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Riegelwood Mill  
Riegelwood, North Carolina**

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**DIVISION OF WASTE MANAGEMENT  
FAYETTEVILLE REGIONAL OFFICE**

**Solid Waste Management Plan**

**Prepared: August, 1995**

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## Executive Summary

McKim & Creed Engineers, P.A. (McKim & Creed) has completed the Waste Management Plan (WMP) for the Federal Paper Board Company, Incorporated (FPB) paper mill in Riegelwood, North Carolina. In order to identify feasible disposal and waste reduction options, McKim & Creed performed the following tasks:

- Review of recent records and data provided by FPB personnel to identify waste generation variables
- Discussions with FPB personnel regarding planned operational changes and plant modifications
- Identification and review of source reduction alternatives
- Determination of testing required to evaluate alternate disposal options for remaining waste streams with recommendations to FPB
- Projection of intermediate and future waste quantities at the mill

Summary and recommendations of this study are as follows:

- Seven distinct solid waste streams are currently managed at the mill and placed in the landfill. These include: 1) wood yard wastes, 2) bottom ash, 3) grits, 4) dregs, 5) dumpster garbage/trash, 6) debris (maintenance and construction/demolition), and 7) dewatered sludge. The bottom ash, grits, and dregs are process wastes whereas the garbage/trash and debris are general mill wastes.
- McKim & Creed recommends a waste reduction strategy to FPB which would affect a reduction in currently landfilled wastes of an estimated 42 percent by weight and 62 percent by volume through elimination of nearly all of the wood yard wastes and much of the cardboard and municipal portions of the general mill wastes. It is planned that this strategy be fully implemented by January 1, 1996.

## I. PURPOSE AND METHODOLOGY

Federal Paper Board Company, Incorporated (FPB) is considering future waste disposal alternatives for the various waste streams generated at the company's paper mill in Riegelwood, North Carolina. Presently, solid waste disposal at FPB consists primarily of on-site landfilling.

In order to identify feasible disposal and waste reduction options, McKim & Creed performed the following tasks during the course of this study:

- Compilation and review of recent FPB records and data, including a 1992 *Waste Characterization and Analysis Report* prepared by RMT, Inc., pertaining to solid waste generation rates and characterization.
- Discussions with the appropriate FPB representatives to identify solid waste generation variables, including future planned operational changes and plant modifications.
- Site visit and tour to discuss individual wastes generated at the mill and the effects of recommended waste reduction measures and the proposed mill modernization program on these individual waste streams.
- Research of current solid waste requirements and projection of expected future requirements in a rapidly changing regulatory environment.
- Identification of potential waste reduction management strategies including waste reuse and/or recycling in order to affect a true reduction in waste generated at the mill.
- Identification of potential solid waste disposal alternatives for each waste stream generated at the Riegelwood plant.
- Preparation of recommendations based upon findings from completion of above tasks.

## II. FACILITY BACKGROUND

The FPB mill is located near the Cape Fear River in Riegelwood, North Carolina, as shown on Figure 1. This mill produces pulp and paper from purchased pine and hardwood trees and wood chips. The plant's production process involves all aspects of pulp and paper production from debarking of trees to final cutting of paper into sheets and rolls.

## III. WASTE STREAM CHARACTERISTICS

### A. Waste Stream Identification

Seven distinct solid waste streams are managed at the mill. These wastes are defined as follows:

- Wood yard wastes consist of old logs and wood chips, bark used for daily cover at landfill, wood chips mixed with soil, and miscellaneous wood wastes. These wastes are currently managed in the landfill.
- Bottom ash is piped in liquid form from the moving grate in the boilers to the ash pit where it is dewatered, excavated and eventually landfilled.
- Grits are gritty, dark green sediment from the slakers in the Pulp Mill. Grits are currently disposed in the landfill.
- Dregs are solids recovered from the dregs filter in the Pulp Mill and are currently hauled to the landfill for disposal.
- General mill wastes are inclusive of dumpster waste from the mill and the on-site contractors, general trash and garbage picked up around the site, construction and demolition debris, and maintenance debris. These wastes are also currently disposed in the landfill.
- Sludge or primary clarifier solids are either burned in the power boilers or dewatered and landfilled.

## B. Waste Quantities

Based on data provided by FPB personnel, McKim & Creed estimated solid waste quantities currently being managed in the landfill. An account of how McKim & Creed arrived at these estimates is located in Appendix A. Based on these estimates, wood yard wastes account for approximately 507 tons per week of solid waste. Process wastes contribute about 446 tons per week. General mill wastes provide for approximately 99 tons per week. A summary of these wastes and their contribution to the landfill waste stream is shown in Table 1.

**Table 1**  
**Estimated Current Waste Quantities**  
**(Until January 1, 1996)**

	Estimated (tons/week)	Weight Contribution (%)	Density (lbs./ft <sup>3</sup> )	Estimated (yd <sup>3</sup> /week)	Volume Contribution (%)
Wood Yard	507	35.5	26.3	1,428	47.5
Bottom Ash	211	14.8	55.2	283	9.4
Grits	28	2.0	63.6	33	1.1
Dregs	207	14.5	76.3	201	6.7
General Mill	99	6.9	11.2	653	21.7
Sawmill Waste:	133	9.3	154.0	5.1	
Trash	25	1.8	55.0	33.0	1.1
Ash	63	4.4	63.5	73.0	2.4
Bark / Wood	45	3.0	68.8	48.0	1.6
Dewatered Sludge	242	17	70.0	256.0	8.5
TOTALS	1,427	100.0	N/A	3,008	100

## C. Chemical Properties

In order for the wastes generated by the mill to be classified as industrial wastes, they must be evaluated and found to be non-hazardous. FPB has tested all major waste streams and composite samples in accordance with the Toxicity Characteristic Leaching Procedure (TCLP) or the water leaching test. These tests and their results are accepted by State regulatory agencies and are needed to confirm that the waste streams produced at the mill are non-hazardous and thus industrial wastes per the definition in *15A NCAC 13B .1602*.

## IV. CURRENT WASTE DISPOSAL PRACTICES

Table 2 includes a summary of mill processes, the resulting waste streams and the current disposal operations of the mill.

**Table 2  
Current Mill Processes, Wastes  
And Disposal Operation**

<b>Equipment or Process</b>	<b>Resulting Waste</b>	<b>Current Disposal Operation</b>
Debarking	Bark	Wood yard /Landfill
Screening	Chips	Wood yard /Landfill
Power Plant	Bottom Ash	Ash Pond/Landfill
Pulp Mill	Dregs	Landfill
Slakers	Grits	Landfill
Construction/Demolition	Debris	Landfill/ACM Area

Note: a Bark and chips that are too small are sent to the power plant to be used as fuel. Excess bark and chips are stockpiled in the wood yard. Wood yard wastes are also inclusive of other miscellaneous wastes such as wooden cable spools, large tree stumps and wood chips purchased for daily cover.

In addition to the process wastes that are placed in the landfill (as shown in the above table), general mill waste and maintenance debris are also landfilled. Wood chips and bark as well as sawdust are currently used as a source of daily cover over the waste streams based on an agreement between FPB and the North Carolina Department of Environment, Health and Natural Resources (NCDEHNR), Division of Solid Waste Management (DSWM).

## **V. PROPOSED WASTE DISPOSAL PRACTICES**

In order to reduce the amount of waste landfilled at the site, the mill plans to implement waste reduction measures by January 1, 1996, including off-site disposal of municipal solid waste (MSW); chipping and reuse of wood yard wastes and a limited cardboard recycling program at the mill. The mill also plans a mill modernization program which will increase the output of the mill from the current 2,435 tons/day of bleached market pulp and paperboard to 3,000 tons/day, an increase of 23.2% over current output. The effects of each of these conditions on the individual waste streams was evaluated and are subsequently discussed.

### **A. Waste Reduction/Management Strategies**

During the course of this study, McKim & Creed has recommended that FPB employ a waste reduction strategy which involves eliminating the office trash/cafeteria waste from the landfill. This would in turn reduce or

eliminate the need for daily cover. Several waste management steps have been recommended to FPB as follows:

1. Contract for off-site disposal of general mill waste/cafeteria waste. Municipal solid wastes can no longer be accepted from the sawmill in Armour. In order to ensure that all municipal solid waste is disposed off-site, FPB must also transport the contents of any dumpster, which is inaccessible to the waste disposal contractor, to the compactor.
2. Contract for collection and recycling of cardboard in the receiving area, including on-site compaction.
3. Contract for grinding and recycling/reuse of bulky wood waste from the wood yard.

In order for the landfill to avoid the need for daily cover, the municipal solid waste should be diverted from the landfill. This is especially imperative for any cafeteria (i.e., food) waste that is part of the municipal solid waste stream. Implementation of Step 1 above would effectively remove all municipal solid waste. Step 1 would also allow FPB to eliminate the purchased bark/wood chips from the wood yard used for daily cover in the landfill resulting in a substantial cost savings.

- The cardboard program, described in Step (2) above, in conjunction with the aluminum can recycling program currently in effect at the mill will eliminate a good portion of the recyclables generated by mill personnel from the general mill waste streams. Plastic containers are not allowed at the mill as they can get caught in the process machinery; glass is used exclusively in the laboratories and reused. The occasional broken glass beaker is recycled by personnel in at least two of the laboratories according to FPB.

FPB has elected to contract with a waste disposal contractor to manage the off-site disposal of dumpster trash/waste and the limited cardboard collection beginning by January 1, 1996.

The projected waste quantities effective after implementation of the waste reduction measures are modified from current values as follows:

- As discussed with FPB personnel at the mill on June 14, 1995, wood yard wastes are anticipated to be reduced by a minimum of about ninety percent (90%) as most wood yard wastes can be ground or chipped and reused.
- Bottom ash and grits and dregs are assumed to be unaffected by the waste reduction measures as they are process wastes.
- Under the general mill waste category, the mill's and on-site contractors' dumpster trash and garbage will be disposed off-site.
- Sludge is currently dewatered and excavated from the sludge pond area and landfilled. FPB personnel estimate that about 20,000 cubic yards of sludge will be placed in the landfill by December 31, 1996. FPB is hoping to evaluate alternate uses for the sludge after 1996 depending upon the outcome of the proposed sludge studies.

This waste management strategy will significantly reduce the quantity of solid waste directed to the landfill through the elimination of the purchased bark/wood chips, the dumpster trash/garbage portion of the general mill waste, the sawmill wood/bark and dumpster waste, and the portion of the wood yard wastes which will be chipped/ground and reused. These waste streams together constitute 42.3 percent of weight or 62.3 percent of volume of the total solid waste currently directed to the landfill. Of these waste streams, about 90 percent of the remaining wood yard wastes (about 23,728 tons/year) will be chipped and recycled/reused.

McKim & Creed recommends that FPB maintain records of the actual quantities of wood wastes that are chipped/ground and recycled/reused; the quantity of dumpster trash/garbage disposed off-site, and the quantity of cardboard compacted and taken off-site for recycling. The cardboard program and the wood waste recycling/reuse efforts constitute true reductions in waste.

Estimated waste quantities after implementation of these measures are shown in Table 3.

**Table 3**  
**Estimated Waste Quantities After**  
**Implementation of Waste Reduction Measures**  
**(January 1, 1996 through December 31, 1999)**

	Quantity (tons/week)	Weight Contribution (%)	Density (lbs./ft <sup>3</sup> )	Estimated Volume (yd <sup>3</sup> /week)	Volume Contribution (%)
Wood Yard	51	6.2	26.3	143	12.6
Bottom Ash	211	25.6	55.2	283	25.0
Grits	28	3.4	63.6	33	2.9
Dregs	207	25.1	76.3	201	17.7
General Mill a	22	2.7	11.2	145	12.8
Sawmill Waste	63	7.6	73	6.4	
Trash	0	0	55	0	0
Ash	63	7.6	63.5	73	6.4
Bark / Wood	0	0	68.8	0	
Sludge	242	29.4	70	256	22.6
TOTALS	824	100	N/A	1,134	100.0

## B. Projected Future Quantities

The mill modernization program will increase mill output production by about 23% by the year 2000 through the purchase and installation of a new lime recovery facility including a new kiln, a new dregs filter and a new slaker; a new recovery boiler in the power plant, and a change from elemental chlorine to an oxygen and/or chlorine dioxide system in the bleaching plant. The effects of mill modernization on the various waste stream quantities were discussed at the mill during the meeting and site visits on June 13 and 14, 1995. The conclusions are as follows:

- Wood yard wastes quantities will remain unchanged by mill modernization.
- Bottom ash quantities will also remain unchanged by mill modernization. It is our understanding that additional power for mill operation will be purchased power and that the power plant is currently at its bark/wood waste-burning capacity.
- Grits and dregs will increase proportionally to the increase in mill pulp and paperboard production.
- The only waste in the general mill category which will be affected by the mill modernization program will be construction and demolition debris. These materials will be handled as discreet waste streams and taken off-site during mill modernization.

- It has been conservatively estimated that dewatered primary clarifier sludge will continue to be placed in the landfill in the future. The current disposal rate is carried into the future.

McKim & Creed has estimated future solid waste quantities to be landfilled for the year 2000. Projections are based on the planned increase in plant production and the implementation of the waste reduction/management strategy. A summary of the projected quantities is shown in Table 4.

**Table 4  
Projected Waste Quantities  
Year 2000**

	Quantity (tons/week)	Weight Contribution (%)	Density (lbs./ft <sup>3</sup> )	Estimated Volume (yd <sup>3</sup> /week)	Volume Contribution %
Wood Yard	51	5.8	26.3	43	12
Bottom Ash	211	24	55.2	283	23.8
Grits	35	4	63.6	41	3.4
Dregs	255	29	76.3	248	20.9
General Mill	22	2.5	11.2	145	12.2
Dumpster	0	0	65	0	0
Ash	63	7.2	63.5	73	6.1
Bark / Wood	0	0	68.8	0	0
Dewatered Sludge	242	27.5	70.0	256	21.5
TOTAL	879	100	N/A	1,189	100

### C. Summary

The current estimated landfill waste production rate is 3,008 cubic yards per week or 1,427 tons per week. After the waste reduction measures (January 1, 1996 through December 31, 1999), the estimated landfill waste production rate will be 1,134 cubic yards per week or 824 tons per week. This represents a 62.3% reduction by volume or a 42.3% reduction by weight from the current rate. After mill modernization (January 1, 2000), the estimated landfill waste production rate is 1,189 cubic yards per week or 879 tons per week. This represents a 60.5% by volume or 38.4% reduction by weight from the current rate.

## D. Projected Quantities for Three 5 Year Phases

	1998-1999	2000-2012	First 5 Years	First 10 Years	First 15 Years
	Estimated (yd3/week)	Estimated (yd3/week)	Estimated (yd3)	Estimated (yd3)	Estimated (yd3)
Wood Yard	143	143	37,180	74,360	111,540
Bottom Ash	283	283	73,580	147,160	220,740
Grits	33	41	9,828	20,488	31,148
Dregs	201	248	59,592	124,072	188,552
General Mill	145	145	37,700	75,400	113,100
Dumpster	0	0	0	0	0
Bark	73	73	18,980	37,960	56,940
Ash	0	0	0	0	0
<b>Total</b>	<b>878</b>	<b>933</b>	<b>236,860</b>	<b>479,440</b>	<b>722,020</b>
(without sludge)					
Sludge	256	256	66,560	133,120	199,680
<b>Total</b>	<b>1134</b>	<b>1,189</b>	<b>303,420</b>	<b>612,560</b>	<b>921,700</b>
(with sludge)					

## VII. CONCLUSIONS AND RECOMMENDATIONS

McKim & Creed has completed the Waste Management Plan (WMP) for the FPB paper mill in Riegelwood, North Carolina. McKim & Creed has evaluated the current and future waste quantities to be disposed in the mill's landfill based upon current operating procedures and future developments as described by FPB personnel.

McKim & Creed has recommended several waste reduction strategies to FPB in order to affect a significant reduction in waste quantities disposed in the landfill as follows:

1. Contract for off-site disposal of general mill waste/cafeteria waste. Municipal solid wastes could no longer be accepted from the sawmill in Armour. In order to ensure that all municipal solid waste is disposed off-site, FPB must also transport the contents of any dumpster, which is inaccessible to the waste disposal contractor, to the compactor.
2. Contract for collection and recycling of cardboard and other paper recyclables, including on-site compaction.

3. Contract for grinding and recycling of bulky wood waste from the wood yard.

These strategies will significantly reduce the volume requirements of the new industrial waste landfill. These reductions will also result in true waste reductions through recycling or reuse of some of these materials in lieu of disposal.