). The CQA plan was written in accordance with Section .1621 of the NC DENR regulations and will form part of this document as referenced. Prior to closure, the CQA plan will be reviewed and modified as necessary and attached to this closure plan and cost estimate.

3.4 Erosion Control Measures

State and federal erosion control regulations will be followed during closure activities. Prior to establishing vegetation, areas left disturbed for a period greater than 14 days will be covered with jute mesh, temporary vegetation, or an equivalent cover. Other standard management practices for erosion control such as silt fencing, hay bale barriers, etc., will be employed as necessary. In addition, storm water from the cap areas will be routed through the sediment ponds located around the landfill, which will serve to remove suspended sediment.

Section 4
Closure Scenarios

4.1 Routine and Premature Closure

The disposal site will be developed in 18 phases as shown on Sheet No. 13. This operating scenario shown is based on utilizing the working face method of fill and allows for the lateral expansion of the facility in the future. As waste is placed in the active stage, it will be graded, spread, and compacted along the working face. As final subgrade elevations are reached, the working face will move to the south, into the next lined phase. Next, either the finished areas will be covered with a temporary cover, which will minimize the generation of leachate, or a final cover will be constructed.

Prior to construction of the final cap, surface water that comes into contact with waste will be managed as leachate. Surface water runoff from areas of vegetated intermediate cap will be discharged through appropriate sedimentation controls.

With the exception of Phase 1 and Phase 2, which occupy a footprint area of approximately 14 and 15 acres, respectively, each of the landfill's 18 phases covers approximately 5 acres. Phase 3 and Phase 4 have a combined life expectancy of approximately 5 years (*i.e.*, until other phases have to be opened to accommodate leachate generated by stormwater runoff).

Final cap construction will proceed from phase to phase. As Phase 3 and Phase 4 near capacity, the Phase 5 and Phase 6 cells will be constructed to provide temporary containment for leachate generated from stormwater runoff. Phase 3 and part of Phase 4 will then be capped as filling continues in Phase 4 to minimize the generation of leachate. Construction will proceed in this manner through the life of the landfill.

4.2 Closure Cost Estimate

For purposes of meeting NC DENR financial assurance requirements, the cost to close the intermediate 19-acre cell was calculated to be approximately $2.6 million (Attachment 1). This estimate includes the estimated cost for Domtar to hire an independent third party as general contractor (not a corporate subsidiary or parent, or affiliate of the permittee) to perform each task, including the costs of preparing and executing bid documents for the selection of a general contractor and supervising the general contractor's performance.

Unit costs are based on information from contractors in the southeastern United States, vendor estimates, published costs, or engineering estimates. Costs reflect a rate of return of 5 percent

and an inflation rate of 4 percent. Specific cost allowances are not included for interest during construction, legal fees, financial consultants, debt service, or equipment depreciation. Closure costs include an administrative allowance of 20 percent of the capital cost plus a general contingency of 40 percent.

The following is a description of those closure items in Attachment 1 that may require explanation.

4.2.1 Control Grading

This item includes relocating waste, surface preparation, and obtaining proper surface elevations. Erosion control measures are shown as separate line items.

4.2.2 Geosynthetic Clay Liner

This item includes placing GCL for the low permeability layer of the final cover.

4.2.3 40-mil Textured Very Flexible Polyethylene Geomembrane

This item includes obtaining and installing 40-mil textured VFPE geomembrane for the final cover.

4.2.4 Geonet Drainage Composite

This item includes obtaining and installing geonet drainage composite for the final cover.

4.2.5 Vegetative Support Layer

This item includes placing fill material for the vegetative support layer and assumes that all necessary material will be available from an on-site stockpile. The cost for this item is based on in-place volumes.

4.2.6 Topsoil

This item includes placing topsoil for the final cover and assumes that all necessary material will be available from an on-site stockpile. The cost for this item is based on in-place volumes.

4.2.7 Vegetation

Establishing a vegetative cover includes the following items:

- Soil testing

- Amending soil with lime, fertilizer, and organic matter
- Incorporating soil amendments, including disking, harrowing, sprigging, and herbicide application
- Spreading and disking surface thatch

4.2.8 Closure Survey

This item includes survey of the entire closure area to determine final elevations of the cap. The cost to prepare a drawing of the final elevations showing contour intervals at 2-foot contours is included as a separate item.

4.2.9 Administrative Costs

Administrative costs shown as 20 percent of the total capital cost include the following items:

- Redesigning final closure, if necessary, in accordance with existing site conditions and applicable regulations
- Contracting for technical consulting services
- Providing administrative overhead for oversight
- Preparing final closure certification
- The costs for an independent third-party consultant for all services associated with preparing and executing bid documents, selection of an independent third-party construction contractor, and supervision of the contractor's general performance

4.3 Maximum Waste Inventory

It is expected that over the entire life of the facility, the maximum waste inventory will be approximately 10.7 million cy. The maximum waste inventory in Phase 3 and Phase 4 will be approximately 506,000 cy.

Section 5
Closure Schedule

It is expected that closure for this scenario would not require longer than 180 days. However, if the project were to exceed this duration, Domtar would take the steps necessary to prevent threats to human health and the environment from the unclosed landfill unit. The closure period would be extended only with NC DENR approval. In addition, closure activities for the landfill unit would be completed in accordance with this plan.

Section 6
Closure Certification and Deed Notation

Following closure of the landfill unit, Domtar will submit to NC DENR a certification, signed by an independent registered professional engineer verifying that closure has been completed in accordance with the closure plan, and a copy placed in the site operating record. In addition, within 90 days after closure activities are complete, Domtar will record a notation onto the land deed and/or some other legal instrument that is normally examined during a title search stating that the property has been used as a solid waste disposal facility landfill unit. The notation will include the following information:

- The land has been used as a solid waste disposal facility landfill unit.
- The land use is restricted to ensure that the cap system integrity or other containment components are not compromised, and monitoring systems are not disturbed.
- That any re-use of the property will not increase the potential threat to human health or the environment.
- The name of the permittee, the type of disposal facility, and the beginning and closure dates of the disposal activities will be included.
- The locations and dimensions of the landfill unit with respect to permanently surveyed benchmarks and section corners on a plat prepared and sealed by a land surveyor will be included.
- The notation will be certified by an Engineer or Land Surveyor stating that all closure requirements have been completed as determined necessary by the Department.

Domtar will submit a certified copy of the recording instrument to NC DENR and place a copy in the operating record within 120 days after permit expiration, revocation, or as otherwise directed by NC DENR.

Section 7
Post-closure Monitoring and Maintenance

7.1 Final Cover Maintenance/Inspection Schedule

The finished cap and perimeter berm will receive a visual inspection on a weekly basis to check for and document evidence of settling, subsidence, erosion, and other potential failures of the final cover. These inspections will also encompass the perimeter berm, ditches, channels, and sediment basin to ensure storm water runoff and runon are being properly routed. These inspections, along with any repairs that were required, will be documented and maintained on file by Domtar.

In addition, the landfill will be mowed at least once per growing season, and fertilized and reseeded as necessary. This will protect the final cover against erosion and decrease the potential for leachate generation. Vegetation that poses a threat to the integrity of the final cover, such as deep-rooted shrubs and trees, will be removed.

7.2 Leachate Collection System/Miscellaneous Maintenance

Domtar will perform the following maintenance activities for the duration of the post-closure care period:

- **Pumps**. Proper maintenance of this equipment is critical to the operation of the leachate collection and transfer system. The manufacturer's recommendation for routine inspection and cleaning intervals will be followed for pumps and pump controls, with pump inspections occurring no less than once per week. The collection piping will be jet cleaned at least annually. In addition, all valves and flow measurement devices will be inspected and cleaned as necessary on a regular basis.
- **Leachate Treatment**. Leachate collected in the wet well of the leachate transfer station will continue to be treated in the mill wastewater treatment system for the duration of the post-closure period. Leachate collection may be discontinued if testing establishes that leachate treatment is no longer necessary and upon approval of NC DENR (see Subsection 5.6.2 of the permit application).
- **Access Control**. Access to the landfill facility will be controlled by secure fencing for the duration of the post-closure period.

7.3 Groundwater Monitoring System

Groundwater will continue to be monitored as described in Subsection 5.6.1 and in Appendix O, Sampling and Analysis Procedures for Groundwater, of the permit application for the duration of the post-closure period.

7.4 Gas Monitoring

Gas monitoring at the site will not be performed at the landfill due to the predominantly inorganic nature of the wastes, as discussed in Subsection 5.6.3 of the landfill permit application document.

Section 8
Post-closure Cost Estimate

The post-closure cost estimate was based on monitoring and maintaining Phase 3 and Phase 4 of the disposal facility for a period of 30 years after final closure. This estimate is included as Attachment 2. Unit costs are based on information from contractors in the southeastern United States, vendor estimates, published costs, or engineering estimates. Costs reflect current pricing. The present value of post-closure care for Phase 3 and Phase 4 is estimated to be $2.8 million (see Attachment 2), assuming a 5-year life for Phase 3 and Phase 4, a 30-year post-closure care duration, 4 percent inflation rate, and 5 percent interest rate. Specific cost allowances are not included for interest during construction, legal fees, financial consultants, debt service, or equipment depreciation. Post-closure costs include an administrative allowance of 20 percent of the capital cost plus a general contingency of 40 percent.

8.1 Routine Inspection

This item is for inspecting the site twice each year for 2 years to determine the necessary maintenance required.

8.2 Maintenance of On-site Improvements

This item is for repair and maintenance of all on-site permanent improvements and equipment including signs, gates, fences, roads, or other structures necessary to maintain closure of the site.

8.3 Maintaining Vegetation

The cost is included to mow the site two times per year, reseeding as necessary, and applying weed control measures.

8.4 Repair of Final Cover

This item is for controlling erosion, settlement, and ponding on the final cover.

8.5 Maintaining Surface Drainage Features

This item includes the cost of repairing erosion for 10 percent of the total ditch length per year.

8.6 Groundwater Monitoring Well Sampling

The cost is included to sample and analyze one sample per year for each of the 12 monitoring wells in accordance with the groundwater monitoring, sampling, and analysis plan for the duration of the post-closure period.

8.7 Leachate Collection System Maintenance

The cost is included to maintain the two additional leachate pumps in Phase 3 in accordance with manufacturer's recommendations. This cost was derived by multiplying the capital cost of the pumps by 10 percent representing the depreciation of each pump over its useful life.

8.8 Administrative Costs

Administrative costs shown as 20 percent of the total capital cost include the following items:

- Record keeping
- Contracting for technical consulting services
- Administrative overhead for oversight
- Preparing post-closure certification
- The costs for an independent third-party consultant for all services associated with preparing and executing bid documents, selection of an independent third-party construction contractor, and supervision of the contractor's general performance

8.9 Post-Closure Costs Not Included

No allowance has been made for the following items:

- Air sampling
- Soil sampling
- Surface water sampling
- Gas sampling
- Monitoring well abandonment
- Leachate treatment

Section 9
Contact Persons

The following office can be contacted during the post-closure period:

Environmental Manager
Domtar Paper Company, LLC
Plymouth Mill
West Main Street Extension
PO Box 747
Plymouth, North Carolina 27962
(252) 793-8111

Section 10
Landfill Property Use

Currently, there are no planned uses of the property during the post-closure period. In the event a use is realized, NC DENR will be contacted for approval. All proposed activities will be restricted to prevent damage to the integrity of the final cover, liner, and all other components of the containment system.

Section 11
Post-closure Certification

Following completion of post-closure care and verifying that post-closure care has been completed in accordance with this post-closure plan, Domtar will notify NC DENR that a certification, signed by a registered professional engineer, has been placed in the operating record.

Attachment 1
Opinion of Probable Costs
Landfill No. 3 Closure,
Phase 1a, 1b, 2, 3, and 4 Cost Estimate

OPINION OF PROBABLE COSTS					
CLOSURE OF LANDFILL NO. 3, PHASE 1a, 1b, 2, 3, and 4				By:	TWM
DOMTAR PAPER COMPANY, LLC, PLYMOUTH, NORTH CAROLINA				Checked:	DM
RMT PROJECT NO. 05794.41				Date:	8/11/2010

Footprint (acres):	34.30	Disposal Rate (cyds/year):	155,464
Volume (cyds):	1,737,063		
Waste Unit Weight (lbs/cf):	70		
Phase Operations (years):	11	Post-Closure Care (years):	30
Rate of Return:	7.1%	Inflation:	2.0%

DESCRIPTION: Closure of Phases 1 through 4 (approximately 34 acres)

ITEM NO.	*ITEM DESCRIPTION*	*QUANTITY*	*UNITS*	*UNIT COST*	*TOTAL COSTS*
1.00	**CONSTRUCT MULTILAYERED CAP**				
1.01	CONTROL GRADING	165,900	SY	$ 1.20	$ 199,080
1.02	SELECT ASH (1-FT THICK)	52,300	CY	$ 5.00	$ 261,500
1.03	GCL	1,493,000	SF	$ 0.74	$ 1,104,820
1.04	40-MIL TEXTURED LLDPE MEMBRANE	1,493,000	SF	$ 0.46	$ 686,780
1.05	GEONET COMPOSITE	1,368,000	SF	$ 0.73	$ 998,640
1.06	GEOCUSHION	124,600	SF	$ 0.56	$ 69,776
1.07	PASSIVE GAS SYSTEM	1,700	LF	$ 55.00	$ 93,500
1.08	VEGETATIVE SUPPORT LAYER	55,300	CY	$ 6.00	$ 331,800
1.09	TOPSOIL (6 INCHES THICK)	27,600	CY	$ 6.00	$ 165,600
1.10	FINAL GRADING	165,900	SY	$ 0.60	$ 99,540
1.11	SEEDING, FERTILIZING, & MULCHING	34	ACRE	$ 3,000.00	$ 102,000
1.12	BORROW AREA SEEDING, FERTILIZING, & MULCHING	10	ACRE	$ 3,000.00	$ 30,000
2.00	**STORMWATER CONTROLS**				
2.01	DOWNSLOPE FLUMES	2,850	LF	$ 90.00	$ 256,500
2.02	RIPRAP	590	CY	$ 60.00	$ 35,400
2.03	ENERGY DISSIPATERS	6	EA	$ 20,000.00	$ 120,000
2.04	4" DIA DRAINAGE LAYER COLLECTION PIPES	11,200	LF	$ 15.00	$ 168,000
3.00	**EROSION CONTROL**				
3.01	SILT FENCING	5,700	LF	$ 3.75	$ 21,375
3.02	TURF REINFORCEMENT MAT (TRM)	6,800	SY	$ 5.85	$ 39,780
3.03	EROSION CONTROL AND REVEGETATION MAT (ECRM)	23,600	SY	$ 1.80	$ 42,480
3.04	MISC. EROSION AND SEDIMENT CONTROLS	1	LS	$ 10,000.00	$ 10,000
4.00	**SURVEYING**	34	ACRE	$ 2,700.00	$ 91,800
	SUBTOTAL				***$ 4,928,371***
5.00	**ADMINISTRATION (2% OF CONSTRUCTION)**	1	LS	$ 98,567.42	$ 98,567
6.00	**MOBILIZATION (5 % OF CONSTRUCTION)**	1	LS	$ 246,418.55	$ 246,419
7.00	**DEMOBILIZATION (1% OF CONSTRUCTION)**	1	LS	$ 49,283.71	$ 49,284
8.00	**ENGINEERING SERVICES**	1	LS	$ 50,000.00	$ 50,000
9.00	**CONSTRUCT.MGMT. SVCS. & CERTIFIC. RPT. (10% OF CONSTRUCTION)**	1	LS	$ 492,837.10	$ 492,837
	SUBTOTAL				***$ 5,865,478***
	TOTAL CAPITAL COST ESTIMATE				***$ 5,865,478***
	PER ACRE CAPITAL COST ESTIMATE				*$ 171,005*
	TOTAL PRESENT VALUE CAPITAL COST ESTIMATE				**$ 3,393,701**

Attachment 2
Opinion of Probable Costs
Landfill No. 3 Post-closure,
Phase 1a, 1b, 2, 3, and 4 Cost Estimate

OPINION OF PROBABLE COSTS

POST-CLOSURE, LANDFILL NO. 3 PHASE 1a,1b, 2, 3, and 4

DOMTAR PAPER COMPANY, LLC, PLYMOUTH, NORTH CAROLINA

RMT PROJECT NO. 05794.41

By: TWM
Checked: DM
Date: 8/9/2010
Revision #1 9/16/2010

Footprint (acres):	34.30	Disposal Rate (cyds/year):	155,464
Volume (cyds):	1,231,063		
Waste Unit Weight (lbs/cf):	70		
Phase Operations (years):	8	Post-Closure Care (years):	30

DESCRIPTION: Post-Closure Care of Phases 1 through 4 (approximately 34 acres)

ITEM NO.	*ITEM DESCRIPTION*	*QUANTITY*	*UNITS*	*UNIT COST*	*TOTAL COSTS*
1.00	**ROUTINE INSPECTION (2 TRIPS PER YEAR)**	2	EACH	$ 3,000.00	$ 6,000
2.00	**MAINTENANCE OF ON-SITE IMPROVEMENTS**	1	YEAR	$ 7,500.00	$ 7,500
3.00	**MAINTAIN VEGETATION (34 ACRES AT $300/ACRE/YEAR)**	34	ACRE	$ 300.00	$ 10,290
4.00	**REPAIR FINAL COVER**	1	YEAR	$ 5,000.00	$ 5,000
5.00	**MAINTAIN SURFACE DRAINAGE FEATURES (1500 FT AT $4/LF/YR)**	1	YEAR	$ 6,000.00	$ 6,000
6.00	**MAINTAIN LEACHATE COLLECTION**				
6.01	MAINTENANCE OF LEACHATE PUMPS (10% OF CAPITAL COST/PUMP/YEAR)	5	PUMP	$ 2,700.00	$ 13,500
7.00	SUBTOTAL				$ 48,290
8.00	**TOTAL POST-CLOSURE CAPITAL COST ESTIMATE PER YEAR**				**$ 48,290**
8.01	TOTAL POST-CLOSURE CAPITAL COST ESTIMATE PER ACRE				$ 1,420
9.00	**TOTAL POST-CLOSURE CAPITAL COST ESTIMATE - 30 YEARS**				**$ 1,448,700**