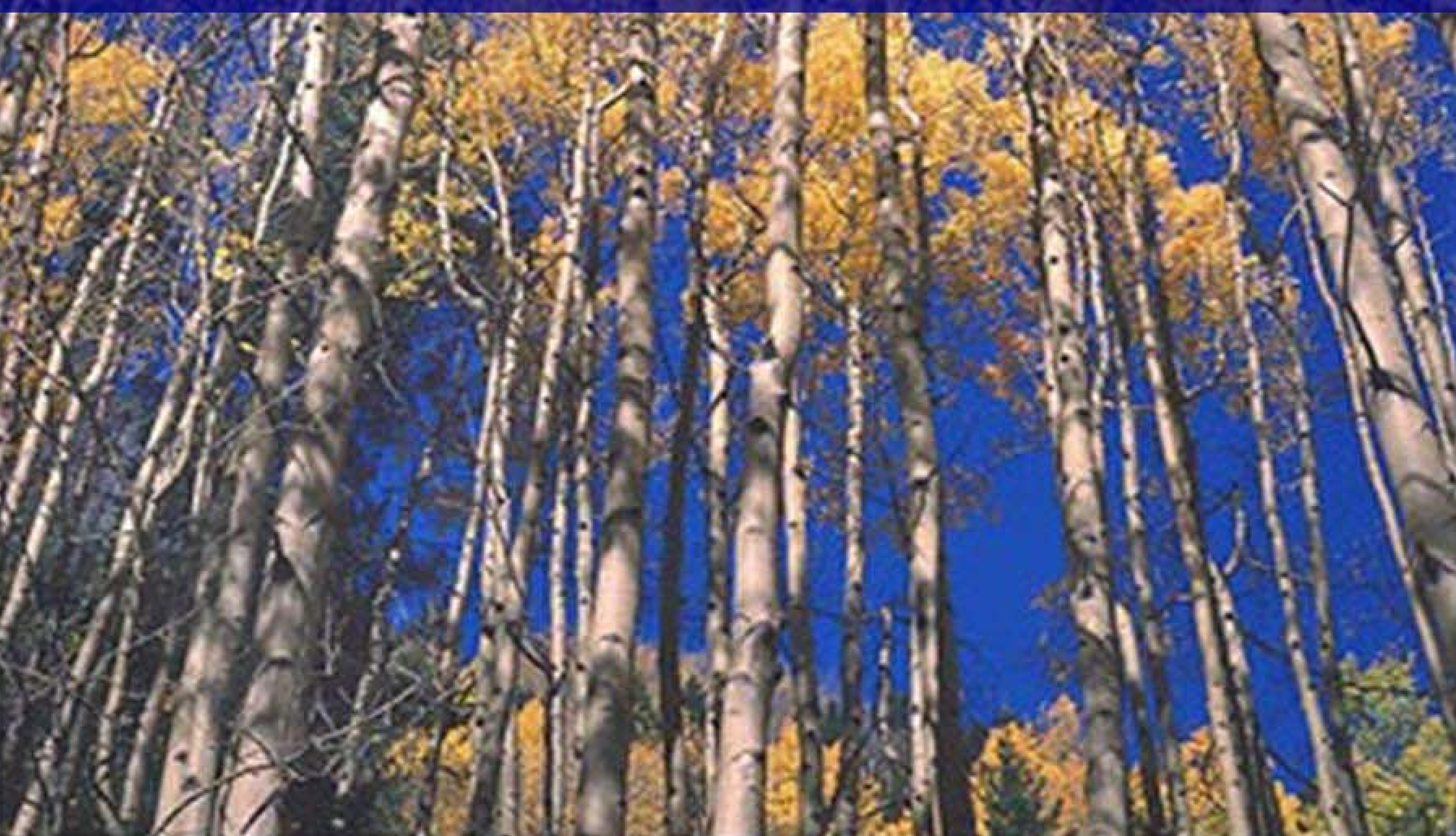
Draft Environmental Impact Statement

Minnesota
DEPARTMENT OF NATURAL RESOURCES

UPM/Blandin Paper Mill Thunderhawk Project

Grand Rapids, Minnesota

January 2006



UPM/Blandin Paper
Thunderhawk Project
Grand Rapids, Minnesota

Draft Environmental Impact Statement

January 2006

Prepared by

Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155-4025

with assistance from

HDR Engineering, Inc.
6190 Golden Hills Dr.
Minneapolis, MN 55416

Draft Environmental Impact Statement for the UPM/Blandin Paper Mill Expansion Thunderhawk Project Grand Rapids, Minnesota

Responsible Government Unit

Minnesota Department of Natural Resources

Contact Person

Bill Johnson
Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, Minnesota 55155-4025
(651) 259-5157
Fax (651) 297-1500

Proposer

UPM-Kymmene/Blandin Paper Mill
115 First Street, SW
Grand Rapids, Minnesota 55744-3699
(218) 327-6200

Proposer's Contact Person

Bill Spreeman
Manager, Environmental Affairs
(218) 327-6306

Abstract

The Draft Environmental Impact Statement (DEIS) documents the analysis of potential impacts associated with developing or not developing the UPM/Blandin Paper Mill Thunderhawk Project. Significant issues include noise, traffic, socioeconomics, and cumulative timber harvesting effects.

Certification of Responsible Government Unit

I hereby certify that the information contained in this document is true and complete to the best of my knowledge, and that copies of the completed DEIS have been made available to all persons and parties on the official EQB distribution list.

Bill Johnson
Natural Resources Program Consultant
DNR Division of Ecological Services

January 30, 2006

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ACRONYMS AND ABBREVIATIONS

AD	air-dry
ADT	average daily traffic
AFB	aquatic filter barriers
ARDC	Arrowhead Regional Development Commission
AST	above ground storage tanks
ATR	automatic traffic recorder
BACT	best available control technology
BAT	best available technologies
BDt	bone-dry tons (U.S.)
BLS	Bureau of Labor Statistics
BMP	best management practice
BOD	biological oxygen demand
dB	decibel
DEED	Department of Employment and Economic Development
DEIS	Draft Environmental Impact Statement
DNR	Department of Natural Resources
dtpd	dry tons per day
EAW	Environmental Assessment Worksheet
ECS	ecological classification system
EIS	Environmental Impact Statement
ELC	Ecological Land Classification
EPA	Environmental Protection Agency
EQB	Environmental Quality Board
FIA	Forest Inventory and Analysis
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FTE	full-time equivalent
GEIS	Generic Environmental Impact Statement
GIS	Geographic Information Systems
GP	General Permit
GRPUC	Grand Rapids Public Utilities Commission
HAP	hazardous air pollutants
L_{10}	descriptor when average sound level exceeded 10 percent of the time
L_{50}	descriptor when average sound level exceeded 50 percent of the time
L_{eq}	descriptor for average sound level
LWC	lightweight coated (paper)
LOP	letter of permission
LOS	level of service
MFRC	Minnesota Forest Resources Council
mgd	million gallons per day

Mn/DOT	Minnesota Department of Transportation
MNRRA	Mississippi National River and Recreation Area
MPCA	Minnesota Pollution Control Agency
NCRS	North Central Research Station
NEPA	National Environmental Policy Act
NIPF	Non-industrial Private Forest
NPC	Native Plant Community
NPDES	National Pollution Discharge Elimination System
OHWL	ordinary high water level
PCC	precipitated calcium carbonate
PGW	pressurized groundwood mill
PHV	peak hourly volume
PM	particulate matter
P.M.	afternoon and evening time
PM5	Paper Machine 5
PM6	Paper Machine 6
PM7	Paper Machine 7
PSD	prevention of significant deterioration
PTE	potential to emit
PUC	Public Utilities Commission
PWI	Protected Waters Inventory
REC	Rapids Energy Center
RGU	responsible governmental unit
RNV	Range of Natural Variation
RPC	regional purchase coefficients
RTO	regenerative thermal oxidizer
SAM	social accounting matrix
SCS	Soil Conservation Service
SDD	Scoping Decision Document
SDS	State Disposal System
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollution Prevention Plan
TMP	thermo mechanical pulp mill
TPD	tons per day
TPY	tons per year
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
UST	underground storage tank
VGS	Vegetation Growth Stages
VOC	volatile organic compounds
WWTF	wastewater treatment facilities

GLOSSARY

Bole	The trunk of a tree.
breast height	4 1/2 feet above ground level. See diameter at breast height.
cable skidder	A skidder that employs a mainline and chokers to gather and fasten the load.
Chips	Woody material cut into short, thin wafers. Chips are used as a raw material for pulping and fiberboard or as biomass fuel.
clearcut	The harvest of all the trees in an area. Clearcutting is used to aid species whose seedlings require full sunlight to grow well.
clear-fell	Removal of all trees in an area.
cord	A unit of wood cut for fuel that is equal to a stack 4 x 4 by 8 feet or 128 cubic feet.
deciduous	Shedding or losing leaves annually; the opposite of evergreen. Trees such as maple, ash, cherry, and larch are deciduous.
delimber	A self-propelled or portable machine used to remove branches from trees or tree parts.
diameter at breast height (dbh)	Standard measurement of a tree's diameter, usually taken at 4 1/2 feet above the ground.
even-aged stand	A stand in which the age difference between the oldest and youngest trees is minimal, usually no greater than 10 to 20 years. Even –aged stands are perpetuated by cutting all the trees within a relatively short period of time.
evergreens	Plants that retain foliage year round.
feller-buncher	A harvesting machine that cuts a tree with shears or a saw and then piles it.
felling	The cutting of standing trees.
forest	A biological community dominated by trees and other woody plants.
forestland	A classification of land use in the Natural Resources Inventory (NRI). It includes areas where trees cover at least 10 percent of the land and must be at least an acre in size.
forest types	Associations of tree species that have similar ecological requirements.
freesheet	A freesheet is a sheet of paper that does not contain groundwood. It is generally of a higher quality, a high density, and is less absorbent.
grapple skidder	A skidder using a large suspended grapple to pick up and fasten the load.
hardwoods	A general term encompassing broadleaf, deciduous trees.
increment borer	An augerlike tool with a hollow bit designed to extract cores from tree stems for the determination of age and growth rate.
landing	A cleared area within a timber harvest where harvested logs are processed, piled, and loaded for transport to a sawmill or other facility.
mast	Nuts and seeds, such as acorns, beechnuts, and chestnuts, of trees that serve as food for wildlife.

niche	The physical and functional "address" of an organism within an ecosystem.
oriented strand board	Panel products manufactured by gluing and high-temperature pressing of layers of thin wood chips, with each layer oriented at a right angle to adjacent layers.
overstory	The level of forest canopy that includes the crowns of dominant, codominant, and intermediate trees.
pole	Roundwood of a diameter smaller than saw-log size, suitable – without further conversion – for supporting transmission lines or for rough construction.
pole stand	A stand of trees whose average dbh is between 4 and 10 inches.
pole timber	Trees 4 to 10 inches dbh.
pulpwood	Wood suitable for use in paper manufacturing.
rotation	The number of years required to grow a stand to a desired size or maturity.
roundwood	Wood products that are used in their original form, only being cut to length. Includes firewood, posts, poles, pulpwood, and similar products.
sapling	A tree at least 4 1/2 feet tall and up to 4 inches in diameter.
sapling stand	A stand of trees whose average dbh is between 1 and 4 inches.
sawlog	A log large enough to be sawed economically on a sawmill. Sawlogs are usually at least 8 inches in diameter at the small end.
sawlog tree	A tree at least 11 inches dbh and suitable for conversion to lumber. Sometimes, trees 11 to 14 inches dbh are called small sawlog trees, and trees larger than 18 inches dbh are called large sawlog trees.
sawtimber	Trees from which sawlogs can be made.
sawtimber stand	A stand of trees whose average dbh is greater than 11 inches.
seedling	A young tree grown from the seed up to the sapling stage, that is a height of 4 1/2 to 6 feet (1.5 to 2 meters
selection harvest	The harvest of all individual trees or small groups at regular intervals to maintain an uneven-aged forest. Selection harvests are used to manage species that do not need sunlight to survive.
silviculture	The care and cultivation of forest trees; forestry.
shelterwood	The cutting of most trees, leaving those needed to produce sufficient shade to protect young seedlings growing beneath them.
skidder	A forest tractor which carries the wood load partly on the machine with the rest skidded along the ground.
skidding	The act of moving trees from the site of felling to a leading area or landing. Tractors, horses, or specialized logging equipment can be used for skidding. Skidding methods vary in their impact on soils and the remaining stands.
slash	Branches and other woody material left on a site after logging.
slasher	A self-propelled, portable, or stationary machine used at roadside, intermediate landing, or millyard to buck trees or tree parts to predetermined lengths.

snag	A dead tree that is still standing. Snags provide important food and cover for a wide variety of wildlife species.
softwood	Any tree in the gymnosperm group, including pines, hemlocks, larches, spruces, firs, and junipers. Softwoods often are called conifers although some, such as junipers and yews do not produce cones.
stand	A group of forest trees of sufficiently uniform species composition, age, and condition to be considered a homogeneous unit for management purposes.
stand density	The quantity of trees per unit area, usually evaluated in terms of basal area, crown cover and stocking.
stocking	The number and density of trees in a forest stand. Stands are often classified as understocked, well-stocked, or overstocked.
succession	The natural replacement of one plant (or animal) community by another over time in the absence of disturbance.
thinning	A partial cut in an immature, overstocked stand of trees used to increase the stand's value growth by concentrating on individuals with the best potential.
timberland	Forested land that is capable of producing crops of industrial wood at a rate of at least 20 cf/ac per year and has not been withdrawn from timber production.
tolerance	A tree species' capacity to grow in shade
uneven-aged stand	Three or more age classes of trees represented.
windthrow	A tree felled by wind. Windthrows, also known as blowdowns, are common among shallow-rooted species and in areas where cutting has reduced stand density.
woodland	See forest.

EXECUTIVE SUMMARY

ABSTRACT

The Draft Environmental Impact Statement (DEIS) documents the analysis of potential impacts associated with developing or not developing the UPM/Blandin Paper Mill Thunderhawk Project. Significant issues include noise, traffic, socioeconomics, and cumulative timber harvesting effects.

EIS PROCESS

The purpose of this DEIS is to provide information needed to evaluate the proposed UPM/Blandin Paper Mill Thunderhawk Project's potential for significant environmental effects, consider alternatives, explore methods for reducing adverse effects, and provide information to the public regulatory agencies, the public, and the Project Proposer.

Minnesota DNR (Department of Natural Resources) conducted a discretionary scoping Environmental Assessment Worksheet (EAW) on the Project pursuant to Minn. Rules part 4410.200, subp. 3B, which directs the preparation of an environmental impact statement (EIS) when a Project Proposer and Responsible Government Unit (RGU) agree that an EIS be prepared. The DNR is the RGU for the EIS. In accordance with the Minnesota Environmental Quality Board (EQB) rules, the DNR scoped potentially significant issues and has prepared this DEIS to determine in depth how construction and operation of the Project could affect the following potentially significant issues:

- Noise
- Traffic
- Rail
- Socioeconomics
- Cumulative Timber Harvest

Regarding "Cumulative Timber Harvest," the DEIS is to compare the findings of the proposed Project's timber harvest analysis with the findings of the Final Generic EIS on statewide timber harvest. The DEIS will discuss the Project-specific cumulative timber harvest effects in relation to the GEIS. RGUs are required to consider information from an available GEIS by tiering according to Minn. Rules part 4410.3800, subpart 8. The Minnesota Environmental Quality Board (EQB) determined that the GEIS did not remain adequate for use in accordance with Minnesota Rules part 4410.3800, subpart 8, in project-specific review. The EQB also noted "while the Timber Harvesting GEIS is no longer adequate as a whole, nor as accurate as it was when completed, it still contains useful information." While a project-specific EIS typically examines environmental impacts within a limited geographic area, a GEIS analyzes the cumulative impacts associated with a number of separate, yet related activities. In the case of the GEIS on timber harvesting and forest management, cumulative impacts are those resulting from the hundreds of individual logging activities occurring in the state each year – in effect, the collective impacts of these individual operations on the state's overall environmental quality. The Final Scoping Decision dictates which GEIS-type information is to be explicitly considered in the DEIS. This includes the GEIS's forest condition projections, identification of potentially significant cumulative impacts, and recommended programmatic mitigative responses.

The EIS must address the full range of Project-related impacts. The following topics are not expected to involve significant impacts, but are analyzed in the EIS using additional information beyond that provided in the scoping EAW.

Stationary Source Air Emissions	Land Cover
Land Use/Zoning	Water Resources/Water Quality
Wildlife and Fisheries Resources	Geologic Hazards/Soils
Solid and Hazardous Wastes	Above Ground Storage Tanks
Visual Impacts	Designated Parks, Recreation Area, Trails
Infrastructure/Public Services	

This summary lists the major impacts expected to result from the proposed Project that are discussed in the DEIS. Techniques to mitigate for, or reduce, those same impacts are identified as well. After a public review period, comments received on the DEIS will be addressed in the Final EIS to be prepared by DNR.

ALTERNATIVES

The DEIS considers the proposed Project and alternatives. Alternatives considered include: No-Build, different fiber sources, forest productivity and utilization measures, rotation ages on UPM/Blandin-managed lands, paper warehousing options, and statewide timber harvesting scenarios.

PROJECT ACTIONS

UPM-Kymmene/Blandin Paper Company (UPM/Blandin Paper) proposes to expand and modify its paper mill located in Grand Rapids, Minnesota; see Figure 1-1 through Figure 1-6. The existing mill produces lightweight coated publication-grade paper through two paper machines (PM5 and PM6). The mill's annual output is approximately 380,000 short tons. The Project's main feature is the addition of a complete paper manufacturing line that is designated as paper machine No. 7 (PM7). The Project includes increasing pulp producing capacity, optimization of the PM6 paper line and the addition of warehouse facilities. Should the Project occur, the existing PM5 line would be shut down permanently in conjunction with start-up of the new operations. The facility's wood use would increase approximately 197,000 cords annually, to a total estimated wood consumption at the mill of 400,000 cords per year.

The proposed Project would use wood as the primary raw material to produce publication-grade rolled paper. Both hardwood (e.g., aspen) and softwood (e.g., spruce, balsam) species supply the mill. For the purpose of DEIS impact assessment, the increase in wood usage is assumed to come from timber harvesting activities in Minnesota, only.

The following summarizes the major Project features and Project-related site modifications.

WOOD-RELATED OPERATIONS

- Raw Wood Transport: Project implementation will increase truck traffic supplying wood to the Mill and the number of rail cars will increase.
- Woodyard: The Project includes installation of a chip receiving station.
- Woodroom: 1) Addition of a new mechanical debarker to the hardwood line; 2) Modification of the softwood feed system; 3) Addition of a new chipper to the woodroom; and 4) Construction of three new storage silos.
- Mechanical Pulping: 1) Potential addition of two to four Pressurized Groundwood Mill (PGW) grinders; 2) Modify existing PGW peroxide bleaching system feeding to PM6; 3) Install a new refining and peroxide bleaching system to the PGW for PM7, and 4) Install a new thermo mechanical pulp mill (TMP).
- Chemical Pulping: Install a new kraft pulp makedown line.

PAPER MANUFACTURING

- Stock Preparation: Install a kaolin processing station and a new Precipitated Calcium Carbonate (PCC) facility.
- Paper Machine Process: 1) Install PM7; 2) Modifications to PM6; and 3) Shut down PM5.
- Paper Finishing: Addition of paper finishing facilities for PM7.
- Roll Storage: Addition of roll storage area for PM7.
- Paper Warehousing: Addition of a new paper warehouse where three options are under consideration. Warehouse Option 2 is located within downtown Grand Rapids, Warehouse Option 4 is located west of the mill's woodyard, and Warehouse Option 5 is an existing warehouse located in Duluth, Minnesota. Early in Project development five warehouse options were under consideration, which explains the naming scheme. Warehouse Options 1 and 3 were dropped by UPM/Blandin Paper Mill prior to DEIS evaluation.
- Finished Product Transport: An increase in the number of trucks or rail cars will take place depending upon the selected warehouse option.

PRODUCTION OUTPUTS

- The paper mill's production will increase by 314,000 short tons per year of lightweight publication-grade paper.

WOOD USE

- Wood Use Amounts: Roundwood and kraft pulp use will increase with the proposed Project.
- Sources of Wood: It is assumed for this DEIS that the entire Project-related increase in wood use will be sourced from Minnesota forests. Existing and future mill operations will utilize some wood imports from Canada, Michigan, and Wisconsin.

WATER USE

- Water Intake Structure and Pumping Station: The Project proposes to install a new (second) water intake structure and a pumping structure for process water appropriations. The new intake is proposed to be installed upstream from the Blandin Dam and will appropriate water from the Mississippi River Paper Mill Reservoir.
- Fire Suppression System: Replace the existing fire suppression system with a new system.
- Non-Contact Cooling Loop System: Install a non-contact water cooling loop system; water will be appropriated from the Mississippi River Paper Mill Reservoir using the existing water intake structure.
- Closed-loop Cooling Towers: Modification to an existing cooling structure and addition of a second cooling tower.

WASTEWATER TREATMENT

- Modify the municipal wastewater treatment facilities to treat the Project-related increased flow and pollutant loads. This modification is considered a connected action. A detailed analysis of the wastewater treatment facilities' modifications was performed and documented in the Wastewater Treatment Facilities Improvement Modification Study for Blandin Paper/Thunderhawk Project, prepared for the City of Grand Rapids Public Utilities Commission (January 2006). Please reference the project file for a copy of this study. The Executive Summmary is provided as Appendix J to the DEIS.

ENERGY INFRASTRUCTURE

- Allete/Minnesota Power operates the Rapids Energy Center (REC) at the UPM/Blandin Paper Mill site. Energy-related infrastructure improvements at the REC include installation of a new steam accumulator, improvements to the water demineralization plant, installation of a new 280 x 10^6 BTU/hr gas-fired back-up boiler, and installation of a new power feed line. This modification is considered a connected action.
- UPM/Blandin Paper Mill-specific energy infrastructure improvement: Installation of a heat recovery system for the TMP where waste heat is captured and redirected back into the papermaking process.

OTHER INFRASTRUCTURE

- Existing on-site utilities, such as storm sewer, sanitary sewer, potable water mains, and fire mains, will need to be relocated for the installation of PM7.

SITE PREPARATION AND SCHEDULE

- Site preparation activities will take place on the UPM/Blandin Paper Mill site for the TMP, PM7, and associated components; in addition, site preparation will occur off site for the paper warehousing facility.
- A comprehensive construction schedule has not been developed. Once all approvals have been secured, UPM/Blandin Paper Mill indicates that construction could commence in late 2006 to early 2007, with new paper machine line start-up possible in late 2008-2009.

PROJECT EFFECTS

This DEIS discusses and evaluates impacts, alternatives and mitigation measures associated with the construction and activities of the proposed UPM/Blandin Paper Mill expansion and modifications. Non-significant effects will be addressed by either:

- Using the same information as contained in the EAW
- Using information beyond that contained in the EAW

DNR also identified potentially significant impacts requiring substantial investigation beyond the EAW. These impact categories include traffic, rail, noise, cumulative timber harvest, and socioeconomic, and are discussed briefly below.

TRAFFIC

The traffic operations analysis resulted in identification of increases in average intersection delays throughout the study area. However, each of the study area intersections is expected to remain at Level of Service (LOS) C or better. Increases to various lane group delays were noted, generally less than five seconds per vehicle. In general, Warehouse Option 5 had higher delay values due to the higher number of trucks traveling to and from the Project site.

In general, an increase of 16 vehicles during the P.M. peak hour is expected based on the increase of employees working at the site. An increase in truck traffic to and from the site varies depending on the various warehouse options. An increase of approximately 71 trucks on a daily basis was estimated for Warehouse Options 2 and 4, while an increase of approximately 137 trucks was estimated for Warehouse Option 5.

Within the City of Grand Rapids, the traffic impacts have been quantified by the intersection analysis. The highest impacts are anticipated to be associated with Warehouse Option 5, which would result in approximately 120 additional trips per day to be routed on Trunk Highway (TH) 2 near Grand Rapids. The highest existing daily volume on TH 2 is 6,200 vehicles per day, which drops to 2,400 vehicles per day east of the City of Swan River. Adding 120 vehicles per day would result in an increase of 2 to 5 percent in traffic volume, which is similar to the intersection analyses. However, even the highest volume segment is below the conservative estimate of 6,500 vehicles per day at LOS C. In addition, the geometry of TH 2 includes some passing lanes that result in higher capacity.

When compared to the baseline condition, the proposed Project will result in approximately 2.0 percent higher delays for all roadway users if the warehouse were placed on or adjacent to the mill site. Warehouse Option 5 creates a delay increase of 2.5 percent for roadway users, although individually compared to Warehouse Options 2 and 4, it is approximately 35 percent higher in delay.

The expansion of the UPM/Blandin Paper Mill is unlikely to cause excessive delays to drivers along the existing roadway network. Annual delay costs for Warehouse Options 2 and 4 ranged between $42,000 and $64,000. Warehouse Option 5 would result in annual delay costs ranging from $58,000 to $85,000. The increase in delay of individual lane groups could be mitigated to acceptable levels of service by adjusting the signal timing at the study area intersections. It may also be possible to change a particular travel route to improve individual turning movements if significant delays are encountered.

RAIL

The proposed Project will not increase the number of trains per day. However, motorist delay impacts are expected because the number of cars per train will increase. The number of cars on Trains 1 and 2 (Superior, Wisconsin, to Grand Rapids, Minnesota, and return) is expected to increase from 18 to 37 cars per day for Warehouse Options 2 and 4. The frequency of trains is not expected to increase. In Warehouse Option 5 the number of cars on Trains 1 and 2 is expected to increase from 18 to 20 cars per day. The proposed Project would cause motorist delay impacts from increased roadway crossing blockage by trains serving the UPM/Blandin Paper Mill.

The additional cars in each of the warehouse options increase the amount of time the trains take to cross each intersection, thus adding to the delay time. The total delay for these scenarios was calculated as delay costs for cars and trucks.

The total daily delay caused by rail traffic in the baseline scenario (existing conditions) is 103.3 minutes, or about 11.5 minutes per intersection. This translates into $11.58 in delay costs per day, or $4,226 per year. In Warehouse Option 2, daily delay increased by an additional 53 minutes to 156 minutes per day. This additional delay costs $10.33 per day, or $3,770 per year. Delay costs for Warehouse Option 4 were an additional $8.60 per day, or $3,141 per year. Warehouse Option 5 caused the least amount of delay among the various warehousing options. The delay cost in Grand Rapids was $1.18 more per day versus the baseline, or about $430 per year.

The expansion of the UPM/Blandin Paper Mill is unlikely to cause delay to the extent that mitigation is required. However, closing the 12th Avenue NW crossing and diverting traffic to the 18th Avenue NW crossing, as recommended by the Arrowhead Regional Development Commission (ARDC), would eliminate most of the delay caused by trains switching tracks to service the paper mill. The additional traffic at the 18th Avenue NW crossing would experience less delay versus the 12th Avenue NW crossing because trains are less frequent and move at a higher speed. Closing 12th Avenue NW could save $1,520 per year in delay costs; two to four times this amount could be saved in public maintenance costs.

NOISE

Based on observations of the project area, the ambient acoustic environment near the facility consists of noise contributions from:

- traffic on local roadways
- activities at nearby residences (recreation, landscaping, etc.)
- activities at the facility
- wind

Noise from mill-related indoor activities does not stand out in the outdoor (or ambient) acoustic environment as discrete discernable noise events. Rather, facility noise can be described as a dull but dominant hum in the overall ambient acoustic environment in areas in close proximity to the site. This dull hum in the ambient acoustic environment is punctuated by noise from discrete outdoor events, from both mill-related and off-site activities. At the mill these discrete noise events include material handling activities in the woodyard, including Lieberr cranes moving logs; logs falling into the surge pile; trucks delivering logs; bobcat loaders used for housekeeping.

In December 2005, a contractor for the mill measured noise levels at residences near the facility to assess the existing noise environment. Noise was measured hourly continuous 24-hour period. The plant operated normally during the data collection period.

HDR Engineering, Inc. performed a noise analysis for the proposed Project. The analysis:

- Measured noise emissions from material handling activities in the woodyard, which is the dominant outdoor noise-emitting activity at the facility.
- Used a commercial acoustical analysis software package (Cadna-A) to model noise emissions from proposed activities at the mill.
- Combined predicted noise levels with measured noise levels and compared the results with maximum allowable noise levels under Minnesota Pollution Control Agency (MPCA) rules.

Results of that comparison show a predicted increase of approximately one or two dBA above existing noise levels and no predicted exceedences of the MPCA maximum allowable noise levels.

SOCIOECONOMIC EFFECTS

Construction Related Impacts

Construction activities for the proposed Project are expected to commence in late 2006 and be completed in 2008 or 2009. In total, excluding planning contingencies, total construction expenditures are currently forecast to be $654 million (in 2005 dollars) over the construction period. Of this amount, $484 million relates to the purchases of machinery and equipment. For assessing the economic impacts, these purchases are assumed not to be local (i.e., they occur outside of Itasca County). In general, these purchases will be made from equipment manufacturers in Europe and elsewhere in the United States. The balance of the construction costs of $171 million reflect expenditures related to (i) labor for the construction of the facility, (ii) project management, and (iii) engineering. Based upon a set of assumptions, approximately $96 million (in 2005 dollars) of the construction expenditures are estimated to be locally based.

The local economic impact of the proposed Project is very significant for Itasca County, as it is expected to generate 506 full-time equivalent (FTE) jobs in 2006, 823 FTE jobs in 2007, and 15 FTE jobs in 2008.

Operations Related Impacts – Compared to Existing Operations

The total economic effects of the full-scale operation of the paper mill, after the Thunderhawk Project, on the economy of Itasca County were estimated for the three warehousing options relative to the base case or the existing operation of the paper mill. With the existing paper mill operations, approximately 58 percent of total paper mill expenditures are locally based. The components of the paper mill operations costs that are predominantly local relate to labor, wood, energy, maintenance materials, etc. Expenditures related to logistics, chemical products, or other inputs are generally not locally based.

Warehouse Options 2 and 4 (near proposed Project site)

In these options, the net steady state operating expenditures in excess of existing operations is approximately $114 million per year. Based on a detailed breakdown of these expenditures, it is estimated that approximately 53 percent or $60 million per year is locally spent. The direct local employment impact is estimated to be approximately 27 FTEs annually at steady state. The total economic impact including indirect and induced effects is 173 FTEs and approximately $73 million in output.

Warehouse Option 5 (not in proposed Project vicinity – Duluth)

The economic impacts are moderately lower when the warehouse is assumed not be located in the direct vicinity of the Project because some of the incremental employment is not locally based. The direct local employment impact is estimated to be approximately 23 FTEs annually at steady state. The total economic impact including indirect and induced effects is 153 FTEs and approximately $71 million in output.

Operations Related Impacts – Compared to the No-Build Alternative

The total economic effects of the Thunderhawk Project were also derived relative to the No-Build Alternative. If under the No-Build Alternative PM5 is shut down and PM6 remains in operation, this option represents a reduction in plant expenditures of approximately $80 million, of which 60 percent is estimated to be locally based. This option also represents a significant reduction in employment levels at the mill of about 250 jobs.

When compared to the No-Build Alternative and PM5 shutting down, Warehouse Options 2 and 4's Build Alternative results in an additional 277 direct jobs, 259 indirect jobs, and 190 induced jobs for a total of 726 jobs. The total output impact is estimated at $159 million, including $108 million in direct output. The Warehouse Option 5 Build Alternative (when compared to the No-Build and PM5 shutdown) results in an estimated total economic impact of 702 jobs and $152 million of output. The direct effect is estimated at 273 jobs and $103 million output.

Business Impacts

Warehouse Option 2 would require the acquisition of several properties near the existing UPM/Blandin Paper Mill that contain businesses. Properties that would be acquired under Warehouse Option 2 include a financial services business, a bakery, a textiles store, and a few business service establishments. In total, there are six businesses that would be acquired. Several apartments are also located above some of these buildings.

Housing Impacts

Warehouse Option 4 would require the acquisition of several residences near the existing facility. Warehouse Option 2 would require the acquisition of several buildings that currently house apartments above existing businesses. Currently, two of these apartment units are occupied. Warehouse Option 4 would require the acquisition of eight smaller, affordably-priced single-family residences located west of the UPM/Blandin Paper Mill's woodyard. Some of these properties are currently owned by the Proposer. The company has obtained options to purchase the remaining properties. Sale prices and relocation costs would be negotiated between the Proposer and the seller.

FORESTRY/TIMBER HARVESTING

Forestry Assessment: Background Information and Modeling

The Project will increase the mill's annual consumption of aspen, spruce, and balsam fir by a projected 197,000 cords per year. The Project's increase in wood use will accordingly add to the statewide aggregate demand for roundwood for industrial and non-industrial consumptive purposes. The Generic Environmental Impact Statement Study for Timber Harvesting and Forest Management (Minnesota Environmental Quality Board, 1994), or GEIS, determined that projects like UPM/Blandin Paper's proposed Thunderhawk Project will contribute to the potential cumulative environmental effects likely to result from all timber harvest activities conducted in the state. RGUs are required to use information regarding these cumulative effects from an available GEIS through tiering when conducting project-specific review. The DEIS incorporates by reference the findings and conclusions of the GEIS. See Appendix B: Final Scoping Decision Document and Appendix H: Executive Summary on the Final GEIS.

The DEIS assesses the No-Build and Build Alternatives in terms of projected change in Minnesota forest conditions at decade intervals from the present to the year 2040. Two comparisons are made. First, the No-Build Alternative is compared to the GEIS Base Harvest Scenario. The second comparison is the projected change between the Build and No-Build Alternatives. Potential impacts for both alternatives are assessed in terms of the 17 types of impacts identified by the GEIS. Mitigation is assessed for the Build Alternative relative to the GEIS's Strategic Programmatic Responses, which are authorized under the Minnesota Sustainable Forest Resources Act (M.S. 89A). Measures being implemented by the Proposer on its ownerships or through its open-market purposes are to also be detailed. Potential unmitigated impacts and mitigative alternatives are identified for the Build Alternative.

The impact assessments required several types of modeling, including: forest conditions modeling; timber harvest modeling; forest wildlife modeling; and habitat/Range of Natural Variation (RNV) modeling. The forest conditions/harvest scheduling modeling relied on the most recent Forest Inventory and Analysis (FIA) dataset. Modeling occurred at both statewide and landscape scales; the latter involved RNV-type modeling conducted for the Minnesota Drift and Lake Plains and Northern Superior Uplands ecosections. Derivative scenarios of the No-Build and Build Alternatives were modeled; results of these outputs are presented where additional insight can be provided. All wood was assumed to come from harvest in Minnesota (e.g., no imports).

Modeling Results: Evaluation of No-Build Alternative

The DEIS compares forest conditions from model projections for the No-Build Alternative and the GEIS Base Harvest Scenario.

Harvest Volumes

The GEIS Base Harvest Scenario harvests approximately 12.5 percent more timber than the DEIS No-Build Alternative. Harvest levels by forest group differ the most between the "other hardwoods" group, with the GEIS Base Harvest Scenario harvesting twice the amount projected in the No-Build Alternative. The No-Build Alternative harvests approximately 8.5 percent more aspen than the GEIS Base Harvest Scenario over the 40-year study period. Spruce-fir harvest is an average 63,000 cords/yr higher under the No-Build Alternative than the GEIS Base Harvest Scenario. See Table ES- 1.

Table ES- 1
Timber Volumes Harvested (M cords/yr) for the GEIS Base Harvest Scenario and DEIS No-Build Alternative

	Forest Products Group	Decade Starting in Year					Average 1990 - 2040
		1990	2000	2010	2020	2030	
GEIS Base Harvest Scenario	Aspen	2,382	2,238	1,865	1,854	1,867	2,041
	Spruce-fir	405	409	406	401	412	407
	Pine	415	441	435	438	442	434
	Other Hdwds	828	1101	1,482	1,479	1,388	1,256
	Total	4,030	4,189	4,188	4,172	4,109	4,138
	Forest Products Group	**Decade Starting in Year**					**Average 2000 - 2040**
		1990	**2000**	**2010**	**2020**	**2030**	
DEIS No-Build Alternative	Aspen	***	2,212	2,214	2,207	2,218	2,213
	Spruce-fir	***	454	470	504	446	468
	Pine	***	347	397	363	360	367
	Other Hdwds	***	658	602	592	653	626
	Total	***	3,671	3,683	3,666	3,677	3,674
	Forest Products Group	**Decade Starting in Year**					**Average**
		1990	**2000**	**2010**	**2020**	**2030**	
Difference (DEIS minus GEIS)	Aspen	***	-26	349	353	351	171
	Spruce-fir	***	45	64	103	34	62
	Pine	***	-94	-38	-75	-82	-67
	Other Hdwds	***	-443	-880	-887	-735	-629
	Total	***	-518	-505	-506	-432	-463

Both studies have very similar harvest patterns by ownership group. The overall harvest level is lower for the No-Build Alternative, with less harvest on private lands projected in percentage terms compared to the GEIS Base Harvest Scenario. See Table ES- 2.

Table ES- 2
Harvest Volume Projection Comparison by Land Ownership for the No-Build Alternative

Forest Ownership Group	DEIS Projected Average Harvest (M cords/yr)	DEIS Projected Harvest as a Percent of Statewide Total Volume	GEIS Projected Harvest for Ownership Group as a Percent of Statewide Area Harvested
National Forest	330	9.0	7.1
State	757	20.6	18.1
County/Local	840	22.9	22.5
All Other Lands	1,746	47.5	52.3
Total	3,674	100.0	100

Forest Area

Most harvesting under the No-Build Alternative is projected to occur in the aspen forest cover type, and this harvest is substantially greater than the GEIS Base Harvest Scenario. This is because the GEIS assumed that 25 percent of the aspen demand would shift to other species by 2010 and relatively little of that shift had occurred up to 2001. More acres of aspen are harvested in the earlier decades under the No-Build Alternative; this reflects opportunities to capture aspen volume from older, lower volume stands that are poorly stocked with low if not negative projected growth rates.

Regarding northern hardwoods, lowland hardwoods, and oak forest cover types, large differences between the GEIS Base Harvest Scenario and No-Build Alternative are present; the GEIS harvested more of these types than the No-Build Alternative. These differences are principally due to the GEIS's assumption that these types would be subject to even-aged management prescriptions. Harvest for both jack pine and paper birch are greater under the No-Build Alternative than under the GEIS Base Harvest Scenario. See Table ES- 3.

Table ES- 3
Average Area Regeneration Harvested (acres/yr) for the No-Build Alternative and the Base Harvest Scenario of the GEIS in Forest Cover Type Groups that use Even-aged Management

Forest Cover Type Group	DEIS Harvest Projection for Decade Starting in Year				DEIS Average (2001-2041)	GEIS Average (1990-2040)	Difference (DEIS minus GEIS)
	2001	2011	2021	2031			
Jack Pine	10,568	9,177	4,665	2,698	6,777	2,354	4,423
Red Pine	1,963	3,260	3,505	3,431	3,040	3,778	-738
Upland spruce-fir	5,658	6,852	6,387	3,808	5,676	6,674	-998
Northern hardwood*	81	84	321	2,682	792	6,288	-5,496
Oak	66	84	46	38	58	9,338	-9,280
Aspen	138,760	102,809	96,160	94,556	108,071	106,362	1,709
Paper birch	6,287	9,399	12,050	12,623	10,090	6,710	3,380
Lowland spruce	890	1,855	1,326	1,311	1,346	5,638	-4,293
Tamarack	86	188	106	122	126	906	-780
Lowland hardwood*	0	0	0	0	0	4,976	-4,976
Total	164,358	133,708	124,566	121,269	135,975	153,024	-17,049
Percent of area regeneration harvested that is in aspen forest cover type group	84	77	77	78	79	70	

The last row shows percentage of regeneration harvest occurring in aspen forest cover type each decade. Northern and lowland hardwoods are typically not subject to even-aged management treatments. Inclusion reflects treatment in the GEIS, which assumed even-aged management for these cover type groups

Age Class Distributions

Projected changes in age class distributions are summarized below.

All Forest Cover Types

Results are similar between the No-Build Alternative and GEIS Base Harvest Scenario. For both there tend to be younger stands and older stands with fewer stands at ages just beyond typical rotation ages.

Aspen Forest Cover Type

Projected changes to this cover type are quite different than projected for other forest types. Some older age classes are expected to succeed to other types. In general, the model harvested almost all available acres in this type. Overall, the model projects substantially more young aspen forest in 2041 than is present today.

Upland Spruce-fir Forest Cover Type

This type has undergone large recent losses due to spruce budworm. However, additional acres are likely to be added as a result of natural succession of older aspen, paper birch, and jack pine sites in some landscape ecosystems. Substantial harvesting is projected for this forest type, but is projected to be at sustainable levels.

Lowland Spruce Forest Cover Type

This forest type has large areas of older forest that do not undergo much in the model projection or historically. The model satisfied spruce-fir demands from harvesting in the uplands, both from aspen stands and upland spruce-fir stands. Most areas of lowland spruce would only be available for harvest in the winter.

Red Pine Forest Cover Type

Older age classes are projected to be well represented. Harvest that does occur is projected to be at sustainable levels. Thinning was the selected prescription for some areas in this type, especially for DNR and National Forest lands.

White Pine Forest Cover Type

Modeling results suggest that the white pine forest will simply grow older over the planning horizon. Although not modeled, younger age classes are expected to increase from present levels due to planned restoration activities by public land management agencies.

Jack Pine Forest Cover Type

Jack pine is a short-lived conifer that requires disturbance to regenerate. Large areas of young jack pine are projected for 2041 based upon the assumption that stands can be regenerated. Substantial management effort will need to be applied or large areas will succeed to other forest types.

Paper Birch Forest Cover Type

The model projects an increase in age classes less than age 40 in 2041 due to assumed harvest and regeneration activity. The DEIS model tends to harvest some birch stands to capture substantial volumes of aspen that are present in those stands. However, much area in the paper birch-type simply ages 40 years and is expected to succeed to other types. Some of this succession is desirable from an ecological perspective.

Other Forest Cover Types

Distributions for lowland hardwoods, oak, northern hardwoods, tamarack, and northern white cedar are projected to essentially age by 40 years over the study period with very little even-aged management activity occurring. Similar results were projected by the GEIS, although the GEIS did assume that northern hardwoods would be managed under even-aged systems. Some markets for tamarack are developing, but the areas harvested are still relatively small compared to the area of this forest cover type.

Implications of Modeling Results

The sustained high industrial demand for aspen that was modeled in the DEIS represents a large difference in underlying assumptions between the GEIS and DEIS. The DEIS projects continued high demand for aspen while the GEIS assumed a 25 percent shift in demand to other species. Additional observations are provided.

- The No-Build Alternative analysis indicates that the year 2002 statewide harvest level for aspen (2.21 million cords/ year) could be sustained over the 40-year planning horizon. The 2.21 million-cord level is very close to the *maximum* sustainable level of 2.42 million cords/yr estimated by the analysis for the 40-year planning horizon. The fact that statewide harvest is nearing the maximum sustainable level of aspen harvest is a source of concern.
- Harvest in the aspen forest cover type provides both aspen and other non-aspen species that can be used by industry. Because aspen stands are typically harvested using even-aged management prescriptions, harvest of other marketable species occurs at the same time. This non-aspen type volume is of sufficient quantity to supply current industrial demand for these other species. This means that there has been relatively modest harvest activity in many cover types that contain little or no aspen; this is projected to continue under the No-Build Alternative absent substantial species substitution in the forest industries sector.
- Both the GEIS and DEIS project a younger aspen forest cover type over time; the average age for the aspen forest cover type drops from 41 years to 34 years over the DEIS study period. Both jack pine and paper birch show an increase in average stand age, but not as much as projected in the GEIS. The DEIS projects a greater increase in average age for oak, lowland hardwoods, and northern hardwoods than the GEIS.

- The aspen forest cover type exhibits an imbalance in age distribution, with much of the imbalance present on public lands. Because the age distribution on private lands is relatively constant for the younger age classes, large increased areas of "next rotation" aspen are not likely to be available in the next 40 years. Similarly, large increases in aspen-type acreage harvested on public ownerships cannot be expected in future years because of instilled goals to achieve a more-balanced age class distribution in management plans. Additional aspen does not appear to be available from DNR or County lands because both are using area control to achieve a fairly even age class balance by 2041. Regardless, few acres in the aspen forest cover type go unharvested over the study period under the No-Build Alternative.

Modeling Results: Evaluation of Build Alternative

The DEIS compares forest conditions from model projections for the No-Build Alternative and Build Alternative.

Harvest Volumes

The Project-related increase in annual statewide harvest volume is projected to be less than 197,000 cords/yr because the Project does not come online until the latter part of Decade 1 of the study period. This means that aspen harvest is projected to increase an average of 76,000 cords/yr. Spruce-fir harvest levels are substantially lower than the expected value of 98,500 cords/yr because the No-Build Alternative resulted in spruce-fir harvest levels above the assumed minimum levels for this type. Statewide spruce-fir harvest levels are high enough for the Build Alternative to cover the assumed 98,500 cords per year increase for spruce-fir over 2002 levels. See Table ES- 4.

Table ES- 4

Timber Volumes Harvested for No-Build and Build Alternatives (thousand cords/yr)

	Forest Product Group	Decade Starting in Year				Average 1990 - 2040
		2000	2010	2020	2030	
No-Build Alternative	Aspen	2,212	2,214	2,207	2,218	2,213
	Spruce-fir	454	470	504	446	468
	Jack Pine Logs	89	75	39	22	56
	Red Pine Logs	166	192	219	239	204
	Tamarack	8	8	19	13	12
	Pine Pulp	84	123	87	86	95
	Other Hardwoods	575	528	519	562	546
	Firewood	83	74	73	92	81
	Total	3,671	3,683	3,666	3,677	3,674
	Forest Product Group	Decade Starting in Year				Average 2000 - 2040
		2000	2010	2020	2030	
Build Alternative	Aspen	2,243	2,303	2,304	2,303	2,288
	Spruce-fir	444	502	504	504	488
	Jack Pine Logs	93	71	39	27	57
	Red Pine Logs	167	190	214	264	209
	Tamarack	8	10	25	11	13
	Pine Pulp	90	118	93	93	98
	Other Hardwoods	628	603	614	595	610
	Firewood	89	85	74	94	85
	Total	3,761	3,881	3,867	3,890	3,850
	Forest Product Group	Decade Starting in Year				Average
		2000	2010	2020	2030	
Difference (Build Alternative minus No-Build Alternative)	Aspen	31	89	97	85	76
	Spruce-fir	-10	32	0	58	20
	Jack Pine Logs	4	-4	-1	5	1
	Red Pine Logs	2	-2	-5	25	5
	Tamarack	0	2	7	-2	1
	Pine Pulp	6	-5	6	7	4
	Other Hardwoods	53	75	95	33	64
	Firewood	5	11	1	2	5
	Total	90	198	200	213	175

Regarding harvest volumes by ownership group, some 70 percent of the Build Alternative-related increase is attributed to harvest from private landowners, or “other owners” group. The increase ascribed on public lands under the Build Alternative is not in the aspen forest cover type group because harvest in that cover type is currently at or near allowable cut levels. See Table ES- 5.

Table ES- 5
Projected Increase in Harvest Volume by Ownership Group
For the No-Build and Build Alternatives

Ownership Group	Average Harvest No-Build Alternative (M cords/yr)	Average Harvest Build Alternative (M cords/yr)	Increase with Build Alternative (M cords/yr)	Projected Percent of Statewide Volume Increase Supplied by Ownership Group	Projected Percent Increase in Harvest Volume for Ownership Group with the Project over the 40-year Period 2001-2041
National Forest	330	330	0	0	0.0
State	757	782	25	14	3.3
County/Local	840	869	28	16	3.4
All Other Owners	1,746	1,868	122	70	7.0
Total	3,674	3,850	175	100	4.8

Forest Area

The area harvested at least once over the study period increases from 5.7 million acres to 5.9 million acres under the Build Alternative, which is roughly a 3.5 percent increase. Approximately 59,000 acres (out of 200,000 total) is assigned to uneven-aged management treatment options, generally scheduled in northern hardwood stands to capture additional available aspen. About 60 percent of the increase is on private lands and increases are in forest types other than aspen. Similar to the No-Build Alternative, the model projects that most of the aspen type will be harvested regardless of ownership under the Build Alternative.

As previously noted, the affected area increases approximately 3.5 percent while the volume of harvest increases 4.6 percent under the Build Alternative. This occurs because with assumed increasing aspen values over time, rotation lengths tend to be lengthened (with the added time), thus increasing the average yields per-acre at rotation. Overall, modeling with the Project brought 199,000 additional acres into timber production over the planning horizon. See Table ES- 6.

Table ES- 6

Comparison of Silvicultural Treatment Types Assigned to Forestland (thousand acres) by the Scheduling Model for the No-Build and Build Alternatives

	Even-aged with thinning	Even-aged without thinning	Even-aged with residual overstory	Uneven-aged or Multi-aged	No Harvest	Total Area
No-Build Alternative						
US Forest Service Reserved	0	0	0	0	726	726
National Forest Lands	53	475	114	134	991	1,768
DNR Lands	20	1,019	19	8	2,640	3,706
County Lands	8	1,094	23	12	1,478	2,616
UPM/Blandin Paper Lands	0	90	2	0	46	138
Private Lands	0	2,461	48	33	4,224	6,767
Other Owners	0	87	2	0	208	297
Total	81	5,226	208	188	10,314	16,017
Build Alternative						
US Forest Service Reserved	0	0	0	0	726	726
National Forest Lands	53	475	114	134	991	1,768
DNR Lands	20	1,037	21	15	2,613	3,706
County Lands	8	1,137	25	18	1,428	2,616
UPM/Blandin Paper Lands	0	90	2	0	46	138
Private Lands	0	2,529	54	79	4,105	6,767
Other Owners	0	89	2	0	206	297
Total	81	5,357	217	246	10,115	16,017
Increase With Project						
US Forest Service Reserved	0	0	0	0	0	0
National Forest Lands	0	0	0	0	0	0
DNR Lands	0	18	2	7	-27	0
County Lands	0	43	2	5	-51	0
UPM/Blandin Paper Lands	0	0	0	0	0	0
Private Lands	0	67	5	46	-119	0
Other Owners	0	2	0	0	-2	0
Total	0	131	10	59	-199	0

** Comparison includes all Minnesota forestland except those forest land acres classified as open land.*

Age Class Distributions

The Project will not directly influence all forest types subject to harvest in Minnesota. The forest types directly affected by the Project are aspen, upland spruce-fir, lowland spruce, red pine, white pine, and jack pine. There is minimal difference between the No-Build and Build Alternatives for the selected forest cover types over the study period. Observations offered under the No-Build Alternative on changes in age class distributions over the study period apply to the Build Alternative.

Area of Mature Forest

The amount of mature forest increases steadily under both the Build and No-Build Alternatives over the study period. Mature forest was defined for modeling purposes similar to effective extended rotation forestry, or ERF, as used by the DNR for planning on state-managed lands. The statewide increase in area of mature forest is almost 2 million acres over the 40-year planning horizon. See Table ES- 7.

Table ES- 7

All Ownerships: Area of Mature Forest (thousand acres)

Scenario	Year 0	Year 10	Year 20	Year 30	Year 40
No-Build Altenative	7,021	7,474	8,082	8,646	9,136
Build Alternative	7,021	7,538	8,066	8,582	9,011

Species Substitution in Response to Sustained Industrial Demand for Aspen

The DEIS modeled a scenario where a projected decline in aspen demand occurs due to high aspen stumpage prices, which results in species substitution for the Build Alternative. Overall, the model results under this condition were similar to the results for the No-Build Alternative; this occurred even though the total statewide harvest level is almost 200,000 cords/yr greater with the Project. In general, total wood supply does not appear to be a concern for species other than aspen over the study period.

Implications of Modeling Results

The analyses show that the aspen supply is tight under both the Build and No-Build Alternatives. Information on aspen supply is somewhat clouded by a lack of information about the availability of private timberlands for harvest. With the Project, aspen harvest levels are increased by 98,500 cords/yr, with modeling results suggesting that this increase can be sustained under the set of assumptions modeled in the DEIS. Additional observations are provided.

- Model results for both the Build and No-Build Alternatives suggest that most all acres available for harvest in the aspen forest cover type will be harvested with or without the Project. There was no significant increase in the area harvested, and since aspen harvest on public lands is near allowable cut levels, harvest area cannot increase much if at all on public lands in the aspen forest cover type. Model results suggest however that harvest volumes from public acres can be improved by increasing emphasis on aspen growth and mortality losses when sequencing stands for harvest (e.g., increasing yields). Additional aspen is also likely available in the paper birch type and through realization of uneven-aged management in northern hardwood stands. In that rising aspen values may encourage longer rotation ages for aspen stands, additional productivity gains could be realized over the study period.
- The need to harvest aspen volume tends to drive the forest projection model in its scheduling of harvests for all analyses. The modeling results suggest relatively little harvesting in other forest cover types, which is a concern for jack pine and paper birch that require disturbance for sustaining viable populations. How well the existing mix of forest industry in Minnesota

matches with the State's forest resources in terms of existing and desired mix of forest cover types is open to question. Increases in aspen imports since the GEIS reflect potential imbalances between existing industry and forest resource harvesting potentials.

- The model results suggest rising aspen values over time, which may translate into increased aspen stumpage prices over time. An increase in aspen stumpage prices, whether actually realized or just expected, would likely contribute to stimulating additional species substitution (for aspen) in the market; this substitution was not assumed to occur for either the Build or No-Build Alternative. Additional modeling suggests that such substitution, if realized, would contribute to sustainable timber harvest potentials and forest conditions over time. Rising stumpage prices may make additional acres of private land available for harvest, acres of which are not assumed to be available in the DEIS's alternatives analysis. Modeling projection about what constitutes the sustainable level of aspen harvest over the study period is sensitive to private land availability, and is a source of uncertainty. Regardless, aspen harvest levels under the Build Alternative appear to be close to the maximum sustainable level over the study period.

17 GEIS Impacts Areas: Build Alternative Analysis

The GEIS identified 17 potential significant cumulative impacts that could be expected under the GEIS Base Harvest Scenario, harvest level of 4.0 million cords per year; see the Final GEIS Sections 5.2-5.5 for an overview. The DEIS evaluated the proposed Project relative to the 17 GEIS impacts. The criteria used to evaluate the significance of impacts for both DEIS alternatives are those that were used for the same purpose in the GEIS.

Impact 1: Changes to Minnesota Forests – Size and Composition of Forest Land Base (public and private)

The size and composition of the forest land base can change due to conversion to competing land uses (for both forest and timberland) and imposition of additional constraints on timber harvesting and forest management practices (for timberland). The Build Alternative is expected to have minimal effect on changes in the extent of forest cover and timberland acreage. It is possible that demand created from the Project may stimulate timber values and thereby foster retention of some additional land in forest cover and timberland status.

Impact 2: Changes to Minnesota Forests – Patterns of Forest Cover in Areas of Mixed Land Use

Opportunities to gain forest acreage are present in the forestry-agricultural transition areas in Minnesota. However, the overall habitat value of any gain in forest land is complicated where non-forest habitat types (e.g., agriculture or urban) are intermixed with forest habitat, or where forest patches are isolated and small. The Project is not expected to have much effect on lowland hardwoods or oak forest cover types that are most susceptible to this impact; these types are not a significant source of wood for the Project. The Build Alternative is not expected to produce significantly adverse impacts on small patches of forest land.

Impact 3: Changes to Minnesota Forests – Tree Species Mix

The mix of species present in a given cover type can change due to both natural factors (e.g., forest succession, natural disturbance such as wind or fire) or human-induced factors (e.g., forest management objectives, harvesting patterns and practices). Management-related changes are likely most pronounced in individual stands, not necessarily as a large change in vegetative composition, but rather a given tree species becoming less abundant or reduced to a minor species on a particular site. The Build Alternative is not expected to produce an adversely significant reduction in the presence of individual tree species. All aspen stands available for harvest will likely be harvested regardless of whether the Project is implemented or not. Given the diverse mix of individual tree species found in most Minnesota forest cover types, a significant loss of individual tree species is very unlikely.

Impact 4: Changes to Minnesota Forests – Age Class Structure

A forest type may exhibit an unsustainable age class structure because it provides insufficient replacement of mature stand acreage over time. Paper birch exhibits an unbalanced, deficient age class structure while red pine lacks the disturbance (e.g., fire, harvest) necessary to regenerate future stands. Assuming there is enough disturbance (e.g., harvest) to create enough acreage of younger age classes, the Project itself is not projected to have an appreciable effect on replacement cover type age class structure over the study period. Range of Natural Variation (RNV) analysis suggests that Project implementation will result in a large departure from the natural distribution of Vegetation Growth Stages (VGS) for the birch-aspen-spruce-fir Native Plant Community (NPC) in northeastern Minnesota; such a change could be important. Some marginally important changes would also occur within the dry-mesic-pine-oak and mesic with and red pine native plant communities under the Build Alternative.

Impact 5: Forest Species – Genetic Variability

Genetic variability in forest plant species can be lost through the reduction or isolation of habitat or communities supporting a species, or through a reduction of geographic ecotypes to the point that a viable population disappears or the species faces local extinction from a given region. Genetic variability is thought to be particularly important for plant species at the edge of their range, or those found in critically imperiled and imperiled forest and savanna plant communities. Such impacts would most likely occur in the natural forest communities that originally covered the Bigwoods and Prairie-Forest transition zone such as mixed oak forests, natural maple-basswood forests, and the southernmost white pine and pine-hardwood forests.

The Build Alternative is expected to result in an increase in even-aged timber harvesting systems. This means that some negative impacts to genetic resources for plants living in select natural communities will likely occur. The RNV analysis indicates seven types of native plant communities will likely undergo negative effects, or move away from RNV, for at least one decade over the study period; movement away from historic population ranges is a potential source of loss in local genetic diversity. Given the small contribution to statewide timber harvest, the Project's impacts are expected to be minor. The extent to which such adverse impacts materialize depends on whether landowners, foresters and loggers reserve or regenerate tree species that are rare in a given region of the state and implement harvesting practices that will enable these rare plant communities to be regenerated.

Impact 6: Federal- or State-listed Plant Species of Special Concern, Threatened, or Endangered or their Habitats

Harvest or forest management activity can diminish habitat and thus disturb a plant species listed by either state or federal authority as having a special concern, threatened, or endangered status. Listed forest-dependent rare plant species of Minnesota are poorly adapted to trampling types of injury, and all are of small stature and easily damaged with the exception of the one tree species on the list. Project implementation is not expected to produce adverse impacts to listed species substantially different than the No-Build Alternative given the similarity in the acreages by forest type and age class. Any added effect due to the Build Alternative should be very small.

Impact 7: Forest Health – Change in Susceptibility or Vulnerability

Change in forest condition or management actions can lead to changed susceptibility (risk of an outbreak/infection) or vulnerability (damage if an outbreak occurs) in terms of forest health. This can occur either directly or indirectly and take the form of outbreaks of forest pests or diseases, especially due to increasing acreages of older (i.e., black spruce and spruce-fir) and younger (white pine) stands. The Project will change the age class structure of forest cover types slightly; additional acres of young forest at the end of the planning period will be present for jack pine, spruce-fir, aspen, paper birch, and lowland spruce. Because the Build Alternative uses spruce-fir for papermaking, effort should be expended by land managers to maintain and increase this cover type on suitable sites that are subject to harvest, especially on private ownerships.

Impact 8: Projected Harvesting Affecting Site Nutrient Capital

Essential nutrients, such as calcium, magnesium, or potassium, can be lost from sensitive forested sites through removal and/or redistribution during harvest and follow-up activities. Such losses can be significant if not replaced/recovered over the term of the projected stand rotation.

With certain assumptions in place, the additional acres subject annually to potential nutrient loss to the risk of nutrient depletion from the Build Alternative is projected as follows:

- Calcium loss – approximately 900 acres.
- Magnesium loss – approximately 460 acres.
- Potassium loss – approximately 275 acres.

Over the 40-year study period, this amounts to an estimated: 1) 36,000 additional acres subject to potential significant losses of calcium; 2) 18,400 additional acres subject to potential significant losses of magnesium; and 3) 11,040 additional acres subject to potential significant losses of potassium. These potential losses are not cumulative; certain sites would be susceptible to losses of more than one nutrient.

Since completion of the GEIS, research suggests less potential for harvest-related loss on mineral soils and with greater potential on organic soils.

Impact 9: Projected Harvesting Affecting Soil Physical Structure

Harvest-related operations can result in unacceptable levels of soil compaction or puddling, especially on fine soils exhibiting low strength, or capacity to withstand forces without experiencing failure. It was not possible to estimate the extent to which additional timber harvesting resulting from the Project would be distributed across sites having high, moderate, and low sensitivity to compaction. Given the small increase in Project-related harvest, coupled with the results of DNR's Guideline Implementation Monitoring and the GEIS Report Card Study, the Build Alternative is not expected to result in significant levels of soil compaction.

Impact 10: Projected Harvesting Causing Accelerated Erosion from Forest Roads

The development of forest roads can result in surface erosion rates that exceed accepted norms, especially on moderately and heavily trafficked areas (e.g., skid trails) within harvest units and on haul roads. Erosion-related soil losses occur as a function soil type, surface slopes, and precipitation; in Minnesota the greatest erosion rates occur in southeastern Minnesota. The Build Alternative is not projected to be a substantial source of erosion-related soil losses. Less than 50 acres harvested each year to supply the Project's wood fiber needs are projected to experience significant soil erosion. This estimate also assumes harvesting activity attributed to the Project will occur on the steep slopes of southeast Minnesota at the same rate as was projected to occur in the GEIS. Given that little harvest in this part of the state is expected with the Project, the 50-acre figure is likely an overestimate of potential impact.

Impact 11: Projected Changes in the Populations of Forest Dependent Wildlife (by changes in amounts of habitat available)

Populations of forest-dependent animals can be adversely affected by reductions in available habitat. For mammals, reptiles, and amphibians occurring in Minnesota's forests, little or no adverse effect is projected under the Build Alternative. A similar conclusion is reached regarding Minnesota forest birds; little effect is attributed to Project implementation. The forest bird assessment includes an RNV component; approximately 3.8 times as many bird species would move toward their historic population estimate as away from it by 2041 under both the Build and No-Build Alternatives. Still, approximately 35 percent of all bird species would remain below their RNV populations with or without the Project over the study period. For bird species that do show a decline in later decades, many are associated with either young, early-successional forests or older, mature forest. The former are affected by the majority of forest types aging 40 years while the latter are affected by the current imbalanced age class distribution of mature aspen. Little change is expected for ruffed grouse or spruce grouse due to the Build Alternative.

Impact 12: Projected Harvesting Affecting Populations of Endangered, Threatened, or Special Concern Species of Animals

Harvest or forest management activity can diminish habitat and thus disturb an animal species listed by either state or federal authority as having a special concern, threatened, or endangered status. The Project is not expected to significantly affect the habitat of any listed species. Bald eagle and red-shouldered hawk populations are projected to decline, or remain below their RNV midpoint population level, in northern Minnesota under both the Build and No-Build Alternatives; this decline is 22 percent and 6 percent respectively for these two species. Substantial uncertainty surrounds the Bald eagle projection due to data limitations.

Impact 13: Projected Harvesting Affecting Patterns of Mature Lowland Conifer Stands

Mature lowland cover patches, especially where they occur in relatively small, separate patches within more extensive upland forests, provide important local cover for a variety of mammals, particularly as winter cover. Potentially affected animals include deer, moose, snowshoe hare, spruce grouse, Connecticut warbler, palm warbler, yellow-bellied flycatcher, and Swainson's thrush. The maintenance of these patches, especially of black spruce and balsam fir, is particularly important where their presence across the landscape is limited. The Build Alternative is projected to result in little harvest in the lowland spruce cover type; total harvest area increased with the Project by 15,000 acres over the study period, which is a very small proportion of the 1.648 million acres estimated in this cover type. The Project is not likely to produce significantly adverse impacts on mature lowland conifer forests.

Impact 14: Projected Harvesting Affecting the Availability of Food Producing Trees for Forest-dependent Wildlife

The loss of tree species that provide vital food for wildlife (oaks, hickories, and mountain ash) can result in reductions in dependent wildlife populations. Whether losses are due to harvest or not, replacement of food providing tree species is important to maintain viable wildlife populations. Although not expected to cause an increase in oak harvest, the Build Alternative will increase harvest activity on the state's northern hardwood forests (that contain mast producing trees); it is estimated that some 17,000 acres will be affected over the 40-year study period, or an average of just under 500 acres per year. Tree removal rates are not expected to exceed replenishment rates considering that over 2 million acres are present in this type. No significant impacts on mast-producing trees are expected.

Impact 15: Forestry and Recreation: Projected Harvesting in the Absence of Visual Management Guidelines (VMGs) on Visually Sensitive Areas

Timber harvest conducted on visually sensitive areas without the use of VMGs in planning and execution of a timber sale can result in adverse visual, aesthetic, and recreational impacts. Practices that can have a particularly adverse visual effect include road placement and design, lack of visual buffers, size and shape of cut, and slash and debris disposal practices. It is projected that up to 17 percent of the additional harvest generated by the Project will occur on forest land that is visually sensitive but not where VMGs are applied. An estimated 900 acres of visually sensitive forestland would be harvested under the Build Alternative each year without the application of appropriate visual management guidelines.

Impact 16: Projected Development of Permanent Forest Roads in Relatively Undeveloped Forest Areas

The US Forest Service has developed the Recreation Opportunity Spectrum (ROS) to classify a site's recreation potential. The development of permanent forest roads for conducting timber harvest activities in ROS Primitive areas, and ROS Semiprimitive Nonmotorized areas, can adversely affect recreation opportunities. Little additional road building is expected with the Project; Proposer lands are well roaded and no areas are considered to be ROS Primitive or Semiprimitive Nonmotorized. Assuming that harvest under the Build Alternative is proportional to the distribution of harvest under the GEIS Base Harvest Scenario, the Project will result annually in harvesting less than 10 additional acres of forest land possessing characteristics of the Primitive ROS class, and approximately 100 acres of forest land possessing characteristics defining the Semiprimitive Nonmotorized ROS class. These acres are considered, by definition, to be significantly impacted. However, the extent of this impact is very small in the context of the state's 16.2 million acre forest land base and is below the level projected under the GEIS Base Harvest Scenario.

Impact 17: Projected Harvesting Affecting Unique Cultural and Historical Resources

The destruction of heritage resources, including cultural landscapes, structural remains, archaelogical remains, or Native American traditional use sites, or disturbance of cemeteries, is an adverse impact that can be associated with timber harvest activity. "Destroyed" means damage to a site such that its scientific, cultural, or spiritual values was diminished in whole or in part. Significant impacts are likely to occur and the number of impacts will increase as the level of harvesting increases. The Project is expected to increase timber harvesting an average of 5,250 acres per year over the study period. Assuming landowner and/or logger consultation for the presence of sensitive resources, an estimated 3,000 acres each year would be harvested without prior knowledge of the presence of cultural or historic resources. Such sites would be subject to possible historic/cultural resource damage or destruction, and thus harvest would result in significantly adverse impacts. It is not possible to qualify the potential for impact any further. Whether significantly adverse impacts do actually occur will depend on the degree harvest occurs under frozen soil conditions (currently 64 percent of all public and corporately-owned private forest lands are reported to be harvested when the ground is frozen), extent of harvesting in riparian areas, additional landowner and logger awareness to conduct pre-harvest inventory checks, and whether cultural or historic sites are actually present on the sites harvested.

Summary of Significant Impacts Projected Under the Build Alternative

The analysis concluded that the additional timber harvesting and forest management activity needed to supply the Project's 197,000 cords per year annual wood fiber requirement will result in the following significant environmental impacts:

Impact 5: Forest Species – Genetic Variability

The Build Alternative is expected to result in an increase in even-aged timber harvesting systems. This means that some negative impacts to genetic resources for plants living in select natural communities will likely occur. The RNV analysis indicates seven types of native plant communities will likely undergo negative effects, or move away from RNV, for at least one decade over the study period; movement away from historic population ranges is a potential source of loss in local genetic diversity. Given the small contribution to statewide timber harvest, the Project's impacts are expected to be minor. The extent to which such adverse impacts materialize depends on whether landowners, foresters and loggers reserve or regenerate tree species that are rare in a given region of the state and implement harvesting practices that will enable these rare plant communities to be regenerated.

Impact 8: *Projected Harvesting Affecting Site Nutrient Capital*

With certain assumptions in place, the additional acres subject annually to potential nutrient loss to the risk of nutrient depletion from the Build Alternative's is projected as follows:

- Calcium loss – approximately 900 acres.
- Magnesium loss – approximately 460 acres.
- Potassium loss – approximately 275 acres.

Over the 40-year study period, this amounts to an estimated: 1) 36,000 additional acres subject to potential significant losses of calcium; 2) 18,400 additional acres subject to potential significant losses of magnesium; and 3) 11,040 additional acres subject to potential significant losses of potassium. These potential losses are not cumulative; certain sites would be susceptible to losses of more than one nutrient. Since completion of the GEIS, research suggests less potential for harvest-related loss on mineral soils and with greater potential on organic soils.

Impact 10: *Projected Harvesting Resulting in Accelerated Erosion from Forest Roads*

The Build Alternative is not projected to be a substantial source of erosion-related soil losses. Less than 50 harvested acres harvested each year to supply the Project's wood fiber needs is projected to experience significant soil erosion. This estimate also assumes harvesting activity attributed to the Project will occur on the steep slopes of southeast Minnesota at the same rate as was projected to occur in the GEIS. Given that little harvest in this part of the state is expected with the Project, the 50-acre figure is likely an overestimate of potential impact.

Impact 15: *Forestry and Recreation: Projected Harvesting in the Absence of Visual Management Guidelines (VMGs) on Visually Sensitive Areas*

An estimated 900 acres of visually sensitive forestland would be harvested under the Build Alternative each year without the application of appropriate visual management guidelines.

Impact 16: *Projected Development of Permanent Forest Roads in Relatively Undeveloped Forest Areas*

Annually, up to an estimated 10 acres of forestland possessing characteristics of the Primitive ROS class and approximately 100 acres of forest land possessing characteristics defining the Semiprimitive Non-motorized ROS class would be subject to the development of permanent forest roads.

Impact 17: *Projected Harvesting Affecting Unique Cultural and Historic Resources*

Up to approximately 3,000 acres each year would be harvested without prior knowledge of the presence of cultural or historic resources. Such sites would be subject to possible historic/cultural resource damage or destruction, and thus harvest would result in significantly adverse impacts. It is not possible to qualify the potential for impact any further. Whether significantly adverse impacts do actually occur will depend on the degree harvest occurs under frozen soil conditions (currently 64 percent of all public and corporately-owned private forest lands are reported to be harvested when the ground is frozen), extent of harvesting in riparian areas, additional landowner and logger awareness to conduct pre-harvest inventory checks, and whether cultural or historic sites are actually present on the sites harvested.

Mitigation for the Significant Impacts under the Build Alternative

Mitigation measures are typically evaluated for significant adverse impacts caused by the proposed Project. The DEIS identifies mitigation measures that are available for consideration as a means of avoiding or minimizing Project-related adverse impacts to forest resources. Because these impacts are cumulative in nature, both programmatic and Project-specific measures are available for consideration. Programmatic measures are available as a result of the enactment of the Minnesota Sustainable Forest Resources Act (M.S. Chapter 89A). Project-specific measures are those actions available to the Proposer, whether instituted on a voluntary or regulatory basis.

Programmatic Mitigation

The GEIS recommended that programmatic mitigation in Minnesota take three forms: site-level responses; landscape-scale responses; and forest-resources research. The Minnesota Forest Resources Council (MFRC) is responsible for the development and implementation of the programmatic mitigative recommendations of the GEIS as authorized under the Minnesota Sustainable Forest Resources Act. Principal activities conducted by the MFRC include development of the Voluntary Site-Level Forest Management Guidelines and multiple Landscape Plans. The current status of all these programs was assessed in the DNR-sanctioned GEIS Report Card Study.

Programmatic Mitigation – Build Alternative

The following programmatic measures are available to address the impacts identified under the Build Alternative.

Impact 5: Forest Species – Genetic Variability

The principal programmatic mitigative measure is to continue to fund and maintain the Minnesota County Biological Survey. Factors to consider include:

- Completion of the statewide on-the-ground surveys;
- Ongoing data updates as new features become known;
- Continuation of logger-education programs.

Impact 8: Projected Harvesting Affecting Site Nutrient Capital

The principal programmatic mitigative measure is to ensure continued application of the appropriate Voluntary Site-Level Forest Management Guideline. Continued funding of MFRC's effort to improve the site-level guidelines and logger education is necessary. Funding an accelerated guideline implementation and effectiveness program is also an available mitigation strategy for this impact. Further study of coarse-woody debris retention can also be valuable; DNR and the MFRC are conducting such a study that may result in improved practices.

Impact 10: Projected Harvesting Resulting in Accelerated Erosion from Forest Roads

The principal programmatic mitigative measure is to ensure continued application of the appropriate Voluntary Site-Level Forest Management Guideline for forest soils; riparian guidelines are also applicable. Continued funding of MFRC's effort to improve the site-level guidelines and logger education is necessary. Funding an accelerated guideline implementation and effectiveness program is also an available mitigation strategy for this impact.

Impact 15: Forestry and Recreation: Projected Harvesting in the Absence of Visual Management Guidelines (VMGs) on Visually Sensitive Areas

The principal programmatic mitigative measure is to ensure continued application of the appropriate Voluntary Site-Level Forest Management Guideline for visual impacts; riparian guidelines are also applicable. Continued funding of MFRC's effort to improve the site-level guidelines and logger education is necessary. Funding an accelerated guideline implementation and effectiveness program is also an available mitigation strategy for this impact. Visual Sensitivity Classification Maps have been developed for 16 counties. Conducting coordinated forest road and trail planning is another available mitigative strategy.

Impact 16: Projected Development of Permanent Forest Roads in Relatively Undeveloped Forest Areas

The adoption and implementation of landscape-based road and trail plans is the best available programmatic mitigation strategy. Efforts to do this planning should be encouraged and funded as opportunities arise. For impacts that occur on federal ownerships, the recently adopted forest management plans are one vehicle to avoid or minimize impacts. Funding for the continued development and application of visual management guidelines is also a potential measure.

Impact 17: Projected Harvesting Affecting Unique Cultural and Historic Resources

The principal programmatic mitigative measure is to ensure continued application of the appropriate Voluntary Site-Level Forest Management Guideline for unique cultural and historic resources; riparian guidelines are also applicable. Funding an accelerated guideline implementation and effectiveness program is also an available mitigation strategy for this impact. Factors to consider include:

- Continued funding of inventory lists of known cultural and historic resources;
- Continued funding of logger education program; and
- Continued funding of MFRC's effort to improve the site-level guidelines and logger education is necessary.

Project-Specific Mitigation – Build Alternative

Project-related impacts can be addressed through actions currently being implemented, or are potentially available, to the Proposer through ongoing operations (at the mill or on Company ownerships) or through its procurement activities. Both site-level and landscape-level measures are available. UPM/Blandin Paper Company is committed to conducting sustainable forestry practices and planning. A listing of these commitments is contained in the DEIS.

The following Project-specific measures are available to address the impacts identified under the Build Alternative.

Impact 5: Forest Species – Genetic Variability

The use of information regarding sensitive communities and sites, and tree species, located at the edge of their range during harvest is the mitigative measure for this impact; see Voluntary Site-level Forest Management Guidelines, Wildlife Habitat, pages 26-35. The Proposer is committed to following this guideline for harvest occurring on its own lands; under rare exceptions, it is also followed for all non-industrial private forest lands and government lands where it controls the stumpage. Specific measures being employed by UPM/Blandin Paper to implement the applicable guideline include, but are not limited to, the following:

- Establishing Forests of Exceptional Conservation Value;
- Maintaining existing baseline plant databases;
- Use of life-cycle forest planning model;
- Avoiding establishment of exotic tree species on sites outside their natural range; and
- Identification/protection of known sites during harvest activity.

Impact 8: Projected Harvesting Affecting Site Nutrient Capital

The use of information regarding the nutrient content and sustainability of a site's soils, and then applying the appropriate management actions, is the mitigative measure for this impact; see Voluntary Site-level

Forest Management Guidelines, Forest Soil Productivity, pages 16-23. The Proposer is committed to following this guideline for harvest occurring on its own lands; under rare exceptions, it is also followed for all non-industrial private forest lands and government lands where it controls the stumpage. Specific measures being employed by UPM/Blandin Paper to implement the applicable guideline include, but are not limited to, the following:

- ❖ Planning for soil productivity;
- ❖ Employing measures to protect soil resources;
- ❖ Conducting site inspections;
- ❖ Conducting monitoring both during and after harvest; and
- ❖ Taking remedial actions as necessary.

<u>Impact 10</u>: Projected Harvesting Resulting in Accelerated Erosion from Forest Roads

The application of the appropriate Voluntary Site-level Forest Management Guidelines regarding forest roads and riparian areas are the mitigation for this impact; see the Guidelines, Forest Roads, pages 1-47 and Riparian Areas, pages 1-13. The Proposer is committed to following this guideline for harvest occurring on its own lands; under rare exceptions, it is also followed for all non-industrial private forest lands and government lands where it controls the stumpage. Specific measures being employed by UPM/Blandin Paper to implement the applicable guideline include, but are limited to, the following:

- ❖ Providing and enforcing contract provisions to address the impact;
- ❖ Employing appropriate forest road designs;
- ❖ Correctly aligning and locating forest roads to minimize effects;
- ❖ Employing water quality and soil erosion Best Management Practices (BMPs);
- ❖ Conducting monitoring both during and after harvest; and
- ❖ Taking remedial actions as necessary.

<u>Impact 15</u>: Forestry and Recreation: Projected Harvesting in the Absence of Visual Management Guidelines (VMGs) on Visually Sensitive Areas

The application of the appropriate Voluntary Site-level Forest Management Guideline regarding application and use of VMGs is the mitigation for this impact; see the Guidelines, Visual Quality, pages 1-9. The Proposer is committed to following this guideline for harvest occurring on its own lands; under rare exceptions, it is followed for all non-industrial private forest lands and government lands where it controls the stumpage. Specific measures being employed by UPM/Blandin Paper to implement the applicable guideline include, but are limited to, the following:

- Continue to conduct Visual Quality and Aesthetics Program; and
- Applying measures to minimize adverse visual impacts.

Impact 16: Projected Development of Permanent Forest Roads in Relatively Undeveloped Forest Areas

No Project-specific mitigation is proposed for this impact area.

Impact 17: Projected Harvesting Affecting Unique Cultural and Historic Resources

The application of the appropriate Voluntary Site-level Forest Management Guideline regarding the identification and avoidance of unique cultural and historical resources is the mitigation for this impact; see the Guidelines, Cultural Resources, pages 1-24. The Proposer is committed to following this guideline for harvest occurring on its own lands; under rare exceptions, it is also followed for all non-industrial private forest lands and government lands where it controls the stumpage. Specific measures being employed by UPM/Blandin Paper to implement the applicable guideline include, but are limited to, the following:

- Conducting pre-harvest inspections for potential cultural and historic resources;
- Identification/protection of known sites during harvest activity; and
- Conducting monitoring both during and after harvest; and
- Taking remedial actions as necessary.

CHAPTER 1.0
INTRODUCTION

1.1 PROJECT OVERVIEW

UPM/Blandin Paper Company (UPM/Blandin Paper) proposes to expand and modify its paper mill located in Grand Rapids, Minnesota; see Figure 1-1, Figure 1-2, Figure 1-3, Figure 1-4, Figure 1-5, and Figure 1-6. The Project is known as Thunderhawk (proposed Project or Project). The Project adds a complete new paper manufacturing line to the mill designated as paper machine No. 7 (PM7). The Project also increases pulp producing capacity, optimizes the PM6 paper line, and adds warehouse facilities. Should these actions be approved, the existing PM5 line would be shut down and decommissioned.

The Project involves other features, including: 1) addition of a precipitated calcium carbonate (PCC) facility; 2) improvements to energy-related infrastructure; and 3) modifications to the Grand Rapids Wastewater Treatment Facilities. These are connected actions to the proposed Project and are described in Chapter 3.0.

1.2 ABOUT THE PROPOSER

UPM/Blandin Paper is a wholly-owned member of the UPM-Kymmene Group, the latter of which is headquartered in Helsinki, Finland. Founded in 1901 in Grand Rapids, Minnesota, the Blandin Paper Mill became UPM-Kymmene's first North American mill upon its purchase in October 1997. Its two paper machines have an annual capacity of about 380,000 short tons (345,000 metric tons). All paper manufactured by Blandin is lightweight coated (LWC), named for its clay-based, glossy coating that makes it attractive as a publication paper. The facility employs approximately 500 personnel. The company owns and manages 194,000 acres of forestland.

1.3 EIS PURPOSE AND OVERVIEW

The purpose of this Draft Environmental Impact Statement (DEIS) is to provide information to:

- Evaluate the proposed Project's potentially significant environmental effects;
- Consider alternatives;
- Explore methods for reducing adverse effects; and
- Provide information to the public and project decision makers.

The DEIS shall not be used to justify a decision; indications of adverse environmental effects in the DEIS shall not necessarily require that the proposed Project be denied. The DEIS should be used as a document that assists in issuing or denying permits or approvals for the Project and in identifying measures necessary to avoid, reduce, or mitigate adverse environmental effects.

An EIS is required under Minnesota Rules part 4410.2000, subpart 3B when a Responsible Governmental Unit (RGU) and Project Proposer agree that an EIS be prepared. The Minnesota Department of Natural Resources (DNR) is the designated RGU for preparing the EIS. In December 2004, DNR prepared a scoping Environmental Assessment Worksheet (EAW) and a Draft Scoping Decision Document (DSDD) to identify the proposed Project's potentially significant effects and determine what issues and alternatives would be addressed in the EIS. DNR distributed the documents for public review and held a public meeting on January 12, 2005. Based on comments received, DNR finalized the proposed EIS scope and issued a Final Scoping Decision in February 2005. This document serves as the DEIS blueprint. Both the EAW and Final Scoping Decision are included in this document as Appendix A and Appendix B, respectively.

Based on the Final Scoping Decision, this DEIS discusses and evaluates impacts, alternatives, and mitigation measures associated with the construction and proposed activities of the UPM/Blandin Paper Thunderhawk Project. As set forth in the Final Scoping Decision, DNR determined that the following issues were not relevant or were so minor that they would not be addressed in the DEIS:

- Fisheries
- Listed species and sensitive ecological resources
- Water-related land use management district
- Geologic hazards and soil conditions
- Water surface use
- Vehicle-related emissions
- Odors and dust
- Archaeological, historical, or architectural resources
- Prime or unique farmlands
- Scenic views or vistas
- Other unique resources
- Infrastructure and public services
- Electric utilities

DNR also determined and stated in the Final Scoping Decision that numerous topics are not expected to present significant impacts, but would be addressed in the DEIS using limited information beyond that in the EAW commensurate with the anticipated impacts. These mill specific topics include:

- Potential conflicts with past and surrounding land uses
- Land cover
- Aquatic wildlife present near the proposed intake structures
- Physical impacts upon water resources from installation of a new water intake structure
- Process-related water use and recycling
- Erosion and sedimentation
- Surface water runoff
- Solid wastes, hazardous wastes, and above ground storage tanks (ASTs)
- Stationary source air emissions
- Designated parks, recreation areas, or trails
- Visual impacts
- Compatibility with plans and local land use regulations
- Infrastructure and public services

DNR identified the following topics in the Final Scoping Decision that may result in potentially significant impacts and would include information substantially beyond that included in the EAW:

- Traffic effects
- Noise effects
- Socioeconomic effects

Lastly, the Final Scoping Decision determined that the DEIS would also discuss the potential cumulative impacts associated with the facility's proposed increase in wood use, which would occur in the context of other large-scale forest industry projects and related statewide cumulative timber harvesting/forest management effects.

Therefore, the DEIS will examine the potential impacts associated with the proposed Project and the No-Build Alternative, and discuss technology, scale, configurational, and mitigation alternatives as set forth in the Final Scoping Decision.

1.4 PROPOSED PROJECT

The proposed Project's main feature is the addition of a complete paper manufacturing line that is designated as PM7. The Project also includes increasing pulp producing capacity, optimization of the PM6 paper line, and the addition of warehouse facilities. Should the Project occur, the existing PM5 line would be shut down permanently in conjunction with start-up of the new operations. The facility's wood use would increase by approximately 197,000 cords annually to a total estimated wood consumption at the mill of 400,000 cords per year.

The Project uses wood as the primary raw material to produce publication-grade rolled paper. Both hardwood (e.g., aspen) and softwood (e.g., spruce, balsam) species will continue to supply the mill. Project elements that require new construction, cause physical manipulation of the environment, or produce wastes can be considered in terms of:

- Wood-related Operations
- Paper Manufacturing
- Production Outputs
- Wood Use
- Water Use
- Wastewater Treatment
- Energy Infrastructure
- Other Infrastructure
- Site Preparation and Schedule

1.5 PROJECT LOCATION AND LEGAL DESCRIPTION

The proposed Project occurs in the City of Grand Rapids, Itasca County, Minnesota. The following legal land description will be used if the Project is implemented:

UPM/Blandin Paper Mill

- NE¼ NE¼ Section 20 Township 55N Range 25W
- NW¼ NW¼ Section 21 Township 55N Range 25W

Paper Warehouse Option 2

- NW¼ NW¼ Section 21 Township 55N Range 25W

Paper Warehouse Option 4

- NE¼ NE¼ Section 20 Township 55N Range 25W

Paper Warehouse Option 5

- SE¼ NW¼ Section 3 Township 495N Range 14W

Figure 1-1
Project Location

Figure 1-2
Project Boundary

Figure 1-3
Existing UPM/Blandin Paper Mill Layout

Figure 1-4
Aerial Photo of the Existing Site

Figure 1-5
Location of Warehouse Option 5

Figure 1-6
Modified Facility Layout

CHAPTER 2.0
GOVERNMENT APPROVALS

All known and potential government permits and approvals for the proposed Project are listed in Table 2-1 and described in the text following the table. Although the EIS provides information for use in permit issuance or denial, it is not required to gather or present all necessary permit-related information. No permits may be issued until the EIS has been found adequate.

Table 2-1
Government Permits, License, and Approvals

Unit of Government	Type of Application	Status
USACE	▪ Section 10 Permit	To be obtained
	▪ Section 404 Permit	To be obtained
DNR	▪ Public Waters Work Permit	To be obtained
	▪ Water Appropriation Permit Amendment	To be obtained
MPCA	▪ Air Modification Permit	To be obtained
	▪ NPDES General Stormwater Permit for Construction Activity	To be obtained
	▪ NPDES General Stormwater Permit for Industrial Activity	To be obtained
	▪ NPDES / SDS Discharge Permit	To be obtained
	▪ Section 401 Certification	To be obtained
	▪ Hazardous Waste License	Existing license
	▪ Aboveground Storage Tank Permit Amendment	Existing permit
City of Grand Rapids	▪ Commercial Building Permit	To be obtained
	▪ Zoning Permit (Commercial)	To be obtained
	▪ Building Code Compliance	To be obtained
Grand Rapids Public Utilities	▪ Industrial Wastewater Discharge User Agreements	Existing permit

NPDES - National Pollutant Discharge Elimination System
SDS - State Disposal System

2.1 UNITED STATES ARMY CORPS OF ENGINEERS

The U.S. Army Corps of Engineers' (USACE) Regulatory Programs includes Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C 1344). The St. Paul District's regulatory jurisdiction covers the states of Minnesota and Wisconsin.

2.1.1 SECTION 404 PERMIT

Under Section 404, a USACE permit is required for the discharge of dredged or fill material into waters of the United States, including wetlands, rivers, streams, and lakes. This permit will be needed for installation of the new water intake structure.

2.1.2 SECTION 10 PERMIT

Under Section 10, a USACE permit is required to do any work in, over, or under a Navigable Water of the United States. Waterbodies have been designated as Navigable Waters of the United States based on their past, present, or potential use for transportation for interstate commerce. This includes work over and under the water. These waters include many of the larger rivers and lakes, such as the Minnesota, St. Croix, and Mississippi Rivers, Lake Superior, and the Mississippi headwaters lakes. This permit will be needed for installation of the new water intake structure.

2.2 MINNESOTA DEPARTMENT OF NATURAL RESOURCES

2.2.1 PUBLIC WATERS WORK PERMIT

According to Minnesota Statue 103G and Minnesota Rule 6115, a Public Waters Work Permit is required for proposed Projects constructed below the ordinary high water (OHWL) level, which alter the course, current, or cross section of public waters or public waters wetlands. The OHWL is the top of the bank for watercourses. For water basins, the OHWL is an elevation where the vegetation changes from predominantly aquatic to predominantly terrestrial. The permit program applies to those lakes, wetlands, and streams identified on DNR Public Water Inventory maps. The Paper Mill Reservoir is identified on the Public Waters Inventory (PWI) Maps as PWI #31-533. This permit will be needed for installation of the new water intake structure. In addition, impingement and/or entrainment-related effects are regulated under this DNR permit.

2.2.2 WATER APPROPRIATION PERMIT AMENDMENT

According to Minnesota Statutes 103G and Minnesota Rule 6115, a water use (appropriation) permit from DNR Division of Waters is required for all users withdrawing more than 10,000 gallons of water per day or one million gallons per year. UPM/Blandin Paper Mill will need to amend their existing Water Appropriation Permit based upon the proposed pumping rate and volume of water required. This permit will be needed for installation of the new water intake structure. In addition, impingement and/or entrainment-related effects are regulated under this DNR permit.

2.3 MINNESOTA POLLUTION CONTROL AGENCY

2.3.1 SECTION 401 CERTIFICATION

Section 401 of the Clean Water Act (33 U.S.C. 1344) expressly requires that activities that may result in discharges to navigable waters and require a federal license or permit to construct, modify, or operate, must be conducted in compliance with Sections 301, 302, 303, 306, and 307 of the Clean Water Act. These portions of the Clean Water Act are directives for the development of state water quality standards. In order to ensure these activities comply with the Clean Water Act and the state water quality standards, a determination is made by the state agency with primary water quality regulatory responsibilities under the Clean Water Act. Such a determination is known as a "401 Certification." In Minnesota, Minnesota Pollution Control Agency (MPCA) is the delegated agency responsible under Minnesota Statute 115.03 Powers and Duties for making certification determinations on federal permits that affect waters of the state. This certification goes with the Section 404 Permit. It is required for discharges of dredged or fill material into waters of the state. This is needed for construction of the new intake structure.

2.3.2 AIR MODIFICATION PERMIT

According to the Clean Air Act and Minnesota Rule 7007, UPM/Blandin Paper Mill has secured a Total Facility Permit (Title V Operating Permit). If a facility wants to make changes at its facility after receiving a Total Facility Permit, it should first determine if it will need an amendment to its permit. To do this the facility must: calculate the potential to emit (PTE) of the modification, review the applicable state and federal rules and regulations, and determine the applicable amendment type (if one is necessary). These items should all be done before starting construction on the modification because some amendment types require that the permit amendment be issued before construction commences on the modification. The different permit amendment types are differentiated based on different threshold levels of emissions and/or the applicability of certain Federal programs. The types of amendments are administrative, contravening permit terms, minor, moderate, and major. It is anticipated that the proposed Project will require a major permit amendment.

2.3.3 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)/ STATE DISPOSAL SYSTEM (SDS) DISCHARGE PERMIT

NPDES permits regulate wastewater discharges to lakes, streams, wetlands, and other surface waters. SDS (Minnesota Statute 115) permits regulate the construction and operation of wastewater disposal systems, including land treatment systems. Together, NPDES/SDS permits establish specific limits and requirements to protect Minnesota's surface and ground water quality for a variety of uses, including drinking water, fishing, and recreation.

For Minnesota industrial facilities, the MPCA tries to issue these permits as consolidated water quality management permits. An individual NPDES/SDS permit for an industrial facility may cover a number of different waste types and activities, including industrial process wastewater, contact cooling water, non-contact cooling water (applicable to the proposed Project), and stormwater. Several general NPDES/SDS permits also are available. An "Attachment For Non-Contact Cooling Water" may need to be filed for the proposed Project as a part of the NPDES/SDS permit process. NPDES/SDS permit requirements may include monitoring, limits, and management practices designed to protect surface and groundwater quality.

2.3.3.1 General Stormwater Permit for Construction Activities

NPDES is a compliance-based general permit program delegated to the MPCA by the Environmental Protection Agency (EPA). The permit requires prevention of construction site erosion through implementation of Best Management Practices (BMP) for erosion control. Permit application materials must include typical engineering plans showing the BMP details. The permit covers all construction projects disturbing greater than one acre of land. The stormwater program for construction activity is designed to reduce the amount of sediment and pollution entering surface and ground water both during and after construction projects. Through this permit, the owner is required to develop a Stormwater Pollution Prevention Plan (SWPPP) that incorporates specific BMPs applicable to their site. The Paper Mill Reservoir is considered an Impaired Lake under the Impaired Waters listing, thus requiring extra BMPs. This permit is required for construction of the proposed Project, because an area greater than an acre of land will be disturbed.

2.3.3.2 General Stormwater Permit for Industrial Activities

NPDES is a compliance-based general permit program delegated to the MPCA by the EPA. The Stormwater Program for industrial activity is designed to reduce the amount of pollution that enters surface and ground water from industrial facilities in the form of stormwater runoff. Stormwater at industrial sites may come into contact with any number of harmful pollutants, including toxic metals, oil, grease, de-icing salts and other chemicals from rooftops, roads, parking lots, and from activities such as storage and material handling. The primary requirement is the development and implementation of a SWPPP. The SWPPP must be tailored to site-specific conditions and designed with the goal of eliminating or minimizing stormwater contact with potential pollutants through the use of BMPs.

Public (municipal) and private operators of industrial facilities included in one of the 11 categories of industrial activity, defined in the federal regulations by an industry's Standard Industrial Classification (SIC) code or a narrative description of the activity found at the industrial site, are required to apply for a permit. Some facilities may be eligible for the no exposure exclusion from permitting. Such facilities must apply and certify that a condition of no exposure exists and that the facility meets the definition of no exposure of industrial activities and materials to storm water. This permit is required to ensure that stormwater runoff from the site does not contact pollutants and carry them to a nearby surface water or other biotic community.

2.3.4 HAZARDOUS WASTE LICENSE

The procedures for application and issuance are described in Minnesota Rule 7045. A permit application for a new facility or activity may be submitted at any time. However, it is recommended that the permit application be submitted at least 180 days before the planned date of the commencement of facility construction of the activity. If a permit has been issued by the MPCA, the individual holding the permit may file with the agency, at any time, a written application for modification of the permit or for revocation and re-issuance of the permit, unless the reason for the application is the adoption by a federal agency of a new or amended pollution standard, limitation, or effluent guideline. Then, the permittee must file an application within the time for filing specified by the federal agency as a part of the notice of adoption published in the Federal Registration.

A permit holder who requests the issuance, modification, revocation, or re-issuance of a permit must complete, sign, and submit to the MPCA a written application. A person who generates hazardous waste must obtain a hazardous waste generator license for each individual generation site.

The UPM/Blandin Paper Mill is designated as a small quantity generator and will continue to operate under its current MPCA Hazardous Waste License. No charge or amendment is anticipated.

2.3.5 Above Ground Storage Tank Permit Amendment

2.3.5.1 Facilities with More than One Million Gallons Capacity

Facilities that have more than one million gallons capacity must obtain an individual permit from the MPCA according to Minnesota Rules Chapter 7001.4205-4250. These facilities must create a standard safe operation and are required to use industry standards for tank construction and maintenance activities.

2.3.5.2 Facilities with Less than One Million Gallons Capacity

Facilities storing less than one million gallons of liquid substances shall follow Minnesota Rules Chapter 7151. The general requirements for these facilities are:

- Underground storage tanks (USTs) of any size cannot be used as ASTs.
- Tank owners and operators must clearly label the contents of all tanks and lines (piping).
- Field-erected tanks must be internally and externally inspected using American Petroleum Institute protocol.
- Owners or operators removing ASTs must sample the areas around the tank to ensure that there is no contamination resulting from substances stored in the tank.
- Tanks greater than 500 gallons in capacity and less than or equal to 1,100 gallons in capacity and located within 500 feet of a Class 2 Surface Water must meet the labeling and secondary containment requirements only. Class 2 Surface Waters include any waters used for fishing, fish culture, bathing or any recreational purpose for which quality is or may be necessary to protect aquatic life, terrestrial life, or the public health, safety, and welfare.

The existing above ground storage tank permit will need to be amended by adding the proposed storage tanks capacity, material stored, and location on site. In addition, the amendment will identify secondary containment.

2.4 CITY OF GRAND RAPIDS

2.4.1 COMMERCIAL BUILDING PERMIT

A Building Permit would be required for construction of the proposed Project. Buildings would have to be constructed to comply with building codes.

2.4.2 ZONING PERMIT (COMMERCIAL)

A Zoning Permit may be required for the proposed Project, because a change in zoning classification may be required.

2.4.3 BUILDING CODE COMPLIANCE

In an effort to ensure buildings are constructed to minimum standards for safety and durability, Grand Rapids has adopted the Minnesota State Building Code. Building code enforcement staff reviews building plans and permit applications, issues building permits, and conducts a wide range of field inspections to ensure compliance with state and local building and zoning codes.

The Minnesota State Building Code requires an owner or authorized agent who intends to construct, enlarge, alter, repair, move, demolish, or change the occupancy of a building or structure; erect, install, enlarge, alter, repair, remove, convert, or replace any gas, mechanical, electrical, plumbing system, or other equipment, the installation of which is regulated by the code; or cause any such work to be done, shall first make application to the building official and obtain the required permit. This compliance is needed for the proposed Project to ensure that buildings and structures meet all conditions of the building code and building permit.

2.5 GRAND RAPIDS PUBLIC UTILITIES

2.5.1 INDUSTRIAL WASTEWATER DISCHARGER USER AGREEMENTS

Two industrial wastewater discharge user agreements regulate wastewater discharge to the Grand Rapids Public Utilities Commission (GRPUC) wastewater treatment facilities (WWTF) from the mill, one for the Primary Plant and one for the Secondary Plant. No modifications to the Primary Plant Agreement are anticipated for PM7. The Secondary Plant agreement will need to be modified for biological oxygen demand (BOD) and possibly temperature for PM7.

CHAPTER 3.0
PROPOSED PROJECT AND ALTERNATIVES

3.1 PROJECT DESCRIPTION

UPM-Kymmene/Blandin Paper Company (UPM/Blandin Paper) proposes to expand and modify its paper mill located in Grand Rapids, Minnesota; see Figure 1-1, Figure 1-2, Figure 1-3, Figure 1-4, Figure 1-5, and Figure 1-6. The Project is known as Thunderhawk (proposed Project or Project). The Project's main feature is the addition of a complete paper manufacturing line that is designated as PM7. The Project also includes increasing pulp producing capacity, optimization of the PM6 paper line, and the addition of warehouse facilities. Should the Project occur, the existing PM5 line would be shut down permanently in conjunction with start-up of the new operations. The facility's wood use would increase approximately 197,000 cords annually to a total estimated wood consumption at the mill of 400,000 cords per year.

The Project uses wood as the primary raw material to produce publication-grade rolled paper. Both hardwood (e.g., aspen) and softwood (e.g., spruce, balsam) species supply the mill. Project elements that require new construction, cause physical manipulation of the environment, or produce wastes can be considered in terms of:

- Wood-related Operations
- Paper Manufacturing
- Production Outputs
- Wood Use
- Water Use
- Wastewater Treatment
- Energy Infrastructure
- Other Infrastructure
- Site Preparation and Schedule

3.2 WOOD-RELATED OPERATIONS

3.2.1 WOODYARD

3.2.1.1 Overview

The UPM/Blandin Paper Mill receives hardwood and softwood logs for use in the facility's paper-making operations. The mill has an existing woodyard whose basic function is to receive, store, and retrieve wood. Wood is transported to the mill principally by truck in the form of 100-inch logs, but some is delivered by rail. The woodyard would continue to be used with the Project; see Table 3-1.

3.2.1.2 Chip Receiving Station

The woodyard does not receive chips at present. The Project includes installation of a chip receiving station, which would be a large pit with a belt-conveyor located underneath. It would allow the mill to receive and process softwood chips purchased on the open market when needed. The chip receiving station would be constructed in the woodyard to accommodate deliveries by either truck or rail. The likely location would be in the vicinity of the wood chip storage towers; the exact location has not been determined.

Truck deliveries would self-unload into the chip receiving station while rail cars will be emptied through bottom dumping. The unloading would be over a hopper that would feed the chip storage towers. A belt-conveyor would move the wood chips through screening and then convey the chips to the storage towers. The amount of chips that would be processed in this way is not known; however, it is expected to be minimal due to other Project-related changes that are proposed to minimize future reliance on purchased chips.

***Action*:** Addition of a new chip receiving station.

Table 3-1
Projected Raw Wood Transport and Arrivals

Time Period	Softwoods	Hardwoods	Totals
Present Condition (YTD thru August 2004)	256 cords/day 20 truck/day 40 rail cars/year	179 cords/day 18 trucks/day	435 cords/day 38 trucks/day 40 rail cars/year
Proposed Condition	441 cords/day 31/trucks day 500 rail cars/year	565 cords/day 57 trucks/day	1006 cords/day 88 trucks/day 500 rail cars/year

3.2.2 WOODROOM

3.2.2.1 Overview

Wood used at the mill is transported from the woodyard to an existing woodroom. Both hardwood and softwood logs will be processed in the woodroom. The present purpose of the woodroom is to debark the source 100-inch logs and cut them to 50-inch lengths. These 50-inch logs are then conveyed to the Pressurized Groundwood Mill (PGW) for further processing. The future woodroom will continue to process hardwoods as it does now, but will treat softwoods differently in the future.

For the woodroom's hardwood line, a new mechanical debarker will be added to handle increased wood throughput. It will be installed parallel to an existing mechanical debarker and will include associated belt conveyors. Once debarked, the stripped logs are sent to the PGW.

The woodroom will also be modified to accommodate softwood chipping. The infeed to the debarking drum will be straight in from the west, rather than from the south. This will allow longer wood lengths to be processed. A new chipper will be installed after the debarking drum to chip softwood for the new Thermo Mechanical Pulp Mill (TMP). The TMP is discussed in the next section. Because up to 20 percent of the TMP chips may be aspen, a conveyor will be added before or after the hardwood drum to direct aspen to the new chipper.

All chips, regardless of source, will be screened to remove fines and oversized chips. The fines will be burned at the Rapids Energy Center (REC) powerhouse while the oversized material will be returned to the chipper. The chipper and screen will be located in a building addition on the south end of the woodroom. The screened chips will be conveyed to two new chip storage silos before being conveyed to the new TMP plant. Aspen chips will be stored in the second storage silo.

***Action*:** 1) Addition of a new mechanical debarker to the hardwood line; 2) Modification of the softwood infeed system; 3) Addition of a new chipper to the woodroom; and 4) Construction of three new storage silos.

3.2.3 MECHANICAL PULPING

3.2.3.1 Overview

Roundwood logs and chips must undergo mechanical pulping to strip the individual fibers from the parent wood material. The Project proposes to use the existing, but modified, PGW while requiring the installation of a new TMP.

3.2.3.2 Pressurized Groundwood Mill

The current PGW processes both hardwoods and softwoods. The hardwood line (e.g., aspen) has four grinders while the softwood line (e.g., spruce, balsam) has six grinders. Debarked logs from the woodroom or block storage area are conveyed to these grinders, which contain large, rotating, abrasive stones that strip wood fibers off the logs. Water is sprayed onto the stone to wash the abraded pulp off the grinder surfaces as well as cool the stone's surface. This whole process occurs under pressurized conditions and at temperatures above the boiling point of water. The flow of pulp slurry collects at the bottom of the grinder and is then conveyed via pipe to a common hardwood or common softwood grinder stock chest.

All of the PGW grinders will grind aspen with the proposed Project. The production rate of the grinders is reduced to achieve the needed quality for PM7. Two to four additional grinders may be needed to supply enough aspen PGW pulp. The added grinders would go with the six grinders currently processing softwood. The PGW building would be expanded to the west to house the added grinders.

The wood fiber slurry next undergoes a screening and cleaning process. Screens remove "large" wood pieces or fiber bundles that were not completely processed in the grinder. An estimated 20-30 percent of the slurry stream is screened out, or "rejected," for further processing within the reject refining system. Rejected fibers undergo further mechanical action to break apart the fiber bundles. This product is screened once again, where the system "accepts" go forward to the cleaning stage while the rejects return to the reject system for more reprocessing.

The system *accepts* are cleaned by passing the slurry through a series of hydro-cyclones that remove dense material such as dirt, metal, or wood matter. The rejects from the cleaner system are removed for eventual treatment in the municipal WWTF; this makes up approximately one percent of the pulp production at this point in the process. The accepted pulp goes on to a vacuum-type thickener where the pulp is concentrated from approximately 1 to 10 percent solids before eventual storage until needed. Water removed at this stage is collected and reused as shower water for the grinders and other dilution points in the process.

When needed, the pulp is pulled from storage and is diluted again with process water obtained from the paper machine proper (i.e., white water). Some additional refinement occurs, and then the pulp is bleached, using sodium hydrosulfite or dithionite for softwood pulp and hydrogen peroxide for hardwood pulp. Other chemicals used in the peroxide-based treatment include sodium hydroxide or *caustic*, sodium silicate, ethylene diamine tetraacetic acid (EDTA) for sequestering metal ions, and sulfuric acid for pH control.

The proposed Project restricts the PGW to processing aspen only, but its processed pulp output will be used in both PM6 and PM7.

Pulp to PM6

The existing peroxide bleaching system will be used for pulp directed to PM6, but it will undergo some Project-related modification. The modifications require the installation of a new pulp washing system to remove residual bleaching chemicals and dissolved wood material. This system consists of a belt-type dewatering press with associated piping, tanks, and pumps. Filtrate from the washing press is directed to the pulp mill process water system. Paper machine white water is used to dilute the pulp after the washing press. These improvements will be housed in the existing PGW structure.

***Action*:** Modify existing PGW peroxide bleaching system.

Pulp to PM7

A new refining and peroxide bleaching system will be added to the PGW for the PM7-directed pulp. Major components include:

- Belt-type dewatering presses (2)
- Pulp/bleach chemical mixer
- Retention tower
- Belt-type washing presses (2)
- High consistency post refiner

This system will be in a building addition on the southern side of the PGW.

***Action*:** Install a new refining and peroxide bleaching system to PGW.

3.2.3.3 Thermo Mechanical Pulp Mill

The proposed Project includes the installation of a new TMP at the facility. Like the PGW, the TMP is a form of mechanical pulping, but it is chip-based rather than log-based. Wood chips are passed between rotating discs with serrated metal plates attached to the opposing surfaces. This mechanical action, when operating at high temperatures and pressures, breaks the chips into individual fibers. The temperatures and pressure in the TMP are higher than those in the PGW. Relative to the PGW, pulp fibers generated in the TMP are more intact and longer, thus providing better strength properties for the finished paper product. Both softwood and hardwood chips can be processed in the TMP.

Chips will be directed from the chip storage towers to the TMP; all chips must be washed prior to refining. The aspen chips will be treated with caustic and hydrogen peroxide before refining to assist in chip softening. All three types of chips (i.e., aspen, spruce, balsam) will be mixed together prior to TMP refining. The TMP fiber refining is proposed to occur in three stages to assure that the fibers are adequately developed, thus providing the desired paper strength and smoothness properties.

Once the pulp is refined, it is processed in the TMP much the same way as occurs for the PGW pulp. However, TMP processing does not use centrifugal cleaners, and a cleaning stage is not necessary. Screens remove the wood pieces or fiber bundles that were not completely processed in the refiner. An estimated 30-40 percent of the process stream is screened out or rejected, where the reject undergoes further mechanical action to break apart the fiber bundles. This product is screened once again with the system *accepts* going forward to the thickening stage and the rejects returning to the reject system for reprocessing.

The pulp *accepts* go to a vacuum-type thickener where the pulp slurry is thickened to about 10 percent solids before storage. The water that is removed is collected in a large tank to be reused as dilution water at the refiners and other dilution points in the process. Once removed from storage, the pulp is bleached using hydrogen peroxide. Other chemicals used in the peroxide bleaching process are sodium hydroxide, sodium silicate, EDTA for sequestering metal ions, and sulfuric acid for pH control.

The TMP will provide fiber for both PM6 and PM7. The TMP structure is located south of the PM5 assembly and immediately west of PM7; see Figure 1-6 – Modified Facility Layout. Major components of this system are:

- Chip handling
- Refining
- Thickening
- Storage
- Bleaching

Bleached TMP pulp will be pumped to the adjoining PM7 area. Bleached TMP pulp for PM6 will be pumped via a new above-ground pipe bridge to the PM6 area.

***Action*:** Install a new TMP.

3.2.4 CHEMICAL PULPING

Chemical pulp manufactured by the kraft process[1] is used to reinforce the paper by providing higher tear and tensile strength desirable for the type of publication paper produced by the mill. The mill does not produce kraft pulp itself; the company purchases its kraft pulp on the open market from (primarily) Canadian mill sources. Kraft pulp is transported in bale form, each of which weighs 480 air-dry pounds (AD lbs.) at an estimated 10 percent moisture content. The bales are slurried in a hydrapulper, which uses process white water to agitate and break up the bales to form the kraft slurry, which is in turn directed to the paper machines.

Kraft pulp bales are delivered to the mill via truck or rail to the existing kraft warehouse, which is located next to the PM5 building in the central part of the site. The bales are repulped as needed in existing kraft slushing equipment and related systems. Once reconstituted, the pulp then stored in existing tanks next to the kraft pulpers.

A new kraft pulp makedown line is needed because the proposed Project will increase kraft pulp utilization by approximately 50 percent. While this need for additional slushing capacity is certain, whether one or two new pulpers (with dewiring units and feed conveyors) will be needed will not be known until the final mill layout is determined. Regardless, at least one new pulper is proposed with the Project. A new kraft pulp tank, which will also be located near the stock preparation of PM7, will also be required so that stock blending can be done for PM7's specific process needs.

***Action*:** Install a new kraft pulp makedown line.

[1] The kraft process (also known as kraft pulping) is used in production of paper pulp and involves the use of caustic sodium hydroxide and sodium sulfide to extract the lignin (a chemical compound that is an integral part of the cell walls of some cells) from the wood fiber in large pressure vessels called digesters.

3.3 PAPER MANUFACTURING

3.3.1 STOCK PREPARATION

The stock preparation process prepares the fiber furnish mix, water, and additives for the paper machine sheet forming process. Kraft and mechanical pulp fibers are refined to develop the correct fiber morphology to enhance the strength and printing characteristics of the finished product. The different fibers (i.e., kraft, mechanical pulp, and broke) are then mixed in precise ratios that depend upon the grade of paper being made. Additives such as filler clay, starch, and dye are mixed into the blend of fibers to make up the furnish or "stock" from which paper is made.

3.3.1.1 Pigments

One dimension of paper quality is appearance in terms of whiteness and luster. Pigments are added during the paper production process to provide these qualities. Total annual pigment consumption post-Project is expected to be 250,000 tons.

Kaolin

The mill currently uses kaolin clay in the operation of PM5 and PM6 for pigmentation purposes. Kaolin clay is transported exclusively by rail in either a dry or slurry form; either type could be used under future mill operations. If clay comes to the mill in dry form, it requires receiving hoppers, storage silos, and a makedown facility to produce slurry for future use in the paper machine. When liquefied, the clay is stored in tanks at 30-70 percent solids, which means that it can be piped to additional points in the paper machine stock preparation process.

Rail deliveries will increase by an estimated 10 cars a week as a result of the Project. Future mill operations will require approximately 175,000 tons of kaolin clay to supply production for PM6 and PM7.

***Action*:** Add a kaolin processing station.

Precipitated Calcium Carbonate

The proposed Project also includes the use of PCC to meet pigment requirements. The PCC will be produced on site in a facility owned and operated by an independent vendor; this Project element is a connected action. No supplier has been identified at this time.

Background Information

Today the paper mill uses clay pigment instead of PCC, which is processed in Georgia and transported to Grand Rapids by rail. On-site production of PCC requires a processing plant with major inputs of quicklime (CaO), water, carbon dioxide (CO_2 from local flue gas), and electricity. The major outputs are PCC, process effluent, and solid waste. The basic site footprint is currently estimated at 200 ft x 300 ft (dependent on volume requirement). The PCC plant would employ five to seven people and operate virtually 24 hours a day, 7 days a week. The final PCC product is pumped via pipeline to the paper mill.

The effects of the PCC plant relating to air emissions, water and wastewater, solid waste, and noise are discussed in their respective sections.

PCC is a synthetic calcium carbonate material that is used by a variety of industries, including paper, plastics, paints, roof and floor tiles, sealants, and food-grade applications (toothpaste, antacids, animal feed). PCC is produced for the paper industry by combining calcium oxide (lime), water, and carbon dioxide under carefully controlled conditions. Process controls and technologies result in a variety of PCC materials with specific crystal structures and size ranges. Various manufacturers currently operate 55 satellite PCC plants at paper mills around the world. A PCC facility typically operates 24 hours per day, 365 days per year.

Process Description

PCC is produced by combining calcium oxide, carbon dioxide, and water. The final product is a mixture of PCC and water which is pumped to the host paper mill for storage and use. The process begins when dry calcium oxide (quicklime) is delivered to the PCC plant in trucks or by railcar. The calcium oxide is pneumatically transferred to storage silos. Fabric filter dust collectors located on top of the silos clean the air displaced during the transfer. The captured calcium oxide dust is returned to the silo for use.

Next, the calcium oxide is combined with water to produce calcium hydroxide, as shown below:

$$CaO + H_2O \rightarrow Ca(OH)_2$$

A water slurry of calcium hydroxide, which is in a water slurry, passes through a screen to remove large particles called lime grit. The screened calcium hydroxide slurry is then pumped into batch reactors called carbonators. The oversized lime grit is dewatered and stored on site for use as an agricultural soil additive; see Solid Waste section.

Typically, manufacturers use combustion gas from the paper mill lime kiln, recovery boiler, or power boiler as the source of carbon dioxide to produce PCC. In this case, flue gas from the REC boilers will provide carbon dioxide (CO_2) for use in the manufacture process. The combustion gas is removed from the host mill’s combustion source only after the gas has passed through the mill’s pollution control equipment. The quality of the gas entering the PCC process is identical to the gas that is discharged to the atmosphere from the mill’s stacks.

Water scrubbers are used to prepare the gas for use in the PCC process. After passing through the scrubbers, the gas is injected into the carbonators where the carbon dioxide and calcium hydroxide combine to form PCC, as in the following chemical reaction:

$$CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$$

The PCC and water mixture is again screened to remove large particles, and the final PCC product is stored in agitated tanks prior to being pumped to the paper mill.

Major Equipment

- Scrubber: Wet (water) venturi scrubber used to remove particulate and lower temperature of the incoming flue gas.
- Compressor: Typically blower device used to pull flue gases into PCC plant process.
- Slaker: Enclosed mixer is used to produce calcium hydroxide (CaOH) from quicklime (CaO) and water (process water from host mill).
- Dewatering Screw: Used to remove water from slaker rejects to make percent solids suitable for transport and landfilling (or reclamation use).
- Screens: There are several sets of screens in process to remove oversized material.
- Cooling Towers: Towers used to cool down process water through evaporative means.
- Carbonator: Reactor used to precipitate calcium carbonate ($CaCO_3$) from calcium hydroxide (CaOH) and CO_2 (input from local flue gas).

PCC use is expected to be approximately 75,000 tons per year. Where the PCC operation will be located at the mill has not been determined. Key elements of the manufacture and processing of PCC are:

- PCC plant building
- PCC storage tanks
- Flue gas pipe and facilities
- PCC plant process equipment

The process equipment will be provided by the supplier, while UPM/Blandin Paper Mill will supply the buildings and utilities.

***Action*:** Install a new PCC facility.

3.3.1.2 Other Inputs

No other major raw materials are used during stock preparation. However, all paper machines have some miscellaneous process aid chemicals that do not add substance to the paper. These include wet end starch (0-15 lbs/ton paper produced depending on grade), defoamers (< 1 percent), retention aids (1-2 lbs/ton), microbiological control agents (< 1 percent), and felt cleaners (< 1 percent). Each of these agents will be present in the operation of PM6 and PM7.

Total use of these agents is expected to be double the amount historically consumed at the mill.

3.3.2 PAPER MACHINE PROCESS

The paper machine process consists of forming, pressing, drying, and reeling of the finished paper product.

Prepared fiber stock is directed to the paper machine sheet forming area; here a thin stream of fiber stock is injected under high pressure into a twin-wire sheet former. The paper sheet that forms is quickly transported through the machine to remove as much water as possible from it by gravity and vacuum means.

Water removed during the early part of the forming process is very high in solids content, while water removed later by vacuum is much lower in solids. These two types of “cloudy” and “clear” white water are collected and reused in the paper machine stock system. Surplus white water is pumped to a saveall where the fibers and clay are removed and returned to the overall process. The resulting clarified white water is then directed back into the pulp mill, to repulp kraft and broke, and as a replacement for fresh water wherever it is practical to do so.

After forming, the sheet is transferred to a press section where more water is removed by mechanical means. For example, the sheet entering the press section has a moisture content of about 80 percent water; when it leaves the press section it is about 55 percent water. Water remaining in the paper at this point must be removed by evaporation. This is accomplished by holding the sheet against steam-heated cylinders. This part of the paper machine is called the dryer section. The paper is then wound up on a spool at the reel. See Figure 3-1 – Project Schematic, for the Project’s estimated paper production.

3.3.2.1 Paper Machine 7

The proposed Project includes the installation of a new, complete paper manufacturing line designated as PM7. This will require the construction of a building to house the paper machine and provide space for paper finishing and roll storage.

The new machine will be of a twin-wire former-type with a forming section wire width of approximately 437 inches. The paper machine design speed is as follows:

- Construction speed: 7,218 feet per minute
- Production speed: 6,890 feet per minute
- Average speed: 5,906 feet per minute

PM7 is projected to have an annual output of 496,000 short tons of publication-grade paper.

***Action*:** Install a new paper machine.

Figure 3-1
Project Schematic

3.3.2.2 Paper Machine 6

The mill has housed PM6 since 1989. No new construction is proposed under the Project for PM6. Rather, the Project proposes to increase the efficiency of PM6 in two principal areas:

- Waste Reduction: Process-related waste generation can be reduced from current conditions. Waste reduction can be accomplished by lowering the proportion of fiber stock being transferred back to the pulper for reuse in the paper machine. An 8 percent decrease in waste generation may be realized, with waste going from 16 to 8 percent of the paper stock being processed in PM6. The benefit accrues from higher paper stock capture that results in more finished materials being generated by the paper machine.
- Possible Paper Mill Speedup*:* More production could be achieved with increased operating speed. This could be accomplished by modifying the machine's drive section. The potential increase in fiber use associated with the proposed machine speedup is reflected in the values offered in the Scoping EAW.

PM6 is projected to have an annual output of 265,000 short tons of publication-grade paper.

Action: Modification of an existing paper machine.

3.3.2.3 Paper Machine 5

The mill has housed PM5 since 1975. The Project proposes the complete shutdown of PM5 prior to the start-up of PM7. The PM5 buildings that are considered useable will be retained under the Project and saved for future PM7 operational support.

***Action*:** Shut down of an existing paper machine.

3.3.3 PAPER FINISHING

The paper finishing process transfers paper from large, jumbo reels to smaller rolls that are to be wrapped and shipped to the customer. This can include supercalendaring, which is the mechanical process of polishing the sheet of paper. This is accomplished by threading the paper through an alternating series of fiber/synthetic rolls and heated steel rolls. The slippage of paper between these two types of rolls gives a glossy finish to the paper. The finished product would then be staged from the paper finishing area for shipping to the paper warehouse.

3.3.3.1 Paper Machine 7

The paper machine requires construction of paper finishing facilities. This will be part of the overall PM7 building structure.

***Action*:** Addition of new paper finishing facilities.

3.3.4 ROLL STORAGE

The roll storage area is used to store mechanical rolls associated with the components of the paper machine. It is a support area for ongoing mechanical maintenance operations.

3.3.4.1 Paper Machine 7

Installation of roll storage facilities, which are of a typical warehouse design, will be part of the Project. This will be a section of PM7's housing.

***Action*:** Addition of a new roll storage area.

3.3.5 PAPER WAREHOUSING

UPM/Blandin Paper Mill is considering the addition of a new paper warehouse to the facility. Short-term storage is now accomplished on-site in the PM5 and PM6 shipping areas, but this is considered insufficient to handle future production levels for PM6 and PM7. The warehouse design itself will be typical of facilities providing short-term storage and shipping services, including multiple shipping bays.

This Project feature is necessary to alleviate potential Project-related traffic congestion. It will also ensure future flexibility in shipping and receiving operations, which is an important cost control factor, especially for logistical costs. Three options have been proposed, including some that involve the acquisition of adjoining properties or use of warehouse facilities in Duluth; see Figure 3-2 and Figure 3-3.

The Final Scoping Decision identifies two other potential paper warehouse options that were designated as Warehouse Options 1 and 3. Both of these alternatives, which placed the proposed paper warehouse within the confines of the existing site, have been removed from consideration by UPM/Blandin Paper Mill. In addition, the Final Scoping Decision identified the City of Coleraine as a potential location for Warehouse Option 5 (along with the City of Duluth). Placing a new warehouse in Coleraine has been dropped from consideration by UPM/Blandin Paper Mill too.

3.3.5.1 Warehouse Option 2

The option involves the construction of a new warehouse just east of PM6. This warehouse would service both PM6 and PM7. It will require the acquisition of neighboring properties and the potential abandonment of NW Third Street.

3.3.5.2 Warehouse Option 4

In this option a new warehouse would be built off site west of the woodyard. Blandin Paper Company owns some of the property at this site, but additional property will need to be purchased to allow for this development. Two special trucks would transport paper from PM6 and PM7 to the warehouse under this option.

Figure 3-2
Proposed Site Layout Warehouse Option 2

Figure 3-3
Proposed Site Layout Warehouse Option 4

3.3.5.3 Warehouse Option 5

This option involves using an existing off-site warehouse in an industrial park in Duluth, Minnesota. The specific location is the Lake Superior Warehouse Company, which provides roadway connector routes and access to multiple railways and carriers; see Figure 1-5.

Action: Addition of a new paper warehouse.

3.3.6 FINISHED PRODUCT TRANSPORT

Finished product will be transported either from the mill proper or the paper warehouse to the respective customer. Currently shipments average approximately nine railway cars and nine trucks per day. Thus, the majority of paper (by weight) has been shipped by rail (approximately 80 percent). These rates, however, vary from day to day, with costs serving as the primary determinant of shipping mode. It is therefore possible that future ratios may be different; see Table 3-2.

Table 3-2
Finished Paper Product Transport and Departures

Time Period	Maximum Number of Rail Cars	Minimum Number of Rail Cars	Maximum Number of Trucks	Minimum Number of Trucks
Present Condition (Warehouse on-site)	12	1	45	9
Proposed Condition (Warehouse on-site)	23	1	93	23
Proposed Condition (Warehouse off site)		1	93	89

3.4 PRODUCTION OUTPUTS

The existing paper mill's baseline production capacity averaged 446,605 short tons per year over the period 1993-2002. The mill has been running downsized capacities since 2003, which accompanied the permanent shutdown of PM3 and PM4. The proposed expansion will increase the paper mill's production to 761,000 short tons per year. The incremental increase in production (over baseline) will be 314,000 short tons per year; see Figure 3-4.

3.5 WOOD USE

The mill uses wood as the principal raw material for the purpose of industrial paper production.

3.5.1 TYPES OF WOOD

The three principal tree species used by the mill are aspen, balsam, and spruce.

3.5.2 WOOD USE AMOUNTS

The amount of roundwood and kraft pulp used at the facility is described below.

3.5.2.1 Roundwood

The proportion of each species used in the facility's wood supply has varied considerably in response to wood market conditions, paper product demand, weather, availability, and pulp and paper process technology. Aspen, for example, has been as little as 20 percent to as much as 57 percent of the species mix for paper produced at the mill over the past decade. Currently, on an annualized basis, aspen makes up 41 percent of the mill's total wood use. Similarly, spruce consumption has ranged from 34,000 to 95,000 cords per year. UPM/Blandin Paper fully anticipates the mix of these three species will continue to vary in the future due to both economic and non-economic factors that drive stumpage prices and species availability.

Total pulpwood use has ranged between 166,000 and 221,000 cords per year over the past decade. Annual wood use dropped in 2003 in association with the permanent shutdown of PM3 and PM4. Consequently, annualized wood use for 2004 is estimated to be approximately 166,000 cords, or some 25 percent less than the facility's total wood use in 2002. This means that the amount of wood consumed by the mill in 2002 would be more indicative of its annual wood needs over the past decade. UPM/Blandin Paper's average annual wood use from 1994 through 2002 has been calculated as a baseline value of 203,000 cords.

The proposed Project will increase wood use by an estimated 197,000 cords per year. Approximately 110,000 cords, or 56 percent of this increase, is anticipated to be aspen, with the remaining 87,000 cords consisting of the softwoods spruce and balsam. However, as indicated above, there will likely be considerable year-to-year variability in facility's species mix. Total annual wood consumption at the mill is projected to be 400,000 cords.

***Action*:** Increase the use of roundwood.

3.5.2.2 Kraft Pulp

The facility uses kraft pulp purchased from Canadian sources. In 2003, kraft usage was 92,109 AD short tons used that year in the operations of PM5 and PM6. In 2002, kraft usage totaled 131,784 AD short tons resulting from the operation of PMs 3, 4, 5, and 6. Future kraft pulp consumption is estimated to be 147,208 AD tons annually, which is an increase from current operations of approximately 52,000 AD short tons per year.

***Action*:** Increase the use of kraft pulp.

Figure 3-4
Paper Mill Production

See Table 3-3, Summary of Historical, Current, and Planned Incremental Wood Use, and Figure 3-5, Historic and Proposed Levels of Wood Use.

Table 3-3
Summary of Historical, Current, and Planned Incremental Wood Use

(100-inch cords)	Aspen	Balsam	Spruce	Total
Range 1994-2003	35,000 – 118,000	41,000 – 62,000	34,000 – 95,000	166,000 – 221,000
Baseline (Average) 1994-2002	92,000	53,000	58,000	203,000
Proposed Increase	+110,000	+28,000	+59,000	+197,000
Proposed Total New Use	202,000	81,000	117,000	400,000

Kraft Pulp Use		
Current	**Projected Increase**	**Total**
95,208 AD tons/yr	52,000 AD tons/yr	147,208 AD tons/yr

3.5.3 SOURCES OF WOOD

Roundwood used at the facility originates from: 1) harvest of company owned and managed timberlands; 2) Minnesota wood purchased on the open market; and 3) wood imports.

UPM/Blandin Paper Mill anticipates that approximately 144,000 cords (73 percent) of the Project-related increase in wood needs will be sourced from Minnesota timberlands. The balance of 53,000 cords will be imported, primarily from Canada, Michigan, and Wisconsin. The company has not identified a specific procurement zone because open-market wood purchases will be made wherever economically feasible. The company predicts that imports will remain an important source of wood for the Project; see Figure 3-6, Project-Related Wood Sources: Minnesota and Imports. Please not that for the purpose of impact assessment (modeling the worst case scenario) the increase in wood usage associated with the Project is assumed to come entirely from timber harvesting activities in Minnesota, thus, modeling efforts are centered around the additional197,000 cords per year harvested from Minnesota forests.

Roundwood procured in Minnesota proper will come from timber harvest occurring on a variety of ownerships. These include UPM/Blandin Paper Mill lands, other industrial and non-industrial private lands, and county, state, and federal lands. The company has provided a profile of timber procurement by ownership; see Figure 3-7 – Current Blandin Paper Company Wood Sources by Owner. It should be noted that UPM/Blandin Paper Mill believes that the relative proportions across ownerships can change substantially over relatively short periods (e.g., 2-3 years).

Figure 3-5
Historic and Proposed Levels of Wood Use

Figure 3-6
Project-Related Wood Sources: Minnesota and Imports

Figure 3-7

Current Blandin Paper Company Wood Sources by Owner

3.6 WATER USE

The paper production process uses water to meet equipment cooling and process-related requirements.

3.6.1 WATER INTAKE STRUCTURE AND PUMPING STATION

Current and future facility-related water needs will be met by using water appropriated from the Mississippi River Paper Mill Reservoir. Water is appropriated through an intake structure located just upstream of the Blandin Dam, just off the northern riverbank.

The Project includes the addition of a new water intake structure and pumping station. The new components will be located in the same vicinity as the current intake facility. Installation of the new structure improves the maintainability and reliability of the pumping equipment compared to the current situation. The destinations and uses of water do not change from the current management condition. The new pumping house will contain both intake water pumping and filtering equipment.

Action: Add a new intake structure and pumping station.

3.6.2 FIRE SUPPRESSION SYSTEM

State and city building regulations and insurance underwriters require the facility to install, maintain, and operate a fire suppression system. The system is supplied by the fresh water storage tank, which contains river water that has been filtered to make it useable for this and other applications. The fire extinguishing water system only consumes water when the sprinklers are activated or when fire extinguishing hoses are being used. When on standby, there is no water use; the pipes are kept pressurized to provide for an instantaneous start if fire fighting is necessary.

The existing system is capable of taking care of the new mill components. However, the installation of a new water intake and pumping station makes it feasible to consider locating a new fire suppression system in the same area. Once online, the new system would replace the existing system.

***Action*:** Replace the existing fire suppression system with a new system.

3.6.3 NON-CONTACT WATER COOLING LOOP SYSTEM

The proposed Project includes the addition of a non-contact cooling loop with heat exchangers and an existing cooling tower for: 1) cooling the TMP and PGW motors, and 2) the chiller system for cooling of electric and control rooms. This cooling loop will likely only be needed during the summer months, most likely for three or four months a year, and will produce wastewater with a maximum temperature of 115º F. A second situation currently being investigated adds additional cooling towers to cool vacuum pumps. A side benefit of the second possibility is that the additional cooling will result in wastewater with a maximum temperature of 110º F. In winter UPM/Blandin Paper expects that non-contact cooling water would be introduced to the intake and would allow for recovery of all the energy. The cooling loop is a once-through type of water appropriation where the device will receive water via an existing intake structure, which is housed in the Blandin Dam proper. Used water will be returned to the Mississippi River through the existing discharge structure as a regulated warm water discharge.

***Action*:** Install a non-contact water cooling loop system.

The proposed installation of a non-contact cooling system with the Project would create a new warm water discharge into the river. It would affect the same general reach of river associated with the current warm water discharge from Allete/Minnesota Power's No. 6 Turbine Generator (which would be terminated). The temperature and potentially affected area profile of the proposed discharge is expected to be similar to the current condition.

The proposed discharge will require a MPCA NPDES SDS permit transfer. MPCA's permit process will require UPM/Blandin Paper Mill to demonstrate that the pollutant flow and loading will not diminish water quality before the permit will be issued. The Project will meet all permit requirements.

3.6.4 COOLING WATER TOWERS

The proposed Project includes the addition of cooling water towers as an additional measure for achieving acceptable non-contact cooling water loop and effluent discharge temperatures; see Figure 3-8. The towers do not affect water use and appropriations.

***Action*:** Install cooling towers.

Figure 3-8 Cooling Towers

3.7 WASTEWATER TREATMENT

3.7.1 WASTEWATER TREATMENT FACILITIES

Industrial wastewater generated at the UPM/Blandin Paper Mill is treated by the Grand Rapids WWTF, owned and operated by the GRPUC. The WWTF are distributed between two site locations. Wastewater from the mill is initially pumped to the Primary Plant; see Figure 3-9. Treatment by coagulation/flocculation and clarification results in primary solids removal. Septage, domestic wastewater, and nutrients are then added to the primary effluent before it is pumped to the Secondary Plant, which is located approximately a mile away; see Figure 3-9. Biological treatment by an activated sludge process occurs at the Secondary Plant. Unit processes include aeration, clarification, and disinfection. Treated effluent is discharged from the Secondary Plant into the Mississippi River at an outfall structure located approximately two miles downstream of the Blandin Dam under NPDES Discharge Permit No. MN 0022080.

The addition of PM7 will result in increased flow and pollutant loads to the WWTF. The influent flow is expected to increase approximately 3.4 million gallons per day (mgd) to an annual average daily flow of 10.0 mgd. Influent quality will also change with PM7 as the BOD, total suspended solids (TSS), and temperature of the waste will increase from current conditions. Without taking into account remaining useful life, the existing facilities have adequate capacity for future average loading conditions. However, the existing facilities do not have adequate capacity to treat future peak loading conditions.

To mitigate future peak TSS loads, the addition of flow equalization and increased sludge dewatering capacity is proposed. To mitigate future peak BOD loads, additional oxygen for the aeration basins is proposed. To mitigate future peak temperature loads, a non-contact cooling water loop system at the mill and supplemental surface aeration at the Secondary Plant is proposed. Additional improvements are also required due to the age and condition of the existing facilities.

The installation of any new technology to mitigate waste stream quantity and quality due to PM7 is a connected action. Since the new facilities will be designed to perform at least as well as the existing facilities, and the existing facilities perform well within existing NPDES/SDS permit limits, then no permit modifications are anticipated for PM7. A detailed analysis of the wastewater treatment facilities' modifications was performed and documented in the Wastewater Treatment Facilities Improvement Modification Study for Blandin Paper/Thunderhawk Project, prepared for the City of Grand Rapids Public Utilities Commission (September 2005). Please reference the project file for a copy of this study.

Figure 3-9
Wastewater Treatment Facility Location

3.8 ENERGY INFRASTRUCTURE

3.8.1 ALLETE/MINNESOTA POWER COMPONENTS

Allete/Minnesota Power operates the REC at the mill site. Although separate from the paper making operations, there is an interdependence between the REC and the UPM/Blandin Paper Mill. The REC is an important source of energy for mill-related operations. In return, the mill provides the REC with waste wood and water appropriations.

The REC provides the paper mill with all of its steam requirements, most of its pneumatic (e.g., pressurized air) requirements, and up to one-third of the mill's electrical demand. REC steam is used to dry paper in the paper machines, condition paper, and heat the water used in papermaking. The paper mill uses electrical power to drive the paper machines, as well as for office equipment and lighting. Some 30 megawatts (MW) are currently supplied by the REC to the mill for these purposes. There is a need mill-wide for compressed air.

The mill delivers the waste wood created in the papermaking process to the REC Wood Barn. This is done by conveyor and typically some 200 tons of wood refuse is delivered daily for temporary storage in the barn or is directly delivered to the coal- and wood-fired boilers. The mill-delivered wood accounts for approximately one-quarter (1/4) of the total daily wood burned at the REC. The paper mill also provides the REC with filtered river water, which is used for wash down purposes and cooling various pieces of equipment. The mill also supplies fire protection to the REC.

The REC consists of four boilers (Nos. 5, 6, 7, and 8), two steam turbine generators (Nos. 6 and 7), and two hydro-generators (Nos. 4 and 5) that are located at the dam. Boilers 5 and 6 are coal- and wood-fired units while Boilers 7 and 8 are gas-fired units. The two steam generators can each supply approximately 15 MW of electricity. The two hydro-generators augment the electrical power produced at the facility; both generate electricity that is based on run-of-the-river-type flows and typically produce about 1 MW combined.

Allete/Minnesota Power also plans to retire the REC's No. 6 Turbine Generator. This is not a connected action because it is independent of the Project; the turbine generator is housed in the PM3 and PM4 structure that is being removed from the site prior to Project implementation. The result will be a reduction in the REC's self-generation of electrical power by 15 MW. The decommissioning of the turbine generator also eliminates Allete/Minnesota Power's water appropriation from the existing intake structure for turbine-related cooling. The previously referenced installation of a non-contact water cooling loop will use the existing intake structure as that system's water source. No change is proposed for the No. 7 Turbine Generator, which does not use appropriated river water for cooling purposes.

Each of the following Project elements is a connected action being done for the Project by Allete/Minnesota Power.

3.8.1.1 Steam Accumulator

The REC boilers mainly produce steam used in the mill; however, some steam is also a byproduct of TMP operation and associated heat recovery. Regardless of source, system-related steam pressures vary according to process and mechanical needs and exactly which machinery is operating at a given time. In papermaking, sudden steam fluctuations can occur when paper machines suddenly come online or offline, for example during paper breaks or while switching to heavier grades of paper.

The Project includes the installation of a new steam accumulator to reduce pressure variability in the steam system. TMP heat recovery produces steam at a fairly constant output capacity but cannot adapt to large fluctuations in steam use. The new steam accumulator is designed to provide stability to the steam supply when sudden steam fluctuations occur. It provides a benefit similar to a capacitor bank on an electrical system; overall system stability is maintained when this component is in place. The steam accumulator will be located and connected to the existing powerhouse on the south side of the building.

3.8.1.2 Water Demineralization Plant

The boilers use screened and demineralized river water for make up. The current demineralization plant is located within the power plant. The demineralization system consists of tanks and pumps and does not require a separate building (from the power plant). The Project includes improvements to the water demineralization plant; this may involve construction of an extension on the power plant, or use of the same building that will house the new steam accumulator.

3.8.1.3 Back-up Boiler

TMP heat recovery will provide a significant portion of the additional steam that will be used by the mill when the Project is complete. Circumstances may arise where the TMP must be down, but both PM6 and PM7 are expected to continue operations. There is insufficient steam capacity with the current boiler system to meet all projected steam system requirements with the TMP down.

Addition of a 280 x 10^6 BTU/hr natural gas-fired boiler is proposed for those occasions where the TMP is shut down and both paper machines are in production. This new boiler might also be used if either the solid-fuel boilers or other gas-fired boiler(s) are offline for maintenance during normal production. The new boiler will be located close to the two existing gas boilers in the same housing.

3.8.1.4 Electric Power Feed Lines

The mill uses electricity purchased from Allete/Minnesota Power. The electricity used at the mill comes off the grid or is generated by the REC.

Electricity use will increase substantially with the Project. A new power feed line will need to be installed to handle the increased electrical load. The Project will rely on the local transmission system; no new transmission towers are needed. Rather, existing lines can be upgraded to handle the additional load. The lines would be located on the existing right-or-way. The existing on-site substation would be enlarged. UPM/Blandin Paper and Allete/Minnesota Power are also in discussions about possibly putting in an auxiliary condenser with a closed loop cooling system attached to the existing power plant.

Action: Add energy-related infrastructure.

3.8.2 UPM/Blandin Paper Mill Components

As noted in the previous discussion about steam management, excess process heat from the TMP is a potential source of steam energy for the Project. This is because the process of disintegrating the wood chips into fibers in the TMP refiners produces heat. A fair portion of that heat is in the form of steam that can be converted in a heat recovery system to clean steam for use in paper drying, or part of it can be bound to heat recovery condensate. Before the condensate is pumped to the waste water system, further heat can be recovered using water/water heat exchangers to heat paper machine white water, and thus move heat to the paper machine system.

The Project-related installation of the new TMP provides opportunities for waste heat capture and redirection back into papermaking processes.

***Action*:** Install a heat recovery system.

3.9 OTHER INFRASTRUCTURE

Some existing utilities that supported historic mill functions, especially operations for PM3 and PM4, will have to be relocated. In particular, installation of PM7 will require the likely relocation of some on-site storm sewer, sanitary sewers, potable water mains, and fire mains. The mill effluent sewers for PM5 and PM6 will also require rerouting, and a new line to handle PM7 will be needed. Most of this activity will be restricted to the existing mill site, although some off-site connections to the main, area-wide system will likely be necessary.

Action: Conduct minor modifications to infrastructure.

3.10 SITE PREPARATION AND SCHEDULE

The Project will require site preparation related to construction of the TMP, PM7, and its components, and the paper warehouse option that is chosen. The proposed new plant expansion would be located in an area renovated after the removal of support structures for PM3 and PM4. These areas are commonly known as the research facility, shipping, Number 3 and 4 paper lines, old power plant, coating preparation, and TMP.

The area requiring site preparation can be described as follows. The new PM7, finishing complex, and roll grinding building is envisioned as occupying an area starting just south of NW Second Street, extending to the south approximately 400 feet and starting approximately 150 feet west of Pokegama Avenue, extending to the west approximately 1,500 feet. A new TMP plant will be located on the west end of the paper machine building. Multiple options are being considered for paper warehousing, some on-site and some off site; see Figure 1-5, Figure 3-2, and Figure 3-3.

The types of equipment and materials that are expected to be used for the construction activity are those typical to large, industrial projects. Excavation equipment such as dozers, diggers, backhoes, and trucks will be used for establishing appropriate elevation levels and the placement of pilings and other foundation structures. Construction of buildings will involve the use of crane-type lifting equipment.

The construction will progress in a normal sequence. The elevation and foundation work will be completed first, followed by the building structures proper, with the interior work completed last. New foundations and footings are required for the new buildings and equipment.

The comprehensive construction schedule has not been formulated at this time. Construction could commence from late 2006 to early 2007, with start-up of the new paper machine line possible in 2008 to 2009.

Action: Conduct site preparation activities.

3.11 PROJECT PURPOSE

The purpose of the proposed modifications is to increase production capacity and output of the facility. Existing PM5 is nearing the end of its useful life. Blandin Paper Company believes market conditions are such that production should be increased.

3.12 PROJECT ALTERNATIVES

Minnesota Environmental Quality Board (EQB) rules (Minnesota Rules Part 4410.200, subpart 1) state that the purpose of an EIS is to provide information for governmental units, the proposer of the project, and other persons to evaluate projects which have the potential for significant environmental effects, to consider alternatives to the proposed project, and to explore methods for reducing adverse environmental effects. The Rules further state that the scoping process shall be used to reduce the scope and bulk of an EIS to examination of the potentially significant issues (Minnesota Rules part 4410.2100, Subpart 1).

EQB rules require an EIS to consider alternatives for sites, technologies, modified designs or layouts, modified scale or magnitude, and alternatives incorporating reasonable mitigation measures, all identified through comments received during the EIS scoping and DEIS comment periods. Alternatives may be excluded from analysis for a number of reasons, e.g., the alternative does not meet the underlying purpose of the project or does not have any significant environmental benefits. The Final Scoping Decision prepared by the DNR proposed the following alternatives for inclusion in the EIS: Proposed Project, No-

Build Alternative, Technology Alternative, Modified Design or Layouts, Scale or Magnitude Alternatives, and Site Alternatives.

Minnesota Rules part 4410.2300, regarding EIS content, provides for elimination of alternatives included in the original scope based on information developed through the EIS analysis. Alternatives to be dismissed must be discussed briefly with the reasons for their elimination.

3.12.1 NO-BUILD ALTERNATIVE

Evaluation of the No-Build Alternative in the DEIS considers the Project site, surrounding area, and mill operations as if the proposed Project were not developed. The environmental and socioeconomic aspects of not developing the Project are presented within the appropriate sections relating to specific issues.

The existing conditions at the Project site would continue to exist under the No-Build Alternative. PM6 would continue to operate. But PM5 would be shut down at some point since it has reached the end of its useful life. The Project site is a fully-developed industrial facility that was originally developed in 1901. Paper production for the present mill dates back to March 1902, when Itasca Paper Company began to make its first newsprint with PM1. A dam was built on the Mississippi River at this site as part of the original development. In addition, electricity has been produced at the site continuously since 1901.

The Project would not be constructed at the UPM/Blandin Paper Mill or at any of the three proposed paper warehouse options under the No-Build Alternative. The PCC facility would not be built. The upgrade modifications to the Grand Rapids WWTF and the REC would not take place. Under the No-Build Alternative, the UPM/Blandin Paper Mill would continue to operate producing paper with PM6 and associated facilities. Potential adverse environmental impacts associated with development of the proposed Project would not occur, nor would any potential positive impacts such as creation of jobs and local service needs.

3.12.2 TECHNOLOGY ALTERNATIVES

3.12.2.1 Paper Production Technologies

Many different paper production technologies exist. The proposed Project relies on technologies that optimize the existing and proposed facility for the products being produced. The peroxide bleaching systems, currently used in the PGW and proposed to be used in the TMP, are relatively benign compared to other available pulping processes. Few hazardous chemicals are currently used and no new hazardous chemicals are proposed with the Project. During project scoping, the DNR has not identified hazardous chemical use as a significant issue with the Project.

During scoping, it was recommended that the DEIS examine the use of advanced enzyme-based papermaking approaches and the use of alternative (more benign) and/or locally produced pigments. Both comments were offered to reduce potential hazardous waste generation.

The substitution of an enzyme-based pulping process over the current and proposed processes has not been demonstrated through existing research and applied technologies. Given that the current and future mill operations apply a lesser-impact technology in the pulping operations, no significant environmental benefit is gained when comparing the proposed Project to an evaluation of proposed enzyme-based papermaking alternatives.

Regarding alternative pigments, the two pigments in question, kaolin clay and PCC, are natural minerals that are not considered to be hazardous. They require purification to the quality specifications required for the paper manufacturing process. Any waste or byproducts that result from their use in papermaking is considered non-hazardous solid waste. Viable substitutes that meet the process specifications for the grades of paper produced at the mill are not currently available. It is conceivable that substitutes will be developed in the future, and these will be considered by UPM/Blandin Paper Mill subject to any procedural or regulatory requirements in place at the time. Regarding use of local sources, the quality needed for the publication-grade paper manufactured at the mill is not available locally. Given these factors, the underlying need or purpose of the Project is not met under the proposed alternative.

EIS scoping also generated a recommendation that the DEIS analyze the feasibility of using cooling towers instead of the proposed Project's reliance on a new non-contact cooling water system. Adoption of cooling towers may offer the opportunity to reduce impacts to the receiving water, which is the Mississippi River, and to generate improvement over the existing condition. The DEIS analyzes the potential effects of incorporating cooling towers as a Project component. The cooling towers are proposed to be placed within the paper mill. Their main function is to cool the mills effluent to the WWTF. The issue is also examined in the GRPUC WWTF report in its evaluation of the potential temperature characteristics of the facility's future industrial wastewater flows.

Regarding evaluating opportunities to "close the loop" and reduce the amount of mill-related water use, UPM/Blandin Paper Mill concurs that identification of opportunities for water re-use and recycling is a desirable Project element. Pre-Project engineering will include measures to reduce the use of water for both cooling and manufacturing where feasible and practical. This concept will be applied to both the clear water and white water systems. The DEIS analyzes water appropriations use and displays a water budget. Within the Water Use section, the DEIS evaluates water conservation and recycling during the paper making process.

Significant environmental benefit over the proposed Project is not provided through the use of alternative paper production technologies.

3.12.2.2 Fiber Sources

Alternative sources of wood fiber are evaluated in the EIS. The feasibility to use wood fiber sources other than aspen, spruce, and balsam is evaluated. This includes how future forest management in

Minnesota may affect species availability for use with the Project, which was also recommended during EIS scoping.

Comments received during EIS scoping requested that the DEIS consider an alternative requiring the use of recycled fiber paper as a pulp source, in conjunction with first generation pulp produced at the mill or open-market kraft purchases. Use of recycled paper could lessen Project-related demand for first generation pulp, thus lessening potential impacts to forest resources. UPM/Blandin Paper Mill indicates that the paper manufacturing process will be designed to allow for the introduction of recycled fiber, although there is no current plan to use this product as a substantial fiber source. Current operations do allow for the use of such fiber when requested by the customer; future management will operate similarly. Recycled fiber may be added as a process component if and when: 1) requested by a customer; 2) general demand for a recycled fiber component in the finished product increases; 3) local fiber supplies increase in dependability and quality; and/or 4) local fiber supplies become economically competitive with existing or anticipated fiber sources.

In considering the potential role that could be played by recycled fiber use in future mill operations, it is unlikely that the amounts potentially used would result in a substantial reduction of roundwood use even with favorable market conditions. The EIS does not analyze the use of recycled fiber paper as a pulp source.

Use of agricultural crop residue was also suggested as an alternative to be discussed in the EIS. The use of such fiber sources have not been proven for the manufacturing process proposed under this Project. Continuous research and development efforts are underway with the principal goal of investigating and evaluating alternative fiber sources, including agricultural crop residue. Absent proven technology, the underlying need and purpose of the Project is not met with this alternative.

A comment was also offered regarding demolition and construction waste as a fiber source for papermaking purposes. The use of such fiber sources have not been proven for the manufacturing process proposed for the Project. In addition, it is possible that use of such materials could introduce pollutant/contamination sources not present with the current Project, thus increasing the potential for adverse impacts that would have to be addressed with the Project. Significant environmental benefit would not be gained compared to the Project as proposed. The EIS does not analyze the use of crop residue or construction waste as a fiber source for the proposed Project. Neither of the aforementioned fiber sources are technologically feasible.

3.12.2.3 Forest Management

The DEIS analyzes forest management measures that demonstrate the potential to increase forest productivity and utilization. As recommended in EIS scoping, both adverse and beneficial effects will be examined to ensure that ecological and non-consumptive human use values are considered.

A comment was also received that UPM/Blandin Paper Mill must disclose how its rotation age by tree species or NPC will change the natural growth stage mix of UPM/Blandin-managed lands. The timber harvest section of the DEIS evaluates this issue.

3.12.3 MODIFIED DESIGNS OR LAYOUTS

3.12.3.1 New Paper Machine and On-Site Infrastructure

The DEIS does not intend to evaluate a modified design or layout for PM7 per se because the underlying purpose of the Project will not be met. Alternative layouts would not improve on the balance between Project features, nor provide environmental benefits. The proposed site layout takes advantage of the existing space and infrastructure.

3.12.3.2 Paper Warehouse Options

The DEIS analyzes the potential impacts of three different locations for Project-related paper warehousing. Specific sites have been selected for Warehouse Options 2, 4, and 5; see Figure 1-5, Figure 3-1, Figure 3-2, and Figure 3-11. Warehouse Options 1 and 3 occur within the confines of the mill and have been dropped from consideration by UPM/Blandin Paper Mill. Warehouse Options 2 and 4 are proposed to be located off site but in the immediate project vicinity.

The specific location for Warehouse Option 5 has been identified as the Lake Superior Warehouse Company in Duluth, Minnesota. The facility is an existing warehouse with appropriate roadway connector routes and access to multiple railways and carriers.

Figure 3-10

Aerial Photo Rendition of the Proposed Site and Warehouse Option 2

Figure 3-11
Aerial Photo Rendition of the Proposed Site – Warehouse Option 4 or 5

Regarding Warehouse Option 2, the DNR received comment on the need for discussion of the potential impacts to City of Grand Rapids Blocks 17 and 18, especially as a function of the ongoing Central Business District Study. The EIS evaluated the socioeconomic, traffic, and visual effects of Warehouse Option 2 on Block 17 of the Central Business District.

Comment also provided during EIS scoping requested discussion of how implementation of Warehouse Option 4 may affect Syndicate Park and the Mississippi Melodie Showboat site. The EIS evaluated Warehouse Option 4's effects on Syndicate Park and the showboat landing. It appears that if Warehouse Option 4 is selected, it will acquire Syndicate Park and have little impact on the showboat landing.

During scoping, it was asked whether UPM/Blandin Paper Mill examined alternative locations (other than the Coleraine or Duluth sites) for Warehouse Option 5; a specific location in the Grand Rapids industrial park was noted in the comment. UPM/Blandin Paper Mill examined a series of locations, including other sites in the City of Grand Rapids. No rail access was provided at other potential sites, thus the underlying need for this Project component was not met.

3.12.4 SCALE OR MAGNITUDE ALTERNATIVES

3.12.4.1 Operational Change in Project Scale or Magnitude

The capacity of the proposed new paper machine and associated facilities reflects the efficiencies of production and responds to market conditions. The DEIS evaluates technical, economic, or environmental reasons for reducing the proposed scale of paper production. If DEIS analysis identifies significant environmental impacts that could be significantly reduced through scale modifications, this alternative will be reconsidered.

Comments received during EIS scoping requested consideration of alternative scales for the Project. Specifically, comments mentioned a project that exhibits: 1) annual harvest of 300,000 cords per year (larger scale), or 2) a smaller scale project.

The first would result from operational efficiencies leading to a potential future machine "speedup." UPM/Blandin Paper Mill indicates that a future machine "speedup" is not guaranteed; many past refinements were made as an alternative to investing in a complete new paper machine. All paper machines do not go through "speedups" and it would be impossible to speculate on any future project that would result in an increased fiber throughput or machine capacity for PM7. The machine rating that has been offered is the maximum specification that may or may not be immediately realized. Future improvements typically would be focused on reduced waste or improved efficiency to reach design capacity. These may not necessarily result in an increase in raw material inputs. The RGU is to consider reasonable alternatives to the proposed Project according to the EQB Rules. It is unlikely that the Project will consume an additional 100,000 cords per (e.g., total 300,000 cords) year in addition to the proposed wood use.

It is also noted that the Project assumes all wood used by the Project is sourced from Minnesota forests (e.g., no imports). This is *de facto* consideration of a 27 percent increased raw material (e.g., wood pulp sourced from roundwood) throughput with the Project.

Regarding the latter, the PM7 design specifications were developed with the "best available" estimate of needed capacity for predicted market conditions at Project completion as well as UPM/Blandin Paper Mill's experience with successful past projects. The paper machine's specifications are based on the existing infrastructure to support the manufacturing process and the introduction of appropriate proven processes and equipment. The investment would not be justified for a smaller paper machine and future potential capacity upgrades would not be cost effective or timely in the specified product market. It is not feasible for UPM/Blandin Paper Mill to implement a smaller scale project because the underlying need or purpose of the Project would not be met.

The comment is correct, however, that economic considerations alone shall preclude the consideration of reasonable Project alternatives in an EIS. It is further noted that because UPM/Blandin Paper Mill procures wood from its own lands or on the open market, examination of a smaller-scaled project has limited application because normal demand fluctuations in state-wide timber harvest can reasonably account for the difference between the proposed Project and a hypothetically smaller project. This is further complicated by the increasing role being played by roundwood imports for the Minnesota-based pulp and paper industry. Examination of a smaller project *per se* does not necessarily translate into significant environmental benefit over the proposed Project given the dynamic nature of timber markets.

RGUs are to weigh the importance of the impact and the relevance of information in making reasoned choices among alternatives and considering mitigation measures. RGUs are also to consider the relationship between the cost of data and analyses and the relevance and importance of the information and level of detail to be prepared for the EIS. DNR has determined greater value is attained in the DEIS by evaluating the Project as if all wood were procured in Minnesota (e.g., no imports), which examines the maximum Project impact to Minnesota forest resources. Because the Project will in actuality use less wood than is actually being assessed, significant environmental benefit is not gained by examining a lower wood use scenario as proposed in the comment.

3.12.4.2 Statewide Timber Harvest Levels

The evaluation of cumulative timber harvesting/forest management effects in Section 5 of the DEIS considers the statewide level of timber harvest projected in the Generic Environmental Impact Statement (GEIS) Base Harvest Scenario and the most recent available data. Specifically:

- The GEIS Base Harvest Scenario projected a statewide timber harvest level of 4.0 million cords per year, which was the 1990 level.
- The No-Build Alternative will be based on the most recent available data on the level of statewide timber harvest. The most recent data is for the year ending in 2001. Total wood harvested that year was 3.675 million cords.
- The proposed Project will be based on the assumption that all of the projected increase in wood use is from timber harvested in Minnesota (i.e., no imports). This is considered a conservative scenario and would have the greatest impact on Minnesota forests statewide. The amount for this alternative is the sum of total wood harvested in 2001 and the Project-related increase of 197,000 cords per year. The value for this alternative statewide is 3.872 million cords per year.

Comments received during EIS scoping requested that the DEIS evaluate the Project relative to the GEIS Medium Harvest Scenario (4.0 million cords annually) harvest level, which better describes what will be occurring over the next 20 years. In terms of the recommendation, recent history suggests that the rate of statewide timber harvest has remained relatively constant; over the period 1995 to 2002 total wood harvest in Minnesota from timberland was as high as 3.82 million cords (1999) and as low as 3.56 million cords (2001). This harvest level trend is expected to be sustained for the foreseeable future and is more closely related to the GEIS Base Harvest Scenario than the GEIS Medium Harvest Scenario. The rate of statewide harvest projected under the GEIS Medium Harvest Scenario has not been realized. Examination of the Project against the GEIS Medium Harvest Scenario will not yield a significant comparison between the proposed Project and existing conditions. As it will if compared to the GEIS Base Harvest Scenario, rules provide that the EIS shall compare the potentially significant impacts of other reasonable alternatives to the proposed Project.

3.12.5 SITE ALTERNATIVES

The EQB rules allow the RGU to exclude alternative sites if other sites do not have any significant environmental benefit compared to the proposed project, or if other sites do not meet the underlying need and purpose of the project. The Minnesota EQB’s Guide to Minnesota Environmental Review Rules lists a number of factors for the RGU to consider when deciding whether alternative sites would meet the underlying need for or purpose of the project.

No alternative sites will be evaluated for this Project. The site is an integral part of the Project as paper has been milled at the location for 103 years. UPM/Blandin Paper Mill was originally incorporated as the Itasca Paper Company and has owned the site since 1901. Renamed the Blandin Paper Company in 1929, UPM/Blandin Paper Mill is a subsidiary of UPM-Kymmene North America since 1997. Alternative sites would not meet the underlying need or purpose of the Project. Use of alternative sites would result in inefficient utilization of existing infrastructure.

Comment received during EIS scoping requested that the DEIS consider an alternative site regarding the Clay-Boswell Power Plant. UPM/Blandin Paper Mill reported that alternative sites were considered for the proposed Project, but these were eliminated based on logistics, available infrastructure, and ownership-related factors, all of which substantially increased Project-related costs.

Regarding consideration of the Clay-Boswell Power Plant, the facility is not for sale, thus precluding any option for UPM/Blandin Paper Mill to establish operations within the existing power plant's development footprint. The recommendation to relocate paper making operations adjacent to the power plant, if a site were available for purchase, would represent a significantly increased scale of development than that proposed with the Project. The development associated with the proposed Project *per se* is relatively narrow, focused on the installation of the TMP and the paper machine itself. Development of an entirely new mill operation (such as the Clay-Boswell Power Plant) would have a much greater development footprint than what is proposed with the Project, with an associated increase in potentially adverse effects. Significant environmental benefit is not gained in locating the Project at, or adjacent to, the Clay-Boswell Power Plant.

In considering site alternatives, the continued use of the current site, with its history and existing infrastructure, is justified beyond economic reasons. When considering alternative sites under the criteria offered in the EQB rules, consideration of the proposed site would not meet the underlying need or purpose of the Project, nor would significant environmental benefit be gained over the proposed Project.

3.12.6 MITIGATION MEASURES

The EIS analysis of potential effects of the proposed mill facilities and improvements considers reasonable mitigation measures to reduce any potentially significant adverse impacts.

Section 5 of the DEIS discusses mitigation measures of the cumulative statewide timber harvest effects. The DEIS evaluates the potential use of alternative wood fiber sources other than aspen, spruce, and balsam. The evaluation includes how future forest management in Minnesota may affect species availability for use with the Project, which was recommended during EIS scoping. Use of alternative wood species is a potential mitigation measure in balancing the age class and cover type structure of the state's forest resource.

Section 5 of the DEIS analyzes forest management measures that demonstrate potential to increase forest productivity and utilization. As recommended in EIS scoping, both adverse and beneficial effects will be examined to ensure that ecological and non-consumptive human use values are considered. These site-level responses, which take the form of harvesting practices and equipment, are a potential mitigation measure that can be used to mitigate the significant impacts of statewide timber harvest.

Section 5 of the DEIS assesses the sustainability of projected harvest levels for the Build Alternative in terms of the implementation of the GEIS Strategic Programmatic Responses, which is accomplished through the programs authorized by the Minnesota Sustainable Forest Resources Act (SFRA; Minn. Stat.

Chapter 89A). The complement of programmatic mitigations are designed to mitigate the significant impacts of statewide timber harvest.

Section 5 of the DEIS assesses measures being implemented by UPM/Blandin Paper Mill on its ownerships or through its open-market purchases. These voluntary actions undertaken by UPM/Blandin Paper Mill have the potential to mitigate the significant impacts of statewide timber harvest.

Minnesota Rules Part 4410.2300, subpart G directs that the RGU is to consider comments regarding reasonable mitigation measures offered on the proposed scope *or* the DEIS. Consistent with the rule, and as previously noted, the DEIS will discuss mitigation specific to the Project under the Build Alternative, including the GEIS's recommended programmatic measures as implemented under the Minnesota SFRA, and measures being implemented by UPM/Blandin Paper on its ownerships or through its open-market purchases; see Final Scoping Decision Section 3.4.3.3. Also consistent with the rule, all of the mitigation measures proposed in the comment will be discussed in the DEIS. The DEIS will recommend incorporation of additional reasonable measures based on the result of the DEIS analysis and any additional comment provided on the DEIS.

Comments received during EIS scoping requested that the DEIS consider an alternative imposing binding procurement policies on UPM/Blandin Paper Mill with its wood suppliers. The commenter suggests a mechanism to implement the measures specifically that "Blandin and any future owner of the mill maintain and enforce binding procurement policies with its wood suppliers." Such a mechanism is appropriate and available for UPM/Blandin Paper Mill to implement under the state's voluntary approach to mitigating the significant cumulative environmental effects of statewide timber harvest. This is considered in the DEIS's analysis of mitigation measures being implemented by UPM/Blandin Paper through its open market purchases.

CHAPTER 4.0
POTENTIALLY SIGNIFICANT IMPACTS REQUIRING DETAILED ANALYSIS

4.1 TRAFFIC AND TRANSPORTATION

4.1.1 EXISTING CONDITIONS

The roadway network that surrounds UPM/Blandin Paper Mill generally consists of streets that intersect each other at 90 degree angles to form a grid of signalized intersections within Grand Rapids. There are two main highways, Trunk Highway (TH) 2 and TH 169 that intersect approximately two blocks northeast of the UPM/Blandin Paper Mill campus; see Figure 4-1. These two highways are vital to UPM/Blandin Paper Mill operations, as employees and trucks traveling to/from the existing campus use them on a daily basis.

4.1.1.1 Study Area Intersections

Based on discussions with the Minnesota Department of Transportation (Mn/DOT), the City of Grand Rapids, Blandin Paper Company and consultation of the scoping EAW, 11 intersections were identified as susceptible to impacts of changes with PM7; see Figure 4-1. Table 4-1 documents each of the study area intersections and the existing traffic control that was used for the operational analysis. A site visit was made to each study area intersection to collect lane configuration and signal phasing information as well as to observe existing traffic operations. The existing signal timing information for the study area intersections was obtained from Mn/DOT District One in Duluth.

Table 4-1
Study Area Intersections

Study Intersection	Traffic Control
TH 169 and First Street S	Signalized
TH 169 and Second Street NW	Signalized
TH 169 and Third Street NW	Signalized
TH 169 and TH 2/Pokegama Avenue NE	Signalized
TH 2/First Avenue NE	Signalized
TH 2 and TH 169/Sixth Avenue NE	Signalized
TH 2/First Avenue NW	Signalized
TH 2/Second Avenue NW	Signalized
TH 2 and TH 38/Third Avenue NW	Signalized
TH 2/12th Avenue NW	Unsignalized
TH 2/18th Avenue NW	Unsignalized

Source: HDR Engineering, Inc. verified by Mn/DOT, City of Grand Rapids, and UPM/Blandin Paper

Figure 4-1
Intersections and Railroad Crossings Evaluated

4.1.1.2 Existing Traffic Volumes

Daily Volumes

UPM/Blandin Paper Mill generates two main types of vehicular traffic from the existing campus:

1. **Employees working at the site** – Employees generate the highest number of trips to/from the existing site. There are approximately 494 employees currently working on the UPM/Blandin Paper Mill campus during an average weekday. The employees work various shifts depending on whether they are hourly or salary positions. It has been estimated, based on the various start and finish times of the shifts, that approximately 300 vehicles travel along the existing roadway network to/from work on an average weekday[2]. The actual study area intersections that employees travel through depends on where in the plant they work and the location of the various parking lots within or adjacent to the site; see Figure 4-1. Table 4-2 depicts the estimated daily vehicular trips for both the weekday and weekend at the UPM/Blandin Paper Mill.

2. **Truck traffic traveling to/from the site** – Raw materials and finished products shipped to/from the UPM/Blandin Paper Mill via trucks use the surrounding roadway network. The trucks destined to/from the mill access different roadways based on where the raw material is required within the overall layout of the site. Table 4-2 depicts the existing daily average truck traffic that is generated based on the current production rates. Each of the trips made to/from the site travel through the intersections described above based on the particular material that is being delivered or picked up.

Table 4-2
Distribution of Daily Vehicular Traffic Serving UPM/Blandin Paper Mill
(baseline scenario)

Current Conditions	On-Site Warehouse		Off-Site Warehouses	
	Average Daily Vehicular Traffic		Average Daily Vehicular Traffic	
PM5 & PM6	Monday-Friday	Saturday-Sunday	Monday-Friday	Saturday-Sunday
Employees	300	150	300	150
Paper Shipments	9	9	9	9
Kraft Pulp	4	4	14	14
Other Raw Material and Misc.	9	1	na	na
Pigments	0	0	0	0
Pulpwood	38	0	38	0

Source: UPM/Blandin Paper

[2] This is approximately 75 percent of the actual total employees, because all employees are not present during any particular day.

Peak Hour Volumes

Based on discussions with Mn/DOT's traffic engineering staff and verification with existing traffic volume counts, the P.M. peak hour was selected for purposes of determining the potential traffic impacts due to increases in vehicular and truck traffic through the study area intersections. Turning movement volumes were collected at each of the study area intersections by Traffic Data, Inc. (TDI) from 3:00 p.m. to 6:00 p.m. on June 22, 2005. The intersection of TH 2 and TH 38/Third Street NW was not counted in 2005, as it already had recent data collected by Mn/DOT District One on December 17, 2003. Using the recent counts, it was determined that the P.M. peak hour at the intersections generally occurred from 4:15 p.m. to 5:15 p.m. The turning movement count at the TH 2 and TH 38/Third Avenue NW intersection was adjusted based on the recent turning movement counts along TH 2. Table 4-3 depicts the year 2005 P.M. peak hour volumes that were used for purposes of this analysis.

Table 4-3
2005 P.M. Peak Hour Intersection Volumes

Study Intersection	2005 P.M. Peak Hour											
	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
TH 169 & First Street S	48	14	2	267	15	126	4	1015	148	133	1004	24
2. TH 169 & NW Second Street	3	7	79	137	8	14	72	930	244	14	928	18
3. TH 169 & NW Third Street	2	19	62	31	25	20	35	882	19	6	832	16
4. TH 169 & TH 2/ Pokegama Ave.	11	483	318	211	437	15	350	352	224	28	322	3
5. TH 2 & NE First Avenue	20	745	22	59	699	17	29	36	112	17	25	10
6. TH 2 & NE Sixth Avenue/TH 169	10	569	245	15	516	19	207	107	21	27	118	7
7. TH 2 & NW First Avenue	20	759	21	13	737	41	25	40	27	33	40	28
8. TH 2 & NW Second Avenue		776	57	30	777		54		24			
9. TH 2 & NW Third Avenue/TH 38	21	683	20	21	771	14	11	10	25	9	4	25
10. TH 2 & NW 12th Avenue	11	731	4	12	725	22	0	0	16	2	1	11
11. TH 2 & NW 18th Avenue		709	1	9	734		1		22			

Source: Traffic Data, Inc. except for (9) collected by Mn/DOT

4.1.1.3 Existing Traffic Operations

Observations of traffic volumes provide an understanding of the general nature of traffic, but are insufficient to indicate either the ability of the street network to carry additional traffic or the quality of service provided by the street system. For this reason the concept of level of service (LOS) has been developed to correlate numerical traffic data to subjective descriptions of traffic performance at intersections. Similar to an academic report card, LOS "A" represents high-quality operations where motorists experience little or no delay at each intersection. Conversely, LOS "F" represents over-saturated conditions where motorists experience long delays and congestion. The thresholds for each LOS letter grade are standards of the Highway Capacity Manual and are the same in major cities and rural areas. The LOS thresholds are documented in Table 4-4.

Table 4-4
Level of Service Description

Intersections		Average Stopped Delay (seconds per vehicle)	
		Signalized Intersections	Unsignalized Intersections
A	Most vehicles do not stop	≤ 10	≤ 10
B	Some vehicles stop, slightly below LOS A	> 10 and ≤ 20	> 10 and ≤ 15
C	Significant number of stops, some do not stop	> 20 and ≤ 35	> 15 and ≤ 25
D	Many stop, individual cycle failure	> 35 and ≤ 55	> 25 and ≤ 35
E	Frequent individual cycle failure: at capacity	> 55 and ≤ 80	> 35 and ≤ 50
F	Arrival rate exceeds capacity	> 80	> 50

Source: Highway Capacity Manual (2000)

Although the LOS criteria are the same for every intersection in the United States, the acceptable "index of congestion" can be set by any local or state roadway authority. For example, in the Minneapolis area, LOS D is considered acceptable, whereas rural highway intersections may use LOS B as the index of congestion. In regional centers like Grand Rapids, LOS C is typically considered the lowest acceptable level of service.

The traffic engineering software Synchro®[3] was used for purposes of determining the average intersection delay and LOS for each of the study area intersections. All of the data collected was coded into Synchro® to determine the existing conditions at each of the study area intersections.

Table 4-5 depicts the average intersection delay and level of service for the overall study area intersections as well as for each individual lane group.

[3] Synchro® is Mn/DOT's preferred intersection capacity model and is based on the methodologies of the *Highway Capacity Manual*. Synchro® is trademarked by Trafficware.

Table 4-5
Average Intersection Delay and Level of Service (Existing Condition)

Study Intersection	2005 P.M. Peak Hour												Overall Intersection
	Eastbound			Westbound			Northbound			Southbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
1. TH 169 & First Street S		47.7/D			157.5/F	37.0/D	8.9/A	15.3/B		19.5/B	7.2/A		29.6/C
2. TH 169 & NW Second St.	41.0/D	41.1/D	41.5/D	56.3/E	41.2/D		2.0/A	5.6/A		6.1/A	8.2/A	4.7/A	11.4/B
3. TH 169 & NW Third St.		50.4/D	49.4/D		57.5/E		1.1/A	1.4/A		1.9/A	4.0/A		7.6/A
4. TH 169 & TH 2/ Pokegama Ave.	12.7/B	15.7/B		77.7/E	20.7/C		31.0/C	25.2/C	24.8/C	32.9/C	44.1/D		28.9/C
5. TH 2 & NE First Ave.	4.6/A	5.8/A		5.0/A	4.9/A			43.2/D		38.3/D			9.9/A
6. TH 2 & NE Sixth Ave./ TH 169		18.8/B	19.3/B		14.3/B		31.4/C	26.5/C		45.7/D	51.2/D		22.4/C
7. TH 2 & NW First Ave.	4.8/A	6.1/A		2.7/A	2.8/A			39.6/D	36.4/D		41.1/D	36.6/D	8.9/A
8. TH 2 & NW Second Ave.		6.3/A		6.9/A	8.5/A		38.4/D	36.3/D					9.0/A
9. TH 2 & NW Third Ave./ TH 38	6.6/A	7.0/A			8.1/A			37.9/D		36.7/D	36.5/D		9.7/A
10. TH 2 & NW 12th Ave.		0.2/A			0.3/A			11.5/B			18.9/C		0.7/A
11. TH 2 & NW 18th Avenue		0.2/A			0.2/A			12.5/B					0.4/A

Source: HDR Engineering, Inc.

Notes: 1. Intersections 10 and 11 are unsignalized.

2. Delay and LOS results for signalized intersections are based upon exclusive lanes along each approach.

3. Delay and LOS results for unsignalized intersections are based upon the overall approach.

The following observations can be made regarding the existing quality of traffic operations in the study area around Grand Rapids:

- Each overall intersection operates at LOS C or better, indicating operations that are typically considered acceptable on a weekday basis. This may not necessarily be the case for Fridays, holidays, or other times when recreational traffic increases above typical weekday conditions.
- TH 2 through traffic operates at LOS C or better and TH 169 through traffic operates at LOS B or better. This is consistent with Mn/DOT's signal timing policies to promote mobility for the highest traffic volume (mainline) to reduce delays for the greatest number of road users.
- Every signalized intersection has at least one traffic movement that operates at deficient levels (LOS D or worse). This outcome is expected based on Mn/DOT's goal to reduce delays for the greatest number of road users (i.e., lower volume movements are subjected to higher delays). Some of the highest delay movements include:
  - First Street S westbound through traffic at TH 169 operates at LOS F
  - Second Street NW westbound left turn traffic at TH 169 operates at LOS E
  - Third Street NW westbound through traffic at TH 169 operates at LOS E

4.1.2 TRAFFIC IMPACTS

4.1.2.1 Methodology and Assumptions

As documented, the P.M. peak hour was selected for determining the operational impacts associated with the increased traffic to/from the UPM/Blandin Paper Mill site. UPM/Blandin Paper Mill provided the expected increase in both daily employee and truck related trips to/from the site. For purposes of this report, an estimate of trips during the P.M. peak hour was calculated based on the overall increase in daily trips.

4.1.2.2 No-Build Alternative

For the No-Build Alternative, no changes are anticipated to vehicle traffic volume unless PM5 were closed. If PM5 were closed, employees associated with operating this machine and the associated raw materials and finished product would not be transported on the public street system. In this case, the public would realize a nominal benefit in terms of reduced delays.

4.1.2.3 Build Alternatives

Table 4-6 depicts the daily trips for the existing conditions as well as for the three warehouse options that were analyzed. The daily trips associated with a particular option were divided into the general direction that they would be traveling along the existing roadway network. The increase in trucks during the P.M. peak hour was then estimated by determining the increase from existing conditions based on a typical 12-hour shift. The overall daily increase in trucks was divided to obtain an hourly increase that was then assigned to the general direction of travel within the study area. A minimum of one truck was added to the existing P.M. peak hour volumes for analysis purposes only (to account for potential minor variations in volume).

Table 4-6
Summary of Daily and P.M. Peak Hour Trips by Cargo and Direction

Paper Mill Logistics	Scenario	Monday thru Friday: Summary of Daily Trips					Monday thru Friday: Trips Added to Existing PM Peak Hour				
		East	West	North	South	Total	East	West	North	South	Total
Employee Vehicles (hourly shift & salaried employes)	Existing	75	75	75	75	300	--	--	--	--	--
	Option 2	79	79	79	79	316	4	4	4	4	16
	Option 4	79	79	79	79	316	4	4	4	4	16
	Duluth	79	79	79	79	316	4	4	4	4	16
Paper Shipments	Existing	7	0	0	2	9	--	--	--	--	--
	Option 2	15	0	0	4	19	1	0	0	1	2
	Option 4	15	0	0	4	19	1	0	0	1	2
	Duluth	59	0	0	10	69	7	0	0	1	8
Kraft Pulp	Existing	0	0	0	4	4	--	--	--	--	--
	Option 2	0	0	0	6	6	0	0	0	1	1
	Option 4	0	0	0	6	6	0	0	0	1	1
	Duluth	22	0	0	0	22	3	0	0	0	3
Other Raw Materials	Existing	5	0	2	2	9	--	--	--	--	--
	Option 2	10	1	4	3	18	1	1	1	1	4
	Option 4	10	1	4	3	18	1	1	1	1	4
	Duluth	10	1	4	3	18	1	1	1	1	4
Pigments	Existing	0	0	0	0	0	--	--	--	--	--
	Option 2	0	0	0	0	0	0	0	0	0	0
	Option 4	0	0	0	0	0	0	0	0	0	0
	Duluth	0	0	0	0	0	0	0	0	0	0
Pulpwood	Existing	13	13	6	6	38	--	--	--	--	--
	Option 2	29	29	15	15	88	2	2	2	2	8
	Option 4	29	29	15	15	88	2	2	2	2	8
	Duluth	29	29	15	15	88	2	2	2	2	8
Total Employees(vehicles)	Existing	75	75	75	75	300	--	--	--	--	--
	Option 2	79	79	79	79	316	4	4	4	4	16
	Option 4	79	79	79	79	316	4	4	4	4	16
	Duluth	79	79	79	79	316	4	4	4	4	16
Total Operations (trucks)	Existing	25	13	8	14	60	--	--	--	--	--
	Option 2	54	30	19	28	131	4	3	3	5	15
	Option 4	54	30	19	28	131	4	3	3	5	15
	Duluth	120	30	19	28	197	12	3	3	4	22

Source: UPM/Blandin Paper

Notes: 1. The analysis assumes that employees travel via automobile. All other operations travel via trucks.
2. Trips during P.M. Peak Hour were generated based on an average eight hour shit with trucks arriving evenly through the shift.

In general, an increase of 16 vehicles during the P.M. peak hour is expected based on the increase of employees working at the site. An increase in truck traffic to/from the site varies depending on the various warehouse options. An increase by approximately 71 trucks on a daily basis was estimated for Warehouse Options 2 and 4, while an increase of approximately 137 trucks was estimated for Warehouse

Option 5. The increase during the P.M. peak hour was then estimated and assigned to the various intersections based on the directions of travel to/from the site. Table 4-7 depicts the intersection volumes for Warehouse Options 2 and 4 and Warehouse Option 5 in Duluth.

Table 4-7
Intersection Turning Movement Volumes for Each Option

Option	2005 P.M. Peak Hour											
	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
TH 169 (Pokegama Avenue) / South 1st Street												
Existing P.M. Peak Hour	48	14	2	267	15	126	4	1015	148	133	1004	24
Warehouse Option 2	48	14	3	267	15	126	5	1020	148	133	1005	24
Warehouse Option 4	48	14	3	267	15	126	5	1020	148	133	1005	24
Warehouse Option 5	48	14	3	267	15	126	5	1019	148	133	1006	24
TH 169 (Pokegama Avenue) / North 2nd Street												
Existing P.M. Peak Hour	3	7	79	137	8	14	72	930	244	14	928	18
Warehouse Option 2	23	7	142	17	8	14	108	899	244	14	928	49
Warehouse Option 4	4	7	80	137	8	14	73	934	244	14	928	18
Warehouse Option 5	3	7	80	137	8	14	73.0	934	244	14	929	18
TH 169 (Pokegama Avenue) / North 3rd Street												
Existing P.M. Peak Hour	2	19	62	31	25	20	35	882	19	6	832	16
Warehouse Option 2				56		20		887	19	6	838	
Warehouse Option 4	4	19	62	31	25	20	35	887	19	6	832	18
Warehouse Option 5	4	19	62	31.0	25	20.0	35	886	19	6	833	18
TH 169 (Pokegama Avenue) / TH 2 (North 4th Street)												
Existing P.M. Peak Hour	11	483	318	211	437	15	350	352	224	28	322	3
Warehouse Option 2	15	485	318	211	442	15	354	350	225	28	312	17
Warehouse Option 4	11	485	318	211	442	15	354	354	225	28	324	5
Warehouse Option 5	11	492	318	211	445	15	353	354	225	28	324	5
TH 2 (Northeast 4th Street) / Northeast 1st Avenue												
Existing P.M. Peak Hour	20	745	22	59	699	17	29	36	112	17	25	10
Warehouse Option 2	20	748	22	59	704	17	29	36	112	17	25	10
Warehouse Option 4	20	748	22	59	704	17	29	36	112	17	25	10
Warehouse Option 5	20	755	22	59	707	17	29	36	112	17	25	10
TH 2 / TH 169 (East Junction)												
Existing P.M. Peak Hour	10	569	245	15	516	19	207	107	21	27	118	7
Warehouse Option 2	10	570	247	15	521	19	207	107	21	27	118	7
Warehouse Option 4	10	570	247	15	521	19	207	107	21	27	118	7
Duluth Warehouse Option	10	570	254	15	521	19	210	107	21	27	118	7
TH 2 (Northwest 4th Street) / Northwest 1st Avenue												
Existing P.M. Peak Hour	20	759	21	13	737	41	25	40	27	33	40	28
Warehouse Option 2	20	759	21	27	746	41	25	40	33	33	40	28
Warehouse Option 4	20	759	21	15	746	41	25	40	29	33	40	28
Warehouse Option 5	20	767	21	15	748	41	25	40	29	33	40	28

Option	2005 P.M. Peak Hour											
	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
TH 2 (Northwest Fourth Street) / Northwest Second Avenue												
Existing P.M. Peak Hour		776	57	30	777		54		24			
Warehouse Option 2		776	60	35	781		56		24			
Warehouse Option 4		776	60	35	783		56		24			
Warehouse Option 5		776	60	35	783		56		32			
TH 2 (Northwest Fourth Street) / TH 38 (Northwest Third Avenue)												
Existing P.M. Peak Hour	21	683	20	21	771	14	11	10	25	9	4	25
Warehouse Option 2	21	685	20	21	777	14	11	10	25	10	4	25
Warehouse Option 4	21	685	20	21	777	14	11	10	25	10	4	25
Warehouse Option 5	21	685	20	21	779	14	11	10	25	10	4	25
TH 2 (Northwest Fourth Street) / 12th Avenue Northwest												
Existing P.M. Peak Hour	11	731	4	12	725	22	0	0	16	2	1	11
Warehouse Option 2	11	733	7	16	727	22	0	0	15	2	1	11
Warehouse Option 4	11	733	7	16	727	22	0	0	16	2	1	11
Warehouse Option 5	11	733	7	18	727	22	0	0	16	2	1	11
TH 2 (Northwest Fourth Street) / 18th Avenue Northwest												
Existing P.M. Peak Hour		709	1	9	734		1		22			
Warehouse Option 2		714	1	9	736		1		22			
Warehouse Option 4		714	1	9	736		1		22			
Warehouse Option 5		714	1	9	736		1		22			

Source: HDR Engineering, Inc. based on information from UPM/Blandin Paper

4.1.2.4 Delay Impacts

A traffic operational analysis was then conducted using the volumes depicted in Table 4-7. Two new Synchro® networks were coded based on the volume and truck increases associated with the various options. Table 4-8 depicts the associated average intersection delay for all of the options analyzed for this study.

<u>No-Build Alternative</u>

The No-Build Alternative resulting in no shut down of PM5 would be equivalent to the existing P.M. peak hour delay documented. If PM5 were closed, nominal decreases in delay would be expected at each studied intersection.

<u>Warehouse Option 2</u>

The closure of NW Third Street west of TH 169 is expected to decrease delay at the intersection of TH 169 (Pokegama Avenue) and Third Street by approximately 3.0 seconds per vehicle due to the revised "T" configuration of this intersection. However, these delays would be offset by the system as a result of delays increasing by approximately 3.0 seconds per vehicle at adjacent intersection(s). Therefore, the system benefits of vacating NW Third Street as a result of Warehouse Option 2 are offset by the impacts at adjacent intersections.

Table 4-8
Average Intersection Delay for Each Option

Study Intersection	Scenario	2005 PM Peak Hour												
		Eastbound			Westbound			Northbound			Southbound			Overall Intersection
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
1. TH 169 & 1st Street S	*Existing PM Peak Hour*		47.7/D			157.5/F	37.0/D	8.9/A	15.3/B		19.5/B	7.2/A		29.6/C
	Warehouse Options 2		48.7/D			160.9/F	37.0/D	8.9/A	15.5/B		22.9/C	6.4/A		29.8/C
	Warehouse Options 4		48.7/D			160.9/F	37.0/D	8.9/A	15.5/B		22.9/C	6.4/A		29.8/C
	Duluth Warehouse Option		48.7/D			160.9/F	37.0/D	8.9/A	15.5/B		22.5/C	6.4/A		29.8/C
2. TH 169 & NW 2nd Street	*Existing PM Peak Hour*	41.0/D	41.1/D	41.5/D	56.3/E	41.2/D		2.0/A	5.6/A		6.1/A	8.2/A	4.7/A	11.4/B
	Warehouse Option 2	42.5/D	41.2/D	42.1/D	56.9/E	41.3/D		4.3/A	4.1/A		6.8/A	16.1/B	8.8/A	14.8/B
	Warehouse Options 4	41.1/D	41.1/D	41.5/D	56.3/E	41.2/D		2.0/A	5.6/A		6.4/A	8.4/A	4.9/A	11.5/B
	Duluth Warehouse Option	41.0/D	41.1/D	41.5/D	56.3/E	41.2/D		2.0/A	5.6/A		6.4/A	8.5/A	4.9/A	11.5/B
3. TH 169 & NW 3rd Street	*Existing PM Peak Hour*		50.4/D	49.4/D		57.5/E		1.1/A	1.4/A		1.9/A	4.0/A		7.6/A
	Warehouse Option 2					53.1/D			2.1/A		3.6/A	4.2/A		4.7/A
	Warehouse Options 4		50.7/D	49.3/D		57.0/E		1.1/A	1.4/A		1.9/A	4.0/A		7.7/A
	Duluth Warehouse Option		50.7/D	49.3/D		57.0/E		1.1/A	1.4/A		1.9/A	4.1/A		7.7/A
4. TH 169 & TH 2/Pokegama Ave.	*Existing PM Peak Hour*	12.7/B	15.7/B		77.7/E	20.7/C		31.0/C	25.2/C	24.8/C	32.9/C	44.1/D		28.9/C
	Warehouse Options 2	12.8/B	15.9/B		78.7/E	21.1/C		36.2/C	29.9/C	41.4/D	32.9/C	44.6/D		31.7/C
	Warehouse Options 4	12.7/B	15.9/B		78.7/E	21.1/C		34.5/C	25.5/C	24.5/C	32.9/C	44.4/D		29.5/C
	Duluth Warehouse Option	12.8/B	16.2/B		81.2/F	21.4/C		33.2/C	25.5/C	24.5/C	32.9/C	44.4/D		29.7/C
5. TH 2 & NE 1st Avenue	*Existing PM Peak Hour*	4.6/A	5.8/A		5.0/A	4.9/A			43.2/D		38.3/D			9.9/A
	Warehouse Options 2	4.7/A	5.9/A		5.0/A	5.0/A			43.2/D		38.3/D			9.9/A
	Warehouse Options 4	4.5/A	5.8/A		5.0/A	5.0/A			43.2/D		38.3/D			9.9/A
	Duluth Warehouse Option	4.5/A	5.8/A		5.0/A	5.0/A			43.2/D		38.3/D			9.9/A
6. TH 2 & NE 6th Avenue/TH 169	*Existing PM Peak Hour*		18.8/B	19.3/B		14.3/B		31.4/C	26.5/C		45.7/D	51.2/D		22.4/C
	Warehouse Options 2		19.8/B	20.5/C		14.5/B		31.4/C	26.5/C		45.7/D	51.2/D		22.9/C
	Warehouse Options 4		19.8/B	20.5/C		14.5/B		31.4/C	26.5/C		45.7/D	51.2/D		22.9/C
	Duluth Warehouse Option		20.0/B	20.9/C		14.6/B		31.3/C	26.3/C		45.7/D	51.2/D		23.0/C
7. TH 2 & NW 1st Avenue	*Existing PM Peak Hour*	4.8/A	6.1/A		2.7/A	2.8/A			39.6/D	36.4/D		41.1/D	36.6/D	8.9/A
	Warehouse Options 2	4.8/A	6.1/A		3.2/A	3.3/A			39.6/D	36.5/D		41.1/D	36.6/D	9.1/A
	Warehouse Options 4	4.8/A	6.1/A		3.2/A	3.3/A			39.6/D	36.5/D		41.1/D	36.6/D	9.1/A
	Duluth Warehouse Option	4.8/A	6.2/A		3.2/A	3.3/A			39.6/D	36.5/D		41.1/D	36.6/D	9.1/A
8. TH 2 & NW 2nd Avenue	*Existing PM Peak Hour*		6.3/A		6.9/A	8.5/A		38.4/D	36.3/D					9.0/A
	Warehouse Options 2		6.3/A		7.0/A	8.5/A		38.5/D	36.3/D					9.0/A
	Warehouse Options 4		6.3/A		7.0/A	8.5/A		38.5/D	36.3/D					9.0/A
	Duluth Warehouse Option		6.3/A		7.0/A	8.6/A		38.5/D	36.5/D					9.0/A
9. TH 2 & NW 3rd Avenue/TH 38	*Existing PM Peak Hour*	6.6/A	7.0/A			8.1/A			37.9/D		36.7/D	36.5/D		9.7/A
	Warehouse Options 2	6.6/A	7.0/A			8.2/A			37.9/D		36.8/D	36.5/D		9.8/A
	Warehouse Options 4	6.6/A	7.0/A			8.2/A			37.9/D		36.8/D	36.5/D		9.8/A
	Duluth Warehouse Option	6.6/A	7.0/A			8.2/A			37.9/D		36.8/D	36.5/D		9.8/A
10. TH 2 & NW 12th Avenue	*Existing PM Peak Hour*		0.2/A			0.3/A			11.5/B			18.9/C		0.7/A
	Warehouse Options 2		0.2/A			0.4/A			11.5/B			19.2/C		0.7/A
	Warehouse Options 4		0.2/A			0.4/A			11.5/B			19.2/C		0.7/A
	Duluth Warehouse Option		0.2/A			0.5/A			11.5/B			19.3/C		0.8/A
11. TH 2 & NW 18th Avenue	*Existing PM Peak Hour*		0.0/A			0.2/A			12.5/B					0.4/A
	Warehouse Options 2		0.0/A			0.2/A			12.6/B					0.4/A
	Warehouse Options 4		0.0/A			0.2/A			12.6/B					0.4/A
	Duluth Warehouse Option		0.0/A			0.2/A			12.6/B					0.4/A

Notes: 1. Intersections 10 and 11 are unsignalized.

2. Delay and LOS results for signalized intersections are based upon exclusive lanes along each approach.

3. Delay and LOS results for unsignalized intersections are based upon the overall approach.

Warehouse Option 4

This warehouse option would result in system delays all less than 5.0 seconds per vehicle on any single movement, with overall intersection delay impacts of generally less than 1.0 second per vehicle when compared to the existing conditions. One intersection movement drops a LOS letter grade; the eastbound right turn at the east junction of TH 2 and TH 169 (NE Fourth Street and NE Sixth Avenue). This movement is expected to experience an increase of 1.2 seconds per vehicle and drop from LOS B to LOS C.

Warehouse Option 5

Similar to Warehouse Options 2 and 4, the system impacts from this option are generally minor, although more perceptible than the on-site options. Multiple approaches change LOS letter grade, although the overall intersection delays are still approximately 1.0 second per vehicle. A few movements slipped one letter grade as follows:

- TH 169 / TH 2 (west) – WB left – LOS E to F
- TH 169/First Street South – SB left – LOS B to C

Summary

The traffic operations analysis resulted in identification of increases in average intersection delays throughout the study area. However, each of the study area intersections is expected to remain at LOS C or better. Increases to various lane group delays were noted, generally less than five seconds per vehicle. In general, Warehouse Option 5 had higher delay values due to the higher number of trucks traveling to/from the site.

4.1.2.5 Economic Assessment of Delay

In projects that impact transportation systems, it is often useful to quantify delays experienced by motorists in monetary terms. Mn/DOT recommends using a value of time of $10.21 per hour for cars, and $18.93 per hour for commercial vehicles. Using delay data from Table 4-8 and truck percentage estimates from traffic count data, the delay costs for cars and trucks were calculated; see Table 4-9. Delay costs were also calculated for both vehicle types according to their specific intersection turning movements (Table 4-10). It is important to note that the total daily delay was estimated by using daily (12-hour) traffic counts from several of the intersections to determine the percentage of delays experienced during the peak hour. Using Mn/DOT provided 12-hour turning movement counts (at TH 2 and TH 38), an analysis concluded the delay during the P.M. peak hour accounted for approximately 10 percent of the daily delay. This value is equivalent to the industry practice of 10 percent of traffic occurring during the P.M. peak hour. Thus, the P.M. peak hour delay times were then divided by this percentage to calculate average daily delay. As previously documented, the system impacts of Warehouse Options 2 and 4 were deemed similar, and thus were combined for this economic analysis.

Table 4-9

Daily and Annual Delay Cost (Using Overall Average Intersection Delay)

	Daily Delay Costs (Using Average Delay for Intersection and ADT estimate)			Annual Delay Costs (Using Average Delay for Intersection and ADT estimate)		
	Cars	Trucks	Total	Cars	Trucks	Total
Existing P.M. Peak Hour	$8,265.86	$ 1,150.83	$ 9,416.69	$ 3,017,038	$420,053	$3,437,090
Warehouse Options 2 & 4	$8,367.08	$ 1,165.09	$ 9,532.17	$ 3,053,984	$425,257	$3,479,241
Warehouse Option 5	$8,404.68	$ 1,170.40	$ 9,575.07	$ 3,067,707	$427,195	$3,494,902
Difference between baseline and Option 2 & 4	$ 101.22	$ 14.26	$ 115.48	$ 36,946	$ 5,205	$ 42,150
Difference between baseline and Option 5	$ 138.82	$ 19.57	$ 158.39	$ 50,670	$ 7,142	$ 57,812

ADT = Average Daily Traffic

Table 4-10

Daily and Annual Delay Cost (Using Delay by Turning Movement)

	Daily Delay Costs (Using Delay by turning movement and ADT estimate)			Annual Delay Costs (Using Delay by turning movement and ADT estimate)		
	Cars	Trucks	Total	Cars	Trucks	Total
Existing P.M. Peak Hour	$8,007.58	$ 1,116.33	$ 9,123.91	$ 2,922,767	$ 407,460	$3,330,227
Warehouse Options 2 & 4	$8,161.49	$ 1,137.72	$ 9,299.21	$ 2,978,945	$ 415,269	$3,394,213
Warehouse Option 5	$8,210.86	$ 1,144.76	$ 9,355.61	$ 2,996,964	$ 417,836	$3,414,799
Difference between baseline and Option 2 & 4	$ 153.91	$ 21.39	$ 175.30	$ 56,178	$ 7,808	$ 63,986
Difference between baseline and Option 5	$ 203.28	$ 28.43	$ 231.70	$ 74,197	$ 10,375	$ 84,572

The two methodologies described in Table 4-9 and Table 4-10 were used to balance each other. In general, the methodology in Table 4-9 is more precise, but due to the assumptions in this analysis, it cannot be concluded that Table 4-10 is more accurate. In either case, the anticipated increase in annual delay costs to roadway users is expected to be between $42,000 and $64,000 for either on-site warehouse option (Option 2 or 4) and between $57,812 and $84,572 for Warehouse Option 5 in Duluth.[4]

When compared to the baseline condition, the expansion of PM7 will result in approximately 2.0 percent higher delays for all roadway users if the warehouse were placed on-site. Warehouse Option 5 creates a

[4] All economic references are based on Y2005 US$, as recommended by Mn/DOT's Office of Investment Management. No life-cycle costs are estimated as part of this document, although it could be obtained by selecting an inflation and discount rate in addition to a proposed life cycle for PM7. This analysis is not intended to be an economic analysis but rather a comparison between warehouse options and indication of general delay impacts onto the existing roadway network.

delay increase of 2.5 percent for roadway users, although individually compared to the on-site option is approximately 35 percent higher in delay.

4.1.2.6 Unique Area Impacts

18th Avenue NW Intersection with TH 2

As part of the scoping EAW process, the intersection of U.S. 2 / 18th Avenue NW was identified as an intersection susceptible to possible signalization in addition to expansion of an eastbound right turn lane. These improvements could possibly be in conjunction with the closure of the 12th Avenue NW railroad grade crossing and realignment of other local streets north of TH 2.

As indicated in Table 4-8, higher delays due to truck traffic at this intersection are not expected to push this intersection above the delay thresholds to justify signalization. However, this analysis alone is not sufficient to dismiss the possibility of signalizing this intersection or installing an eastbound right turn lane. The following observations can be made that may justify signalization:

1. Closing the 12th Avenue NW railroad grade crossing would route additional traffic over this crossing. This topic is discussed in the rail section of this document. More trains cross the 12th Avenue NW crossing due to switching activities near the mill, therefore closure of this crossing would result in reduced delay and increased safety for the traveling public and UPM/Blandin Paper Mill traffic.

2. Unlike left turn lanes, the justification of right turn lanes is almost never based on delay calculations. This is because right turning traffic typically experiences lower delays and therefore does not create mainline conflicts. Due to the presence of the railroad grade crossing, in addition to truck movements, it is highly likely that a right turn lane could be justified on safety reasons, which is outside the consideration of this EIS.

3. Surprisingly to many drivers, installing a traffic signal at (especially) an unwarranted intersection almost always increases the frequency of crashes. However, certain crashes (especially right angle crashes) can be mitigated with the installation of a traffic signal.

Warehouse Option 5

The existing land use of the potential Warehouse Option 5 in Duluth is warehousing and is expected to remain so, as documented by the land use plan for the City of Duluth. As such, addition of the UPM/Blandin Paper Mill-generated traffic would result in "double-counting" of traffic, as the existing roadway network has already accounted for traffic associated with a warehouse on this site.

This methodology is consistent with typical transportation planning studies and has been verified with Mn/DOT District One. One of the most common criticisms of this approach is that different tenants within similar land uses may generate rates higher or lower than are typical for that land use. This is a market influence that could change.

4.1.2.7 Roadway Segment Impacts

The most effective and identifiable impact of any traffic increase is at intersections. Impacts occur at intersections before roadway segments, due to the confluence of traffic streams at the intersection. However, over long distances without major intersections, impacts can occur on a segment basis without being intersection related (freeways excluded).

Using the most conservative estimates, a two-lane highway with no passing lanes and no turn lanes can accommodate approximately 6,500 vehicles per day at LOS C. A two-lane highway with passing lanes, left and right turn lanes, and adequate passing zones can operate with more than 13,000 vehicles per day still at LOS C. As a general rule of thumb, two-lane highways with more than 10,000 vehicles per day are typically widened to four lanes by Mn/DOT, although some lower volume routes have been widened for peaking recreational traffic or other reasons.

Within the City of Grand Rapids, the traffic impacts have been quantified by the intersection analysis. The highest impacts are anticipated to be driven by Warehouse Option 5 in Duluth, resulting in approximately 120 additional trips per day to be routed on TH 2 near Grand Rapids. The highest daily volume on TH 2 between Grand Rapids and Duluth is 6,200 vehicles per day, which drops to 2,400 vehicles per day east of Swan River. Adding 120 vehicles per day results in an increase of 2-5 percent in traffic volume; similar to the intersection analyses. However, even the highest volume segment is below the conservative estimate of 6,500 vehicles per day at LOS C. In addition, the geometry of TH 2 includes some passing lanes, which results in higher capacity.

4.1.2.8 Uncertainty

It is important to note that this study made several assumptions, all of which are subject to some degree of uncertainty. The actual delay experienced by vehicles may vary widely. The Synchro® analyses are representative of the average delay experienced by each vehicle. In addition, daily delay times were estimated from the P.M. peak hour delay times.

4.1.3 MITIGATION/CONCLUSIONS

The expansion of the UPM/Blandin Paper Mill is unlikely to cause excessive delays to drivers along the existing roadway network. Annual delay costs for Warehouse Options 2 and 4 ranged between approximately $42,000 and $64,000. Warehouse Option 5 resulted in annual delay costs ranging from approximately $58,000 to $85,000. The increases in delay of individual lane groups could be mitigated to acceptable levels of service by adjusting the signal timing at the study area intersections. It may also be possible to change a particular travel route to improve individual turning movements if delays are encountered.

At this time, however, there are minimal increases in delay to motorists at the study area intersections based on expansion of PM7.

4.2 RAIL IMPACTS

4.2.1 EXISTING CONDITIONS

The City of Grand Rapids is served by a single track mainline owned and operated by the BNSF Railway Company[5] (BNSF) as part of BNSF's Lakes Subdivision from Cass Lake, Minnesota to Superior, Wisconsin. This corridor connects North Dakota to the ports of Duluth and Superior. BNSF is a major transporter of raw materials and finished products to and from the UPM/Blandin Paper Mill. Canadian Pacific Railway (CPR) also operates trains on this track. The rail corridor carries an average of approximately four trains per day.

4.2.1.1 At-Grade Highway Railroad Crossings

Nine at-grade highway/railroad crossings are located in Grand Rapids with the 18th Avenue NW crossing on the west, and Seventh Avenue SE on the east. The UPM/Blandin Paper Mill is located between the 12th Avenue NW and Second Avenue NW crossings. The majority of the at-grade railroad crossings are in the downtown area of Grand Rapids, as documented in Table 4-11 and shown in Figure 4-1.

4.2.1.2 Rail Access to Mill

The mill is served by three spurs that radiate out from the mainline to various portions of the mill. One spur separates from the mainline 200 feet west of 12th Avenue NW and serves the PGW. Another spur separates from this spur 300 feet east of 12th Avenue NW and heads southeast to serve the kraft warehouse, pigments, and other regulated material (ORM) area. A third spur separates from the mainline near Sixth Avenue NW to serve the general warehouses. A railyard for the paper mill is located north of the mainline between Seventh and Fourth Avenue NW.

[5] The BNSF Railway Company was formerly known as the Burlington Northern Santa Fe Railway Company.

Table 4-11
At-Grade Highway Railroad Crossings in Grand Rapids

USDOT[1] Number	Street[1,3]	Warning Device[1,3]	Train Volume (per day)[2]	Train speed (mph)[2]	ADT[1]	Traffic Speed (mph)[1]	Truck percentage[4]
097685B	18th Avenue NW	Crossbucks/ Stop Sign	2.3	25	400	30	10
097684U	12th Avenue NW	Gates, bells, lights	6.3	12	1050	30	5
097880S	2nd Avenue NW	Gates, bells, lights	4.3	12	5400	30	5
097679X	1st Avenue NW	Gates, bells, lights	4.3	12	3540	30	5
097678R	Pokegama Avenue NE	Gates, bells, lights	4.3	12	11500	30	7
097787U	1st Avenue NE	Gates, bells, lights	4.3	12	3650	30	5
097786M	3rd Avenue NE	Crossbucks	4.3	12	3450	30	5
097785F	5th Avenue NE	Crossbucks	4.3	12	630	30	5
075733C	7th Avenue SE	Gates, bells, lights	4.3	25	9300	30	10

Source: 1. Federal Railroad Administration – http://safetydata.fra.dot.gov/OfficeofSafety
2. The BNSF Railway Company
3. Field Verification by HDR Engineering, Inc.
4. Grand Rapids Area Transportation Plan Update – Arrowhead Regional Development Commission (ARDC) 2002

4.2.1.3 Existing Rail Traffic

According to BNSF, up to six (6) trains currently operate through Grand Rapids with varying degrees of frequency throughout the week; see Table 4-12.

Table 4-12
Existing Rail Traffic Conditions

Train ID[1]	Origin	Destination	Frequency	Average Length
1	Superior, WI	Grand Rapids, MN	daily	18 cars(990 ft)
2	Grand Rapids, MN	Superior, WI	daily	18 cars (990 ft)
3	Superior, WI	Minot, ND	3 trains/week	60 cars (3300 ft)
4	Minot, ND	Superior, WI	3 trains/week	70 cars (3850 ft)
5	Superior, WI (CPR)	Bemidji, MN	5 trains/week	10 cars (550 ft)
6	Bemidji, MN (CPR)	Superior, WI	5 trains/week	10 cars (550 ft)

Source: BNSF Railway Company and UPM/Blandin Paper
[1] The Train ID listed in this analysis is for this document only, no reference to these numbers is made by any other entity.

Trains 1 and 2 represent the "turn" that BNSF operates from Superior, Wisconsin, to serve UPM/Blandin Paper Mill each day (Table 4-13). Trains 3 and 4 are the only other through traffic on BNSF, which do not stop in Grand Rapids. The CPR trains (5 and 6) operating via track rights do not stop in Grand

Rapids either. The BNSF trains serving UPM/Blandin Paper typically average approximately 18 cars for the mill as documented in Table 4-13.

Table 4-13
Distribution of Train Cars Serving UPM/Blandin Paper Mill
(baseline scenario)

Current Conditions PM5 and PM6	Average Daily Rail Traffic	
	Monday-Friday	Saturday-Sunday
Paper Shipments	9	9
Kraft Pulp	3	3
Other Raw Material and Miscellaneous	2	1
Pigments	4	4
Pulpwood	0	0
Totals	18	17

Source: UPM/Blandin Paper

According to BNSF, occasional unit trains – typically grain trains – run on a seasonal basis through Grand Rapids. However, BNSF noted these trains are quite rare, and the amount of grain traffic in this corridor has continued to decrease in recent years as other corridors handle the traffic instead. For this reason, occasional seasonal movements were not included in this analysis.

4.2.1.4 Existing Rail Speed

This segment of BNSF's Lakes Subdivision has a maximum authorized speed of 25 miles per hour (mph) between Gunn, Minnesota and Cohasset, Minnesota. Within Grand Rapids (between Milepost 111.2 and 112.3 – or between Seventh Avenue SE and 12th Avenue NW), BNSF observes a restriction of 12 mph until any train occupies all grade crossings. Due to the average length of most trains, an operating speed of 12 mph was assumed.

4.2.1.5 Operating Characteristics of Trains

Train 1 (Superior to Grand Rapids) approaches from the east at 12 mph and comes to a stop when the back of the train has traveled 200 feet west of 12th Avenue NW. It is assumed the average speed at which the train crosses 12th Avenue NW is 6 mph. The train then performs switching duties within the mill or at the yard north of the mainline making occasional movements across 12th Avenue NW at an average speed of 5 mph. In Warehouse Option 2, the warehouse is located east of the existing mill between First and Second Avenue NW. Switching duties, including the drop off of empty cars along a spur serving the warehouse, are expected to occupy Second Avenue NW for five additional minutes.

Train 2 (Grand Rapids to Superior) is similar to train 1, except the direction of travel is reversed. Some switching maneuvers are made over 12th Avenue NW at an average speed of 5 mph. After assembling the eastbound traffic, the eastbound train departs the mill through downtown Grand Rapids at a speed of 12 mph before increasing to 25 mph once all crossings are occupied. In Warehouse Option 2, switching duties and adding loaded cars to the train are expected to decrease the average crossing speeds at all of the intersections. In addition, all of the crossings from Second Avenue NW to Third Avenue NE are expected to be occupied for an additional five minutes. In Warehouse Option 4, the warehouse is located west of the mill between 12th and 18th Avenue NW. Switching duties and adding loaded cars to the train are expected to decrease the average crossing speeds at all of the intersections and block the 12th Avenue NW and Third Street NW crossings for five additional minutes.

Train 3 (Superior to Minot) travels westbound across all of the crossings at a speed of 12 mph, except 12th Avenue NW and 18th Avenue NW. Once the front of the train has passed by 12th Avenue, the train is allowed to speed up to 25 mph. It is unlikely a train averaging 60 cars could accelerate to 25 mph from 12 mph over the 2,539 ft distance between 18th Avenue NW and 12th Avenue NW. Based on likely acceleration characteristics, it is assumed a train could achieve a speed of 18 mph over that distance. Taking this into account, the average crossing speed for 12th Avenue NW is assumed to be 15 mph. The average crossing speed assumed for 18th Avenue NW is 18 mph.

Train 4 (Minot to Superior) travels eastbound at 25 mph, but it must be traveling at 12 mph once it crosses 12th Avenue NW. It is assumed the 70-car train must begin slowing down one mile west of 12th Avenue NW. Due to the length of the train, the 18th Avenue NW crossing will be occupied when it crosses 12th Avenue NW. Thus the train is assumed to cross 18th Avenue NW at an average speed of 15 mph. The train is allowed to accelerate to 25 mph east of Fifth Avenue NE. Due to the length of the train, all of the crossings in downtown would be occupied at the same time. The length and weight of the train make it unlikely that the end of the train would be crossing Seventh Avenue much faster than 18 mph. Thus the average crossing speed assumed for Seventh Avenue NW is 15 mph. The average crossing speeds assumed for the Fifth and Third Avenue NW crossings are 14 mph and 13 mph, respectively.

Train 5 (CPR – Superior to Bemidji) travels westbound at 25 mph, but must be traveling at 12 mph once it crosses Fifth Avenue NE. Since Fifth and Seventh Avenues are 840 feet apart, it is assumed the length of the train crosses Seventh Avenue SE at an average speed of 12 mph. The train is allowed to accelerate to 25 mph west of 12th Avenue NW. Because the train is relatively short, it is assumed that the train crosses 18th Avenue NW at 25 mph.

Train 6 (CPR – Bemidji to Superior) must be traveling at 12 mph once it crosses 12th Avenue NW. Since 18th and 12th Avenues are 2,530 feet apart, there is adequate room to slow from 25 mph to 12 mph. The train is allowed to accelerate to 25 mph east of Fifth Avenue NE. Because the distance between Fifth Avenue NE and Seventh Avenue SE is 840 feet, it is assumed that the train crosses Seventh Avenue SE at 15 mph.

4.2.2 IMPACTS

4.2.2.1 Methodology and Assumptions

To estimate the impact of increased rail operations on vehicular traffic due to the mill expansion, a baseline scenario was defined. This scenario represents the existing conditions (rail traffic, intersection configurations). The time trains spend crossing each intersection was calculated using information about each train (direction, length, speed, and frequency). The average delay per vehicle was determined using average daily traffic (ADT) data for each intersection. Average daily delay costs were estimated using Mn/DOT's recommended monetary value of time for cars and trucks.

The Baseline Scenario results were compared to the results from three different warehouse options as well as the No-Build Alternative. In Warehouse Options 2 and 4, the number of cars on Trains 1 and 2 (Superior to Grand Rapids and return) is expected to increase from 18 to 37 cars per day. The frequency of trains is not expected to increase, nor is the length of any of the other trains (trains 3-6). In Warehouse Option 5 (an off site warehouse in Duluth), the number of cars on Trains 1 and 2 is expected to increase from 18 to 20 cars per day. In the No-Build Alternative, the number of cars on Trains 1 and 2 is expected to decrease from 18 cars to 12 cars per day[6] if PM5 were closed. No changes would be expected in rail traffic or delays in the No-Build Alternative not resulting in closure of PM5. Table 4-14 summarizes the number of rail cars for each alternative.

The additional cars in each of the warehouse options increases the amount of time the trains take crossing each intersection, thus adding to delay. The total delay for these options was monetized into delay costs for cars and trucks. A more detailed explanation of the methodology and assumptions (and operating characteristics) used for each train are described below.

[6] This is based on the approximate PM5 and PM6 production of 130,00 and 250,000 short tons, respectively, as cited in the "UPM/Blandin Paper Mill EAW."

Table 4-14
Distribution of Train Cars Serving UPM/Blandin Paper Mill
(all scenarios)

Cargo Type	Average Daily Rail Traffic					
	Current Conditions and No-Build Alternative		Warehouse Options 2 and 4		Warehouse Option 5	
	Monday-Friday	Saturday-Sunday	Monday- Friday	Saturday-Sunday	Monday-Friday	Saturday-Sunday
Paper Shipments	9	9	18	18	6	6
Kraft Pulp	3	3	4	4	0	0
Other Raw Material and Misc.	2	1	3	0	3	0
Pigments	4	4	10	10	10	10
Pulpwood	0	0	1	1	1	1
Totals	18	17	37	34	20	17

Source: UPM/Blandin Paper

4.2.2.2 Grade Crossing Delay Calculation

For each train, the average car length was assumed to be 55 feet. It was assumed that intersections equipped with gates would incur an additional 30 seconds of delay (20 seconds advance warning, 5 seconds for the gates to close, and 5 seconds for the gates to open once the train had passed). It was assumed intersections without gates (crossbucks only) would incur 10 seconds of delay. Thus, the time it took a train to cross an intersection (neglecting intersection width) was calculated by dividing the train length by the average crossing speed (plus delay time) at that intersection.

The average delay per vehicle was calculated by dividing the delay at the intersection by the ADT. The delay costs for cars and trucks were determined by multiplying the average delay per vehicle by the ADT and by the proportion of vehicles that are cars and trucks, followed by the Mn/DOT recommended value of time of $10.21 and $18.93 per hour for cars and trucks, respectively.

A sample calculation is shown below using Train 1 in the Baseline Scenario.

Using data from Table 4-13 and Table 4-14, the train length is 18 cars × 55 feet = 990 feet and the train speed is 12 mph.

The time it takes the train to cross the intersection (neglecting intersection width) is:

$$990\ feet \times \frac{1\ hour}{12\ miles} \times \frac{1\ mile}{5280\ feet} \times \frac{3600\,\text{sec}}{mile} = 56.25\ \text{seconds}$$

However, there is an extra 30 seconds of delay due to the signal warnings. Using Second Avenue NW as an example (ADT of 5400, Truck percentage of 5 percent) the average daily delay costs are:

$$\frac{56.25\,\text{sec.} + 30\,\text{sec.}}{5400\ \textit{vehicles}} = 0.01597 \text{ seconds/vehicle}$$

The total daily delay cost at this intersection for cars is:

$$(56.25 \text{ sec.} + 30 \text{ sec.}) \times (0.95) \times \frac{\$10.21}{hour} \times \frac{1\ hour}{3600\,\text{sec.}} = \$0.23 \text{ per day}$$

For trucks, the daily delay cost at this intersection is:

$$(56.25 \text{ sec.} + 30 \text{ sec.}) \times (0.05) \times \frac{\$18.93}{hour} \times \frac{1\ hour}{3600\,\text{sec.}} = \$0.02 \text{ per day}$$

The average daily delay costs experienced by cars and trucks at each intersection due to each of the trains were added to determine the total average daily delay. This process was repeated for Warehouse Options 2, 4, and 5.

4.2.2.3 Delay Impacts

The total daily delay caused by rail traffic in the baseline scenario is 103.3 minutes, or about 11.5 minutes per intersection. This translates into $11.58 in delay costs per day, or $4,226 per year. In Warehouse Option 2, daily delay increased by an additional 53 minutes to 156 minutes per day. This additional delay costs $10.33 per day, or $3,770 per year. Delay costs for Warehouse Option 4 were an additional $8.60 per day, or $3,141 per year. Warehouse Option 5 (an off site location in Duluth) caused the least amount of delay among the various warehousing options. The delay cost was $1.18 more per day versus the baseline, or about $430 per year; see Table 4-15. An analysis of the No-Build Alternative (only PM6 operating) showed a slight decrease in delay costs.

Table 4-15
Summary of Delay Costs

	Delay		Delay Costs		Delay Cost Difference from Baseline	
	Minutes	Minutes per Intersection	Per Day	Per Year	Per Day	Per Year
Baseline	103	11.5	$11.58	$4,226.00	-----	-----
Warehouse Option 2	156	14.2	$21.91	$7,996.00	$10.33	$3,770.00
Warehouse Option 4	137	12.4	$20.18	$7,367.00	$ 8.60	$3,141.00
Warehouse Option 5	105	11.7	$12.76	$4,656.00	$ 1.18	$ 430.00

4.2.2.4 Uncertainty

It is important to note that this study made several assumptions, all of which are subject to some degree of uncertainty. The actual delay experienced by vehicles may vary widely from annualized average conditions in the above analysis. Uncertainty in delay may be due to unknown train characteristics (i.e. the number of locomotives and the actual number of cars), track conditions, and weather conditions. There is also some variability in the train schedules. A train will probably not cause as much total delay to motorists if it crosses through town at 3 a.m. versus 3 p.m.

4.2.3 Mitigation

The expansion of the UPM/Blandin Paper Mill is unlikely to cause delay to the degree that mitigation is required. However, closing the 12th Avenue NW crossing and diverting traffic to the 18th Avenue NW crossing as recommended by the ARDC, would eliminate most of the delay caused by trains switching tracks to service the paper mill. The additional traffic at the 18th Avenue NW crossing would experience less delay versus the 12th Avenue NW crossing because trains are less frequent and move at a higher speed. Closing 12th Avenue NW could save $1,520 per year in delay costs; two to four times this amount could be saved in public maintenance costs.

4.3 NOISE

4.3.1 Fundamentals of Environmental Acoustics

Noise, or unwanted sound, is measured in decibels (dB) – a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted scale corresponds to the sensitivity range for human hearing. Noise levels are measured in dBA, the A-weighted sound level in decibels. When noise levels change 3 dBA, the change is considered to be barely perceptible to human hearing. However, a 5 dBA change in noise level is clearly noticeable. A 10 dBA change in noise levels is perceived as a doubling or halving of noise loudness, while a 20 dBA change is considered a dramatic change in loudness.

The L_{eq} is the descriptor, which in a stated period of time, contains the same acoustic energy as the time-varying sound level during the same period, or the average sound level. Statistical descriptors like L_{10} and L_{50} represent the noise level exceeded 10 percent and 50 percent of the stated period of time, respectively. In practical terms, they represent noise levels exceeded for six minutes and 30 minutes per hour. The relationship between L_{eq} (an energy-based average) and the L_{50} (a statistical average), and also between L_{10} and L_{50} can be used to characterize the extent to which noise levels vary or remain in a steady state. When L_{eq} and L_{50} are comparable (within one or two dB of each other), it is an indication that sound levels do not fluctuate widely. Similarly, when the L_{10} and L_{50} are within three dBA of each other it is also considered an indication that noise levels do not fluctuate widely. When these two relationships occur together it is an indication that overall noise levels are fairly stable.

4.3.2 MINNESOTA NOISE POLLUTION CONTROL REGULATIONS

The MPCA regulates maximum allowable outdoor noise levels through Minnesota Rules 7030, Noise Pollution Control. The rule identifies maximum allowable noise levels during both daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) using the L_{10} and L_{50} statistical descriptors. The Minnesota Noise Pollution Control regulation establishes these limits for three land use categories called noise area classifications. Residences are included in Noise Area Classification 1. The daytime noise limits are 65 dBA (L_{10}) and 60 dBA (L_{50}); nighttime limits are 55 dBA (L_{10}) and 50 dBA (L_{50}).

4.3.3 EXISTING NOISE LEVELS

Based on observations of the project area, the ambient acoustic environment near the UPM/Blandin Paper Mill consists of noise contributions from:

- wind and vegetation
- traffic on local roadways
- activities at nearby residences (recreation, landscaping, etc.)
- outdoor activities at the mill

Noise from mill-related indoor activities does not stand out as discrete discernable noise events. Rather, it is perceived as a dull but dominant hum in the overall ambient acoustic environment. This dull hum in the ambient acoustic environment is punctuated by noise from discrete outdoor events, both mill-related and from off-site activities. These discrete noises are mostly material handling activities in the mill's woodyard (Lieberr cranes moving logs, logs falling into the surge pile, etc.). Because noise from indoor activities is somewhat attenuated by the mill buildings, and because it blends into the acoustic environment as a component of background noise, it was not modeled in the analysis of future noise levels. Rather, it is a component of the existing noise levels in the monitoring data and was added to modeling results in the analysis of future noise levels. Therefore, this analysis focused on outdoor activities at the mill. Most of the outdoor activities at the mill occur in the woodyard, on the western side of the project site, adjacent to the Paper Mill Reservoir.

On December 28, 2005, a contractor for the mill measured noise levels at three residences in the area to assess the existing noise environment. The monitoring events measured noise levels for a continuous 24-hour period, and stored monitoring data (including the L_{10} and L_{50} statistical descriptors) every hour for 24 continuous hours. Normal plant operation was reported during the data collection period. The measurement was performed at the south side of the Mississippi River at the corner of 1st Street SW and 10th Avenue SW.

Typical noise-producing activities in the woodyard included trucks delivering logs, mobile cranes used for material handling activities including: loading conveyors at the debarking operation (these cranes move throughout the woodyard bringing logs to the debarking area), loading wagons in the woodyard, unloading delivery trucks, housecleaning activities (including sweeping the pavement), debarked logs dropping from the overhead conveyor into the surge piles (these logs are fed into the mill during nighttime hours), and other equipment, vehicular, and materials movements on site.

Table 4-16 presents the hourly noise monitoring data at Location 1, which is the location closest to the facility. The accepted convention is to round noise levels to whole numbers. However, one decimal place is shown below because it is used in a later section to compare L_{10}, L_{50}, and L_{eq} and develop a characterization of the ambient acoustic environment. Nighttime, defined by MPCA as occurring between 10:00 p.m. and 7:00 a.m., is shown using shading in Table 4-16. The noise monitoring data do not show dramatic changes from daytime to nighttime noise levels, and there is fairly close agreement between measured L_{10} and L_{50} values throughout the 24-hour monitoring period.

Table 4-16
Existing Noise Levels at Nearest Noise-Sensitive Receptor

Date	Time	Duration	Measured L_{10}	MPCA L_{10} limit	Measured L_{50}	MPCA L_{50} Limit
			(dBA)			
28 Dec 05	1000-1100	3600	52.7	65	47.9	60
28 Dec 05	1100-1200	3600	50.7	65	47.1	60
28 Dec 05	1200-1300	3600	52.3	65	47.7	60
28 Dec 05	1300-1400	3600	51.1	65	46.6	60
28 Dec 05	1400-1500	3600	54.2	65	48.4	60
28 Dec 05	1500-1600	3600	50.1	65	48.1	60
28 Dec 05	1600-1700	3600	52.8	65	48.5	60
28 Dec 05	1700-1800	3600	54	65	49.3	60
28 Dec 05	1800-1900	3600	50.6	65	48.2	60
28 Dec 05	1900-2000	3600	46.9	65	45.8	60
28 Dec 05	2000-2100	3600	46.4	65	44.8	60
28 Dec 05	2100-2200	3600	45.3	65	44.7	60
28 Dec 05	2200-2300	3600	45.9	55	44.2	50
28 Dec 05	2300-2400	3600	45.1	55	43.6	50
29 Dec 05	2400-0100	3600	44.5	55	43	50
29 Dec 05	0100-0200	3600	44.9	55	44	50
29 Dec 05	0200-0300	3600	45.7	55	44.4	50
29 Dec 05	0300-0400	3600	44.7	55	44	50
29 Dec 05	0400-0500	3600	45.5	55	44.5	50
29 Dec 05	0500-0600	3600	49.9	55	45.6	50
29 Dec 05	0600-0700	3600	50.2	55	47.6	50
29 Dec 05	0700-0800	3600	53	65	48.9	60
29 Dec 05	0800-0900	3600	49	65	47.5	60
29 Dec 05	0900-1000	3600	54.5	65	46.5	60

4.3.4 IMPACTS

4.3.4.1 Methodology and Assumptions

HDR staff toured the UPM/Blandin Paper Mill and observed mill-related noise from outdoor activities in the woodyard. HDR measured noise emissions from several outdoor activities. Those measurements were used as noise emission levels in the analysis of future noise levels. HDR did not model any noise from indoor activities.

Methods

The evaluation of future noise levels required predicting future mill-related noise from outdoor activities and adding the predicted levels to measured existing noise levels to create an overall noise level. The 24-hour monitoring data includes noise contributions from outdoor activities during both daytime and nighttime. Some of these activities are expected to continue in the future; others are expected to cease.

HDR performed an analysis to evaluate the noise contribution from activities that are discontinuing (e.g., the large front-end loader used to load debarked logs into the facility at the surge piles). The goal of this analysis was to determine if the noise monitoring data should be adjusted by mathematically removing the noise contribution from activities that will be discontinued (so they are not included in the analysis of future noise levels). Results of the analysis indicate that noise from activities that will be discontinued does not have a dramatic effect on the existing peak nighttime noise levels. Therefore its inclusion in the monitoring data and subsequent inclusion in predictions of future noise levels does not reduce the validity of the noise analysis. Ultimately, noise from activities that will be discontinued will be offset by the increase in material handling activities in the woodyard. Knowing this, the analysis of future noise levels continued, and the noise monitoring data was not adjusted for use in the analysis of future noise.

HDR used an acoustical analysis model (Cadna-A), a commercial software tool, to evaluate future noise levels at the mill. Cadna-A, a three-dimensional model, depicts noise sources using measured noise source terms, propagates sound levels to receivers, evaluates building and terrain effects, and predicts hourly L_{eq} values in dBA. The Minnesota Noise Pollution Control rule makes use of the L_{10} and L_{50} statistical descriptors to regulate environmental noise. Cadna-A does not calculate L_{10} or L_{50} values. Therefore use of Cadna-A requires knowledge of the relationship between L_{eq}, $L_{10,}$ and L_{50} to facilitate conversion of L_{eq} (from the model) to L_{10} and L_{50} for comparison with noise limits in MPCA rules.

HDR reviewed the 24-hour noise monitoring data to evaluate the relationships between L_{eq}, L_{10}, and L_{50}. The goal of this review was to determine the average differences between L_{eq}, L_{10}, and L_{50}. If the dominant outdoor noise emitting activities at the mill will continue to operate as they do now, then this analysis could use the relationships between L_{eq}, L_{10}, and L_{50} found in the 24-hour noise monitoring data to convert predictions of future noise levels (model results) into L_{10} and L_{50} for comparison with MPCA limits. Table 4-17 also shows the comparisons between L_{eq} and L_{50}, and L_{10} and L_{50} values in the 24-hour noise monitoring data collected near residences across the Mississippi River from the mill. The comparisons shown below include:

- L_{eq} minus L_{50} is the difference between the energy average noise level and the statistical average noise level,
- L_{10} minus L_{50} is the difference between the noise level exceeded 10 percent of the time and the noise level exceeded 50 percent of the time – when the difference between these two descriptors is less than three dBA, it is an indication of steady-state noise levels.

HDR performed these comparisons on all 24-hour noise monitoring data sets (including monitoring data collected elsewhere in the project area). Based on an evaluation of 24-hour noise monitoring data, the average difference between L_{eq} and L_{50} is 2.3 dBA and the average difference between L_{50} and L_{10} is 2.6 dBA. Therefore HDR proposes to utilize those relationships to convert the modeled L_{eq} into L_{10} and L_{50}. To convert Cadna-A results from L_{eq} to L_{50}, a correction of 2.3 dBA will be added to the L_{eq} (noise model results). To convert the L_{50} into an L_{10}, a correction of 2.6 dBA will be added to the L_{50}. The dominant outdoor noise sources observed from the monitoring location are material handling activities in the woodyard that will continue to occur if PM7 is built and operated. Therefore, use of the relationships found in the 24-hour noise monitoring data is suitable and appropriate for converting modeling results expressed as L_{eq} into L_{10} and L_{50} values for comparison with MPCA noise limits.

Table 4-17
Evaluation of 24-Hour Noise Monitoring Data

Time	Measured L_{eq}	Measured L_{10}	Measured L_{50}	L_{eq} minus L_{50}	L_{10} minus L_{50}
	(dBA)				
10 - 11 am	52	53	48	4.4	4.8
11 - 12 noon	51	51	47	3.4	3.6
12 noon – 1 pm	50	52	48	2.3	4.6
1 - 2 pm	50	51	47	3.4	4.5
2 - 3 pm	52	54	48	3.5	5.8
3 - 4 pm	51	50	48	2.7	2.0
4 - 5 pm	52	53	49	3.2	4.3
5 - 6 pm	53	54	49	3.2	4.7
6 - 7 pm	49	51	48	1.0	2.4
7 - 8 pm	52	47	46	5.8	1.1
8 - 9 pm	46	46	45	1.1	1.6
9 - 10 pm	46	45	45	1.4	0.6
10 - 11 pm	45	46	44	0.8	1.7
11 – 12 midnight	49	45	44	5.3	1.5
12 midnight – 1am	45	45	43	1.9	1.5
1 – 2 am	45	45	44	0.8	0.9
2 – 3 am	45	46	44	0.7	1.3
3 – 4 am	44	45	44	0.1	0.7
4 – 5 am	47	46	45	2.3	1.0
5 – 6 am	48	50	46	2.3	4.3
6 – 7 am	49	50	48	1.3	2.6
7 – 8 am	52	53	49	3.4	4.1
8 – 9 am	48	49	48	0.9	1.5
9 – 10 am	51	55	47	4.2	8.0

4.3.4.2 Predicting Future Noise Using the Cadna-A Model

This analysis assumes that mill-related outdoor noise levels will remain the same as they are now, as discussed under the No-Build Alternative. The following is a discussion of the analysis of future noise levels assuming PM7 is constructed.

Activities selected for inclusion into the model were identified through reviewing the description of future operations in the scoping EAW, conversations with mill staff, observations made while touring the mill, and measuring noise levels on-site. The Cadna-A model allowed the analysis of point sources (stationary equipment) and line sources (mobile equipment) simultaneously. Cadna-A calculated average hourly mill-related noise levels expressed using the L_{eq} descriptor.

Point Sources

The point sources modeled in the analysis included:

- Liebherr cranes unloading logs from idling delivery trucks at two locations in the roundwood storage area
- Liebherr cranes loading logs into wagons at four locations in the roundwood storage area and in the log storage area near the surge piles
- Liebherr cranes loading hardwoods into the woodroom for debarking
- Liebherr cranes loading softwoods into the woodroom for debarking

Line Source Analysis

The line sources modeled in the analysis included:

- Trucks delivering raw logs to the woodyard
- The Bobcat loader used for housecleaning activities at four locations throughout the woodyard and surrounding areas
- Train movements on-site

Barriers Included in the Analysis

Cadna-A also modeled barriers at the Facility including:

- The 25-foot-tall noise wall constructed near the debarking conveyors and surge piles
- The stacked-log noise walls on the south side of the roundwood storage area
- The stacked-log noise walls on the eastern side of the roundwood storage area
- The stacked logs in the center of the roundwood storage area

Residences immediately adjacent to the reservoir, south of the mill, were also modeled in Cadna-A as noise receivers. The receiver height was modeled as five feet at each residence, and was modeled in a location representative of areas of outdoor human activity closest to the waters edge.

4.3.4.3 Mill-Related Onsite Noise – Build Alternative

Mill-Site Build Alternative

Table 4-18 shows the Cadna-A results at each receiver (expressed as predicted L_{eq}), the calculated L_{50}, existing peak daytime L_{50} background noise levels (the highest value from the monitoring data), the predicted overall L_{50} and the maximum allowable daytime L_{50} level per the Minnesota Rules.

Analysis results indicate that daytime noise levels may increase one to two dBA on an L_{50} basis at some receptors; no increase is predicted at other receptors. Overall noise levels are not predicted to exceed MPCA daytime L_{50} limits.

Table 4-18
Daytime L_{50} Modeling Results

Receiver	Predicted L_{eq} (dBA)	Calculated L_{50} (dBA)	Existing Peak Daytime L_{50} (dBA)	Predicted Overall L_{50} (dBA)	MPCA Daytime L_{50} limit (dBA)
1	40	42	49	50	60
2	40	43	49	50	60
3	41	43	49	50	60
4	42	44	49	50	60
5	42	45	49	50	60
6	42	45	49	50	60
7	43	45	49	50	60
8	43	45	49	51	60
9	44	46	49	51	60
10	43	45	49	50	60
11	43	45	49	50	60
12	43	45	49	50	60
13	42	45	49	50	60
14	43	45	49	50	60
15	42	45	49	50	60
16	42	44	49	50	60
17	38	41	49	50	60
18	36	38	49	49	60
19	35	38	49	49	60
20	35	37	49	49	60
21	35	37	49	49	60
22	30	33	49	49	60
23	31	33	49	49	60
24	35	37	49	49	60
25	35	38	49	49	60
26	36	38	49	49	60
27	36	39	49	49	60
28	37	39	49	49	60
29	37	39	49	49	60

Table 4-19 shows the Cadna-A results at each receiver (expressed as predicted L_{eq}), the calculated $L_{50,}$ existing peak daytime L_{10} background noise levels (the highest value from the monitoring data), the predicted overall L_{10} and the maximum allowable daytime L_{50} level per the Minnesota Rules.

Analysis results indicate that daytime noise levels may increase one dBA on an L_{10} basis at some receptors; no increase is predicted at others. Overall noise levels are not predicted to exceed MPCA daytime L_{10} limits.

Table 4-19
Daytime L_{10} Modeling Results

Receiver	Predicted L_{eq} (dBA)	Calculated L_{10} (dBA)	Existing Peak Daytime L_{10} (dBA)	Predicted Overall Daytime L_{10} (dBA)	MPCA Daytime L_{10} Limit (dBA)
1	40	45	55	55	65
2	40	45	55	55	65
3	41	45	55	55	65
4	42	47	55	56	65
5	42	47	55	56	65
6	42	47	55	56	65
7	43	48	55	56	65
8	43	48	55	56	65
9	44	49	55	56	65
10	43	48	55	56	65
11	43	48	55	56	65
12	43	48	55	56	65
13	42	47	55	56	65
14	43	48	55	56	65
15	42	47	55	56	65
16	42	46	55	56	65
17	38	43	55	55	65
18	36	41	55	55	65
19	35	40	55	55	65
20	35	40	55	55	65
21	35	40	55	55	65
22	30	35	55	55	65
23	31	36	55	55	65
24	35	40	55	55	65
25	35	40	55	55	65
26	36	41	55	55	65
27	36	41	55	55	65
28	37	42	55	55	65
29	37	42	55	55	65

The proposed expansion requires round the clock operations in the woodyard to supply enough wood for the mill. Nighttime activities differ slightly from daytime activities:

- Trucks will not deliver raw logs at night
- Liebherr cranes will not unload delivery trucks at night

Although noise from these activities contributed to daytime noise levels at nearby residences, they were not major noise sources. Stacked wood in the woodyard shields noise emissions from these two sources. Therefore noise from these two sources does not dominate the acoustic environment. This analysis conservatively used predicted daytime noise levels to represent nighttime noise levels. Table 4-20 shows the Cadna-A results at each receiver (expressed as predicted L_{eq}), the calculated L_{50}, existing peak nighttime L_{50} background noise levels (the highest value from the monitoring data), the predicted overall L_{50}, and the maximum allowable nighttime L_{50} level per the Minnesota Rules.

Table 4-20
Nighttime L_{50} Modeling Results

Receiver	Predicted L_{eq} (dBA)	Calculated L_{50} (dBA)	Existing Peak Nighttime L_{50} (dBA)	Predicted Overall L_{50} (dBA)	MPCA Nighttime L_{50} Limit (dBA)
1	40	42	48	49	50
2	40	43	48	49	50
3	41	43	48	49	50
4	42	44	48	50	50
5	42	45	48	50	50
6	42	45	48	50	50
7	43	45	48	50	50
8	43	45	48	50	50
9	44	46	48	50	50
10	43	45	48	50	50
11	43	45	48	50	50
12	43	45	48	50	50
13	42	45	48	50	50
14	43	45	48	50	50
15	42	45	48	50	50
16	42	44	48	49	50
17	38	41	48	49	50
18	36	38	48	48	50
19	35	38	48	48	50
20	35	37	48	48	50
21	35	37	48	48	50
22	30	33	48	48	50
23	31	33	48	48	50
24	35	37	48	48	50
25	35	38	48	48	50
26	36	38	48	48	50
27	36	39	48	48	50
28	37	39	48	49	50
29	37	39	48	49	50

Analysis results indicate that when noise from mill-related outdoor activities (modeled) is combined with ambient noise levels (measured), overall nighttime noise levels may increase one to two dBA on an L_{50} basis at some receivers; no increase is predicted at other receivers. Overall nighttime noise levels (modeled + measured) are not predicted to exceed MPCA nighttime L_{50} limits.

Table 4-21 shows the Cadna-A results at each receiver (expressed as predicted L_{eq}), the calculated L_{10}, existing peak nighttime L_{10} background noise levels (the highest value from the monitoring data), the predicted overall L_{10} and the maximum allowable nighttime L_{50} level per the Minnesota Rules.

Table 4-21
Nighttime L_{10} Modeling Results

Receiver	Predicted L_{eq} (dBA)	Calculated L_{10} (dBA)	Existing Peak Nighttime L_{10} (dBA)	Predicted Overall Nighttime L_{10} (dBA)	MPCA L_{10} Nighttime Limit (dBA)
1	40	45	50	51	55
2	40	45	50	51	55
3	41	45	50	51	55
4	42	47	50	52	55
5	42	47	50	52	55
6	42	47	50	52	55
7	43	48	50	52	55
8	43	48	50	52	55
9	44	49	50	52	55
10	43	48	50	52	55
11	43	48	50	52	55
12	43	48	50	52	55
13	42	47	50	52	55
14	43	48	50	52	55
15	42	47	50	52	55
16	42	46	50	52	55
17	38	43	50	51	55
18	36	41	50	50	55
19	35	40	50	50	55
20	35	40	50	50	55
21	35	40	50	50	55
22	30	35	50	50	55
23	31	36	50	50	55
24	35	40	50	50	55
25	35	40	50	50	55
26	36	41	50	50	55
27	36	41	50	51	55
28	37	42	50	51	55
29	37	42	50	51	55

Analysis results indicate that nighttime noise levels may increase one to two dBA on an L_{10} basis at some receivers; no increase is predicted at other receivers. Overall nighttime noise levels (modeled + measured) are not predicted to exceed MPCA nighttime L_{10} limits.

4.3.4.4 Mill-Related Off-Site Noise – Build Alternative

The proposed Project creates additional heavy truck traffic related to Warehouse Options 2, 4, and 5. The option-specific heavy truck traffic volumes were evaluated to determine if potential noise increases were likely to be of a magnitude that required noise modeling.

<u>Warehouse Options 2 or 4</u>

The Grand Rapids Area Transportation Plan Update (Plan), ARDC (January 2002), states that TH 2 is one of the most important freight roadways in the state, averaging over 600 trucks per day in Grand Rapids. The Plan also states that TH 2 has an ADT of 14,000 vehicles in Grand Rapids. This equates to trucks making up 4.3 percent of the ADT on TH 2, as shown in Table 4-22.

Table 4-22
Percentage of Heavy Trucks in ADT

Route No.	Functional Class	Overall ADT Grand Rapids	ADT Trucks	Percent Trucks of Overall ADT
TH 2	Principal Arterial	14,000	600	4.3 percent

TH 2 has an existing peak hourly volume (PHV) of 1,640 vehicles near the UPM/Blandin Paper Mill. It is assumed 4.3 percent of these vehicles are trucks (71 trucks). HDR traffic analyses have determined that adding either Warehouse Option 2 or Warehouse Option 4 will increase truck traffic during the existing P.M. Peak Hour by 14 trucks. Table 4-23 shows this calculation. This increase in the volume of heavy trucks will not produce a noticeable increase in traffic noise.

Table 4-23
Predicted Increase in Heavy Trucks from Warehouse Options 2 or 4

Route No.	Existing PHV		Warehouse Options 2 or 4 PHV	
	Autos	Trucks	Autos	Trucks
TH 2	1569	71	1569	85

The construction of Warehouse Options 2 or 4 would increase trucks by 19.7 percent over the existing truck level. HDR modeled these traffic mixes in MINNOISE on a generic 2-mile stretch of road with a receptor located 75 feet perpendicular from the midpoint of the roadway. Table 4-24 shows that the addition of Warehouse Option 2 or Warehouse Option 4 increased noise levels by 0.4 dBA. Noise level increases under 3 dBA are recognized as imperceptible to the average human ear. This increase is considered imperceptible to the average human ear, therefore no additional analyses were performed.

Table 4-24
Predicted Traffic Noise Increase due to Warehouse Options 2 and 4

	L_{10} (dBA)	L_{50} (dBA)
Existing PHV	71.4	64.2
Warehouse Options 2 or 4 PHV	71.8	64.6
Change	*+0.4*	*+0.4*

Warehouse Option 5

Warehouse Option 5 is located in a warehouse land-use district in the City of Duluth. Mn/DOT automatic traffic recorder (ATR) data reports the 30th highest hour traffic volume as 2,836 vehicles, 4.7 percent of which are assumed to be trucks (133 trucks). Warehouse Option 5 proposes to add 21 trucks; this would only increase trucks by 15.5 percent over the existing level as shown in Table 4-25.

Table 4-25
Predicted Increase in Heavy Trucks from Warehouse Option 5

Route No.	Existing PHV		Warehouse Option 5 PHV	
	Autos	Trucks	Autos	Trucks
I-535	2703	133	2703	154

HDR modeled these traffic mixes in MINNOISE on a generic 2-mile stretch of road with a receptor located 75 feet perpendicular from the midpoint of the roadway. The addition of Warehouse Option 5 only increased noise levels by 0.3 dBA, as shown in Table 4-26. This increase is considered imperceptible to the average human ear, therefore no additional analyses were performed.

Table 4-26
Predicted Traffic Noise Increase due to Warehouse Option 5

	L_{10} (dBA)	L_{50} (dBA)
Existing PHV	75.8	69.6
Warehouse Option 5 PHV	76.1	69.9
Change	*+0.3*	*+0.3*

Analysis results indicate that the low number of additional trucks predicted to be added as a result of the construction of Warehouse Options 2, 4, or 5 will result in insignificant increases in traffic noise levels. No further traffic noise analyses were necessary.

4.3.4.5 No-Build Alternative

For the No-Build Alternative, no changes are anticipated to daytime and nighttime noise volumes unless PM5 were closed. If PM5 were closed, the operation of machinery and associated new material handling levels would decrease. Likewise, the raw materials and finished products associated with this line would not be transported on the public street system. In this case, the public would realize a nominal benefit in terms of nighttime noise reduction mainly in the woodyard area.

4.4 SOCIOECONOMIC EFFECTS

4.4.1 EXISTING CONDITIONS

4.4.1.1 Population and Population Trends

As shown in Table 4-27, the 2003 population of Grand Rapids was 8,233, while the population of Itasca County was 44,198. Eighteen other communities are located in Itasca County, including Cohasset (population 2,515), Coleraine (population 1,115), and Keewatin (population 1,158).[7] Grand Rapids is thus the largest community in Itasca County although it accounts for less than one-fifth of the total county population.

Table 4-27

Population of City, County, and State

Geographic Area	1990 Census	2000 Census	2003 Update	Percentage Change 1990 - 2000	Percentage Change 2000 – 2003
City of Grand Rapids	7,976	7,764	8,233	-2.7	6.04
Itasca County	40,863	43,992	44,198	7.7	0.47
State of Minnesota	4.4 million	4.9 million	5 million	11.4	2.04

Source: U.S. Census, State Demographer

Grand Rapids grew by more than 6 percent and experienced much faster growth than the county on average or the entire state of Minnesota between 2002 and 2003. According to some projections, the population of Grand Rapids and surrounding areas is expected to decline in the next few years by about 2 percent.[8]

The racial composition of the Grand Rapids population for 1990 and 2000 is shown in Table 4-28. Between 1990 and 2000, there was an increase in the population of non-white residents, including African American, American Indian, and Latino persons. However, these groups account for only approximately

7 For population counts for smaller communities in Itasca County see Department of Employment and Economic Development (DEED).

8 Evangelical Lutheran Church of America. Department for Research and Evaluation estimates population growth in areas including Grand Rapids over the period 2003 to 2008 at -1.8 percent. According to US Census, the population of Itasca County is expected to decline between 1999 and 2010 by 2.4 percent (see "Park Facility and Recreation Programming Analysis; Recommendations for the Future," March 20, 2001, page 14, Table 1.).

5 percent of total population. The city remains a fairly homogeneous community; however, small changes in its racial composition are taking place.

Table 4-28
Race Distribution in Grand Rapids

Racial Group	1990 Percent of Total Population	2000 Percent of Total Population	Change in Population Group 1990 to 2000 in Percent
White	97.8	95.5	-4.9
African American	approximately 0.1	approximately 0.3	144.4
American Indian or Native Alaskan	1.7	1.9	9.5
Asian	approximately 0.3	0.7	185.0
Some other race	approximately 0.1	approximately 0.4	233.3
Two or more races	-	1.1	0.0
Hispanic or Latino (of any race)	approximately 0.4	0.9	100.0

Source: U.S. Census 2000

Table 4-29 presents age trends in the population of Grand Rapids. As shown, the share of persons 44 years of age and younger in the city decreased between 1990 and 2000 from 62 percent to approximately 56 percent. The last column in the table also shows that this age group declined in absolute numbers over the same period by 9 to 26 percent approximately, depending on the specific age bracket. The table suggests that in Grand Rapids, there are fewer people of working age and child-bearing age, and that they are having fewer children. At the same time, these trends are associated with an increase in older persons over the age of 65. Persons between 45 and 64 years of age and over 65 increased by 16.4 percent and 9.9 percent, respectively. These age groups account for approximately 20 percent of the city's total population.

Table 4-29
Distribution of Population in Grand Rapids across Age Groups

<table>
<tr><th>Age Groups</th><th>1990 Percent of Total Population</th><th>Age Groups</th><th>2000 Percent of Total Population</th><th>Age Groups</th><th>Change in Population Group 1990 to 2000 in Percent</th></tr>
<tr><td>Under 17 years</td><td>26.1</td><td>Under 15 years</td><td>17.8</td><td>Under 5 years</td><td>-26.4</td></tr>
<tr><td>17 to 44 years</td><td>36.0</td><td>15 to 44 years</td><td>38.2</td><td>5 to 19/20 years</td><td>-11.6</td></tr>
<tr><td>45 to 64 years</td><td>17.6</td><td>45 to 64 years</td><td>21.0</td><td>19/20 years to 44</td><td>-9.4</td></tr>
<tr><td rowspan="2">65 years and over</td><td rowspan="2">20.3</td><td rowspan="2">65 years and over</td><td rowspan="2">23.0</td><td>45 to 64</td><td>16.4</td></tr>
<tr><td>65 years and over</td><td>9.9</td></tr>
</table>

Source: U.S. Census
Note: Due to changes in classification and reporting, figures for the same population groups across years could not be reported

Table 4-30 shows the household size in Grand Rapids in 1990 and 2000. For all categories of households (i.e., owner and renter occupied housing), the average household size decreased between 1990 and 2000. This is consistent with inferences from Table 4.60 suggesting a reduction in the number of children both in absolute and relative terms. The reduction in the number of children per family or household is thus likely to be the key driver behind the trend reported in Table 4-30.[9]

Table 4-30

Average Household Size, Persons per Households in Grand Rapids

Household Category	1990	2000
All Households	2.35	2.15
Households – Owners	2.58	2.4
Households – Renters	1.92	1.77

Source: U.S. Census 2000

4.4.1.2 Education and Occupational Structure

Table 4-31 shows that the percentage of people with less than a 12th grade education and no high school diploma declined substantially over the period 1990 to 2000. The most common level of educational attainment in Grand Rapids, however, still remains a high school diploma, with 33.1 percent of the adult population achieving this level. The number of people with some secondary education and advanced degrees is increasing in Grand Rapids.

Table 4-31

Educational Attainment

Educational Level	1990 Percent of Population 25 Years and Over	2000 Percent of Population 25 Years and Over	Change In Population Group 1990 to 2000 in Percent
Less than 9th grade	10.6	5.3	-48.7
9th to 12th grade, no diploma	11.6	8.0	-29.5
High school graduate (includes equivalency)	31.6	33.1	7.5
Some college, no degree	19.2	27.4	46.6
Bachelor's degree	10.1	12.7	28.6
Graduate or professional degree	4.3	5.3	26.4

Source: U.S. Census

4.4.1.3 Labor Market

Table 4-32 shows the 2004 unemployment rate in Grand Rapids, Itasca County, the state, and the entire United States as reported by the Minnesota Department of Employment and Economic Development.

9 Other factors contributing to the reduction in average household size may include an increase in single-person households and single-parent households.

Table 4-32
Unemployment Rate in Grand Rapids, County, State, and Nationwide

Year or Month	Unemployment Rate (Percent)			
	Grand Rapids	Itasca County	Minnesota	U.S.
2004	12	7.2	4.7	5.6

Source: Department of Employment and Economic Development (DEED) - Labor Market Information: LAUS Annual Average 2004

In Itasca County, the trade, transportation, and utilities industry employs the largest percentage of workers (21.6 percent) followed by government (20.8 percent), the manufacturing industry (9.2 percent), and the natural resources and mining industry (3.2 percent), as shown in Table 4-33. In the Economic Development Region, consisting of six surrounding counties, the government sector is the largest employer followed by trade, transportation, and utilities.

Table 4-33
Employment by Industry

Industry	Percentage Employed	
	Itasca County	Arrowhead Econ Dev Region*
Natural Resources and Mining	3.2	3.1
Construction	5.0	4.4
Manufacturing	9.2	7.9
Trade, Transportation, and Utilities	21.6	19.1
Information	0.9	2.1
Financial Activities	3.0	4.5
Professional and Business Services	7.3	5.9
Education and Health Services	14.0	17.9
Leisure and Hospitality	10.4	11.3
Other Services	4.5	3.4
Government	20.8	20.5

Source: Department of Employment and Economic Development (DEED) - Labor Market Information: CEW Annual Data 2003

** Metropolitan Statistical Area*

Note: Arrowhead Economic Development Region consists of (1) Aitkin County, (2) Carlton County, (3) Cook County, (4) Itasca County, (5) Koochiching County, (6) Lake County, and (7) St. Louis County.

The two largest employers in Grand Rapids are the Minnesota Independent School District # 318 and the UPM/Blandin Paper Company, as shown in Table 4-34.

Income and Poverty Status

Median household income in 1999 in the City of Grand Rapids and Itasca County was $28,991, and $36,324, respectively, both well below the median household income for the United States at $41,994. The percentage of families and individuals below poverty level in Grand Rapids and nationwide is shown in Table 4-35. In Grand Rapids in 2000, 9 percent of families and 11 percent of individuals were below poverty level. This is a similar level of poverty incidence as the nationwide level, but higher than the state and Itasca County.

Table 4-34
Major Employers in Grand Rapids

Employer	Products/Services	Number of Employees
MN Independent School District #318	Elementary and Secondary Schools	600
UPM/Blandin Paper Company	Pulp, Paper, and Paperboard Mills	498
Grand Itasca Medical Center	General Medical and Surgical Hospitals	482
Itasca, County of	Executive, Legislative, and Other Gen. Govt. Support	310
Arrowhead Promotion	Other Support Services	272
City of Grand Rapids and Public Utilities	Executive, Legislative, and Other Gen. Govt. Support	270
Wal-Mart	Department Stores	185
Potlatch	Pulp, Paper, and Paperboard Mills	162
Cub Foods	Grocery Stores	125
All Season Vehicle	Other Transportation Equipment Manufacturing	120
Itasca County Nursing Home	Nursing Care Facilities	120
Target	Department Stores	120
Sawmill Inn	Hotels (exc. Casino Hotels) and Motels	115
L & M Supply	Hardware Stores	107

Source: City of Grand Rapids Official Website (information as of June 2005)

Table 4-35
Poverty Status

Category of Population	Below Poverty Level in Percent of Total in Respective Group			
	Grand Rapids	Itasca County	Minnesota	U.S.
Families	9	7.7	5.1	9.2
Individuals	11	10.6	7.9	12.4

Source: U.S. Census 2000

4.4.2 ECONOMIC IMPACT

4.4.2.1 Methodology

This section provides an assessment of the economic impact of the proposed Project for UPM/Blandin Paper Mill in Grand Rapids, Minnesota. The Project involves the following key elements:

1. The addition of a complete paper manufacturing line that is designated as PM7;
2. The optimization of the PM6 paper line;
3. Increased pulping capacity; and,
4. The addition of warehouse facilities: Two broad warehousing options are considered in the economic analysis that follows:
    - Warehouse facilities are developed off site but in the immediate Project vicinity (Warehouse Options 2 and 4); and,
    - Warehouse facilities are developed outside the Project vicinity (Warehouse Option 5) in the City of Duluth, Minnesota.

In the economic analysis that follows, it is assumed that the existing PM5 line would be shut down permanently in conjunction with start-up of the new operations. The facility's wood use would increase approximately 197,000 cords and paper production would increase by 315,000 tons annually.

Construction of the facility is expected to commence from late 2006 to early 2007, with start-up of new paper machine line possible in 2008 to 2009.[10] The total construction costs of approximately $654 million (excluding contingencies).[11]

Economic impact analysis is the study of the effect of a change in the demand for goods and services on the level of economic activity in a given area, as measured by business output (sales), value added (gross regional product), employment, labor income, and tax revenue. This change in demand can result from decisions made by firms, governments, or households. The UPM/Blandin Paper Thunderhawk Project will generate two different types of impact on the local economy (Itasca County):

- Impact of the construction activities at the paper mill to expand plant operational capacity
- Impact of the expanded plant capacity

Traditionally, economic impact analysis involves the estimation of three distinct types of expenditure/production activity, commonly referred to as "direct effects," "indirect effects," and "induced effects." The total economic impact is the sum of these direct, indirect, and induced economic effects for the Project being evaluated.

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[10] Since, this analysis the project schedule was shifted back several months.

[11] In the construction cost estimates provided, there was a contingency of approximately 5 percent assumed to accommodate the potential for additional costs. These were not included in this analysis.

Direct Effects

Direct effects are the changes in local business activity occurring as a direct consequence of investment (e.g., construction of facility) and spending (e.g., operation of facility) decisions by economic agents such as a paper mill. Direct impacts refer in particular to those financial transactions occurring as the result of direct spending by the paper mill. Direct spending results in the employment of workers, sales of locally produced goods, and services and generation of local tax revenues.

Calculating the direct benefits associated with construction and the operation activities related to the expanded production at the facility in Grand Rapids, was based on output estimates from the UPM/Blandin Paper Mill (as measured by operating expenditures, including maintenance costs and other fixed costs). Note that the cost of inputs purchased outside the region was subtracted from the total expenditures before deriving the impacts so that only the local effect would be captured in the analysis.

Indirect Effects

Indirect economic impacts refer to off-site economic activities that are directly attributable to the construction and operation activities related to the expanded operations. They are the result of purchases by local firms who are the direct suppliers to the mill. The spending by these supplier firms for labor, goods, and services necessary for the production of their product or service creates output from other firms further down the production chain, thus bringing about additional employment, income, and tax activity. Output, employment, income, and tax revenue resulting from spending by supplier firms (but not households) are considered to be indirect effects of the Project.

Induced Effects

Induced economic impacts represent the increase in output, employment, and earnings over and above the direct and indirect impacts, generated by successive rounds of spending (often referred to as re-spending). Induced impacts are changes in regional business output, employment, income, and tax revenue that are the result of personal (household) spending for goods and services – including employees of the paper mill, employees of direct supplier firms (direct impact), and employees of all other firms comprising the indirect impact. As with business purchasing, personal consumption creates additional economic output, leading to still more employment, income, and tax flows.

4.4.2.2 Multipliers

The indirect and induced economic impacts of a project or facility are often referred to as "multiplier effects," since they can make the overall economic impacts substantially larger than the direct effect alone. In reality, while indirect and induced impacts do always occur, the net impact on the total level of economic activity in an area may or may not be increased by multiplier effects. That outcome depends on the definition of the study area and the ability of the area to provide additional workers and capital resources, or to attract them from elsewhere.

Multipliers can be expressed in terms of output or jobs. An output multiplier is the total overall increase in dollars of business output (sales) for all industries, per dollar of additional final demand (purchases) of a given industry in that area. A job multiplier is the total overall increase in jobs for all industries, per new job created in a given industry. The higher the multiplier, the greater is the total economic response to the initial direct effect.

4.4.2.3 IMPLAN® Model

To calculate the economic impacts for the proposed Project, the IMPLAN® model was utilized. This is an input-output[12] based economic impact assessment model originally developed by the U.S. Forest Service (now maintained by the Minnesota IMPLAN Group, Inc.). The model data files include transaction information (intra-regional and import/export) for 509 different industrial sectors (generally four- and five-digit North American Industry Classification System [NAICS] code breakdown), and data on more than 20 different economic variables, including employment, output, and employee compensation. To assess the impacts of this Project, data files were used for the Itasca County level so that all reported economic impacts represent the Itasca County effects. The most recent available data is from 2002.

In conducting the impact analysis, two adjustments were made to help ensure that all impact estimates would be truly incremental and specific to the study area:

1. Since the original numbers were expressed in 2002 dollars, they were adjusted for inflation during the analysis to express the results in 2005 dollars.[13]
2. Social Accounting Matrix (SAM) multipliers used for estimating indirect and induced effects were modified with Regional Purchase Coefficients (RPC)[14] to ensure that imports would not be counted. The SAM multiplier effects included only households. Only municipal and selected suburban benefits are measured and reported.

4.4.2.4 Impact Analysis Results

<u>Construction Related Impacts</u>

Construction activities for the proposed Project are expected to commence from late 2006 to early 2007, with start-up of the new paper machine line possible in 2008 to 2009.[10] In total, excluding planning contingencies, total construction expenditures are currently forecast to be $654 million (in 2005 dollars) over the construction period. Of this amount, $484 million relates to the purchases of machinery and

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12 An I/O model calculates impact multipliers, which are then used to compute direct, indirect, and induced effects – output, value added, employment, personal income, and local tax revenue generated per dollar of direct spending for labor, goods, and services.

13 Deflators derived from the most current Bureau of Labor Statistics (BLS) Growth Model were used to convert the cash flows from 2002 to 2005 estimates. These deflators are applied at the commodity level and vary by different goods and services and range from 4.9 percent to 9.1 percent.

14 RPCs are ratios indicating the fraction of total demand for goods and services within a region (both by business and household) is satisfied from within the region; all remaining demand is satisfied by imports, which provide no direct economic benefit to the region. In other words, they filter out economic leakages from the region.

equipment. For assessing the economic impacts, these purchases are assumed not to be local (i.e., they occur outside of Itasca County). In general, these purchases will be made from equipment manufacturers in Europe and elsewhere in the United States. The balance of the construction costs of $171 million reflect expenditures related to labor for the construction of the facility, project management, and engineering.

To determine the local economic impact of construction activities for the proposed Project, the following assumptions were made:

1. All of the equipment costs are from outside the county;
2. Approximately two-thirds of the construction labor originates from Itasca County;
3. The engineering expenditures are to engineering firms outside of the region; and,
4. The project management expenditures are local.

Based on these assumptions, approximately $96 million (in 2005 dollars) of the construction expenditures are estimated to be locally based.

The effects of the construction of the paper mill expansion in Grand Rapids were estimated for 2006, 2007, and 2008 and are reported in Table 4-36, Table 4-37, and Table 4-38.. The local economic impact of the proposed Project is very significant for Itasca County, as it is expected to generate 506 jobs[15] in 2006, 823 jobs in 2007, and 15 jobs in 2008.

Table 4-36
UPM/Blandin Paper Mill Construction-Related Impacts for 2006

Impact Category	Direct	Indirect	Induced	Total
Employment (jobs)	334	64	108	506
Output ($ Millions)	$36.7	$6.9	$8.70	$52.3
Value Added ($ Millions)	$17.4	$3.6	$5.5	$26.5
Taxes ($ Millions)	-	-	-	$5.7
State/Local	-	-	-	$1.9
Federal	-	-	-	$3.8

15 Jobs refer to both full-time and part-time positions.

Table 4-37
UPM/Blandin Paper Mill Construction-Related Impacts for 2007

Impact Category	Direct	Indirect	Induced	Total
Employment (jobs)	546	102	175	823
Output ($ Millions)	$58.9	$10.9	$14.0	$83.8
Value Added ($ Millions)	$28.1	$5.7	$8.9	$42.7
Taxes ($ Millions)	-	-	-	$9.2
State/Local	-	-	-	$3.0
Federal	-	-	-	$6.2

Table 4-38
UPM/Blandin Paper Mill Construction-Related Impacts for 2008

Impact Category	Direct	Indirect	Induced	Total
Employment (jobs)	8	3	4	15
Output ($ Millions)	$1.5	$0.4	$0.3	$2.2
Value Added ($ Millions)	$0.6	$0.2	$0.2	$1.0
Taxes ($ Millions)	-	-	-	$0.2
State/Local	-	-	-	$0.1
Federal	-	-	-	$0.1

The economic impacts presented above reflect the impact of construction-related expenditures for 2006, 2007, and 2008.[10] It does not necessarily mean that these impacts will occur in precisely the same calendar year as the construction expenditures. In particular, the induced effects will be present for some time after the construction period is completed.

In total, the construction-related impacts will have a significant impact on Grand Rapids and Itasca County. For example, in 2007, the direct jobs provided through construction activities will exceed employment at all current Grand Rapids employers with the exception of Independent School District #318. For the construction period, this will strain local community resources such as housing, medical, and school services. Local public agencies should start planning for these potential impacts and develop service delivery strategies for managing this period. For example, the addition of temporary or short-term positions in health care, education, and other sectors, and the addition of temporary space (e.g., portables for schools) could be considered.

Operations Related Impacts – Compared to Existing Operations

The total economic effects of the "steady state" or full-scale operation of the paper mill on the economy of Itasca County after the expansion were estimated for the two warehousing options relative to the base case or the existing operation of the paper mill. With existing paper mill operations, approximately 58 percent of total paper mill expenditures are locally based. The components of the paper mill operations costs that are predominantly local relate to labor, wood, energy, maintenance materials, etc. Expenditures related to logistics and chemical products are generally not locally based.

Warehouse Options 2 and 4 (near proposed Project site)

In these options, the net steady state operating expenditures in excess of existing operations are approximately $114 million per year. Based on a detailed breakdown of these expenditures, it is estimated that approximately 53 percent or $60 million per year is locally spent. The direct local employment impact is estimated to be approximately 27 jobs annually at steady state.

The total ongoing economic impact of this option is provided in Table 4-39. The total economic impact, including indirect and induced effects, is 173 jobs and approximately $77 million in output.

Table 4-39
Local Ongoing Economic Impact of the UPM/Blandin Paper Mill Project
(Warehouse Options 2 and 4) Relative to Existing Conditions
(2005 Dollars)

Impact Category	Direct	Indirect	Induced	Total
Employment (jobs)	27	104	41	173
Output ($ Millions)	$60.3	$13.7	$3.3	$77.3
Value Added ($ Millions)	$5.5	$7.1	$2.1	$14.7
Taxes ($ Millions)	-	-	-	$3.1
State/Local	-	-	-	$1.4
Federal	-	-	-	$1.8

In reality, while the economic impacts have been developed, it is not likely that this warehousing option would be considered under the No-Build Alternative. However, it is possible that a warehouse off site (e.g., in Duluth) could still be developed under the No-Build Alternative.

Warehouse Option 5 (not in proposed Project vicinity – Duluth, Minnesota)

The economic impacts are moderately lower when the warehouse is assumed not to be located in the direct vicinity of the proposed Project, as some of the incremental employment is not locally based. The direct local employment impact is estimated to be approximately 23 jobs annually at steady state. The total ongoing economic impact of this option is provided in Table 4-40. The total economic impact, including indirect and induced effects, is 153 jobs and approximately $71 million in output.

Table 4-40
Local Ongoing Economic Impact of the UPM/Blandin Paper Mill Project
(Warehouse Option 5) Relative to Existing Conditions (2005 Dollars)

Impact Category	Direct	Indirect	Induced	Total
Employment (jobs)	23	93	36	153
Output ($ Millions)	$55.7	$12.2	$2.9	$70.8
Value Added ($ Millions)	$4.7	$6.4	$1.9	$13.0
Taxes ($ Millions)				$2.8
State/Local				$1.2
Federal				$1.3

Operations Related Impacts – Compared to the No-Build Alternative

The total economic effects of the proposed Project were also derived relative to the No-Build Alternative. In this assessment, it is assumed that PM5 is shut down and that PM6 is maintained as in the base case.

In total, the No-Build Alternative represents a reduction in plant expenditures of approximately $80 million, of which 60 percent is estimated to be locally based. Relative to the base case, the No-Build Alternative also represents a significant reduction in employment levels at the mill of about 250 jobs.

Table 4-41 and Table 4-42 provide the total annual ongoing economic impact of the proposed Project relative to the No-Build Alternative. Table 4-41 shows that relative to the No-Build Alternative, Warehouse Options 2 and 4 would result in an additional 277 direct jobs, 259 indirect jobs, and 190 induced jobs for a total of 726 jobs. The total output impact is estimated at $159 million, including $108 million in direct output. As Table 4-42 shows, results for Warehouse Option 5 are similar. The total economic impact is estimated at 702 jobs and $152 million of output. The direct effect is estimated at 273 jobs and $103 output.

Table 4-41
Local Ongoing Economic Impact of the UPM/Blandin Paper Mill Project
(*Warehouse Options 2 and 4*), *Relative to the No-Build Alternative,*
(2005 Dollars)

Impact Category	Direct	Indirect	Induced	Total
Employment (jobs)	277	259	190	726
Output ($ Millions)	$108.0	$35.8	$15.2	$159.1
Value Added ($ Millions)	$43.6	$17.3	$9.7	$70.6
Taxes ($ Millions)	-	-	-	$13.9
State/Local	-	-	-	$5.6
Federal	-	-	-	$8.2

Table 4-42
Local Ongoing Economic Impact of the UPM/Blandin Paper Mill Project
(Warehouse Option 5), Relative to the No-Build Alternative, (2005 Dollars)

Impact Category	Direct	Indirect	Induced	Total
Employment (jobs)	273	245	184	702
Output ($ Millions)	$103.4	33.8	$14.8	$152.2
Value Added ($ Millions)	$42.9	$16.3	$9.4	$68.6
Taxes ($ Millions)	-	-	-	$13.4
State/Local	-	-	-	$5.5
Federal	-	-	-	$8.0

4.4.2.5 Summary of Ongoing Local Economic Impacts

A summary of the total local economic impacts (e.g., including indirect and induced effects) for each option considered is presented in Table 4-43. Obviously, the greatest local economic impacts would be experienced when the proposed Project is compared to the No-Build Alternative. In this case, there is a significant local economic impact due to the large-scale direct employment impacts of approximately 275 jobs which result in large value-added impacts.

Table 4-43
Local Total Ongoing Economic Impact of the Proposed Project
(includes indirect and induced effects)

Impact Category	Option 2 & 4 vs. Existing Operations	Option 5 vs. Existing Operations	Options 2 & 4 vs. No-Build Alternative	Option 5 vs. No-Build Alternative
Employment	173	153	726	702
Output ($ Millions)	$77.3	$70.8	$159.1	$152.2
Value Added ($ Millions)	$14.7	$13.0	$70.6	$68.6
Taxes ($ Millions)	$3.1	$2.8	$13.9	$13.4
State / Local	$1.4	$1.2	$5.6	$5.5
Federal	$1.8	$1.3	$8.2	$8.0

4.4.2.6 Business Impacts

UPM/Blandin Paper Mill and its support facilities are located near the Central Business District (CBD) and close to commercial and mixed use developments that include retail and office space as well as some mixed uses. Major local highways (TH 2 and TH 169) and railroad tracks – which may also serve as key access routes for transportation of supplies to the plant and production outputs – also cross the CBD area.

According to preliminary estimates, truck traffic within the impact area may increase from 60 trucks per day to 137 per day, and train traffic may increase from 18 rail cars per day to 37 per day (depending on warehousing options). It is also anticipated that some additional traffic increases may be generated due to employee and service vehicles entering and leaving the mill as well as traffic associated with any proposed off site location.

The 1996 CBD Redevelopment Plan identified the accessibility of CBD from throughout the region, convenience, safety, and attractive circulation within CBD as some of the primary requirements for the plan and critical for CBD success.[16] The 2005 Downtown Master Redevelopment Plan points out traffic-related and visual factors as key elements of downtown redevelopment (including improvements to streetscape, pedestrian crossings and "walk-ability" of the downtown area).[17] The 2005 document also notes that highways represent opportunities, but also pose challenges for redevelopment, as highway traffic may prevent some forms of development immediately adjacent to the highways.

As discussed in the Traffic section, traffic impacts from the Project are not considered significant.

Warehouse Option 2 would directly impact several businesses, apartments, and parking areas located just east of PM6 in the block bordered by Second Street NW, Third Street NW, First Avenue NW, and Second Avenue NW adjacent to Block 18 to the west. Figure 4-2 (Potentially Impacted Parcels) shows the project area and the properties that may be acquired under all warehouse alternatives.

Properties that would be acquired under Warehouse Option 2 include a financial services business, a bakery, a textiles store, and a few business service establishments. In total, there are six businesses that would be acquired. Apartments are also located above some of these buildings.

As also shown on Figure 4-2, several properties within areas which may serve as paper warehouse locations are currently owned by Blandin Paper Company. Blandin Paper Company is securing options to purchase the remaining properties. A review of local real estate resources indicates that some office and commercial spaces are available for rent in Grand Rapids; however, sale prices and relocation options would be negotiated between Blandin Paper Company and the seller.[18] The suitability of these replacement properties for a particular business has to be determined on a case-by-case basis. Financial conditions of the new space, as well as costs of moving and adjusting to the new business conditions, are

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[16] See "CBD Redevelopment Plan. An Amendment to the City's Comprehensive Plan," June 1996. Report prepared by Grand Rapids Planning Commission. The 1996 Redevelopment Plan specifies further maintaining through traffic on trunk highways and designated bypasses as one of the secondary requirements – or supportive to the primary design requirements – for a redevelopment strategy. A 1988 Community workshop also identified traffic and access to CBD as one of the greatest concerns and indicated the need for improved transportation arteries (see "CBD Development Plan Grand Rapids, Minnesota," March 1989, report prepared by Trkla, Pettigrew, Allen & Payne, Inc.

[17] See "Downtown Redevelopment Master Plan," Draft #1, July 2005, report prepared by Hoisington Koegler Group, Inc. pages 10-11.

[18] Current or historical data on vacancy rates in the business real estate market were not available. Such data would likely have to be collected from a survey of real estate companies.

also likely to play a major role in business decisions. Overall, the loss or possible relocation of these businesses is not anticipated to cause significant economic impacts to the community as a whole. However, there may be individual cases of negative effects on small businesses.

It should also be noted that the area to be occupied by Warehouse Option 2 is located just at the entry to CBD (Block 17) together with Block 18 and neighboring Block 19 to the east. Blocks 18 and 19 are considered the pivotal blocks that mark the linkage between the downtown riverfront and the remainder of CBD, and are recommended as the highest priority redevelopment sites.[19] Proposed redevelopment concepts for this area involve a public parking area in the southeast corner of the block bordered by enhanced landscaping and commercial developments with storefronts facing Third Street NW and First Avenue NW. The 2000 Riverfront Framework Plan indicates that many stores in Block 18 have already improved both their business storefronts and rear entrances.

The construction of a warehouse just opposite this block could increase traffic around the block to a level at which the area may be considered congested and not easily accessible. In addition, the visual effects of a busy warehouse with trucks arriving and leaving and loading and unloading deliveries may change the character of the area or reduce its attractiveness to businesses and their customers. The 2005 Downtown Master Redevelopment Plan points out that truck traffic in this area would be a barrier to the development goals of the Downtown Plan, and that a warehouse would set a strong industrial tone for the area that would then change the desired character of this section of the Downtown.[20]

4.4.2.7 Housing and Related Impacts

Warehouse Option 4 would require the acquisition of several residences near the existing facility. As described above, Warehouse Option 2 would require the acquisition of several buildings that currently house some apartments above existing businesses. Currently, two of these apartment units are occupied.

Warehouse Option 4 would require the acquisition of 10 smaller, affordably priced, single-family residences located west of the mill’s woodyard. This location utilizes a designated JOBZ zone that offers employers certain tax incentives. As shown in Figure 4-2, some of these properties are currently owned by Blandin Paper Company. The company is obtaining options to purchase the remaining properties. Sale prices and relocation costs would be negotiated between Blandin Paper Company and the seller.

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[19] See “Riverfront Framework Plan,” August 2000, report prepared by Smith Group JJR.

[20] See “Downtown Redevelopment Master Plan,” Draft #1, July 2005, report prepared by Hoisington Koegler Group, Inc., pages 15 and 17.

Figure 4-2
Potentially Impacted Parcels

The current housing market in Grand Rapids today is limited in terms of affordable rental and owner-occupied housing, and therefore relocation options are somewhat limited.

A 2003 housing study for Grand Rapids found that the city has very little available land left for development.[21] This land may not necessarily be developed into communities with affordable housing.

In general, new construction projects in Grand Rapids tend to offer homes priced at $150,000 or more. This is substantially more than the median price of a resale home at $90,500. There is a perception that housing in Grand Rapids is relatively expensive. Partly because of this factor, the rural areas in the county are capturing more of new household growth as they are often seen as more affordable to buyers.

Regarding the rental housing market, the same 2003 housing study found that the overall vacancy rate in Grand Rapids is about one percent, which is much lower than the industry standard of five percent. Out of several properties surveyed for the 2003 study, only one had any vacancies. In affordable housing projects and in projects offering subsidized housing, there are waiting lists with several names and the waiting time varies from 6 months to 24 months.

Grand Rapids employers interviewed for the 2003 housing study also indicated that more affordable housing should be made available to workers. Typically, an affordable family house was defined as under $100,000, and affordable rents were defined as rents under $600 per month. While the average monthly rent for a one-bedroom unit and a two-bedroom unit was found to be well in the range of $600, it should be noted that according to the survey conducted for the study rents in newer properties tended to exceed this figure. The above discussion suggests that development of affordable new rental housing may be very difficult, and a significant public subsidy may be required.

As a result, there are reasons to believe that any lost stock of affordable housing might not be easily replaced somewhere else within the city, or substituted with another option such as rental housing. However, given the small number of potential residential acquisitions, impacts on housing are not expected to be significant.

[21] See "Housing Market Analysis and Demand estimates for Grand Rapids, Minnesota," a report by Maxfield Research, September 2003.

There is also a risk that the construction period by itself may contribute negatively to the availability of affordable housing. As shown in the socioeconomic overview section, the percentage of employment in construction is relatively small. Construction workers to be employed by the Project would largely have to come from outside of Grand Rapids. Some of these construction workers may wish to rent an apartment or house for themselves and their families. This would create pressure on the already tight rental housing market (as discussed in the previous section) which in turn could create rent increases.

New rental housing projects may be built in response to this additional demand and would alleviate the pressure on the rental housing market. However, there is a risk that these projects will be developed to quickly fill the gap in the current supply of housing, rather than be based on longer-term needs of the community.

In addition, construction workers coming to Grand Rapids from outside the county would increase demand for social services such as health care, daycare, and schools. To the extent that this additional demand can be accommodated with current resources and budget allocations, Grand Rapids residents may also face other disruptions and inconveniences, such as difficulties or longer waiting times to get a medical appointment, larger class sizes in schools, and difficulties in obtaining space in daycare centers or in making childcare arrangements.

4.4.3 MITIGATION

The 2005 Downtown Redevelopment Master Plan discusses circumstances for the case of UPM/Blandin Paper expansion that would mitigate the negative effects of Warehouse Option 2. The proposed strategy includes the construction of offices along First Avenue West (South of Third Street) possibly combined with an extended rail facility along the north side of Third Street. The latter variation would also involve retail or office developments on Block 18 that require proximity to the plant and construction of housing related to UPM/Blandin Paper.[22]

Construction of offices along First Avenue West is intended to provide a buffer between the warehouse and the commercial uses in Block 18. On the other hand, the extended rail facility is intended to capitalize on business development opportunities in the CBD that may be created by the UPM/Blandin Paper expansion.

The 2005 Downtown Redevelopment Master Plan also suggests that steps should be taken to prevent truck traffic from using Second Street East of Pokegama and First Avenue East as shortcuts to eastbound Highway 2. Some of the possible steps pointed out in the Plan include specific regulations on truck traffic in the area adjacent to Block 19 as well as physical street improvements or layouts.[23]

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[22] See "Downtown Redevelopment Master Plan," Draft #1, July 2005, report prepared by Hoisington Koegler Group, Inc., pages 17-18.

[23] See "Downtown Redevelopment Master Plan," Draft #1, July 2005, report prepared by Hoisington Koegler Group, Inc., page 15.

Similar restrictions on truck traffic could also be used in all of the Downtown area and even under other warehouse options so as to ensure a balance between easy access to the CBD by cars, pedestrians, and bikes, and good access to Highway 2 by trucks and other highway users.

Other mitigation strategies may include general street improvements, crosswalk enhancements, and perhaps speed limitations. These strategies may help ensure a good sense of safety as well as generate an appealing visual effect of a well-maintained and managed Downtown that, in turn, would attract people despite increased traffic.

CHAPTER 5.0
FORESTRY/TIMBER HARVESTING/HABITAT BIODIVERSITY
POTENTIALLY SIGNIFICANT IMPACTS REQUIRING
DETAILED ANALYSIS

5.1 FORESTRY/TIMBER HARVESTING

5.1.1 EXISTING CONDITIONS

The statewide forest inventory for Minnesota is based on a dataset known as the Forest Inventory and Analysis (FIA). FIA is a program of the United States Department of Agriculture (USDA) Forest Service with a stated mission of estimating and reporting the status, trends, and conditions of the nation's forest resources with known confidence (Miles et al. 2005). The DEIS analysis specifically considers two sets of FIA-type inventory information, one reported in 1990 and the second reported in 2003 (e.g., data collected over the period 1999-2003)[24].

The total land area of Minnesota is 50.9 million acres; 32 percent (16.2 million acres) is classified as forestland. There are three components to forestland: 1) Timberland[25] — forestland that is not restricted from harvesting by statute, administrative regulation, or designation and is capable of growing trees at a minimum rate of 20 cubic feet per acre per year; 2) Reserved forestland — land that is restricted from harvesting by statute, administrative regulation, or designation (i.e., national parks, wilderness areas, etc.); and 3) Other forestland — low-productivity forestland that is not capable of growing trees at a rate of 20 cubic feet per acre per year.

The estimated area of forestland declined from 16.7 million acres in 1990 to 16.2 million acres in 2003. During the same period, the area of timberland increased slightly from 14.7 million acres in 1990 to 14.8 million acres in 2003 (see Figure 5-1[26]). The decrease in Forestland and the increase in Timberland are due in large part to changes in the Reserved and Other forestland components. The decline in the area of Reserved forestland was due to a change in procedures rather than a change in land use between the two FIA datasets. In 1990, field crews did not always visit field plots that were within a reserved boundary. For the 2001 FIA, all forest plots were visited and a number of plots within the mapped reserved boundaries were determined to be non-reserved and/or non-forest.

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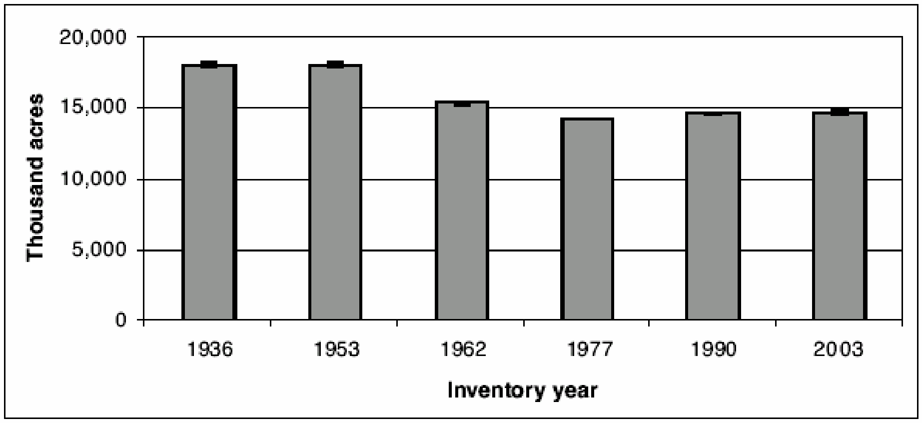
[24] The FIA database proper is referred to as "2001 FIA;" for the purposes of the DEIS, information regarding current forest condition in 2003 will be referenced to 2003, which is the most recent year that data is available over the 5-year cohort of collected data.

[25] Timberland may not be equivalent to the area actually available for commercial timber harvesting or other access. The actual availability of land for various uses depends upon owner decisions that consider economic, environmental, and social factors.

[26] The accuracy bracket atop each bar in Figures 5.1, 5.3, and 5.4 provide a measure of reliability of these estimates. In 2003, there was a two out of three chance that if a 100-percent inventory had been taken, using the same methods, the result would have been within the limits indicated by the bracket — 14,759.8 thousand acres, plus or minus 112.2 thousand acres.

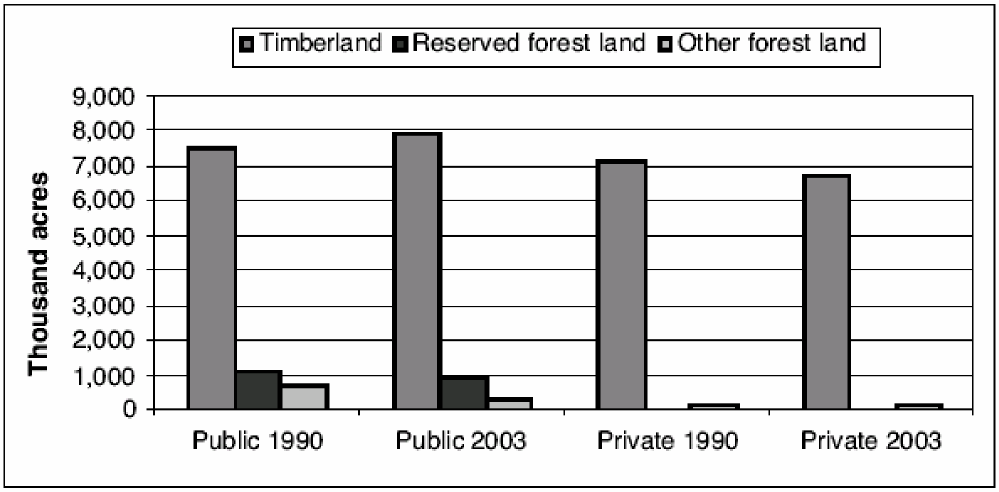
Figure 5-1
Area of Timberland in Minnesota by Inventory Year



The estimate of Reserved forestland decreased from 1.117 million acres in 1990 to 942 thousand acres in 2003, and the area estimate of Other forestland decreased from 840 thousand acres to 528 thousand acres. Nearly half of this acreage decrease in Reserved and Other forestland was due to reclassification to non-forestland, with the other half due to reclassification to Timberland. The net effect was a decrease in the area estimate for forestland and an increase in the area estimate for Timberland.

The estimate of forestland in public ownership remained relatively constant between 1990 and 2003 (see Figure 5-2). The public timberland estimate, however, increased from 7.6 million acres in 1990 to 8.0 million acres in 2003, with a corresponding decline in the area of Other and Reserved forestland. Private ownership declined from 7.1 million acres to 6.8 million acres over the same period. Hardwood forest types are concentrated on private lands (54 percent) while softwood forest types are concentrated on public lands (74 percent).

Figure 5-2
Area of Forestland in Minnesota
Owner Category and Inventory Year



The aspen/birch forest type, with 6.3 million acres of timberland, is the dominant forest type in Minnesota (Figure 5-3) and is an important resource for forest industries. Nearly four-fifths of all the coniferous timberland in the state is of the spruce-fir forest type (3.2 million acres). Between inventories, the estimate of hardwood forest types increased from 10.2 million acres in 1990 to 10.5 million acres in 2003, while the estimate for softwood forest types decreased from 4.4 million acres in 1990 to 4.1 million acres in 2003. This appears to be the result of new stocking and forest typing algorithms used in conjunction with a new plot configuration rather than a change in species composition because roughly 31 percent of Minnesota's growing-stock volume was in softwood tree species in both 1990 and 2003.

The area of timberland by stand diameter class showed a consistent trend from 1962 to 1990 (Figure 5-4). The 2001 FIA classifies stands into small, medium, and large diameter stand size classes; these correspond to the 1990 FIA seedling/sapling, pole, and sawtimber size classes. The area of medium diameter stands declined from 8.5 million acres in 1962 to 5.3 million acres in 1990, while the area in large diameter stands increased from 2.4 million to 4.9 million acres.

Figure 5-3
Area of Timberland in Minnesota in 1990 and 2003 by Forest Type

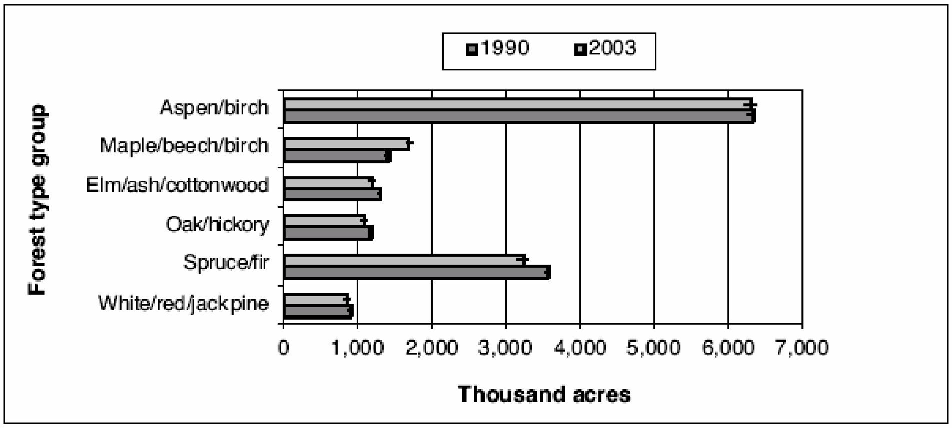
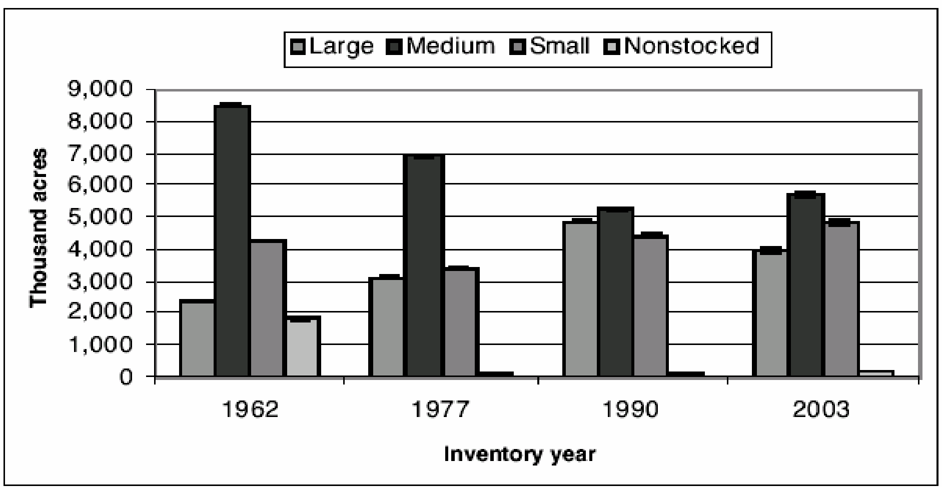


Figure 5-4
Area of Timberland in Minnesota by Stand Diameter and Inventory Year



Note: Columns in Figure 5-4 are presented in the same order as they appear in the key to the Figure. Order across the axis from left to right is large, medium and small diameter, and nonstocked.

Changes to the stand diameter class algorithm between the 1990 and 2001 FIA, along with the new plot configuration, make comparisons of the 2003 stand diameter numbers to earlier years difficult at best. From 1990 to 2003 the area classified as medium diameter stands, stands where a plurality of the stocking is in hardwoods 5 to 11 inches in diameter at breast height (dbh) and softwoods 5 to 9 inches dbh, rose from 5.3 million to 5.7 million acres, despite a 13 percent decline in the number of poletimber-size trees. Over the same period, the area classified as large diameter stands, sawtimber stands where a plurality of the stocking is in trees at least 9 inches dbh for conifers or 11.0 inches dbh for deciduous trees, decreased by 19 percent (947 thousand acres) from 4,890.3 thousand acres to 3,943.4 thousand acres, even though there was only a 4 percent decrease in the number of sawtimber-size trees; see Table 5-1 and Table 5-2.

Table 5-1
Minnesota Forest Resources – Species Group / Stand Age Class[27]

Forest Type	Total Acres	Stand Age – 5-yr Classes Acres																				
		0-5 Years	6-10 Years	11-15 Years	16-20 Years	21-25 Years	26-30 Years	31-35 Years	36-40 Years	41-45 Years	46-50 Years	51-55 Years	56-60 Years	61-65 Years	66-70 Years	71-75 Years	76-80 Years	81-85 Years	86-90 Years	91-95 Years	96-100 Years	100+ Years
Jack pine	481,760	10,061	21,891	13,118	18,512	35,532	26,568	32,327	45,225	30,030	48,034	22,288	56,810	21,906	17,444	8,382	23,366	17,386	9,670	1,151	13,669	8,392
Red pine	405,988	16,162	19,453	27,970	40,702	23,196	38,468	29,218	30,216	28,404	17,544	15,433	22,361	22,401	10,876	16,925	12,201	8,876	3,278	4,501	8,548	9,256
Eastern white pine	116,100	695	0	1,607	3,035	1,435	0	804	1,877	4,232	7,605	804	3,392	0	12,183	12,979	18,143	9,385	733	5,295	5,405	26,492
Balsam fir	447,699	17,332	17,435	31,920	16,679	19,344	22,319	13,698	30,910	36,607	63,556	42,301	33,883	21,309	7,913	21,784	6,681	4,395	8,673	10,151	8,029	12,780
White spruce	112,378	16,124	12,064	5,603	15,108	5,217	5,642	8,567	7,308	6,750	9,899	0	3,968	5,449	4,255	0	466	4,601	0	1,273	84	0
Black spruce	1,620,127	29,714	11,478	22,081	25,568	40,489	32,227	45,914	74,899	83,916	130,476	95,001	136,368	151,892	80,491	117,566	103,242	60,916	77,429	47,922	65,320	187,218
Tamarack	891,867	20,229	6,329	6,931	23,109	10,328	12,885	48,667	52,265	54,329	94,457	26,445	46,614	62,016	69,943	45,197	36,185	28,636	38,701	30,351	62,229	116,021
Northern white-cedar	624,896	4,106	3,567	0	682	0	7,843	10,934	6,586	21,469	15,933	32,987	37,079	7,735	34,734	29,948	37,796	43,076	37,126	22,853	35,247	235,196
Eastern red cedar	16,943	0	0	0	0	0	3,547	0	0	0	0	0	0	4,179	0	2,715	3,787	0	2,715	0	0	0
Scotch pine	3,906	0	0	820	0	1,636	0	1,449	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White pine / red oak / white ash	86,112	1,788	0	0	4,340	0	0	0	3,361	4,315	15,848	16,419	4,232	0	6,434	3,214	6,160	0	8,896	0	3,536	7,571
Eastern red cedar / hardwood	8,529	0	0	0	0	0	0	0	0	0	0	947	0	0	0	4,971	0	0	0	0	0	2,611
Other pine / hardwood	192,418	3,786	4,878	9,439	8,726	15,278	10,811	13,010	15,866	0	22,692	6,436	20,971	6,912	19,809	14,624	0	3,091	10,427	0	3,361	2,301
Oak / Hickory Group	1,516	896	0	0	0	0	0	0	0	0	459	0	0	0	0	0	0	0	0	0	0	160
Post oak / blackjack oak	65,798	5,043	0	0	0	0	0	4,315	5,978	0	0	0	11,233	6,416	2,090	6,115	10,755	0	3,228	818	7,422	2,384
White oak / red oak / hickory	251,731	6,054	5,208	0	0	3,393	1,442	5,053	6,491	20,796	7,874	20,541	28,534	24,969	20,248	18,237	29,710	9,606	22,363	6,620	3,474	11,117
White oak	14,045	0	0	0	0	0	0	1,360	0	0	0	0	905	0	2,768	116	3,228	2,544	0	0	2,302	823
Northern red oak	305,147	5,780	795	2,301	0	1,573	5,176	4,523	6,303	7,590	14,267	8,144	22,548	31,366	47,296	33,404	40,679	21,587	16,179	9,305	9,382	16,952
Bur oak	202,035	4,356	0	3,197	3,334	0	0	0	0	6,689	6,012	12,570	12,217	3,282	8,459	11,159	12,473	30,362	21,744	13,264	19,315	33,601
Black walnut	7,335	0	0	0	0	0	0	0	0	0	0	0	0	2,903	0	3,620	0	0	0	0	0	812
Red maple / oak	39,618	3,228	3,214	446	0	0	0	2,544	2,312	1,125	4,315	0	6,201	4,640	6,826	0	0	0	0	0	0	4,769
Mixed upland hardwoods	275,075	11,626	3,283	4,698	2,276	0	4,361	2,433	12,694	7,315	25,020	26,824	33,317	7,170	17,634	15,170	32,921	12,067	18,041	8,688	14,205	15,330
Elm / Ash / Cottonwood Group	2,897	1,229	0	0	0	0	0	0	0	968	700	0	0	0	0	0	0	0	0	0	0	0
Black ash / American elm / red maple	886,297	38,132	5,078	4,166	8,196	11,154	15,897	21,256	28,411	13,992	67,914	41,302	89,122	66,376	58,923	80,024	56,850	28,826	53,307	32,379	38,226	126,768
River birch / sycamore	24,557	0	0	0	0	2,544	3,567	6,487	3,392	0	0	0	804	3,392	3,567	0	804	0	0	0	0	0
Cottonwood	40,381	0	0	0	3,716	1,401	0	3,090	0	2,030	7,426	0	11,967	0	329	0	3,442	0	2,646	0	2,569	1,764

[27] Refer to Appendix C, Section 2.1 for sampling error.

Table 5-1
Minnesota Forest Resources – Species Group / Stand Age Class[27]

Forest Type	Total Acres	Stand Age – 5-yr Classes Acres																				
		0-5 Years	6-10 Years	11-15 Years	16-20 Years	21-25 Years	26-30 Years	31-35 Years	36-40 Years	41-45 Years	46-50 Years	51-55 Years	56-60 Years	61-65 Years	66-70 Years	71-75 Years	76-80 Years	81-85 Years	86-90 Years	91-95 Years	96-100 Years	100+ Years
Willow	49,439	6,072	15,095	0	0	5,301	0	7,216	0	1,707	5,766	0	2,856	2,192	0	0	1,788	0	0	0	1,447	0
Sycamore / pecan / American elm	8,019	0	0	0	0	0	3,313	0	724	0	0	0	0	0	0	3,134	848	0	0	0	0	0
Sugarberry / hackberry / elm / green ash	205,671	10,012	4,035	7,584	3,620	1,664	7,516	10,101	20,460	15,241	22,502	14,598	17,137	13,167	23,487	11,433	4,029	7,573	7,849	799	1,151	1,715
Silver maple / American elm	40,841	2,787	0	0	0	0	1,588	0	1,614	0	6,836	1,599	0	6,683	5,252	1,696	3,671	2,779	0	0	6,336	0
Red maple / lowland	15,801	0	0	0	0	0	0	0	840	0	0	0	1,697	6,266	0	4,315	0	0	2,682	0	0	0
Cottonwood / willow	10,325	0	0	2,544	947	0	0	0	0	0	0	0	0	0	3,620	3,214	0	0	0	0	0	0
Maple / Beech / Birch Group	181	0	0	0	0	0	0	0	0	0	0	0	0	0	181	0	0	0	0	0	0	0
Sugar maple / beech / yellow birch	593,006	22,619	10,745	5,566	6,629	11,306	7,943	14,537	33,514	20,546	42,847	40,107	76,204	41,406	65,592	57,955	54,676	27,420	20,561	9,179	7,046	16,607
Black cherry	5,399	2,558	0	0	0	0	0	0	2,840	0	0	0	0	0	0	0	0	0	0	0	0	0
Cherry / ash / yellow-poplar	5,990	0	0	0	2,455	0	0	0	0	0	0	0	0	821	0	2,715	0	0	0	0	0	0
Hard maple / basswood	909,222	17,760	12,998	5,596	10,964	4,335	7,410	13,247	12,778	40,353	46,970	35,237	102,086	83,091	113,537	95,377	90,309	55,670	61,276	12,320	45,033	42,876
Elm / ash / locust	147,580	4,181	3,744	979	2,729	7,926	6,041	2,517	14,786	9,059	15,784	21,034	4,953	17,741	6,705	7,034	7,394	5,906	0	958	0	8,109
Red maple / upland	96,216	19,217	1,336	0	0	2,658	804	2,462	8,005	1,224	7,222	12,346	11,329	9,876	11,226	0	3,134	848	3,727	0	0	804
Aspen / Birch Group	4,486	0	0	754	0	0	0	1,343	773	235	0	555	0	0	264	0	0	561	0	0	0	0
Aspen	5,109,591	472,870	414,046	344,177	286,244	287,280	282,449	258,234	293,262	326,485	391,383	325,044	395,455	339,571	271,880	157,976	124,535	54,798	32,185	15,297	16,656	19,767
Paper birch	1,207,436	39,951	25,026	25,313	27,068	32,415	15,232	21,980	39,010	36,585	128,313	109,683	108,374	119,497	157,155	110,835	75,571	48,038	31,140	26,246	13,019	16,983
Balsam poplar	460,469	27,058	24,256	17,341	27,140	13,848	12,522	36,799	38,158	42,649	40,206	45,082	37,105	21,229	21,516	18,887	21,333	3,283	764	4,894	3,120	3,278
Other exotic hardwoods	3,838	0	0	0	0	1,681	0	0	0	0	0	0	2,157	0	0	0	0	0	0	0	0	0
Non stocked	231,671	231,671	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	16,230,334	1,053,099	625,953	544,152	541,779	540,934	535,570	624,084	800,857	824,640	1,267,859	973,724	1,341,881	1,115,853	1,112,636	920,722	826,175	492,230	495,338	264,265	396,129	932,455

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Source: Web citation: Miles, Patrick D. Jul-11-2005. U.S. Department of Agriculture, Forest Service, North Central Research Station

Table 5-2
Minnesota Forest Ownership

Forest type	Total Acres	Ownership Class Acres								
		National Forest	National Park Service	Fish and Wildlife Service	Dept. of Defense	Other Federal	State	County and Municipal	Other Local Govt.	Private
Jack pine	481,760	147,406	10,021	0	0	13,994	99,540	53,332	941	156,526
Red pine	405,988	129,137	3,392	0	0	8,944	94,759	28,409	0	141,346
Eastern white pine	116,100	61,772	4,317	0	0	0	12,413	5,595	0	32,003
Balsam fir	447,699	105,017	0	0	0	7,081	123,614	45,337	0	166,649
White spruce	112,378	21,600	0	0	0	226	52,433	3,677	0	34,442
Black spruce	1,620,127	350,746	1,705	0	0	7,757	763,956	225,945	3,567	266,451
Tamarack	891,867	71,549	2,558	4,339	1,512	6,814	490,102	149,079	0	165,915
Northern white cedar	624,896	116,009	0	0	0	13,563	288,527	85,287	0	121,510
Eastern red cedar	16,943	0	0	0	0	0	2,715	0	0	14,228
Scotch pine	3,906	0	0	0	0	0	0	0	0	3,906
White pine / red oak / white ash	86,112	15,500	7,405	0	0	0	11,694	5,059	0	46,454
Eastern red cedar / hardwood	8,529	0	0	0	0	0	0	0	0	8,529
Other pine / hardwood	192,418	52,932	0	0	0	0	33,702	13,473	0	92,311
Oak / Hickory Group	1,516	0	0	0	0	0	486	0	0	1,030
Post oak / blackjack oak	65,798	0	0	3,492	0	0	2,895	3,228	0	56,184
White oak / red oak / hickory	251,731	0	0	0	0	0	29,038	10,239	0	212,453

Table 5-2
Minnesota Forest Ownership

Forest type	Total Acres	Ownership Class Acres								
		National Forest	National Park Service	Fish and Wildlife Service	Dept. of Defense	Other Federal	State	County and Municipal	Other Local Govt.	Private
White oak	14,045	0	0	0	0	0	2,768	0	0	11,277
Northern red oak	305,147	1,595	4,351	0	8,670	0	47,936	28,670	0	213,925
Bur oak	202,035	0	0	2,337	0	0	22,614	1,763	0	175,322
Black walnut	7,335	0	0	0	0	0	0	0	0	7,335
Red maple / oak	39,618	2,544	0	0	0	0	4,947	4,785	0	27,342
Mixed upland hardwoods	275,075	4,968	0	5,663	0	0	18,975	5,040	0	240,429
Elm / Ash / Cottonwood Group	2,897	0	0	0	0	0	742	0	0	2,156
Black ash / American elm / red maple	886,297	67,185	0	5,132	0	3,576	247,722	109,564	0	453,117
River birch / sycamore	24,557	6,784	0	0	0	0	10,933	3,567	0	3,273
Cottonwood	40,381	0	0	0	0	0	13,425	2,455	0	24,501
Willow	49,439	0	0	1,447	0	0	14,498	827	0	32,667
Sycamore / pecan / American elm	8,019	0	0	0	0	0	0	4,037	0	3,982
Sugarberry / hackberry / elm / green ash	205,671	1,151	0	5,002	0	0	13,330	6,804	0	179,384
Silver maple / American elm	40,841	0	0	3,442	0	2,895	3,671	0	0	30,834

Table 5-2
Minnesota Forest Ownership

Forest type	Total Acres	Ownership Class Acres								
		National Forest	National Park Service	Fish and Wildlife Service	Dept. of Defense	Other Federal	State	County and Municipal	Other Local Govt.	Private
Red maple / lowland	15,801	3,392	0	0	0	0	840	804	0	10,765
Cottonwood / willow	10,325	0	0	3,214	0	0	947	0	0	6,164
Maple / Beech / Birch Group	181	0	0	0	0	0	181	0	0	0
Sugar maple / beech / yellow birch	593,006	93,565	1,821	0	0	2,896	103,107	70,973	0	320,644
Black cherry	5,399	0	0	0	0	0	0	0	0	5,399
Cherry / ash / yellow-poplar	5,990	0	0	0	0	0	0	0	0	5,990
Hard maple / basswood	909,222	73,095	0	10,368	0	6,762	142,488	98,960	0	577,550
Elm / ash / locust	147,580	4,784	0	0	0	0	17,682	7,592	0	117,523
Red maple / upland	96,216	12,852	0	0	0	2,989	13,960	15,937	0	50,478
Aspen / Birch Group	4,486	773	0	0	0	0	808	809	0	2,097
Aspen	5,109,591	721,925	35,788	15,256	4,335	47,843	1,248,582	773,522	3,567	2,258,772
Paper birch	1,207,436	380,987	5,968	1,150	0	3,058	245,053	178,315	0	392,906
Balsam poplar	460,469	28,121	0	0	0	7,827	162,506	35,095	0	226,920
Other exotic hardwoods	3,838	0	0	0	0	0	0	0	0	3,838
Non stocked	231,671	14,454	0	0	0	3,536	101,224	19,019	0	93,438
Total	16,230,334	2,489,842	77,325	60,841	14,518	139,757	4,444,811	1,997,197	8,075	6,997,967

Source: Web citation: Miles, Patrick D. Jul-11-2005. U.S. Department of Agriculture, Forest Service, North Central Research Station

5.1.2 IMPACTS

5.1.2.1 Cumulative Effects of Statewide Timber Harvesting

Generic Environmental Impact Statement Study on Timber Harvesting and Forest Management

The Build Alternative of the Project will increase UPM/Blandin Paper mill's annual consumption of roundwood by a projected 197,000 cords per year, thus adding to the statewide aggregate roundwood demand for industrial and non-industrial consumptive purposes. According to the Generic Environmental Impact Statement (GEIS) Study for Timber Harvesting and Forest Management (Minnesota Environmental Quality Board, 1994), or GEIS, projects like UPM/Blandin Paper's Thunderhawk Project will contribute to the potential cumulative environmental effects likely to result from all timber harvest activities conducted in the state. Potential significant cumulative impacts identified by the GEIS include the following: cover patterns; species mix; age structure (for paper birch in particular); biodiversity, including rare biota; forest health; soil nutrients; soil permeability; soil erosion rates; forest dependent wildlife species; conifer stand patterns; food-producing trees; visual aesthetics; recreation; and cultural and historic resources. The GEIS analysis also explored potential mitigation strategies, assessed their effectiveness, and offered strategic recommendations for further action. See Appendix H: Executive Summary on Final GEIS.

Relationship of the GEIS to the DEIS

RGUs are required to use information from an available GEIS through tiering when conducting project-specific review. Consistent with this requirement, the Final Scoping Decision identified the GEIS as a source of information in evaluating the Project's impacts to forest resources. The DEIS incorporates by reference the findings and conclusions of the GEIS. See Appendix B: Final Scoping Decision Document and Appendix H: Executive Summary on GEIS Report Card Study.

Treatment of GEIS Impacts and Mitigation in the DEIS

The Final Scoping Decision requires the DEIS to assess the No-Build and Build Alternatives in terms of projected change in Minnesota forest conditions at decade intervals from the present to the year 2040. The projection of forest condition is to be characterized in terms of forest extent and diversity as measured by cover type and age class structure. Changes in forest condition under the No-Build Alternative are to be compared to the GEIS Base Harvest Scenario (e.g., harvest of approximately 4 million cords of wood per year). Changes under the Build Alternative are to be compared to those changes projected for the No-Build Alternative.

Mitigation under the Final Scoping Decision is to be assessed for the Build Alternative in terms of the progress in implementing the GEIS's Strategic Programmatic Responses, which are authorized under the

Minnesota Sustainable Forest Resources Act (M.S. 89A). The analysis is to consider the long-term ability of potentially affected resources to sustain forest outputs and values. Measures being implemented by the Proposer on its ownerships or through its open-market purchases are also to be detailed.

The Final Scoping Decision also requires identification of potential unmitigated impacts for the Build Alternative. Where impacts are noted alternatives are to be examined regarding: 1) alternative sources of wood fiber for the Project, and 2) investments to increase forest productivity and utilization. See Final Scoping Decision (February 2005) for further information (Appendix B).

5.1.3 MODELING IN THE DEIS

The assessment of impacts under the No-Build and Build Alternatives is both quantitative and qualitative. Modeling was conducted to provide quantitative information regarding future forest conditions (in terms of cover type, age class, and harvest scheduling), wildlife populations, and habitat quality. Model outputs are interpreted in the context of the GEIS 17 impact areas. Various scenarios were modeled in the course of the analysis. The Build and No-Build Alternatives which this chapter focuses on correspond to Scenario A&P (Build Alternative) and Scenario A (No-Build Alternative) respectively. A series scenarios involve a higher availability factor for timber harvesting on private lands. More detail on modeling scenarios is included in Appendix C. See Appendix C: Forestry/Timber Harvesting Methodology and Future Conditions Report for more detail on DEIS-related modeling.

5.1.3.1 Forest Conditions Modeling

Projection of forest conditions requires predicting timber yield streams under alternative management options. Because the Final Scoping Decision required use of the most recent available Minnesota FIA Database (USDA Forest Service, 2003), a yield model was needed that could project forest conditions on forested FIA plots. The STEMS individual tree growth model (Miner et al. 1988) is the most widely used model for such purposes in Lake States forestry practice. The model operates at the level of the individual tree, allowing straightforward handling of the multi-species forested conditions prevalent in Minnesota. The STEMS model is the Lake States variant of the Forest Vegetation Simulation, or FVS, (Teck et. al., 1996).

The STEMS model operates on a tree list. Tree lists for each forested plot condition were generated from the FIA database. Only trees alive and 1-inch dbh (diameter at breast height), and larger at the time of the inventory were included in the tree list. The important tree attributes were species code, dbh, crown ratio, tree condition code, tree site index, and tree expansion factor.

Use of an alternative, stand-based model was considered. Such an approach was determined problematic for many reasons. The most obvious reason is the lack of resolution in terms of the multi-species nature common to all forest types in Minnesota. Strengths and weaknesses of the STEMS Model are listed below.

STEMS Model Strengths

- Reliance on the most recent FIA allows for comparisons with the model outputs of the GEIS, which was based primarily on the previous 1990 FIA.
- STEMS is an accepted individual tree growth model that allows for straightforward handling of multi-species forested conditions prevalent in Minnesota.
- Addition of the UPM/Blandin Paper ownership allows better consideration of potential Project-specific impacts and mitigation.
- Addition of the state-owned county-managed attributes allowed for consideration of owner-specific management treatment options and general availability of lands for harvest.
- Addition of the NPC classes for FIA plots allowed for more complete successional modeling.
- Assumptions regarding better utilization are more relevant to today's practices than has been historically the case.
- Estimating young forest conditions allows consideration of this age class in the analysis rather than ignore them.
- Yield stream predictions for trees per acre and basal area per acre allow for consideration of leave-tree management guidelines.
- Assumptions regarding red pine plantation management allow for a more realistic treatment of this species where thinning is a standard practice (relative to other forest types.)

STEMS Model Limitations

- Differences in data collection methodologies between the 1990 and 2001 FIA datasets complicates direct comparisons between the two sources of information.
- STEMS does not estimate cover type change and succession. It can also "grow" trees beyond species-specific life expectancies.
- As with any dataset, the FIA is a statistical sample subject to sampling error.

5.1.3.2 Timber Harvest Modeling

Forest condition projection also requires predicting when forest management actions, typically timber harvest, will occur over the life of a stand. It must be robust enough to recognize the possibility that some stands may be subject to multiple harvests over the study period, while others are not harvested at all. The DEIS relies on an updated version of the Dualplan Model used for the GEIS (Hoganson and Rose, 1984). The model was used most recently for developing forest plans for both the Chippewa and Superior National Forests in Minnesota (USDA, 2004). The scheduling model is based on a linear programming formulation of the forest management situation. Decision variables describe the management options available for individual forest management units (analysis areas). Dualplan uses a specialized solution technique that allows recognition of a large number of analysis areas.

In defining analysis areas, each forested plot condition of the 2001 FIA statewide inventory was further subdivided, with additional divisions representing area differences in terms of riparian areas and availability of private land for harvest. Each analysis area represented from 1 to 7,700 acres of similar forest condition and availability for harvest. In total, over 31,000 analysis areas were represented in the model. To take advantage of recent analyses and plans developed for national forestlands in Minnesota, modeling results from those analyses were input directly into the model to represent management plans for national forestlands.

The forest management scheduling model can be interpreted as a series of analyses, one for each analysis area that also considers analysis area-level contributions toward forest-wide management constraints imposed by landowner objectives. These forest-wide constraints can be used to describe a wide range of possible forest management objectives involving both economic and environmental considerations. For example, the recent plans developed for the Chippewa and Superior National Forests in Minnesota, most forest-wide constraints described objectives related to desired future conditions of the forest for major NPC groups. Desired future conditions for a NPC group were generally described in terms of the desired forest cover type mix for the NPC and a limit on harvesting in that NPC group in each decade.

Multiple model scenarios were developed over the course of the analysis. These reflected a few potentially key assumptions about the resource situation. Particular emphasis was placed on: 1) assumptions regarding the availability of private lands for timber harvest in the aspen forest cover type, and 2) the degree that demand for other tree species might increase by other wood users in Minnesota. Consistent with the Final Scoping Decision, one No-Build Alternative and one Build Alternative were subject to detailed analysis in the DEIS. Key assumptions, strengths and weaknesses of the Dualplan Model are listed below.

Dualplan Model Key Assumptions

- No-Build Alternative Harvest Levels. The No-Build Alternative is based on the 2002 statewide harvesting rate of 3.675 million cords per year[28]. All decades in the planning horizon are constrained to have an average annual statewide harvest equal to this value. Harvest levels for aspen in particular were also constrained in each decade to 2.206 million cords/yr, which was the 2002 statewide annual harvest level for this forest type. Constraints were also included for red pine sawlogs and spruce-fir roundwood to sustain harvest to at least the 2002 levels. For these other product groups, harvest levels are allowed to increase above 2002 levels, but increase are limited by the constraints on the overall statewide harvest level described above which limit harvesting to an average of 3.675 million cords per year in each decade of the planning horizon.

[28] The DEIS relies on the 2002 harvest level because it was the most recent data available during DEIS preparation.

- Build Alternative Harvest Levels. The Build Alternative differs in terms of harvest levels only by the addition of the Project's projected increase in harvest to the 2002 statewide harvest levels. This means that 98,500 cords of aspen and 98,500 cords of spruce-fir were added to the 2002 level, which matches the total projected increase of 197,000 cords per year.
- Anticipated Project Start-Up. The Build Alternative assumes that the Project is to be completed in 2007 with the increase of wood use only in the last 4 years of Decade 1.
- Aspen Demand and Species Substitution. The GEIS analysis assumed that approximately 25 percent of the anticipated demand for aspen would shift to other species by 2010. Such a shift has not yet occurred but there is evidence that some shifts are starting to occur. For the No-Build Alternative for this DEIS, future harvest levels for the aspen product group(trembling aspen, bigtooth aspen and balm of gilead) are assumed to constant over time at the estimated harvest level for aspen in 2002.
- Minimum Harvest Levels for Aspen. The estimated constant harvest level for aspen (based on estimated level for year 2002) is 2.206 million cords/yr. For the GEIS Base Harvest Scenario, the aspen harvest level was assumed to decline by year 2010 to 1.85 million cords per year. GEIS aspen harvest levels are not nearly as large a component of overall statewide harvest as used in the DEIS analysis.
- Relative Proportion of Aspen Harvest Volume. In 2002, 60 percent of the estimated timber volume harvested in Minnesota was aspen (including balm of gilead). This is a high percentage considering that stands in the aspen forest cover type average approximately 65 percent aspen by volume, which means that a substantial component of non-aspen harvest volume is supplied from the aspen forest cover type. Of concern is the need for at least some harvest in other forest cover types that need disturbance to sustain the forest cover type (e.g., jack pine and paper birch). With an assumed decline in demand for aspen, GEIS analyses assumed that the aspen product group comprised 44.4 percent of the statewide timber harvest volume for years beyond 2010 for the GEIS Base Harvest Scenario.
- Consideration of Area Control Methods. Historically, public land management agencies in Minnesota have used area control methods to calculate allowable cuts. Area control methods emphasize limits on the total area of forest harvested during each time period of the planning horizon. Upper limits on the total area harvested each decade were set separately for state and county lands for forest cover types that typically use even-aged management. For the DEIS analysis, minimum harvest areas per decade for forest cover types were also included for the Chippewa and Superior National Forests (consistent with recently adopted forest plans). Minimum harvest areas were not identified for other ownerships. The issue is important in considering limited demand for harvesting forest cover types requiring maintenance of a disturbance regime to maintain these forest types (e.g., jack pine; paper birch).
- National Forest Lands. Model outputs from recent forest planning for both the Chippewa and Superior National Forests were directly input into the DEIS scheduling model and were not revised based on model estimates for other ownerships.

- State Lands – Minimum Stand Ages. DEIS-related modeling used minimum stand ages for mature forests that generally agree with DNR classifications for effective extended rotation forestry (ERF).
- State Lands – Area Control Limiting Regeneration Harvesting. Limits on area harvested were set considering the long-term desired future conditions for each forest cover type in terms of the percentage of timberland that is desired to be effective ERF. The effective ERF target is 12.5 percent for the aspen cover type. For aspen, a target of 19.4 percent of the aspen cover type was exhibited in the model for the 0-9 year age class within each decade. Decades 1 and 2 of the planning horizon allowed for up to 10 percent greater area in this age class to deal with the current aspen age-class imbalance.
- State Lands – Short Term Objectives. DNR generally projects to treat more acres in the next 10 years compared to a long-term average. The DEIS modeling relates these short-term plans to both Decades 1 and 2, with Decade 1 starting in 2001 as the midpoint year of measurement for the latest FIA inventory. Departures are generally justified by the imbalanced nature of the stand distributions and short-lived nature of trees present in the associated forest cover type.
- State Lands – Availability for Harvest. The analysis assumed that 95 percent of all timberland on DNR lands is available for harvest. This is an estimated 3.7 million acres of DNR forestland and approximately 3.3 million acres of DNR timberland.
- County Lands. Area control restraints were applied to county ownerships for jack pine, spruce-fir, aspen, paper birch, lowland spruce, tamarack, and red pine. Rotation ages were established allowing for departures from area harvested for Decades 1 and 2; departures are generally justified by the imbalanced nature of the stand distributions and short-lived nature of trees present in the associated forest cover type. Similar to DNR lands, 95percent of county timberlands were assumed to be available for harvest.
- UPM/Blandin Paper Lands. The analysis considered 98 percent of Proposer lands available for harvest. No other direct constraints were applied.
- Other Private Lands. The analyses recognized that substantial uncertainty surrounds the availability of private lands for timber harvest. Assumptions underlying timber land availability are important in developing harvest estimates, especially for the aspen forest cover type that is in high demand by industry. Regarding availability in general, the model assumed that acres of private lands become available over time with availability dependent on stand age and forest cover type. Older stands were viewed as more likely to be unavailable recognizing that harvesting opportunities for these owners have likely been turned down in the past. For example, under the Build Alternative assumptions, 80 percent of the aspen in the age 40-49 year age class were considered available for harvest in Decade 1, and by Decades 4, 95 percent of these acres are assumed available. In contrast, for the age 70-79 year age class under the same alternative, only 60 percent of the area in the age class is considered available in Decade 1.

Specific assumptions for all forest cover types and age classes are shown in Appendix C.[29] No other direct constraints were applied.

- Ecological Areas. The USFS assigned an associated ecological classification, or NPC, to each analysis area. Twenty three NPC classes were recognized. Approximately 95 percent of all plots were correlated with NPC classifications. Five percent were not due to USFS concerns about confidentiality of specific plot locations.
- Riparian Areas. Each FIA plot was assumed to have a proportion of its area in a riparian condition. The proportion considered riparian area ranged from 1.51 to 6.08 percent over 12 forest cover type groups. Definitions of riparian areas are based on the Minnesota Forest Resources Council Voluntary Site-Level Forest Management Guidelines for riparian area management.
- Silvicultural Treatment Options – Harvest Scheduling. Treatment options were assigned to each analysis area. Even-aged or uneven-aged options were considered depending on the forest cover type. A "no-harvest" option was also considered for each analysis area.
- Silvicultural Treatment Options – Riparian Areas. Harvest was limited such that at least 40 square feet of basal area were retained in the stand post-harvest.
- Silvicultural Treatment Options – Minimum Rotation Lengths. Minor variation is present in minimum rotation lengths across ownerships for most forest cover types. Red pine is a notable exception where DNR lands emphasize long rotations with thinning.
- Planning Horizon. The Final Scoping Decision requires a forty-year planning horizon with four ten-year planning periods. Harvests were assumed to occur at the midpoint of each planning period. Forest conditions were measured at the beginning and end of each planning period.
- Silvicultural Treatment Options – Reforestation Activities. Reforestation activities involving changes in forest type after harvest were considered only in silvicultural treatment options on National Forest lands. A range of factors influence regeneration decisions for specific landowners. Harvest volumes from reforestation efforts were not tracked in the model as they would generally occur beyond the end of the 40-year planning horizon. In addition, with a 40-year planning horizon, areas regenerated did not contribute any harvestable volume from a second rotation.
- Ending Inventory Values. Although projections of harvests and forest conditions were developed only until 2040, timber production potentials were considered for periods beyond the end of the planning horizon when scheduling management activities for each analysis area. Values for future full rotations were estimated based on site index and forest cover type using soil expectation values (Davis et al. 2001) and typical economic rotation ages for the forest cover type associated with each analysis area. Recognizing values associated with harvesting beyond the end of the 40-year planning horizon helps prevent the model from focusing on only achieving timber supply objectives over the 40-year planning horizon. The model tracks and

[29] DEIS-related modeling included a derivative private land availability scenario where private lands are assumed to be less available. This is noted in Appendix C.

constrains timber harvest flows only over the first 40 years, but it also considers an infinite planning horizon when evaluating and selecting management schedules for each analysis area.

- Forest Succession. The model did not directly project forest succession. Short-lived species, such as jack pine, aspen, and birch, were shown as occurring at ages (model outputs) beyond that where natural succession to other forest types will have occurred. Projections on the degree that natural succession is likely to occur is provided qualitatively.

Dualplan Model Strengths

- The model allowed for the evaluation of multiple management options.
- Because Dualplan was used in the Forest Service's recent forest planning, data and information developed for that process was able to be directly imported for use in the DEIS regarding national forestlands.
- Allowable cut limits were included for each decade for the forest cover type groups that are generally managed using even-aged management.
- The model did not include constraints to force some minimal harvesting level in all forest cover types. Instead, cover types are considered together when developing management schedules to sustain minimal timber volume flows over time for specific forest cover types.
- The model allowed for consideration of both stand-level and forest-wide management objectives.
- The model allowed for examination of multiple scenarios, which allows for sensitivity analysis to be run to delineate the resilience of model outputs across changes in key inputs.
- As an optimization-type model, important insights can be gained regarding management opportunities not captured in other types of models.
- The model's treatment of aspen demand and species substitution better reflects current and projected conditions than levels assumed in the GEIS.
- The model provides updated estimates of future timber harvest volumes by species groups based on actual estimate of statewide harvest levels for 2002, rather than those projected in the GEIS. For the GEIS Base Harvest Scenario, harvest levels from the aspen product group were assumed to decline by approximately 25 percent by the year 2010. The GEIS did not project aspen harvest volumes to be nearly as large of a component of overall statewide harvest as estimated in 2002.
- Tracking of stand age classes by NPC allowed for consideration of potential forest wildlife and habitat impacts important for specific native plant communities.
- Inclusion of a riparian area analysis areas allowed for evaluation riparian-oriented management treatment options to be considered in the quantitative analysis.

Dualplan Model Limitations

- Optimization models are not predictive by nature. Modeling results have to be viewed as "what could be" rather than a prediction of the future.
- The use of "simplified assumptions" was necessary due to time constraints. For example, reliance on the FIA as the source data reduced opportunity to incorporate more refined sources of data, such as DNR inventory information.
- Because of confidentiality considerations, a very small number of FIA plots (< 5 percent) were not classified according to whether they are state-owned county managed or state-owned DNR-managed lands.
- Substantial uncertainty remains around the potential for harvest to occur on NIPF lands.
- The representation of riparian areas in the model is based on limited inventory data. Detailed data on riparian areas was available only for National Forests lands. The percentage of each forest cover type in riparian areas on National Forest lands was used to estimate the amount of forest in other ownerships that are in riparian areas. Overall, modeling results related to timber supply are not likely sensitive to the uncertainty surrounding these estimates.
- The short planning horizon tended to complicate consideration of model outputs. Forest management typically operates across multiple rotations, which can be much longer than 40 years for some species.
- Because forest succession was not modeled directly, only a qualitative interpretation of forest cover type changes was possible using model outputs.
- Other than for national forest lands, constraints were not included to distribute harvest disturbances across native plant communities.

5.1.3.3 Forest Wildlife Modeling

Forest Bird Population Modeling

The assessment of potential effects to Minnesota's forest wildlife resources and biodiversity included consideration of outputs from wildlife population models. Two different models were used to complete both a statewide impact assessment and interpret results in a northern Minnesota context, which is the primary location of the state's forest resources. One model was a RNV for northern Minnesota, while the other was FIA-based and statewide. The forest bird RNV model was used in northern Minnesota and incorporates output from the forestry RNV model for both current and projected future forest condition. The FIA-based model was used to assess statewide population impacts and was linked directly to output from the forestry model that provided current and future forest condition. Both the RNV and the FIA models were based on the forestry model, the RNV model used the forestry model's results as is with and without Project inputs.

RNV-based Model

RNV as a concept is used to understand the types and amounts of habitat that existed across a regional landscape under natural disturbance regimes. RNV modeling is a primary tool used to develop strategies to maintain sustainable populations of plant and animal communities, especially for retention of biodiversity and protection of endangered and threatened species. The underlying concept for RNV is that over relatively recent history prior to European settlement, the native communities of plants and animals adapted to particular ranges in the amounts of forest types and ages created by the dominant forest regenerating disturbances of the presettlement forest. For Minnesota, the predominant large-scale forest disturbances were fire and wind (Frelich, 2002). Maintaining conditions within the RNV provides a landscape-scale management strategy for retaining biodiversity and a variety of habitat conditions.

The RNV model in the DEIS analysis considered NPC information for two ecosections in northern Minnesota, specifically the Northern Superior Uplands (NSU) and the Drift and Lake Plains (DLP). These two ecosections constitute a majority of northern Minnesota's forestland base. Information required to quantify the RNV of breeding bird populations include: 1) a base map of the native forest types for each ecosection; 2) estimates of percentage ranges for each successional stage within each ecosystem type; (3) current numbers of acres for each successional stage and ecosystem type; (4) modeled future numbers of acres for each successional stage and ecosystem type; and (5) bird species-specific habitat relationships and abundances. Data consisted of forest bird monitoring data collected within the Chippewa and Superior National Forests; the data was collected from 1991 through 2003.

Key Assumptions

- The bird/habitat information is linked directly to forest cover type and age.
- The data is statistically valid because they represent standardized counts conducted by qualified and trained observers.
- Use of the mean abundance value from all survey years to calculate the current and historic midpoint for each species population accounts for year-to-year fluctuations in populations of individual bird species over the survey period.
- Cross referencing stand identification information to native ecosystem types, and successional stages within each type, can be accomplished within an acceptable degree of interpretation error.
- Current habitat associations, and the relative abundance of individual bird species in those habitats, are the same today as occurred historically.
- Individual species populations will be sustainable over time if they occur across the landscape at a level where they existed historically. For the purposes of the DEIS, historically refers to the previous 100s to 1000s of years.

Strengths

- The RNV approach provides insights into landscape scale changes in habitat suitability and related species abundances.
- The model relies on the best available population data for bird species.

Limitations

- Similar to the GEIS, population densities are kept static for the RNV analysis. Bird population densities are not static, but there is no accepted mechanism to predict changes in species densities over the next 40 years.
- Because historic abundance values are not known, it is impossible to determine whether current habitat associations and species abundances indeed match the historic condition.
- The model is not spatially explicit.
- The model does not easily capture population trajectories for all bird species equally. Greater uncertainty exists for species that: 1) have large home ranges, 2) are associated with riparian forest habitat, and 3) have low population sizes.

FIA-based Model

Statewide breeding bird populations (e.g., outside the NSU and DLP ecosections) were derived by multiplying estimates of bird density per acre of forest by the total acres of each forest cover type in Minnesota, and then summing across all cover types in all ecoregions statewide. Each forest cover type has an estimate of the amount of acres in each ecoregion; similarly, each bird species has a separate density estimate for each forest cover type in each ecoregion. This is the same model that was used for the GEIS. Bird density estimates were derived from updated estimates originally derived in the GEIS. Sources of updated information included: Natural Resources Research Institute (NRRI) forest bird monitoring program, USGS Breeding Bird Survey, and US Fish & Wildlife Service Mourning Dove survey data. When no updated data was available, the original GEIS values were used.

The area of all forestland (acres) was computed by stand-size class by forest type using FIA data from 1999-2003 with pre-determined queries from the FIA instruction manual. Fuzzed coordinates intersected with a digital map of ecoregion boundaries to compute acres per ecoregion. Although FIA provides information for a larger number of forest types, types were aggregated into ten classes. Many bird species reach their range limits in Minnesota, so distributions were delineated along ecoregion boundaries. Within ecoregions 4 and 9, the two largest ecoregions, county boundaries were used to delineate range limits and calculate forest type acreages.

Key Assumptions

- The estimated size of breeding bird populations, based on the proposed methodology, reasonably captures actual forest conditions.
- There is no measurable effect associated with using multiple sources of data to update population estimates.
- When necessary to use the original density values developed for the GEIS, the values are considered reliable.

Strengths

- The approach provides insights into landscape scale changes in habitat suitability and related species abundances.
- The model relies on the best available population data for bird species.

Limitations

- The model is not spatially explicit.
- The aggregation of the total set of FIA forest types to ten classes results in some loss in model precision.
- The model does not easily capture population trajectories for all bird species equally. Greater uncertainty exists for species that: 1) have large home ranges, 2) are associated with riparian forest habitat, and 3) have low population sizes.

Forest Wildlife

The habitat matrix from the GEIS Wildlife Technical Paper was used for mammals, reptiles, and amphibians (Jaakko Pöyry 1992, Table 3.8). This matrix specifies habitat suitability indexes based on acreage of forest that is at least 20 years old for the appropriate forest types statewide. For small and medium mammals, the GEIS used three matrices, one for recent clearcuts, and one each for productive and unproductive forestlands. In these matrices, each forest type and size class (sapling, pole, sawtimber) was assigned a weighting factor reflecting habitat value for each wildlife species. These weightings were 0, absent; 2, low; 5, medium; and 10, high. Some forest type and size class categories had two weightings depending on whether a site was moist, near agricultural fields, or had mast trees present (oak tree or white spruce). These weightings were multiplied by the appropriate acreages for a statewide habitat suitability index.

For this analysis the three matrices were incorporated into a single matrix in which the weightings were adjusted to reflect the proportion of acreage in each forest type that was unproductive or moist, and the recent clearcuts were included as a separate category within each cover type (i.e. less than 10 years old). The spatial constraints related to agricultural fields and presence of oak and spruce trees were added to this analysis due to the absence of spatial data and lack of ability to match up FIA plots with the analyses of forest change that had been used for the GEIS. In addition, Lee Frelich and Peter Jordan (the latter devised the original deer, moose and bear analyses for the GEIS) devised a new habitat weighting matrix for a statewide analysis of white-tailed deer, moose, and black bear. The previous analyses for the GEIS used detailed spatial analyses on a township basis, and that was not possible here. The final habitat matrix for small mammals and deer, moose and bear, and the table that allowed conversion of age class data from the forest change analysis to size class are shown in Appendix E, Table E-13. Note that assumptions are made that moist stands, unproductive stands, age classes, and interspersion of conifers and deciduous stands in northern Minnesota are random and occur throughout the landscape. No statewide analyses in the absence of spatially explicit harvesting scenarios are possible without these assumptions.

Mammal, Reptiles, and Amphibians Habitat Model Strengths and Limitations

The model used to conduct the analysis of potential changes in habitat suitability for forest-dwelling mammals, reptiles, and amphibians from timber harvest has both strengths and limitations.

Strengths

- It can be applied on a statewide basis using the 2001 FIA dataset and forest change model outputs (e.g., forest cover type and tree size class).
- The model construct relates directly to comparison with the GEIS's significance criterion, where an impact is considered significant if the available habitat of a species is projected to change by 25 or more percent.
- The model also is a logical way to make use of limited knowledge of mammals, reptiles, and amphibians use of habitats on a statewide basis; the model makes a minimal number of assumptions compared to more complex models.

Limitations

- Retention of data uncertainties imbedded in the FIA data and forest projection model outputs.
- The spatial complexity of animal habitats, which is important to a number of species, is poorly addressed. The model is limited in that it only provides information on how much poor, good, and very good habitat is available for a given species, not the degree to which that habitat is actually used by a given species, or the number of individuals that are present in the state.

Each of these factors is considered in the impact assessment.

5.1.3.4 Habitat Modeling

Similar to the wildlife modeling, a RNV model received outputs from the other forest management models to compare the directions and magnitudes of deviation from RNV between the Build and No-Build Alternatives. Trends toward or away from the RNV were first assessed for the No-Build Alternative, which was followed by subsequent evaluation of the marginal change between the Build and No-Build Alternative. The resulting comparison reflects the percent change from the RNV between the alternatives, thus allowing for a determination of relative effect of the additional harvest required for the

Build Alternative. Assessments were conducted at the scale of individual VGS that constitute native plant communities (NPC), with comparisons at the 10-, 20-, 30-, and 40-year intervals used in the forest management model.

The successional models behind the RNV analysis are presented in Appendix D.1. These were derived from Frelich (1999-2000), with the inclusion of forest management pathways that describe how different silvicultural operations (i.e., thinning or clearcutting) move stands into different VGS categories. The use of the RNV model also required development of a cross-reference between the NPCs used in the model and the forest type classification used in the forest harvest simulations; this is presented in Appendix D.2.

The finest level of comparisons between the Build and No-Build Alternatives occurs at the level of an individual VGS within an NPC. To conduct this analysis, the percentage of a landscape ecosystem within a VGS was calculated under the No-Build Alternative. This “Reference Level” was calculated as (acres in VGS/acres of NPC). Next, the percentage of a landscape ecosystem within a VGS under the Build Alternative was calculated. Lastly, the percent increase or decrease in that VGS was calculated. The percentage change over the reference level gives the percent of the landscape affected under the Build Alternative. This percent-affected was then input to the SUSTAIN scoring model to provide a score describing the direction and magnitude of the Build Alternative on that particular VGS.

RNV-Habitat Model Strengths and Limitations

Any type of forest projection model has strengths and limitations; this is true for the RNV-habitat change model employed in the DEIS.

Strengths

- The principal strength of this model is that it provides insights into landscape-scale changes in habitat suitability, which is especially true when the model directly accepts the outputs from the forest condition projection model.
- The model relies on the best available information on the current ecological condition of Minnesota’s natural forest plant communities coupled with an understanding of forest successional patterns. Because the model focuses on change at the NPC-scale, it offers the benefit of avoiding the problems associated with modeling large numbers of individual species (e.g., endangered and threatened species lists).

Limitations

- The RNV model is limited in that it must be applied across broad spatial scales, ecological sections or larger, and thus is not appropriate for subsection or finer-scale analyses. Related to the scale of application, the RNV model outputs provide an overview on the direction and magnitude of changes in forest composition and structure, which in turn relate the overall integrity of plant and animal populations; it is thus not designed to answer questions on an individual species basis.

- Forest patch dynamics are not taken into account, which is important because patch sizes and distribution may also have played a major part in maintaining plant and animal communities.

5.1.4 ASSESSMENT OF FOREST CHANGE UNDER THE NO-BUILD AND BUILD ALTERNATIVES

5.1.4.1 Data Sources

The starting point for projections of future forest cover type and age class structure was the previously referenced statewide FIA. FIA is a program of the United States Department of Agriculture (USDA) Forest Service (Forest Service) with a stated mission of estimating and reporting the status, trends, and conditions of the nation's forest resources with known confidence (Miles et al. 2005).

FIA is a statistical sample of all forestlands, productive and unproductive, on all ownerships, public and private. There are three phases to the FIA inventory. In Phase 1, remotely-sensed data are used to classify a sample of points by land use categories. In Phase 2, a subset of the sample points from Phase 1 are visited on the ground and data on forest and tree conditions are collected. In Phase 3, a subsample of Phase 2 plots receive an additional suite of measurements that are aimed at assessing forest health. (For more detailed information on sample design and plot layout see Miles et al. 2005 and Alerich et al. 2004.)

Data from the most recently completed survey cycle is used for DEIS modeling. In Minnesota, an entire FIA inventory cycle takes five years to complete. The most recently completed cycle was started in 1999 and completed in 2003. Over the 5-year period, 5,165 Phase 2 forested plots were measured with approximately 20 percent of the plots measured each year (Miles et al. 2005). The midpoint of the survey is 2001. Therefore, the dataset proper is referred to as 2001 FIA, which is consistent with the naming convention used in the GEIS Report Card Study (Kilgore et al. 2005).

FIA is a statistical sample and therefore is subject to sampling error. FIA has established guidelines on acceptable levels of sampling error. In the case of area of timberland, FIA requires a sampling error of 3 percent or less per one million acres of timberland at the 67 percent confidence level (see Alerich et al. 2004 for a full listing of sampling error targets). Sampling error estimate for the 2001 inventory is 0.76 percent for area of timberland. There is a two out of three chance that if the entire area of Minnesota had been inventoried, then the total amount of timberland would be within 14,759.8 +/- 112.2 thousand acres (Miles et al. 2005). As the inventory data are subdivided the sampling error increases and the reliability of the estimate decreases. For example, the estimate of aspen forest type timberland in Itasca County is 497.8 thousand acres and the associated sampling error is 4.1 percent (based on formula in Miles et al. 1995). For a complete listing of sampling errors for the 2001 inventory see Miles et al. (2005).

5.1.4.2 Differences between the 1990 and 2001 Statewide Forest Inventory

Projections of future forest cover type and age class structure conducted for this DEIS are to be compared to the projections of the GEIS Base Harvest Scenario. The two sets of projections are based on different statewide forest inventories, with projections in this DEIS using the 2001 inventory and projections in the GEIS using the 1990 inventory.

Kilgore et al. (2005) reviewed the procedural changes in the inventories and assessed how they may affect comparisons. Kilgore et al. (2005) noted the following changes: survey procedure (periodic in 1990 versus annual in 2001), duration of field effort (3 years in 1990 and 5 years in 2001), plot layout (10 subplots per plot in 1990 versus 4 subplots per plot in 2001), sampling intensity (more intensive survey in 1990 than 2001), new algorithms for forest type and stand size classification, determination of reserved status (field verified in 2001 but not in 1990), and distance to water and stand size fields (present in 1990 but dropped in 2001). They concluded, "…the effect of most of these changes is increased difficulty in making highly precise comparisons of 1990 and 2001 results. The GEIS forest type algorithm was singled out as a major source of error between projected and actual forest conditions (Kilgore et al. 2005, p. 80)".

Another major difference between the 1990 and 2001 inventory was the adoption of a mapped plot design in the 2001 inventory. The FIA plot layout is a cluster sample of points where the number and arrangement of points have varied over time and by FIA region. Points may straddle more than one forest condition, for example mature forest and a clearcut. Difficulties arise when one condition (forest type, stocking, etc.) must be assigned to the plot. Different methods to handle multiple conditions arose over time within FIA. Methods typically involved moving sample plots, which introduced bias, or averaging of conditions, which created unrealistic conditions (see Birdsey 1995 for a historical discussion of the "straddler plot" problem). In 1993, FIA adopted the mapped plot design, which prohibited both the movement of plot points and the averaging of multiple plot conditions.

In the 2001 FIA, forest conditions were defined as combinations of reserved status, owner group, forest type, stand size class, regeneration status, and stand density. In the event that two or more conditions were observed on a forest plot, the separate conditions were mapped and the proportion of the plot in each determined. There were 6,250 forested plot conditions on 5,165 forested plots in the 2001 FIA. This condition information was preserved in the analysis (see Construction of Statewide Forest Inventory Dataset below).

Another change in FIA procedures that occurred between the 1990 and 2001 inventories was the aggregation of all private forest plot conditions into one, undifferentiated private class. This change was necessitated by the need to protect the privacy of landowners and was mandated by the fiscal year 2000 Consolidated Appropriations Bill (PL 106-113). The change means that forest plot conditions on private industrial and private non-industrial land could not be separated in the publicly available database.

Additional examination of the FIA dataset revealed a second issue related to ownership. Between 1990 and 2003 the estimated amount of forestland and timberland in the state-owned class increased by 671.8 thousand acres and 1,032.5 thousand acres, respectively. DNR estimated its total amount of commercial forestland at approximately three million acres (personal communication, Dr. C.M. Chen, DNR, May 23, 2005), which was much closer to the 1990 FIA estimate than the 2001 FIA estimate.

It is likely that there are several reasons for the change. Miles et al. (2005) pointed out that plots within Reserved forest boundaries were not field verified in the 1990 FIA but assumed Reserved. All forested plots were visited in the 2001 FIA and some plots classified as reserved in the 1990 FIA turned out not to be reserved after all, effectively increasing the amount of timberland at the expense of reserved forestland. A second explanation put forth by DNR staff was the reclassification of unproductive black spruce in the 1990 FIA as timberland in the 2001 FIA and productive black spruce in the 1990 FIA as other forest types in the 2001 FIA (personal communication, Dr. C.M. Chen, DNR, May 23, 2005). A third explanation put forth by personnel involved in the forestry modeling was the possibility that state-owned, county-managed forestland was classified as county-owned in the 1990 FIA and state-owned in the 2001 FIA. A decrease in the amount of county-owned forestland and timberland between the 1990 and 2001 FIAs lent support to the last explanation as a possible cause.

5.1.4.3 Additions to the 2001 Statewide Forest Inventory Dataset

The two ownership classification issues were addressed through data requests to the North Central Research Station (NCRS) FIA. The first request was for the release of the identity of 2001 FIA plots on land owned by the Blandin Paper Company. This information was recorded by FIA and its release required authorization by the Blandin Paper Company. The release of this information provided the means to model UPM/Blandin Paper-specific impacts and mitigations.

The second request focused on identifying state-owned, county-managed plots. The identification of these plots required a GIS intersection of precise 2001 FIA plot coordinates with a data layer depicting state-owned county-managed areas (DNR 2005). The Forest Service provided the identity of approximately 90 percent of the plots listed as state-owned in the 2001 FIA database and that fell in a state-owned, county-managed area. The remaining 10 percent of plots were not released by the Forest Service because of concerns over “plot integrity,” which was described by FIA staff as the release of information that would enable the identification of plot locations to an unacceptably small area (personal communication, Geoff Holden, NCRS, June 20, 2005). The information allowed for the assignment of more accurate, owner-specific management prescriptions.

A third and final request of the Forest Service was the identification of NPC classes to 2001 FIA plots. A GIS intersection of precise 2001 FIA plot coordinates with data layers depicting NPC classes was the source of this information. Classifications for the Minnesota-Ontario Peatlands, Northern Superior Uplands, and Drift and Lake Plains ecosections were provided. The Forest Service released the identity of approximately 95 percent of the plots intersecting the three ecological classification system (ECS) sections, with the remaining 5 percent held because of concerns about plot integrity. The information allowed for more complete successional and forest productivity modeling. It also allows for tracking the location of harvesting in the forest management modeling process as it allows for tracking of harvest within each NPC.

5.1.4.4 Construction of the Statewide Forest Inventory Dataset

Statewide forest inventory data were provided as FIADB Version 1.7 (Alerich et al. 2004). A database was created allowing for the preparation of the data needed in the growth and yield modeling and forest management scheduling. The database was tested by comparing data generated from queries to summaries published by the Forest Service (Miles et al. 2005).

A dataset consisting of 6,250 records, one for each forested plot condition, was created for use in the forest management-scheduling model. The important forest plot condition attributes were county, plot number, condition number, land class, reserve status, ownership, national forest designation, forest type, stand age, stand size class, site class, site index, site index species, stand origin, stand origin species, condition proportion, area expansion factor, ecological subsection, latitude (approximate), longitude (approximate), NPC, UPM/Blandin Paper company ownership, and state-owned, county-managed status. The last three fields were not in the publicly available database but provided by FIA.

5.1.4.5 Comparison of Forestry GEIS Modeling and DEIS Modeling

The DEIS evaluation requires consideration of the modeling outputs from the DEIS models and the GEIS Base Harvest Scenario. In many respects the models used in the DEIS are similar to those employed in the GEIS. In the broadest sense both analyses require algorithms to “grow stands of trees” and determine “when, where, and if harvest” occurs. The GEIS and DEIS models are of an optimization-type that maximize the worth of the net present value of timber production while satisfying statewide harvest levels constraints and sustainable management policies of public land management agencies. An optimization model can help identify upper limits or bounds on what is likely possible, but it is not necessarily a good predictor of what will happen. However, there are important differences in the underlying assumptions between the two analyses. The differences are presented below.

Levels of Harvest

The GEIS Base Harvest Scenario evaluated a projected statewide level of 4.0 to 4.1 million cords per year; this was the level of harvest circa 1990. For the DEIS No-Build Alternative, statewide harvest levels are assumed to remain constant at 2002 levels as reported by the DNR (2004), which was 3.675 million cords per year.[30]

[30] All wood harvested for the Build and No-Build Alternatives is assumed to come from harvest of Minnesota timberland. Thus while the Proposer anticipates that approximately a quarter of the wood to be used with the project to be from imported, non-Minnesota sources, the Final Scoping Decision required the analysis to assume that all wood would come from Minnesota. This assumption will ascertain the maximum possible effect from the project.

Species Substitution

The GEIS assumed the statewide harvest volume of aspen would decline because of species substitution for aspen in the market. This was an important assumption in the GEIS. In the analyses for the GEIS, initial results suggested that the 1991-2000 aspen harvest level was not sustainable over the planning horizon of the GEIS. For the GEIS, it was then assumed that by 2010, approximately 25 percent of the statewide harvest of aspen would shift to other species. Specifically, for the GEIS Base Harvest Scenario, it was assumed that the aspen harvest level would decline to 1.85 million cords/yr for the period 2010 to 2040. That anticipated level of decline in aspen use has not occurred. Statewide aspen harvest levels for 2002 were estimated at 2.21 million cords (DNR 2004). The No-Build Alternative assumed an annual statewide harvest level for aspen of 2.206 million cords per year.

Table 5-3 summarizes the assumptions between the GEIS and DEIS alternatives. Additional detail is provided in Appendix C.

Table 5-3
Summary of Assumptions for the GEIS and DEIS Modeling Alternatives

Study	Alternative	Availability of Private Lands in Aspen Forest Cover Type	Additional Species Substitution for Aspen	Statewide Harvest Level All Species (M cords/yr)	Statewide Harvest Level Aspen (M cords/yr)	Statewide Harvest Level Spruce-fir (M cords/yr)	Allowable Cut Limits on Public lands
GEIS	Base Harvest Scenario	90 percent	Yes	4000.0	2041.0 (Average)	407.0 (Average)	No
DEIS	No-Build Alternative	Time Dependent	No	3675.0	2206.0	405.0	Yes
	Build Alternative	Time Dependent	No	3872.0	2304.5	503.5	Yes

Availability of Private Lands

Wood in Minnesota is procured from both public and private sources, the latter also known as non-industrial private forests (NIPFs). The GEIS assumed that 90 percent of NIPF lands would be available for harvest as soon as they are older than a minimum harvest age. Since the GEIS was completed, it is notable that aspen prices have increased substantially in Minnesota. This price increase suggests that substantial areas of private land in the aspen forest cover type are currently not available for harvest at lower prices. To compensate for this difference between now and conditions as envisioned in the early 1990s, the DEIS established a more detailed description of the availability of private land for harvest. Availability assumptions are based on both the age and forest cover type of each forest condition class for each FIA plot. Private lands are assumed to gradually become available over time with older stands assumed not as likely to be available earlier because these private landowners have likely already declined harvest opportunities in recent years. See modeling discussion in Appendix C.

Allowable Cuts – Area Control

The GEIS did not impose allowable cut limits for public lands, in particular for state and county ownerships. For this study, allowable cut limits were included on state and county ownerships for each decade for forest cover type groups that are generally managed using even-aged management. These limits were upper bound limits on the area that could be harvested. Constraints to force at least some minimal harvesting level in each forest cover type were not included.

Shadow Pricing and Stumpage Assumptions

Both the GEIS and DEIS models generated shadow prices (e.g., marginal costs) to estimate the relative cost of producing additional cords of wood under the respective alternatives. The utility of these generated shadow prices is not in their actual value, but rather it is in their relative values within each of the models as a measure of the relative availability of aspen and other species in meeting the targeted levels of demands and the resulting allocation of harvesting among FIA plots.

Both models included assumptions for stumpage prices, as well as other variables, to generate the shadow prices. Thus stumpage price assumptions were developed for the various types of wood that are available in Minnesota. The actual assumed stumpage prices, factoring of other harvesting costs, and resulting shadow prices differed between the two models in these ways:

- The GEIS assumed a base wood cost (i.e., stumpage price) for aspen and other species of $22 per cord and then adjusted harvesting costs based on numerous factors, including stand volumes, tree sizes, likely end products, and transportation costs. The DEIS assumed an average stumpage price for aspen pulpwood of $60 per cord.
- The GEIS Base Harvest Scenario model generated marginal costs (or shadow prices) for aspen (delivered to the mill) that increased from about $45 per cord the first decade (1990-1999) to about $61 per cord in the fifth decade (2030-2039). These higher marginal costs for aspen were coupled with an assumed shift of about 25 percent of projected aspen demand to other hardwood species in order for the modeled scenarios to be feasible.
- The DEIS use of shadow prices is similar to shadow pricing in the GEIS, but specific shadow price values for specific products are not comparable between the GEIS and DEIS. Rather than constrain the model to specific levels for every product group as was done in the GEIS, the DEIS set limits on the total statewide harvest volume to estimated statewide levels for 2002. This resulted in negative shadow prices on harvest volumes that contribute to the statewide total. These negative shadow prices act like an internal “tax” or disincentive to keep from scheduling more volume for harvest. The positive shadow prices for aspen volume harvested add incentive in the model to focus harvest on obtaining aspen volume (Appendix C).
- Current prices paid for aspen delivered to the mill are in the $80-$90 per cord range. There are a lot of factors affecting these higher aspen prices, including the fact that a large shift in aspen demand to other hardwoods has not yet fully occurred as assumed in the GEIS. Other factors include: market speculation; wood imports; and lower than projected (by the GEIS) statewide harvest levels for other species.

In considering the differences between the GEIS and DEIS modeling, the fact that current stumpage prices and generated shadow prices in the DEIS are different from those generated in the GEIS does not mean that one or the other does a better job at projecting the degree of difficulty in meeting harvest demands for aspen and other species in the future. Both assessments consider the shadow prices/marginal costs generated by the models as representing relative costs only (i.e., they do not reflect prices that would necessarily be paid for a particular product), but reflect the relative difficulty of meeting wood demand in the future decades under the Build and No-Build Alternatives and derivative scenarios.

Shift in Demand from Aspen to Other Hardwoods

The GEIS analyses assumed that approximately 25 percent of the demand for aspen would shift to other species, especially hardwoods, by 2010. Large net shifts in demand have not yet occurred, as reported in the most recent statistics for the state involving 2002 harvest levels (DNR 2004). The DEIS modeling used additional scenarios to examine shifts in demand to other species, but not to the degree anticipated in the GEIS.

Silvicultural Treatment

The DEIS assumed uneven-aged management to be the primary management tool for the northern hardwoods, lowland hardwoods, and oak forest cover types. The GEIS assumed even-aged management as the primary silvicultural treatment for these forest types, with substantial areas assigned to an even-aged management type of treatment.

Cover Type Change

Succession from one cover type to another was modeled in the GEIS, but was not employed in this study except as represented in management plans for National Forest lands. Instead, the DEIS modeling assumed the FIA and other study plots and associated acreage will largely remain in their original cover type. However, such acreage was modeled forward in terms of stand aging, including replacement of harvested stands with regenerated stands upon harvest. Cover type change is discussed qualitatively in the section on significant impacts based on knowledge of successional pathways, cover type change with natural regeneration after harvesting and planned forest cover type restoration activities.

5.1.5 Forest Change With No-Build Alternative

5.1.5.1 Key Assumption

The estimated total statewide harvest level in 2002 was 3.675 million cords, and this level was assumed to apply in all years of the 40-year planning horizon for analysis of the No-Build Alternative. The following text describes the results of the forest projection modeling regarding harvest-related changes in: 1) volumes; 2) forest area; and 3) age-class distributions. The results are offered in the context of the GEIS Base Harvest Scenario where relevant.

5.1.5.2 Changes in Projected Harvest Volumes

Table 5-4 compares the volumes harvested per decade for the GEIS Base Harvest Scenario to the DEIS No-Build Alternative. Note that modeling scenarios were identified in Section 5.1.3 – Modeling in the DEIS. The GEIS Base Harvest Scenario harvests nearly 12.5 percent more timber. The greatest difference in harvest levels between the two is for the “other hardwoods” species group, with essentially twice the average annual harvest for this product group in the GEIS. The GEIS assumed 25 percent of the aspen demand would shift to other hardwoods by year 2010. The present analysis included constraints to force statewide harvest levels for aspen, spruce-fir and red pine sawlogs to be sustained at least at estimated harvest levels that occurred in 2002. On average, compared to the GEIS, the present modeling was forced to harvest 8.5 percent more aspen each year over its 40-year planning horizon for the No-Build Alternative. For spruce-fir, the minimum level was 405,000 cords/yr, and the projected level exceeded this in all decades by an average of 63,000 cord/yr, reflecting higher values for spruce-fir (stumpage prices) and an available supply of spruce-fir. Harvest levels for pine were less with the DEIS, most likely reflecting plans for longer rotation ages for red pine on state and federal lands.

Table 5.5 compares harvest volume projections by land ownership group for the DEIS No-Build Alternative to the harvest projections for the GEIS Base Harvest Scenario. Both studies have quite similar harvest patterns by ownership group. The overall harvest level is lower for the DEIS with private lands harvesting less in percentage terms compared to the GEIS. The area of state forest lands as represented by the 2001 FIA is slightly higher and this likely at least partially explains the slightly higher percentage of harvest from state lands for the DEIS (20.6 percent vs. 18.1 percent).

Table 5-4

Timber Volumes Harvested (M cords/yr) for the GEIS Base Harvest Scenario And DEIS No-Build Alternative (Scenario A)

	Forest Products Group	Decade Starting in Year					Average 1990 - 2040
		1990	2000	2010	2020	2030	
GEIS Base Harvest Scenario	Aspen	2,382	2,238	1,865	1,854	1,867	2,041
	Spruce-fir	405	409	406	401	412	407
	Pine	415	441	435	438	442	434
	Other Hdwds	828	1101	1,482	1,479	1,388	1,256
	Total	4,030	4,189	4,188	4,172	4,109	4,138
	Forest Products Group	Decade Starting in Year					Average 2000 - 2040
		1990	2000	2010	2020	2030	
DEIS No-Build Alternative	Aspen	***	2,212	2,214	2,207	2,218	2,213
	Spruce-fir	***	454	470	504	446	468
	Pine	***	347	397	363	360	367
	Other Hdwds	***	658	602	592	653	626
	Total	***	3,671	3,683	3,666	3,677	3,674
	Forest Products Group	Decade Starting in Year					Average
		1990	2000	2010	2020	2030	
Difference (DEIS minus GEIS)	Aspen	***	-26	349	353	351	171
	Spruce-fir	***	45	64	103	34	62
	Pine	***	-94	-38	-75	-82	-67
	Other Hdwds	***	-443	-880	-887	-735	-629
	Total	***	-518	-505	-506	-432	-463

Table 5.5

Harvest Volume Projection Comparison by Land Ownership for the No-Build Alternative (Scenario A)

Forest Ownership Group	DEIS Projected Average Harvest (M cords/yr)	DEIS Projected Harvest as a Percent of Statewide Total Volume	GEIS Projected Harvest for Ownership Group as a Percent of Statewide Area Harvested
National Forest	330	9.0	7.1
State	757	20.6	18.1
County/Local	840	22.9	22.5
All Other Lands	1,746	47.5	52.3
Total	3,674	100.0	100

5.1.5.3 Changes in Forest Area

Table 5-6 shows the average area regeneration harvested (acres/yr) in forest cover type groups that use even-aged management for the No-Build Alternative. Average annual harvest levels are also shown for the GEIS Base Harvest Scenario. The last row of the table shows the percentage of even-aged, regeneration harvests that occur in the aspen forest cover type each decade. The table shows clearly that most harvesting occurs in the aspen forest cover type, with that type even comprising more of the harvest in the DEIS results than in the GEIS results. The GEIS assumed that 25 percent of the aspen demand would shift to other species and relatively little of that shift had occurred to 2001.

The DEIS analysis assumes that uneven-aged management to be the primary management tool for the northern hardwoods, lowland hardwoods and oak forest cover types. The GEIS assumed even-aged management was the primary silvicultural treatment type for these types, explaining the relatively large differences shown for these types in Table 5-6. The present analysis shows substantially more harvesting in the jack pine type than the GEIS. This is likely a result of both higher prices for jack pine and the recent emphasis in the USDA Forest Service plans for the Chippewa and Superior National Forests to harvest and regenerate older jack pine to help maintain acres of the jack pine type. DNR plans are also addressing the retention and increase of jack pine type in appropriate landscapes, including harvesting of older jack pine. The harvest of older aged jack pine may also be accelerated by continuation of recent outbreaks of jack pine budworm. The present analysis also harvested, on average, about 3,400 more acres/yr in the birch type. This is at least partially explained by the opportunity to also harvest substantial volumes of aspen from many stands in the paper birch type. The DEIS model harvests more acres in the earlier decades, reflecting opportunities to capture aspen volume from older, lower volume stands that are poorly stocked with low if not negative projected growth rates.

Table 5.6
Average Area Regeneration Harvested (acres/yr) for the No-Build Alternative and the Base Harvest Scenario of the GEIS in Forest Cover Type Groups that Use Even-aged Management

Forest Cover Type Group	DEIS Harvest Projection for Decade Starting in Year				DEIS Average (2001-2041)	GEIS Average (1990-2040)	Difference (DEIS minus GEIS)
	2001	2011	2021	2031			
Jack Pine	10,568	9,177	4,665	2,698	6,777	2,354	4423
Red Pine	1,963	3,260	3,505	3,431	3,040	3,778	-738
Upland spruce-fir	5,658	6,852	6,387	3,808	5,676	6,674	-998
Northern hardwood	81	84	321	2,682	792	6,288	-5,496
Oak	66	84	46	38	58	9,338	-9,280
Aspen	138,760	102,809	96,160	94,556	108,071	106,362	1,709
Paper birch	6,287	9,399	12,050	12,623	10,090	6,710	3,380
Lowland spruce	890	1,855	1,326	1,311	1,346	5,638	-4,293
Tamarack	86	188	106	122	126	906	-780
Lowland hardwood	0	0	0	0	0	4,976	-4,976
Total	164,358	133,708	124,566	121,269	135,975	153,024	-17,049
Percent of area regeneration harvested that is in aspen forest cover type group	84	77	77	78	79	70	

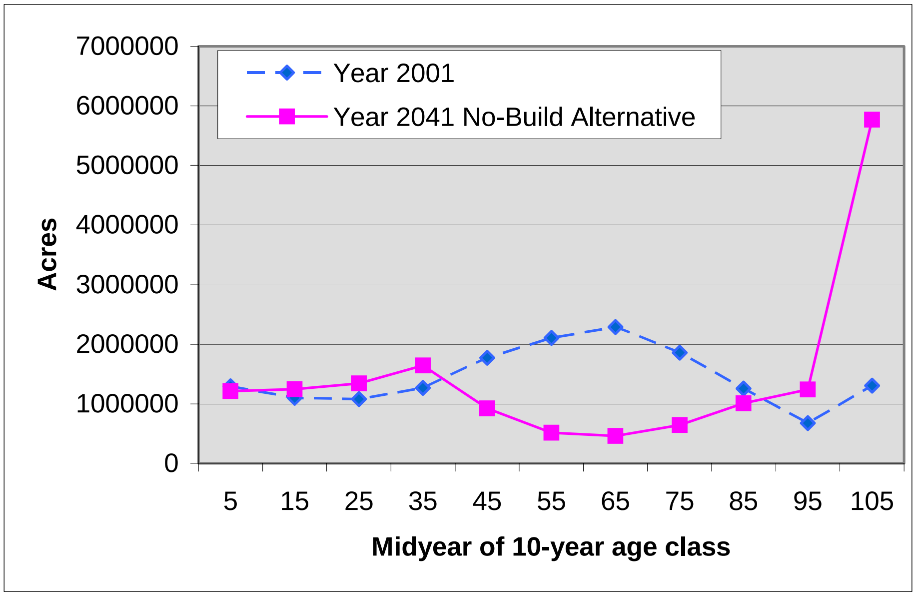
The last row shows percentage of regeneration harvest occurring in aspen forest cover type each decade. Northern and lowland hardwoods are typically not subject to even-aged management treatments. Inclusion reflects treatment in the GEIS, which assumed even-aged management for these cover type groups.

5.1.5.4 Changes in Age Class Distributions

All Forest Cover Types

Results of this analysis are generally similar to the GEIS findings regarding the 2041 age class distributions for forest cover types. The GEIS describes bimodal age distributions in year 2040 for forest cover types other than aspen. In other words, in year 2040, there tends to be younger stands and older stands with fewer stands at ages just beyond typical rotation ages. Figure 5-5 (All Forest Types – No-Build Alternative) shows the statewide age class distribution for all forestland in 2041. In Figure 5-5, the large spike for the oldest age class in year 2040 represents the large portion of the forest that ages by 40 years over the planning horizon to reach an age of 100 years or older.

Figure 5-5
All Forest Types – No-Build Alternative

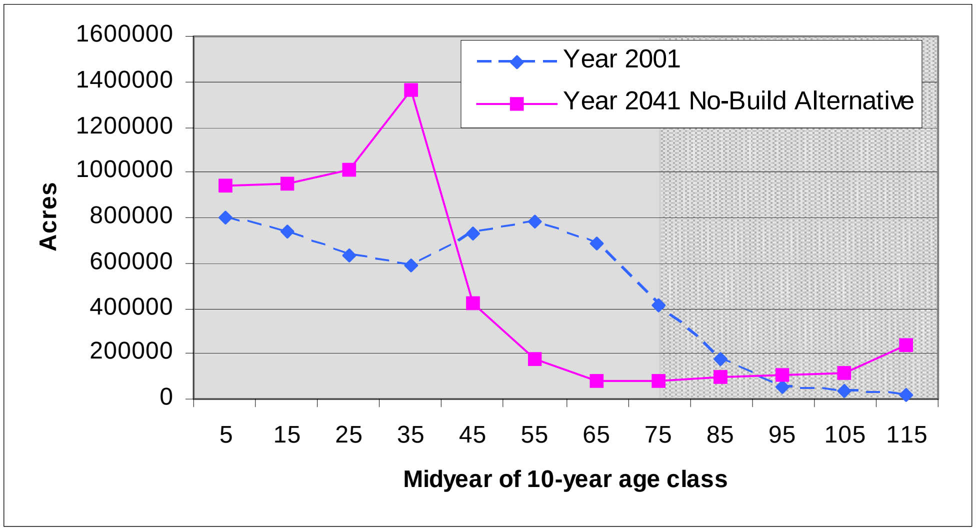


Stand age class distribution of all forestland in year 2041 under the No-Build Alternative. However, the relatively high proportion of acreage of older stands in 2041 in Figure C-1 and subsequent figures is partly an artifact of modeling. Model assumptions were simplified, especially because forest succession was not modeled. In reality, with succession the overstory of some of the oldest stands die resulting in a potentially younger overstory age (stand age), and for areas in initially in cover types like, aspen, paper birch and jack pine, a likely change in forest cover type to northern hardwoods or spruce-fir.

Aspen Forest Cover Type

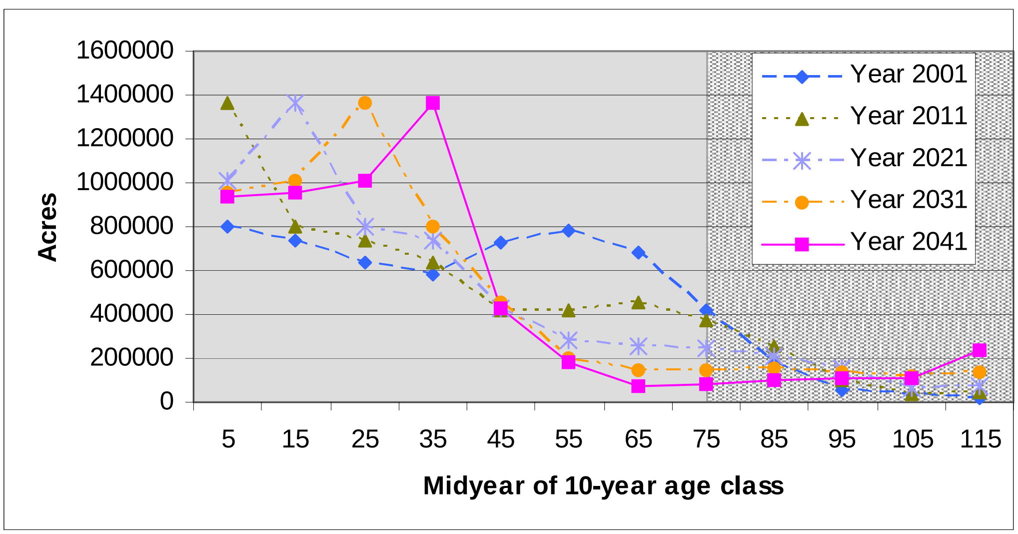
Changes in the age distribution over the 40-year planning horizon are quite different for the aspen forest cover type than for other forest types; see Figure 5-6 (Aspen No-Build Alternative). The year 2041 scenarios show more acres in age classes greater than age 100, but for these older ages, natural succession will have moved many of these older stands to other forest cover types, most likely to the northern hardwoods or the spruce-fir forest cover type. In general, the model harvested almost all available acres in this type; see Figure 5-7 (Aspen – Age by Decade No-Build Alternative).

Figure 5-6
Aspen – No-Build Alternative



Projected stand age class distribution of the aspen forest cover type in year 2041, No-Build Alternative. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Figure 5-7
Aspen – Age by Decade No-Build Alternative



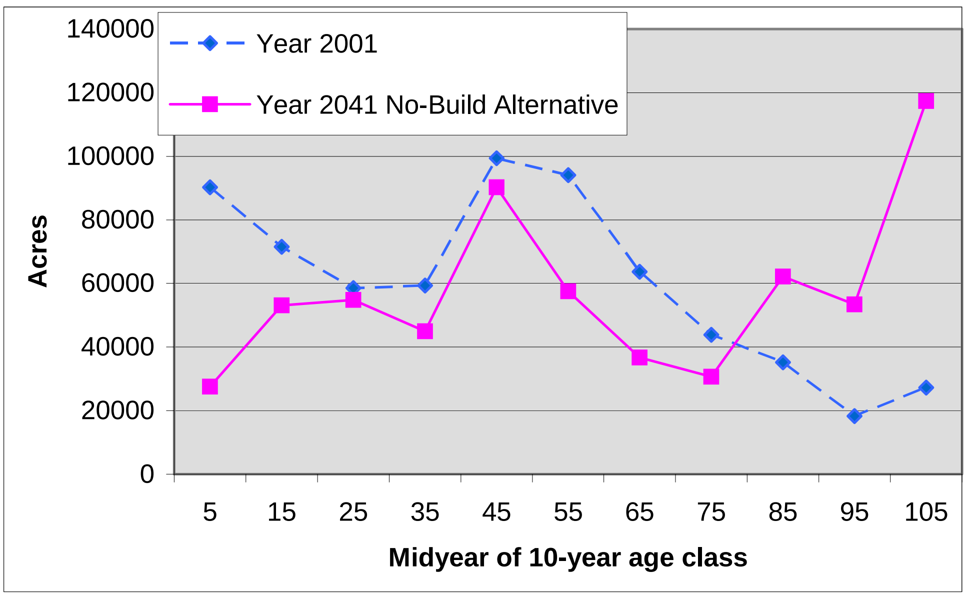
Stand age class distribution of the aspen forest cover type by decade over the period 2001-2041, No-Build Alternative. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

[31] The maximum rotation age offered for forest cover types evaluated in the DEIS are sourced from DNR's Subsection Forest Resource Management Planning (SFRMP) process.

Upland Spruce-fir Forest Cover Type

Figure 5-8 (Upland Spruce-fir – No-Build Alternative) shows the projection of Upland Spruce-fir, which reflects the large recent losses to spruce budworm. Additional acres would likely be added to this forest cover type as a result of natural succession of older aspen, birch and jack pine sites in some landscape ecosystems[32]. These additions would likely occur at ages in the 20-year to 70-year age classes reflecting the shade tolerance of spruce and fir and its development in the understory of other cover types. Substantial harvesting is occurring in this forest cover type, but the area in age classes younger than age 40 do not suggest harvest levels over the planning horizon are above sustainable levels; see Figure 5-9 (Upland Spruce-fir – Age by Every Other Decade No-Build Alternative).

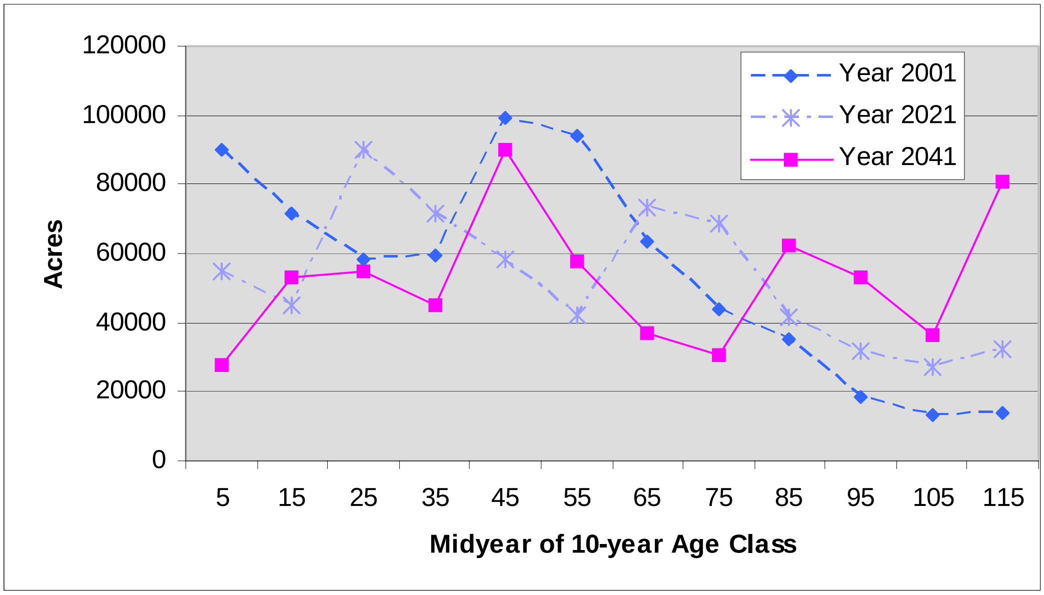
Figure 5-8
Upland Spruce-fir – No-Build Alternative



Projected stand age class distribution of the upland spruce-fir forest cover type in year 2041, No-Build Alternative. The maximum rotation age[31] for upland spruce-fir is 110 years, which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

32 A landscape ecosystem is defined as functional land units that differ significantly from one another in abiotic characteristics as well as their related biotic components.

Figure 5-9
Upland Spruce-fir – Age by Every Other Decade No-Build Alternative



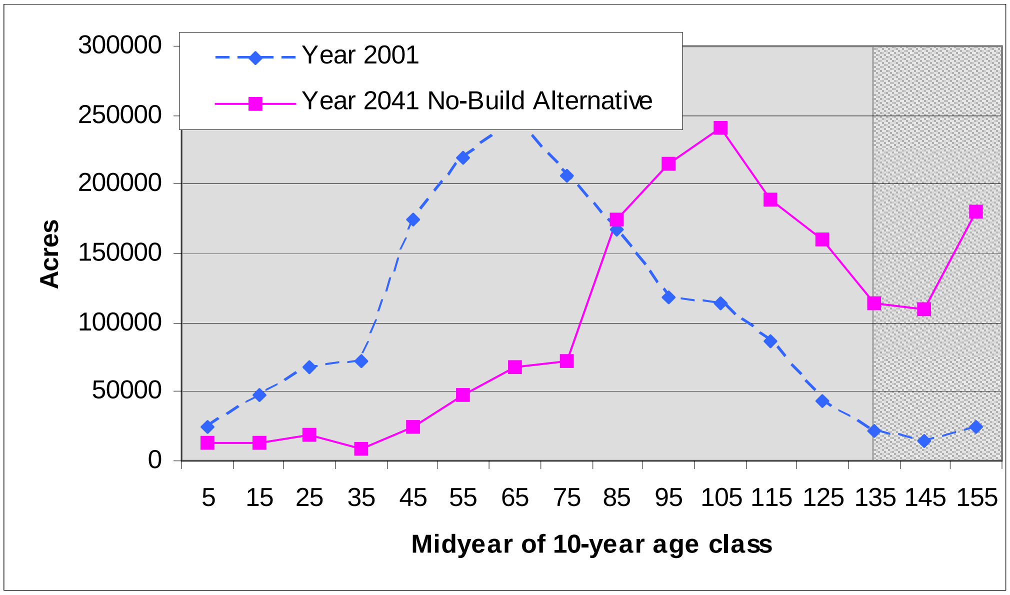
Stand age class distribution of the upland spruce-fir forest cover type by decade over the period 2001-2041, No-Build Alternative. The maximum rotation age[31] for upland spruce-fir is 110 years, which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Lowland Spruce Forest Cover Type

The 2041 age class distribution for Lowland spruce (Figure 5-10, Lowland Spruce – No-Build Alternative) reflects a forest cover type with large areas of older forest. Harvesting in this forest cover type has been relatively low in the past, and the relatively little area in age classes less than age 40 in year 2041 reflect that the scheduling model scheduled relatively little of this forest cover type for harvesting; see Figure 5-11 (Lowland Spruce – Age by Decade No-Build Alternative). In general, the model satisfied spruce-fir demands from harvesting in the uplands, both from aspen stands and upland spruce-fir stands. Most of these areas would only be available for harvest in the winter.

Figure 5-10

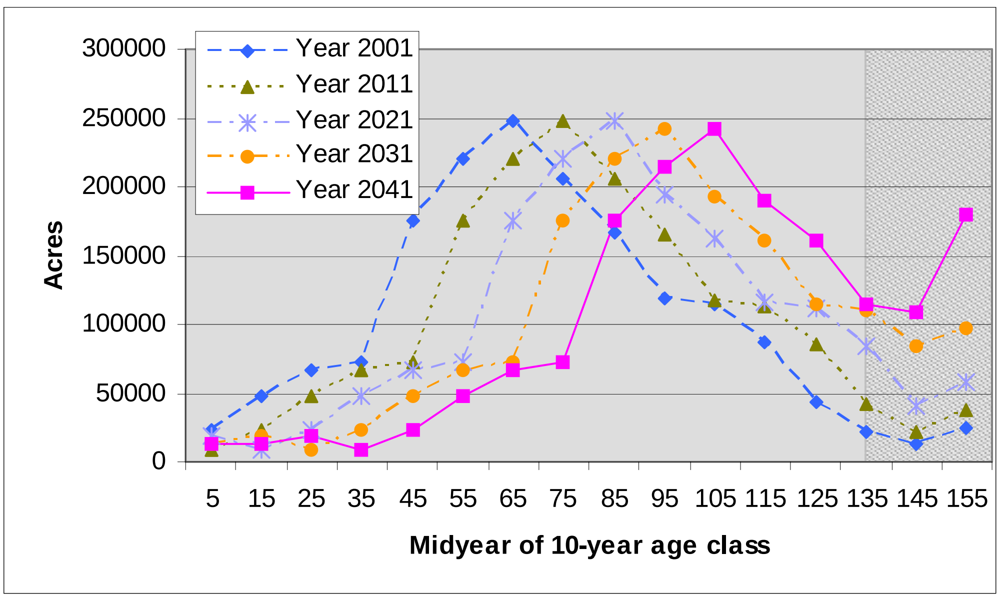
Lowland Spruce – No-Build Alternative



Stand age class distribution of the lowland spruce forest cover type in year 2041, No-Build Alternative. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Figure 5-11

Lowland Spruce – Age by Decade No-Build Alternative

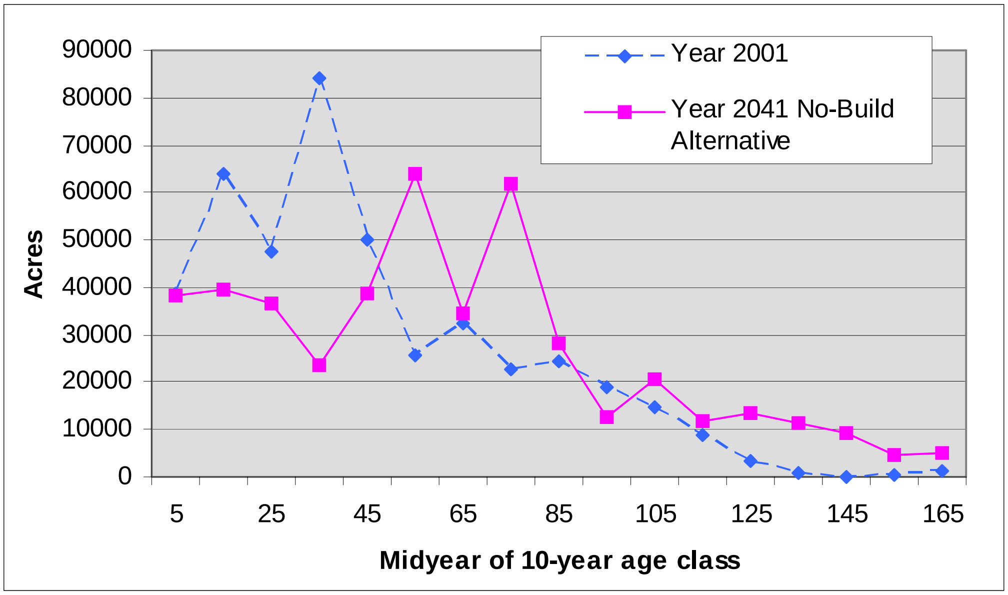


Stand age class distribution of the lowland spruce forest cover type by decade over the period 2001-2041, No-Build Alternative. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Red Pine Forest Cover Type

Modeling results for red pine are presented in Figure 5-12, Red Pine – No-Build Alternative. Older age classes are well represented. The areas in the younger age classes reflect harvesting in this type, at levels that are sustainable. Thinning was selected for some of the area in this type, especially for DNR and National Forest lands where rotations of 100 years or more are planned. Increasing the area of older red pine is an important objective for wildlife and modeling results suggest such changes will occur.

Figure 5-12
Red Pine – No-Build Alternative

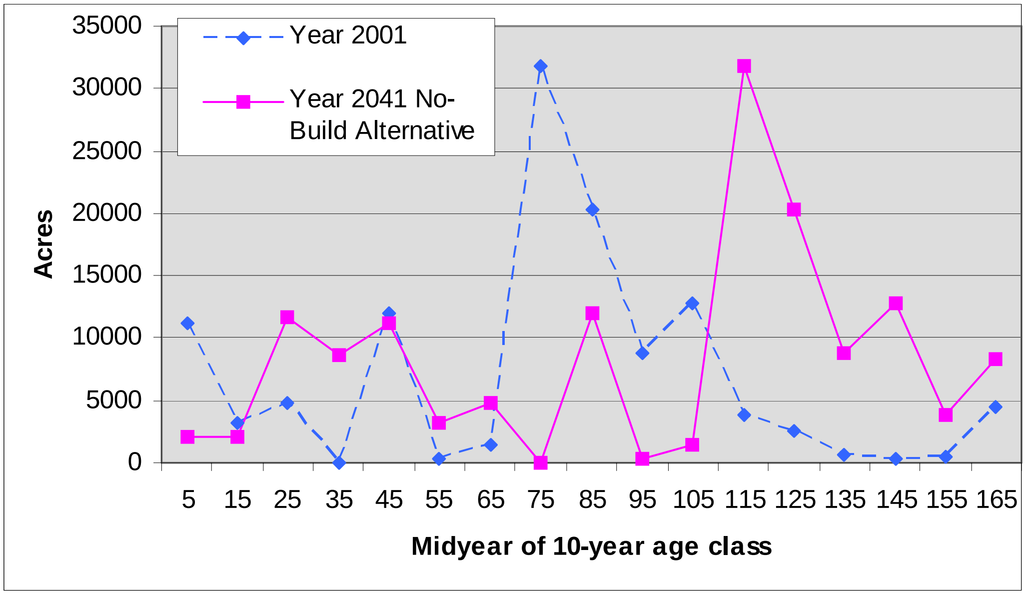


Stand age class distribution of the red pine forest cover type in year 2041, No-Build Alternative. The maximum rotation age[31] for red pine is 165 years, which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

White Pine Forest Cover Type

Modeling results suggest that the white pine forest will simply grow older over the planning horizon (Figure 5-13, White Pine – No-Build Alternative). The irregularities in the shape of the age distributions reflect the relatively small area in this forest cover type; there is a limited number of FIA plots in this forest type, thus providing a limited precision of data. In general, most areas in this type will be managed using uneven-aged management. Not represented in the modeling would be the planned restoration activities by public land management agencies for this forest cover type. The area in the young age classes reflects the regeneration activities on National Forest lands that were included in the model.

Figure 5-13
White Pine – No-Build Alternative

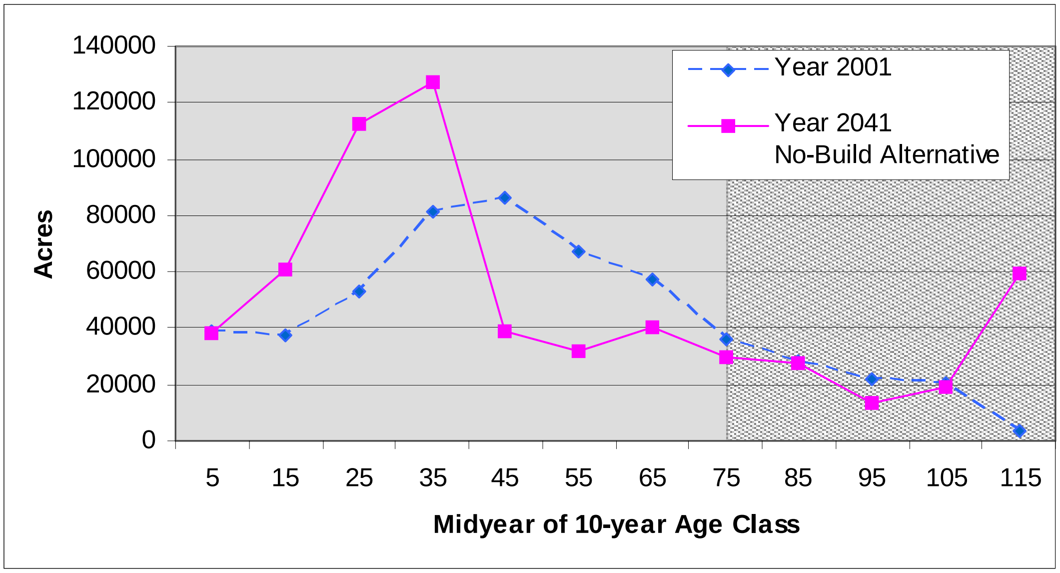


Stand age class distribution of the white pine forest cover type in year 2041, No-Build Alternative. The maximum rotation age[31] for white pine is 200 years, which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Jack Pine Forest Cover Type

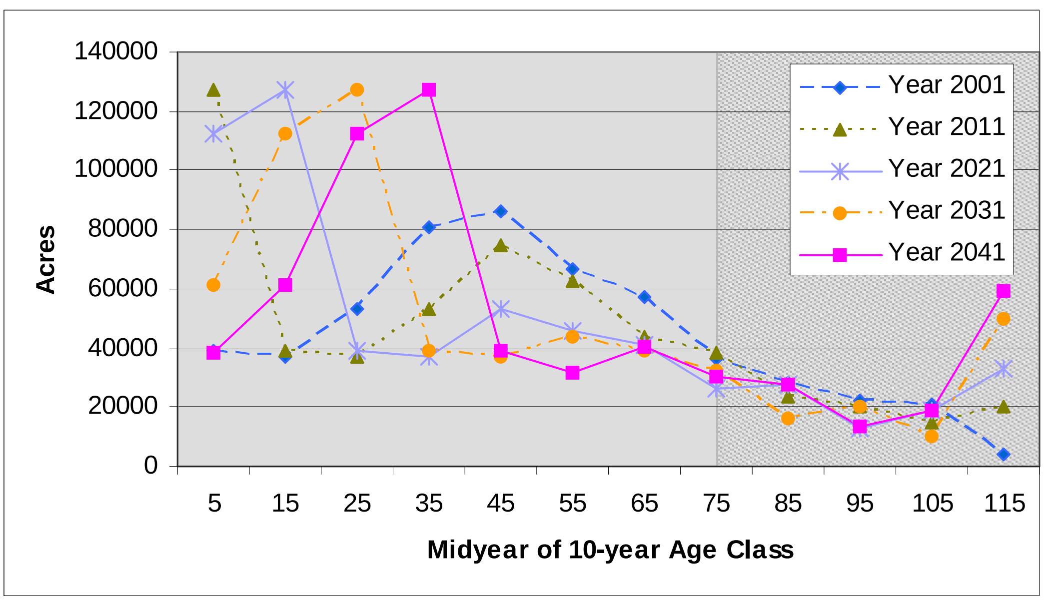
Jack pine is a short-lived conifer that requires disturbance to regenerate (Figure 5-14, Jack Pine – No-Build Alternative). The large areas of young jack pine projected for 2041 are based on the assumption that areas of jack pine can be regenerated back to this condition. Sustained management to regenerate the species will be necessary of large areas will succeed to other forest types; see Figure 5-15, Jack Pine – Age By Decade No-Build Alternative. Recent price increases for jack pine sawlogs have helped to increase harvest activities in this forest cover type as well as activity related to remediating jack pine budworm outbreaks.

Figure 5-14
Jack Pine – No-Build Alternative



Stand age class distribution of the jack pine forest cover type in year 2041, No-Build Alternative. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Figure 5-15
Jack Pine – Age by Decade Under No-Build Alternative

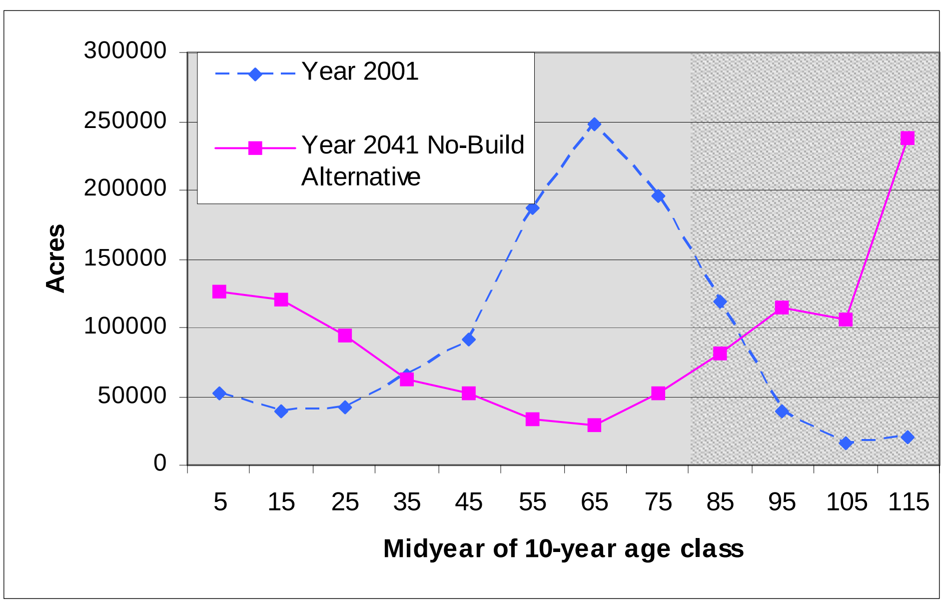


Stand age class distribution of the jack pine forest cover type by decade over the period 2001-2041, No-Build Alternative. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Paper Birch Forest Cover Type

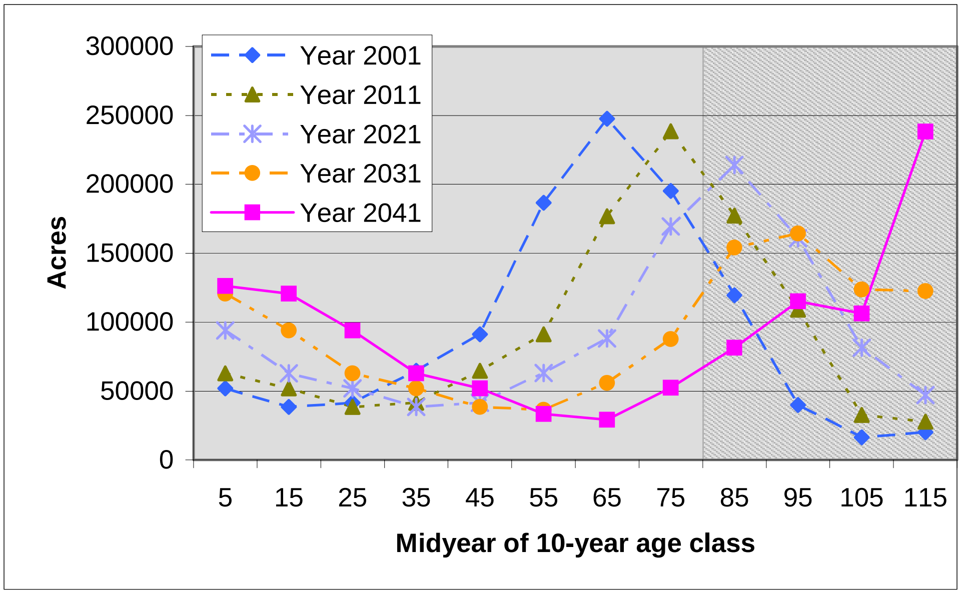
The age class distributions for paper birch in years 2001 and 2041 are shown in Figure 5-16, Paper Birch – No-Build Alternative. For year 2041, acres in the age classes less than age 40 reflect acres of the paper birch type that were harvested and regenerated as birch over the planning horizon. The total area of birch less than age 40 in 2041 is substantially larger than the estimated area of paper birch less than age 40 in 2001. However, by 2041 much of the area in the birch type has simply aged 40 years and has reached an age where natural succession has occurred. At least from an ecological perspective, some of this succession is acceptable if not desirable as the paper birch forest cover type is more abundant today in most NPCs compared to estimates of its occurrence in presettlement times. It should be noted that the DEIS model tends to harvest some birch stands to capture substantial volumes of aspen that are present in those stands; see Figure 5-17, Paper Birch – Age By Decade No-Build Alternative. The USDA Forest Service has made regenerating birch an important objective in their recent forest plans for the Chippewa and Superior National Forests and those plans are included in the management schedules for this study (for both the No-Build and Build Alternatives).

Figure 5-16
Paper Birch – No-Build Alternative



Stand age class distribution of the paper birch forest cover type in year 2041, No-Build Alternative. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Figure 5-17
Paper Birch – Age by Decade No-Build Alternative



Stand age class distribution of the paper birch forest cover type by decade over the period 2001-2041, No-Build Alternative. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Other Forest Cover Types

Regarding age class distributions for lowland hardwoods, oak, northern hardwoods, tamarack and northern white cedar, these are not shown because for all of these forest types very little even-aged management was projected by the model. All of these forest cover types were projected to essentially age by 40 years over the study period with very little even-aged management activity occurring.[33] Similar results were projected by the GEIS, however it should be noted that the GEIS did assume that northern hardwoods would be managed under even-aged systems. Some markets for tamarack are developing, but the areas harvested are still relatively small compared to the area of this forest cover type

[33] The DEIS model did project significant uneven-aged management activity in the northern hardwoods cover type in the fourth decade, but cover type age structure was not significantly altered by this. GEIS results for the tamarack and white cedar cover types were similar to those generated for the DEIS. The GEIS model results differ from the DEIS results in the lowland hardwoods, northern hardwoods, and oak types in that the GEIS projected substantial even-aged management to occur in these types. There has been recent evidence of greater industrial species substitution for aspen, and if this trend continues, more management than projected by the model is likely to occur in cover types with modest aspen volumes. An exception is likely to be white cedar, where little management is likely to occur due to regeneration concerns.

5.1.5.5 Implications of Modeling Results – Sustained Industrial Demand for Aspen

Estimated Maximum Sustainable Aspen Harvest Levels

The forest management scheduling projections indicates that the ability to sustain 2002 aspen harvest levels over the 40-year planning horizon under the No-Build Alternative is a potential source of concern. As described earlier, the GEIS identified similar concerns and lowered the aspen statewide harvest levels for each GEIS scenario by assuming markets would shift demand for aspen to other species. No-Build Alternative projections indicates that the year 2002 statewide harvest level for aspen (2.21 million cords/year) could be sustained over the 40 year planning horizon. The 2.21 million-cord level is very close to the projected *maximum* sustainable level of 2.42 million cords/yr estimated by the analysis for the 40-year planning horizon.

Consequences of Aspen Forest Type Management on Non-Aspen Forest Types

As of 2002, harvest in the aspen cover type has supplied most of the volume of aspen harvested *and* much of the statewide timber demand for most other species. This occurred because although aspen accounts for approximately 60 percent of the total statewide harvest volume of all species, on average stands in the aspen forest-type contain only approximately 65 percent aspen by volume. Since harvest in the aspen forest type typically occurs under an even-aged management prescription, the balance of 35 percent by volume is made up of other marketable non-aspen species types. This non-aspen type volume, which is generated as a result of harvest in the aspen forest type, is of sufficient quantity to supply current industrial demand for these species.

One result of this situation is that as of 2002, there has been relatively modest harvesting activity in many cover types that contain little or no aspen. This trend is projected to continue under the No-Build Alternative. This contrasts with the GEIS Base Harvest Scenario over the last 30 years of its planning horizon, which assumed that substantial species substitution would occur with aspen harvest volume falling to approximately 45 percent of the total statewide harvest. Without substantial species substitution in the forest industries sector, harvest activity in forest types that contain only small components of aspen will likely remain limited.[34]

Average Forestland Age

Table 5-7 shows the average age of forestland acres in each forest cover type for the DEIS No-Build Alternative. Final GEIS Table 5.9 is similar and shows timberland acres for the GEIS Base Harvest Scenario. For both the GEIS and the DEIS, the average age for the aspen cover type group drops from 41 years to 34 years over the planning horizon. This means that both the GEIS analysis and DEIS analyses are projecting a younger aspen forest cover type over time. For both the jack pine and paper birch type, the DEIS shows the average age increasing over the planning horizon, but not as much as in the GEIS. For the GEIS, the average age in year 2040 is 92 years for the paper birch type while for the DEIS it is 68

[34] There is recent evidence of greater species substitution for aspen, and if this trend continues, more management than projected in the model is likely to occur in forest types containing little or no aspen.

years. For the DEIS, the scheduling model is likely harvesting more birch to also capture aspen volume present in many stands in the birch cover type. For jack pine, the average age increases to only 50 years while in the GEIS it is 77 years. More harvesting is likely occurring in the jack pine type to take advantage of the higher jack pine prices compared to prices at the time of the GEIS, in addition to the desire to regenerate old jack pine stands (National Forest and DNR direction) and to help remediate jack pine budworm outbreaks. The GEIS has average ages increasing for the oak, lowland hardwoods, and northern hardwoods cover types, but the increases are larger for the present analysis because less harvesting occurs in these types and the emphasis has shifted substantially to uneven-aged management in these types.

Table 5.7
Average Age of Forestland Acres by Forest Cover Type for the No-Build Alternative

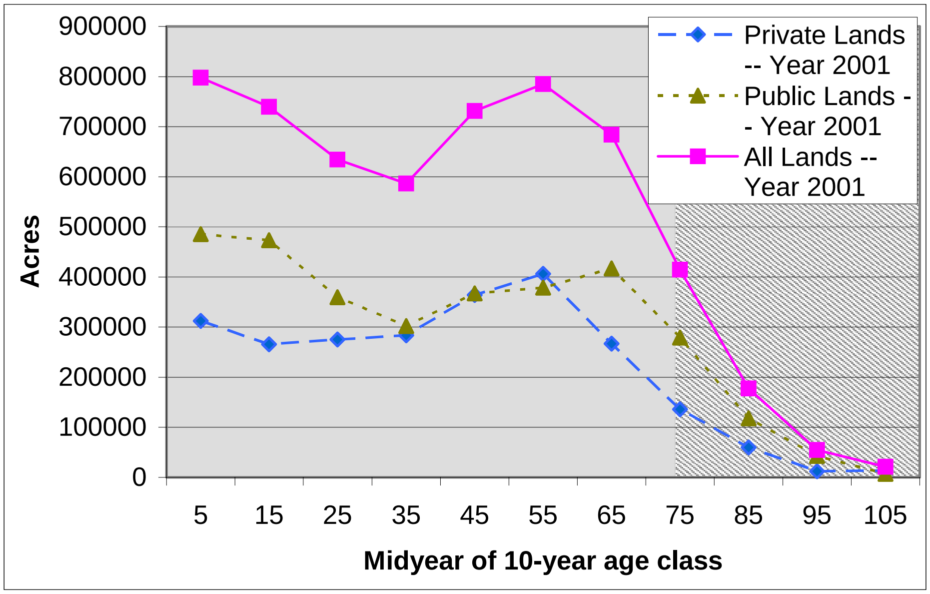
Forest Cover Type	Year 2001	Year 2011	Year 2021	Year 2031	Year 2041
Jack Pine	49	44	42	45	50
Red Pine	46	51	55	58	62
White Pine	75	80	86	94	99
Upland Spruce-fir	45	50	53	57	64
Oak	69	78	88	98	108
Northern Hardwoods	65	75	85	95	104
Aspen	41	35	34	34	34
Paper Birch	61	66	68	68	68
Lowland Spruce	72	81	90	99	108
Tamarack	69	79	89	99	109
Lowland Hardwood	66	76	86	96	106
Cedar	94	104	114	123	132

The forest scheduling modeling suggests that sustaining aspen supply over the planning horizon is a potential concern if the underlying assumptions are correct.

Figure 5-18, Aspen Private / Public Year 0, shows the statewide aspen age class distribution and its components of public and private lands. Much of the imbalance in the age distribution is present on public lands. The age class distribution of the aspen forest cover type on private lands is relatively constant for the younger age classes; see Figure 5-19. From this distribution one cannot expect large increased areas of "next rotation" aspen to become available in the next 40 years from private lands. However, the balanced nature does not suggest that areas aging and becoming available from private lands will decline over time.

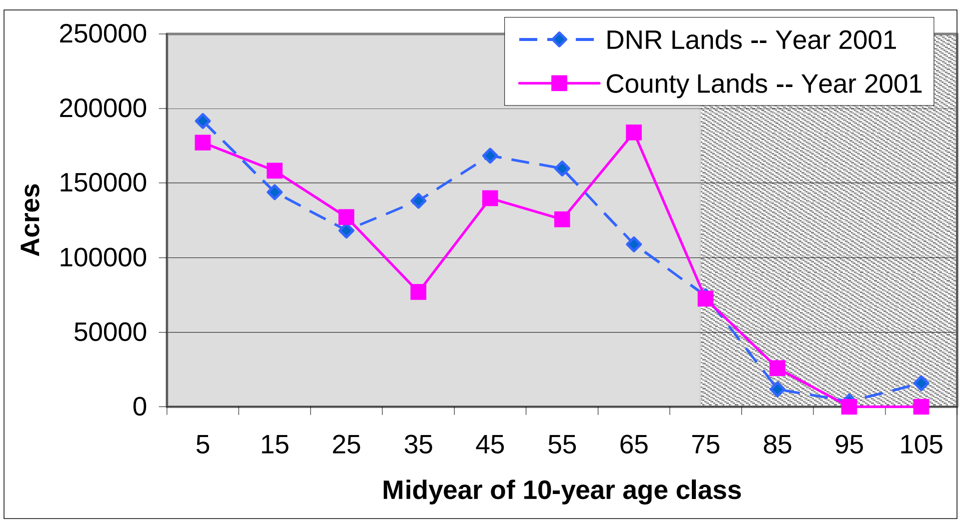
Public lands have plans in place that emphasize moving towards a more balanced age-class distribution of the aspen forest cover type over time by limiting the area harvested each decade. Large increases in acres harvested in the aspen forest cover type cannot be expected from public lands in future years. Figure 5-19, Aspen DNR / County Year 0, shows similar, irregular aspen age class distribution in 2001 for both DNR managed and county managed lands.

Figure 5-18
Aspen Private / Public Year 0



Stand age class distributions for the aspen forest cover type for year 2001 for private forestlands and public forestlands. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

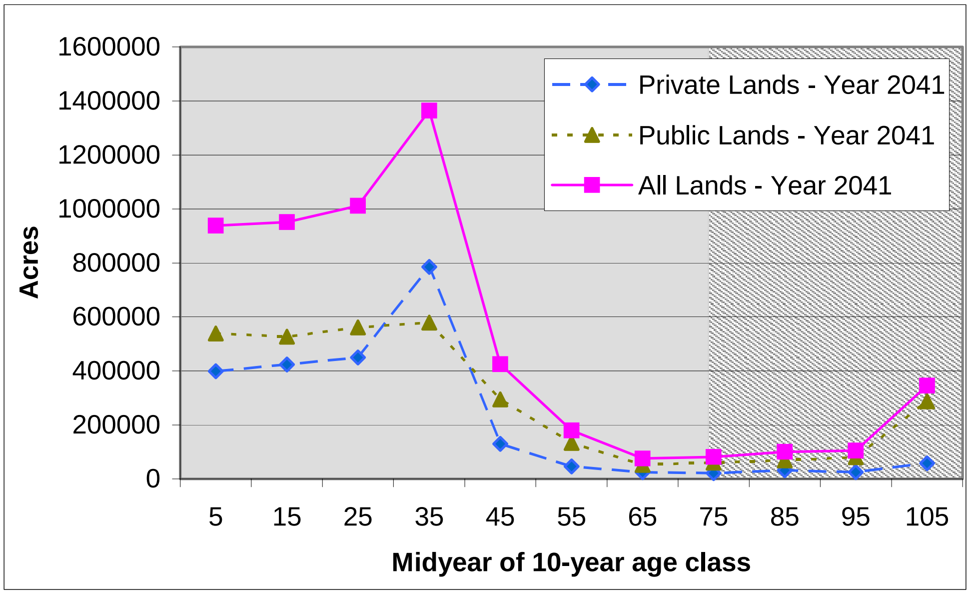
Figure 5-19
Aspen DNR / County Year 0



Stand age class distributions for the aspen forest cover type for year 2001 for DNR forestlands and County forestlands. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Figure 5-20, Aspen Private / Public Year 40, shows the aspen age class distribution at the end of the planning horizon. The nearly 400,000 acres in the oldest age class represent acres in the aspen forest cover type in 2001 that will likely succeed to other forest cover types over the planning horizon.

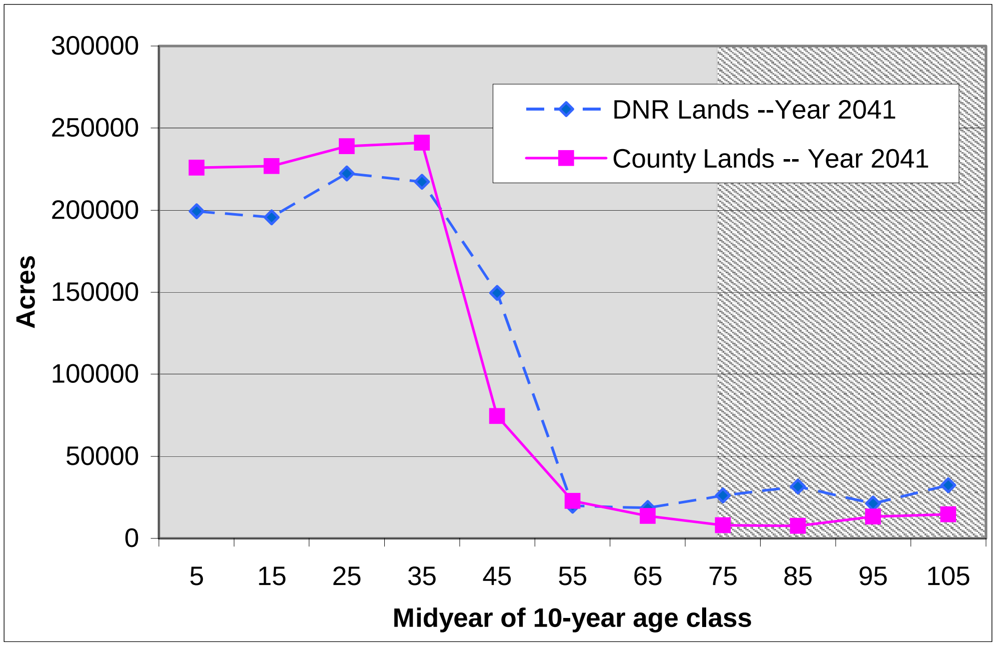
Figure 5-20
Aspen Private / Public Year 40



Stand age class distributions for the aspen forest cover type for year 2041 for private forest lands and public forest lands under the No-Build Alternative. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Some wood users have questioned whether opportunities may be present for the state and county to harvest more area in the aspen forest cover type. Figure 5-21, Aspen DNR / County Year 40, shows the age class distribution for the aspen forest cover type in year 2041 for state and county lands. As the figure reflects, both ownerships are using area control with a fairly even age-class balance achieved by year 2041. In 2041, the DNR lands have larger area in the age 40-70 age classes reflecting the desire to have areas of extended rotation forestry on DNR lands. Overall, relaxing forest regulation constraints on state or county lands does not appear to be a viable solution to concerns over aspen supplies, as results show few acres have gone unharvested over the planning horizon.

Figure 5-21
Aspen DNR / County Year 40



Stand age class distributions for the aspen forest cover type for year 2041 for DNR forestlands and County forestlands under the No-Build Alternative. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

5.1.6 FOREST CHANGE WITH BUILD ALTERNATIVE

5.1.6.1 Restatement of Proposed Project

Project Description

As noted in DEIS Chapter 3, the proposed Project will increase facility-related annual roundwood use by approximately 197,000 cords per year. Processed wood fiber is the principal material used in the production of industrial paper grades. If the Project is implemented, the mill's total annual roundwood use will equal 400,000 cords per year.

The three principal tree species used by the mill are aspen, balsam, and spruce. Regarding aspen, both trembling (*Populus tremuloides*) and bigtooth (*Populus grandidentata*) are used. Spruce utilization is predominantly white spruce (*Picea glauca*) and black spruce (*Picea mariana*); small amounts of Norway spruce (*Picea abies*) are also used from plantation thinnings. The type of balsam fir used is *Abies balsamea*.

Wood Use

The facility uses both roundwood and kraft pulp in its operations.

Roundwood

The proportion of each species used in the facility's wood supply has varied considerably in response to wood market conditions, paper product demand, weather, availability, and pulp and paper process technology. Aspen, for example, has been as little as 20 percent to as much as 57 percent of the species mix for paper produced at the mill over the past decade. Currently, on an annualized basis, aspen makes up 41 percent of the mill's total wood use. Similarly, spruce consumption has ranged from 34,000 to 95,000 cords per year. UPM/Blandin Paper fully anticipates the mix of these three species will continue to vary in the future due to both economic and non-economic factors that drive stumpage prices and species availability.

Total pulpwood use has ranged between 166,000 and 221,000 cords per year over the past decade. Annual wood use dropped in 2003 in association with the permanent shutdown of PM3 and PM4. Consequently, annualized wood use for 2004 is estimated to be approximately 166,000 cords, or some 25 percent less than the facility's total wood use in 2002. This means that the amount of wood consumed by the mill in 2002 would be more indicative of its annual wood needs over the past decade. UPM/Blandin Paper's average annual wood use from 1994 through 2002 has been calculated as a baseline value of 203,000 cords.

The proposed Project will increase wood use by an estimated 197,000 cords per year. Approximately 110,000 cords, or 56 percent of this increase, is anticipated to be aspen, with the remaining 87,000 cords consisting of the softwoods spruce and balsam. However, as indicated above, there will likely be considerable year-to-year variability in facility's species mix. Total annual wood consumption at the mill is projected to be 400,000 cords per year.

Kraft Pulp

The facility uses kraft pulp purchased from Canadian sources. In 2003, kraft usage was 92,109 air dry (AD) short tons used that year in the operations of PM5 and PM6. In 2002, kraft usage totaled 131,784 AD short tons resulting from the operation of PMs 3, 4, 5, and 6. Future kraft pulp consumption is estimated to be 147,208 AD tons annually, which is an increase from current operations of approximately 52,000 AD short tons per year. The DEIS's assessment of potential impacts to forest resources does not include an assessment of proposed changes in use of kraft pulp.

See Table 3-3 and Chapter 3.0, Figure 3.5, Historic and Proposed Levels of Wood Use.

Sources of Wood

Roundwood used at the facility originates from: 1) harvest of company owned and managed timberlands; 2) Minnesota wood purchased on the open market; and 3) wood imports.

Table 5-5
Summary of Historical, Current, and Planned Incremental Wood Use

(100-inch cords)	Aspen	Balsam	Spruce	Total
Range 1994-2003	35,000 – 118,000	41,000 – 62,000	34,000 – 95,000	166,000 – 221,000
Baseline (Average) 1994-2002	92,000	53,000	58,000	203,000
Proposed Increase	+110,000	+28,000	+59,000	+197,000
Proposed Total New Use	202,000	81,000	117,000	400,000

Kraft Pulp Use		
Current	**Projected Increase**	**Total**
95,208 AD tons/yr	52,000 AD tons/yr	147,208 AD tons/yr

UPM/Blandin Paper Mill anticipates that approximately 144,000 cords (73 percent) of the Project-related increase in wood needs will be sourced from Minnesota timberlands. The balance of 53,000 cords will be imported, primarily from Canada, Michigan, and Wisconsin. The company has not identified a specific procurement zone because open-market wood purchases will be made wherever economically feasible. The company predicts that imports will remain an important source of wood for the Project; see Chapter 3.0, Table 3.6, Project-Related Wood Sources: Minnesota and Imports. Note that for the purpose of impact assessment (modeling the worst case scenario) the increase in wood usage associated with the Project is assumed to come entirely from timber harvesting activities in Minnesota, thus, modeling efforts are centered around the additional 197,000 cords per year harvested from Minnesota forests.

Roundwood procured in Minnesota proper will come from timber harvest occurring on a variety of ownerships. These include UPM/Blandin Paper Mill lands, other industrial and non-industrial private lands, and county, state, and federal lands. The company has provided a profile of timber procurement by ownership; see Chapter 3.0, Table 3.7, Current UPM/Blandin Paper Company Wood Sources by Owner. It should be noted that UPM/Blandin Paper Mill believes that the relative proportions across ownerships can change substantially over relatively short periods (e.g., 2-3 years).

5.1.6.2 Key Assumption

An annual harvest level of 3.872 million cords per year was assumed to apply in all years after year 2006 of the 40-year planning horizon for analysis of the Build Alternative. This value is derived by summing the annual total statewide harvest level in 2002 (e.g., 3.675 million cords) with the Project-related increase of 197,000 cords per year. The following text describes the results of the forest projection modeling regarding harvest-related changes in: 1) volumes; 2) forest area; and 3) age-class distributions. The results are offered as compared to the No-Build Alternative.

5.1.6.3 Changes in Projected Harvest Volumes

Table 5-6 compares the volumes harvested per decade for the No-Build and Build Alternatives. As noted, the Project is projected to increase annual wood consumption by 197,000 cords/yr. However, because this increase does not start until later in Decade 1 of the planning horizon, the average annual increase in statewide harvest volume for the entire planning horizon is less than 197,000 cords/yr. The average annual increase in spruce-fir harvest for the Build Alternative is only 20,000 cords over the No-Build Alternative because the No-Build Alternative resulted in spruce-fir harvest levels above the assumed minimum levels for spruce-fir. Statewide spruce-fir harvest levels are high enough for the Build Alternative to cover the assumed 98,500 cord per year increase for spruce-fir over 2002 levels.

Table 5-6
Timber Volumes Harvested for No-Build and Build Alternatives (thousand cords/yr)

	Forest Product Group	Decade Starting in Year				Average 1990 - 2040
		2000	2010	2020	2030	
No-Build Alternative	Aspen	2,212	2,214	2,207	2,218	2,213
	Spruce-fir	454	470	504	446	468
	Jack Pine Logs	89	75	39	22	56
	Red Pine Logs	166	192	219	239	204
	Tamarack	8	8	19	13	12
	Pine Pulp	84	123	87	86	95
	Other Hardwoods	575	528	519	562	546
	Firewood	83	74	73	92	81
	Total	3,671	3,683	3,666	3,677	3,674
	Forest Product Group	Decade Starting in Year				Average 2000 - 2040
		2000	2010	2020	2030	
Build Alternative	Aspen	2,243	2,303	2,304	2,303	2,288
	Spruce-fir	444	502	504	504	488
	Jack Pine Logs	93	71	39	27	57
	Red Pine Logs	167	190	214	264	209
	Tamarack	8	10	25	11	13
	Pine Pulp	90	118	93	93	98
	Other Hardwoods	628	603	614	595	610
	Firewood	89	85	74	94	85
	Total	3,761	3,881	3,867	3,890	3,850
	Forest Product Group	Decade Starting in Year				Average
		2000	2010	2020	2030	
Difference (Build Alternative minus No-Build Alternative)	Aspen	31	89	97	85	76
	Spruce-fir	-10	32	0	58	20
	Jack Pine Logs	4	-4	-1	5	1
	Red Pine Logs	2	-2	-5	25	5
	Tamarack	0	2	7	-2	1
	Pine Pulp	6	-5	6	7	4
	Other Hardwoods	53	75	95	33	64
	Firewood	5	11	1	2	5
	Total	90	198	200	213	175

Table 5-7 shows the projected increase in harvest volume by ownership group for the Build and No-Build Alternatives. As expected, the majority of the increase, or approximately some 70 percent of the increase, is from private landowners in the "other owners" group in Table 5-7. The increase in harvesting on state and county lands is not in the aspen forest cover type group as harvesting in that cover type is currently at or near allowable cut levels.

Table 5-7
Projected Increase in Harvest Volume by Ownership Group for the No-Build (Scenario A) and Build Alternatives (Scenario A&P)

Ownership Group	Average Harvest No-Build Alternative (M cords/yr)	Average Harvest Build Alternative (M cords/yr)	Increase with Build Alternative (M cords/yr)	Projected Percent of Statewide Volume Increase Supplied by Ownership Group	Projected Percent Increase in Harvest Volume for Ownership Group with the Project over the 40-year Period 2001-2041
National Forest	330	330	0	0	0.0
State	757	782	25	14	3.3
County/Local	840	869	28	16	3.4
All Other Owners	1,746	1,868	122	70	7.0
Total	3,674	3,850	175	100	4.8

5.1.6.4 Changes in Forest Area

Table 5-8 shows the area of the forest assigned to different silvicultural treatment options for the No-Build and Build Alternatives. In the bottom section of the table, differences between the No-Build and Build Alternatives are shown in terms of areas assigned to each of the treatment options. With the Project, the area harvested at least once over the planning horizon increases from 5.7 million acres to 5.9 million acres, roughly a 3.5 percent increase. Some of this increase (59,000 acres) is assigned to uneven-aged management treatment options, generally in northern hardwood stands. The intent is to capture additional aspen volumes present in some mixed hardwood stands. Most of the increase in harvest area is on private lands – about 60 percent. Increases in harvesting on both private lands and public lands are in forest types other than aspen. The model is simplified in that it does not recognize that additional acres in the aspen forest type could become available from private lands if aspen stumpage prices increase as a result of the Project. As with public lands, private lands in the aspen forest cover type assumed available for harvest are generally harvested within the planning horizon regardless of whether the Project is implemented.

The statewide timber harvest volume increase with the Project is 4.6 percent over the 40-year horizon. The Project results in a 5.4 percent increase in statewide timber harvest. Since Project-related harvest does not begin until late in Decade 1, the contribution over the 40-year study period (e.g. 2001-2041) is less than this amount. In the modeling results, the percentage increase in area harvested over the planning horizon (3.5 percent) is less than the percentage increase in harvest volume with the Project. Under the Build Alternative, the area assigned to even-aged harvest over the 40 years increases by only 2.5 percent, from 5.226 million acres to 5.357 million acres (Table 5-8). Aspen volume is valued relatively high by the model with aspen values increasing more over time with the Project (Appendix C). With increasing aspen values over time, rotation lengths tend to be lengthened with the added time increasing the average yields per acre at rotation. As an example, consider a stand that is currently growing at the interest rate (4 percent used in this DEIS). Under constant prices such a stand is generally financially mature. For stands in the aspen cover type, this would generally be at an age of approximately 40 years. But with increasing timber values over time, delaying its harvest, even when stand volume is growing at less than the interest rate, could still be desirable financially. For example if a stand grows at 3 percent per year between age 40 and age 50, the volume yield of the stand at harvest would increase by approximately 34 percent if rotation age is increased from age 40 to age 50. In general, the sequencing of stands for harvest can be an important factor for achieving management objectives over time. Rising timber values over time suggest longer rotations with higher yields per acre at rotation. Overall, with the Project the model brought 199,000 additional acres into timber production over the planning horizon (Table 5-8). This helped to lengthen rotations on other acres where increased growth could be realized, especially growth of aspen.

Table 5-8
Comparison of Silvicultural Treatment Types Assigned to Forestland (thousand acres) by the Scheduling Model for the No-Build (Scenario A) and Build (Scenario A&P) Alternatives

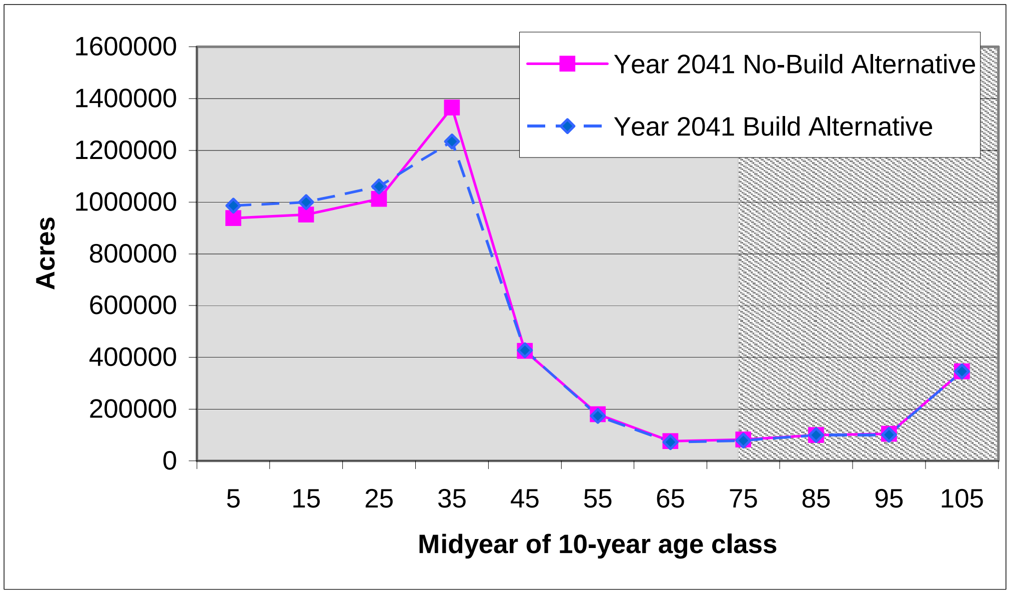
	Even-aged with thinning	Even-aged without thinning	Even-aged with residual overstory	Uneven-aged or Multi-aged	No Harvest	Total Area
No-Build Alternative						
US Forest Service Reserved	0	0	0	0	726	726
National Forest Lands	53	475	114	134	991	1,768
DNR Lands	20	1,019	19	8	2,640	3,706
County Lands	8	1,094	23	12	1,478	2,616
UPM/Blandin Paper Lands	0	90	2	0	46	138
Private Lands	0	2,461	48	33	4,224	6,767
Other Owners	0	87	2	0	208	297
Total	81	5,226	208	188	10,314	16,017
Build Alternative						
US Forest Service Reserved	0	0	0	0	726	726
National Forest Lands	53	475	114	134	991	1,768
DNR Lands	20	1,037	21	15	2,613	3,706
County Lands	8	1,137	25	18	1,428	2,616
UPM/Blandin Paper Lands	0	90	2	0	46	138
Private Lands	0	2,529	54	79	4,105	6,767
Other Owners	0	89	2	0	206	297
Total	81	5,357	217	246	10,115	16,017
Increase With Project						
US Forest Service Reserved	0	0	0	0	0	0
National Forest Lands	0	0	0	0	0	0
DNR Lands	0	18	2	7	-27	0
County Lands	0	43	2	5	-51	0
UPM/Blandin Paper Lands	0	0	0	0	0	0
Private Lands	0	67	5	46	-119	0
Other Owners	0	2	0	0	-2	0
Total	0	131	10	59	-199	0

** Comparison includes all Minnesota forestland except those forest land acres classified as open land.*

5.1.6.5 Changes in Age Class Distributions – General

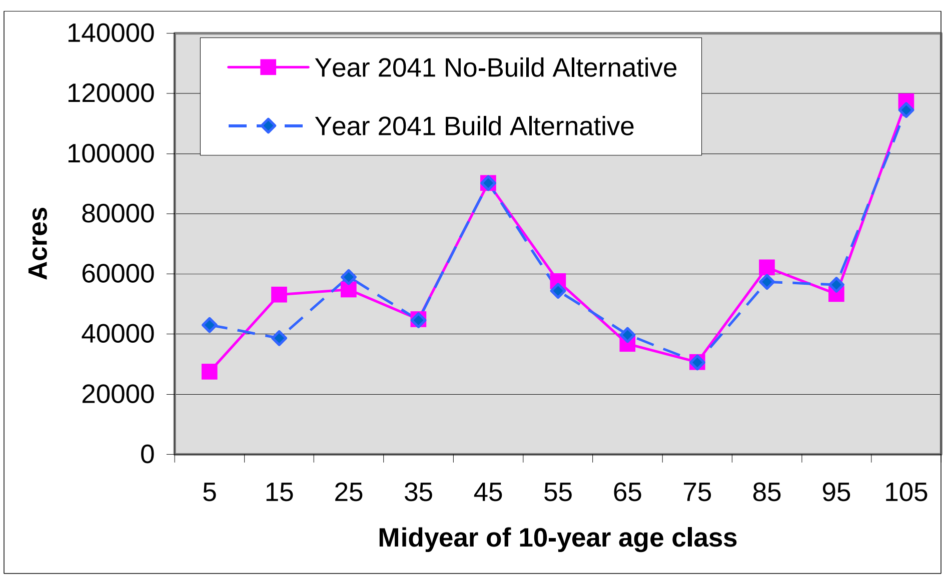
The Project will not directly influence all forest types subject to harvest in Minnesota. Figures 5.22-5.27 compare the age class distributions for six of the forest cover types most likely to be influenced by the Project. The forest types directly affected by the Project are aspen, upland spruce fir, lowland spruce, red pine, white pine, and jack pine.

Figure 5-22
Aspen – No-Build and Build Alternatives



Comparison of stand age class distributions of the aspen forest cover type in year 2041 for the No-Build and Build Alternatives. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

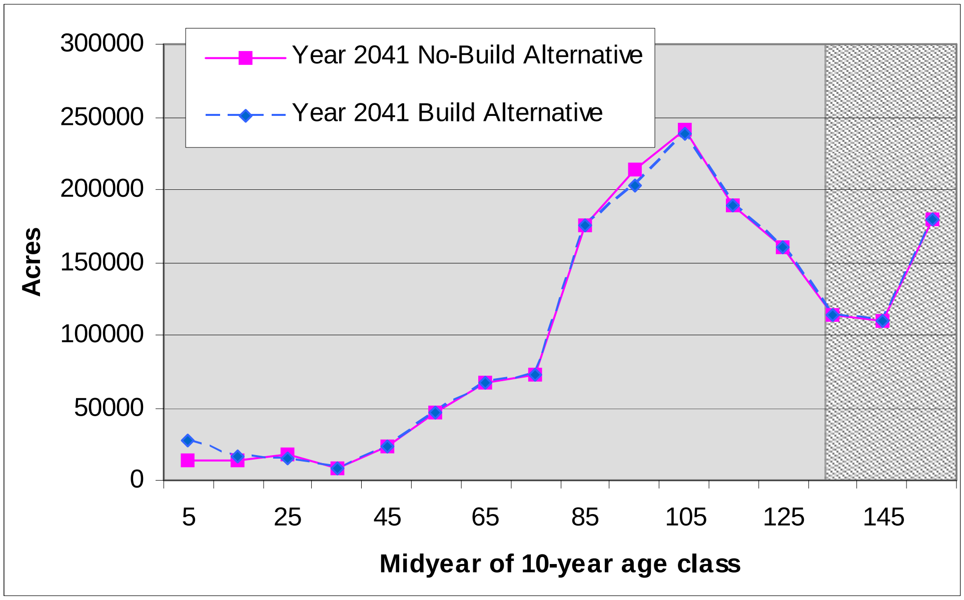
Figure 5-23
Upland Spruce-fir – No-Build and Build Alternatives



Comparison of stand age class distributions of the upland spruce-fir forest cover type in year 2041 for the No-Build and Build Alternatives. The maximum rotation age[31] for upland spruce-fir is 110 years, which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Figure 5-24

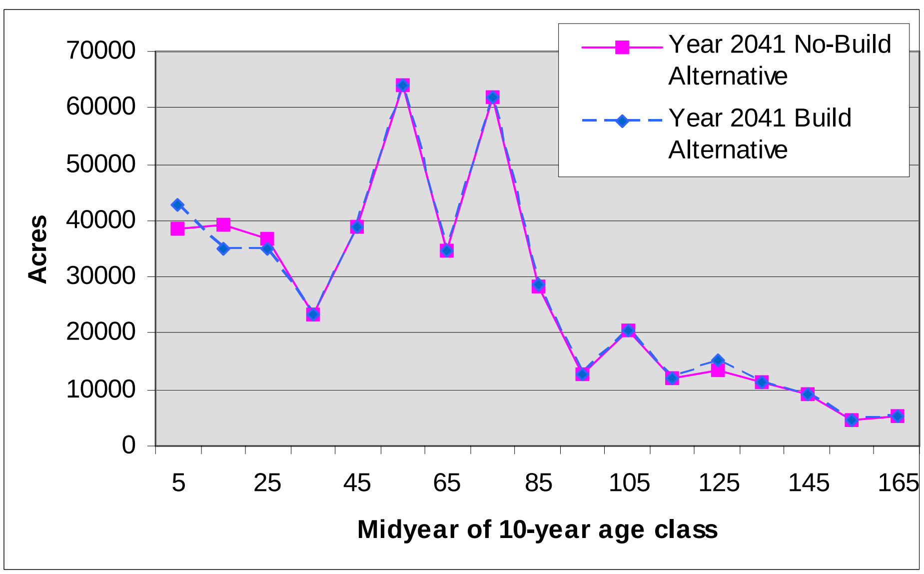
Lowland Spruce – No-Build and Build Alternatives



Comparison of stand age class distributions of the lowland spruce forest cover type in year 2041 for the No-Build and Build Alternatives. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Figure 5-25

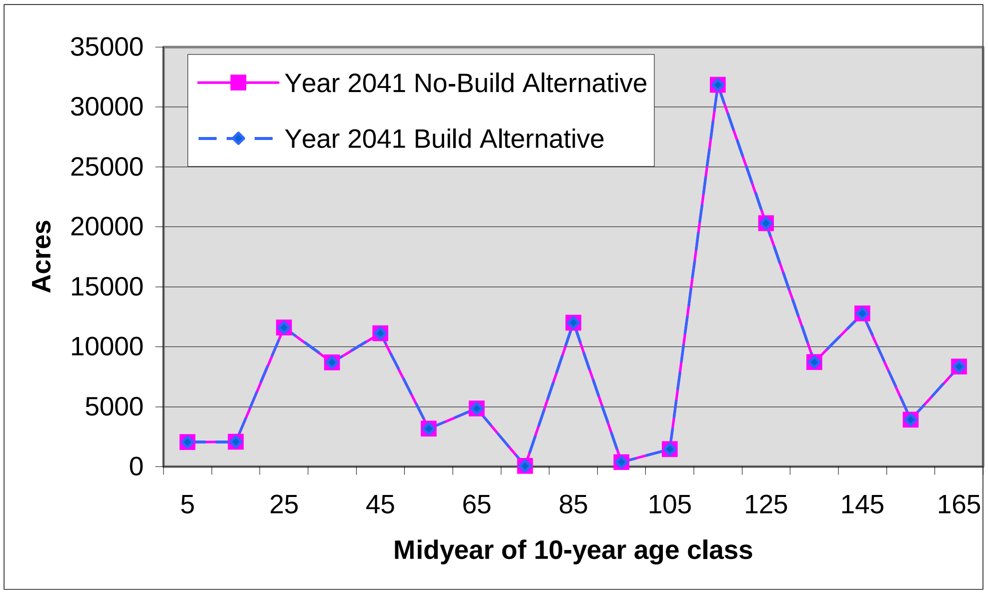
Red Pine – No-Build and Build Alternatives



Comparison of stand age class distributions of the red pine forest cover type in year 2041 for the No-Build and Build Alternatives. The maximum rotation age[31] for red pine is 165 years, which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Figure 5-26

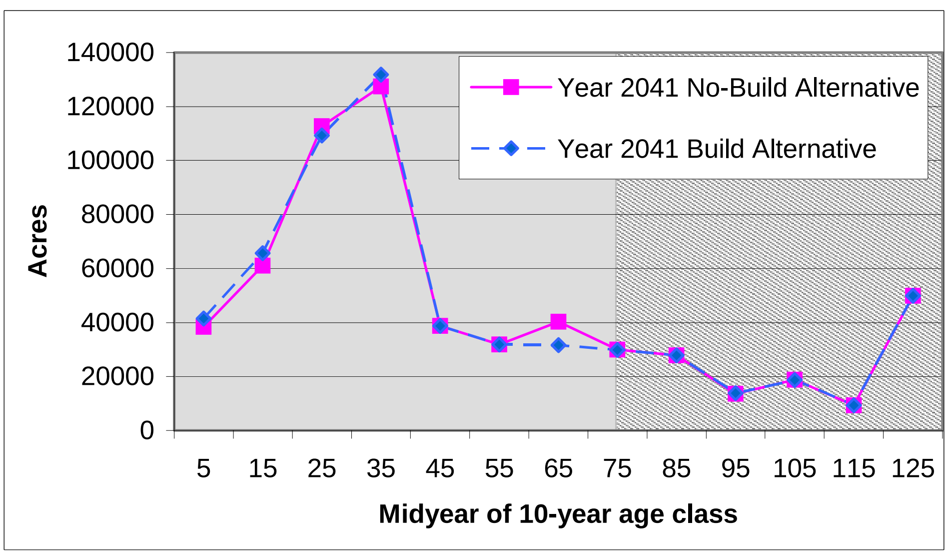
White Pine – No-Build and Build Alternatives



Comparison of stand age class distributions of the white pine forest cover type in year 2041 for the No-Build and Build Alternatives. The maximum rotation age31 for white pine is 200 years, which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

Figure 5-27

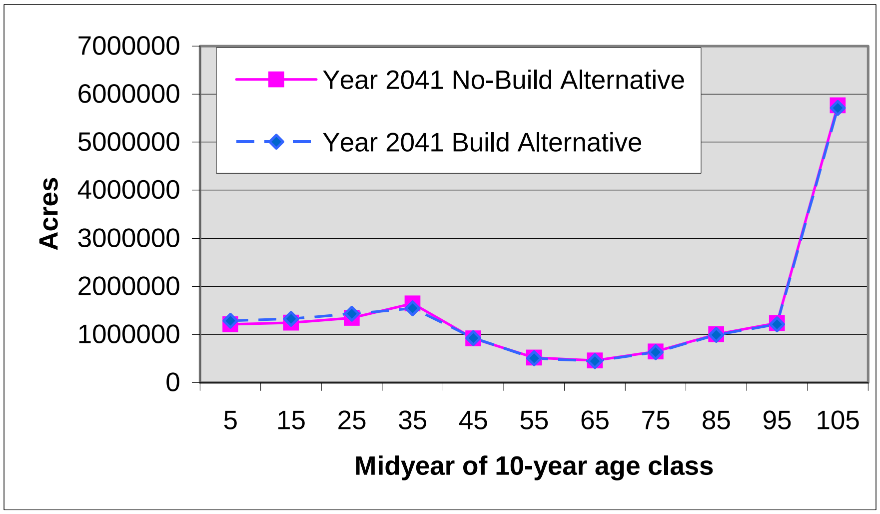
Jack Pine – No-Build and Build Alternatives



Comparison of stand age class distributions of the jack pine forest cover type in year 2041 for the No-Build and Build Alternatives. Slashed area represents those age classes where stands are beyond the maximum rotation age[31], which is defined as the maximum age at which a forest type will retain its biological ability to regenerate to the same forest type and remain commercially viable as a marketable timber sale. Stands beyond the maximum rotation age are likely to succeed to other forest types.

The comparisons show minimal difference between the No-Build and Build Alternatives for the selected forest cover types. There is no appreciable difference between the alternatives in terms of changes to age class distributions over the planning period. Figure 5-28, All Forest Types – No-Build and Build Alternatives, shows forest age class distributions across all cover types for this same No-Build and Build Alternative comparison.

Figure 5-28
All Forest Types – No-Build and Build Alternative



Comparison of stand age class distributions of all forestland in year 2041 for the No-Build and Build Alternatives.

5.1.6.6 Changes in Age Class Distributions – Area of Mature Forest

The analysis tracked the amount of mature forest over time for both alternatives as a means of monitoring forest conditions. Mature forest was defined for modeling purposes similarly to the term effective extended rotation forestry, or ERF, as used by the Minnesota DNR for planning on state-managed lands. For this study, mature forest was considered to be all forest land older than the stand ages shown in Table 5-9. These ages are approximate ages of optimal rotation age for timber production. Ages are also comparable to ages used by the Minnesota DNR to define areas providing effective ERF. However the DNR uses older ages for red pine and oak since sawtimber production is assumed to be the primary objective of the final harvest on most sites. DNR also assumes much older final rotation ages for white pine since DNR policy is to manage all white pine as ERF. An important difference to note is that DNR objectives for ERF are also based on timberland acres that do not include substantial areas of older forest found in reserve areas. Direct comparisons of area estimates of mature forest with the DNR's goals for ERF are thus generally not appropriate. For both alternatives, the amount of mature forest increases steadily over time; see Table 5-10. The statewide increase is almost 2 million acres over the 40-year planning horizon.

Table 5-9
Minimum Stand Ages for Mature Forest

Forest Cover Type Group	Minimum Age for Mature Forest (yrs)
Jack pine	50
Red Pine	60
White Pine	60
Upland spruce-fir	50
Oak	60
Northern hardwoods	80
Aspen	45
Paper Birch	55
Lowland spruce	100
Tamarack	85
Lowland hardwood	80
Cedar	80

Table 5-10
All Ownerships: Area of Mature Forest (thousand acres)

Scenario	Year 0	Year 10	Year 20	Year 30	Year 40
No-Build Alternative	7,021	7,474	8,082	8,646	9136
Build Alternative	7,021	7,538	8,066	8,582	9,011

5.1.6.7 Species Substitution in Response to Sustained Industrial Demand for Aspen

Aspen stumpage prices have increased substantially in recent years. The DNR has estimated that in 2005, the demand for aspen will decline by approximately 95,000 cords (DNR 2004). Much of this decline is attributed to shifts in use by wood users to other species. The Build Alternative was also analyzed where this projected decline in demand for aspen by other aspen users was assumed to occur (Appendix C). Overall, modeling results for the Build Alternative with this species substitution were similar to results for the No-Build Alternative; this occurred even though the total statewide harvest level is almost 200,000 cords/yr greater with the Project. Generally, total wood supply in relation to current harvest levels does not appear to be a concern for species other than aspen.

5.1.6.8 Implications of Modeling Results under the Build Alternative

The Project would raise statewide harvest levels by an estimated 5.4 percent with approximately half of the increase assumed to be aspen volume. In general, analyses show that the aspen supply situation is tight and somewhat clouded by a lack of information about the availability of private timberlands for harvest. With the Project, aspen harvest levels are increased by 98,500 cords/yr, with modeling results suggesting that this increase can be realized under the assumptions modeled.

Model results for the Build Alternative did not show any significant increase in the area harvested in the aspen forest cover type relative to the No-Build Alternative; results suggest that most all acres available for harvest in the aspen forest cover type will be harvested with or without the Project. On public lands, harvest area in the aspen forest cover type is near allowable cut levels. In other words, if the Project is implemented the harvest area cannot increase much if at all on public lands in the aspen forest cover type. However, results from using an optimization modeling approach suggest that harvest volumes from those areas can be increased with the Project by increasing emphasis on aspen growth and aspen mortality losses when sequencing stands for harvest. Emphasis is more on increasing yields from harvests projected to occur during the planning horizon. Additional aspen harvest volume can be realized as subspecies components from harvests in forest cover types other than aspen, most notably from the paper birch cover type. Results also suggest opportunities for realizing more aspen volume through uneven-aged management of northern hardwood stands that also contain substantial aspen volumes. Generally, model results with the Project suggest rising aspen values over the planning horizon with management schedules adjusted to use slightly longer rotation ages for aspen. This results in higher yields per acre at rotation with the Project.

Both for the No-Build and Build Alternatives, the need to harvest aspen volume tends to drive the model in its scheduling of harvests. Estimates of statewide harvest levels for 2002 were assumed as a baseline level for harvest levels in future years. In 2002, 60 percent of the estimated statewide harvest was aspen by volume. With average stands in the aspen cover type containing 65 percent aspen by volume, harvesting aspen stands can provide much of the demand for other timber species in the state. Model results suggest relatively little harvesting in other forest cover types. Harvesting is needed to sustain cover types like jack pine and paper birch with public land management agencies planning to harvest more areas in those forest cover types if market opportunities exist. Model results thus point to potential concern as to how well existing forest industry in Minnesota is matched with Minnesota's forest resources in terms of the existing and desired mix of forest cover types. Increases in aspen imports since the GEIS reflect potential imbalances between existing industry and forest resource harvesting potentials.

Model results suggest rising aspen values over time. These values do not equate to stumpage price projections, but results generally suggest that aspen stumpage prices may increase over time. Increases or even expected increases in aspen stumpage prices would likely help stimulate additional species substitution in the market – substitution that was not assumed to occur in the analyses for either the No-Build or Build Alternative. Sensitivity analyses as reported in summaries of additional scenarios modeled (Appendix C) suggest that species substitution in the market for aspen would help sustain timber harvest potentials and forest conditions over time. Rising stumpage prices may also help make additional acres of private lands available for harvest -- acres assumed unavailable for harvest in the analyses. Sensitivity analyses (Appendix C) show that the sustainable harvest level for aspen over the 40-year planning horizon is sensitive to assumptions about the availability of private lands for harvest, with aspen harvest levels with the Build Alternative close to maximum sustainable levels over the 40-year planning horizon.

5.2 ANALYSIS OF NO-BUILD AND BUILD ALTERNATIVES REGARDING THE 17 GEIS IMPACT AREAS

5.2.1 GEIS STUDY ON TIMBER HARVESTING AND FOREST MANAGEMENT

In 1994, the Minnesota Environmental Quality Board (MEQB) completed a GEIS on timber harvesting and management in Minnesota. The study examined the effect expanded timber harvesting might have on the environment. The GEIS assessed environmental and related impacts at three different levels (Base, Medium, and High) of statewide timber harvesting intensity. Mitigation strategies were suggested to address the potential impacts identified as being significantly adverse. These recommendations included site-level responses, landscape-level responses, and forest resources research.

The DEIS incorporates by reference and tiers information from the GEIS Base Harvest Scenario analysis to assess the potential environmental effects associated with implementation of the No-Build and Build Alternatives. This is done in accordance with Minnesota Rules parts 4410.2400 and 4410.3800, subp. 8; see Appendix G for further discussion. The DEIS references the GEIS Base Harvest Scenario because that is the level of timber harvest examined (e.g., 4 million cords per year) that best matches current and projected future statewide timber harvest levels.

5.2.2 17 GEIS IMPACT AREAS: ALTERNATIVES ANALYSIS

The GEIS identified 17 potential significant impacts that could be expected under the GEIS Base Harvest Scenario harvest level of 4.0 million cords per year; see the Final GEIS Sections 5.2-5.5 for an overview. Forest conditions were projected over a 50-year period at decadal intervals.

This section of the DEIS details the potential environmental effects of implementing the No-Build or Build Alternatives in terms of the 17 GEIS impact areas. The criteria used to evaluate the significance of impacts for both DEIS alternatives are those that were used for the same purpose in the GEIS.

5.2.2.1 Impact 1: Changes to Minnesota's Forests – Size and Composition of Forest Land Base (public and private)

An impact is considered significant if it is projected that there will be cumulative over the 40-year study period:[1]

- A change of 3 percent in the size of the total Minnesota forest land base.
- A change of 3 percent in the area of timberland (commercial forest land) available for wood production.
- A change of 7 percent in the area of the total forest land base by ecoregion.
- A change of 7 percent in the area of timberland by ecoregion.

Summary of GEIS Findings

The forest and timberland area changes were not assumed to result from timber harvesting and forest management practices, *per se*, but rather the influences of competing land uses (for both forest and timberland) and additional constraints placed on timber harvesting and forest management practices (for timberland). At the Base Harvest Scenario, the GEIS projected the following changes (statewide and by ecoregion) to the state's forestland base would occur over the study's 50 year planning horizon.

Statewide

The total forest area was expected to remain stable over the period 1990–2040, but the state's commercial forests, or timberland, was projected to drop significantly (greater than 3 but less than 7 percent). This drop was anticipated due to additional reservation of timberland. More importantly, the implementation of constraints on forest management and timber harvesting to meet concerns for non-timber values will reduce the amount of timberland actually available for harvest. This additional *defacto* reservation of timberland was expected to occur primarily on public lands, although it was anticipated that additional lands would be reserved on both public and private forests.

Ecoregions

The GEIS analysis subdivided the state into seven ecoregions; see Figure 5.29, Minnesota State Ecoregion. An ecoregion is a geographic region with similar physical and biophysical characteristics. The GEIS findings by ecoregion are as follows:

Figure 5-29
Minnesota State Ecoregions

Ecoregion 1, Glacial Lake Plains

This region was expected to continue to decline in total forest area, due primarily to conversion to agriculture in the west. Unproductive areas were projected to remain largely unchanged, with development occurring primarily on the region's timberlands. Significantly-adverse changes to both the region's forest and timberland base were projected.

Ecoregion 2, Border Lakes

This region contains a large proportion of Reserved forest land and is generally not well-suited to development. No significant change in forest area was projected, but the availability of timberland was anticipated to be reduced as a result of additional constraints being placed on timber harvesting and forest management practices. Significantly-adverse changes were projected to occur to the region's timberland base.

Ecoregion 3, Lake Superior Highlands

This small region was projected to experience a significant (greater than 7 percent) decline in both overall forest and timberland area from 1990 to 2040, due primarily to recreation related development along the North Shore, located mostly in the southern portion of the region.

Ecoregion 4, Central Pine-hardwood Forest

This ecoregion was expected to see a modest decrease in area of forest land and a somewhat greater reduction in the area of timberland over the 50 year study period. Factors contributing to decreased timberland availability were documented as constraints on forest management and timber harvest practices. The estimated decrease in the region's forest area was expected to range between 3 and 7 percent. The decrease in timberland acreage was anticipated to exceed 7 percent and was therefore considered significantly-adverse.

Ecoregion 5, Western Prairie/Forest Transition Zone

The GEIS projected forest and timberland area in this ecoregion would increase in excess of 7 percent from 1990-2040.

Ecoregion 6, Eastern Prairie/Forest Transition Zone

The GEIS projected forest and timberland area in this ecoregion would increase in excess of 7 percent from 1990-2040.

Ecoregion 7, Western Prairies

The GEIS projected forest and timberland area in this ecoregion would increase in excess of 7 percent from 1990-2040.

No-Build Alternative Analysis

The GEIS Report Card Study found that timberland area estimates for the year 2001 were approximately 25,000 acres less than what was projected to exist at the GEIS Base Harvest Scenario. The GEIS also projected the existence of approximately 300,000 additional Reserved and Other forest acres than was indicated by the 2001 FIA data. While these differences are considerable, the GEIS Report Card Study documented procedural changes in FIA that were implemented between the 1990 GEIS date and the recent GEIS Report Card Study. Taken together, these differences account for nearly all of the variation in Forest, Timberland, and Other forest land acreage estimates.

The GEIS Report Card Study concluded that much if not all of the apparent loss in the reserved and other forest acreage came from reclassification procedures rather than actual forest change. When adjusting for the 1990-2001 changes in Reserved and Other forest due to classification procedure changes in the FIA, the actual area change for the two northern FIA units appear essentially unchanged. The GEIS Report Card Study noted, however, that the projected increases in forest area in the two southern FIA units do not appear to be materializing, thus the GEIS projections appear inaccurate for that portion of the state. Statewide, the GEIS projected a 0.8 percent increase in total forest area by 2040 for the Base Harvest Scenario. Given the FIA sampling error and other inconsistencies in estimating the above components, (i.e., Timberland, especially Reserved, and Other forest), these GEIS projections, with adjustments for Reserved and Other forest, are consistent with and within the margin of sampling error for the first decade.

Projected forest land change through 2041 assumes that acreage of forest is not lost from harvesting *per se*. Rather it is lost when land use changes. Such change is unlikely for Reserved forest, within specified public forest ownership boundaries, and for Unproductive (typically wet) sites. However, land use changes can occur on private lands. Recognizing the many local to regional vagaries in projecting development which in turn impacts forest land, the likely influences on forest land area change include the following:

- Open and unmanaged agricultural land will continue to revert to forest at historic rates, especially in remote rural areas.
- Planting such acres with conifers and other woody crops (e.g., hybrid poplars) will continue at rates dependent on conservation program support, competing crop support systems, energy markets, and traditional wood products (primarily pulpwood) markets.
- Forest acreage will be lost largely in metro and metro fringe areas, and in outstate high quality outdoor recreation areas where recreational home sites and associated support service are most likely to develop. Other sources of loss come from the installation of other infrastructure, such as permanent forest clearing for new transmission and utility line corridors or road right-of-way expansions.

- The expected acreage loss (on a percentage basis) will be higher for timberland than total forest land because the latter is also subject to *defacto* reservation, i.e., public and perhaps other landowner reluctance to incur the disturbance of timber harvesting. However, this loss of availability for harvesting will be difficult to quantify. Some of it is due to parcelization, which results in smaller, less manageable blocks of timberland.

Decadal total forest acreage change by region (FIA unit) may be projected to continue as described in Table 5-11.

Table 5-11
Actual Versus GEIS Projected Total Forest Acreage
(Unadjusted for Reserved and Other Forest Classification Changes)

FIA Unit	FIA 1990	FIA 2001	Actual Change 1990-2001	GEIS Projected 1990 - 2040 Change
Aspen-Birch	7,362,000	7,109,853	-3.4%	-5.7%
Northern Pine	6,336,400	6,165,020	-2.7%	-10.7%
Central Hardwoods	2,357,200	2,357,511	0.0%	34.9%
Prairie	660,400	597,949	-9.5%	46.0%
All units	16,714,800	16,230,334	-2.9%	0.2%

Source: GEIS Report Card Study; page 9.

Simple projection of the average –2.9 percent decade loss in overall forest area statewide results in total forest acreage dropping to 88.9 percent of its current level in 2041. Uncertainty surrounds this estimate because as noted earlier in this section, there were confusing changes in FIA procedures and classification between 1990 and 2001, with most of these affecting Reserved and Other forest acreage. Consequently, it is appropriate to examine the changes in timberland area only as shown in Table 5-12.

Table 5-12
Actual Timberland Area and DEIS Projections of Timberland Acreage

FIA Unit	FIA 1990*	FIA 2001*	Actual Change	DEIS Simplistic Projection of 2001-2041 Change
Aspen-Birch	5,878,700	5,963,689	1.45%	5.93%
Northern Pine	5,944,000	5,977,340	0.56%	2.26%
Central Hardwoods	2,260,700	2,257,970	-0.12%	-0.48%
Prairie	639,800	560,833	-12.34%	-41.00%
All units	14,723,200	14,759,832	0.25%	1.00%

**14,723,200 acres from FIA report by Miles et al. 1995. However, GEIS report was based on an earlier version of the 1990 FIA data and showed 14,773,400.*

Given these timberland results for 1990-2001 and the DEIS projections of change, further interpretation is needed. It appears that timberland area statewide will remain stable over the coming decades. However, the GEIS projected increase in forest area for the Central Hardwoods and Prairie FIA units has not materialized. In fact, prairie region timberland area, while small, is clearly declining.

Also important to note is that formal Reserved forest area is likely to increase in the future and that other forest areas, particularly lowlands (wetlands), should remain undeveloped. Consequently, given the changes noted in table 1.4b for timberland, below are suggested changes in total forest area by ecoregion for 2001-2041:

- GEIS ecoregions 1, 2, 3, and 4 – no discernable change
- GEIS ecoregions 5 and 6 – no discernable change
- GEIS ecoregion 7 – a significant loss in forest area, possible up to 40 percent
- All ecoregions combined – no discernable change

These projections of forest and timberland area changes for the No-Build Alternative should be viewed as a refinement of those in the GEIS and suggestion of important changes in total forest area and timberland acreage in prairie areas (GEIS Ecoregion 7) for the study period. The fact that changes are likely to be gradual allows time for action that can compensate for this loss. More important than forest area, however, is the above-discussed issue of availability for timberland.

Build Alternative Analysis

Analysis of FIA data through the GEIS and GEIS Report Card Study concluded changes in forest land area are largely influenced by factors other than timber harvesting. One source occurs from non-forest land being converted to a forested condition by planting or natural colonization of old fields by tree species, including abandoned pasture land with trees. Forest land conversion to non-forest land by clearing for agriculture, residential, or urban development is another large factor. The Project itself is expected to have minimal effect on changes in the extent of forest cover and timberland acreage. In fact, the demand created from the Project may stimulate timber values and thereby foster retention of some additional land in forest cover and timberland status.

5.2.2.2 Impact 2: Changes to Minnesota Forests – Patterns of Forest Cover in Areas of Mixed Land Use

> An impact is considered significant if noncontiguous forested tracts or patches less than 300 acres in size are projected to experience clearcutting of more than 20 percent of the tract or patch in any one decade.

Summary of GEIS Findings

The GEIS concluded that forest acreage was being gained in the forestry-agricultural transition areas in Minnesota (ecoregions 5, 6, 7). This was based on regrowth statistics of the oak and elm-ash-cottonwood forest cover types common to the agricultural regions. In 1990 these ecoregions combined contained 13.4 percent of the total forest acreage in the state. However, even the large percentage increases the GEIS estimated for the next 50 years would barely return these regions to the forest acreage levels of the 1950s. Additionally, the concentration of oak-hickory forest type common to these ecoregions in older age classes, coupled with high harvest levels, could negatively affect the overall habitat value of existing forest patches. The GEIS concluded that the small average stand sizes in this cover type and these ecoregions, and the projected acreage of unharvested stands, suggest the impacts to wildlife associated with harvesting these forest patches could result in significantly adverse impacts. Forest patch size affects forest-interior breeding bird species, especially in regions of the State where non-forest habitat types (e.g., agriculture or urban) are intermixed. Data limitations in the GEIS precluded the ability to document impacts on a site-specific basis.

No-Build Alternative Analysis

The annual volume harvested under the No-Build Alternative is estimated to be approximately 11 percent less than what was assumed to occur under the GEIS Base Harvest Scenario. Those forest cover types that the GEIS concluded have the greatest susceptibility to changing patterns of forest cover in areas of mixed land uses were the oak and elm-ash-cottonwood forest types in the forestry-agricultural transition areas of Minnesota (GEIS ecoregions 5, 6, and 7). Comparing the GEIS and No-Build Alternative estimates of acres harvested statewide in each of these cover types suggests there will be approximately 5,000 fewer lowland hardwood acres and 9,300 fewer acres of the oak cover type subject to regeneration harvest each year on average under the No-Build Alternative versus the GEIS Base Harvest Scenario over the 40-year study horizon. Additionally, the GEIS Report Card Study documented greater use of uneven-aged management by the state's public and corporate private forest landowners than when the GEIS was prepared (7 percent of acres subject to uneven-aged management in 1994 versus 12 percent in 2005).[35]

Clearcutting activity on small, non-contiguous forested tracts will likely be substantially lower under the No-Build Alternative, resulting in decreased adverse impacts than projected in the GEIS. Forest fragmentation that does occur will likely occur in areas of private ownership and will impact breeding birds that are sensitive to forest edges. In addition, an increase in nest predation (decrease in productivity) in forests with high edge density and perimeter area ratios may adversely affect ground nesting breeding bird species.

Build Alternative Analysis

Based on the anticipated extent of timber harvesting activity and types of forest land needed to supply the wood fiber required for the Project, few acres in lowland hardwoods or oak forest cover types are

[35] The GEIS Report Card Study used a survey-based methodology to assess the implementation of the GEIS mitigation strategies, including use of uneven-aged management. Formal monitoring occurs through the MFRC Guideline Implementation Monitoring Program. Projections for the DEIS, while including more uneven-aged management than assumed in the GEIS, still have a small proportion of the forest assigned to uneven-aged management.

projected to be regeneration harvested over the 40 year study period.[36] While timber procurement areas are dynamic in response to changing market and supply conditions, it is expected that few stands in GEIS ecoregions 5, 6, and 7 will be harvested to provide wood for the Project. The types of wood fiber needed for the Project are typically found in the aspen, upland spruce fir, lowland spruce, red pine, white pine, and jack pine cover types. Oak and lowland hardwood cover types, which are the cover types the GEIS concluded as having the greatest susceptibility to changing patterns of forest cover in areas of mixed land uses, are not expected to be a significant source of wood fiber for the Project. The Project is not expected to produce significantly adverse impacts (as defined above) on small patches of forest land.

5.2.2.3 Impact 3: Changes to Minnesota Forests—Tree Species Mix

An impact is considered significant if projected gross changes in the relative proportion of any tree species exceed 25 percent for the respective cover types over the 40-year planning period.[37]

Summary of GEIS Findings

The GEIS concluded that at the level of timber harvesting and forest management associated with the Base Harvesting Scenario, no tree species would be reduced to a level that would jeopardize their continued presence in the forest. While the GEIS found that major tree species composition changes within forest cover types would not occur, it indicated that species composition changes would occur in specific stands as a result of implementing new harvesting or silvicultural practices. The GEIS was not able to identify a clear pattern of change in tree species composition within specific cover types due to the varying influence of natural (e.g., forest succession, natural disturbance) and human-induced factors (e.g., forest management objectives, harvesting patterns and practices). Due to the high frequency of mixed species stands, the GEIS suggested that future tree species composition within a given cover type could be heavily influenced by the consistent choice of rotation age and timber harvesting practices.

The GEIS projected that the level of timber harvesting associated with the Base Harvesting Scenario would contribute to diminishing the area of the jack pine, black spruce, balsam fir, and paper birch cover types on Minnesota timberland by as much as 32, 24, 35, and 32 percent, respectively. In making these projections, the GEIS noted that some of these cover type changes would be a consequence of successional changes and not necessarily timber harvesting. It also concluded that due to the high number of tree species commonly found within a given cover type, such changes would not drastically change the vegetative composition at either the site-specific or regional level, but rather result in a given tree species becoming less abundant or reduced to a minor species on a particular site.

[36] The FIA data did not have the spatial resolution necessary to describe the ecoregion-scale effects. It was therefore not possible to model patch-size issues directly in the DEIS. Ecoregion-scale projections in the DEIS are based on extrapolation of GEIS Base Harvest Scenario findings regarding projected spatial distribution of timber harvest over the GEIS study period.

[37] The DEIS used only a 40-year study period.

Focusing on minor tree species found within Minnesota, the GEIS projected at the Base Harvest Scenario that Kentucky coffeetree, honey locust, yellow oak, and sycamore would be significantly impacted. Such significant impacts were anticipated to occur to these species principally because they are species found in Minnesota near the edge of their range or not abundant within their range. Acknowledging the value of conifers within aspen stands, the GEIS was not able to predict whether significant losses of conifers within these stands would occur if shorter rotation aspen management was deployed on a large scale.

No-Build Alternative Analysis

In comparing GEIS Base Harvest Scenario projections to actual conditions of forest cover type change, the GEIS Report Card Study found agreement in direction between actual and projected results for 10 of 14 forest cover types. Due primarily to differing methodologies, the differences between the GEIS projections and actual cover type distribution based on the 2001 FIA data were sometimes considerable, even when the direction of change was found to be the same. This was particularly true for the smaller and typically mixed species cover types. The GEIS Report Card Study concluded that actual forest type dynamics due to insect and/or disease issues, windstorms, and subtle shifts in harvesting methods were also important influences on changes in cover type acreage from 1990-2000.

Similar to the GEIS, analyses for this DEIS suggest that much of the forest will not be harvested in the planning horizon, making a large portion of the forest substantially older by the year 2041 (see Figure 5.5). Although changes in forest cover type were not modeled directly for this study, insights concerning changes can be inferred from the age class distributions presented earlier for each forest cover type (see Figures 5.5 to 5.17). Natural succession will shift acres in the older age classes of the aspen, jack pine, and paper birch cover types to the northern hardwoods and spruce-fir cover types. The age at which this shift occurs varies, with areas in the north shifting at older ages. Specific shifts for each cover type will vary by NPC. For example, in the northeastern portion of the state, most native plant communities have the birch, aspen and jack pine types shifting to spruce-fir.

Similar to projections for the GEIS, most of the area in the aspen cover type will be harvested over the planning horizon, with the age distribution of aspen shifting substantially to many more acres in younger age classes (see Figures 5.6 and 5.7). The GEIS shows a shift in the average age of the aspen forest type (timberland) from 41 years in 1990 to 34 years in 2041. Analyses for the DEIS for the No-Build Alternative showed a shift in the average age of the aspen forest cover type (forestland) from 41 years in 2001 to 34 years in 2041. Although the averages reported differ in terms of timberland and forestland, the trend is the same in both studies, specifically the aspen forest type is projected to be substantially younger by 2041.

The minor tree species the GEIS projected would be significantly impacted at the Base Harvesting Scenario (Kentucky coffeetree, honey locust, yellow oak, sycamore) are found principally in those forest cover types that are being harvested at a considerably lower rate than was projected to occur in the GEIS at the Base Harvesting Scenario. In the absence of the Project, approximately 9,300, 5,500 and 5,000 fewer acres are projected to be regeneration harvested each year through 2041 than was projected to occur in the GEIS at the Base Harvesting Scenario for the oak, northern hardwood, and lowland hardwood cover types, respectively. This reduced harvesting activity will result in less adverse impacts on individual tree specie abundance than what was projected to occur in the GEIS at the Base Harvesting Scenario. The results of the DEIS modeling under the No-Build Alternative are in line with GEIS findings in that the effects observed are not loss of tree species as much as changes associated with stand age; see Final GEIS, page 5-73.

Also relevant to this impact area is that all MFRC Regional Landscape plans (except that of the Northern Landscape region) have made recommendations for balancing forest age class and cover type within their respective regions; see GEIS Report Card Study, page 99. For example, the North Central Landscape recommended an increased component of red, white, and jack pine, cedar, tamarack, spruce, and fir. Similarly, the West Central Landscape recommended numeric targets to restore native forested types from the current 11 percent (579,000 acres) to 15 percent (825,000 acres) in the landscape. If implemented, such activities will help lessen the likelihood that individual tree species abundance will significantly decline.

Build Alternative Analysis

A comparison of forest cover type acreage modeled with and without the Project at the end of the study planning period shows virtually no change. All aspen stands available for harvest will likely be harvested regardless of whether this Project is implemented or not, and given the diverse mix of individual tree species in most Minnesota forest cover types, a significant loss of individual tree species is very unlikely. Additionally, the major forest cover types harvested to support the additional wood fiber needs of the Project are not associated with the minor tree species of concern highlighted in the GEIS that live in the southeast corner of the state, the area least likely to be impacted by the Project. The projected acreage of mature forest in 2041 shows a decrease of just 1 percent with the Project as compared to without the Project. Further, the presence of a range of different age classes for each cover type, including the presence of considerable mature forest acreage, will minimize the likelihood that minor tree species only found in certain age classes are lost. Taken together, the Project is not expected to produce a significantly adverse reduction in the presence of individual tree species.

5.2.2.4 Impact 4: Changes to Minnesota Forests - Age Class Structure

An impact is considered significant if the projected replacement age class structure of forests, by cover type, at the end of the 40-year planning period, is insufficient to provide replacement of mature stand acreage (i.e., sustainability of forest communities).[38]

[38] The DEIS used only a 40-year study period.

Summary of GEIS Findings

The GEIS analysis found the replacement age class structure for timberland in the paper birch cover type was potentially deficient under the Base Harvest Scenario. Because the paper birch cover type was projected to remain unbalanced through the full, 50-year GEIS study period, it constituted a significant impact under the criterion.

No-Build Alternative Analysis

The DEIS model projects the age class structure of Minnesota's forests under the No-Build Alternative to be similar to the GEIS-projected 2040 age class distributions for forest cover types. A concern about cover type age class structure is evident for sunlight-demanding and pioneer species that depend on a major disturbance for regeneration, such as jack pine (fire) and paper birch (windstorms, clearcutting).

The GEIS projected the paper birch cover type to lose timberland acreage through succession of many older, untreated stands to other forest types over the 50-year study period. Compared to the harvest estimate for the GEIS Base Harvest Scenario, the No-Build Alternative results in approximately 3,400 additional acres of paper birch cover type subjected to clearcutting. Still, the relatively large acreage in the older age classes suggests that large areas of paper birch will succeed to other types unless it is harvested soon.

The GEIS Report Card Study indicates the birch acreage decline is being compensated for by conversion of mixed stands to birch following harvesting for aspen or balsam fir and because of spruce-budworm damage to balsam fir in mixed stands. But despite the resulting acreage increases for birch, the replacement of older age classes remains a problem. Consequently, the projected age-class structure by the end of the planning period will likely be insufficient to provide full replacement of currently mature acreage. Similarly, the jack pine acreage is projected to have insufficient disturbance associated with the No-Build Alternative to maintain its present extent across the landscape.[39] Thus lacking disturbance, the resulting age-class structure for these two forest types will not support the full replacement of older age classes, which means that eventually there will be an inadequate amount of older age classes in these types.[40]

For forest types dominated by later successional and shade tolerant species such as sugar maple and basswood, the DEIS updates the GEIS by assuming increased use of uneven-aged management systems. For those cover types, younger age classes result primarily from major disturbance, e.g., clearcutting. However, with uneven-aged management, harvesting of mature stands typically removes a portion of main canopy stems, which is an estimated 30-50 percent of the stand volume, and leaves room for others to regenerate, grow, and fill in those spaces. With time and further growth, such stands may be harvested

[39] Whether the resulting age-class structure will adequately provide support replacement of older age-classes is a consideration. If there is insufficient disturbance to produce adequate acres of young forest, then eventually there will also be an inadequate amount of older age classes in these types.

again in 10-30 years. Under such a system, these stands are periodically set back in age 10-30 years (according to measures of remaining canopy tree age), but not to a very young stand age. Consequently such treatment will maintain the largest acreage in the age classes approaching maturity. Further, such treatment eliminates the need for large replacement acreage in the form of very young stands.

Build Alternative Analysis

Table 5-13 below lists the current and DEIS-projected 2041 acreage of mature stands for each forest cover type. The table indicates the amount of mature forest at the end of the planning horizon for the Build and No-Build Alternatives. Results in bold indicate the cover types most strongly affected by Project implementation. Note this table assumes no change in forest area by cover type for the period 2001-2041.

No significant impacts on replacement cover type age class structure are projected to occur as a result of Project implementation during the 40-year analysis period. The projected growth and harvest activity associated with the Project indicates substantial acreage of mature forest will be retained and replaced for most cover types, thus perpetuating that cover type. This outcome assumes there is enough disturbance (e.g., harvest) to create enough acreage in the younger age classes to move into the older age classes in the future. Additionally, the Build Alternative promotes more young stand acreage in all of these cover types, thus reducing concern for replacement.

Table 5-13
DEIS-projected Mature Stand Acreage by Cover Type, 2041

Cover Type	DEIS Minimum Age for Mature Forest	Projected Mature Stand Acreage and (percent) (2041) No-Build Alternative	Projected Mature Stand Acreage and (percent) (2041) Build Alternative
Jack Pine	**50**	**221,875 (37)**	**213,151 (36)**
Red Pine	60	214,138 (47)	216,042 (47)
White Pine	60	104,631 (73)	104,631 (73)
Upland Spruce-fir	**50**	**357,900 (57)**	**353,034 (56)**
Oak	60	1,052,211 (95)	1,052,211 (95)
Northern Hardwoods	**80**	**1,716,120 (85)**	**1,700,516 (84)**
Aspen	**45**	**1,102,998 (20)**	**1,087,544 (19)**
Paper Birch	**55**	**639,456 (58)**	**560,366 (50)**
Lowland Spruce	100	994,906 (60)	991,549 (60)
Tamarack	85	686,892 (62)	686,892 (62)
Lowland Hardwoods	80	1,022,851 (81)	1,022,851 (81)
Cedar	80	571,758 (94)	571,758 (94)

40 Large areas of jack pine in the BWCAW are expected to succeed relatively soon to spruce-fir. Both the US Forest Service and DNR are aware of projected losses in this forest cover type.

RNV analyses indicate that NPCs in northern Minnesota are generally moving toward RNV conditions in terms of the relative frequency of growth stages of NPCs. Departures from natural distribution of VGS, which are ecologically defined cover types, would occur with the Project as compared to the No-Build Alternative for some native plant communities. Specifically:

- The Mesic Birch-Aspen-Spruce-Fir (NSU/6) native plant community in the northeastern Minnesota Northern Superior Uplands section (NSU/6) showed strong movement away from RNV in Decades 2 through 4 of the study period; see Appendix D, Table D-5.
- Four other NPCs showed consistent negative change (e.g., movement away from RNV) in Decade 4. These are: the Mesic White and Red Pine system of the NSU (NSU/2) and the three pine dominated NPCs of the Drift and Lake Plains (Dry-mesic Pine Oak Forest (DLP/11), Dry-mesic Pine Forest (DLP/12) (Table D-5), and Dry Pine Forest (DLP/13)); see Appendix D.[41]

Whether these NPCs in particular undergo the projected change depends on the degree to which multi-aged stands of late successional types, which are currently below their minimum RNV population level, are created as a feature of future forest management, including applications of the appropriate Voluntary Site-Level Forest Management Guidelines.[42]

5.2.2.5 Impact 5: Forest Species – Genetic Variability

An impact is considered significant if there is projected to be a loss of genetic variability in forest plant or animal species as measured by:

1. a reduction or isolation of habitat or communities supporting a species, or
2. a reduction of geographic ecotypes such that a species now present as a viable population disappears or is approaching extirpation from any ecoregion.

Summary of GEIS Findings

The GEIS concluded that many tree species have gradual genetic variation from warm-dry climates to cold-wet climates (southwest to northeast in Minnesota). Therefore, to the degree timber harvesting and forest management activities were projected to eliminate or isolate one or more populations of tree species, the GEIS projected a significant impact on genetic diversity. Final GEIS Table 5.22 identifies the range limits associated with major tree species found in Minnesota; see GEIS Table 5.22.

41 These systems are pine types in their late successional stages where aspen is a strong component of the early and mid-successional stages; these types were targeted as a source of aspen fiber by the forest management model.

42 Site-level measures that may be applied include, but are not limited to: 1) diameter or species based thinning operations that "accelerate" succession by altering species composition and diameter distributions; 2) group selection cuts, and 3) numerous other techniques documented in the recent silvicultural literature.

GEIS Table 5.22
Major Tree Species with Range Limits Occurring within Minnesota (ER = ecoregion)

Species	Location of Range Limit
Basswood	Northern Limit: ER 1,2,3
Balsam fir	Western Limit: W. ER 1,4; N ER 5 Southern Outliers: ER 5,6
Balsam poplar	Western Limit: ER 7 Southern Outliers: ER 4,5,6
Bigtooth aspen	Western Limit: W. ER 1,4,5
Black ash	Western Limit: ER 7; W. ER 5,6
Black spruce	Western Limit: ER 7; W. ER 1,4,5 Southern Limit: S. ER 4; ER 5
Bur oak	Northern Limit: ER 1,2,3
Jack pine	Southwestern Limit: ER 7; W. ER 1,4; N ER 5
Paper birch	Western Limit: ER 7; W. ER 1,4 Southern Limit: ER 5,6
Quaking aspen	Western Limit: ER 7
Red maple	Western Limit: ER 7; W. ER 4 Southern Limit: ER 5,6
Red oak	Northern Limit: ER 1,2 Western Limit: ER 7; W. ER 4,5
Red pine	Southwestern Limit: W. ER 1,4; N. ER 5
Sugar maple	Northern Limit: ER 1,2,3 Southwestern Limit: W. ER 4,5; ER 6
Tamarack	Southwestern Limit: W. ER 1,4; S ER 5; N. ER 6
White cedar	Southwestern Limit: W. ER 1,4; ER 5
White oak	Northern Limit: N. ER 5,6; S ER 4
White pine	Southwestern Limit: W. ER 1,4; ER 5,6
White spruce	Southwestern Limit: ER 7; W. ER 1,4; N. ER 5

Source: Jaakko Pöyry Consulting, Inc. (1992e).

Rare Plant Communities

Maintaining several examples of rare plant communities in each ecoregion throughout the state is a way to perpetuate genetic diversity for many species of herbaceous plant, trees, and associated animal species. GEIS Table 5.23 describes the status and occurrence of rare plant communities in 1990. Most of these communities occurred in the forest transition zone—GEIS ecoregions 5 and 6—where agricultural and urban development resulted in extensive habitat loss and fragmentation. In northern Minnesota (ecoregions 1 to 4) few comprehensive surveys of rare plant communities had been undertaken at the time the GEIS was being developed so that remaining occurrences were unknown. Many of the occurrences were consequently not protected, and any harvest in a listed community was considered to cause a significant impact. Within the past five years, the Minnesota County Biological Survey (MCBS) has started work in the northern part of the state.[43] Final GEIS Table 5.23 provides a listing of occurrences of critically endangered, endangered, or threatened, communities by ecoregion; see GEIS Table 5.23.

43 The 2005 MCBS assessed forest lands in the following counties: Becker; Clearwater; Cook; Hubbard; Lake; St. Louis; Wadena. Parts of Cook, Lake, and St. Louis counties will continue to be surveyed in 2006;initiation of Itasca County is proposed.

The GEIS concluded the following implications of timber harvesting on endangered plant communities.

1. Natural forest communities that depend on frequent fire are endangered or critically endangered. This includes savannas and woodlands, both dominated by pines and oaks. The major problem has been fire suppression, which has allowed former savannas and woodlands to convert to dense forests.
2. Natural forest communities that depend on infrequent severe fires are endangered or threatened. This includes mixed oak forests, white and red pine forests, and pine-hardwood community types. The main problem with the pine communities, in addition to fire suppression, has been the failure to restore the pine acreage after early exploitation and land clearing. Limited success in regenerating white pine over the past several decades has contributed to the failure in restoring the white pine acreage to historic levels.[44] This failure in regenerating a large acreage is due in part to the impact of white pine blister rust, expansion of the deer herd, reduced incidence of fire, and the difficulty in controlling competing vegetation. Although red pine has been extensively planted in recent decades, most of it is still young. In addition, pine seed sources were removed over large areas in parts of the state, so that natural reseeding has been slow.
3. Natural forest communities that originally covered the Bigwoods and Prairie-Forest transition zone (ecoregions 5 and 6) are endangered by clearing and conversion of land to other uses, primarily agriculture and urban areas. Included are mixed oak forests, natural maple-basswood forests, and the southernmost white pine and pine-hardwood forests.
4. Upland white cedar forests are endangered. Like the former white and red pine forests, these have been converted to aspen types by land clearing. Reproduction is also hindered by high levels of deer browsing in parts of Minnesota.

No-Build Alternative Analysis

The annual volume harvested under the No-Build Alternative is estimated to be approximately 11 percent less than what was assumed to occur under the GEIS Base Harvest Scenario. By cover type, the estimated extent of harvesting impacts of the No-Build Alternative per decade are projected to be less for all major forest cover type groups except the following: jack pine (estimated average annual increase of approximately 4,400 acres through 2041), paper birch (average annual increase of 3,400 acres), and aspen (1,700 acres additional acres harvested per year compared to the GEIS Base Harvest Scenario). For two of these three tree species, aspen and paper birch, the additional harvesting is not likely to cause a corresponding change in genetic diversity, since they typically resprout after harvest. Thus, the same populations and their genetic diversity will still be present after harvest.

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[44] Since completion of the GEIS, some effort in white pine regeneration has occurred under the White Pine Initiative.

GEIS Table 5.23
Occurrence of Critically Endangered (1), Endangered (2), or Threatened (3), Plant Communities by Ecoregion

Community, Status	Ecoregion 1	2	3	4	5	6	7
Oak savanna, mesic subtype,(1)					X	X	
Jack pine woodland (1)	X			X	X		
Oak savanna, hill subtype (1/2)					X	X	X
Oak savanna, gravel subtype (1/2)					X	X	X
Mixed oak forest, Bigwoods section, mesic subtype (2)					X	X	
Mixed oak forest, central section, mesic subtype (2)					X		X
Maple-basswood forest (Bigwoods section) (2)					X	X	
White pine forest, southeast section (2)						X	
Upland white cedar forest bluff subtype (2)						X	
Northern hardwood-conifer forest, bluff subtype (2)						X	
Oak savanna-bedrock bluff subtype (2)						X	
Jack pine barrens (2)	X	X		X	X		
White cedar swamp seepage subtype (2)	X	X	X	X			
Mixed oak forest, southeast section, mesic subtype (2/3)						X	
Mixed oak forest, southeast section, dry subtype (2/3)						X	
Northern hardwood forest (southern section) (2/3)						X	
Maple-basswood forest, southeast section (2/3)						X	
White pine forest, central section (2/3)	X			X			
Upland white cedar forest, yellow birch subtype (2/3)	X	X	X	X			
White pine-hardwood forest, southeast section, mesic subtype (2/3)						X	
White pine forest, southeast section, dry subtype (2/3)						X	
Northern hardwood-conifer forest, yellow birch-white cedar subtype (2/3)	X		X	X			
Oak savanna dune subtype (2/3)							X
Aspen openings (2/3)							X
Mixed oak forest, Bigwoods section, dry subtype (3)					X	X	
Mixed oak forest, northeast section (3)			X	X			
Northern hardwood forest, northern section (3)	X	X	X	X			
Maple-basswood forest, west central section (3)					X		X
Maple-basswood forest, east central section (3)				X	X		
White pine forest, northeast section (3)		X	X	X			
Red pine forest (3)	X	X	X	X	X		
Upland white cedar forest (3)	X	X	X	X			
White pine-hardwood forest, north central section (3)	X			X	X		
Northern hardwood-conifer forest (3)	X	X	X	X			
Aspen brush prairie (3)							X
Black spruce bog, raised subtype (3)	X	X	X	X			
Black ash swamp, seepage subtype (3)				X	X	X	
Mixed hardwood swamp, seepage subtype (3)				X	X	X	
Mixed oak forest, central section, dry subtype (3)				X	X		
Maple-basswood forest, northern section (3)				X			
Northern conifer scrubland (3)	X	X	X	X			

Source: Jaakko Pöyry Consulting, Inc. (1992e).

For jack pine the situation could be different. If replanted, the gene allele frequency (e.g., genetic diversity) of a stand may be lost, maintained, or altered at the time of harvest depending on the seed source for the planting stock. For replanting practices that follow Minnesota seed zones and seed transfer guidelines, changes in gene pool richness should be minimal. Jack pine stands regenerated using fire or by leaving cones on the ground after harvest will likely maintain local allele frequency. For all other forest cover types, lower harvesting activity than was assumed to occur at the GEIS Base Harvest Scenario will likely decrease the risk of tree species isolation or elimination over the 40-year study period. It should also be noted that no quantitative standard for the amount of reduction in genetic variability was developed for the GEIS; this was because not enough was known then, nor is it known now, about genetic diversity across the landscape in tree and plant species to develop any such criterion.

Loss of genetic variability of trees that are rare or near the edge of their range within a given ecoregion depends on the willingness of local foresters to recognize this situation and include plans to regenerate the locally rare species after harvests. The species of trees and regions of the state where they are susceptible to loss of genetic diversity today is the same as that presented above from the GEIS Table 5.22 in this section.

Loss of genetic variability of herbaceous plants, mosses, and lichens wildlife depends on maintenance of examples of rare plant communities throughout their region of occurrence, minimizing invasive species, and retaining native species after harvest by following the appropriate site-level guidelines. There is no way to analyze such impacts on a statewide basis via a forest change model.

Since the GEIS was completed, a new community classification system has been applied statewide in Minnesota; GEIS Table 5.23 lists those forest and savanna plant communities found in Minnesota (DNR 2003). The new classification system does not always provide a direct analog for each community in the old system.

The DEIS analysis models did not directly address changes in genetic variability, but changes in composition and age class structure predicted by the forest management and RNV modeling work can be related to genetic diversity, which was noted in the GEIS. In all cases, maintaining adequate representation of species and size classes provides for maintenance of genetic pools, as well as habitat for threatened or endangered species, and reductions in the spread of plant diseases or other forest health risks. The GEIS significance criteria for genetic variability and listed species are similar in that both involve: 1) a reduction or isolation of habitat or communities supporting a species; reduction in geographic ecotypes (genetics), or 2) diminishing habitat of species listed as special concern, threatened or endangered (listed species). A number of VGS are below the minimum of their RNV is noted in Appendix D.3.3.

Build Alternative Analysis

Given that the Project is projected to increase the extent of even-aged timber harvesting systems approximately 2.5 percent, negative impacts on genetic resources may occur for some of the tree species and plants living in communities listed in GEIS Tables 5.22 and 5.23. In terms of RNV, seven types of native plant communities are projected to undergo negative effects (i.e., move away from RNV) for at least one decade over the study period; these are: mesic boreal hardwood forest; dry-mesic pine-oak forest; dry-mesic pine forest; mesic white and red pine; dry-mesic white and red pine; mesic birch-aspen-spruce-fir; and northern hardwood conifer. Whether impacts actually occur depend more on whether landowners, foresters and loggers reserve or regenerate tree species that are rare in a given region of the state and implement harvesting practices that will enable these rare plant communities to be regenerated. Given the relatively small Project-related contribution to statewide, even-aged harvesting, the Project's impacts are expected to be minor under the Build Alternative.

5.2.2.6 *Impact 6: Federal- or State-listed Plant Species of Special Concern, Threatened, or Endangered or their Habitats*

An impact is considered significant if any harvest or forest management activity is projected to diminish the habitat and disturb a species listed as of special concern, threatened, or endangered (either federal or state).

Summary of GEIS Findings

The GEIS was not able to conduct a quantitative analysis of harvesting impacts on federal or state threatened or endangered plant species. There was and remains insufficient data for any such quantitative analysis. Moreover, the comparatively coarse level of resolution of the forest change model output would preclude such an analysis. In general, the forest-dependent rare plant species of Minnesota are poorly adapted to trampling types of injury. With the exception of the one tree species on the list, all species are of small stature and easily damaged. Consequently, operation of harvesting equipment can significantly impact populations of rare plant species within areas harvested. In analyzing the impacts projected to occur at the Base Harvest Scenario, the GEIS provided estimates of the numbers of endangered, threatened, or special concern plants by ecoregion. Statewide, 9, 7, and 37 species listed as endangered, threatened, or of special concern, respectively, were projected to be adversely impacted by timber harvesting.

No-Build Alternative Analysis

In comparison to the GEIS Base Harvest Scenario, the No-Build Alternative reflects a reduction in statewide harvest of more than 460,000 cords per year. This translates to an average annual reduction in the number of forested acres harvested of approximately 17,000 acres.[45] By cover type, the estimated extent of harvesting impacts of the No-Build Alternative per decade are projected to be less for all major forest cover type groups except the following: jack pine (estimated average annual increase of approximately 4,400 acres through 2041), paper birch (average annual increase of 3,400 acres), and aspen (1,700 acres additional acres harvested per year compared to the GEIS Base Harvesting Scenario). Changes in age class structure will also occur due to aging of the forest and timber harvesting, and these will impact many of the listed plant species in many ways, some positive and some negative.

In addition to reduced timber harvesting activity, other factors will help mitigate likely impacts to threatened, endangered, or special concern species to a degree greater than was anticipated at the GEIS Base Harvest Scenario. First, the MFRC Voluntary Site-level Forest Management Guidelines include a recommendation to check existing databases and consult with the appropriate DNR staff to determine if endangered, threatened, and species of special concern are present on or near the harvest area. This procedure was not formally recognized within the state as part of timber sale set-up and pre-operational procedures at the time the GEIS was prepared. Additionally, the Minnesota County Biological Survey (MCBS) is proceeding with surveys of the northern forests to locate sites with rare plants there. At this time, surveys of forested counties in the central part of the state have been completed (i.e. Aitkin, Cass, Carlton) and surveys are proceeding in St. Louis, Lake and Cook Counties. When these surveys are complete, it will be easier for forest managers to find more complete and up-to-date data on occurrences of rare plants in the heavily forested part of the state.

Since the GEIS was completed, the state list of critically endangered, endangered, or threatened communities has been re-expressed as critically imperiled and imperiled. The new classification system is a finer division of plant communities, thus more communities are now recognized than in the previous listing. As previously noted, the modified list also reflects new information generated by the MCBS since GEIS completion. With proper information on how to know where these rare communities are located and how to deal with them, potential harvest-related impacts can be lessened. Given that statewide harvest under the No-Build Alternative is less than the level expected under the GEIS analysis, the likelihood of significant impacts is less than what was projected at the GEIS Base Harvest Scenario.

[45] Stand productivity estimates are empirical yields developed from the FIA data and associated volumes and acres harvested. Yields per acre results are a function of the plots chosen by the model for harvest.

Build Alternative Analysis

The Build Alternative would add 197,000 cords of harvest per year, and still be approximately 260,000 cords below the GEIS Base Harvest Scenario. Given the similarity of the acreages by forest type and age class of between the Build and No-Build Alternatives, the additional impacts of the Project upon rare species and their habitats should be very small. Much greater effect can be ascribed to the consequences of existing harvest plans and natural successional and disturbance processes over the next 40 years.

5.2.2.7 Impact 7: Forest Health—change in susceptibility or vulnerability

An impact is considered significant if projected changes to the forest and activities undertaken lead directly or indirectly to changed susceptibility (risk of an outbreak/infection) or vulnerability (damage if an outbreak occurs) to more than 10 percent by area by cover type.

Summary of GEIS Findings

The GEIS made a number of important assumptions in analyzing the impacts timber harvesting would have on forest health. In particular, it was assumed that the DNR pest management and other associated guidelines would be followed on all forest ownership classes. The GEIS concluded that if pest management guidelines were not followed, timber harvesting could have considerable adverse impacts on the health of Minnesota's forests. The GEIS also assumed that the use of extending the rotation of forest cover types could create environmental conditions that were suitable for pests, thereby increasing tree susceptibility and vulnerability to disease. At the GEIS's Base Harvest Scenario, cover types that were projected to experience significant adverse forest health impacts due to increasing acreage of older stands: black spruce and spruce fir, and in the case of white pine, increasing acreage of young stands.

No-Build Alternative Analysis

By 2005, official forest pest management policies had been adopted by organizations that collectively manage half of the state's public and corporately-owned private forest land. These organizations indicated that in 1994, 23 percent of infested acres were treated or harvested to reduce forest pest damage, and the percent of infested acres treated to reduce forest pest damage has changed very little over the past decade (Kilgore et al. 2005).

With the exception of aspen, the amount of mature forest projected to exist at the end of the study period (i.e., 2041) under the No-Build Alternative is projected to be similar to the GEIS (Base Harvest Scenario) estimates; see GEIS Table 5.22. However, stands for most cover types are expected to be, on average, older than what was projected in the GEIS Base Harvest Scenario when considering all stand age classes.

Some cover types do show decreases in average stand age, and these are noted in bold in Table 5-14.[46] This result is due to the fact that the GEIS aspen harvest declined over the projection period with later substitution of northern hardwoods. However, the No-Build Alternative highlighted for this study continues a high level of aspen harvest and thus less substitution than was assumed to occur in the GEIS. The result is that northern hardwood stands are projected to age to a greater degree than was anticipated in the GEIS. Importantly, older forests are commonly associated with an increased tree susceptibility and vulnerability to disease as compared to younger stands. Table 5-14 indicates the average stand age for each cover type in the GEIS and for the No-Build Alternative.

Table 5-14

Average Age of Forest by Cover Type for the GEIS and No-Build Alternative, 2041

Cover Type	Average Stand Age: 2041	
	GEIS Base Harvest Scenario	No-Build Alternative
Jack Pine	**77**	**50**
Red Pine	54	62
White Pine	**104**	**99**
Upland Spruce-Fir	**82**	**64**
Oak	78	108
Northern Hardwoods	90	104
Aspen	34	34
Paper Birch	**92**	**68**
Lowland Spruce	89	108
Tamarack	99	109
Lowland Hardwoods	86	106

From an RNV perspective, the natural aging of most forest types over the study period tends to move systems closer to RNV. This change would result in positive or negative forest health effects depending upon the particular cover type and tree species in question. Losses in younger age classes of conifers would also be a negative relative to RNV. Along with direct losses from insects, salvage harvesting of budworm infected and dying upland spruce-fir absent attention to adequate conifer regeneration is a negative impact on this resource. Conversion to aspen or other hardwoods on non-ecologically suitable sites tends to move conditions away from RNV. However, the large change in upland spruce-fir area is not a consequence of timber harvesting *per se* but is more related to an epidemic of budworm-caused losses over the last decade.

Build Alternative Analysis

The additional harvest associated with the Build Alternative (approximately 197,000 cords annually) will

46 The projected decline in jack pine, white pine, and upland spruce-fir cover types is important because these represent upland conifer ecosystems, which have already experienced significant declines between 1990 and 2001.

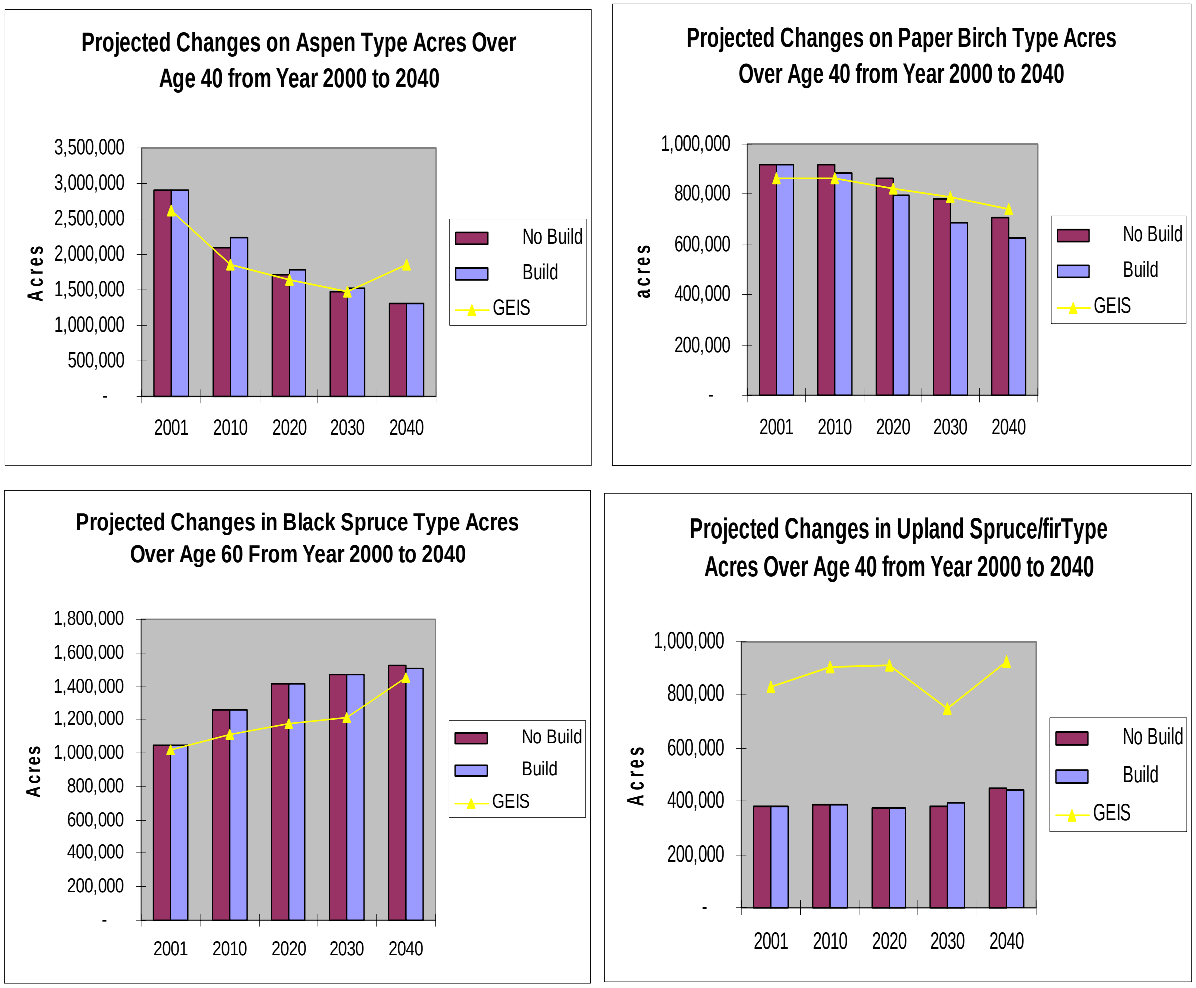
change the age class structure of forest cover types slightly. Table 5-15 indicates the change in the ending (year 2041) age class distribution, by cover type, attributed to the Project. Cover types projected to have additional acres of young forest at the end of the planning period (jack pine, spruce-fir, aspen, paper birch, and lowland spruce) will likely have improved forest health conditions as compared to their condition absent the Project. Note the GEIS suggested older stands could create environmental conditions that are suitable for pests, thereby increasing tree susceptibility and vulnerability to disease. Only the red pine cover type is projected to have an ending age class distribution with increased acres of mature forest.

Table 5-15
Change in Number of Young and Mature Forest Acres in 2041 by Cover Type, from Project Implementation

Cover Type	Young	Mature	Percent of Total Acres
Jack Pine	8,724	(8,724)	1.5
Red Pine	(1,904)	1,904	0.4
White Pine	0	0	0.0
Spruce-Fir	4,867	(4,867)	0.7
Oak	0	0	0.0
Northern Hardwoods	15,604	(15,604)	0.8
Aspen	15,545	(15,455)	0.3
Paper Birch	79,090	(79,090)	7.1
Lowland Spruce	3,357	(3,357)	0.2
Tamarack	0	0	0.0
Lowland Hardwoods	0	0	0.0
Cedar	0	0	0.0

Updated and projected decade changes in older age classes from the timber harvesting model for the No-Build and Build Alternatives can be compared to decade projections made for the GEIS Base Harvest Scenario; Figure 30, Harvest Model Comparison to GEIS Projections for Decade Changes in Older Age Classes. The DEIS harvesting model projects a gradual decade-by-decade decline in aspen and birch older age stands. Under the significance criteria this would help reduce overall forest heath risks to these forest types. Black spruce stands gradually increase in older age classes that tend to increase incidences of rot pathogens.

Figure 5-30
Harvest Model Comparison to GEIS Projections for Decade Changes in Older Age Classes on Forestlands



For all cover types, the marginal change in projected ending age class distribution that can be attributed to the Project is expected to be small relative to each cover type's overall acreage. There are however small positive decade changes (except for spruce-fir) between the Build and No-Build Alternatives in the older age class structures of the aforementioned cover types. The largest change projected is in the birch cover type. All forest types have forest health risks, but these are the ones most closely associated with the Project. As noted in the No-Build Alternative, upland spruce-fir type has suffered major losses due to a continuing budworm epidemic. Because the Project uses spruce-fir in the papermaking process, there is greater need under the Build Alternative for land managers to maintain and increase this cover type on suitable sites that are subject to harvest, especially on private ownerships.

5.2.2.8 Impact 8: Projected Harvesting Affecting Site Nutrient Capital

An impact is considered significant if nutrients removed and/or redistributed during harvest and follow-up activities are not replaced over the term of the projected rotation.

Summary of GEIS Findings

The GEIS concluded that harvesting the merchantable bole of a tree does not remove either nitrogen or phosphorus beyond their rates of replenishment. Areas at risk for loss of calcium were determined to be most closely associated with harvest of aspen-birch and upland hardwoods on medium-textured soils and especially on coarse-textured soils. Based on this determination, the GEIS Base Harvest Scenario estimated approximately 5 million acres were at risk for calcium loss. Loss of magnesium beyond rates of replenishment is especially associated with harvest on coarse-textured soils and organic soils. Under the same harvest scenario, the GEIS estimated about 2.5 million acres would be at risk to magnesium loss. Potassium loss is primarily associated with harvest of aspen-birch on coarse-textured soils and the harvest of all deciduous types on organic soils. Under the Base Harvest Scenario, the GEIS estimated about 1.5 million acres would be subject to potassium loss over the 50 year study horizon.

Based on the summary of timber harvest operations carried out as part of the GEIS, delimbing and topping was estimated to be carried out at a landing on about one-third of the harvests in the early 1990s. This practice does not recycle or replenish the nutrients on the site, and is equivalent to a full-tree harvest in terms of nutrient depletion.

Nutrient depletion related to site preparation techniques was also evaluated in the GEIS. The GEIS's Silvicultural Systems background paper indicated that each year about 18,000 acres were treated using mechanical site preparation techniques. Mechanical techniques that create slash piles or windrows either remove nutrients from the site or localize them, depleting the remainder of the area. The GEIS concluded that site preparation techniques that incorporate materials, or only displace materials a foot or two, do not have negative impacts.

No-Build Alternative Analysis

In comparison to the GEIS Base Harvest Scenario, the No-Build Alternative reflects a reduction in statewide harvest of 464,000 cords, or approximately 17,000 acres per year. Over the GEIS's 50-year planning horizon, an average of 144,000 acres were harvested each year.

This annual reduction in harvest extent of approximately 12 percent is projected to occur across most forest cover types, thereby lessening the extent to which nutrient depletion will occur. Assuming this reduction in timber harvesting activity is proportionate across site nutrient loss risk and adjusting for unequal study periods (50 years for the GEIS; 40 years for the DEIS study period), the GEIS (at the Base

Harvest Scenario) overestimated the number of acres subject to nutrient depletion as follows: calcium loss – 480,000 acres; magnesium loss – 240,000 acres; potassium loss – 144,000 acres.

One factor that will further lessen the extent of nutrient depletion relative to the GEIS Base Harvest Scenario projections is the use of harvesting practices that keep nutrients on and distributed across the harvest site. Recent data on timber harvesting practices indicate mitigation practices such as redistributing slash across the site nutrient depletion is occurring at a level higher than was occurring when the GEIS was prepared. Kilgore et al. (2005) report that 99 percent of the state's public and corporate forest land is currently managed using practices to minimize nutrient loss, roughly twice the number of acres subject to these practices than occurred a decade ago. Such practices include distributing slash throughout the site rather than piled at landings.[47]

An update of the GEIS that focused on nutrient issues was recently completed by the author of the GEIS Forest Soils Technical Paper. The author concluded that after reviewing additional studies of forest soil nutrients completed since the GEIS, the potential impacts of harvesting on forest nutrient soil status are less than originally projected, and that for most mineral soils the nutrient capital is sufficient to tolerate a number of forest rotations without adverse effects. The author also concluded that organic forest soils are much more susceptible to loss of nutrients (especially potassium and phosphorus) than projected in the GEIS (Grigal 2004). Consequently, assessments of forest soil nutrient impacts from timber harvesting as projected in the GEIS need to be modified to account for this updated information.

Build Alternative Analysis

The Build Alternative is expected to increase the number of acres harvested by approximately 5,250 each year over the 40-year study period. To determine acres subject to a nutrient depletion-type effect (according to GEIS significance criteria), the following assumptions are necessary:

- The state's public and corporately-owned private forest land managers are applying slash management practices that minimize nutrient loss (99 percent of all such acres are currently harvested using such practices).
- Half of all harvested acres occurs on the state's family forest land.
- Slash disposal practices to minimize nutrient loss on the state's family forest land occurs on half of all harvested acres (the MN DNR's Guideline Implementation Monitoring program found 75 percent of all harvest sites evaluated used practices that distributed slash across the site).
- The additional acreage harvested to support the Project's wood fiber needs occurs on roughly the same proportion of sites at risk to nutrient loss assumed to occur in the GEIS.

[47] The higher level of slash redistribution currently present may be offset in the future through development of new markets for slash-type material as a source of biomass for power plants.

When applying these assumptions, the **additional acres** annually subject to potential nutrient loss to the risk of nutrient depletion from the Project-related increase in statewide harvesting is projected as follows:

- Calcium loss – approximately 900 acres.
- Magnesium loss – approximately 460 acres.
- Potassium loss – approximately 275 acres.

Over the 40-year study period, this amounts to an estimated: 1) 36,000 additional acres subject to potential significant losses of calcium; 2) 18,400 additional acres subject to potential significant losses of magnesium; and 3) 11,040 additional acres subject to potential significant losses of potassium. It is important to note that these acres are not cumulative, as certain sites would be susceptible to losses of more than one nutrient. As previously noted, updated information on forest soil nutrient depletion suggests the GEIS overestimated nutrient loss impacts on mineral soils, and underestimated such impacts on organic soils.

5.2.2.9 Impact 9: Projected Harvesting Affecting Soil Physical Structure

An impact is considered significant if the proportion of the harvest unit projected to be moderately to severely compacted/puddled exceeds the following threshold proportions:

- 5 percent on highly sensitive sites;
- 10 percent on moderately sensitive sites; and
- 20 percent on sites with low sensitivity.

Summary of GEIS Findings

The GEIS concluded soil compaction impacts were most frequently found on the well-drained medium-textured soils (the most common soils in the state) and the poorly-drained medium and poorly-drained fine soils that have the lowest strength, or capacity to withstand forces without experiencing failure. The GEIS estimated that at the Base Harvest Scenario, approximately 14 percent of all harvest sites over the 50-year study period (including the area that would be devoted to forest haul roads used to transport the timber) would experience compaction/puddling that exceeds the threshold identified in the above criteria. This translated into approximately 330,000 acres significantly impacted from timber harvesting, and an additional 60,000 acres impacted from the development of haul roads (assuming 1 percent of the area harvested was occupied by haul roads). The GEIS concluded that soil compaction and puddling at the Base Harvest Scenario would result in a loss in forest productivity equal to 170,000 acres of forest land from 1990-2040.

No-Build Alternative Analysis

In contrast to the GEIS Base Harvest Scenario projections, the No-Build Alternative reflects a reduction in statewide harvest of 464,000 cords per year. This translates to an average annual reduction in the number of forested acres harvested of approximately 17,000 acres. Assuming a proportionate reduction in harvesting and road building activity on sites susceptible to soil compaction, approximately 800 and 150 less acres respectively would experience significant soil compaction each year than was projected to occur in the GEIS at the Base Harvest Scenario.

Additionally, Minnesota's timber harvesting and forest management guidelines identify practices for minimizing the amount of soil disturbance that occurs during forest management and timber harvesting activity. These practices include:

- Limiting the percentage of the harvest area in roads and landings.
- Limiting the area in skid trails.
- Restricting the extent of rutting in uplands and within wetlands on roads, skid trails, landings, and the general harvest area.
- Utilizing techniques to mitigate compaction on roads and skid trails (e.g., grading, ripping, disking).
- Stabilizing bare soil from surface erosion and ensuring that soil erosion measures are properly maintained and functioning.
- Restricting operations on steep slopes.
- Using slash on skid trails to reduce compaction.

The GEIS Report Card Study documented virtually no change in the amount of timber harvesting that occurs on frozen soil over the past decade. In both 1994 and 2005, agencies reported approximately 64 percent of all sites were harvested when the soil was frozen. Conducting harvest operations under conditions of frozen ground greatly reduces soil compaction and rutting.

Results of Guideline Implementation Monitoring activities found 6 percent of the harvest sites monitored had rutting six inches or deeper, with 78 percent of the rutting confined to less than 5 percent of the harvest area. Further, the field monitoring found harvest site infrastructure such as roads and landings located within the harvest unit (those areas most prone to soil compaction) encompassed 3 percent of the harvest area, the amount recommended in the guidelines. Additionally, the GEIS Report Card Study documented that 64 percent of all timber harvesting on public and corporate private forest land is occurring when the soil is frozen. Together, these findings suggest the area annually subject to soil compaction compared to what was projected to occur at the GEIS Base Harvest Scenario is considerably less than the estimated total of 950 acres per year.

Build Alternative Analysis

Information was not available to estimate the extent to which additional timber harvesting resulting from the Project will be distributed across sites classified as having high, moderate, and low sensitivity to compaction. Results of DNR's Guideline Implementation Monitoring and the GEIS Report Card Study indicate that timber harvesting practices associated with the harvest added by the Project will not result in soil compaction exceeding the significance threshold for adverse impacts.[48]

5.2.2.10 Impact 10: Projected Harvesting Causing Accelerated Erosion from Forest Roads

An impact is considered significant if the rate of soil loss is projected to exceed the limits prescribed by the U.S. Soil Conservation Service expressed as: rate > T; where T varies between 1-5 (tons/ac/yr)

Summary of GEIS Findings

The GEIS estimated that timber harvesting at the Base Harvest Scenario would result in surface erosion rates exceeding T values on less than 1 percent of the area harvested, with such impacts predominantly limited to well-drained soils which exist on steeper slopes. It further concluded that the significance criteria would be exceeded only in moderately and heavily trafficked areas (skid trails) within harvest units and on haul roads. This amounted to about 25,000 acres of forestland significantly impacted over the 50-year study horizon.

The greatest erosion rates were estimated in the GEIS to occur in ecoregion 6. This ecoregion has some of the steepest forested slopes in Minnesota. The southern portion of the state also has the highest rainfall intensity. It was estimated that erosion rates could exceed 14 ton/ac/yr in some areas in ecoregion 6, whereas rates rarely exceed 5 ton/ac/yr in other ecoregions.

The effects of timber harvesting and forest management activities on mass movements were not quantified in the GEIS. The greatest potential for mass movements was estimated to occur in areas with steep slopes such as the Coulee region of southeastern Minnesota (GEIS ecoregion 6) and areas with shallow soils over bedrock (GEIS ecoregions 2 and 3). However, the GEIS found no evidence suggesting that mass movements were a major problem in forested portions of Minnesota.

No-Build Alternative Analysis

In comparison to the GEIS Base Harvest Scenario, the No-Build Alternative reflects an average reduction in statewide timber harvest of 464,000 cords per year. This translates to an average annual reduction in the number of forested acres harvested of approximately 17,000 acres. As a result, there will be a corresponding reduction of approximately 55 acres per year in the number of acres projected to exceed the soil erosion significance threshold. In addition, the oak and northern hardwood cover types were the two cover types estimated to have the largest decrease in harvest activity under the No-Build Alternative compared to the extent of harvesting projected in the GEIS at the Base Harvest Scenario. On an annual

48 The GEIS Report Card Study found that: 1) rutting is limited to less than five percent (<5 percent) of the harvest area 78 percent of the time, and 2) severe rutting (e.g., ruts at least six inches deep) occurs on 6 percent of harvest sites. Also noteworthy is 64 percent of all harvesting on public and corporate, private forest land is conducted under frozen soil conditions.

basis, the oak resource is expected to have nearly 9,300 fewer acres harvested per year than projected in the GEIS, with 5,500 fewer acres harvested in the northern hardwood cover types. With the GEIS projecting the greatest level of soil erosion to occur on the steep slopes of southeast Minnesota where these two cover types are commonly found, the extent of soil erosion will likely be considerably less than was projected in the GEIS, given current harvest levels.

Build Alternative Analysis

Assuming a level of significant soil erosion proportionate to the level of timber harvesting projected in the GEIS, less than an estimated 50 harvested acres would experience significant soil erosion each year. This value represents less than 1 percent of the 5,250 acres projected to be harvested each year, on average, over the study's 40-year planning horizon. This estimate also assumes harvesting activity attributed to the Project will occur on the steep slopes of southeast Minnesota at the same rate as was projected to occur in the GEIS. As such, the estimate likely overstates the potential impact since the Project is not expected to procure a large volume of wood from the forests of southeast Minnesota (where some of the greatest potential for erosion beyond the significance threshold exists).

5.2.2.11 Impact 11: Projected changes in the populations of forest dependent wildlife (by changes in amounts of habitat available)

An impact is considered significant if the available habitat of a species is projected to be changed by 25 percent in any ecoregion.

Summary of GEIS Findings

A total of 173 species of interest were assessed in the GEIS according to the above criteria (22 small- and medium-sized mammals, 5 large mammals, 138 birds, and 8 reptiles and amphibians). At the level of timber harvesting assumed under the Base Harvest Scenario, no large mammals were expected to be significantly impacted, while six small mammals and 39 bird species (28 percent of all bird species occurring in Minnesota) were projected to be significantly adversely affected. Note that these impacts were for individual species in any one ecoregion. Statewide, five species, all of which being birds, were projected to be significantly negatively impacted.

Birds

The species with statewide negative impacts when all forest land (timberland, reserved forest, and unproductive forest land) was considered include Red-shouldered Hawk (also a TE species), Yellow-throated Vireo, Hooded Warbler, Lincoln's Sparrow, and Wilson's Warbler. Loss of mature, contiguous hardwood forest in the southern part of the state was the likely cause of projected declines in the Hooded Warbler population. Projected loss of mature hardwood forests in ecoregions 4, 5, and 6 was the likely cause of the predicted drop in the population of Yellow-throated Vireo. The Red-shouldered Hawk was adversely affected by projected declines of contiguous, mature, deciduous forests in ecoregions 4, 5, and 6.

cause of the predicted drop in the population of Yellow-throated Vireo. The Red-shouldered Hawk was adversely affected by projected declines of contiguous, mature, deciduous forests in ecoregions 4, 5, and 6.

Small Mammals

Gray and fox squirrels were projected to be impacted at the Base Harvest Scenario in one or more ecoregions; these animals are associated with mature oak forests. The northern flying squirrel requires large tracts of forest to maintain stable populations and may be adversely affected by forest fragmentation. Beaver were projected to be impacted for one decade in two ecoregions. The projected decline in this species needs to be viewed against a trend of population increases elsewhere. The remaining species projected to be adversely impacted, lynx and bobcat, occupy a variety of cover types and impacts on these species may reflect an overall reduction in the area of mature forests in these cover types. No small mammals were determined to experience significant statewide impacts.

Reptiles / Amphibians

The ringneck snake was the only species showing adverse impacts under the Base Harvest Scenario. No reptiles and/or amphibians had significant statewide impacts.

No-Build Alternative Analysis

Birds

Population indices were analyzed for 136 species of forest dependent birds to assess this impact area. A habitat suitability index weights each forest type and size class by the estimated bird population density. For the purposes of this study, there were insufficient data for accurate analyses of two species, Bell’s Vireo and Yellow breasted chat, so that the results refer to 134 species. Results are reported at the ten percent (10 percent) change threshold, with 25 percent or greater change assessed as being significant.

As shown in Table 5-16, fourteen species (10.3 percent of all species studied) are predicted to decline more than 10 percent by Decade 4 without the Project, and 3 species (2.2 percent of all species studied) will decline by more than 25 percent. Two special concern, threatened or endangered species, Bald eagle and Red-shouldered hawk, were predicted to decline by more than 5 percent. Four species significantly impacted in the GEIS analyses (Yellow-throated Vireo, Hooded Warbler, Lincoln's Sparrow, and Wilson's Warbler) were not projected to be significantly affected under current levels of timber harvesting, but the GEIS and this analysis are in agreement on impacts on Red-shouldered hawk.

Table 5-16
Species Projected to Decline by at Least 10 Percent by 2041 under the No-Build Alternative; More than 5 Percent for Bald Eagle (*listed as special concern by the state and threatened by the feds*) and Red-shouldered Hawk (*listed as special concern by the state*)[49]

Species	Percent Decline, No-Build Alternative - 2041
American black duck	-26
Bald eagle	-22
Sharp-shinned hawk	-12
Red-shouldered hawk	-5
Great gray owl	-47
Boreal owl	-23
Tree swallow	-27
Gray catbird	-17
Blue-winged warbler	-12
Yellow warbler	-16
Song sparrow	-19
Indigo bunting	-11
Common grackle	-13
American goldfinch	-13

The decline of 8 of 14 species projected under current harvest levels (from their current populations) is likely due to changes predicted to occur in harvest practices that will result in less early successional habitat. Declines in these species is not of concern because their current populations are above their RNV populations. Projected declines in early successional bird species that are above their RNV populations reflect that forests are still responding to region-wide logging of the late 19th and early 20th Centuries. Four of the species that were projected to decline under the current harvest level are associated with mature upland or lowland forests that have a significant conifer component (boreal owl, great gray owl, sharp-shinned hawk, bald eagle). However, the boreal owl, great gray owl and bald eagle also rely on old aspen stands or aspen trees within mixed stands for suitable nest sites. The American black duck is associated with mature riparian forest conditions, and the red-shouldered hawk prefers mature deciduous forests within a wetland landscape matrix. Differences between some wildlife impacts projected in this analysis and the GEIS are likely due to the lower rate of harvest that has actually developed, as compared to that assumed at the GEIS Base Harvest Scenario. Other impacts are likely due to a projected decrease in mature forests under the current harvest levels, possibly the decline of old aspen as a habitat type and as a habitat feature in mixed stands. Harvest under the No-Build Alternative would result in no substantial improvement in species RNV status in northern Minnesota.

Mammals, Reptiles, and Amphibians

No significant statewide changes in habitat availability are likely by the year 2040 under the No-Build Alternative for small, medium and large mammals or reptiles/amphibians. This finding agrees with the

[49] See Appendix D.1 for the full species listing.

GEIS and most likely results from current statewide harvest levels being below those assumed in the GEIS Base Harvest Scenario.

This also applies to the lynx, which has been designated as a federally threatened species since the GEIS was conducted.

Build Alternative Analysis

Forest Birds

Results comparing the Build Alternative are similar to those for the No-Build Alternative. Eight of the 14 bird species that are projected to decline without the Project (Table 5-17) are projected to do as well or better with the Project (Table 5-17, first 14 lines), although no species are far enough apart to the call the difference significant under the GEIS criterion. Three species with projected declines, Bell's vireo, Black-billed magpie, and Yellow-breasted chat, had results that were considered low in precision due to a lack of data and no conclusion can be drawn as to whether the Project would have any significant impact. Three additional species show differences of >5 percent between the Build and No-Build Alternatives (Table 5-17, last three lines). Again, these differences are not significant. Finally, it is apparent the magnitudes of the largest differences between the Build and No-Build Alternatives among 134 species are quite small.

Table 5-17
Difference between Build and No-Build Alternatives for Bird Species of Interest
(see Table 5-16 for projected decline under the No-Build Alternative)

Species	Percent difference: Build Alternative compared to No-Build Alternative, 2041
Species from Table 5-17	
American black duck	0
Bald eagle	0
Sharp-shinned hawk	0
Red-shouldered hawk	-1
Great gray owl	0
Boreal owl	-1
Tree swallow	- 9
Gray catbird	+3
Blue-winged warbler	0
Yellow warbler	+2
Song sparrow	+3
Indigo bunting	+1
Common grackle	+5
American goldfinch	+2
Species with Relatively Large Differences under Build and No-Build Alternative	
Loggerhead shrike	+11
Tree swallow	-9
Common grackle	+5

Additionally, RNV analyses for the Northern Superior Uplands and Drift and Lake Plain Ecosections (which collectively contain most of the forest in the state) indicate that 3.8 times as many bird species would move towards their historical population estimate as away from it by Decade 4 (2041) both with and without the Project. Approximately 35 percent of all species would remain below their RNV population with and without the Project by 2040.

Many of the species that were projected in the modeling to decline statewide in the later decades are associated with edges and early-successional forests (e.g., Indigo Bunting, American Goldfinch, Gray Catbird). This agrees with the forest-type projections that less early successional and more mature forests will be present statewide in the later decades of the study period. Negative impacts projected for species associated with mature forests, specifically Bald Eagle, Cooper's Hawk, and Boreal Owl, are likely due to the current imbalanced age class distribution from an abundance of mature aspen. In addition, because raptor species have low populations, statewide harvest of a small number of FIA plots with suitable habitat at any one time could result in a projected population decline.

With respect to RNV, current forest conditions in the 14 native plant communities have a strong over-representation in the young to intermediate age classes (approximately 10-100 years) and under-representation in the older age classes. The Build Alternative had more negative change than positive in terms of moving VGS toward RNV; See Appendix D, Table D-5. Current populations of forest birds reflect the RNV condition of northern Minnesota forests; species below their RNV midpoint are associated with older and more conifer dominated VGS. More species were projected to be significantly impacted based on the RNV benchmark than the statewide population decline benchmark, and RNV condition was improved as time progressed. In general, more than half of the species modeled have populations that are currently below their midpoint RNV population and future harvest activities under either the No-Build or Build Alternatives will not move most species toward their RNV midpoints in the short-term.

Forest Grouse

Ruffed Grouse and Spruce Grouse were analyzed using the habitat index formulas from the GEIS Wildlife Technical Paper (Jaakko Poyry 1992, pages 72-73). No significant differences were identified when comparing the Build and No-Build Alternative habitat indexes. Differences of +0.3 percent and –0.02 percent are projected for the year 2040 for the Build Alternative as compared to the No-Build Alternative for Ruffed and Spruce grouse, respectively.

Mammals, Reptiles, and Amphibians

Comparing the No-Build and Build Alternatives for 2041 shows no impacts on mammals or reptiles/ amphibians that would meet the GEIS significance criteria (≥25 percent change for most species, ≥5 percent for threatened, endangered or special concern species); see Table 5-18. The largest positive change is 6 percent for Least chipmunk, a species that uses recent clearcuts that could take advantage of the additional harvesting with the Project. The largest negative impact on habitat, 1.3 percent for Marten and 1.6 percent for Spring peeper, are too small for meaningful ecological interpretation.

Table 5-18
Percent Change in Habitat Suitability Index for the Build Alternative as Compared to the No-Build Alternative for the 2041

Species	Percent Change Under the Build Alternative 2041
Snowshoe hare	+0.3
Eastern chipmunk	-0.6
Least chipmunk	+6.1
Red squirrel	-0.7
Gray squirrel	-1.0
Fox squirrel	-1.0
Southern flying squirrel	-1.2
Northern flying squirrel	-0.8
Beaver	+1.1
Woodland deer mouse	-0.9
White-footed mouse	-0.8
Southern red-backed vole	-0.1
Meadow vole	+0.3
Meadow jumping mouse	+1.5
Woodland jumping mouse	-0.3
Porcupine	-0.9
Red fox	+0.6
Gray fox	-0.7
Marten	-1.3
Fisher	-0.8
Lynx	0.0
Bobcat	0.0
White-tailed deer	+0.1
Moose	0.0
Black bear	-0.4
Timber rattlesnake	-0.7
Boreal ringneck snake	-0.9
Eastern hognose snake	-1.0
Eastern newt	-1.1
Red-backed salamander	-1.1
Wood frog	-1.1
Spring peeper	-1.6
Pickerel frog	-0.9

Two additional species, the Gray wolf and Mountain lion, were not analyzed via a habitat suitability matrix. Direct impacts of altering forest composition and size class are nearly non-existent for these species. Instead, they depend on numbers of principal prey species, white-tailed deer for both and moose for the wolves. Since no impacts are projected for these prey species, no significant impact is expected for the Gray wolf or Mountain lion.

5.2.2.12 Impact 12: Projected Harvesting Affecting Populations of Endangered, Threatened, or Special Concern Species of Animals

An impact is considered significant if any harvest or forest management activity is projected to diminish the habitat and disturb a species listed as of special concern, threatened, or endangered (either federal or state).

Summary of GEIS Findings

The GEIS concluded a decrease of 5 percent or more in habitat or population index statewide was considered to be a significantly adverse impact. At the Base Harvest Scenario, the GEIS estimated the only bird species to have its habitat or statewide population index decrease in excess of 5 percent was the Red-shouldered Hawk.

Since the GEIS was completed, the following changes have been made to the federal or state-listed forest-dependent wildlife species of special concern, threatened, or endangered. Among the birds Osprey has been dropped from the state list, and Cerulean warbler, Acadian flycatcher, and Hooded warbler have been added as state species of special concern. Bald eagle, Red-shouldered hawk, and Louisiana waterthrush remain on the state special concern list and Loggerhead shrike remains on the state threatened list. The Gray wolf (Federal threatened) and Mountain lion were and are listed as state special concern, and the timber rattlesnake is listed as state threatened; the pine marten was dropped from the list. The lynx has been listed as a federally threatened species.

No-Build Alternative Analysis

In comparison to the GEIS Base Harvest Scenario, the No-Build Alternative reflects a reduction in statewide harvest averaging 464,000 cords per year. This translates to an average annual reduction in the number of forested acres harvested of approximately 17,000 acres. By cover type, the estimated extent of regeneration harvesting impacts of the No-Build Alternative per decade are projected to be less for all major forest cover type groups except the following: jack pine (estimated average annual increase of approximately 4,400 acres through 2041), paper birch (average annual increase of 3,400 acres), and aspen (1,700 acres additional acres harvested per year compared to the GEIS Base Harvest Scenario). Given habitat requirements of wildlife species listed as threatened, endangered, or special concern, the impact of timber harvesting for the No-Build Alternative in comparison to the GEIS at the Base Harvest Scenario will be more negative for Bald eagle and Timber rattlesnake, less negative for Red-shouldered hawk, Acadian flycatcher, Cerulean warbler, Hooded warbler and lynx, less positive for Loggerhead shrike and Louisiana waterthrush and similar for Gray wolf (Table 5-19). The Mountain lion was not analyzed in the GEIS, but no impacts are expected for the No-Build Alternative.

The only significant impacts for the No-Build Alternative are for Bald eagle and Red-shouldered hawk.

Bald Eagle

The DEIS analysis found that the Bald eagle was projected to decline statewide for the No-Build Alternative by 22 percent. Substantial uncertainty is present whether this species population will be affected by current or future harvest. This is because DEIS-related modeling: 1) did not have complete riparian-associated models available for this species, thus 2) the forest models did not explicitly treat riparian forests as a "wildlife habitat," and impacts to these species were not specific to changes in riparian forest area. It is also noteworthy that the species' population has increased steadily over the past few decades and appears to be sustainable in this region.

Breeding Bald eagles are associated with water bodies, primarily large rivers and lakes in Minnesota. They require mature forests that are at an age where super canopy trees are present and available for nesting. Maintaining or increasing the number of long-lived super canopy trees with and up to 500-1,000m of these larger water bodies will mitigate impacts of forest harvest on this species. This strategy does not imply that a no-cut riparian buffer of this width is needed; the key is to provide current and future super canopy nest trees for this species in close proximity to larger rivers and lakes.

Red-shouldered Hawk

The Red-shouldered Hawk was projected to have populations below its RNV midpoint in the DLP and in the area that includes both the DLP and NSU (although most of the numbers are in the DLP) for all Build and No-Build Alternatives. This species' projected decline is of higher concern (than for Bald eagles) because its population density has decreased over the past 10 years (based on Breeding Bird Survey data). The species requires large patches of mature forest and occurs in the north central region of the state where forest fragmentation is prevalent.

Table 5-19

Percentage Change in Population Indexes (Birds) or Habitat Indexes (Other Species) for Forest-Dependent Species Listed as State or Federal Special Concern, Threatened, or Endangered Expressed as of 2001

Species	GEIS Base Harvest Scenario 1990-2040 (percent)	No-Build Alternative (percent)
Bald eagle	+140	-22
Red-shouldered hawk	-26	-6
Acadian flycatcher*	-19	+10
Loggerhead shrike	+100	+42
Cerulean warbler*	-23	0
Louisiana waterthrush	+12	0
Hooded warbler*	-26	+4
Gray wolf	0	0
Mountain lion*	NA	0
Lynx*	-18	0
Timber rattlesnake	+9	0

An asterisk (*) indicates the species was not listed at the time the GEIS was completed.

In addition to reduced timber harvesting activity in the No-Build Alternative compared to the GEIS Base Harvest Scenario, two other factors will help reduce impacts to threatened, endangered, or special concern species to a degree greater than was anticipated at the GEIS. The first is a recommendation in the MFRC Site-Level Forest Management Guidelines to check existing databases and consulting with the appropriate DNR staff to determine if endangered, threatened, and species of special concern are present on or near the harvest area. This procedure was not formally recognized within the state as part of timber sale set-up and pre-operational procedures at the time the GEIS was prepared. Second, nearly all the forest land managed by public agencies and corporations in the state are managed by forest managers who are aware and sensitive to the need of listed endangered and threatened species. In this regard the percent of sensitive sites known to be important for these species that were reported to be protected by these forest landowners was 92 percent in 2005 (Kilgore et al. 2005); see Table 5-20. The degree that potential impacts are actually reduced depends on the implementation of the site level guideline and use of relevant information in harvest planning.

Table 5-20
Percentage Comparison of Harvested Acres
where Sensitive Sites were Reported to be Protected – 1994 to 2005

	1994	2005
Private Organizations	31	47
Public Organizations	88	93
Total	86	92

Source: GEIS Report Card Study

Build Alternative Analysis

Based on the characteristics of the additional forest land harvested to support the Project's wood fiber needs, the Project will not significantly impact the habitat of any listed species (Table 5-21). No significant Project-related impacts are expected. As with the No-Build Alternative, Bald eagle and Red-shouldered hawk populations are projected to decline or remain below its RNV midpoint population level in northern Minnesota respectively. Habitat analyses were not run for Gray wolf or Mountain lion because these animals depend more on prey availability more than forest type and size class. Both depend on White-tailed deer, the population of which is considered to be adequate, and which is not projected to change as a result of the Project.

Table 5-21
Percent Difference in Habitat Indexes by Species for No-Build and Build Alternatives

Species	No-Build vs. Build Alternatives 2041 (percent)
Bald eagle	0
Red-shouldered hawk	-1
Acadian flycatcher	-1
Loggerhead shrike	+11
Cerulean warbler	-1
Louisiana waterthrush	-1
Hooded warbler	-1
Gray wolf	0
Mountain lion	0
Lynx	0
Timber rattlesnake	-1

Negative difference indicates negative impact of the Project.

5.2.2.13 Impact 13: Projected Harvesting Affecting Patterns of Mature Lowland Conifer Stands

An impact is considered significant if, by ecoregion, net loss of patches of mature lowland conifer between 10 and 200 acres is projected to exceed 25 percent of total patches over the 40-year study period.

Summary of GEIS Findings

The GEIS found that the loss of mature lowland cover patches was an important consideration in regions of the state where lowland conifers occurred in relatively small, separate patches within more extensive upland forests. These patches provide local cover for a variety of mammals, particularly as winter cover. The GEIS habitat assessments for deer, moose, and snowshoe hare included lowland conifer cover adjacent to productive young hardwood stands as an important year-round habitat need. Other closely associated species the GEIS assumed to need mature lowland conifer cover included the northern flying squirrel, pine marten, and fisher. Bird species heavily dependent on mature lowland conifer cover includes Spruce Grouse, Connecticut Warbler, Palm Warbler, Yellow-bellied Flycatcher, and Swainson's Thrush.

At the time the GEIS was completed, data was not available to enable a quantitative comparison of extent of mature lowland conifer patches in northern Minnesota. The GEIS highlighted the importance of maintaining patches of black spruce and balsam fir in areas where their presence across the landscape is limited.

No-Build Alternative Analysis

Although the GEIS was not able to quantify the loss of patches of mature lowland conifer, a comparison of the extent of mature black spruce, northern white cedar, and balsam fir cover types projected to exist in 2000 at the Base Harvest Scenario was made to current conditions as reported in the GEIS Report Card Study. The GEIS Report Card Study reported the following about the extent of these three cover types in 2001 relative to what was projected in the GEIS.

Black Spruce

The 2001 FIA shows a slight (less than 1 percent) increase in timberland acreage. The GEIS projection shows a 21 percent decline for 2000 and a gradual decline each decade until 2040. The GEIS Base Harvest Scenario projected the acreage of mature black spruce forests (stands > 120 years old) in 2000 would be 56,613 acres, whereas the GEIS Report Card Study reported 64,385 actual acres in 2001. The GEIS projected that over the 50-year planning horizon, 303,000 of the 1.35 million acres of timberland in the black spruce forest type would be harvested over the planning horizon. Nearly all of this harvesting was projected to be clearcutting. Projections for the DEIS have substantially less areas of the black spruce, some 53,200 acres, harvested over the 40-year study period.[50]

Balsam Fir

The 2001 FIA shows a dramatic decline of 54 percent in timberland acreage. Extensive spruce budworm damage and preferential partial harvesting of mixed species stands converted several hundred thousand acres of balsam fir to northern hardwood and birch forest types. Additionally, as shown by the changing age class distributions of the latter species, these acres moved largely into the middle (45-75 year) age classes of the hardwood and birch distributions. The GEIS projected an 8 percent decline in acreage and clearly did not capture the insect and disease and preferential harvesting impacts. The GEIS Base Harvest Scenario projected the acreage of mature balsam fir forests (stands > 120 years old) in 2000 would be 51,234 acres, whereas the GEIS Report Card Study reported only 4,211 actual acres in 2001.

Northern White Cedar

The 2001 FIA shows a 12 percent decline in the extent of timberland for this type. However, this type typically occurs as mixed species stands. Like white pine, it was among the most difficult for the GEIS forest type algorithm to predict. The GEIS forest type algorithm produced only 50 percent of the FIA estimated acreage for this type in 1990.[51] Projections roughly maintained that degree of difference in projections and thus GEIS predictions for 2000 showed this type at 52 percent of its 1990 timberland acreage. The GEIS Base Harvest Scenario projected the acreage of mature white cedar forests (stands >

50 The GEIS Report Card Study also reported that it appears that a large portion of black spruce "other forestland" acres were reclassified in 2001 to "non-forest," which is a marsh or wetland with trees class. Impacts of FIA reclassification to "timberland" are thought to be fairly modest.

51 The 1990 FIA used a unique forest type classification algorithm that was modified (e.g., simplified) to allow for projections of forest type change by decade. The GEIS Report Card Study tested the accuracy of modified, 1990 FIA algorithm used in the GEIS against the 2001 FIA.

120 years old) in 2000 would be 66,082 acres, whereas the GEIS Report Card Study reported 142,007 actual acres in 2001.[52]

Tamarack

The 2001 FIA shows a 14 percent increase in timberland acreage while the GEIS projected a decline of 6 percent. However, the GEIS forest type algorithm determined 97 percent of the FIA acreage for this type in 1990. Projections roughly maintained that degree of difference in projections and thus predictions for 200 showed this type at 94 percent of its 1990 timberland acreage. For tamarack, the GEIS projected harvesting 49,000 acres of the over 700,000 acres of timberland in the tamarack type; the DEIS analysis projects only 5,600 acres being subject to harvest in the tamarack forest type.

The lower levels for this study for both spruce-fir and tamarack reflect the increased emphasis on harvesting aspen with the demand for spruce-fir volumes obtained from mixed species stands that also contain species in the aspen group – trembling aspen, bigtooth aspen or balm of gilead. The GEIS assumed approximately 46 percent of the total statewide harvest volume to be aspen while the DEIS model increased this value to 60 percent of the total statewide harvest. If higher aspen prices cause demand for aspen to shift more to other hardwood species, then harvest levels in the black spruce type are likely to increase to levels closer to those projected by the GEIS. Much of the area of lowland conifers is managed by public agencies with plans recognizing potential problems of overharvesting in the lowlands. At least under current conditions as defined for this DEIS by the mix of species demands represented by the 2002 statewide harvest levels, concerns over overharvesting in the lowland conifer type under the No-Build Alternative do not appear as great as reflected in the GEIS analyses.

Build Alternative Analysis

For the analyses it was assumed that the Project will require an average of 98,5000 cords of spruce-fir beginning in year 2007 when the Project is implemented. For the analysis of the No-Build Alternative it was projected that spruce-fir harvest levels would average 468,000 cords/yr, well above the 405,000 cords/yr baseline level reflected by the estimated harvest levels for spruce-fir in year 2002. As a result, with the Build Alternative the harvest volume increase for spruce fir volume averaged only 20,000 cords/yr as compared to the No-Build Alternative. In general, the model obtains spruce-fir volume from stands that also contain aspen volume. With or without the Project, little harvesting is projected for the lowland spruce cover type. Total harvest area in the lowland spruce cover type increased by 15,000 acres from 53,200 acres to 68,200 acres over the entire 40-year planning horizon. These acres are represented by the four youngest 10-year age classes for lowland spruce in Figure 5-11 Lowland Spruce – Age by Decade No-Build Alternative. The total area in the lowland spruce cover type is large, containing an estimated 1,648,000 acres. Given the small harvest acreage projected for the lowland spruce cover type, the Project is not likely to produce significantly adverse impacts on mature lowland conifer forests.

[52] Differences between GEIS estimates and the 2001 FIA are most likely due to error associated with the forest type classification algorithm, along with underestimates in tree mortality.

5.2.2.14 Impact 14: Projected Harvesting Affecting the Availability of Food Producing Trees for Forest-dependent Wildlife

An impact is considered significant if, by ecoregion, the projected rate of removal of tree species that provide vital food for wildlife (oaks, hickories and mountain ash), exceeds their projected rate of replacement.

Summary of GEIS Findings

Under the Base Harvest Scenario, the GEIS projected some wildlife species would experience significant declines in certain ecoregions (such as the grey and fox squirrels which rely on mature oak forests for food and cavity resources). However, the GEIS was not able to make precise estimates of trends in specific food trees. In cases where the food producing species is also part of the dominant forest cover and the age at which that species begins producing the food was known, the relationship was modeled in the GEIS. An example is the projected changes in populations of acorn-eating mammals such as the two mentioned above. These projections were based on the projected changes in oak-dominated cover types in ecoregions 5, 6, and 7 and the southern part of ecoregion 4. Hickory occurs within the oak and northern hardwood forests in these same ecoregions and its abundance is roughly proportional to the acreage of oak and northern hardwood cover types. Mountain ash occurs in open areas of northern Minnesota and is not significantly impacted by timber harvesting.

No-Build Alternative Analysis

In comparison to the GEIS Base Harvest Scenario, the No-Build Alternative reflects a reduction in statewide harvest of 464,000 cords (approximately 17,000 acres) per year. The oak and northern hardwood cover types were the two cover types estimated to have the largest decrease in harvest activity under the No-Build Alternative compared to the extent of harvesting projected in the GEIS. On an annual basis, the oak resource is expected to have nearly 9,300 less acres harvested per year than projected in the GEIS, with 5,500 less acres harvested in the northern hardwood cover type. These two cover types contain trees that provide important food for wildlife. Given the decrease in timber harvesting activity generally and specifically to cover types where mast-producing trees are most common, impacts expected over the next 40 years should be considerably less under the No-Build Alternative when compared to the GEIS Base Harvest Scenario.

Build Alternative Analysis

The Project is not expected to increase harvesting of the oak cover type, which are represented in a number of plant communities currently within or above their RNV. It will result in an increase in harvest activity on the state's northern hardwood forests (which also containing mast producing trees) at a rate of about 17,000 acres over the 40-year study horizon (averaging under 500 acres per year). Given the extent of the state's northern hardwood resources (over 2 million acres), such incremental change in harvest activity attributed to the Project will not result in tree removal rates exceeding replenishment rates. Consequently, no significant impacts on mast-producing trees are expected.

5.2.2.15 Impact 15: Forestry and Recreation: Projected Harvesting in the Absence of Visual Management Guidelines (VMGs) on Visually Sensitive Areas

An impact is considered significant if visual management guidelines (VMGs) are not used in the planning and execution of projected timber sales for visually sensitive areas.

Summary of GEIS Findings

The GEIS concluded that significant visual impacts can occur when proper planning for a timber harvesting operation does not occur. Such practices that can have a particularly adverse visual impact include road placement and design, use of visual buffers (along roads and watercourses), the size and shape of cut, and slash and debris disposal practices. With respect to recreational opportunities, the GEIS stated that timber harvesting can have a beneficial or adverse impact. Timber harvesting practices that reduce the aesthetic experience for subsequent users limit the recreation value of harvested areas and the adjacent unharvested areas. It also concluded that harvest operations and associated forest road development can create additional recreation opportunities, principally for more developed recreation activities.

The GEIS assumed that significantly adverse impacts would occur where timber harvesting operations take place in visually sensitive areas when planning to minimize adverse visual impacts does not occur. At the time the GEIS was developed, visual management guidelines were not routinely used across the state – only certain ownerships and/or geographic regions were applying such practices to address visual concerns related to harvesting. Consequently, the GEIS concluded that at the Base Harvest Scenario, roughly 60 percent of the harvesting operations would not incorporate practices that minimize visual impacts.

No-Build Alternative Analysis

Since the GEIS was completed, Minnesota has developed visual management guidelines to be used when conducting timber harvesting and forest management operations. These guidelines provide management recommendations for enhancing the visual quality of the land, reducing conflicts on multiple-use land, minimizing visual and audible impacts of harvesting activities, minimizing the visibility of the harvest area, minimizing visual impact of slash, minimizing the impact of landing operations, and minimizing the visual contrast created by snags and broken or leaning trees. These visual management guidelines are part of the broader set of voluntary Site-Level Forest Management Guidelines published by the MFRC in 1998.

The GEIS Report Card Study found that all the state's public and private, corporate forest land managers surveyed reported they apply practices that are minimally consistent with (76 percent) or exceed the visual quality guidelines (24 percent). No estimates were made in the GEIS Report Card Study about the extent to which visual quality guidelines are being applied on family forest lands. However, Guideline Implementation Monitoring study field assessments from 2000-2002 found that about one-third of all family forest harvests were conducted on sites that contained a high rating of visual sensitivity. Moreover, landowner or logger awareness that these sites are visual sensitive was found to exist on approximately one-fourth of the visually sensitive sites. It is therefore possible that harvesting operations not incorporating practices to limit visual impacts is less than the 60 percent value offered in the GEIS. When considered with the reduction in approximately 17,000 harvested acres per year that is actually occurring versus what was projected to occur in the GEIS, visual quality impacts from timber harvesting under the No-Build Alternative are substantially less than what was projected to occur in the GEIS at the Base Harvest Scenario.

Build Alternative Analysis

Based on the findings of the GEIS Report Card Study, it is assumed that visual management guidelines will be used on nearly all of the visually sensitive sites harvested on public and corporately-owned private forest land that are harvested to support the wood fiber needs of the Project. Combined with the field monitoring data collected through the DNR's guideline implementation monitoring program, it is projected that up to 17 percent of the additional timber harvesting will occur on forest land that is visually sensitive and no visual management guidelines are applied (all such forest land is owned by private, non-corporate interests). Timber harvesting on these latter acres would constitute a significantly adverse impact. With the Project requiring an average of 5,250 acres of forest land harvested per year to meet its wood fiber needs, the maximum number of additional acres attributed to the Project that are visually sensitive and not harvested using visual management guidelines would be just under 900. To the extent visual management practices are, in fact, applied on the family forest lands that are visually sensitive, the extent of this impact will be diminished.[53]

UPM/Blandin Paper is anticipated to continue to secure wood supplies from organizations and landowners that comply with visual management guidelines. The increased timber harvesting arising from the implementation of the Project is anticipated to occur primarily on private forestlands where landowners are often not aware of voluntary visual management guidelines. Unless the landowner specifies the guidelines should not be applied, UPM/Blandin Paper has standard operating procedures that include applying the guidelines to private lands.

[53] The value cited for potentially affected acreage reflects the best available estimate as derived from DEIS-related modeling and consideration of the GEIS's assumptions and findings. It is also assumed that UPM/Blandin Paper will increase the use of selective harvests to secure a sizable portion of the increased wood needed. The actual value at the end of the study period will depend on the degree that uneven-aged management occurs in conjunction with the application of relevant impact avoidance and minimization measures.

5.2.2.16 Impact 16: Projected Development of Permanent Forest Roads in Relatively Undeveloped Forest Areas

An impact is considered significant if there is projected to be development of permanent forest roads in areas meeting the criteria for either of the following Recreation Opportunity Spectrum (ROS) categories:

- road-less primitive areas.
- semiprimitive nonmotorized areas.

Summary of GEIS Findings

The GEIS evaluated the development of permanent roads in the following two ROS categories that are defined by the USDA-Forest Service:

ROS Primitive

An area three or more miles from all maintained roads or railroads and which has an unmodified natural environment. There can be evidence of foot trails or recreational use, but structures in use are rare. Contact with humans is rare and chances of seeing wildlife are good. Example: Boundary Waters Canoe Area Wilderness. Approximately 3 percent of total forestland and 0.4 percent of timberland in Minnesota meet these criteria.

ROS Semiprimitive Nonmotorized

An area one-half to three miles from all maintained roads or railroads, but which can be close to primitive roads or trails used only occasionally. Modifications to the environment are evident, such as old stumps from logging, but are not apparent to the casual observer. Structures in use are rare. Human contact is low and chances of seeing wildlife are good. Example: Recently undisturbed state lands. Approximately 9 percent of total forest land and 7.2 percent of timberland meet these criteria.

The GEIS defined a permanent forest road as a formed road that is graveled or paved and is maintained in a trafficable condition (as distinct from being allowed to revegetate). The criterion was intended to identify changes in the pattern of disturbance to the least disturbed areas of the unreserved forest lands. The ROS criteria assess levels of disturbance, particularly roads. The criterion was applied to northern counties that are predominantly forested.

Using this criterion, the GEIS concluded only plots harvested on dry sites constituted significant impacts to primitive and semiprimitive nonmotorized recreation opportunities. The criterion specified for use in assessing impacts on primitive class lands further required the identification of those areas designated road-less *primitive* lands and *semiprimitive nonmotorized* lands, where construction of permanent forest roads was projected.

Under the Base Harvest Scenario, the GEIS estimated 32 percent of the forest land designated as primitive and dry was projected to be harvested and therefore significantly impacted. Additionally, 26 percent of the semiprimitive nonmotorized areas was projected to be significantly impacted. This impacted area equaled 4.0 and 17.4 percent of all forested land in the primitive and semiprimitive nonmotorized ROS classes, respectively. Based on the criterion, the GEIS concluded no significant impacts were projected to occur when plots in the "wet" physiographic classes were harvested, as these plots would be accessed when the ground was frozen and therefore are assumed not to result in permanent roads.

No-Build Alternative Analysis

The No-Build Alternative reflects a reduction in statewide harvest of 464,000 cords (approximately 17,000 acres) per year as compared to harvesting extent assumed under the GEIS Base Harvest Scenario. It is impossible to predict the incidence of this decreased harvest activity across the state's forest lands according to how such lands might be characterized using the ROS classification. A reasonable assumption is that the reduction in timber harvesting associated with the No-Build Alternative will be proportionate across the ROS classes, meaning it can be expected that the extent of impacts in the road-less primitive and semiprimitive nonmotorized areas will be about 11 percent less than what was assumed to occur under the GEIS Base Harvest Scenario.[54]

Build Alternative Analysis

Little additional road building is likely to occur as a result of the proposed Project. Proposer lands are well roaded and no areas meet the ROS definition of semi-primitive or primitive. Development of a quantitative estimate of impact under the Build Alternative is predicated on the following two assumptions. First, the forest land needed to supply the Project's wood fiber requirements exhibits the characteristics associated with the various ROS classes in proportion to that of Minnesota's forest land as a whole. Second, the additional timber harvesting needed to support the Project's wood fiber needs will occur proportionately across forest land containing various the characteristics associated with the Primitive and Semi Primitive Nonmotorized ROS designations as was projected to occur in the GEIS.

With these assumptions in place, it is projected that on average the Project will result annually in harvesting less than 10 additional acres of forest land possessing characteristics of the Primitive ROS class and approximately 100 acres of forest land possessing characteristics defining the Semiprimitive Nonmotorized ROS class. These acres are considered, by definition, to be significantly impacted. However, the extent of this impact is very small in the context of the state's 16.2 million acre forest land base and is below the level projected under the GEIS Base Harvest Scenario.

[54] The 11 percent value is used because the overall harvest level under the No-Build Alternative is that much lower than the value used in the GEIS Base Harvest Scenario.

5.2.2.17 Impact 17: Projected Harvesting Affecting Unique Cultural and Historical Resources

An impact is considered significant if heritage resources including cultural landscapes, structural remains, archaeological remains, Native American traditional use sites are destroyed; or cemeteries are disturbed.

Summary of GEIS Findings

The GEIS interpreted the term "destroyed" to mean damage to a site such that its scientific, cultural, or spiritual values was diminished in whole or in part. This interpretation resulted in a conservative (i.e., more protective) assessment of impact by including those sites with a partial loss of values. The GEIS estimated that at the Base Harvest Scenario, the maximum number of timber harvesting sites containing heritage resources that would be impacted would be about 100,000 sites over the 50-year study period – roughly half of all sites. Importantly, the GEIS stated there was insufficient data to assess, even qualitatively, the extent that these sites will actually be impacted. It did conclude, however, that significant impacts were likely to occur and the number of impacts will increase as the level of harvesting increases.

No-Build Alternative Analysis

Since the GEIS was completed, Minnesota's Site-Level Forest Management Guidelines have been available to assist forest land owners, managers, and timber harvesters in applying practices that protect important ecological and cultural forest values. Specifically, the site-level guidelines recommend that prior to initiating a timber harvesting operation, the owner and operator consult the appropriate organizations and inventories to determine if known cultural resources are present on the proposed management area. This includes: checking inventories to identify potential cultural resources on or near the harvest site; communicating to loggers and resource managers protection strategies to employ during harvesting; avoiding forest management activities within the cultural resource area when practical and feasible; prohibiting location of landings, roads, and skid trails in cultural resource areas; delineating cultural resource areas with flagging or other appropriate methods; and reducing soil disturbance within a cultural resource area. Data from the DNR's Guideline Implementation Monitoring field assessments indicates pre-harvest checks for the presence of cultural/historic resources were conducted on approximately 44 percent of all recently-harvested sites the program evaluated from 2000-2002. This data, combined with an overall lower level of harvest under the No-Build Alternative as compared to the GEIS Base Harvest Scenario, suggests that the level of cultural and historical resource impact will be less than assumed to occur in the GEIS.

Build Alternative Analysis

The Project is expected to increase timber harvesting an average of 5,250 acres per year over the 40-year study period. Assuming landowner or logger consultation for the presence of cultural and historic resources occurs on 44 percent of all sites harvested (based on the Guideline Implementation Monitoring findings for 2000-2002), approximately 3,000 acres each year would be harvested without prior knowledge of the presence of cultural or historic resources. Such sites would be subject to possible historic/cultural resource damage or destruction and, consequently result in a significantly adverse impact. As was concluded in the GEIS, it is impossible to predict the extent to which damage or destruction of would actually occur on these sites. Factors that will influence the extent of this impact include increased timber harvest activity when the ground is frozen (currently 64 percent of all public and corporately-owned private forest lands are harvested when the ground is frozen), extent of harvesting in riparian areas, and additional landowner and logger awareness of the need to conduct pre-harvest cultural/historic inventory checks.

5.2.3 SUMMARY OF SIGNIFICANT IMPACTS PROJECTED UNDER THE BUILD ALTERNATIVE

The analysis concluded that the additional timber harvesting and forest management activity needed to supply the Project's 197,000 cords per year annual wood fiber requirement could result in the following significant environmental impacts (based on GEIS significance criteria):

5.2.3.1 Impact 5: Forest Species – Genetic Variability

Limited instances of loss of genetic variability are possible for some of the tree species and plants living in the plant communities existing on the edge of their natural range, or those found in critically imperiled and imperiled forest and savanna plant communities. Such impacts would most likely occur in the natural forest communities that originally covered the Bigwoods and Prairie-Forest transition zone such as mixed oak forests, natural maple-basswood forests, and the southernmost white pine and pine-hardwood forests. The extent to which such adverse impacts materialize depends on whether landowners, foresters and loggers reserve or regenerate tree species that are rare in a given region of the state and implement harvesting practices that will enable these rare plant communities to be regenerated.

5.2.3.2 Impact 8: Projected Harvesting Affecting Site Nutrient Capital

By the GEIS estimation process, the maximum forestland acreage estimated to annually be subject to potential nutrient loss from timber harvesting is projected to be as follows: calcium loss: approximately 900 acres; magnesium loss: approximately 460 acres; and potassium loss: approximately 275 acres. Over the Project's 40-year study period, this amounts to 36,000 additional acres subject to potentially significant losses of calcium; 18,400 additional acres subject to potentially significant losses of magnesium; and 11,040 additional acres subject to potentially significant losses of potassium. It is important to note that these acres are not cumulative, as certain sites would be susceptible to losses of more than one nutrient.

5.2.3.3 Impact 10: Projected Harvesting resulting in Accelerated Erosion from Forest Roads

Less than 50 harvested acres harvested each year to supply the Project's wood fiber needs is projected to experience significant soil erosion. This estimate also assumes harvesting activity attributed to the Project will occur on the steep slopes of southeast Minnesota at the same rate as was projected to occur in the GEIS, which is likely an overestimate of the contribution ecoregion 6 forests will make in providing the Project's wood fiber needs.

5.2.3.4 Impact 15: Forestry and Recreation: Projected Harvesting in the Absence of Visual Management Guidelines (VMGs) on Visually Sensitive Areas

An estimated 900 acres of visually sensitive forestland would be harvested each year without the application of appropriate visual management guidelines.

5.2.3.5 Impact 16: Projected Development of Permanent Forest Roads in Relatively Undeveloped Forest Areas

Annually, up to an estimated 10 acres of forestland possessing characteristics of the Primitive ROS class and approximately 100 acres of forest land possessing characteristics defining the Semiprimitive Nonmotorized ROS class would be subject to the development of permanent forest roads.

5.2.3.6 Impact 17: Projected Harvesting Affecting Unique Cultural and Historic Resources

Up to approximately 3,000 acres of forestland would be harvested each year without prior knowledge of whether cultural or historic resources exist on the site. Such sites would be subject to possible historic/cultural resource damage or destruction and, consequently result in a significantly adverse impact. The extent to which such harvesting would result in actual damage to cultural or historic resources depends on soil conditions at the time of harvest (currently 64 percent of all public and corporately-owned private forest lands are harvested when the ground is frozen) and the existence of cultural or historic resources on the sites harvested.

5.3 MITIGATION

Mitigation measures are typically evaluated for significant adverse impacts caused by the proposed Project. This section of the DEIS identifies mitigation measures that are available for consideration as a means for avoiding or minimizing Project-related adverse impacts.

5.3.1 MITIGATIVE MEASURES FOR THE 17 GEIS IMPACT AREAS

In accordance with the Final Scoping Decision, potentially significant impacts are taken from the DEIS's evaluation of the 17 GEIS impact areas; see Section 5.2 for the analysis of these impacts. It should be noted that these impacts are cumulative in nature, or in other words result from the interaction of the

Project's impacts with the impacts from other past, present, or reasonably foreseeable future projects. Therefore both programmatic and Project-specific mitigation measures are available for consideration.

Programmatic measures are available as a result of the enactment of the Minnesota Sustainable Forest Resources Act (SFRA, M.S. Chapter 89A). This legislation established the Minnesota Forest Resources Council and a series of other related initiatives. These measures are typically voluntary, with implementation targeted across the entire forest products industry and supporting institutions on all forest land ownerships. They take the form of site-level, landscape-level, and research-based responses. The current status of programmatic measures is detailed in the GEIS Report Card Study, which is available concurrent with the DEIS; see Appendix H for the Executive Summary of the GEIS Report Card Study.

Project-specific measures are those actions available to the Proposer, whether instituted on a voluntary or regulatory basis. These measures can be applied on its own lands, or through controls present from its open-market roundwood purchases.

5.3.2 MITIGATION – PROGRAMMATIC MEASURES

The impacts of the Project can be addressed through the ongoing implementation of the strategic statewide programmatic responses as required under the Minnesota Sustainable Forest Resources Act. Both site-level and landscape-level responses apply to the Project. General information will be discussed first, which will be followed by those responses that apply to each of the specific impact areas.

5.3.2.1 General Information – Site Level Guidelines

Origin and Current Status of the Voluntary Guidelines

The Minnesota Forest Resources Council was charged with coordinating the development of site-level timber harvesting and forest management guidelines to address the cumulative significant effects of statewide timber harvest. The guidelines were developed over a two-year period and adopted as the *MFRC Voluntary Site-level Forest Management Guidelines* in February 1999.

There is extensive survey result information included in the GEIS Report Card Study regarding current guideline implementation, training and monitoring (see Appendix H, Executive Summary of the GEIS Report Card Study). Overall the report card reports a high level of adoption of the guidelines in policy and in practice by public and corporate forest land managers. Forest managers' perceptions regarding the overall effectiveness of the guidelines vary but are seen as useful by the larger majority of survey respondents.

Implementation and Monitoring of the Voluntary Guidelines

In 1998, the MFRC developed four goals for the implementation of the guidelines as mandated in the SFRA.

The goals are:

- Develop organizational support for the guideline development through letters of support.
- Ensure user awareness and understanding of the guidelines.
- Obtain user commitment to apply the guidelines.
- Measure the actual application of specific practices set forth in the guidelines.

The Minnesota Logger Education Program (MLEP) established guideline training as a continuing element of logger education. Additionally, the Center for Continuing Education (CCE) at the University of Minnesota has the objective of promoting excellence in natural resource management through educational opportunities. The CCE has organized or sponsored many of the annual educational workshops that train resource managers and landowners in the use of the guidelines. Additionally there is some internal industry and agency training sessions on guideline use.

By 2004, more than 90 percent of the timber harvesting statewide was done by loggers who had received guideline training. Sixty-three percent of organizations have sent all of their staff to training and 93 percent have sent at least most of their staff to training. The GEIS Report Card Study indicates that 92 percent of survey respondents representing 97 percent of the public and industrial owners stated they require application of guidelines. It is unclear from this response if industrial owners require application of the guidelines on NIPF lands from which they receive wood.

The MFRC convened a committee to oversee the development of the procedures and protocols for monitoring the application of the guidelines on public and private forestland. Independent contractors conducted the field monitoring of 334 harvest sites from 2000-2002. Monitoring findings are summarized in the three-year guideline implementation monitoring report summary, *Baseline Monitoring for Implementation of the Timber Harvesting and Forest Management Guidelines on Public and Private Forestland in Minnesota: Combined Report for 2000, 2001, and 2002*.

In the GEIS Report Card Study, results from the MFRC monitoring effort was to be compared to that of report card survey findings; however, the report card assessment concluded that comparisons of guideline implementation monitoring data and the results of the survey of GEIS mitigation implementation progress were very limited, as the two evaluations were greatly different in scope and specificity. For example, retention of snags varies on a site-by-site basis based on safety concerns, visual quality concerns, and other management objectives.

One area of concern in the monitoring effort was in riparian areas. It was found that 52 percent of the riparian areas were in compliance with the guidelines where as all organizations surveyed in the report card indicated as having riparian management zone (RMZ) practices consistent with the guidelines. Note that surveyed managers in the GEIS Report Card Study repeatedly mention the need to tailor site-specific prescriptions (including the use of guidelines) to the conditions and management objectives associated with a site. The two-year monitoring results suggested that a very small portion of the state's riparian forests (0.4 percent per year) is affected by timber harvest. In 2003, the DNR and MFRC concluded that land use decisions that result in the loss of productive forestland may have more enduring effects than timber harvesting in riparian areas. Therefore, the DNR Resource Assessment Unit began focusing its monitoring efforts on forestland use changes, using change detection methods and satellite imagery similar to those used in riparian monitoring.

General Information – Landscape-Level Planning and Coordination

The GEIS recommends the development of landscape-level responses to address potential problems that may occur on a statewide level across landowner types. The SFRA codified the landscape-level goals and objectives recommended in the GEIS and directed the establishment of regional committees. The overarching landscape-level goal of the MFRC as established by the SFRA is to "establish a framework that enables long-term strategic planning and landscape coordination to occur."

Regional forest resource committees are the mechanism by which landscape-based forest resource planning occurs. Committees have been established in each of the six landscapes identified by the MFRC as major forested landscapes. Landscape plans are now finalized and approved by the FRC for all six landscape regions and plan coordination groups actively meet in all regions.

The Forest Resources Council established the following broad goals for use by regional committees as they carry out their landscape-level planning and coordination responsibilities:

- Land area covered by forests within a region's landscape will be the same or larger.
- Forests within a region's landscape will be in a variety of ownerships, serving both public and private interests.
- Within forested landscapes, healthy, resilient, and functioning ecosystems will be maintained within appropriate mixes of forest cover types and age classes to promote timber production, biological diversity and viable forest-dependent fish and wildlife habitats.
- Forests within a region's landscape will be providing a full range of products, services, and values, including timber products, wildlife, and tourism, that are major contributors to economic stability, environmental quality, social satisfaction and community well-being.
- Forests within a region's landscape will be viewed by citizens as integral contributors to the quality of life enjoyed by current as well as future generations. The citizenry will be knowledgeable about forest conditions and opportunities within the region and actively engaged in their stewardship.

GEIS Report Card Study survey found organizational involvement in MFRC landscape planning program has varied. Organizations were modestly to moderately involved in the MFRC's landscape planning process. The greatest level of organizational involvement was planning strategies to achieve future forest conditions, while involvement was the least in the assessment of regional conditions. See the GEIS Report Card Study for additional information.

Perceptions of effectiveness of the MFRC's landscape program vary: While 32 percent of the forestland is managed by organizations who perceive the program to be very effective in identifying and addressing landscape-level forest resource issues and coordinating forest management activities across large landscapes and multiple ownerships, 38 percent is managed by organizations that believe the program minimally effective or not effective in addressing landscape-level issues and facilitating coordination. Public organizations generally find the program to be more effective than do private organizations.

The MFRC landscape program has modestly influenced forest management activities. Thirteen of the 21 responding organizations indicated they have made some to extensive change in their management practices as a result of the landscape program, while eight stated the program has resulted in few to no changes.

5.3.2.2 Strategic Statewide Programmatic Responses – Specific Impact Areas

The DEIS evaluated the Project in the context of the 17 GEIS impact areas and was determined to have an effect for six of the 17 impacts.

Impact 5 Projected harvesting affecting genetic variability of plant or animal species.

The principal programmatic strategy to address this impact is to ensure that information on sensitive natural communities and sites is available to land managers early in the harvest planning process. This is accomplished through the Minnesota County Biological Survey (MCBS) and its related information systems. The MCBS, which is a systematic survey of rare biological features, has been completed for the significant portions of the state and is underway in several northern-forested counties. Continued funding of the MCBS on-the-ground surveys is necessary to ensure that full coverage of the state is developed. Funding will also be required in the future to maintain and make accessible MCBS-type information, including the addition of new sites and features as new occurrences are identified. UPM/Blandin Paper maintains an inventory of special areas (i.e. springs) on their lands. Logger-education efforts should also continue. The MFRC Voluntary Site-level Forest Management Guidelines, Wildlife Habitat, pages 26-35, address this issue of plant species occurring near or at the edge of their range.

Impact 8 Projected harvesting affecting site nutrient capital.

This impact area is addressed through the application of site-level measures to address soil nutrient impacts as offered in the MFRC Voluntary Site-level Forest Management Guidelines. Continued funding of MFRC efforts to ensure continued improvement in the site-level guidelines and logger education are the most effective programmatic strategies to deal with this impact area. Funding an accelerated guideline implementation and effectiveness monitoring program is also an available mitigative strategy; the results of this activity feed into the ongoing guideline and education program refinement processes. The MFRC and DNR will be conducting a review of the logging residue and coarse woody debris literature, which may result in revisions to the coarse woody debris portions of the site-level guideline. This new interest in the use of additional logging residue is independent of the Project, but if conducted may result in improved practices that better mitigate potential impacts.

Impact 10 Projected harvesting causing accelerated erosion from forest roads.

This impact area is addressed through the application of site-level measures to address soil erosion as offered in the MFRC Voluntary Site-level Forest Management Guidelines. Guidelines for riparian management are also applicable to avoiding or minimizing these types of impacts. Continued funding of MFRC efforts to ensure continued improvement in the site-level guidelines and logger educations programs are the most effective programmatic strategies to deal with this impact area. Funding an accelerated guideline implementation and effectiveness monitoring program is also an available mitigative strategy; the results of this activity feed into the ongoing guideline and education program refinement processes.

Impact 15 Projected harvesting in the absence of visual management guidelines (VMGs) on visually sensitive areas.

This impact area is addressed through the application of site-level measures to address adverse visual impacts as offered in the MFRC Voluntary Site-level Forest Management Guidelines. Guidelines for riparian management are also applicable to avoiding or minimizing these types of impacts. Continued funding of MFRC efforts to ensure continued improvement in the site-level guidelines and logger education programs are the most effective programmatic strategies to deal with this impact area. Funding an accelerated guideline implementation and effectiveness monitoring program is also an available mitigative strategy; the results of this activity feed into the ongoing guideline and education refinement processes. Visual Sensitivity Classification Maps have been developed for 16 Minnesota counties and are available for consideration in harvest-related planning. Coordinated road and trail planning is another mitigative strategy, where consistent use and application of VMGs along visually sensitive corridors that cross multiple ownerships. Within the UPM/Blandin Paper Site Harvest Plan, the visual sensitivity is mapped.

Impact 16 Projected development of permanent roads in primitive and semiprimitive nonmotorized areas.

The adoption and implementation of landscape-based road and trail plans is the best programmatic mitigation strategy that is available to address this area of impact. Efforts to do this planning should be encouraged and funded as opportunities arise. For impacts that occur on federal ownerships, the recently adopted forest management plans are one vehicle to avoid or minimize impacts. Support for the continued development and application of visual management guidelines is also a potential measure.

Impact 17 Projected harvesting affecting unique cultural and historical resources.

The principal programmatic strategy to address this impact is to ensure that information on cultural and historic sites is available to land managers early in the harvest planning process. There are specific site-level measures that have been developed to avoid or minimize impacts that are found in the MFRC

Voluntary Site-level Forest Management Guidelines. Guidelines for riparian management are also applicable to avoiding or minimizing these types of impacts. Continued funding of: 1) inventory lists of known sensitive cultural and historical resources, 2) logger education programs, and 3) MFRC efforts to ensure continued improvement in the site-level guidelines, are the most effective programmatic strategies to deal with this impact area. UPM/Blandin Paper maintains an inventory of cultural/historic areas of significance on their lands. Funding an accelerated guideline implementation and effectiveness monitoring program is also an available mitigative strategy; the results of this activity feed into the ongoing guideline and education program refinement processes.

5.3.2.3 Mitigation – Project-Specific Measures

The impacts of the Project can be addressed through actions currently being implemented or potentially available to the Project Proposer. Both site-level and landscape-level measures are available to the Proposer. UPM/Blandin Paper Company's ongoing commitments to conduct sustainable forestry practices and planning will be discussed first, which will be followed by specific measures that apply to each of the impact areas listed.

UPM/Blandin Paper's Ongoing Commitments to Mitigate Timber Harvest Impacts

The following is a listing of the Proposer's existing commitments to mitigate the cumulative environmental effects of statewide timber harvest.

1. UPM/Blandin Paper is an active member of the American Forest and Paper Association (AF&PA). To maintain its membership in good standing, the company is required to operate according to specific guidelines that are embodied in the Sustainable Forestry Board's SFI® Standard. The following is a list of applicable objectives:

   Objective 1: To broaden the implementation of sustainable forestry by ensuring long-term harvest levels based on the use of the best scientific information available.

   Objective 2: To ensure long-term forest productivity and conservation of forest resources through prompt reforestation, soil conservation, afforestation, and other measures.

   Objective 3: To protect water quality in streams, lakes and other water bodies.

   Objective 4: Manage the quality and distribution of wildlife habitats and contribute to the conservation of biological diversity by developing and implementing stand- and landscape-level measures that promote habitat diversity and the conservation of forest plants and animals, including aquatic fauna.

   Objective 5: Manage the visual impact of harvesting and other forest operations.

Objective 6: Manage company lands of ecological, geologic, cultural or historic significance in a manner that recognizes their special qualities.

Objective 7: To promote the efficient use of forest resources.

Objective 8: To broaden the practice of sustainable forestry through procurement programs.

Objective 9: To improve forestry research, science and technology upon which sound forest management decisions are based.

Objective 10: To improve the practice of sustainable forest management by resource professionals, logging professionals, and contractors through appropriate training and education programs.

Objective 11: Commitment to comply with applicable federal, provincial, state or local forestry and related environmental laws and regulations.

Objective 12: To broaden the practice of sustainable forestry by encouraging the public and forestry community to participate in the commitment to sustainable forestry, and publicly report progress.

Objective 13: To promote continual improvement in the practice of sustainable forestry and monitor, measure and report performance in achieving the commitment to sustainable forestry.

The Proposer maintains a record of activities that are taken to achieve these objectives. This record is subject to independent third-party audit procedures and reporting. Report summaries are available upon request.

2. UPM/Blandin Paper is committed to applying the Minnesota Forest Resources Council's *Voluntary Site Level Forest Management Guidelines* principles and practices to all of its own forest lands, and with rare exceptions, to all non-industrial private forest lands and government lands where it controls the stumpage. The *Guidelines* embody numerous Best Management Practices (BMPs) related to forest management have been developed through the participation of various stakeholders and are implemented through voluntary commitment to sustainable forestry.

3. UPM/Blandin Paper adheres to the voluntary Water Quality BMPs and requires contractors and its staff foresters to be trained in BMP application, which is accomplished through training offered by the Minnesota Logger Education Program. These training sessions are taught by qualified, knowledgeable industry foresters, environmentalists, and state personnel.

4. Visual Quality BMPs for forest management reduce the apparent size of harvest units, or create harvest site design features that are visually appealing. These were developed cooperatively by DNR, Minnesota Forest Industries, Minnesota Resort Association, and the USFS. UPM/Blandin Paper applies voluntary visual quality practices on company-owned lands and lands harvested in its non-industrial private land program, as guided by County Visual Quality standards and as part of its company-wide standard operating practices. The practices include the use of commercial thinning, multiple-stage cuts, leaving patches of trees, creating narrow openings into the harvest area, and utilizing natural terrain and vegetative features, all designed to produce natural forest stands.

5. Visual management guidelines (VMGs) have been developed by a number of the forested counties in northern Minnesota that are consistent with the goals of Visual Quality BMPs. For example, some counties have classified some of their roads by visual sensitivity. These VMGs also help minimize visual impacts and are implemented on UPM/Blandin Paper-owned timberlands. The company is signatory to the Minnesota Forest Resources Partnership's Memorandum of Understanding for Visual Quality.

6. UPM/Blandin Paper's ecologically based management regime identifies biodiversity features and sensitive areas during its inventory process on company, and when appropriate, on other ownerships. For example, UPM/Blandin Paper has cooperated with The Nature Conservancy in the development of a management plan for the Sand Lake/ Seven Beavers Area based on Native Plant Communities of Minnesota.

7. Minnesota's Legislative Commission on Minnesota Resources (LCMR) has funded the Minnesota Forest Bird Diversity Initiative. The status of migratory bird populations, especially neo-tropical species, is an issue of national importance. UPM/Blandin Paper cooperated in this program to study the potential effects of timber management on forest bird populations.

8. UPM/Blandin Paper maintains a state-of-the-art forest inventory system, which includes monitoring age class and cover type structure of forests. The system contains current stand information for day-by-day management of the forest by company forestry staff, and this information is supplied into the forest management planning process. Information compiled in the system includes: age of the stands; stand type; stand composition; soil information; and geographic information. Stand-level information is collected by foresters using hand-held field data recorders that is incorporated into the geographic information system (GIS) database to use in determining site-level modifications to management prescriptions. Basic prescriptions are modified to reflect each stand's needs. As large databases become available to the company, (i.e., region wide identification of cultural and historic areas), they will be incorporated into the data system. UPM/Blandin Paper has a license with the Minnesota DNR Natural Heritage and Nongame Research Program for access to its Endangered, Threatened, and Species of Special

Concern database; this data layer is incorporated into the company's GIS. UPM/Blandin Paper also agrees to notify the Natural Heritage and Nongame Research Program of any new locations.

9. The company maintains and continually upgrades a listing of known cultural, unique, and historical sites and protects all sites as required by law.

10. UPM/Blandin Paper has participated extensively in developing the North Central Landscape Plan, mandated by the Sustainable Forest Resources Act. The company's Forest Ecologist is responsible for ensuring that all UPM/Blandin Paper site level harvest and silviculture plans take into account neighboring ownerships and ecologically important landscape features.

11. In support of protecting sensitive sites, the company maintains an inventory of sites (e.g., peatlands and state-listed protected waters).

12. UPM/Blandin Paper has participated through the Minnesota Forest Resources Council in developing site-level guidelines for forest management activities, and will continue to participate as improvements are made periodically.

13. UPM/Blandin Paper continues to look for methods to increase wood fiber productivity of timberlands. The company has increased utilization by going from a four-inch (4") top diameter to a three-inch (3") top diameter for 100-inch (100") long wood. UPM/Blandin Paper contracts for cut-to-length timber harvesting that retains slash onsite and minimizes soil impacts. When conventional harvest systems are used on Proposer lands, logging debris is used to stabilize skid trails and the remainder is returned and spread on site. The company has expanded wood storage capabilities to increase winter harvesting that will minimize impacts.

14. The company requires onsite inspection of each individual stand as harvest preparation plans are being made. At this time, professional assessment is made of entry requirements, area to be treated, special requirements, and if needed harvesting guidelines and regeneration methods.

15. UPM/Blandin Paper has actively promoted and supported funding for conservation easements that permanently protect forest land from non-forest development and fragmentation.

16. UPM/Blandin Paper has worked extensively with the MLEP director to develop a Minnesota Master Logger Certification program, which will document and raise to new standards of excellence the performance of participating loggers, ensuring their harvesting practices on all ownerships follow guidelines and standards very similar to the SFI Objectives mentioned above.

17. The Proposer grows many species on company lands that cannot be used for mill-related papermaking. Roundwood harvested in this instance is sold to other mills, along with sub-

standard aspen, balsam fir and spruce, which is not also used. UPM/Blandin Paper has a Marketing Forester whose job is to find a market to sell wood from company lands and controlled stumpage sources to other mills in the area. This is a means of promoting use of alternate species. As the other mills, which are able to use these species and lower quality wood, buy these products, the company is supplied with additional higher quality aspen, balsam fir, and spruce roundwood needed for its operations.

5.3.2.4 Project-specific Measures – Specific Impact Areas

The DEIS evaluated the Project in the context of the 17 GEIS impact areas and was determined to have an effect for six of the 17 impacts. What follows is the mitigation available to address these impacts.

Impact 5: Projected harvesting affecting genetic variability of plant or animal species

The use of information regarding sensitive communities and sites, and tree species, located at the edge of their range during harvest is the mitigative measure for this impact; see Voluntary Site-level Forest Management Guidelines, Wildlife Habitat, pages 26-35. The Proposer is committed to following this guideline for harvest occurring on its own lands, and with rare exceptions, and is following it also for all non-industrial private forest lands and government lands where it controls the stumpage.

The driving factor behind the guideline is to employ measures designed to identify and protect rare habitats and/or genetic diversity. This is done be accessing available databases and considering the information during harvest planning. Specific measures being employed by UPM/Blandin Paper to implement the applicable guideline include, but are not limited to, the following:

Forests of Exceptional Conservation Value (FECV). UPM/Blandin Paper employs a standardized planning process to address the identification of known viable occurrences on company-managed lands of G-1 and G-2 species and communities, and for collecting information in cooperation with the Minnesota DNR Natural Heritage and Nongame Research Program[55]. The FECV planning process has two stages:

Stage 1. Identifying Threatened and Endangered Species and Critically Imperilled or Imperilled Ecological Communities

The company conducts a search of the NatureServe database across its leased lands to identify any known occurrence of critically imperilled or imperilled forest species and ecological communities. This search will be conducted online by accessing the NatureServe Explorer at www.natureserveexplorer.org.

From the NatureServe database, the company will retain the list of viable forest species and ecological communities identified as Global Heritage Rank G-1 and G-2. The company will check the viability of the record to ensure that the historical record is accurate and reliable.

[55] The forests of northern Minnesota have very few species and communities that have G1 and G2 rank.

The company will then consult the Natural Heritage Network Directory for known element occurrences of G-1 and G-2 forest species and ecological communities that are geographically located on its ownership. If the forest species and ecological communities are not located within the controlled lands of the company, they will be removed from consideration.

Stage 2. Develop Conservation Strategies

Prior to developing a Conservation Strategy for forest communities identified as FECVs, the company will conduct an assessment of the historical disturbance patterns and successional processes, including the risk of fire and other disturbance regimes.

If a known occurrence of an aquatic species or community is identified, the company will implement appropriate water quality BMPs. It is assumed that BMPs will be sufficient to provide protection to any identified species or communities.

As new information and mechanisms are developed to identify and protect Forests of Exceptional Conservation Value, the company will adjust and refine its plans. The company will proceed with the expectation that mechanisms will be available to provide economic return for the societal values provided by the company's forests including: conservation easements, rental payments, land trades, tax policy, direct purchases or other equitable forms of securing economic return.

The company will evaluate the overall costs to implement a conservation strategy. If the protection of an individual species or community carries exceptionally high costs or carries with it disproportionate impacts on the company, the company is free to implement other management or operational alternatives that are more appropriate from an economic and sustainability standpoint.

The Forest Ecologist conducts appropriate ongoing training in the identification and protection of threatened and endangered species, as well as critically imperilled and imperilled species and ecological communities.

Sites locations are included in the GIS database. Collection of additional information on imperilled and critically imperilled sites is being developed through participation in the NCASI led cooperative project with NatureServe. Results of the NCASI project will be monitored and used to incorporate additional measures for the conservation of biologic diversity.

Baseline Plant Data

The Proposer established baseline plant data during habitat typing of forest inventory plots in 1998 and 1999. Information was collected for all plant species found on the plot, not just those needed for habitat type identification. The data is maintained in an existing company GIS. Since the coordinates of all the plots are in the GIS, they can be resampled at any time to evaluate changes in species composition due to management activities. UPM/Blandin Paper does not maintain a specific plan for managing biodiversity due to ongoing emphasis for managing habitat types for their successional stages, which emulates maintenance of all the components of a habitat type and thus providing for biodiversity.

Life-cycle Forests

UPM/Blandin Paper conducts harvest to emulate nature. Small gaps or patches, selection harvest, commercial thinning, shelterwoods, and seed tree harvests are used to mimic wind events and fires that would have naturally occurred in the various habitat types. The timing for commercial thinning will be at intervals that natural thinning would occur. A variety of species, ages, and vertical structure will be common with a variety of successional stages across the landscape.

Exotic Species and Species Mixes

The Proposer minimizes the planting of exotic tree species that are introduced from outside their natural range. A company goal is to regenerate areas with the same species or species mixes that occur naturally on the site. Many sites are being brought back to their natural species mixes using the Habitat Typing system. Foresters are working with the mill to utilize more species and species mixes so that all commercial species can be managed and maintained.

Site Protection

UPM/Blandin Paper has identified sites that contain unique biological and/or ecological attributes. These sites are managed to conserve their local or regional importance and to protect their unique attributes. The company works in cooperation with the Minnesota Natural Heritage Program when appropriate to protect special sites, and may also work with other experts to identify unique biological and ecological sites across its lands in Minnesota, and manage them for their unique features.

Local knowledge and/or the assistance of knowledgeable organizations are utilized in the identification of unique and special sites. Management and protection strategies are developed for sites that require conservation or protection measures to promote the site’s unique character. Known sites are identified in the GIS and appropriate designations, restrictions, and management needs are identified. Management activities that are needed to protect and perpetuate the unique characteristics of the site are prescribed on an annual basis. The location of newly discovered sites are catalogued and recorded in the GIS. For all practices, the forester must identify any special areas, and threatened and endangered plant and animal species or habitats, and show them on project plan map. Special features are to be marked on the ground with paint or ribbon as appropriate so that operator thoroughly understands and can locate them.

Impact 8 Projected harvesting affecting site nutrient capital

The use of information regarding the nutrient content and sustainability of a site's soils, and then applying the appropriate management actions, is the mitigative measure for this impact; see Voluntary Site-level Forest Management Guidelines, Forest Soil Productivity, pages 16-23. The Proposer is committed to following this guideline for harvest occurring on its own lands, and with rare exceptions, and is following it also for all non-industrial private forest lands and government lands where it controls the stumpage.

The driving factor behind the guideline is to identify sites where roundwood harvest can result in nutrient "mining" of the site and apply the correct mix of prescriptive measures to minimize impact potentials. Once the potential for impact is identified, site-level measures can include: retaining or redistributing slash on the site; avoiding full-tree harvesting or full-tree skidding that piles slash without redistributing it; adding nutrients to the site; and/or avoiding shortened rotations. Specific measures being employed by UPM/Blandin Paper to implement the applicable guideline include, but are not limited to, the following.

Planning for Soil Productivity

UPM/Blandin Paper includes soil conservation planning as part of its ongoing management activities. Declines in forest productivity as a result of management practices are an undesirable outcome. The company conducts harvesting activities and mechanical site preparation that protects existing soil physical and chemical properties. Habitat-type characterization is used to assist in determining site productivity potential and evaluating appropriate silvicultural prescriptions and harvesting operations. Minimizing loss of nutrients on nutrient-sensitive soils is an explicit planning goal.

Measures to Protect Soil Resources

The company conducts the following measures consistent with the applicable Voluntary Site-level Forest Management Guideline:

- Review habitat type, soil and site conditions to determine timing of harvest, harvest methods and equipment and weather related seasonal closure of the operation.
- Avoid harvest activities on fine or medium-textured soils and poorly drained soils when soils are saturated, immediately after heavy rains, and during very wet autumns, when transpiration has ceased. To protect site productivity, forester may suspend operations on sensitive soils to prevent excessive rutting and compaction.
- Encourage use of low ground pressure equipment and use of slash mats to extend operating seasons or times; e.g., for summer cut black spruce, use temporary mats, bundles of pvc pipe, etc. to cross the typical "moat" at edge of swamp, and cut only where timber stand is of sufficient density that harvesters will generate a suitable slash travel mat to support weight of equipment.
- Employ erosion control that maintains or establishes vegetation on slopes that contain high proportions of fine sand and silt, low organic matter, and slow permeability.

- Employ harvest techniques that minimize the need to operate equipment on steep slopes. Where operation on steep slopes is necessary employ appropriate equipment.
- Reduce volume, velocity and distance of water flows on roads and skid trails by building water diversion structures consistent with appropriate water quality BMPs.
- Reserve natural site nutrients by leaving slash fairly evenly distributed on site to avoid any reduction to tree growth or any change in vegetative composition of the site.

Site Inspections and Harvest Management

Area foresters should conduct pre-harvest inspections by walking over cutting blocks at least twice before any work is done. Foresters are to review all of the above with the contract logger during pre-work field session. At the same time, they are instructed to make sure the logger understands the map and written instructions and that he will review same with all appropriate crew employees, explaining clearly that no work is to be done within the protected area.

The forester signs the check-off sheet as required acknowledging discussion and understanding of harvest plan and site specific considerations. Check-off sheets will be either UPM/Blandin Paper's Site Harvest Plan or generic Site Requirements Checkoff, or various government sign-off forms.

Contractors are to obtain approval from the company forester prior to commencing harvest activities. Any changes to harvest regulations or cutting area must be approved by forester.

If during field operations the contractor reports previously unidentified features and forester deems them to be significant, the site plan maps are to be updated accordingly.

Impact 10 Projected harvesting causing accelerated erosion from forest roads

The application of the appropriate Voluntary Site-level Forest Management Guidelines regarding forest roads and riparian areas are the mitigation for this impact; see the Guidelines, Forest Roads, pages 1-47 and Riparian Areas, pages 1-13. The Proposer is committed to following this guideline for harvest occurring on its own lands, and with rare exceptions, and is following it also for all non-industrial private forest lands and government lands where it controls the stumpage.

The principal approach under these guidelines is to provide safe and efficient access to harvest sites while disturbing the smallest amount of the site possible. With proper planning, construction, and maintenance, the amount of erosion and resulting sedimentation from the creation of new forest roads can be minimized. Measures applied must be configured to the specifics of the site and include considerations on design, alignment and location, water crossings, and drainage. Specific measures being employed by UPM/Blandin Paper to implement the applicable guideline include, but are not limited to, the following.

Contract Provisions

Blandin contracts require contractors to comply with Minnesota BMPs for water quality protection, including road-related measures, in all of their activities.

Contractors providing road-building services that contract directly with UPM/Blandin Paper Company are supervised by Company Foresters. Contractors performing such services receive on-the-job training in applicable Minnesota BMPs and the Company's procedures.

Forest Roads – Design Considerations

UPM/Blandin Paper requires that roadway planning should:

- Examine existing access routes to determine whether they are the best routes to improve, and consider whether relocation would provide a better long-term access route.
- Consider future management activities that may utilize common roads for adjacent stands or ownership.
- Minimize total road mileage and ground disturbance required to meet landowner objectives.
- Limit the area disturbed by roads to less than 1-2 percent of the management area.
- Establish appropriate stabilization, drainage and erosion control measures, to be applied on a daily basis during all phases of an operation.
- Minimize road width consistent with road safety and design considerations.
- Recognize that if road closure is anticipated, the road approaches should be designed to facilitate effective closure after completion of management activities.

Forest Roads – Alignment and Location

UPM/Blandin Paper requires that roadway planning should:

- Identify prior to construction locations for construction of new roads, borrow areas, and gravel pits that avoid cultural resources and sensitive areas.
- Locate roads to minimize the amount of cut-and-fill and the number of wetland crossings.
- Locate roads away from lakes, streams, open water wetlands, wetland inclusions, seasonal ponds, seeps and springs wherever possible, to provide adequate filter strips.
- Wherever practical, locate roads outside of filter strips or the riparian management zone, whichever is wider.
- Locate roads to avoid concentrating runoff and reduce the potential for non-point source pollution.
- Avoid locating roads below the high water mark of lakes, streams, wetlands and seasonal ponds whenever possible.
- Avoid locating roads on unstable slopes subject to slumping or creep whenever practical.

- Avoid constructing roads with grades in excess of 10 percent; on highly erodible soils, maximum grades of 5 percent are recommended.
- Minimize down-road flow and ponding by constructing roads with a slight grade of 1 percent or 2 percent and with appropriate ditches where practical.
- Plan forest roads to be a minimum distance of 4,000 feet apart and a maximum of 5,000 feet.

Forest Roads – Maintaining Water Quality and Minimizing Erosion

The company requires the following actions to be made to maintain the effectiveness of erosion control measures:

- Regularly inspect drainage and erosion control structures.
- Keep debris clear from culverts, ditches, dips, and other structures to prevent clogging.
- Move debris away from water and stabilize if necessary.
- Maintain natural surface drainage patterns during each phase of maintenance.
- Control subsurface drainage consistent with natural drainage patterns.

Forest Roads – Monitoring

UPM/Blandin Paper will conduct monitoring of water quality BMP implementation on all fee and purchased stumpage tracts.

Impact 15 Projected harvesting in the absence of visual management guidelines (VMGs) on visually sensitive areas

The application of the appropriate Voluntary Site-level Forest Management Guideline regarding application and use of VMGs is the mitigation for this impact; see the Guidelines, Visual Quality, pages 1-9. The Proposer is committed to following this guideline for harvest occurring on its own lands, and with rare exceptions, and is following it also for all non-industrial private forest lands and government lands where it controls the stumpage.

The basic tenet of mitigating adverse harvest-related impacts to sensitive visual resources is to ensure such features are recognized in harvest planning and taking steps to reduce impacts from harvest-related activity (e.g., road development; site preparation). Specific measures being employed by UPM/Blandin Paper to implement the applicable guideline include, but are not limited to, the following.

Visual Quality and Aesthetics Program

The Proposer is committed to considering the visual impacts of its management activities and managing appropriately. The visual quality and aesthetics program is designed to create a pleasant managed forest landscape and also address special requirements indicated by sensitive view sheds. Program goals are achieved by utilizing a comprehensive system that addresses aesthetic considerations in concert with recognition of the interaction and trade-offs between this program and other landowner objectives for forest productivity, and wildlife habitat dynamics.

The basis of the company's aesthetic guidelines is MFRC's Voluntary Site-level Forest Management Guidelines. The Sustainable Forestry Initiative's performance measures and core indicators also provide additional aesthetics standards and metrics.

Until UPM/Blandin Paper acquires route sensitivity data for the GIS, foresters are directed to use their best judgment to classify sites and routes as most sensitive, moderately sensitive or less sensitive according to Minnesota Forest Management Guidelines and plan cutting blocks accordingly. Layout of the harvest is to include design features from guidelines where practical.

Additional visual quality techniques include:

- Reduce apparent size of clearcuts by using patches of leave trees, topographic features, and narrow openings along roadsides.
- Eliminate or minimize slash within first 50 feet from travel routes or recreational areas.
- Limit slash along sensitive routes to maximum height of 2 feet, avoid windrows or slash piles.
- Regenerate and/ or stabilize landings ASAP after use.
- Leave all snags possible; however, some situations call for removal for safety, aesthetics, or disease prevention.
- Avoid tracking mud onto highways by using appropriate road surface material.
- Limit operation of heavy equipment during periods of peak recreational use or normal sleep hours, or defer harvest until after peak tourist season.
- Inform and educate recreational users about the harvest activity and limits to their being on site.

Impact 16 Projected development of permanent roads in primitive and semiprimitive nonmotorized areas

No Project-specific mitigation is proposed for this impact area.

Impact 17 Projected harvesting affecting unique cultural and historical resources

The application of the appropriate Voluntary Site-level Forest Management Guideline regarding the identification and avoidance of unique cultural and historical resources is the mitigation for this impact; see the Guidelines, Cultural Resources, pages 1-24. The Proposer is committed to following this guideline for harvest occurring on its own lands, and with rare exceptions is following it also for all non-industrial private forest lands and government lands where it controls the stumpage.

The basic tenet of mitigating adverse harvest-related impacts to sensitive visual resources is to ensure such features are recognized in harvest planning and taking steps to reduce impacts from harvest-related activity (e.g., road development; site preparation). Specific measures being employed by UPM/Blandin Paper to implement the applicable guideline include, but are not limited to, the following.

Pre-harvest Inspections

Area Foresters should walk over cutting blocks at least twice before any work is done. During the planning phase while taking volume plots, they are required to look for cultural and historic sites. When located, these features are to be recorded in the company GIS. Special features are to be marked on the ground with pink paint or ribbon as appropriate so that the operator thoroughly understands and can locate them. All highly sensitive features and all riparian areas adjacent to trout waters are to be marked by foresters.

Foresters are to review this information with the contract logger during pre-work field session. At the same time, the company requires that the logger understands the map and written instructions. The contract logger is to review this information with all appropriate crew employees, explaining clearly that no work is to be done within the protected area.

Forester are to sign the check-off sheet as required acknowledging discussion and understanding of harvest plan and site specific considerations. Check-off sheets will be either UPM/Blandin Paper's Site Harvest Plan or generic Site Requirements Checkoff, or various government sign-off forms.

Contractors are to obtain approval from the company forester prior to commencing harvest activities. Any changes to harvest regulations or cutting area must be approved by forester.

If during field operations the contractor reports previously unidentified features and forester deems them to be significant, the site plan maps are to be updated accordingly.

5.4 ADDITIONAL INFLUENCES NOT EVALUATED BY THE GEIS

The Final Scoping Decision requires the DEIS to consider other factors not anticipated by the GEIS and how these could affect the respective impact projections.

5.4.1 INVASIVE PLANT SPECIES

Timber harvest or other activities can result in the introduction or spread of non-native invasive plant species through the transport of seeds to disturbed, uninfested sites by vehicles, machinery, or clothing (e.g., typically footwear). These plants out compete native species potentially resulting in habitat degradation. In general these invasive plant types require sites exhibiting disturbed soils with good light, which is potentially available through forest road and skid trail development. Forest productivity and health, and habitat for both plants and animals, can be adversely affected by the introduction and establishment of invasive plant species.

5.4.2 DEER BROWSING

Excessive deer browsing can impede tree regeneration to damaging levels, even to potentially eliminating native plants important to biodiversity retention or limiting success in post-harvesting regeneration efforts. The latter, reduced regeneration success can affect DEIS assumptions about the regeneration of harvested conifer types, especially upland conifers such as jack pine and white pine.

5.4.3 OFF-HIGHWAY VEHICLE USE

Unmanaged off-highway vehicle (OHV) use, whether for utilitarian or recreational purposes, can result in adverse impacts to forest soils and vegetation. While OHV operation on designated forest roads or recreational trails is typically sustainable, travel off designated routes can create and/or sustain disturbed conditions in terms of soils and vegetation. This results in potential for erosion or sedimentation to natural waters through soil mass movement or rutting. Because harvest-related activity can open new areas for OHV access post-harvest, there is potential for harvest-related water quality BMPs to be compromised by later OHV-related activity. OHVs can result in disturbance-type effects to wildlife species that are sensitive to intrusion.

5.4.4 INVASIVE INSECT AND DISEASE RISKS

Gypsy Moth

The Gypsy moth is a major invasive insect species that causes widespread tree mortality. It primarily defoliates hardwood trees including oak, aspen, basswood, and birch. During outbreaks, oak and aspen will experience the bulk of the defoliation and will undergo light to severe defoliation. Aspen on wet or very poor sites and over-mature aspen may suffer significant mortality. The climate in northern Minnesota is now severe enough to limit gypsy moth population growth; into the future this may not be so depending upon climatic and genetic factors. Because of the large aspen cover type with significant areas on wet and poorer sites, gypsy moth impacts could be a major negative impact over the 40 year scoping horizon. Wood quarantines from known areas of infestation (such as Wisconsin and Michigan) and a healthy forest condition are the best known deterrents to gypsy moth damage. Harvests and intermediate thinning can be applied to reduce food quality and shelter for gypsy moth larvae and pupae. The released trees will grow larger, more vigorous crowns that are more likely to survive defoliation. These methods decrease the likelihood and severity of defoliation and to improve the vigor of forest stands thereby increasing tree survival following gypsy moth defoliation.

Oak Wilt

Oak wilt, caused by the native fungus, *Ceratocystis fagacearum*, is one of the most serious diseases of oaks *(Quercus)* in the Midwest and kills thousands of oak trees every year. The disease causes clogged water conducting vessels, leading to wilt and death of infected trees. Red oaks are more susceptible than white oaks and can die within a few weeks. Spread of the disease occurs both above and below the ground. New infection centers are created when certain species of beetles pick up fungal spores from infected trees and carry them to healthy trees. If these beetles land on fresh wounds, the tree will likely become infected. Belowground spread occurs when the fungus grows from infected trees to healthy trees through grafted roots. Oak wilt is a potentially serious problem for southern and central Minnesota forests. In thinning stands attention must be given to not damaging remaining trees. Areas impacted by the proposed Project are not likely to affect oak stands in the geographic range where the risk is significant.

Sudden Oak Death

First observed in 1995 in California, Sudden Oak Death is the disease that has been killing large numbers of oak trees in coastal areas of California and southern Oregon. The pathogen, recently identified as *Phytophthora ramorum* (*P. Ramorum*), occurs on many plants in addition to oaks, including several ornamental species. Spread of the disease is not thoroughly understood at this point, but nurseries in many States have received infected ornamental stocks from nurseries on the west coast. Oak forest types cover over 50 percent of all timberland in the Eastern United States and are also highly valued urban trees. Because research indicates that some eastern species of oak are susceptible to P. ramorum, this disease poses a major threat to our region, and many States have placed quarantines on nursery stock from California. Avoidance of timber harvesting during drought times may reduce the degree of damage from this organism.

Emerald Ash Borer

The emerald ash borer, *Agrilus planipennis*, was discovered infesting and killing thousands of ash trees *(Fraxinus spp.)* in southeastern Michigan in summer of 2002. Evidence now suggests that *A. planipennis* first entered Michigan at least 5 to 10 years ago. The State of Michigan imposed quarantine on movement of ash trees and ash wood products to limit human-assisted spread of this pest. Canada and Ohio also initiated quarantines in 2003. It is not known how far north this insect may spread, however introduction to Minnesota would be a major impact to the ash resource. At this time, the best way to control spread to Minnesota is banning imports of ash logs and lumber from Michigan and Wisconsin. Timber harvesting does not increase the risk of increased damage and would act as a way to salvage dying trees and possibly delay the spread of the agent.

Asian Longhorned Beetle

The Asian longhorned beetle is an invasive species originating in China and North Korea. The beetle came to America in pallets and was first detected in 1996 in New York. The beetle has also caused considerable damage in Chicago from a 1998 infestation. The Asian longhorned beetle is a serious and expensive threat to North American hardwood trees. It is not known how far north this insect may spread. Timber harvesting does not increase the risk of increased damage and would act as a way to salvage dying trees and possibly delay the spread of the agent. Minnesota has a huge acreage of susceptible species (i.e. aspen and maple).

Hypoxylon Canker

Mortality from hypoxylon canker was covered in the GEIS but not to the extent that aspen could be commercially or pre-commercially thinned over significant areas. This is now being done on the Blandin

Paper Company's lands. A Minnesota study addressed the incidence of Hypoxylon canker related to pre-commercial compares canker prevalence, tree mortality, tree density, height, diameter, and volume between two thinned treatments (Ostry, Rugg, Ward, 2004). Over time there did not appear to be an increased degree of tree mortality due to cankers in thinned stands. However care must be taken not excessively damage remaining aspen stems in the thinning process.

5.4.5 CHANGES IN FOREST OWNERSHIP CLASS

The GEIS did not project the current shift in industrial forestlands to timber management organizations (TMOs) and resulting changes in management. To date only one major change has happened in Minnesota, resulting in the sale of 308,000 acres. The perceived disadvantages of these changes are that the lands may not be managed as sustainability as with industrial owners and that the lands will be sold off for development. The tax advantages for real estate investment trusts (REITs) and other TMO business structures improve returns on a historically low rate of return forestry business. The perceived advantages of these new owners from a forest management perspective is that they tend to be focused on growing forests in a natural manner, and merchandizing wood to its highest value, thereby serving markets better.

TMO owners will dispose of the higher and better use lands but these lands usually represent a small percentage of the forest ownership. There will likely be more shifts to these types of structure during the coming years, mostly in the form of Forest Management REIT's. In Minnesota there is no track record to judge the impact of these types of ownership changes.

While not a change in ownership class, one larger private owner has began a hunting lease program that restricts public use of lands traditionally open to hunting and other recreational purposes. This activity may impact traditional recreational values including hunting and access to other forestlands, but to what extend is not known at this time.

5.4.5.1 Natural Growth Stage Mix of Proposer-Managed Lands

The Final Scoping Decision required a qualitative assessment of how rotation-ages by tree species or NPC will change the natural growth stage mix of Proposer-managed lands.

Description of Company Lands

The Blandin Paper Company lands (193,340 acres) are comprised of 9 percent plantations (mostly white spruce, *Picea glauca*) and 91 percent natural forests and wetlands. Of the 91 percent natural forest (in a landscape perspective), 52 percent are plant communities that are mainly comprised of aspen (*Populus tremuloides*), birch (*Betula papyrifera*), spruce (*Picea glauca*), and fir (*Abies balsamea*); 22 percent are northern hardwood communities comprised of sugar maple (*Acer saccharum*), basswood (*Tilia americana*), and yellow birch (*Betula alleghaniensis*); 15 percent are pine communities comprised of red pine (*Pinus resinosa*), white pine (*Pinus strobus*), and jack pine (*Pinus banksiana*); and 11 percent are non-forested wetlands and sensitive forested wetlands (northern white cedar, *Thuja occidentalis*). Forests studied vary from pure stands to mixed species, and all together contain 21 different tree species, numerous shrub species, and several hundred forb species.

Forest Age Classes

The company's forestland exhibits the following age class distribution:

Current Age Classes

- 0-49 = 64 percent
- 50-79 = 22 percent
- 80-99 = 8 percent
- 100+ = 6 percent

Habitat Typing Approach

The GEIS did not project the current shift in industrial forestlands to timber management organizations (TMOs) and resulting changes in management. To date only one major change has happened in Minnesota, resulting in the sale on 308,000 acres. The consequences of such shifts in ownerships are difficult to project; there is little precedent for this activity in Minnesota. Much rests on the management objectives of the new landowner. To the degree that future management continues to emphasize sustainable forest management, little or no effect may be present. Conversion of forest land to other land uses is an impact identified by the GEIS.

Company land managers consider habitat type in their decisions on where to use a life-cycle management approach. Attempts are made to balance productivity with ecological considerations. Management emphasis is to capture the natural productive capacities of best site lands (about 52 percent of productive land) to grow the most wood for mill use and trading stock while providing a reasonable financial rate of return. This requires combining habitat typing and ecological management with semi-intensive silvicultural practices. The ecological goal over a 50-year period is to gain similar biodiversity and successional conditions to non-managed (custodial approach) 65-year-old stands. Higher quality wood is expected to be obtained in shorter timeframes through the use of ecological principles, which is the principal focus the life-cycle approach.

The "Habitat Type" (plant classification) forest classification system was developed by Dr. John Kotar (Kotar and Burger, 2000). This was combined with traditional forest cover types and soil typing. Lands were then divided into ecological capability classes. From this point, Class 1 and 2 were targeted for a life-cycle approach; see Table 5-22.

Table 5-22

Seven Management Strategy Matrix

	CLASS 1 Production Forests	CLASS 2 Quality Forestry	CLASS 3 Maintenance Forestry	CLASS 4 Special Management Areas
Physical Description	Highly suited to aspen and/or spruce-fir establishment 2. Planted forests 3. Idle Ag-lands	Above average productivity potential, mostly upland sites	Below average productivity potential, many lowland sites	Unique areas: old forests, biotopes, corridors, etc.
Goals	Maximum volume growth in least time; quality and uniformity of fiber.	Capture natural forest value and volume potential. Practices emulate nature at key times in structural development; wood quality	Harvest and regenerate; selective harvests possible. Low inputs, multiple use	Protect and enhance biodiversity, social stewardship
Habitat Types (See Table 5-23 for code definitions)	ATiCa, ATiPo, AAbAa, AbArAo, AbFnAu, AbThSp	AtiCa, AtiPo, AAbAa, AbArAo, AbFnAu, AbThSp, AbArV, AbArV-Ly, FnTiAt, AbPiV, AbPiG, AbPiP1	AbThLe, AbFnThAn, AbFnThAn-Moss, FnLa, PmCh, PmP1	Any

Table 5-23

Habitat Type Codes

Habitat Code	Tree Species
AbPiPl	*Abies balsamea, Picea glauca, Pleurozium spp.*
AbPiG	*Abies balsamea, Picea glauca, Gaultheria procumbens*
AbPiV	*Abies balsamea, Picea glauca, Vaccinium angustifolium*
AbArV	*Abies balsamea, Acer rubrum, Vaccinium angustifolium*
AbArV-Ly	*Abies balsamea, Acer rubrum, Vaccinium angustifolium, Lycopodium spp. variant*
AbArAo	*Abies balsamea, Acer rubrum, Apocynum androsaemifolium*
AAbAa	*Acer saccharum, Abies balsamea, Aralia nudicaulis*
ATiCa	*Acer saccharum, Tilia americana, Polygonatum pubescens*
ATiPo	*Acer saccharum, Tilia americana, Caulophyllum thalictroides*
FnTiAt	*Fraxinus nigra, Tilia americana, Athyrium filix-femina*
AbFnAu	*Abies balsamea, Fraxinus nigra, Asarum canadense*
FnLa	*Fraxinus nigra, Laportea canadensis*
AbFnThAn	*Abies balsamea, Fraxinus nigra, Thuja occidentalis, Alnus rugosa*
AbFnThAn-Moss	*Abies balsamea, Fraxinus nigra, Thuja occidentalis, Alnus rugosa, moss variant*
AbThSp	*Abies balsamea, Thuja occidentalis, Sphagnum spp.*
AbThLe	*Abies balsamea, Thuja occidentalis, Ledum groenlandicum*
PmCh	*Picea mariana, Chameadaphne caliculata*
PmPl	*Picea mariana, Pleurozium spp.*

Table source: Kotar and Burger. 2000. Field Guide to Forest Habitat Type Classification for North Central Minnesota

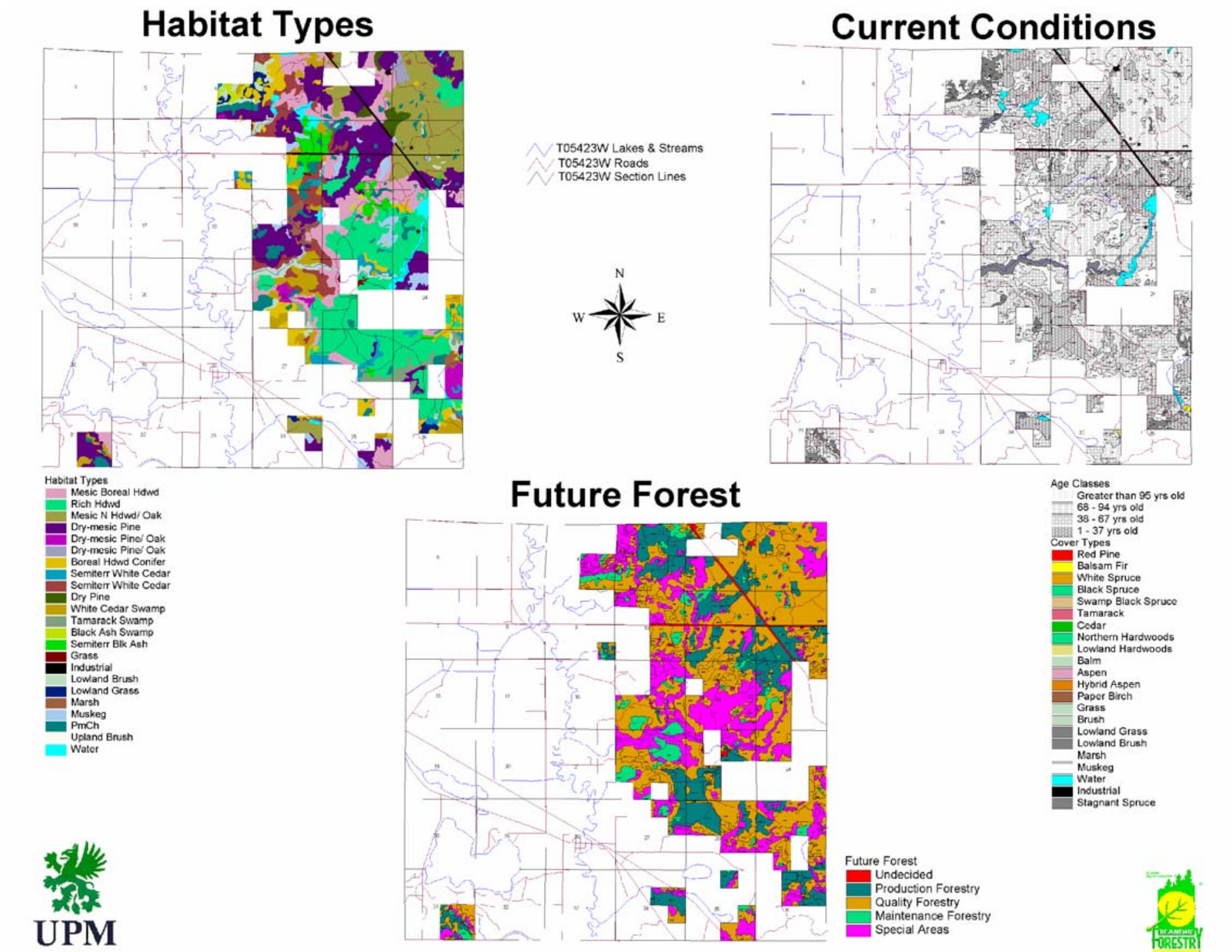
Repeated exams are made of each stand of trees during its natural lifetime and appropriate action is taken, if needed; measures include regeneration success monitoring, pre-commercial spacing, commercial thinning(s), and regeneration harvest. In certain cases, this harvest may be preceded by silvicultural treatments designed to assist natural reforestation processes. An example might be scarification of the forest floor using anchor chaining to expose mineral soil for seedbed development in oak or mixed-conifer forest types.

Life-cycle forestry means each forest parcel will be entered 3-5 times during its lifetime, from seedling to regeneration harvest. Some sites may only need attention at regeneration harvest, then a check for survival/regeneration in the next couple of years. However, most sites will need to be given a pre-commercial thinning/spacing, possible commercial thinning, and some will see several thinnings. Site index 70 has been the lower limit for pre-commercial aspen thinning. Northern hardwoods on rich habitat types are managed in an all-age system, with continuous cover.

Whenever feasible, loggers perform silvicultural stand treatments before or following harvest, or before leaving the site, for maximum cost efficiency. Mixed stands of aspen, balsam fir, and spruce, when occurring on certain habitat types, will be the focus of this management template. These stands offer the greatest opportunity to gain or restore conifers by using alternative cutting patterns and natural regeneration by seeding, limiting aspen suckering, and follow-up supplemental tree planting. Gains in species diversity are one result, such as the reintroduction of white pine on appropriate sites where it is not currently found. Other considerations are neighboring ownerships, structural diversity of neighboring forest areas, and forest certification requirements.

UPM/Blandin Paper has established goals for future forest conditions consistent with the Management Strategy Matrix. See Figure 5-31, Future Forest on Company Lands, for a depiction of the management prescriptions (and related goals) for company-owned lands.

Figure 5-31
Future Forest on Company Lands



5.5 ALTERNATIVES FOR ADDRESSING POTENTIALLY UNMITIGATED IMPACTS UNDER THE BUILD ALTERNATIVE

The GEIS identified 17 areas of potentially significant cumulative environmental impact that could be attributed to statewide timber harvest. The GEIS concluded that mitigation was available to address these impacts, however even with implementation of its recommendations it was likely that cumulative unmitigated impacts would remain; see Final GEIS Section 5.7.4. For statewide timber harvest, these potentially unmitigated impacts are: loss of forest area and timberlands; changes to age class and cover type structure; incidence of pest and disease; impacts on biodiversity; impacts on forest soils, including nutrients, soil physical structure, and erosion; impacts archaeological and cemetery sites; impacts on traditional use sites; loss of primitive and semiprimitive non-motorized recreation opportunities; impacts on motorized recreational uses; and impacts on tourism and travel-based industries.

In terms of the Build Alternative, the Project could contribute to the cumulative unmitigated impacts resulting from statewide timber harvest in the following areas: impacts on biodiversity (Impact 5); forest soils – nutrients (Impact 8); forest soils – erosion (Impact 10); loss of primitive and semiprimitive non-motorized recreational opportunities (Impact 16); and impacts on cultural and historic resources (Impact 17). The Final Scoping Decision requires the DEIS to consider the Project's potentially unmitigated impacts in terms of: 1) alternative sources of wood fiber; 2) investments to increase forest utilization and productivity; and 3) alternatives incorporating reasonable mitigation measures.

5.5.1 ALTERNATIVE SOURCES OF WOOD FIBER

UPM/Blandin Paper's current and future mill operations propose to use aspen-type roundwood. Aspen is the principal species used by pulp-based industries production in Minnesota. Substituting species other than Minnesota aspen is considered one means to lessen the impacts associated with the state's heavy industry reliance on aspen. Measures available to the Proposer include:

5.5.1.1 Use of Imported Roundwood

The Proposer uses wood from both Minnesota and non-Minnesota sources. The Proposer anticipates that approximately 73 percent of the roundwood would be purchased from Minnesota sources with the balance of 27 percent coming from roundwood imports, principally from Canada, Wisconsin, and Michigan. Use of wood from non-Minnesota sources results in a *de facto* reduction of the Project's contribution to statewide cumulative effects.[56]

5.5.1.2 Mix Flexibility

UPM/Blandin Paper has flexibility in the percentage mix of the primary use species (e.g., aspen, spruce, balsam fir). The company reports that significant amounts of spruce can be substituted for aspen during

[56] The DEIS analysis assumes that all of the wood used to supply the project will be from Minnesota. This is done to evaluate the maximum possible timber harvest effects from project implementation

times of tight aspen supplies, which are most likely to occur over the next 10-15 years. Flexibility is also present for balsam fir; greater amounts of balsam have been used at the mill in the last few years since this species has become more available as a result of the spruce budworm infestation. The ability to shift within the mix of existing species will remain a feature of wood procurement and associated mill operation under the Build Alternative.

5.5.1.3 Non-target Species Marketing

The Proposer's procurement activity can result in the acquisition of non-targeted types of roundwood (e.g., species other than aspen, spruce, or balsam fir). When UPM/Blandin Paper acquires this type of roundwood, either from harvesting operations on its own lands or through open-market purchases, this wood is marketed to other mills in the area for use. This activity provides for substitution species other than aspen generally, and may provide additional aspen, balsam, and spruce in the market for purchase and use by the Proposer.

5.5.1.4 Species Substitution

Only aspen, balsam fir and spruce trees have so far proven technically feasible for the specific grade of paper UPM/Blandin intends to produce as part of the Thunderhawk Project. Basswood and cottonwood are also species that do not fulfill the end product quality specifications today, but might someday with further advances in technology. Species that are not acceptable in any amounts are tamarack, cedar, hard maple, birch, or oak. Flax fiber, which is a byproduct of flaxseed oil generation, is receiving attention as an alternative fiber source. At present, it is infeasible for flax fiber to be used as a substitute for roundwood-generated pulp, although research is underway on this issue.

Relevant technical issues regarding species substitution include:

1. *Fiber quality*. Wood fiber characteristics must match the quality standards of the finished paper product. Red pine fiber is used in small amounts by some mills to manufacture various grades of paper; red pine-type roundwood availability could be achieved through increased plantation thinning. The Proposer has evaluated the use of red pine as a substitute fiber source. Test data show the presence of relatively high levels of pitch or extractives requiring process modifications; additional expense would be incurred if the use of red pine increases significantly.
2. *Variability and Logistics.* Pulp and paper processes require consistency. To reduce variability, any new species used needs to be stored separate from other species, and metered into the wood flow in even, consistent proportions. As the number of species used at the mill increases, the complexity of onsite management (e.g., hauling, storage, sequencing) increases, which in turn can be cost prohibitive. Alternate species also need to be available in steady, predictable quantities.

The Proposer indicates the firm is continually conducting fiber tests. Use of alternative sources of wood fiber will occur subject to process specifications and operational feasibility.

5.5.1.5 Poplar and Aspen Plantations

Developing aspen substitutes will be most important during the next 10 to 15 years due to tight supplies. Up to 10 percent plantation grown hybrid poplars may eventually be available as a substitute for standard aspen. This fiber would come from farmer produced wood being grown on marginal farm lands that were likely in native forest in earlier times. Forestation of marginal agricultural lands with poplars or aspen would be a positive impact to forestland area and could help to balance age class structures of other native cover types. Planting stock used must be insect and disease resistant to mitigate pest and disease problems often associated with these operations. The 2004 DNR Forest Resources Report indicates that there are 22,000 acres of poplar plantations. Interview information indicates that approximately 2,000 acres are being added annually to the total acreage estimate.

Plantations of hybrid aspen and improved native aspen currently exist but are largely in the form of field trials. The Proposer reports that use of hybrid aspen as an alternative source of wood fiber will occur subject to process specifications and operational feasibility. Regarding the potential use of hybrid popular, the Proposer indicates that some fiber tests have been conducted, but the results are inconclusive.

DEIS-related modeling included consideration of shifting the species used to supply the Project from a mix of aspen and spruce-fir to all spruce-fir. Any such shift is expected to be relatively small in the terms of statewide consumption levels and this shift would likely be short-term in nature. Results suggest that over the relatively short planning horizon used, the cumulative impact on the age distribution of the lowland spruce cover type would not be great. However, an important assumption in the DEIS analysis to note was that conifer types harvested can be successfully regenerated as conifers.
In summary, potential Project-related contributions to the GEIS-identified unmitigated impacts can be potentially lessened through substitution of alternative fiber sources, feasibility of which still needs to be determined on a case-by-case basis as a function of ongoing research on process and quality specifications. Other measures probably provide a more proven opportunity to lessen impacts, including mix flexibility, non-target species marketing, use of imported roundwood, potential use of hybrid poplar and aspen, and potential shifting species to all spruce-fir. Of these, use of imported wood offers the most benefit to Minnesota's forest resources.

5.5.2 INCREASED UTILIZATION

In-woods utilization improvements were among the main GEIS major productivity/impact mitigation recommendations. Such improvements could come in several forms.

5.5.2.1 Change in Top Size Standard

UPM/Blandin Paper currently utilizes wood to a stringent maximum top size of 3 inches. There are examples of similar type industrial-type users of wood using a two-inch top size standard. Projected utilization gains from 3-inch top in 100-inch lengths include (in-woods measurements and data from Zasada, Hubbard, Adams, 1947; Schlaegel, 1975; Perala, 1971):

- Use stem to 2-inch top to nearest 4-foot length – Black spruce = 10.5 percent volume gain
- Use stem to 2 inch top to nearest 4-foot length – White spruce/balsam = 7 percent gain
- Use stem to 2 inch top to nearest 4-foot length – Aspen = 3.5 percent gain (based on current average stem size of older trees – gain will increase as average diameter becomes less in younger forests)

The Proposer concurs that changing the utilization standard to a 2-inch top diameter could reduce overall mill-related wood demand. Experience suggests, however, that aspen wood pieces of less than 3-inch diameter can become "lost" during the process of debarking, in turn breaking up during debarking. Any implicit gain in aspen volume is actually lost to the debarking process, thus ending up as boiler fuel. Regarding softwoods (e.g., spruce, balsam fir), the proposed addition of chipping capacity with the Project could possibly use wood down to the 2-inch top standard. However, the same debarking issue (as with aspen) of losing small pieces of wood would be present, which may have adverse cost and efficiency implications.

The Proposer indicates further study of the issue is necessary before it could commit to using wood to 2-inch top diameters.

5.5.2.2 Change in Wood Length Standard

The Proposer currently utilizes wood in 100-inch lengths. There are examples of other companies processing wood in multiple lengths, specifically 8, 12, 16, or 20 foot lengths to gain additional fiber from tops left in the woods when using only the 8-foot system. For example using the 8 foot system, if current utilization is to a 3 inch top and the harvester determines the next 8 foot log cut would be at 2.8 inches that portion is left in the woods. Multiple length processing would likely capture an additional 4 to 6 feet of the tree. Other advantages include: 1) facilitating improved in-woods merchandizing, 2) improved wood quality preservation (less moisture loss), and 3) reduced logger processing costs. Adoption of these utilization standards under the Build Alternative would remove an additional 63,000 green tons annually from the estimated 8,453,000 green tons now being removed under the No-Build Alternative.

UPM/Blandin Paper is considering this option, pending further study. The proposed Project design allows for the use of softwoods (not aspen) of lengths between 8-feet and 16-feet. Lengths shorter than 8 feet are infeasible due to storage safety considerations. Other factors requiring further consideration include changes to logging and wood handling systems and benefit-cost analysis. Further investigation is warranted, but changes and equipment upgrades are needed throughout the state's logging industry to improve the viability of this option.

5.5.2.3 Change in Cut-to-Length Processors

Utilizing more chainsaw cut-to-length (CTL) processors will further improve yields by 0.8 percent over feller/buncher/skidder/slasher system. The Proposer reports it has a history of encouraging loggers to invest in modern equipment, including CTL processors. Whether this occurs is outside the scope of the Project; UPM/Blandin Paper does not conduct its own logging operations nor does it purchase logging equipment for independent contractors. The company does encourage the general use of CTL equipment, including supporting college-level training courses devoted to CTL technology.

5.5.2.4 Advanced Screening Systems

Advanced screening systems are available to remove incipient decay fiber from quality fiber; this is not occurring under present mill operations. If used, the use of marginal quality wood could be expanded, thus improving overall harvest efficiency while providing additional waste as fuel for co-generation. The Proposer has no plans to install such a system.

In summary, it is estimated that utilization gains are potentially feasible and could add measurably to UPM/Blandin Paper's annual supply. The projected utilization gains apply to total wood consumed, not just the additional demand associated with Project proposal. Assuming an overall 7 percent utilization gain would add 28,000 cords of wood to UPM/Blandin Paper's annual wood supply. This would reduce the cumulative impacts of total Project-related harvesting by reducing the area harvested by UPM/Blandin Paper by up to 7 percent, or approximately 1,200 acres annually. Most of these measures have been, or are being, studied by the Proposer, with implementation possible as they become financially and operationally feasible.[57]

5.5.2.5 Silvicultural Practices

The Proposer conducts thinning and selective harvest on for both red pine and white spruce. This provides wood fiber while creating the opportunity to promote characteristics of the older growth stages of plant communities other than northern hardwoods, lowland hardwoods, and lowland conifer. UPM/Blandin Paper will thin its white spruce plantations a number of times before final harvest, thus promoting natural regeneration alone with other species in the process (to develop a multi-aged structure). Aspen thinning (precommercial and commercial) provides fiber but also assists with addressing the current aspen age class imbalance.

5.5.3 ALTERNATIVES INCORPORATING REASONABLE MITIGATION MEASURES

The Final Scoping Decision requires consideration of mitigation measures identified through comments on the scope or the draft EIS. Comment was offered during EIS scoping that the Project should be subject to binding procurement policies with its wood suppliers. DEIS Sections 5.3.2.3 and 5.3.2.4 detail the commitments by the Proposer to address the potentially adverse effects of timber harvest on its own

[57] Minnesota's forest products industry in general is considering and/or implementing these utilization measures where meeting production processes and product requirements are not cost prohibitive.

lands or through its open-market purchases. UPM/Blandin Paper has in place procedures and policies that when applied result in the avoidance and/or minimization, or mitigation, of the potentially adverse consequences of timber harvest. DNR does not propose further consideration of such an alternative.

CHAPTER 6.0
TOPICS ON WHICH SIGNIFICANT IMPACTS ARE NOT ANTICIPATED, BUT ADDITIONAL INFORMATION IS PRESENTED IN THE EIS

6.1 LAND USE AND ZONING

6.1.1 COMPATIBILITY WITH PLANS AND LAND USE REGULATIONS

6.1.1.1 Existing Conditions

The site was originally developed in 1901. Paper production for the present mill dates back to March 1902, when the Itasca Paper Company began to make its first newsprint with PM1. A second paper machine was added in 1921, which was followed by Charles K. Blandin's purchase of the mill in 1923. PM3 was installed in 1932, which coincided with a primary product change from newsprint to groundwood printing paper. The primary product again changed in 1955 to the production of coated groundwood printing paper. The PM4 line was added in 1963 to increase the mill's manufacturing capacity. PM1 and PM2 were retired in 1989 and 1932 respectively. The mill was downsized in 2003 with the permanent shutdown of PM3 and PM4. The current papermaking facility consists of two paper machines, PM5 and PM6, which are producing lightweight coated groundwood paper. The present mill site covers approximately 70 acres.

A dam was built on the Mississippi River at this site as part of the original development. Electricity has been produced at the site continuously since 1901. The mill's cogeneration plant was purchased in March of 2000 by Allete/Minnesota Power. The REC provides the mill's steam and a portion of the electricity used in paper production.

The proposed Project is subject to the City of Grand Rapids Comprehensive Plan, which was most recently updated in October 2003 and the city-adopted Zoning Ordinances. The Comprehensive Plan establishes city-wide development goals. In addition, the plan is the starting point for other land use controls, such as the zoning ordinances. The proposed Project is not subject to any other land use plans. The plan indicates that industrial uses should be located along major highway corridors, in industrial or business parks, and adjacent to existing industrial areas. There is a wide variety of land use types near the Project area, including industrial, business, commercial, public use, and residential. The Project is compatible with adjacent and nearby land uses.

The current land use on the mill site is industrial and is zoned SI-2, Shoreland Industrial Park 2; see Figure 6-1. This zoning will not change with the proposed Project. The present site consists primarily of building space, paved surfaces, parking lots, railroad track areas, and wood storage areas. The company has offices across the river from the mill; this area is zoned shoreland limited business (SLB). This area also includes the Blandin Club House and an office parking area for the UPM/Blandin Paper.

The present mill site, including the proposed location for PM7, is bordered on the south by the Mississippi River and paper mill reservoir, which is used locally as a recreational resource that supports a sport fishery. Areas to the north, northeast, and east contain retail businesses, offices, and commercial services. All are zoned as general business (GB), central business district CBD, and shoreland business (SB). GB and SB districts are intended to accommodate a broad range of retail goods and services uses and generally serve the entire community. Though not exclusively so, businesses in these districts are relatively free standing and tend to occupy independent building sites. They may enjoy close proximity to like businesses but depend primarily on good accessibility, high visibility, and a relatively large volume of passing traffic. CBD zoning correlates with downtown Grand Rapids and is intended to serve a regional clientele. It is diversified and intended to offer the full array of high value comparison goods and services; hotel, cultural, tourist, and entertainment services; high density residential; financial; general office, and public use.

Residential units located west from the wood storage area and south across the reservoir are zoned SR-2 and SR-1. The nearest residences are about 350 feet south of the mill, west of Pokegama Avenue. The Shoreland One and Two-Family Residence (SR-2) and Shoreland One-Family Residence (SR-1) Districts are low-density residential districts that generally correlate with existing nearby neighborhoods containing the platted lots of the city.

In addition, Syndicate Park, zoned as SPU – Shoreland Public Use, is located west of the residential area, that is, west of the woodyard. Syndicate Park is a city-owned neighborhood park. Essentially, it is one acre in area with playground equipment and a maintained lawn with mature pine trees.

6.1.1.2 Impacts

<u>Build Alternatives</u>

The proposed Project will occur on land zoned Shoreland Industrial (SI-2). The proposed addition of PM7 does not require the acquisition of additional private commercial properties or rezoning; however, the location of a new paper warehousing facility may require acquisition of adjoining commercial, residential, or public use properties, which in turn would require rezoning.

Paper Warehouse Option 2 involves the construction of a new warehouse just east of PM6. This warehouse would service both PM6 and PM7. This option would affect Block 17 and potentially Block 18 of the Old Mill District, a commercial area in downtown Grand Rapids. The proposed warehouse will require the acquisition of neighboring properties and buildings, displacement of existing businesses and loss of approximately 80 UPM/Blandin Paper Mill parking spaces in three separate parking lots on Block 17. Please refer to the Socioeconomic section for greater detail on the economic impacts. This area is

Figure 6-1

Land Use/Zoning Map Warehouse Options 2 and 4

currently zoned as CBD and would require rezoning from a business to industrial classification. In addition, the proposed warehouse would cause the abandonment of Third Street NW for a one-block segment between First Avenue NW and Second Avenue NW. Third Street NW is not a major traffic carrier or through street and currently ends at Second Avenue NW. With Paper Warehouse Option 2, the street would end one block east at First Avenue NW. Closing Third Street NW will cause changes in local business and loss of approximately 36 on-street parking spaces. Please see the Traffic section for a discussion of traffic-related impacts. The warehouse may cause visual impacts to the visual character of downtown Grand Rapids; see the Visual Impacts section.

Paper Warehouse Option 4 proposes a new warehouse to be built off site west of the mill's woodyard. Two special trucks would transport paper from PM6 and PM7 to the warehouse under this arrangement. Blandin Paper Company owns some of the property at this site, but additional property would be purchased to allow for this development. The additional property includes private residences and a city park, Syndicate Park; see the Socioeconomic section regarding residential displacements. Zoning would be required from shoreland residential and public use to an industrial category. The City's Comprehensive Plan states the area west of the current UPM/Blandin Paper Mill was identified as an area for industrial expansion and rezoning.

Warehouse Option 5 is proposed to be located in an established warehousing facility located in Duluth, Minnesota. The proposed warehouse option conforms to the current industrial zoning designation and no rezoning will be necessary; see Figure 6-2 Landuse/Zoning Map Warehouse Option 5. No significant land use or zoning impacts are anticipated with Warehouse Option 5.

No-Build Alternative

If the addition of PM7 and associated facilities is not implemented, land use, and zoning will remain as is.

6.1.1.3 Mitigation

Significant land use and zoning impacts are not anticipated by the proposed Project, thus mitigation is not required. Both local warehouse options would require acquisition of land and rezoning to an industrial classification. As stated in the City's Comprehensive Plan, industrial facilities should be located adjacent to existing facilities or in an industrial park. In addition, the area west of the woodyard was identified as an area UPM/Blandin Paper may expand towards. All mitigation measures that address the acquisition of properties and displacement of businesses and residences are discussed in the Socioeconomic section.

Figure 6-2

Land Use/Zoning Map Warehouse Option 5

6.2 LAND COVER

6.2.1 EXISTING CONDITIONS

Most of the Project area is developed, except for a swath of vegetation along the paper mill reservoir shoreline. The most prominent cover types are *Impervious Surfaces* (i.e., buildings or structures and paved parking areas and roads) and *Other*, which are mostly graveled and non-paved (earthen) areas throughout the mill site.

The anticipated cover type conversions and quantities, outlined in Table 6-1, are for each of the three Warehouse Options (No-Build or Build Alternatives) of the proposed Project. Existing Conditions is the breakdown of the current cover types on the mill site; see Figure 6-3 – Existing Cover Type.

Table 6-1
Anticipated Cover Types (acres)

Cover Type	Existing Conditions	Warehouse Option 2		Warehouse Option 4		Warehouse Option 5	
		No-Build Alternative	Build Alternative	No-Build Alternative	Build Alternative	No-Build Alternative	Build Alternative
Types 1-8 Wetlands	0	0	0	0	0	0	0
Wooded/Forest	0	0	0	1.25	1.25	0	0
Brush/Grasslands	0	0	0	0.25	0.25	0	0
Cropland	0	0	0	0	0	0	0
Lawn/Landscaping	7	7	9	12.75	10.75	7	9
Impervious Surface	48	50	50	52.5	57	49	49
Other	15	15	13	23.75	21.75	15	13
Total	70	72	72	90.5	90.5	71	71

6.2.2 IMPACTS

6.2.2.1 Build Alternative

The mill site cover type conversions are caused from the addition of structures associated with PM7, PM7 Finishing Area, Roll Shop, TMP, PCC Plant, Coating Kitchen, and new impervious surfaces around the woodyard. The PM7 building and TMP are planned to be constructed on the area of the mill that currently contains an empty building associated with PM3 and PM4, which is going to be demolished.

With the proposed Project, under all warehouse options, most cover type transitions will be from Other to Impervious Surface. The major construction activities will occur on the developed mill site by altering graveled and non-paved (earthen) areas to impervious areas, mainly through the construction of buildings. Warehouse Option 2 will transform a city block adjacent to PM6 that contains business and commercial uses to a warehouse. This will not cause a change in cover type as both existing and proposed conditions are considered impervious; see Figure 6-4 – Warehouse Option 2 Cover Type. The alteration would only increase the amount of impervious surfaces owned by UPM/Blandin Paper Mill. Warehouse Option 4 will convert Syndicate Park and the adjacent east neighborhood (the area surrounded by 16th Avenue NW and 14th Avenue NW and Third Street NW and Second Street NW) to a warehouse and associated driveway. This warehouse option will alter cover types from manicured lawns and impervious surfaces (e.g., houses and roads) to entirely impervious area (i.e., industrial building, parking, and roadways); see Figure 6-5 – Warehouse Option 4 Cover Type. The increase in impervious is approximately 4 acres. Warehouse Option 5 is located in an existing warehouse in Duluth, Minnesota. This option would not cause a land cover type conversion off of the mill site; see Figure 6-6 – Warehouse Option 5 Cover Type.

Cover type changes associated with Warehouse Options 5 would occur on the mill site only. Warehouse Option 2 would acquire adjacent developed property. The proposed warehouses under these options are planned for existing impervious areas. Along with the mill site conversions, Warehouse Option 4 would cause a cover type conversion by siting the warehouse on a city park and adjacent neighborhood. The city park is approximately one-half of a city block. The major conversion associated with this option will be from manicured lawn to impervious surfaces. No significant impacts to cover type conversion or any considerable amounts of conversions are anticipated from the proposed Project.

6.2.2.2 No-Build Alternative

Under the No-Build Alternative no land cover conversions will occur. Cover type categories and quantities will remain as is.

6.2.3 MITIGATION

The proposed Project is not anticipated to cause adverse cover type conversion or a large amount of conversion, thus no mitigation is necessary.

Figure 6-3
Existing Cover Type

Figure 6-4
Warehouse Option 2 Cover Type

Figure 6-5
Warehouse Option 4 Cover Type

Figure 6-6
Warehouse Option 5 Cover Type

6.3 WILDLIFE AND FISHERIES RESOURCES

6.3.1 EXISTING CONDITIONS

The bulk of the site supports wildlife species typical to an industrial setting. Animals present are those adapted to urban conditions where the availability of natural forage and cover is low. Species likely to be found in the area include crows, starlings, and rabbits. Better quality wildlife habitat is, however, available at the Project site's southern boundary along the paper mill reservoir and the Mississippi River. Species typical to northern Minnesota's riparian-type habitats may be present, including various small mammals, a variety of birds, and some reptiles and amphibians (e.g., turtles, frogs). This habitat is limited to narrow strips of natural vegetation located between the developed areas and the river that are broken up with stretches of more developed property.

The Mississippi River Paper Mill Reservoir and the Mississippi River abut the site's southern boundary separated by the Blandin Dam. The river above and below the dam exhibits a warm water fishery, including several species of sport fish. Species present include northern pike, walleye, muskellunge, spottail shiner, yellow bullhead, pumpkinseed, largemouth bass, bowfin, and common sucker. Other aquatic resources include various species of reptiles, amphibians, and invertebrates.

The DNR conducted a fisheries population assessment of the Paper Mill Reservoir in August 2004 using standard gill and trap net methods. No electrofishing data was available for this area. It is important to note that different sampling methods may show different results. For example, gill and trap netting do not sample largemouth and smallmouth bass species well. It appears that the Paper Mill Reservoir contains a fairly diverse assemblage of sport and non-sport species. In addition, this assemblage has remained constant with respect to species richness, species density, and species size. The results shown in Table 6-2 and Table 6-3 compare historic data with current data (2004) and illustrate that the fishery has been stable throughout the last 30 years.

Moreover, the Mississippi River below the Blandin Dam was sampled in 2000 by the MPCA and in 1998 by the United States Geological Survey (USGS). This data, as shown in Table 6-4, was collected using a boom electrofishing method. The data shows that the river appears to have a reasonably healthy cyprinid assemblage. The species present are typical of a warm-water river. The main stresses for fish upon this stretch of the river are low oxygen and temperature differentials during low flow periods from the warm water discharge. These impacts may be relatively minor considering the volume of water in the river to the discharge.

The DNR Natural Heritage and Nongame Research Program was consulted to determine if any rare plant or animal species, or any other natural significant features, are known to occur within the general area of the proposed Project. Records are available for two occurrences of rare species or natural communities that occur, or may occur, in the search area.

Table 6-2
Existing and Historic Gill Net Catch Summary

Survey Date	Number of Sets	Species Common Name	Fish Caught	Number per Set	Lbs. per Set	Mean Weight (lbs)
8/9/2004	9	Yellow Perch	59	6.56	1.37	0.21
	9	Yellow Bullhead	11	1.22	0.80	0.66
	9	White Sucker	3	0.33	0.73	2.19
	9	Walleye	6	0.67	0.65	0.97
	9	Smallmouth Bass	7	0.78	0.74	0.95
	9	Shorthead Redhorse	15	1.67	2.75	1.65
	9	Rock Bass	17	1.89	0.40	0.21
	9	Pumpkinseed Sunfish	33	3.67	0.73	0.20
	9	Northern Pike	24	2.67	5.89	2.21
	9	Largemouth Bass	3	0.33	0.47	1.41
	9	Bowfin (Dogfish)	5	0.56	2.90	5.22
	9	Bluegill	24	2.67	0.81	0.30
	9	Black Crappie	13	1.44	0.10	0.07
8/13/1996	9	Yellow Perch	46	5.11	0.64	0.12
	9	Yellow Bullhead	2	0.22	0.16	0.70
	9	White Sucker	9	1.00	1.99	1.99
	9	Walleye	16	1.78	2.43	1.37
	9	Silver Redhorse	2	0.22	0.62	2.81
	9	Shorthead Redhorse	5	0.56	1.28	2.30
	9	Rock Bass	43	4.78	1.35	0.28
	9	Pumpkinseed Sunfish	6	0.67	NA	NA
	9	Northern Pike	14	1.56	2.14	1.37
	9	Largemouth Bass	1	0.11	0.25	2.27
	9	Bowfin (Dogfish)	3	0.33	1.67	5.02
	9	Bluegill	1	0.11	0.00	0.04
	9	Black Crappie	2	0.22	0.06	0.28
8/13/1990	7	Yellow Perch	16	2.29	0.57	0.25
	7	Yellow Bullhead	23	3.29	2.51	0.77
	7	White Sucker	5	0.71	1.61	2.26
	7	Walleye	20	2.86	2.66	0.93
	7	Tullibee (Cisco)	2	0.29	0.40	1.40
	7	Shorthead Redhorse	11	1.57	3.86	2.45
	7	Rock Bass	5	0.71	0.27	0.38
	7	Pumpkinseed Sunfish	46	6.57	1.06	0.16
	7	Northern Pike	20	2.86	5.16	1.81
	7	Largemouth Bass	3	0.43	0.40	0.93
	7	Brown Bullhead	6	0.86	0.81	0.95
	7	Bowfin (Dogfish)	1	0.14	0.89	6.20
	7	Bluegill	18	2.57	0.83	0.32
	7	Black Crappie	4	0.57	0.14	0.25
	7	Black Bullhead	35	5.00	4.80	0.96

Survey Date	Number of Sets	Species Common Name	Fish Caught	Number per Set	Lbs. per Set	Mean Weight (lbs)
8/3/1987	8	Yellow Perch	82	10.25	2.45	0.24
	8	Yellow Bullhead	4	0.50	0.54	1.08
	8	White Sucker	5	0.63	1.40	2.24
	8	Walleye	9	1.13	1.00	0.89
	8	Shorthead Redhorse	8	1.00	2.56	2.56
	8	Rock Bass	16	2.00	0.94	0.47
	8	Pumpkinseed Sunfish	63	7.88	2.94	0.37
	8	Northern Pike	17	2.13	2.69	1.26
	8	Largemouth Bass	2	0.25	0.05	0.20
	8	Brown Bullhead	9	1.13	1.19	1.06
	8	Bowfin (Dogfish)	1	0.13	0.54	4.30
	8	Bluegill	5	0.63	0.06	0.10
	8	Black Crappie	5	0.63	0.11	0.18
	8	Black Bullhead	21	2.63	1.44	0.55
8/24/1983	7	Yellow Perch	18	2.57	0.41	0.16
	7	Yellow Bullhead	4	0.57	0.46	0.80
	7	White Sucker	6	0.86	1.84	2.15
	7	Walleye	4	0.57	0.60	1.05
	7	Shorthead Redhorse	2	0.29	0.50	1.75
	7	Rock Bass	17	2.43	0.87	0.36
	7	Pumpkinseed Sunfish	17	2.43	0.30	0.12
	7	Northern Pike	18	2.57	3.10	1.21
	7	Muskellunge	1	0.14	0.43	3.00
	7	Largemouth Bass	2	0.29	0.29	1.00
	7	Bowfin (Dogfish)	1	0.14	0.59	4.10
	7	Bluegill	1	0.14	0.03	0.20
	7	Black Bullhead	5	0.71	0.67	0.94
8/14/1978	9	Yellow Perch	43	4.78	1.09	0.23
	9	Yellow Bullhead	23	2.56	1.31	0.51
	9	White Sucker	9	1.00	1.39	1.39
	9	Walleye	18	2.00	1.58	0.79
	9	Shorthead Redhorse	5	0.56	1.06	1.90
	9	Rock Bass	12	1.33	0.32	0.24
	9	Pumpkinseed Sunfish	53	5.89	1.20	0.20
	9	Northern Pike	34	3.78	5.87	1.55
	9	Largemouth Bass	5	0.56	0.39	0.70
	9	Brown Bullhead	1	0.11	0.17	1.50
	9	Bowfin (Dogfish)	5	0.56	2.50	4.50
	9	Bluegill	6	0.67	0.20	0.30
	9	Black Crappie	10	1.11	0.39	0.35
	9	Black Bullhead	46	5.11	2.78	0.54

Survey Date	Number of Sets	Species Common Name	Fish Caught	Number per Set	Lbs. per Set	Mean Weight (lbs)
8/20/1973	2	Yellow Perch	3	1.50	0.25	0.17
	2	Walleye	3	1.50	2.10	1.40
	2	Rock Bass	4	2.00	0.50	0.25
	2	Northern Pike	5	2.50	1.50	0.60

Source: DNR, Grand Rapid Area Fisheries Office

Table 6-3
Existing and Historic Trap Net Catch Summary

Survey Date	Number of Sets	Species Common Name	Fish Caught	Number per Set	Lbs. per Set	Mean Weight (lbs)
8/9/2004	9	Yellow Perch	5	0.56	0.15	0.21
	9	Yellow Bullhead	1	0.11	0.11	0.66
	9	Rock Bass	1	0.11	0.04	0.21
	9	Painted Turtle	1	0.11	NA	NA
	9	Pumpkinseed Sunfish	3	0.33	0.03	0.20
	9	Northern Pike	3	0.33	0.39	2.21
	9	Bowfin (Dogfish)	1	0.11	0.55	5.22
	9	Bluegill	16	1.78	0.11	0.30
	9	Black Crappie	2	0.22	0.01	0.07
8/13/1996	9	Yellow Perch	5	0.56	NA	NA
	9	Yellow Bullhead	4	0.44	0.36	0.81
	9	Walleye	1	0.11	0.05	0.49
	9	Rock Bass	2	0.22	0.14	0.64
	9	Painted Turtle	10	1.11	NA	NA
	9	Pumpkinseed Sunfish	9	1.00	0.15	0.15
	9	Northern Pike	9	1.00	NA	NA
	9	Largemouth Bass	1	0.11	0.01	0.05
	9	Bowfin (Dogfish)	2	0.22	0.75	3.36
	9	Bluegill	11	1.22	0.34	0.28
	9	Black Crappie	4	0.44	0.14	0.31
8/13/1990	8	Yellow Perch	1	0.13	0.03	0.20
	8	Yellow Bullhead	3	0.38	0.26	0.70
	8	White Sucker	2	0.25	0.46	1.85
	8	Rock Bass	1	0.13	0.06	0.50
	8	Pumpkinseed Sunfish	4	0.50	0.06	0.13
	8	Northern Pike	1	0.13	0.34	2.70
	8	Hybrid Sunfish	1	0.13	0.05	0.40
	8	Brown Bullhead	1	0.13	0.20	1.60
	8	Bowfin (Dogfish)	3	0.38	2.11	5.63
	8	Bluegill	32	4.00	1.00	0.25
4/18/1988	0	Yellow Perch	1013	N/A	N/A	N/A
	0	Yellow Bullhead	106	N/A	N/A	N/A
	0	White Sucker	21	N/A	N/A	N/A
	0	Walleye	28	N/A	N/A	N/A

Survey Date	Number of Sets	Species Common Name	Fish Caught	Number per Set	Lbs. per Set	Mean Weight (lbs)
	0	Tullibee (Cisco)	1	N/A	N/A	N/A
	0	Shorthead Redhorse	2	N/A	N/A	N/A
	0	Rock Bass	233	N/A	N/A	N/A
	0	Pumpkinseed Sunfish	282	N/A	N/A	N/A
	0	Northern Pike	1435	N/A	N/A	N/A
	0	Largemouth Bass	11	N/A	N/A	N/A
	0	Brown Bullhead	56	N/A	N/A	N/A
	0	Bowfin (Dogfish)	194	N/A	N/A	N/A
	0	Bluegill	210	N/A	N/A	N/A
	0	Black Crappie	112	N/A	N/A	N/A
	0	Black Bullhead	16	N/A	N/A	N/A
8/24/1983	8	Yellow Perch	12	1.50	0.43	0.28
	8	White Sucker	4	0.50	0.93	1.85
	8	Walleye	3	0.38	0.36	0.97
	8	Rock Bass	2	0.25	0.09	0.35
	8	Pumpkinseed Sunfish	15	1.88	0.25	0.13
	8	Northern Pike	3	0.38	0.16	0.43
	8	Largemouth Bass	1	0.13	0.03	0.20
	8	Bowfin (Dogfish)	2	0.25	1.50	6.00
	8	Bluegill	15	1.88	0.48	0.25
	8	Black Bullhead	4	0.50	0.44	0.88
8/14/1978	12	Yellow Perch	28	2.33	0.67	0.29
	12	Yellow Bullhead	64	5.33	4.35	0.82
	12	White Sucker	24	2.00	4.13	2.07
	12	Rock Bass	8	0.67	0.33	0.49
	12	Pumpkinseed Sunfish	67	5.58	1.47	0.26
	12	Northern Pike	26	2.17	2.86	1.32
	12	Largemouth Bass	8	0.67	0.92	1.38
	12	Brown Bullhead	23	1.92	1.44	0.75
	12	Bowfin (Dogfish)	17	1.42	6.05	4.27
	12	Bluegill	100	8.33	1.87	0.22
	12	Black Crappie	39	3.25	1.53	0.47
	12	Black Bullhead	33	2.75	1.47	0.53
8/20/1973	5	Yellow Perch	11	2.20	0.52	0.24
	5	White Sucker	2	0.40	1.10	2.75
	5	Rock Bass	3	0.60	0.20	0.33
	5	Pumpkinseed Sunfish	2	0.40	0.10	0.25
	5	Northern Pike	7	1.40	1.32	0.94
	5	Largemouth Bass	1	0.20	0.50	2.50
	5	Brown Bullhead	7	1.40	0.60	0.43
	5	Bluegill	18	3.60	1.20	0.33
	5	Black Crappie	4	0.80	0.50	0.63

Source: DNR, Grand Rapid Area Fisheries Office

Table 6-4
Mississippi River Fish Population Assessments

MPCA Sampling Results			
Survey Date	Common Name	Number Collected	Cumulative Weight (g)
8/23/2000	Mimic Shiner	63	87.5
	Johnny Darter	99	99
	Northern Pike	6	2,271
	Shorthead Redhorse	56	31,787
	Spotfin Shiner	307	747
	White Sucker	106	4,429
	Common Shiner	509	1,327
USGS Sampling Results			
Survey Date	Common Name	Number Collected	Cumulative Weight (g)
7/22/1998	Blackchin Shiner	13	10
	Blacknose Shiner	308	235
	Bluntnose Minnow	1	3
	Brassy Minnow	13	6
	Emerald Shiner	26	22
	Largemouth Bass	26	135
	Northern Pike	4	1,317
	Rock Bass	8	1,082
	Sand Shiner	1	<1
	Shorthead Redhorse	1	316
	Smallmouth Bass	1	680
	Spottail Shiner	15	8
	Tadpole Madtom	1	6
	White Sucker	7	1,560
	Yellow Perch	51	2,139

Source: DNR, Grand Rapid Area Fisheries Office

Live specimens of two special concern mussel species, black sandshell mussel (*Ligumia recta*), and creek heelsplitter mussel (*Lasmigona compressa*), were documented in the Mississippi River approximately 2,000 feet downstream of the Blandin Dam. Black sandshell mussels are found in medium to large rivers where waters flow continuously through; most often they are embedded in gravel or firm sand. Creek heelsplitter mussels often occur in the creeks and headwaters of small to medium rivers, embedded in fine gravel or sand. Mussels are susceptible to water quality degradation from changes in runoff or other physical changes such as damming, channelization, dredging, and rapid changes in water levels (e.g., dewatering).

A mercury-related fish consumption advisory has been issued for the Paper Mill Reservoir and the Mississippi River; see Table 6-5 and Table 6-6.

Table 6-5
Fish Consumption Advisory for the Paper Mill Reservoir

Paper Mill Reservoir[1]					
Meal Advice for Pregnant Women, Women who may become pregnant and Children under age 15					
Species	**less than 15"**	**15" to 20"**	**20" to 25"**	**25" to 30"**	**greater than 30"**
Black Bullhead	◔				
Bluegill Sunfish	◔				
Cisco	◔				
Largemouth Bass	◔				
Northern Pike		◑	◑		
Shorthead Redhorse		◑			
Walleye	◑	◑	◑		
White Sucker		◔			
Yellow Bullhead	◑				
Meal Advice for the General Population					
Species	**less than 15"**	**15" to 20"**	**20" to 25"**	**25" to 30"**	**greater than 30"**
Black Bullhead	○				
Bluegill Sunfish	○				
Cisco	○				
Largemouth Bass	○				
Northern Pike		◔	◔		
Shorthead Redhorse		◔			
Walleye	◔	◔	◔		
White Sucker		○			
Yellow Bullhead	◔				
Symbol Key	**unlimited**	**1 meal per week**	**1 meal per month**	**1 meal every 2 months**	**do not eat**
Mercury	○	◔	◑		●
PCBs	□	◧	◩	◪	■

[1] *Year 2000 data from the Minnesota Department of Health*

Table 6-6
Fish Consumption Advisory for the Mississippi River from the Dam in Grand Rapids to the Dam in Brainerd

Mississippi River (Grand Rapids Dam to Brainerd Dam)[1, 2]					
Species	**less than 15"**	**15" to 20"**	**20" to 25"**	**25" to 30"**	**greater than 30"**
Black Bullhead	◑				
Black Crappie	◔				
Bluegill Sunfish	◔				
Bowfin			◑	◑	
Largemouth Bass	◔	◑			
Northern Pike	◔	◑	◑	◑	◑
Rock Bass	◔				
Shorthead Redhorse	◔	◔	◑		
Silver Redhorse		◔			
Smallmouth Bass		◑	◑		
Walleye	◑	◑	◑		
White Sucker		◑	◑		
Yellow Bullhead	◔				
Yellow Perch	◔				
Symbol Key					
Mercury		○	◔	◑	●
Women of child-bearing age and young children	unlimited	1 meal per week	1 meal per month	do not eat	do not eat
Other Persons	unlimited	unlimited	1 meal per week	1 meal per month	do not eat

[1] *Year 2000 data from the Minnesota Department of Health*

[2] *No PCBs fish consumption advisory was published for this reach of the Mississippi River.*

Currently water is appropriated from the Paper Mill Reservoir at the Blandin Dam. The current DNR permit allows a maximum of 16 billion gallons to be appropriated from the river each year or 43.9 mgd (Progressive Consulting Engineers, Inc. 2004). This appropriation supplies process and cooling water to the UPM/Blandin Paper Mill and cooling water to Allete/Minnesota Power. Currently, process water uses are 5.8 mgd, while cooling water use is 27.1 mgd during high-use summer months (AF 2005). Cooling water use varies seasonally with June through August being the highest use months. Thus, during high use months, the current water appropriation is about 32.9 mgd. The current structure is a sluice gate in the Blandin Dam that diverts water from the surface and has traveling screens for removing debris. The current water intake structure causes impingement and entrainment effects upon aquatic organisms as documented in a study by Mossier completed in 1977. Findings from this study are discussed below in the Impacts section.

Currently Allete/Minnesota Power's No. 6 turbine generator discharges warm water into the Minnesota River below the Blandin Dam under an MPCA NPDES permit. The mixing zone is approximately 1,000 ft long. The maximum temperature at the end of the mixing zone is 86º F, with a 5º F maximum temperature change throughout the mixing zone. During 2004, cooling water discharges ranged from 18.2 to 19.9 mgd as a monthly average for the period from June through September. Warm water discharges can reduce the receiving water's ability to hold dissolved gases (e.g., oxygen).

6.3.2 IMPACTS

6.3.2.1 Build Alternative

Impacts to Wildlife

Regarding wildlife species, the Project will result in little or no impact to wildlife species on or near the site. No habitat conversion is associated with the proposal. Noise-related disturbance will be present during construction, but this will be local, temporary, and limited to the construction period itself. Once the Project is built, it is possible that noise-related disturbance effects will be present for wildlife located in the immediate vicinity of the mill due to the round-the-clock operation of the woodyard or other facilities. Species present will either habituate to the noise or be displaced to neighboring habitat areas if available; the result of this displacement will be intra- and inter-specific competition that can result in a small, local population decline. Measures to reduce off-site noise propagation may reduce some of the disturbance effects. Minimal impact is anticipated.

The warehouse options are proposed to be located in previously disturbed areas that do not contain unique wildlife species or habitat, thus the proposed warehouse locations are not anticipated to cause adverse effects upon wildlife resources.

Impacts to Fisheries and Aquatic Organisms – Paper Mill Reservoir

Water intake structures can cause death or injury to aquatic organisms by impingement (being pinned against screens or other parts of a water intake structure) or entrainment (being drawn into the water system and subjected to thermal, physical, or chemical stresses). Aquatic organisms affected by these water withdrawals include fish, fish larvae and eggs, crustaceans, mollusks, invertebrates, and other free-floating microscopic plants and animals.

A previous impingement/entrainment study, 316(b)[58], completed in 1977 for the UPM/Blandin Paper Mill (Mossier, 1977), recorded the annual impingement with the current water intake structure (32.9 mgd) for summer months for both sport and non-sport fish to be 86.3 lbs. Mossier (1977) found that the seasonal pattern of impingement for most species was characterized by the absence or low presence of fish during the winter months, followed by a marked increase in mid- to late summer, and subsequent decline to near zero by late fall or early winter. Mossier (1977) thought that fish movements and the number of

[58] Clean Water Act §316(b) – Cooling Water Intake Structures

individuals available and susceptible to impingement appeared more critical than the fluctuations in cooling water flow rates encountered during the study period.

Moreover, Mossier's (1977) analysis approximated that 5.4 million fish were entrained during the study period. The study revealed the largest numbers of fish were entrained during the months of April through August. Through this period, entrainment rates fluctuated from month to month. The author thought that affected fish were present primarily during or immediately following their spawning season. As Mossier (1977) states, the entrainment and impingement effects upon individual fish of a species appear to be of the same cohort. Thus, young-of-the-year fish were first seen in entrainment samples, but as they grew larger they appeared in impingement samples.

The proposed Project will install a second water intake structure that will appropriate waters from the Paper Mill Reservoir. The existing water intake structure will appropriate water primarily for the proposed non-contact cooling system, whereas the new water intake structure will appropriate water mostly for plant processes. The proposed non-contact cooling system will only likely appropriate water over a 3-4 month period during the summer conditions. Currently all water (33 mgd) appropriated during high use months comes through the existing intake structure. In the future, the estimated appropriation for the new intake during high-use times is proposed to be 14 mgd (AF 2005). The estimated future appropriation through the existing intake is 20 mgd (AF 2005). This gives a total projected appropriation of 34 mgd during high use summer months (based on new DNR Water Appropriation Permit application – See Water Use section for a detailed analysis) for the UPM/Blandin Paper Mill.

Flows through the existing structure will decrease from maximum flows of 33 mgd or more to a maximum of 20 mgd. This should reduce the entrainment and impingement effects associated with the existing structure. The new water intake structure, regardless of water use, may cause intake structure-related impingement and/or entrainment in the absence of impact control measures. However, best available technologies and construction techniques that minimize impingement and entrainment are proposed for the intake structure. Construction of the new intake structure is expected to have little or no impact once operational. Adverse effects to the fishery resources of the Paper Mill Reservoir are not anticipated with the proposed Project.

Impacts to Fisheries and Aquatic Organisms – Mississippi River

The proposed installation of a non-contact cooling system will create a new warm water discharge into the Mississippi River. It will affect the same general reach of river associated with the current warm water discharge from Allete/Minnesota Power's No. 6 Turbine Generator. As discussed in the Water Resources – Water Use section, Allete/Minnesota Power's No. 6 generator and the associated warm water discharge will be terminated if the proposed Project is undertaken. Warm water discharges can reduce the receiving water's ability to hold dissolved gases (e.g., oxygen), maybe to levels too low to support some aquatic species, or at temperatures that can stress aquatic organisms. The potential impacts of water temperature, dissolved oxygen, and impact zone are expected to have a similar profile to the existing conditions. The thermal impacts are expected to be minor. Little or no adverse impacts are anticipated with this Project-related discharge. Detailed analysis of cooling water discharges is presented in the Water Use section 5.4.1.

6.3.2.2 No-Build Alternative

For the No-Build Alternative, no effects to wildlife or fisheries resources are anticipated. The wildlife habitat and species are expected to remain the same. The impingement and entrainment of the fisheries resources are expected to decrease or remain at current impact levels.

6.3.3 MITIGATION

The proposed Project is not expected to cause adverse effects on any terrestrial wildlife; therefore, no mitigation would be required.

The new structure will be designed using best available technologies. This includes meeting the EPA-recommended criteria of 1) limiting the approach velocity of water through the screens at the new inlet to less than 0.5 feet per second and 2) constructing the screen parallel to the riverbank at the inlet (Progressive Consulting Engineers 2004). Because of the reduction of flow through the existing intake, design of the new structure with best available technologies and permitting, little adverse effect beyond the current conditions for impingement and entrainment of aquatic resources are anticipated from the proposed Project.

Impingement and/or entrainment-related impacts are regulated under DNR's Public Waters Works Permit and Water Appropriation Permit Amendment. Measures available to reduce Project-related impingement/entrainment include conducting an impingement study, application of best available technologies (BAT) to the new intake, and using appropriate intake screen sizes, flows, depths, and pipe size to reduce velocities.

Regulations do not specifically identify the BAT. The BAT used will depend on the density, species composition, and timing of the spawn. The EPA is keeping this flexible and identifying BAT for each specific facility. Examples of the technologies in use include:

- Fish diversion or avoidance systems designed to divert fish away from intakes
- Passive intake systems such as non-mechanical screens
- Mechanical screen systems that prevent organisms from entering the intake system
- Fish return systems that transport live organisms away from the intake system

Regarding screening systems, EPA guidance also recommends that the inscreen velocity be less than 0.5 feet/second.

UPM/Blandin Paper Mill has committed to meet all DNR and MPCA permit conditions assigned to both intake structures to avoid, minimize, and mitigate Project-related impingement and/or entrainment effects.

For the new structure, measures include meeting EPA's recommended inscreen velocity of 0.5 ft/sec, orienting the screening intake parallel with the riverbank, and locating the structure itself as close as possible to the existing intake.

Permit-related conditions to control runoff, sedimentation and thermal impacts, with the associated water quality protections, should be protective of the fisheries and their instream habitat. With proper design and operation, impacts to aquatic resources are expected to be minimal. Aside from adhering to DNR, MPCA, and USACE permit conditions and erosion and sedimentation BMPs during construction, no other mitigation measures are required.

6.4 WATER RESOURCES

6.4.1 WATER USE

6.4.1.1 Existing Conditions

Water Appropriations

The existing water intake structure is located within the Blandin Dam and appropriates water from the Paper Mill Reservoir. The current DNR Water Appropriations permit allows a maximum of 16 billion gallons per year or 43.9 mgd to be appropriated from the reservoir (Progressive Consulting Engineers, Inc. 2004). This appropriation supplies process and cooling water to the UPM/Blandin Paper Mill and cooling water to Allete/Minnesota Power. Currently, process water uses are 5.8 mgd, while cooling water use is 27.1 mgd during the high-use summer months (AF 2005). Cooling water use by Allete/Minnesota Power varies seasonally with June through August being the highest use months. Thus, during high use months, the current use is about 32.9 mgd. The current structure is a sluice gate in the Blandin Dam that diverts water from the surface and has traveling screens for removing debris.

Table 6-7 provides a summary of existing, historical, and proposed appropriations. The existing data (2004) is reflective of water appropriations with the retirement of two paper machines. The historical data is reflective of four paper machines, which is the baseline operation used in air permitting and fiber harvest assessments. Summer existing appropriations for 2004 were also compiled since existing maximum use is during summer months.

Table 6-7
Existing Water Appropriations

Use	Summer (June-Sept. 2004) (2 Paper Machines)	Historic (2001) Annual (4 Paper Machines)	Historic (2004) Annual (2 Paper Machines)
Non-contact cooling	7.1 mgd[5]	19.9 mgd[3]	11.1 mgd[1]
	20 mgd[2] *		
Process water	5.8 mgd[5]	10.5 mgd[3]	5.5 mgd[1]
Total	32.9 mgd	30.4 mgd	16.6 mgd[1,4]
Permitted	43.9 mgd[3]	43.9 mgd[3]	43.9 mgd[3]

** Non-contact cooling water flow used by Allete/Minnesota Power*
1. *Data source: 8/19/05 e-mail Bill Spreeman to HDR.*
2. *Data source: 5/31/05 e-mail Scott Jasperson to HDR.*
3. *Data source: 8/18/05 e-mail Bill Spreeman to HDR.*
4. *Data source: 6/24/05 Permit Application for Appropriation of Waters of the State UPM/Blandin Paper Mill to DNR.*
5. *Data source: 8/22/05 Thunderhawk water consumptions spreadsheet by AF.*

Cooling Water Discharge

Currently Allete/Minnesota Power's No. 6 turbine generator discharges non-contact cooling water to the Mississippi River below the Blandin Dam. This discharge is operated by Allete/Minnesota Power and is permitted by the MPCA under NPDES permit number MN0066559. This permit includes monitoring requirements and limits for a 1,000 ft long mixing zone. These limits include a maximum temperature of 86º F measured as a daily average at the end of the mixing zone and a maximum temperature change from upstream to downstream end of the mixing zone of 5.0º F. Both limits apply year-round, but the 86º F maximum limit is most critical in mid- to late summer.

Compliance monitoring data obtained from Allete/Minnesota Power was reviewed to assess the level of compliance with the permit. The time period reviewed was April 15, 2003 through September 2, 2004, which included one winter period and two summer periods. This review did not find any exceedences of the permit limits. In fact, review of the data found that for much of the time, downstream temperatures were lower than upstream temperatures. The exception was during winter months when downstream temperatures were consistently slightly higher. Another exception was July 2, 2003, when it appears the temperature dropped 7.3º F from upstream to downstream. The reason for this change is unknown. Permit conditions, however, are based on monthly averages; and, thus, a single day exceedence would not constitute an exceedence of the permit limit. The generally cooler downstream waters may be due to the intake configuration and the presence of the dam. The upstream temperature monitoring station is located about 50 ft upstream of the intake. The intake is located in the dam and diverts surface water. This surface water is exposed to solar radiation in the reservoir which could increase surface temperatures prior to withdrawal. Water not diverted that flows over the dam could be losing heat to the atmosphere as it moves downstream away from the dam. During the time period used for the above assessment, river flows were also higher than the 7Q10 (i.e., the 7-day low flow period that occurs once in 10 years) flow for the river. The 7Q10 flow is 109.2 cfs (Gary Kimbell, MPCA personal communication July 1, 2005).

The temperature of the discharge, the discharge amount, and river flows by month are presented for the summer of 2004 in Table 6-8.

Table 6-8
Cooling Water Discharge Characteristics and River Flows by Month for the Allete/Minnesota Power Discharge Summer 2004

Month	Daily Average Discharge Temperature Range (º F)	Discharge (mgd)	River Flow * cfs (mgd**)
June	73.07 – 83.5	18.2	989 (639)
July	76.84 – 89.85	19.9	662 (428)
August	71.41 – 88.51	19.8	336 (217)
September	68.89 – 84.59	19.5	1,201 (776)

** USGS, 2005. Water Resources Data Minnesota Water Data 2004. (Station 05211000 Mississippi River at Grand Rapids, MN)*
*** mgd = million gallons per day*

6.4.1.2 Impacts

Build Alternative

Water Appropriations

The proposed Project will install a second water intake structure that will appropriate waters from the Paper Mill Reservoir. The existing structure is located in the Blandin Dam, and the new structure is proposed to be located just upstream of the Blandin Dam.

Under existing conditions the total appropriation, including that used by Allete/Minnesota Power, is taken through the existing inlet. Under the proposed Project water appropriated from the new intake structure will be used primarily for process water. Water appropriated from the existing intake structure will be used primarily for the non-contact cooling water loop. The exception will be some use of the non-contact cooling water as process water mainly during winter. Figure 6-7 provides a water balance for the proposed Project (AF 2005) as well as proposed appropriations.

Comparison of existing flows in Table 6-7 with proposed flows in Table 6-9 shows that the proposed maximum appropriations are slightly higher than the maximum in 2004 when only two machines were operating, while the proposed annual average is less than the historic average represented by 2001.

Table 6-9
Proposed Water Appropriations

Use	Proposed Maximum	Proposed Annual Average
Non-contact cooling	20.0 mgd[1]	17.8 mgd[2]
Process water	14.0 mgd[1]	9.1 mgd
Total	34.0 mgd	26.9 mgd
Permitted	34.0 mgd[1]	34.0 mgd

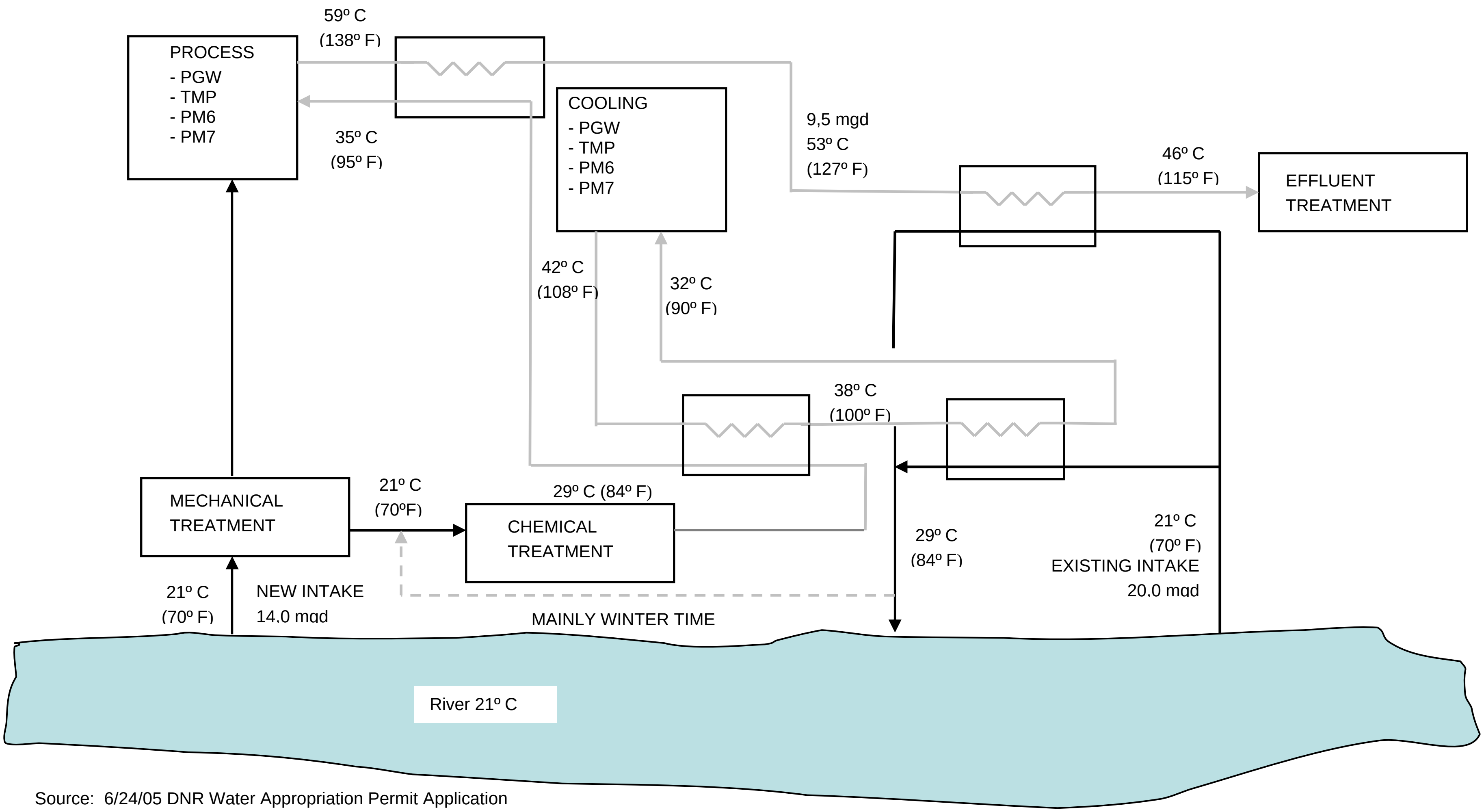
1. Data source: 6/24/05 Permit Application for Appropriation of Waters of the State UPM/Blandin Paper Mill to DNR.
2. Data source: 8/22/05 Thunderhawk water consumptions spreadsheet by AF.

The facility would increase its water use slightly from 2004 conditions, but be below historic annual water appropriations. In addition, the permitted appropriation would be reduced by 22.6 percent with the proposed Project. The proposed non-contact cooling system will likely appropriate water in a 3-4 month period over the summer. However, flows will decrease through the existing structure. Currently 100 percent of the water appropriated comes through the existing intake structure. In the future, a maximum of 20 mgd is planned for the current structure and 14 mgd for the new structure. This represents a 39 percent decrease in water flow through the existing structure during the maximum high-use months of 2004 and a 26 percent decrease compared to the annual average for 2001.

Constructing the new water intake structure will involve work-in-the-bed of the Mississippi River. The structure will be located in the Mississippi River Paper Mill Reservoir just upstream of the Blandin Dam. Project-related construction could include: 1) limited dredging and/or excavation or 2) installation of riprap. Construction activities can cause temporary, localized noise-related disturbances, limited to the construction period itself. Erosion or sedimentation is possible without use of appropriate BMPs, including: 1) deposit of excavated materials in suitable upland areas; 2) control of turbidity with a silt curtain; 3) timing the Project to anticipate desirable flow conditions; and 4) exotic species inspection and control.

The installation of this structure is subject to USACE permitting authority under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. The former regulates all work occurring in the navigable waters of the Unites States, while the latter regulates the discharge of dredged or fill material into the waters of the United States. Both state and federal permits will require that the water intake structure be designed, placed, and operated such that adverse impacts are avoided and/or minimized. Little or no impact is expected from the operation of the intake structure once construction is complete.

Figure 6-7
Proposed Project Water Balance



Source: 6/24/05 DNR Water Appropriation Permit Application

Cooling Water Discharge

Allete/Minnesota Power has agreed to discontinue its cooling water discharge if the proposed Project occurs. The proposed Project includes the addition of a non-contact cooling loop for cooling (1) the TMP and PGW motors and (2) the chiller system for cooling of electrical and control rooms. The discharge will be to the Mississippi River at or near the location of the current Allete/Minnesota Power discharge. This cooling water loop will likely only be needed during the summer months, most likely for three or four months a year. In the winter, UPM/Blandin Paper Mill expects that non-contact cooling water would be introduced to the intake for process water and would allow for recovery of all the energy. The cooling loop is a once-through type of water appropriation where the device will receive water via an existing intake structure, which is housed in the Blandin Dam.

Estimated discharge characteristics include a maximum discharge of 20 mgd and a temperature of 84º F (AF 2005). Discharge limits are anticipated to be the same as those for the current Allete/Minnesota Power permit with a maximum temperature limit of 86º F at the end of the mixing zone, and a maximum temperature change of 5º F based on the monthly average of maximum temperatures.

Significant impacts from the proposed cooling water discharge are not anticipated because:

- The discharge replaces a similar sized cooling water discharge.
- The estimated discharge temperature of 84º F is less than the mixed river temperature limit for the chronic mixing zone of 86 º F.
- The existing discharge appears to meet permit limits.
- The discharge will be reviewed and appropriate limits set through the NPDES permitting process.

Compliance of the existing discharge was documented above for flows greater than the 7Q10 flow. Simple mixing calculations were also completed to document compliance under the 7Q10 flow.

These calculations were completed assuming a discharge temperature of 84º F, a flow of 20 mgd, a 7Q10 of 109.2 cfs, and an allowable mixing zone of 25 percent of the 7Q10. Additional heat inputs and outputs over the 1,000 ft mixing zone were not assessed since straight mixing without heat losses would be a conservative approach. A worst-case upstream river temperature of 83.3º F from Allete/Minnesota Power monitoring data is from August of 2003. The following documents the calculations:

Mixed temperature º F =

$$(20\ \mathrm{MGD} \times 84^{\circ}\ \mathrm{F}) + ((109.2\ \mathrm{cfs} \times 0.25) \times 83.3^{\circ}\ \mathrm{F})) \div (20\ \mathrm{MGD} + (109.2\ \mathrm{cfs} \times 0.25)) = 83.7^{\circ}\ \mathrm{F}$$

Warm water discharges can reduce the receiving water's ability to hold dissolved gases (e.g., oxygen), maybe to levels too low to support some aquatic species, or at temperatures that can stress aquatic organisms. The potential impacts of water temperature, dissolved oxygen, and impact zone are expected to have a similar profile to the existing setting. The thermal impacts are expected to be unchanged from existing conditions. Little or no adverse impacts are anticipated with this Project-related discharge.

Water Conservation and Recycling

The Project includes processes that reuse and conserve water to reduce appropriations and wastewater discharges. Non-contact cooling water appropriations are reduced in the winter months by introducing non-contact cooling water for use as process water. Process water can be classified into two types of white water, "cloudy" and "clear." Both are collected and reused in the paper machine stock system. Surplus white water is pumped to a saveall where the fibers and clay are removed and returned to the overall process. The resulting clarified white water is then directed back into the pulp mill, to repulp kraft and broke, and as a replacement for fresh water whenever it is practical to do so.

Water reuse occurs at the following process stages:

- Within the pulp mill, pulp thickening white water is reused for mechanical pulping.
- Within the paper machine, white water removed from sheet fermentation is reused to blend different pulps and pigments.

These processes are described in greater detail in Sections 3.3.2 Paper Machine Process and 3.2.4 Chemical Pulping. Figure 6-8 and Figure 6-9 show process flow diagrams for the proposed TMP and PM7 white water loops and the PGW white water loops. These diagrams include the reuse cycles. Other machines will have similar white water reuse.

No-Build Alternative

Under the No-Build Alternative, water use appropriations and cooling water discharge are anticipated to remain as they are under existing conditions. No new intake structure will be constructed. It is assumed that the cooling water discharge will remain in place, even if Allete/Minnesota Power discontinues use of the turbine generator No. 6 (regardless of Thunderhawk Project implementation), as UPM/Blandin Paper Mill may take over permit conditions of the discharge.

6.4.1.3 Mitigation

The Project will comply with the requirements of the DNR water appropriation permit amendment and the MPCA NPDES permit. Regarding the warm water discharge from the new non-contact cooling system, it is essentially equivalent to the warm water discharge from cooling turbine No. 6 at the Allete/Minnesota Power facility. Because that discharge will be terminated and replaced with the new discharge, effects on the river are not anticipated to change substantially from the current condition while the discharge is present. Therefore, no mitigation is needed; the NPDES discharge permit is expected to set monitoring requirements and temperature limits.

Figure 6-8

Process Flow Diagram for the TMP and PM7 Whitewater Loops

Figure 6-9

Process Flow Diagram for the PGW's Four Additional Grinders Whitewater Loops

6.4.2 WATER QUALITY – SURFACE WATER

6.4.2.1 Existing Conditions

The existing paper mill site is highly developed. Current land use is industrial, with significant impervious surfaces consisting of parking lots, roof tops, roadways, and other hard surfaces. A category of "other" also represents a significant portion of the existing mill site and proposed Warehouse Options 2, 4, and 5. "Other" means non-vegetated, non-paved areas such as unroofed storage areas and generally undeveloped and unused industrial space. The Land Cover section provides a description of the existing and proposed cover types for the paper mill and proposed warehouse options.

It is generally accepted that an increase of impervious surfaces increases the rate and volume of stormwater runoff, thereby improving conditions for pollutant delivery. However, because there is no existing UPM/Blandin Paper Mill site data relative to stormwater runoff water quality, it is assumed that levels of pollutants generated at this site will be comparable to other industrial sites in Minnesota subject to MPCA stormwater permitting requirements. Known potential pollutants do include wood materials, kaolin slurry, and titanium dioxide.

Stormwater at industrial sites may come into contact with any number of harmful pollutants, including toxic metals, oil, grease, de-icing salts, and various toxic chemicals used in industrial processes. Industrial materials and activities may include material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products, and waste products. If these industrial materials and activities are exposed to precipitation without proper safeguards, they can be picked up by stormwater and carried to nearby surface waters and other biotic communities. Other nonpoint-source pollutants include sediment, nutrients, oxygen-demanding substances, bacteria, viruses, and temperature changes. These pollutants are briefly described below.

Sediments

Sediments are made up of tiny soil particles, sand, leaves, grass, litter, and animal waste that are washed or blown into lakes, wetlands, or streams. This pollutant causes turbidity, destruction of aquatic habitat, transport of attached contaminants and impacts to aquatic organisms.

Nutrients

Excessive nutrients, such as phosphorus and nitrogen, can lead to explosive growth of algae and aquatic plants. Ultimately, increased eutrophication of lakes and wetlands can occur. Excessive nutrients can also be toxic to aquatic organisms and can lower dissolved oxygen levels to fatal levels for fish and other aquatic organisms. Nitrates can be harmful to infants in drinking water.

Oxygen-Demanding Substances

Runoff can deposit large quantities of oxygen-demanding substances into the receiving waters. A pulse of high oxygen-demanding stormwater runoff can totally deplete supplies to the degree that a fish kill can occur. Organic matter and oxidizable metals are common examples of pollutants found in urban runoff.

Chemicals

Hydrocarbons (petroleum) and organic chemicals can be toxic to aquatic life at relatively low concentrations. These materials accumulate in sediments and can be re-suspended later. Common sources include spillage, leakage, improper disposal, emissions, and excessive application.

Application of salt to roads and parking lots results in salts and chloride entering surface and groundwater. Normal application of these de-icing materials is unlikely to result in toxic conditions, but contamination from stockpiles is possible.

Temperature Changes

A natural and consistent temperature regime is important to aquatic system health. Sudden temperature changes due to an alteration in the runoff pattern can have a shock effect. Increases in mean and maximum temperatures can also affect the aquatic ecosystem.

The current stormwater infrastructure is shown in Figure 6-10. The current stormwater system can be divided in two basic areas: one being the mill area where the paper and pulping facilities are located and the other being the woodyard. The mill area is comprised of a series of roof drains and other inlets that empty into a network of underground storm sewer piping. The storm sewer system discharges into the Mississippi River via 19 outfall structures; see table within Figure 6-10. Stormwater within the woodyard area is collected in a retention basin located in the southwest corner. This basin contains an overflow (labeled as 0) that outlets to the Mississippi River.

6.4.2.2 Impacts

Build Alternative

As shown in Table 6-10, impervious surfaces remain the same between the Build and No-Build Alternatives in Warehouse Option 2 and Warehouse Option 5. However, impervious surface area will increase by 3 percent under Warehouse Option 4 Build Alternative. The resulting runoff peaks and volumes are listed in Table 6-10. The flow peaks were calculated via the Rationale Equation using commonly accepted values for dimensionless curve numbers and rainfall intensity. Runoff volumes were calculated using gross runoff derived from 100-year rainfall depths and corresponding curve numbers.

Figure 6-10
Existing and Proposed Stormwater Plan

Table 6-10
Site Runoff

	Existing – No-Build Alternative (70 acres total)	Option 2 Existing & No-Build Alternative (72 acres total)	Option 2 Build Alternative (72 acres total)	Option 4 Existing & No-Build Alternative (90.5 acres total)	Option 4 Build Alternative (90.5 acres total)	Option 5 Existing & No-Build Alternative (71 acres total)	Option 5 Build Alternative (71 acres total)
Lawn / Landscaping - Curve Number ~ 55 (acres)	7 (acres)	7 (acres)	9 (acres)	14.25 (acres)	12.25 (acres)	7 (acres)	9 (acres)
Impervious - Curve Number ~ 90	48 (acres)	50 (acres)	50 (acres)	52.5 (acres)	57 (acres)	49 (acres)	49 (acres)
Other - Curve Number ~ 75	15 (acres)	15 (acres)	13 (acres)	23.75 (acres)	21.25 (acres)	15 (acres)	13 (acres)
Composite Curve Number	83	83	83	81	82	83	83
100-year Peak Flow (cubic feet per second)	350 (cfs)	361 (cfs)	358 (cfs)	437 (cfs)	444 (cfs)	355 (cfs)	353 (cfs)
Peak Percentage Increase Compared to Existing			-1%		1%		-1%
100-year Runoff Volume (acre-feet)	20.1 (acre-ft)	20.7 (acre-ft)	20.7 (acre-ft)	24.5 (acre-ft)	25.3 (acre-ft)	20.4 (acre-ft)	20.4 (acre-ft)
Volume Percentage Increase Compared to Existing			0%		3%		0%

Overall stormwater management at the mill site will not change significantly. The existing roof drains and other inlets will continue to drain through a complex network of underground storm sewers, outletting to the Mississippi River at 24 locations (previously 19 outlets). Warehouse Options 2 and 5 are proposed to consist of the 24 outlets. Warehouse Option 4 may consist of 24 outlets on the mill proper and one or two outlets at the proposed warehouse location. In an effort to alleviate any increased outflows, as well as comply with NPDES permit requirements, additional stormwater detention will be constructed on site and off site for Warehouse Option 4; see Figure 6-11 – Warehouse Option 4 Stormwater Plan. The additional stormwater mitigation will consist of appropriate site grading and an underground pipe leading to a new water detention/sedimentation basin.

The primary areas of soil disturbance will be located at the proposed new TMP, PM7, and Warehouse Option 4 sites; see Figure 3-2 and Figure 3-3. Excavation of 85,000 cubic yards is necessary for the proposed PM7 machine room and roll grinding/storage complex; see Figure 6-12 – Construction Stormwater Plan. Approximately 72,000 cubic yards of compacted granular fill material would be placed to return the site to the required footing elevations. The construction site is fairly level and underlain by permeable soils. The majority of construction will occur within the existing industrial complex in currently buffered areas not subject to erosion.

Figure 6-11

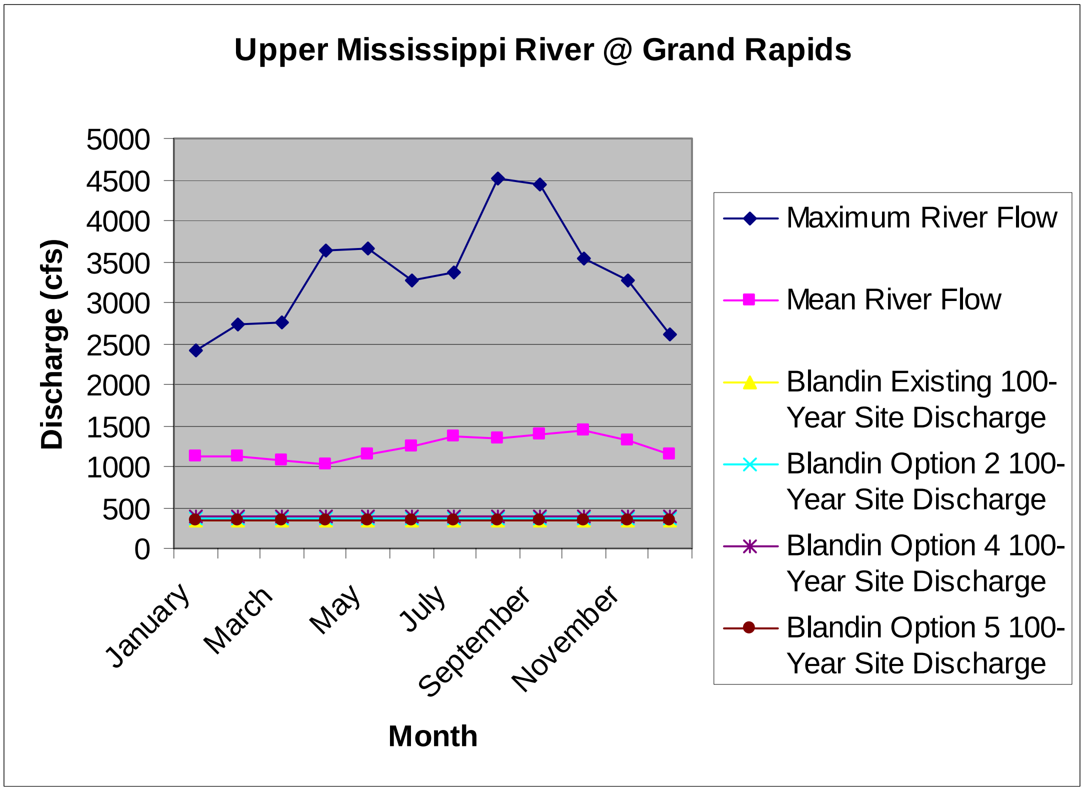
Warehouse Option 4 Stormwater Plan

Figure 6-12

Construction Stormwater Plan

Figure 6-13 shows the maximum and mean flows of the Mississippi River near Grand Rapids. It also compares the existing site conditions with the proposed Project, Warehouse Option 2, 4, and 5 site discharges for the 5.3-inch, 100-year, 24-hour storm event. Peak flows and volumes will increase under Warehouse Option 4 as shown in Table 6-10 without stormwater detention.

Figure 6-13
Maximum and Mean Flows



No-Build Alternative

Under the No-Build Alternative, the proposed expansion will not take place, thus impervious surface areas will not increase. The storm sewer system will remain as is with 19 outlets discharging into the Mississippi River.

6.4.2.3 Mitigation

The increased stormwater generated at the site will be addressed in accordance with the existing/future SWPPP as well as NPDES Phase II regulations. Erosion and sedimentation in the construction area would be minimized using accepted construction methods, including directing construction-related runoff into the existing stormwater system. Stormwater generated within the area of the demolition site would be directed into the process sewer system during construction activity and treated as wastewater. Stormwater system inlets will be protected by inlet protection devices in order to reduce silt-laden direct runoff from entering the system untreated. Where surface runoff could potentially flow directly into the

Mississippi River, the site BMPs would include temporary surface drainage ditches with sedimentation barriers designed to intercept these flows and direct them into the stormwater system.

Best Management Practices

The MPCA has designated the Mississippi River as a Special Water in this location. A general NPDES stormwater construction permit is required for projects that disturb one or more acres. Furthermore, the permit requires that the Project plan provide for one inch of temporary and permanent "water quality volume" treatment and detention of runoff for the net increase in impervious surfaces; if the total Project increase in impervious surface exceeds one acre. Permit compliance requires that additional Special Waters BMPs be followed, such as slope protection, temporary sediment basins, buffer zones, and rate controls, in addition to stormwater inlet protection, silt fences, bale checks, and temporary and permanent revegetation. The NPDES permit also requires a plan that details the specific measures to be implemented, construction phasing, vehicle tracking of sediment, and erosion control inspection measures.

Figure 6-10 depicts the erosion control plan for the site for the modified facility, Warehouse Options 2 and 5. Figure 6-11 shows additional plans for Warehouse Option 4.

In an effort to reduce, eliminate, or otherwise mitigate the effects of the additional impervious surface areas under Warehouse Option 4, runoff from the site will be directed into stormwater ponds. The pond volumes will be adequate water quality volume for one inch of runoff for every additional acre of impervious surface created. Given that the preventative measures will be followed, no significant impact upon stormwater quality is anticipated.

Installation of stormwater ponds should attenuate increases in surface water runoff. Given that the requirements for stormwater detention ponds will be followed, no significant impact upon surface water runoff quantity is anticipated.

6.4.3 WATER QUALITY – WASTEWATER

6.4.3.1 Existing Conditions

Industrial wastewater generated at the mill is treated at the WWTF owned and operated by the GRPUC. The WWTF are distributed between two site locations. Wastewater from the mill is initially pumped to the Industrial Primary Plant. Treatment by clarification results in primary solids removal. Septage, domestic wastewater, and nutrients are then added to the primary clarifier effluent before it is pumped to the Secondary Plant, which is located approximately a mile away; see Figure 3-9. Biological treatment by an activated sludge process occurs at the Secondary Plant. Unit processes include aeration, clarification, and disinfection. The solids produced by the Secondary Plant are designated as waste-activated sludge (WAS). Treated effluent is discharged from the Secondary Plant into the Mississippi River at an outfall structure located approximately two miles downstream of the Blandin Dam; see Figure 3-9.

Current Influent Flows and Loads

The WWTF currently treat wastewater from the UPM/Blandin Paper Mill, the cities of Grand Rapids, La Prairie, and Cohasset, and septage from the counties of Itasca, Cass, and Aitkin. Wastewater from the mill is currently generated by PM5 and PM6 and two pressurized groundwood pulping lines. Existing flows and loads are detailed in Table 6-11 for the period from February 2003 through April 2005. Prior to February 2003, wastewater from the mill included the contributions of PM3 and PM4, which are no longer in operation and have been removed from the mill.

Table 6-11
Existing Influent Flows and Loads for the GRPUC WWTF

Units	Flow	TSS		$CBOD_5$	
	mgd	mg/L	t/d	mg/L	t/d
Annual Average					
Domestic	0.8	330	1.1	204	0.7
Industrial	5.8	1,335	32.0	425	10.2
Total	6.6	1,212	33.1	398	10.9
Maximum Month					
Domestic	1.1	403	1.8	229	1.0
Industrial	7.6	1,893	59.0	480	15.2
Total	8.7	1,684	61.0	449	16.2
Maximum Day					
Domestic	1.7	416	2.9	292	2.0
Industrial	9.2	5,237	200.0	519	19.8
Total	10.8	4,496	203.0	483	21.8

Current Effluent Discharge

Effluent is discharged in the Upper Portion of the Upper Mississippi River Basin (Grand Rapids Dam to Prairie River segment). In accordance with Minnesota Rules 7050.0470, Subpart 4, this segment of the Mississippi River is a Class 2B, 3B, 4A, 4B, 5, and 6 water. The WWTF operate within performance and discharge limits established in both national and state regulations including NPDES and SDS Permit MN 0022080 for discharge into the Mississippi River. The current NPDES permit limits for discharge into the Mississippi River are listed in Table 6-12. In addition to the parameters listed in Table 6-12, priority pollutant total metals that include cadmium, chromium, copper, lead, zinc, and nickel must be monitored. The NPDES permit also requires the monitoring of mercury, dissolved oxygen (DO), and temperature.

Class 2B requirements state that discharges cannot increase the temperature of the stream more than 5º F above natural temperature. This is based on a monthly average of the maximum daily temperature, and in no case shall the discharge exceed the daily average temperature of 86º F. The average maximum final wastewater effluent temperature was 59º F for the period of 2003 to present. During this time period, there were only two days when the maximum wastewater temperature reading exceeded 86º F (by 1º F).

Table 6-12
Current NPDES Permit Limits for GRPUC Mississippi River Wastewater Discharge

Parameter	Effective Period		
	Jan-Dec	Apr-Oct	June-Sept
BOD_5: Monthly Average (kg/d, mg/L)	1436, 25		
BOD_5: Max Week Average (kg/d, mg/L)	2298, 40		
BOD: Percent Removal (percent)	85		
Chlorine Residual: Monthly Maximum (mg/L)		0.038	
Fecal Coliform: Monthly Geometric Mean (No./100 mL)		200	
Total Ammonia Nitrogen: Monthly Average (kg/d, mg/L)			460, 8
pH Range: Monthly Minimum and Maximum	6.0 – 9.0		
TSS: Monthly Average (kg/d, mg/L)	1724, 30		
TSS: Max Weekly Average (kg/d, mg/L)	2586, 45		
TSS: Percent Removal (percent)	85		

The WWTF have demonstrated excellent performance during testing of the NDPES permit parameters since February 2003; see Table 6-13. In excess of 99 percent of influent BOD and TSS were removed, compared to the 85 percent requirement. Only 3 percent of the allowable and permitted BOD and total ammonia nitrogen and 12 percent of the allowable and permitted TSS mass load were discharged into the Mississippi River.

Table 6-13
Testing Results for NPDES Permit Limit Parameters

Parameter	Effective Period		
	Jan-Dec	Apr-Oct	June-Sept
BOD_5: Monthly Average (kg/d, mg/L)	44, 1.9		
BOD_5: Max Week Average (kg/d, mg/L)	59, 2.4		
BOD_5: Percent Removal (percent)	99.6		
Chlorine Residual: Monthly Maximum (mg/L)		0	
Fecal Coliform: Monthly Geometric Mean (No./100 mL)		38	
Total Ammonia Nitrogen: Monthly Average (kg/d, mg/L)			15, 0.6
pH Range: Monthly Minimum and Maximum	7.1 – 7.7		
TSS: Monthly Average (kg/d, mg/L)	219, 9		
TSS: Max Weekly Average (kg/d, mg/L)	321, 12		
TSS: Percent Removal (percent)	99.1		

Current Significant Industrial User Agreements

The UPM/Blandin Paper Mill is classified as a "Significant Industrial User" (SIU) of the WWTF by the NPDES permit. Table 6-14 summarizes the current SIU agreements between the GRPUC and the mill, one for the Industrial Primary Plant and one for the Secondary Plant.

Table 6-14
Current SIU Agreements Between GRPUC and Blandin Paper Company

Parameter	Primary	Secondary
Flow, average (mgd)	13.25	13.25
Flow, peak (mgd)	14.25	14.25
TSS, average (lb/d; t/d)	324,000;162	28,000;14
TSS, peak (lb/d; t/d)	567,000;283.5	33,000;16.5
BOD, average (lb/d; t/d)	N/A	41,300;20.7
BOD, peak (lb/d; t/d)	N/A	57,350;28.7
Maximum Temperature, (F;C)	150; 65	104;40

There were five exceedances of the Secondary Plant SIU TSS peak load during the time period evaluated. These occurred on April 27, May 21, August 10, and October 6 of 2003, and September 26, 2004. The quantities ranged from 35,251 to 338,911 pounds. There was one exceedance of the Industrial Primary Plant SIU temperature peak on September 12, 2004 of 152º F. There was one instance of the Secondary Plant SIU temperature peak of 104º F being reached on July 20, 2004.

Current Solids Produced by the WWTF

Residual solids produced by the WWTF include domestic screenings, industrial screenings, primary sludge, and secondary sludge. Domestic screenings are those produced from the barscreens in the domestic flow preliminary treatment building located at the Industrial Primary Plant. This material consists of rags, plastics, paper, and other large items removed from the domestic wastewater. The domestic screenings are disposed of by Waste Management in the Elk River Sanitary Landfill. Approximately 150 cubic yards of domestic screenings are landfilled annually.

Industrial screenings are those produced from the barscreens in the Industrial Screen House just downstream of the mill. This material consists of wood, bark, and pulp from the industrial wastewater. The mechanical barscreens remove the screenings from the wastewater. The industrial screenings are then loaded into GRPUC sludge trucks and disposed of in the GRPUC Landfill near the Secondary Plant. Approximately 300 cubic yards of industrial screenings are landfilled annually.

The sludge from the three primary clarifiers at the Industrial Primary Plant and the sludge from the three secondary clarifiers at the Secondary Plant, which is pumped from the secondary to the Industrial Primary Plant, are combined in the Solids Dewatering Building at the Industrial Primary Plant. The three belt filter presses remove a majority of the water from the sludge prior to its placement in GRPUC sludge trucks. The dewatered primary sludge/WAS is disposed of in the GRPUC Landfill. Table 6-15 lists the quantities of solids transferred to the GRPUC Landfill, an average of approximately 120 tons/day. High peak daily load events are the result either of process changes, paper machine shutdowns, or power outages at the mill. There are no apparent seasonal or other patterns to the peaks.

Table 6-15
Dewatered Solids Transferred to GRPUC Landfill

Year	Parameter	Loads /Day	Tons/Day	Cubic Yards/Day
2003	Average daily	14	123	165
	Average, max month	18	156	210
	Peak daily	35	312	420
2004	Average daily	12	109	147
	Average, max month	16	145	195
	Peak daily	43	383	516
2005	Average daily	14	122	164
	Average, max month	15	136	184
	Peak daily	30	267	360

Current GRPUC Landfill Capacity

The GRPUC Landfill is operated according to the MPCA approved Solid Waste Management Facility Permit No. SW-210 issued on August 23, 2001 and effective through August 23, 2006. The 43-acre site has a permitted area of 15 acres with a permitted capacity of 1,350,722 cubic yards. The design capacity of the entire site is 4,218,022 cubic yards. A landfill-life of 49 years is estimated by using the difference between the design and permitted capacities and the current sludge production rates. An application for reissuance of Permit No. SW-210 is currently being completed for review and approval by MPCA within the required timeframe.

Existing WWTF Constraints

There are several operational constraints at the current WWTF. In a high peak daily load event, such as a power outage, shutdown of a paper machine, or process change at the mill, the WWTF are inundated with high solids loading. Primary treatment cannot occur after the primary clarifiers are filled with solids and the solids that pass through the clarifiers are sent to the Secondary Plant. Dewatering capacity is inadequate for this peak condition and requires nonstop operation of dewatering equipment over a period of several days following an event to lower excessive solids inventory. Further complication of this situation is the lack of storage capacity for WAS. WAS, which is produced in the secondary clarifiers, is pumped to the Industrial Primary Plant for dewatering along with the primary solids. With an overload of primary solids in the primary clarifiers and dewatering equipment, WAS must be stored in the final clarifiers or held in the aeration basins as biomass. Additional areas of concern include the useful life of some process equipment, buildings, and the lack of redundancy.

6.4.3.2 Impacts

Build Alternative

Future Conditions

The proposed Project will result in increased flow and pollutant loads to the WWTF. The influent flow is expected to increase approximately 3.4 mgd to an annual average daily flow of 10.0 mgd. Influent quality will also change as the BOD, TSS, and temperature of the waste will increase from current conditions. The temperature of the future waste stream from the mill will actually decrease due to temperature mitigation processes being installed at the mill. Without taking into account remaining useful life, the existing facilities have adequate capacity for future average loading conditions. However, the existing facilities do not have adequate capacity to treat future peak loading conditions.

Projected Influent Flows and Loads

Both the quality and quantity of the wastewater is expected to change with the proposed Project as shown in Table 6-16. Average annual flows are expected to increase 52 percent to 10.0 mgd, TSS is expected to increase 90 percent to 62.9 tons/day, and BOD is expected to increase 212 percent to 34.0 tons/day. Maximum monthly flows are expected to increase 53 percent to 13.3 mgd, TSS is expected to increase 92 percent to 117.3 tons/day, and BOD is expected to increase 213 percent to 50.7 tons/day. Maximum daily flows are expected to increase 59 percent to 17.2 mgd, TSS is expected to increase 92 percent to 390.0 tons/day, and BOD is expected to increase 211 percent to 67.8 tons/day.

Table 6-16
Projected Flows and Loads for the GRPUC WWTF

Units	Flow	TSS		$CBOD_5$	
	mgd	mg/L	t/d	mg/L	t/d
Annual Average					
Domestic	1.0	330	1.4	204	0.9
Industrial	9.0	1,632	61.5	879	33.1
Total	10.0	1,501	62.9	811	34.0
Maximum Month					
Domestic	1.4	403	2.3	229	1.3
Industrial	11.9	2,315	115.0	992	49.4
Total	13.3	2,121	117.3	915	50.7
Maximum Day					
Domestic	2.8	416	4.9	292	3.4
Industrial	14.4	6,422	385.0	1,075	64.4
Total	17.2	5,443	390.0	947	67.8

Future Effluent Discharge

It was assumed that future facilities constructed to mitigate the impact of PM7 will be designed to replicate existing WWTF performance. On an annual average basis, this would mean that future pollutant concentrations would stay approximately the same, but mass loadings would increase by 52 percent, the projected annual average flow increase. The total projected future mass loading for BOD would still be only 5 percent of what is allowable by the NPDES permit and TSS would be only 19 percent. Based on this, revisions to the NPDES permit are not anticipated.

Effect on Significant Industrial User Agreements

The existing Industrial Primary Plant SIU agreement limitation of 283.5 tons/day of peak TSS would be exceeded with the proposed Project if it was not for the fact that the TSS load will be equalized in a new equalization basin. The current plans for the Build Alternative include a non-contact water cooling loop system at the mill that will be designed to reduce mill wastewater temperature to a maximum of 115º F. The mill is also contemplating the addition of a cooling tower to cool vacuum pump cooling water. If incorporated into the Build Alternative, an added benefit would be the reduction of the mill maximum temperature to 110º F. Maximum temperatures averaged 131º F for the period of January 2003 to the present. Therefore, the Project results in a 16º F to 21º F reduction in maximum temperature entering the WWTF. It is unlikely that the 150º F Primary Plant agreement limitation could be exceeded following the proposed Project.

Preliminary temperature modeling suggests that under the worst case scenario of 115°F mill wastewater that the temperature in the selector could reach 108.8°F degrees. During the design phase of the Project, additional modeling and pilot study work will be done at these temperatures to establish the actual design parameters for treatment unit sizing and proposed process equipment as well as verify assumptions and initial criteria developed in the modifications study. See Appendix J for additional information.

It is anticipated that the proposed Project will require one modification to each of the SIU agreements with GRPUC. The existing Industrial Primary Plant SIU agreement limitation of 150º F will have to be changed to 115º F or 110º F respectively, with the addition of the non-contact water cooling loop system or with the addition of the non-contact water cooling loop system and an additional cooling tower at the mill. The existing Secondary Plant SIU agreement limitation of 28.7 tons per day will have to be increased. The extent of the increase will have to be determined after the recommended facilities are designed.

Projected Primary and Secondary Solids

Residual solids produced by the WWTF include domestic screenings, industrial screenings, primary sludge, and secondary sludge. Approximately 150 cubic yards of domestic screenings are landfilled annually in the Elk River Sanitary Landfill, and this quantity will not change with the proposed Project. The current plans for the proposed Project include a new screen house/pump station at the mill to replace the existing structure near the mill. Currently, approximately 300 cubic yards of industrial screenings are landfilled annually in the GRPUC Landfill near the Secondary Plant. The quantity to be discharged annually after the Project is dependent on the efficiency of PM7 and the removal efficiency of the new screens, but was assumed to be approximately 450 cubic yards. Average solids production will increase by approximately 42 percent (230 cubic yards/day) over existing conditions. The quantity of WAS produced is dependent on the improvements recommended for implementation and will be discussed with the WWTF improvements recommended.

The primary sludge will be dewatered separately from the secondary sludge in the WWTF modifications recommended for PM7. The separate dewatering is to optimize the dewatering efficiency of the different types of sludge. After dewatering, they will be combined for continued disposal in the GRPUC Landfill. The quantity of sludge is expected to increase as shown in Table 6-17.

Table 6-17
Projected Sludge Production

Design Condition	Primary Plant (dtpd)	Secondary Plant (dtpd)			Total solids (dtpd)
		WAS	EQ solids	Total	
Average	53	15	-	-	68
Max Month	99	27	-	27	126
Peak Day w/o EQ	332	55	-	-	386
Peak Day w/ EQ	167	39	189	76 [1]	243 [1]

[1] *FEQ solids were distributed over a five day period.*

dtpd = dry tons per day

The conversion from the total solids shown in dry tons per day (dtpd) to cubic yards is approximately 3.4. For the average day condition, approximately 230 cubic yards per day to be disposed of in the GRPUC Landfill, an increase from current conditions of approximately 110 cubic yards per day. There is adequate capacity in the GRPUC Landfill for the increased quantities for approximately 34 years if just the difference between landfill design and permitted capacity is used.

The existing Solids Dewatering Building and the two oldest belt filter presses at the Primary Plant will be replaced by screw presses in a new building for primary sludge dewatering. The newest belt filter press will be moved to the Secondary Plant, combined with a new belt filter press and two gravity belt thickeners, and used to dewater both WAS and equalization basin solids. This equipment will be housed in a new building.

Fate of Chemicals in Wastewater

Raw materials that are considered hazardous, due to their respective quantity, are received at the mill, primarily for the pulping and bleaching processes; see Table 6-18. As with most chemicals, these raw materials are not considered hazardous waste. All hazardous raw materials received at the mill will increase with Project implementation. The raw materials are added at different stages during the paper making process; see

Figure 6-10. It appears that all chemicals used in pulp and paper production are received as white water at the WWTF. Below is a brief description of the chemicals, their function in the pulp and paper making process, and their fate in the WWTF.

Table 6-18
Hazardous Raw Materials Listing used at UPM/Blandin Paper Mill

Material (Product Code)	Mode of Shipment	Proper Shipping Name	UN #	No-Build Alternative		Build Alternative	
				Quantities Used/ Received	Storage	Quantities Used/ Received	Storage
Caustic Sodium Hydroxide (4935240)	Rail or Truck	Caustic Soda Sodium Hydroxide Solution Class 8 Un1824 Pg II RQ (Sodium Hydroxide)	UN 1824	1,000 tons	Tank	13,436 tons	Tank
Hydrogen Peroxide 70% (4918335)	Truck	Hydrogen Peroxide, Aqueous Solutions, Stabilized Class 5.1 UN 2015 Pg I	UN 2015	1,200 tons	Tank	8,658 tons	Tank
Sulfuric Acid < 93% (2819314)	Truck	RQ, Sulfuric Acid, 8, UN 1830, II	UN 1830	522 tons	Tank	1,762 tons	Tank
Sulfuric Acid 20% on PM6 (N/A)	Truck	RQ, Sulfuric Acid, 8, UN 2796, II	UN 2796	533 tons	Tank	533 tons	Tank
Sodium Hypochlorite Solution (2812130)	Truck	Hypochlorite Solution, 8, UN 1791, III, RQ (Sodium Hypochlorite)	UN 1791	636,000 lbs	Tank	820,440 lbs	Tank
Sodium Hydrosulfite (2812334)	Truck/Tote	Sodium Hydrosulfite, 4.2, UN 1384, II	UN 1384	2.0 million lbs	Totes	2,563,111 lbs	Totes
Liquid Alum (N/A)	Truck	Corrosive Liquids N.O.S. (Aluminium Sulfate) 8, UN 1760, III	UN 1760	1,460 tons	Tank	No anticipated use with PM7.	Tank
Biocides-- BULAB 7145 (No Code)	Truck Totes		UN 3265	4,800 lbs	Totes	NA	NA
Biocides-- BUSPERSE 289 (No Code)	Truck Totes		UN 1824	70,000 lbs	Totes	NA	NA
Biocides-- Busan 1009 (No Code)	Truck Totes		UN 2922	41,700 lbs	Totes	NA	NA

NA – Not Available

EDTA is a chelating agent used to tie up metals that decompose hydrogen peroxide during the pulp bleaching process. Manganese is the most significant metal the EDTA targets. Once tied up to EDTA, manganese is made soluble and is extracted from pulp at the dewatering press preceding the peroxide bleaching tower. Solubilized manganese and EDTA end up directly or indirectly in the waste water. EDTA is normally broken up and eliminated by bacteria in the secondary stage of wastewater treatment.

Peroxide bleaching is done by mixing hydrogen peroxide, sodium hydroxide, and sodium silicate to pulp in a chemical mixer, at high consistency.

Hydrogen peroxide is activated with sodium hydroxide to generate a perhydroxyl anion which is the bleaching agent of pulp. Not all hydrogen peroxide is used in bleaching reaction. A small portion of initial peroxide charge ends up as residual at the end of the bleaching reaction. Some of that residual peroxide can be used again for bleaching. A portion of the residual peroxide left in pulp is usually reacted with a reducing agent to be eliminated from pulp going to the paper machine. Normally no hydrogen peroxide from bleaching ends up in the WWTF influent.

Sodium hydroxide's main role in pulp bleaching is to activate peroxide, generating perhydroxyl anions. The remaining portion of sodium hydroxide that did not react with peroxide will react with hemicelluloses, the sugar portion of wood fibers. Very little or no sodium hydroxide ends up unused at the end of bleaching reaction.

Sodium silicate contains about 11.5 percent sodium hydroxide. Silicate is used to protect hydrogen peroxide from decomposition in the bleaching process. The sodium hydroxide portion of sodium silicate is used in the same manner as the bulk of sodium hydroxide. The silicate portion of sodium silicate ends up in different silicate forms. These are harmless and end up directly or indirectly in the wastewater.

Sulfuric acid is used to acidify pulp after peroxide bleaching is completed in an alkaline environment. Sulfuric acid reacts with ionic sites created on fibers by perhydroxyl anions and sodium hydroxide. If sulfuric acid is properly dosed to pulp, the excess should be minimal and ends up at the WWTF.

Clay pigments are added to the process to give opacity, brightness, and gloss to the final product. A large portion of the clay pigments are retained in the sheet during the forming and water removal process. Some of the clay pigments are not retained in the sheet and go with the water being removed in the drainage and pressing sections. The clay pigment concentration comes to some equilibrium in the white water recirculation system. A certain amount of clay pigment is lost to the wastewater treatment plant with excess white water. The clay pigments are removed with other solids at the WWTF and disposed of in the GRPUC landfill.

Table 6-19 summarizes the fate of the major chemicals used in the pulping process. None of these chemicals have created or will create problems within the wastewater treatment processes if managed properly. The greatest potential for issues comes from the sodium hydroxide and sulfuric acid additions, which if dumped or overdosed could result in pHs of the incoming wastewater outside of the desired range for bacteria growth. However, pH of the industrial flows has been kept between 5.3 and 9.4 in the past. It is reported and noted that the new Industrial Screen House/Pump Station being planned for construction on the mill site by the mill will have pH monitoring with the capability to neutralize the effluent pH.

Table 6-19
Major Chemical Fate in Pulping Process

Chemical	Chemical Description	Process Use	Fate in Wastewater
EDTA	Chelating agent (soluble organic)	Used to breakdown manganese complexes to form soluble manganese, which is extracted from the pulp prior to bleaching. Removal of manganese enhances the bleaching ability of the hydrogen peroxide.	EDTA is readily biodegradable and is consumed by the biomass during secondary treatment.
Hydrogen Peroxide	Oxidant	Main bleaching agent used. Some of the residual is reused and the remaining portion is reacted with reducing agent prior to the pulp going to the paper machine.	Typically spent or neutralized within pulping process. If not, remaining portion is typically used up oxidizing organics within wastewater prior to reaching WWTF.
Sodium Hydroxide	Base	Activates hydrogen peroxide to generate perhydroxyl anion to bleach the pulp. Portions of remaining chemical are recycled within process, and wasted amounts end up in wastewater.	Adds alkalinity and raises pH of wastewater. If large quantity is wasted or spilled, neutralization may be required prior to secondary treatment to keep pH within range for heterotrophic bacteria growth.
Sodium Silicate	Soluble inert also called waterglass.	Protects hydrogen peroxide from decomposition in the bleaching process.	Silicate portion ends up in wastewater in various silicate forms. These are inert and do not affect wastewater treatment.
Sulfuric Acid	Acid	Used to acidify pulp after peroxide bleaching in alkaline environment. If properly dosed no excess should be found in wastewater.	Consumes alkalinity and lowers pH of wastewater. If large quantity is wasted or spilled, neutralization may be required prior to secondary treatment to keep pH within range for heterotrophic bacteria growth.

WWTF Improvements Evaluated for the Build Alternative

Four alternatives were evaluated that will allow the WWTF to accommodate the addition of PM7 and other processes as well as the elimination of the existing WWTF constraints. These alternatives all include a new non-contact water cooling loop and a new screen house/pump station at the mill. Other common components include flow equalization, aeration system improvements selected to provide additional oxygen as well as to maximize temperature reduction and increased sludge dewatering capacity and construction of a cascade discharge. The alternatives are summarized below:

- Option 1 – Alternative 1: This alternative includes relocating all sludge dewatering facilities from the Industrial Primary Plant to the Secondary Plant. WAS dewatering would be separated from primary sludge dewatering to optimize the dewatering and minimize odor generation. The sludges would be combined prior to landfilling. The existing primary clarifiers and Combined Flow Pump Station would continue to be used under this alternative, but rehabilitation of equipment would be required.
- Option 1 – Alternative 2: This alternative includes relocating WAS dewatering facilities from the Industrial Primary Plant to the Secondary Plant to optimize dewatering and minimize odor generation, while maintaining primary sludge dewatering at the Industrial Primary Plant. The sludges would be combined prior to landfilling. The existing primary clarifiers and Combined Flow Pump Station would continue to be used under this alternative, but rehabilitation of equipment would be required.
- Option 2 – Alternative 1: This alternative includes relocating all primary clarification and all sludge dewatering facilities from the Industrial Primary Plant to the Secondary Plant. In order to accomplish this, the Domestic Lift Station would have to be upgraded to allow it to directly discharge into the forcemain to the Secondary Plant. This would allow the Combined Flow Pump Station to be removed from service. All sludge dewatering facilities would be relocated from the Industrial Primary Plant to the Secondary Plant. WAS dewatering would be kept separate from primary sludge dewatering to optimize dewatering and minimize odor generation. The sludges would be combined prior to landfilling.
- Option 2 – Alternative 2: This alternative includes relocating all primary clarification facilities from the Industrial Primary Plant to the Secondary Plant. In order to accomplish this, the existing secondary clarifiers would be converted into primary clarifiers at the Secondary Plant, and new secondary clarifiers and a new primary sludge pumping station would be constructed at the Secondary Plant. The newest WAS pumping station would continue to be used. The Domestic Lift Station would have to be upgraded to allow it to directly discharge into the forcemain to the Secondary Plant. This would allow the Combined Flow Pump Station to be removed from service. All sludge dewatering facilities would be relocated from the Industrial Primary Plant to the Secondary Plant. WAS dewatering would be kept separate from primary sludge dewatering to optimize dewatering and minimize odor generation. The sludges would be combined prior to landfilling.

6.4.3.3 Recommended Alternative

Option 1 – Alternative 2 is the recommended alternative based on economic factors and ease of a phased implementation. This alternative includes components required for the proposed Project as well as components to address existing WWTF deficiencies. These components include: flow equalization by converting the old A-2 cell, an aerobic selector with coarse-bubble diffusion, fine bubble diffusers in

Aeration Basin A-2, supplemental surface aeration in A-2 for temperature reduction, rehabilitated surface aeration in Aeration Basin A-1, additional sludge dewatering capacity to replace aged equipment and accommodate PM7, and construction of a cascade discharge. Dewatering of the primary solids will be done by new screw presses in a new building at the Industrial Primary Plant. A new WAS day tank and sludge dewatering building with belt filter presses are planned for the Secondary Plant. One belt filter press will be relocated from the Industrial Primary Plant. The new non-contact water cooling loop system and new screen house/pump station at the mill are also required components of the recommended alternative.

The first phase of the recommended alternative should be operational by early 2008 to accommodate the proposed March 31, 2008 PM7 start-up date. Interim treatment must be maintained through Project construction. Effluent quality cannot lapse because of construction activities nor will construction be an excuse for interrupting treatment, bypassing, or contaminating a water supply.

Recommended WWTF Improvements

Projected Influent Flows and Loads after Equalization

Flow equalization is required to cost effectively treat the peak TSS loads shown in Table 6-16. Flow equalization will also allow the Project to be accommodated within the limitations of the existing Industrial Primary Plant SIU agreement. The Old A-2 cell at the Secondary Plant will be converted into a flow equalization basin. This will prevent flow and solids from overloading the Industrial Primary Plant and additionally protect the activated sludge from peak events. Although the equalization basin will have to be cleaned after use, it will provide the rest of the WWTF with a more consistent wastewater for treatment. Table 6-20 shows the projected design loadings on the WWTF after the proposed Project with proposed flow equalization.

Table 6-20 Design Loadings after Equalization

Units	Flow	TSS		$CBOD_5$	
	mgd	mg/L	t/d	mg/L	t/d
Annual Average (A-A)					
Domestic	1.0	330	1.4	204	0.9
Industrial	9.0	1,632	62.0	879	33.1
Total	10.0	1,501	63.0	811	34.0
Maximum Month (MM)					
Domestic	1.4	403	2.3	229	1.3
Industrial	11.9	2,315	115.0	992	49.4
Total	13.3	2,121	117.3	915	50.7
Maximum Day (MD)					
Domestic	2.8	416	4.9	292	3.4
Industrial	12.7	3,711	196	1,066	56
Total	15.5	3,112	201	925	60

Aeration Basins

Due to the loadings expected with the Project, additional biological treatment capacity is needed, as well as flow equalization. An aerobic selector with coarse-bubble diffusion is proposed to ensure growth of appropriate microorganisms. Modifications to the existing aeration basins include installing a liner and fine bubble diffusers in the New A-2 cell. Supplemental surface aeration will be added for temperature reduction. Surface mechanical aeration in the New A-1 cell will be rehabilitated to provide better aeration and biological treatment, and will also provide supplemental temperature reduction. Utilizing the full surface area of both aeration basins was more important for heat reduction than the type of aeration process/equipment utilized.

The aerobic selector is proposed to be a concrete basin to minimize its footprint, but it is aerated with coarse-bubble diffusers which reduce wastewater temperature. The equalization basin will also be a lined earthen basin with floating mixers and a large surface area for its possible role in heat reduction. The lining of the two basins will eliminate future leakage concerns.

Temperature Reduction

As previously mentioned, temperature is regulated at three locations in the WWTF. The Industrial Primary Plant SIU limits peak temperature from the mill to 150º F. The Secondary Plant SIU limits peak temperature from the aeration basins to 104º F. Finally, Class 2B receiving water requirements state that discharges cannot increase the temperature of the river by more than 5º F above natural conditions based on a monthly average of the maximum daily temperature. In no case shall the discharge exceed the daily average temperature of 86º F, both temperatures measured at the end of a mixing zone.

Industrial Primary Plant SIU

In the time period from January 2003 through April 2005, there was only one hourly reading where the mill wastewater effluent exceeded 150º F. The maximum temperature averaged 131º F. The proposed non-contact cooling system will limit mill wastewater to 115º F. The mill is also contemplating the addition of a cooling tower to cool vacuum pump cooling water. If incorporated into the Build Alternative, an added benefit would be the reduction of the miss maximum temperature to 110º F. These improvements represent a 16º F to 21º F reduction respectively in maximum temperature entering the WWTF. In either case, no additional improvements are required for mill effluent temperature reduction.

Secondary Plant SIU

In the time period from January 2003 through April 2005, the Secondary Plant SIU temperature peak of 104º F was reached once. The non-contact cooling system at the mill will ensure that the 104º F temperature limitation is not exceeded. There was concern that the Secondary Plant biology would be stressed by extended operation at 104º F. Therefore, the WWTF improvements recommended for the proposed Project were modeled to determine their respective impacts on temperature. These improvements included adding an aerobic selector with coarse-bubble diffusion and converting one aeration basin to fine-bubble diffusion with supplemental surface aeration for temperature reduction. The second aeration basin retained its existing surface aerators. The proposed improvements also include a flow equalization basin that could be used for temperature reduction. But this was not modeled because the primary function of this facility is to treat a mill spill.

Table 6-21 details the effects of the selected treatment processes on the wastewater temperature. A steady-state temperature model developed by Talati and Stenstrom was applied to each selected treatment process for the worst-case condition. The worst-case condition was defined as peak industrial flow (Maximum day = Mill spill), average domestic flow with maximum domestic temperature (minimum cooling from domestic wastewater), utilizing existing surface aerators (designed for maximum oxygen transfer, not cooling effect), and the assumption that the peak flow and temperature are sustained (actual peak flow spill events are 5-6 hours duration, temperature varies constantly).

Table 6-21 Predicted Wastewater Temperatures

Process	Q (mgd)	115º F Influent		110º F Influent	
		ºF	ºC	ºF	ºC
Industrial Wastewater Effluent	12.7	115.0	46.1	110.0	43.4
Industrial Primary Clarifier Effluent	12.7	112.6	44.8	107.9	42.2
Domestic Wastewater Influent	1.0	65.0	18.3	65.0	18.3
Combined Selector Influent	13.7	108.8	42.7	104.8	40.4
Aeration Basin Influent	13.7	107.8	42.1	103.9	39.9
Aeration Basin Temperature Under Various Operating Options					
2 Aeration Basins, 8 Surface Aerators	13.7	97.5	36.4	95.0	35.0
1 Aeration Basin, 8 Surface Aerators	13.7	102.7	39.3	99.7	37.6
2 Aeration Basins, 0 Surface Aerators	13.7	99.3	37.4	96.6	35.9
1 Aeration Basin, 0 Surface Aerators	13.7	104.1	40.1	100.9	38.3
1 Aeration Basin, 8 Surface Aerators, No FB	6.9	97.7	36.5	95.2	35.1
1 Aeration Basin, 0 Surface Aerators, FB	6.9	98.8	37.1	96.1	35.6
Combined Aeration Basin Effluent	13.7	98.2	36.8	95.6	35.4

As can be seen by Table 6-21, the temperature reduction through the primary clarifiers for the 115° F mill cooling alternative is 2.4º F, mixing the mill effluent with the cooler domestic influent results in a further temperature reduction of 3.8º F. After the aerobic selector, the aeration basin influent temperature is 107.8º F. The typical aeration operation use will be to operate the aerobic selector in series with the A-2 basin with the fine bubble diffusers operational, but no surface splashers. Under this operating condition, A-2 temperatures could reach 104.1º F. Simply activating the surface splashers in A-2 would result in a temperature reduction to 102.7º F. If the flow were then split equally between basins A-1 and A-2, temperatures would be further reduced to 98.2º F. The flow equalization basin could be used to further reduce temperature, but this was not modeled since its primary role is to contain a mill spill.

If the cooling towers are added at the mill to cool the vacuum pumps, a side benefit will be a further cooling of the industrial effluent. As can be seen by the 110º F mill cooling alternative in Table 6-21, the temperature reduction through the primary clarifiers is 2.1º F, mixing the mill effluent with the cooler domestic influent results in a further temperature reduction of 3.1º F. After the aerobic selector, the aeration basin influent temperature is 103.9º F. The typical aeration operation use will be to operate the aerobic selector in series with the A-2 basin with the fine bubble diffusers operational, but no surface splashers. Under this operating condition, A-2 temperatures could reach 100.9º F. Simply activating the surface splashers in A-2 would result in a temperature reduction to 99.7º F. If the flow were then split equally between basins A-1 and A-2, temperatures would be further reduced to 95.6º F. The flow equalization basin could be used to further reduce temperature, but this was not modeled since its primary role is to contain a mill spill.

The temperature models verified the approach taken in the Modifications Study to balance aeration efficiency against the temperature reduction value of selected WWTF improvements. The improvements recommended for the Build Alternative included converting one aeration basin to fine-bubble diffusion and retaining the current surface mechanical aerators for their thermal reduction value. The temperature models were much more sensitive to surface area than they were to the increased temperature of the compressed air used for fine-bubble diffusion. This is why the proposed improvements for the proposed Project utilize the full surface area of both aeration basins, rather than converting one or both to concrete basins.

The temperature models indicate that the aeration basin temperature will stay below the Secondary Plant SIU required 104º F under all conditions, except the one resulting in 104.1º F. This condition included the worst case conditions stated previously, a mill wastewater effluent temperature of 115º F, use of only aeration basin A-2, with no surface aerators activated. Additional surface aerators that are more efficient at reducing heat (at the expense of aeration efficiency) could be added in the future for further cooling if required for process considerations. These could be evaluated during facility design if additional cooling is desired and they could be provided at a fraction of the cost of cooling towers at the mill.

Class 2B River Requirements

WWTF effluent temperature is measured at the Secondary Plant, prior to entering the underground effluent pipeline, which extends 1,050 feet horizontally and 44 feet vertically to its discharge into the river. Physical features which result in further effluent cooling were not measured. In the time period from January 2003 through April 2005, there were only two days when the maximum wastewater effluent temperature reading at the Secondary Plant exceeded 86º F (by 1º F). It is not known what impact these maximum temperatures had on the river, since average river temperatures at both ends of the mixing zone and river flow was not known. The average maximum final wastewater effluent temperature was 59º F in the period from January 2003 through April 2005.

In order to assess whether the increased flows due to the Project could increase the temperature of the river more than 5º F above natural conditions based on a monthly average of the maximum daily temperatures, a simple analysis was performed. For summer conditions, the analysis included the following worst case assumptions: 1) the 87º F peak maximum effluent temperature (not average maximum as required by the Class 2B requirements) recorded in the past could be reached with the new cooling system at the mill and supplemental cooling systems at the Secondary Plant, 2) no further cooling occurs in the effluent pipeline, 3) the wastewater peak day flow of 13.7 mgd occurs for durations much longer than the typical 4 to 6 hour mill spills of the past, and 4) the river is at 7Q10 minimum flow coincident with maximum recorded river temperature of 83.3º F. These assumptions produced a combined temperature of 84.9º F at the end of the mixing zone in the river, a temperature rise of only 1.6º F.

For winter conditions, the analysis included the following worst case assumptions: 1) the 39º F average monthly effluent temperature recorded in January 2004 could be reached after PM7 with the new cooling system at the mill and supplemental cooling systems at the Secondary Plant, 2) no further cooling occurs in the effluent pipeline, 3) the wastewater peak day flow of 13.7 mgd occurs for durations much longer than the typical 4 to 6 hour mill spills of the past, and 4) the river is at 7Q10 minimum flow coincident with a minimum river temperature of 32.1º F (just above freezing). These assumptions produced a combined temperature of 35.1º F at the end of the mixing zone in the river, a temperature rise of only 3º F in January. Using the same assumptions for February 2005, except for the 44º F average monthly effluent temperature recorded, produced a combined temperature of 37.2º F at the end of the mixing zone in the river, and a temperature rise of 5.1º F. While this marginally exceeds the 5º F limit, it is likely that the temperature would be reduced further due to contact with frigid air temperatures.

Summary

The future thermal loading from the WWTF into the Mississippi River will decrease with the implementation of the non-contact cooling system at the mill and the auxiliary systems at the WWTF. The aerobic selector basin, the retention of the existing large surface area aeration basins, and the retention of the surface mechanical aerators and supplementary splashers will more than offset any heat gains resulting from converting one aeration basin to a fine-bubble system. Reducing the thermal load from the WWTF will eliminate Mississippi River impacts. Cooling the mill effluent will primarily occur at the mill. Additional cooling will be accomplished (in the order of implementation) by: 1) activating the supplemental surface aerators in the aeration basin with fine-bubble diffusers, 2) placing both aeration basins in service, and 3) cooling in the equalization basin (assuming it is not being used to contain a spill at the time). Additional aeration basin cooling could be done simply by adding more surface aerators. Additional effluent cooling could also be done by adding cascade aeration to the effluent pipeline.

Existing WWTF Constraints Eliminated

Due to the peak loadings expected with PM7, additional biological capacity is needed as well as flow equalization. Modifications to the aeration basins include a new liner and fine bubble diffusers in one basin to increase oxygen transfer and rehabilitated surface aerators in the other to maintain a temperature suitable for biological activity. Separate treatment of the WAS from the Secondary Plant and primary sludge from the Primary Plant will be implemented in stages. Additional dewatering capacity to replace aged equipment and accommodate PM7 is required and will be provided by new equipment. A new sludge dewatering building and associated pumping and piping will be needed to accommodate the new belt filter presses.

No-Build Alternative

For the No-Build Alternative, no changes in the volume, temperature, or solids of the mill influent to the WWTF are anticipated unless PM5 were closed. If PM5 were closed, then the volume and solids to the WWTF would be reduced. Thus, no modification changes are anticipated to the WWTF as a result of the No-Build Alternative.

6.4.3.4 Mitigation

Several modifications to the WWTF are planned as part of the process improvements associated with the Build Alternative. The existing facilities have adequate capacity for future average loading conditions, but lack adequate capacity to treat future peak loading conditions. To mitigate future peak TSS loads, the addition of flow equalization and increased sludge dewatering capacity is proposed. To mitigate future peak BOD loads, additional oxygen for the aeration basins is proposed. To mitigate future peak temperature loads, non-contact water cooling at the mill and supplemental surface aeration at the Secondary Plant is proposed. Some additional improvements are also required due to the age and condition of the existing facilities.

6.4.3.5 Future Environmental Review Requirements

The proposed modifications are subject to MPCA NPDES permit conditions. The permit process will require additional modeling and pilot study work to validate the effectiveness of the proposed WWTF modifications in meeting requisite water quality protection standards. Under Minnesota Rules Part 4410.3000, subpart 3(2), preparation of an EIS Supplement is required if a project is not exempt and there is substantial new information or new circumstances that significantly affect the potential environmental effects of the proposed Project, and these effects were not considered in the Final EIS or affect the availability of prudent and feasible alternatives with lesser environmental effects. The Proposer has been notified of this provision in the rules regarding future modeling and pilot study work. DNR is RGU for any EIS Supplement prepared for the Project.

6.5 SOLID WASTES, HAZARDOUS WASTES, STORAGE TANKS

6.5.1 SOLID WASTE/HAZARDOUS WASTE

6.5.1.1 Existing Conditions

Solid waste is produced at the UPM/Blandin Paper Mill under operating conditions. Historically and into the future, ash and wastewater treatment solids are the major components of the solid waste produced; see Table 6-22. Bark and wood waste is used as boiler fuel, which produces ash. Typically, this ash has been re-used for agricultural spreading (land applied); whereas coal ash has been landfilled at a permitted facility.

Byproducts of the wastewater treatment process will continue to be generated at the Grand Rapids WWTF. These solids will continue to be disposed of at the permitted landfill owned and operated by the City of Grand Rapids.

Currently less than approximately one ton of hazardous waste is generated. Historically, hazardous waste generation was approximately 4-5 tons prior to 2004; see Table 6-22 and Table 6-23.

UPM/Blandin Paper Mill is designated as a Small Quantity Generator and will continue to operate under its current MPCA Hazardous Waste License Number MND006158943. All hazardous waste is manifested to Treatment Storage Disposal Facilities that are permitted in their respective states and are approved by both MPCA and the state's Hazardous Waste Vendor. Waste Codes, management methods, and reported quantities of hazardous wastes have been summarized in the MPCA Hazardous Waste License Application Forms, which are on file with the MPCA.

Table 6-22
Existing Solid Waste Type and Quantities Produced at the UPM/Blandin Grand Rapids Paper Mill

Waste Type and Treatment	Ash		Waste Water Sludge	Bark and Wood Waste		Domestic Waste	Metals	Others	Hazardous Waste (T)
	Re-use (BDT)	Landfill (BDT)	Re-Use (BDT)	Re-use (BDT)	Landfill (BDT)	Landfill (BDT)	Re-use (BDT)	Landfill (BDT)	
Year 2002 Amount	0	0	31,290	34,888	281	874	0	431	4.4
Year 2003 Amount	3,792	558	47,132	0	541	545	0	352	5.5
Year 2004 Amount	6,086	292	36,505	0	425	337	85	0	1.1

BDT = Bone-dryU.S. ton
T =U.S. tons

6.5.1.2 Impacts

Build Alternative

The estimated future solid waste generation at the UPM/Blandin Paper Mill is shown in Table 6-23. The addition of PM7 will result in an increased burning of bark and wood waste as boiler fuel. Ash production will be slightly greater, approximately 5 percent more than current conditions. There is not anticipated to be a major difference in waste ash production between the No-Build and Build Alternatives; see Table 6-23. It is expected that the current practice of making boiler ash available for agricultural purposes will continue. In the event that ash cannot be made available for this purpose, disposal will occur at the Grand Rapids Industrial Waste Landfill.

All process water, existing and future, will be treated at the Grand Rapids WWTF. The current WWTF is sized to handle the average load of the proposed Project but may need improvements to handle the peak loading conditions. See the Water Quality – Wastewater section.

Hazardous waste generation will not change with the proposed Project; see Table 6-23.

The PCC-generated wastes are new to the facility. The only solid waste produced by the PCC process is grit from the slaker and the PCC product screens. The slaker is an enclosed mixer used to produce calcium hydroxide (CaOH) from quicklime (CaO) and water (process water from host mill). Manufacturers have tested grit from several PCC plants and have confirmed that the material is not a hazardous waste according to USEPA definitions. The grit from the slaker is drained in the spiral classifier to approximately 85 percent solids. The PCC grit may either be dewatered in the classifier or discharged directly to a container with the dewatered slaker grit. The combined grit will contain 50 to 85 percent solids and is either sent to the host mill landfill or reused as an agricultural soil supplement.

Domestic wastes from the PCC plant will consist of waste paper, packaging materials, and other routine garbage. These materials are disposed of in accordance with all applicable regulations.

The only other wastes that will be used at the PCC plant are used oil from the equipment and small amounts of parts washer solvent (usually mineral spirits) for maintenance. Manufacturing facilities typically produce less than 500 gallons of used oil and 50 gallons of parts washer solvent each year. Disposal of these materials will be arranged with an approved recycler, who will transport and recover these materials.

The mill structures that housed PM3 and PM4 will be demolished prior to Project implementation. The Allete/Minnesota Power No. 6 turbine generator is housed in this building will be decommissioned and removed from the site prior to the demolition activity. This demolition activity is exempt from State Environmental Review requirements. This action is not part of the UPM/Blandin Paper Mill proposed

Project and is not subject to the EIS. The demolition area is approximately 345,000 square feet and/or approximately 150,000 cubic yards of fill will be removed.

Table 6-23
Estimated Future Solid Waste Generation at UPM/Blandin Grand Rapids Paper Mill

Waste Treatment and Waste Type	Landfill and Land Applied (REC)	Landfill		WWTF	Hazardous Waste Vender
	Waste Ash (TPY)	Solid Waste* (TPY)	Waste Water Sludge (TPD)	Waste Water (mgd)	Hazardous Waste (T)
No-Build Alternative Amount (without PM7)	3,500-4,000	1,000	120	6.6	<1
Build Alternative Amount (with PM7)	3,675-4,200	1,250	188	10	<1

** Municipal, Demo, Shipping Dunnage, Bark/Gravel (plus PCC byproduct if the proposed Project is implemented)*
T= tons (U.S.)
TPD = tons (U.S.) per day
TPY = tons (U.S.) per year

The following waste materials are anticipated to be generated during construction of the proposed Project. UPM/Blandin Paper proposes to deal with the waste material in the least environmentally damaging manner; see Table 6-24.

Table 6-24
Estimated Waste Materials Generated by Proposed Project

Waste Material	Waste Quantity
Cardboard	150 cubic yards
Concrete	40 cubic yards
Metals	30 tons
Plastics	200 cubic yards
Wood	1,280 cubic yards

All solid wastes generated will be continued to be managed in an appropriate manner consistent with local and state regulations. Any impacts associated with solid waste management are considered minimal.

No-Build Alternative

Under the No-Build Alternative solid waste generation and treatment will remain as is. If PM5 is shut down, solid waste generated may decrease.

6.5.1.3 Mitigation

All solid wastes will be re-used to the extent practical and the balance landfilled in compliance with existing regulations. The WWTF are sized to handle an increased load from the mill. The proposed Project is not expected to create adverse impacts resulting from generation of solid wastes, and no mitigation is required.

As currently occurring, any hazardous waste generated by the UPM/Blandin Paper Mill would be collected, stored, and a licensed operator would transport for disposal in compliance with existing regulations. In addition, UPM/Blandin Paper Mill has an approved Spill Prevention Control and Countermeasure Plan in-place. The purpose of the Plan is to identify potential sources of oil and hazardous substance discharges and facilities and methods to prevent and contain a spill. UPM/Blandin Paper Mill will remain a Small Quantity Generator and will follow the requirements as stated in their existing license.

6.5.2 EXISTING AND PROPOSED STORAGE TANKS

6.5.2.1 Existing Conditions

The paper making process requires the use of lubricating oils, grease, and related petroleum products. Approximately 7,000 gallons of petroleum products are stored on site in drums and small containers and approximately 32,000 gallons of petroleum products are stored in tanks associated with process equipment. In addition, tanks store products that are used in the pulping and paper making processes (Table 6-25).

Table 6-25
Existing Storage Tanks

Tank Identification No. / Loop Number	Tank Description and MPCA Tank Identification Number	Status	Stored Product	Connections/Process
154TK001/ 29-LT-3506	Hydrogen Peroxide #1 MPCA #105	Active	Chemical / bleaching	PGW bleaching
154TK002/ 29-LT-3509	Hydrogen Peroxide #2	Active	Chemical / bleaching	PGW bleaching
128TK002/ 29-LT-2755	No. 5 SW Medium Density Tower MPCA #188	Active	Wood Pulp Storage	Paper Machines via pipe bridge
147CH001/ 29-LT-1715	Hardwood Medium Density Tower MPCA #189	Active	Wood Pulp Storage	Paper Machines via pipe bridge
128CH001/ 29-LT-2721	No. 6 SW Medium Density Tower MPCA #182	Active	Wood Pulp Storage	Paper Machines via pipe bridge
602TK002/ 30-LT-1008	Bleached GWD Storage MPCA #174	Active	Wood Pulp Storage	Paper Machines via pipe bridge
601TK001/ 30-LT-1006	No. 6 Whitewater Storage Tank MPCA #173	Active	Vacuum Water Storage	From Paper Machines via internal piping from PM
621TK001/ 30-LT-1010	No. 5 Whitewater Storage Tank MPCA #240	Active	Vacuum Water Storage	From Paper Machines via internal piping from PM
604TK005/ 44-LT-2270	Raw Broke Storage MPCA #241	Active	Paper machine broke	From Paper Machines via internal piping from PM
919TK001/ 80-LT-1031	Recycle Storage Tank MPCA #104	Active	Wood Pulp Storage	From Paper Machines via internal piping from PM

6.5.2.2 Storage Tank Impacts

Build Alternative

No measurable impacts are anticipated from the current or proposed above ground storage tanks. Additional tanks for the storage of products and materials used in the pulping and paper making process are anticipated (Table 6-26). The additional tanks will primarily service PM6, PM7, and the Precipitated Calcium Carbonate facility (Figure 6-14). Note that tank numbers on Figure 6-14 correspond to Table 6-26.

Regarding the potential for soil contamination, some of the on-site soils are susceptible to contamination. Spill prevention for all construction areas will be maintained through constant inspections and monitoring of construction activity. Strict adherence to spill prevention and control BMPs will be enforced during construction. Once the Project is operational, spill responses will continue to be coordinated by the UPM/Blandin Paper Mill Spill Response Team. The spill team is trained and the mill maintains adequate spill response materials to address any spill of fuels or other petroleum products.

Table 6-26

Proposed Storage Tanks

Tank Identification Number	Tank Description and Tank Capacity	Status	Stored Product	Connections/Process
T001	TMP Bleached Tower (PM7) 528,344 gallons (2,000m3)	Proposed	Wood Pulp Storage	Wood pulp from TMP delivered to PM7
T002	TMP Bleached Tower (PM7) 528,344 gallons (2,000m3)	Proposed	Process bleaching	Wood pulp from TMP delivered to PM7
T003	TMP Un-Bleached Tower (PM7) 792,516 gallons (3,000m3)	Proposed	Wood Pulp Storage	TMP wood pulp storage
T004	TMP Bleaching Tower (PM7) 132,086 gallons (500m3)	Proposed	Process bleaching	TMP bleaching process
T005	TMP Bleached Tower (PM6) 528,344 gallons (2,000m3)	Proposed	Wood Pulp Storage	Wood pulp from TMP delivered to PM7
T006	PWG Bleached Tower (PM7) 528,344 gallons (2,000m3)	Proposed	Wood Pulp Storage	Wood pulp from TMP delivered to PM7
T007	TMP Bleaching Tower (PM7) 132,086 gallons (500m3)	Proposed	Process bleaching	TMP bleaching process
T008	TMP White Water Tower (PM7) 792,516 gallons (3,000m3)	Proposed	Vacuum Water Storage	White Water from PM7 used in TMP process
T009	Clear Filtrate Tower 1,056,688 gallons (4,000m3)	Proposed	Water Storage	Water for use in process
T010	Clear Filtrate Tower 1,056,688 gallons (4,000m3)	Proposed	Water Storage	Water for use in process
T011	TMP Latency Tower 528,344 gallons (2,000m3)	Proposed	Wood Pulp Storage	Closed loop pulp for PM

Tank Identification Number	Tank Description and Tank Capacity	Status	Stored Product	Connections/Process
T012	Fresh Water Tower 528,344 gallons (2,000m3)	Proposed	Water Storage	Make - up water for #7 PM
T013	PM7 Draft Tower 528,344 gallons (2,000m3)	Proposed	Water Storage	Closed loop pulp for PM
T014	Broke Tower 792,516 gallons (3,000m3)	Proposed	Paper machine broke	Closed loop pulp to PM
T015	Broke Tower 792,516 gallons (3,000m3)	Proposed	Paper machine broke	Closed loop pulp to PM
T016	Mega Pulper 528,344 gallons (2,000m3)	Proposed	Pulper process	Kraft Pulp supply to # 7 PM
T017	PCC Storage Tower 264,172 gallons (1,000m3)	Proposed	filler storage	Supply to #7 PM
T018	PCC Storage Tower 264,172 gallons (1,000m3)	Proposed	filler storage	Supply to #7 PM
T019	PCC Storage Tower 264,172 gallons (1,000m3)	Proposed	filler storage	Supply to #7 PM
T020	PCC Storage Tower 264,172 gallons (1,000m3)	Proposed	filler storage	Supply to #7 PM
T021	Koaline Clay Tower 264,172 gallons (1,000m3)	Proposed	filler /coating storage	Supply to #7 PM
T022	Koaline Clay Tower 264,172 gallons (1,000m3)	Proposed	filler /coating storage	Supply to #7 PM
T023	Koaline Clay Tower 264,172 gallons (1,000m3)	Proposed	filler /coating storage	Supply to #7 PM
T024	Day Tank (Clay) 21,133 gallons (80m3)	Proposed	filler /coating storage	Supply to #7 PM
T025	Day Tank (Clay) 21,133 gallons (80m3)	Proposed	filler /coating storage	Supply to #7 PM
T026	Trial Tower / Special Projects 52,834 gallons (200m3)	Proposed	filler /coating storage	Supply to #7 PM
T027	Lime Silo for PCC plant 528,344 gallons (2,000m3)	Proposed	Lime for PCC process	Lime supply for PCC proc.
T028	Lime Silo for PCC plant 528,344 gallons (2,000m3)	Proposed	Lime for PCC process	Lime supply for PCC proc.
T029	Lime Silo for PCC plant 528,344 gallons (2,000m3)	Proposed	Lime for PCC process	Lime supply for PCC proc.

No-Build Alternative

Under the No-Build Alternative, storage tank location, size, and material stored will remain as is. No modification will be necessary. If PM5 is shut down, it is anticipated that the quantity of stored material may decrease.

Figure 6-14
Above Ground Storage Tanks

6.5.2.3 Mitigation

The MPCA AST permit requires weekly inspection of all outside tanks listed in the permit for evidence of leaks, cracks, distortion, corrosion, or settlement, as well as internal and external structural inspections on a schedule specified in the permit and tank inspection summary. In addition, the UPM/Blandin Paper Mill has an approved Spill Prevention Control and Countermeasure Plan. The purpose of the Plan is to identify potential sources of oil and hazardous substance discharges and facilities and methods (existing or required) to prevent and contain a spill. It is aimed primarily at the prevention of spills and surface water contamination. The AST Permit and Spill Prevention Control and Countermeasure Plan will be amended to update with the Project process.

UPM/Blandin Paper Mill will submit for MPCA approval of the design specifications for the new tanks and any new underground piping. Once the MPCA has determined the new tanks and/or lines will have adequate safeguards, the permit modifications will incorporate the new tanks and/or lines into the permit, and a routine inspection schedule will be required by the permit.

All new tanks will be designed to provide secondary containment that meets or exceeds the regulatory requirements for emergency response. The new ASTs will be incorporated into the MPCA AST Permit Modification and will be routinely inspected in accordance with the permit requirements.

6.6 STATIONARY SOURCE AIR EMISSIONS

6.6.1 EXISTING CONDITIONS

The UPM/Blandin Paper Mill currently operates under Air Emission Permit No. 06100001-006, issued February 7, 2005 by the MPCA. Included in the operating permit is both the paper mill and the Allete/Minnesota Power owned and operated REC located at the mill (collectively, Facility). Because REC provides steam and electricity only for the paper mill, UPM/Blandin Paper Mill and REC are co-permittees. The electricity produced by REC is used to offset power that would otherwise be brought in by the electric power grid servicing the paper mill.

The Facility is located in an area designated as attainment with respect to all National and Minnesota Ambient Air Quality Standards (NAAQS and MAAQS, respectively). Implementation of the proposed Project will result in changes to the air quality impacts of the existing facility. These changes will be reviewed and permitted pursuant to the State of Minnesota and Federal air quality permitting regulations.

The main contributing air emission sources at the existing plant consist of four boilers (two natural gas-fired units and two wood/coal-fired units), a PGW mill, PM5, PM6, two coater/dryers, miscellaneous material handling, and truck traffic. The Facility has a PTE of greater than 250 tons per year for all criteria pollutants except lead and thus is an existing major source under the Prevention of Significant

Deterioration (PSD) program. In addition, the Facility is a major source of hazardous air pollutants (HAPs).

The Facility's existing limited PTE, obtained from the Title V operating permit renewal application submitted to the MPCA on December 15, 2003, and updated based on documents developed as part of the Project analysis, is summarized in Table 6-27. The pollutants summarized include particulate matter (PM), particulate matter with an aerodynamic size less than 10 microns (PM_{10}), sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOC).

Figure 6-15 shows the layout of the existing Facility, including the locations of the stacks contained in the current air quality permit.

Table 6-27
Summary of Existing Facility Limited PTE
(tons per year) [1]

Emission Unit	Stack/Vent Number	PM	PM_{10}	SO_2	NO_x	CO	VOC
PGW (including RTO) [2]	035, 038-041, 054	0.13	0.13	0.01	1.73	1.46	33.80
PM5	010-012	--	--	--	--	--	50.78
PM5 Coater/Dryer	019-026	1.96	1.96	0.15	25.77	21.65	14.02
PM6	013-015, 042-048	--	--	--	--	--	97.4
PM6 Coater/Dryer	027-034	3.89	3.89	0.31	51.13	42.95	26.99
Boiler #5 [3]	003	118.26	118.26	1301.91	827.82	1971.00	44.94
Boiler #6 [3]		118.26	118.26	1301-91	827.82	1971.00	44.94
Boiler #7	036	7.02	7.02	0.55	38.1	37.3	5.08
Boiler #8	037	7.02	7.02	0.55	38.1	37.3	5.08
Coal Unload and Convey	055	0.569	0.498	--	--	--	--
Coal Drawdown, Reclaim, Crush, Convey	056	0.057	0.039	--	--	--	--
Coal Drag Conveyor	057	0.0034	0.0016	--	--	--	--
Ash Convey	058	0.23	0.12	--	--	--	--
Fire Pump	062	0.16	0.16	0.15	2.32	0.50	0.19
Unpaved Roads	FS 001	25.64	7.58	--	--	--	--
Chip Pile	FS 002	0.023	0.011	--	--	--	--
Wood Waste Truck Dump	FS 003	0.475	0.224	--	--	--	--
Log Debarking	FS005	3.99	1.83				
Paved Roads	FS 006	47.35	14.00	--	--	--	--
TOTAL		**335.0**	**281.0**	**2605.5**	**1812.8**	**4083.2**	**323.2**

Source: Title V Reissuance Application, Wenck Associates, Inc., December 15, 2003.

[1] *The summary does not include a number of insignificant activities (i.e., miscellaneous natural gas fired space heaters, small boilers, and air make up units; storage tanks; research paper coater; starch silos; log debarking; etc.).*

[2] *RTO means regenerative thermal oxidizer.*

[3] *Reflects emissions from the worst-case fuel combusted by the unit.*

Figure 6-15
Existing Stack Configuration

6.6.2 AIR QUALITY IMPACTS

6.6.2.1 Build Alternative

The main changes to UPM/Blandin Paper Mill's emissions resulting from implementation of the proposed Project consist of the following:

- Installation of a new natural gas package boiler at REC;
- Installation of new grinding stones on existing PGW;
- Installation of a new TMP, including a waste heat recovery system;
- Installation of a new wood chip receiving station;
- Installation of new wood chip handling silos;
- Installation of a new PM7 and associated equipment;
- Installation of new clay unload and convey system;
- Installation of new starch convey and store system;
- Possible installation of a new PCC plant;
- Use of TMP produced pulp in the existing PM6;
- Increased efficiency of PM6 processing operation;
- Shutdown of existing PM5 and associated equipment; and,
- Increased utilization of existing equipment capacities.

The Facility's future limited PTE, obtained from the PSD Permit Application prepared by Wenck Associates, Inc. and submitted to the MPCA in August 2005 (PSD Permit Application) and the Title V operating permit renewal application submitted on December 15, 2003 as updated as part of the Project analysis, is summarized in Table 6-28.

Table 6-28

Summary of Future Facility Limited PTE (ton per year) [1]

Emission Unit	Stack/Vent Number	PM	PM_{10}	SO_2	NO_x	CO	VOC
Chip Receiving Station	New	[2]	[2]	--	--	--	--
Chip Silos	New	0.94	0.94	--	--	--	--
PGW (including RTO)	035, 038-041, 054	0.13	0.13	0.01	1.73	1.46	26.88
TMP (including RTO)	New	0.16	0.16	0.01	2.17	1.82	42.00
PM6	013-015, 042-048	--	--	--	--	--	97.4
PM6 Coater/Dryer	027-034	3.89	3.89	0.31	51.13	42.95	26.99
PM7	New	--	--	--	--	--	114.16
Clay Unload and Convey	New	0.56	0.56	--	--	--	--
Starch Convey and Store	New	0.56	0.56	--	--	--	--
Space Heating for PM7	New	0.39	0.39	0.03	5.17	4.35	0.28
Precipitated Calcium Carbonate Plant Silos	New	1.14	1.14	--	--	--	--
Boiler #5 [3]	003	118.26	118.26	1301.01	827.82	1971.00	44.94
Boiler #6 [3]		118.26	118.26	1301.91	827.82	1971.00	44.94
Boiler #7	036	7.02	7.02	0.55	38.1	37.3	5.08
Boiler #8	037	7.02	7.02	0.55	38.1	37.3	5.08
Peaking Natural Gas Boiler	New	9.14	9.14	0.72	41.26	101.36	6.61
Coal Unload and Convey	055	0.569	0.498	--	--	--	--
Coal Drawdown, Reclaim, Crush, Convey	056	0.057	0.039	--	--	--	--
Coal Drag Conveyor	057	0.0034	0.0016	--	--	--	--
Ash Convey	058	0.23	0.12	--	--	--	--
Fire Pump	062	0.16	0.16	0.15	2.32	0.50	0.19
Unpaved Roads [4]	FS 001	25.31	7.47	--	--	--	--
Chip Pile	FS 002	0.023	0.011	--	--	--	--
Wood Waste Truck Dump	FS 003	0.475	0.224	--	--	--	--
Log Debarking	FS 005 and New	9.25	4.24	--	--	--	--
Paved Roads	FS 006	17.72	3.45	--	--	--	--
TOTAL		**321.3**	**282.9**	**2606.2**	**1835.6**	**4168.7**	**414.6**

Sources: PSD Permit Application, Project Thunderhawk, Wenck Associates, Inc., August 2005. Title V Reissuance Application, Wenck Associates, Inc., December 15, 2003. Email to Ms. Amy Dean of Earth Tech, Wenck Associates, Inc., May 17, 2005.

1 *The summary does not include a number of existing insignificant activities (i.e., miscellaneous natural gas fired space heaters, small boilers, and air make up units; storage tanks; research paper coater; etc.).*

2 *Worst case is to assume that all wood is debarked and chipped rather than received as chips. Therefore, this value set to zero for summary purposes.*

3 *Reflects emissions from the worst-case fuel combusted by the unit.*

4 *Emissions correspond to Warehouse Option 4.*

5 *PM6 calculated at 100 percent PGW based pulp as in existing facility case or consistency. PM7 calculated using remainder of available pulp from TMP and PGW. In the actual case, PM6 and PM7 will use variable amounts of each type of pulp. This method accounts for all possible pulp use between the two paper machines.*

6 *Boiler 9 emissions are calculated using the currently proposed NOx limit as of December 2005 and 100 percent capacity. A capacity limit may be taken which would lower emissions further.*

The difference in permitted allowable emissions is summarized in Table 6-29:

Table 6-29
Permitted Allowable Emission Levels

PM	PM10	SO2	NOx	CO	VOC
-13.8	+1.9	+0.61	+22.8	+85.5	+91.3

6.6.2.2 Mercury Emissions

According to company estimates that have been reviewed by MPCA staff, mercury emissions could increase by approximately 1.5 lbs per year because of the increased solid fuel use in the existing boilers. Total annual emissions from the entire facility after this expansion are estimated to be about 4.3 lb per year, compared to 2.8 lb currently.

The boilers at this facility will be subject to a federal emissions limit (40 CFR Part 63, Subpart DDDDD) for mercury with a compliance deadline of September 13, 2007. The facility's current mercury emissions are less than the federal emissions limit and will remain below the standard after the expansion is completed.

Based on the small amount of mercury from this expansion and from the facility as a whole, and the fact that this facility will be subject to a federal emission limit for mercury, MPCA staff has recommended that the Project proceed without further mercury analysis.

6.6.2.3 EAW Table 5 Sources

Table 5 of the scoping EAW presented the new emissions sources associated with the Project. Since completion of the EAW, the information contained in Table 5 has been revised. Table 6-30 presents a revised EAW Table 5. Also included is the anticipated type of control for the proposed new emissions sources, as obtained from the PSD Permit Application.

Table 6-30
Revised EAW Table 5: Projected Emissions and Sources

Source Identification	Control Type	Emissions
PM7 Production Line	None	VOC
Package Boiler	Flue Gas Recirculation Good Operating Practices None	NO_x, VOC SO_2
TMP	Incineration	VOC
Chip Receiving Station	Fabric Filter	Particulates
Wood Chip Handling Silos	Fabric Filter	Particulates
Clay Unload and Convey	Fabric Filter	Particulates
Starch Convey and Store	Fabric Filter	Particulates
Additional Natural Gas Space Heaters	Good Operating Practices None	NO_x, VOC SO_2
Precipitated Calcium Carbonate Plant Silos	Fabric Filter	Particulates

Source: PSD Permit Application, Project Thunderhawk, Wenck Associates, Inc., August 2005.

6.6.2.4 PSD Applicability

In order to determine the applicability of the PSD permitting requirements for the proposed Project, the net emissions increase must be determined for each PSD-subject pollutant. The net emissions increase is the sum of emissions increases from new emissions units, emissions increases from existing emissions units that are directly caused by the Project, and any emissions increases and decreases that have occurred at the facility within the last five years. The net emissions increase information contained in Table 6-31 was obtained from the PSD Permit Application.

Based on these results, PSD review is triggered for SO_2, NO_x, and VOC. As a result, best available control technology (BACT) and ambient air quality analyses will be required for these pollutants.

BACT Review

A BACT review is required for each new and physically modified existing emissions unit associated with the Project. Although the existing REC boilers, coal, ash, wood waste handling systems, and truck traffic will have emissions increases resulting from the proposed Project, none of these emissions activities will be physically modified. Therefore, none of them are subject to the requirement to perform a BACT review. Emissions from Boiler No. 5 and No. 6 will continue to be controlled by cyclones and electrostatic precipitators.

The PSD Permit Application contains a complete BACT analysis for the new and modified existing emission units associated with the proposed Project. Table 6-30 shows the proposed BACT for each of the new emission units. BACT for the modified existing emissions units (i.e., PGW, PM6, and PM6 coater/dryer) is proposed either as the existing controls (PGW) or no control (PM6 and PM6 coater/dryer). However, a final BACT determination for each new and modified existing source will be made by the MPCA during review of the PSD Permit Application and preparation of the associated operating permit modification.

Table 6-31
Summary of PSD Applicability Evaluation (ton per year)**

	PM	PM_{10}	SO_2	NO_x	VOC	CO	Lead	H_2SO_4	Fluorides
Thunderhawk Increase Alone – Paper Production Sources and Incremental Steam Increase									
Future Paper Sources	56.12	21.09	0.36	60.21	401.71	50.57	0.00	--	--
Past Actual Paper Sources	-41.5	-12.2	-0.1	-24.8	-170.5	-20.8	-1.24E-04	--	--
Steam – Incremental Increase	30.90	12.60	213.42	379.46	10.28	230.10	9.42E-02	4.23	1.48
Sum – Thunderhawk Increase Alone	45.51	21.54	213.63	414.90	241.52	259.86	0.094	4.23	1.48
PM 3/4 Netting – Paper Production Sources and Steam									
Paper Source Reduction from Shutdown	-18.1	-5.0	-0.037	-6.2	-75.3	-5.2	-3.1E-05	--	--
Steam Reduction from Shutdown	-39.8	-9.9	na*	-127.6	-8.5	-212.1	-0.079	-1.34	-0.85
Addition of Center - fired burners to boilers 7 and 8 - Increases	0.065	0.065	0.0052	1.73	0.047	0.721	4.294E-06	--	--
Sum – Net Reduction	-56.97	-14.90	-0.03	-132.02	-83.78	-216.58	-0.079	-1.34	-0.85
Sum – Thunderhawk Project Net Emissions Increase									
Project Value	-11.46	6.64	213.60	282.88	157.73	43.28	0.016	2.90	0.63
PSD Significant Increase Threshold	25	15	40	40	40	100	0.6	7	3
PSD Review Triggered	No	No	Yes	Yes	Yes	No	No	No	No

Source: PSD Permit Application, Project Thunderhawk, Wenck Associates, Inc. August 2005.
** SO_2 reduction from shutdown of PMs 3 and 4 already relied upon for recalculation of gap former/steam box project.*
*** PSD applicability is based on emissions prior to BACT. Therefore permitted emissions from units with BACT will be lower than presented here.*

No-Build Alternative

Under the No-Build Alternative, the facility will continue to be operated as currently permitted. Therefore, the No-Build Alternative emissions are the same as those presented in Table 6-27.

6.6.3 MITIGATION

As part of the PSD review, an air quality impact analysis is required for the pollutants that trigger PSD. Because VOC emissions are associated with the creation of ozone, which is a regional issue rather than a localized issue, air quality modeling is not performed for VOCs in connection with PSD reviews. However, the facility will be required to model the impacts of SO_2 and NO_x for comparison to NAAQS, MAAQS, and the PSD increment consumption limits. A summary of the modeling analysis, obtained from the PSD Permit Application, is presented in Table 6-32. Because compliance with these standards will be required prior to issuance of a modified facility permit authorizing construction of the proposed Project, no mitigation of air quality impacts is anticipated.

Table 6-32
Summary of Air Quality Modeling Analysis

Pollutant	Standard	Averaging Period	Concentration (Mg/m³)	Background (Mg/m³)	Total (Mg/m³)	Limit (Mg/m³)	Compliance?
NO_x	M/NAAQS	Annual	32.32	17	49.32	100	Yes
	Increment	Annual	9.29	--	9.29	25	Yes
SO_2*	M/NAAQS	1-hour	292.81	181	473.81	1300	Yes
		3-hour	163.01	128	291.01	1300	Yes
		24-hour	40.19	60	100.19	365	Yes
	Increment	3-hour	114.11	--	114.11	512	Yes
		24-hour	28.23	--	28.23	91	Yes

Source: PSD Permit Application, Project Thunderhawk, Wenck Associates, Inc., August 2005.
** The annual averaging period was not modeled for SO_2 because the Project impacts were less than the applicable significant impact level.*

6.7 DESIGNATED PARKS, RECREATION AREAS OR TRAILS

6.7.1 EXISTING CONDITIONS

Syndicate Park and the Mississippi Melodie Showboat Site and Dock, located at 16th Avenue NW and Third Street NW, are two designated parks identified in the vicinity of the UPM/Blandin Paper Mill site. A finding in the Facility section of the City of Grand Rapids' Park Facility and Recreation Programming Analysis – Recommendations for the Future (2001) (referred to as Analysis), stated that the anticipated expansion of the UPM/Blandin Paper Mill may eliminate both Syndicate Park and Showboat Landing (and affiliated pine stands and open space). According to the city, Syndicate Park is minimally used because of its location and access issues. The park is not located in close proximity to a majority of the population, and people (especially children) have difficulty walking or biking to the park as they have to cross busy roads and railroad tracks.

Currently, Syndicate Park is a city park approximately one acre in size and features play equipment and field areas with interspersed trees. The primary function of Syndicate Park is a neighborhood park. A neighborhood park as defined in the Analysis (2001) is an area for intense recreational activities such as field games, court games, crafts, playground equipment, skating, etc. Showboat Landing is considered a special use park, and is an outdoor amphitheater, classified as a community park. A community park's use is defined in the Analysis (2001) as an area of diverse environmental quality, suited for intense recreation activities and less-intense activities such as walking, sitting, or picnicking. The Analysis (2001) indicated that the equipment of Syndicate Park needs replacement and is considered a major issue. The Analysis outlines the cost of capital improvements to the Park totaling approximately $39,000.

Specifically, Showboat Landing is the site of the Mississippi Melodie Showboat performances. The performances feature music, solo and chorus singers, dance and comedy skits of the showboat era and are conducted in July each year. A private company maintains Showboat Landing. No capital improvements have been identified for Showboat Landing.

The Mississippi River adjacent to the Project area is a state designated canoe and boating route, titled "Mississippi River 3 – Vermillion River to Palisade." Currently users paddle the reservoir until they reach a point on the shoreline south of the boom and portage the dam for approximately 1,200 yards along the south side of the Mississippi River.

North Country National Scenic Trail is a trail system that connects North Dakota to New York. Some miles are off-road, others follow shared paths, and some are considered road walks. A portion of the Trail follows Third Street NW through Grand Rapids and north of the Project area. This trail segment is considered a road experience.

A number of recreational areas are located relatively close to the City of Grand Rapids but are not within the Project area. These include:

- State Parks: Hill Annex Mine, Schoolcraft, McCarthy Beach, Scenic, Big Bog Recreation Area, and Lake Bemidji
- State Forests: Golden Anniversary, Remer, Hill River, Savanna, George Washington, and Bowstring
- State Trails: Taconite State Trail and a trail spur through eastern portion of Grand Rapids
- State designated Scientific and Natural Areas: Botany Bog (#84) and Wabu Woods (#126)
- Wildlife Management Area: Bass Brook
- State designated snowmobile trails: Grant-In-Aid Trail 142 (Driftskipper Trail) and State Trail 61 (Taconite State Trail)
- State designated Wild and Scenic Rivers: Mississippi River from St. Cloud and Minnesota River south to Anoka.
- Public Waters Inventory (PWI): Paper Mill Reservoir (No. 31-533)
- State designated Rabey Line ATV Trail within the Hill River and Savanna State Forests.
- State Scenic Byway: Trunk Highway 38 (titled "Edge of the Wilderness Scenic Byway")
- America's National Scenic Byways: The Minnesota Great River Road
- National Forest Scenic Byway: The Edge of the Wilderness Scenic Byway (TH 38)
- National Forest: Chippewa National Forest

6.7.2 DESIGNATED PARKS, RECREATION AREAS OR TRAILS IMPACTS

6.7.2.1 Build Alternative

The designated parks, recreational areas, or trails within the Project vicinity are Syndicate Park, Showboat Landing, Mississippi River Canoe and Boating Route, and North Country National Scenic Trail. The acquisition of Syndicate Park would occur if Warehouse Option 4 is chosen. Blandin Beach located on the east side of Forest Lake is the closest city park that provides the same features as Syndicate Park. Residents in the Syndicate Park area may have to travel approximately a quarter-mile to Blandin Beach. The Park acquisition would require a rezoning from SPU District to SI-2 District, which is the current UPM/Blandin Paper Mill designation. Increased noise related to warehouse construction (this will be local and temporary), warehouse operations, increased vehicle traffic along Third Street NW, and railway activity may be an issue of siting the warehouse at Syndicate Park. Visual impacts of the warehouse will be minor as the adjacent property to the west contains warehouses, garages, and storage buildings. According to the City, the park is seldom used.

No direct impacts are anticipated to Showboat Landing, whether Warehouse Option 4 is utilized or not. The northern portion of the Showboat Landing parcel has been previously developed with garages and surface lots. The southern portion of the Showboat Landing parcel contains an amphitheater that is used for the Mississippi Melodie Showboat show. The show takes place during the last three weekends in July. Noise from Warehouse Option 4 may be perceivable at the Mississippi Melodie Showboat performance area and adjacent properties. In addition, Syndicate Park used to provide parking during the shows. If Warehouse Option 4 is implemented, performance goers may have to find alternative parking spots on area streets and open spaces.

If Warehouse Option 4 is not selected, then no adverse impacts to designated parks, recreational areas or trails should result from the proposed expansion.

No impacts are anticipated to the Mississippi River Canoe and Boating Route as a result of the proposed Project. The Project will include the construction of a new intake structure. The new intake structure is proposed to be located just upstream of the Blandin Dam on the north side of the Paper Mill Reservoir. Thus, it would be sited on the opposite side of the Paper Mill Reservoir from the canoe portage route. The DNR route description states that the dam must be portaged on the south side for approximately 1,200 yards. Construction related impacts (i.e., noise and visual impairments) will be local, temporary, and occur only during construction. This portage route is not anticipated to be affected by the proposed Project. It is anticipated that the dam will be portaged in same manner as previously carried out.

The North Country National Scenic Trail through the City of Grand Rapids is mostly a road and/or sidewalk walk. This experience will not change for the user, thus no impacts are anticipated from the proposed Project.

6.7.2.2 No-Build Alternative

Under the No-Build Alternative, no changes to parks, recreational areas, or trails are anticipated. The parks and trails will remain at their current locations and sizes.

6.7.3 MITIGATION

According to the City's Park Facility Analysis (2001), the City has recognized that Blandin Paper Company may expand their facility and acquire the surrounding areas. The City and Blandin Paper Company will need to discuss potential mitigation options. A probable mitigation option would be to help the City replace Syndicate Park with a more accessible park facility. The 2001 Analysis made the following recommendations:

- Obtain land for a neighborhood park in western Grand Rapids, possibly in the to-be-annexed area west of Forest Lake.
- A small play lot park to directly serve children in the area in the northwest.
- Assist the City with their desired development of the various aspects of the proposed riverfront plan to create a year-round community focal point.
- Improve Isaak Walton Park as a public river access facility.
- Assist the City with the acquisition of Sylvan Point.
- Assist with development of the Itasca County Fairgrounds and associated Crystal Lake

If Warehouse Option 4 is not selected, then the proposed Project is not considered to cause adverse effects on Syndicate Park, therefore no mitigation measures are required.

The proposed Project is not anticipated to cause direct adverse impacts upon the Showboat Landing aside from noise during construction, warehouse operation, and increased truck traffic and railroad activity. No mitigation measures are required. As an effort to alleviate noise-related issues, Blandin Paper Company may be able to halt warehouse operations during the performances and performance practice.

The proposed Project is not considered to cause adverse effects on the designated Mississippi River Canoe and Boating Route and the North County National Scenic Trail therefore, no mitigation is required.

6.8 VISUAL RESOURCES

6.8.1 EXISTING CONDITIONS

Mill-related operations require warm water vapor generation where waste warm water vapors are discharged to the atmosphere through a series of exhaust stacks. This warm water vapor discharge is necessary for both current and proposed operations. The paper making process typically requires warm water as a carrier for wood fiber. Once the paper sheet is formed, water needs to be removed via vacuum systems and heated drying. The water vapor that is observed rising from the facility is primarily a result of both water removal processes. Heat exchangers and insulation are utilized to reduce and retain as much energy (as heat) in the paper making process as possible. Visible plumes are created with the warm water vapor discharge and their visibility varies as a function of discharge rates and volumes and weather factors such as ambient temperature, wind speed, and relative humidity. The facility's warm water vapor plumes can be observed from surrounding areas and under certain conditions contribute to local fogging conditions.

The current number of warm water vapor plumes is lower than the historic condition due to the shutdown of PM3 and PM4 in 2003. The existing stacks on the far southern part of the facility (e.g., housing for PM3 and PM4) will be removed prior to the Project. These stacks are now shut down, which means that the site has fewer active stacks now than was the case under the historic condition.

The current visual setting of the UPM/Blandin Paper Mill area is indicative of an industrial manufacturing facility. The buildings are typically large, rectangular in shape, and in general look like warehouses; see Figure 1-4. The UPM/Blandin Paper Mill is situated on the fringe of downtown Grand Rapids, with business and offices adjacent to the east and north. The Paper Mill Reservoir lies to the south and a residential area is adjacent to the west. The mill and its industrial setting has existed at this location since 1901.

6.8.2 VISUAL IMPACTS

6.8.2.1 Build Alternative

Project-related installation of PM7 would add new stacks or warm water vapor vents to the site very similar to those now present for PM6. These structures and related plumes would be in the same general area where these features for PM3 and PM4 historically occurred; however, the new structures would be at a slightly higher elevation, which should result in greater dispersal prior to reaching ground elevations. The new TMP would also generate warm water vapors, likely from an estimated 2 to 4 stacks located in the general area of the historic PM3 and PM4 discharges. In addition, the new PCC facility would generate warm water vapor discharges from the cooling towers. The cooling towers are used to cool down process water through evaporative means.

Overall warm water vapor volumes should appear slightly greater with the proposed Project compared to previous facility operations when PM3, PM4, PM5, and PM6 were operating. The warm water vapor plume associated with the operation of PM6 and PM7 is expected to be greater than the historic profile even with the shutdown of PM3, PM4, and PM5. It is estimated that some 12 to 17 stacks will generate visible water vapor exhaust once the Project is complete and operational. A final number will not be known until the final design specifications have been determined. In terms of generating local fog conditions, the proposed building and stack configuration is expected to reduce these instances from current conditions. The water vapor plume is primarily an aesthetic issue that has been relatively constant since the facility has been in operation.

Building elevations will be similar to the existing PM6 facility. No visual impacts upon the surrounding neighborhoods and environment are anticipated from the height or elevation of the proposed Project. A majority of the new structures (e.g., TMP, PM7, and Finishing Area) will be located at the same place as the Coating Kitchen, PM3, and PM4 structures, which will be demolished.

Warehouse Option 2 involves the construction of a new warehouse just east of PM6. The warehouse may cause minor impacts to the visual character of downtown Grand Rapids. The alterations would be localized and would not affect views of the Mississippi River, historic buildings, or other visual resources by neighbors or travelers. The warehouse would not break up the downtown area or cause inconsistency in the visual layout. The PM5 and PM6 building is in the background of the downtown area. Building the warehouse adjacent to this facility would extend the existing visual appearance. The City of Grand Rapids has been conducting studies and planning to redevelop the CBD and riverfronts areas. Block 17 was not a part of the Grand Rapids Downtown Redevelopment Design Standards or other published redevelopment plans, but it was noted that Block 17 might be developed by the Blandin Paper Company. Block 18, adjacent east of the proposed warehouse location, is where most of the redevelopment assessments begin.

Warehouse Option 4 proposes a new warehouse be built off site west of the mill's woodyard. This warehouse may cause minor visual impacts to the neighborhood west of the UPM/Blandin Paper Mill. Again the visual changes are localized and would not affect views of the Mississippi River, historic buildings, or other visual resources by neighbors or travelers. Most of the visual impacts would result from the loss of mature red pine and maple trees associated with the park. Residences would remain in place (south of Second Street NW) between the Mississippi River and the proposed warehouse site in order to not change river views. In addition, the Showboat Landing, site of the Mississippi Melodie Showboat Show, is located south of the proposed warehouse site. Seating for the show's audience faces south overlooking the Mississippi River, thus the proposed warehouse will not be visible during Showboat performances. However, performance goers will be able to see the warehouse as they enter and exit the Showboat Landing. Noise from warehouse activities may be heard at the adjacent properties. (See the Noise section for additional information.)

Warehouse Option 5 is proposed to be located in an established warehousing facility located in Duluth, Minnesota. This proposed warehouse option conforms to the current industrial zoning designation. No visual impacts are anticipated with Warehouse Option 5.

The proposed Project follows shoreland zoning designations, thus the visual aspects of the Mississippi River shoreland would not be significantly affected.

6.8.2.2 No-Build Alternative

Under the No-Build Alternative, no changes are anticipated to the visual setting of the mill and surrounding areas. Even if PM5 is closed, the building housing the paper machine and facilities would stand. The public may notice a nominal change in the reduced vapor plumes. The surrounding areas would remain as they appear today.

6.8.3 MITIGATION

The proposed Project would not result in a significant change when compared to historic water vapor plume levels. The length and persistence of these plumes would be influenced by the prevailing weather conditions such as temperature, relative humidity, and wind speed and would be most persistent and visible during cold and cool weather, principally during the mid-winter months. On most days of the year, however, visible steam or vapor plumes, if present, would disperse and evaporate after traveling only a moderate distance aloft. No mitigation would be required because steam plumes would disperse and evaporate after traveling only a moderate distance and would not result in a visual impact requiring mitigation.

Where practical throughout plant operations, steam energy would be reclaimed through the application of energy-reclamation technology. Best engineering practices (i.e., stack height, stack configuration) would be used for the design of the proposed Project's energy / water vapor systems to reduce the instances of fogging conditions. The PCC facility's cooling towers would use drift protection to minimize the amount of water vapor escaping the towers.

Warehouse Option 2 would have minor visual impacts on the downtown area. Potential buffering options include fencing, seating, structural planting (e.g., raised beds or planter boxes), lighting and fixtures, and color and texture that blend into the area. Since space is a constraint, landscape-style buffering is not practicable. Lighting options would not want to introduce stray nighttime lighting, thus shielded, cut-off fixtures, or lowering of lighting masts may reduce this effect. The City of Grand Rapids approved a design guide for the downtown area, called Grand Rapids Downtown Redevelopment Design Standards (2003). In addition, the City is preparing a Downtown Redevelopment Master Plan to help establish, enhance, and sustain the downtown area as the City wants. Building design and applications should attempt to mimic these principles.

Due to its location, Warehouse Option 4 would be better served by landscape buffering as a mitigation measure. Maintaining vegetative buffers, such as trees, shrubs, and planter beds around mill and warehouse facilities, would serve to dampen noise from development activities such as commotion from equipment and traffic. Vegetative buffers along Third Street NW and residences along the Mississippi River would both dampen noise and provide a visual barrier for people using the road and living in the area. In addition, warehouse activities could be temporarily halted during Showboat performances to prevent an impact. All warehouse options would follow local zoning ordinances.

CHAPTER 7.0
TOPICS ON WHICH SIGNIFICANT IMPACTS ARE NOT ANTICIPATED

7.1 GEOLOGIC HAZARDS AND SOIL CONDITIONS

7.1.1 EXISTING CONDITIONS

The approximate depth to ground water is a minimum of 18 feet with a 24-foot average. The approximate depth to bedrock is a minimum of 100 feet with a 175-foot average. No geologic site hazards to ground water, such as sinkholes, shallow limestone formations, or karst conditions, exist within the Project area.

The geology of the site is typical for northern Minnesota. The Project area is considered geologically stable and is characterized by a layer of ice contact stratified glacial drift ranging from 100-250 feet in depth. The drift overlays a southeastward-dipping Animikie (620 million year old) rock formation. The specific bedrock under the Project area is formed of Virginia Argillite, which is a clay containing rock.

UPM/Blandin Paper Mill conducted a subsurface soil investigation to characterize the site's soils. Peat soils were detected in one boring hole at the extreme western end of the site. The boring indicates that the area is covered by a 5-foot layer of fill-type sand. The second horizon is a 2-foot layer of peat. No other indications of peat were found in the rest of the boring or in other bore holes. Records indicate that the peat area was formerly the edge of the original dam impoundment area in the early part of the 20th century. When the original dam collapsed, the replacement dam formed a smaller impound area. The specific peat site became dry land that was eventually backfilled and used for the log yard.

Several strata were encountered during the soil survey. The surficial sand fill layer is generally loose to medium sand fill (SP) that is 5-13 feet thick; at some locations this zone contains concrete demolition debris. The surface fill horizon overlies the former natural surface of loose to medium dense native sand (SP) that also contains a number of gravel sizes. The third layer of the strata is characterized by dense sand and gravel deposits (GP) that are found beginning at varying depths of 5-27 feet below the surface. These dense sand and gravel structures were found to extend to the bottoms of the soil exploratory holes, which reached depths of 50-100 feet. At localized areas within the site, a 5-10 foot thick layer of stiff to hard plastic clay (CH) was found situated between the layer of loose to medium natural sand and the horizon composed of dense sand and gravel.

The Soil Conservation Service (SCS) soil-type map indicated 1043C-Udorthents in the parking lot area, which are nearly level to rolling. Udorthents are well drained, and moderately well drained, soils that are found near iron mines and urban areas where soil material has been removed and redeposited by earth moving machinery. The material is typically stratified, but lacks soil horizons, except for those in the underlying buried soil. The soil typically is pale brown to reddish brown, loamy, sandy, or mixed sandy and loamy material. In most areas it is glacial till, but some areas contain low-grade iron ore ranging in size from clay particles to pebble size. Permeability is moderately rapid to slow. Available water capacity ranges from high in the loamy material to low in the sandy material. The surface runoff rate is medium. The organic matter content in these soils is low and natural fertility is low to medium. Included with these soils are small areas of natural soils mainly Nashwauk and Itasca soils on the slightly higher areas or poorly drained Blackhoof and Cathro soils in small depressions. These soil types make up less then 10 percent to the total.

Zimmerman Series soils occur at the site. These soils are typically nearly level to sloping, are excessively drained, and occur on glacial lake and outwash plains. The slopes are generally plane or convex in nature. Typically the surface layer consists of about one inch of organic forest litter. The first defined horizon is dark grayish brown, grayish brown, and dark gray loamy fine sand about three inches thick. The subsoil is about 20 inches of dark yellowish brown fine loamy sand and yellowish brown fine sand. The next 40 inches of soil is light gray and pale brown fine sand that has thin bands of brown loamy fine sand. The underlying material to a depth of 75 inches or greater is pale brown fine sand. In selected areas the soil has loamy layers, while in other areas the soil has sandy layers of predominantly coarse sand. Permeability is rapid in the Zimmerman soil and available water capacity is low. Surface runoff is slow. The soil is strongly acid or medium acid throughout. Organic matter content and natural fertility are low. Included within this soil type area are small areas of somewhat poorly drained Cowhorn soils in shallow depressions and drainage-ways. In areas of poor drainage such as deeper depressions Sago soils may be found. These soils form less then 10 percent of the total soil in this type.

Regarding the potential for soil contamination, some of the onsite soils are susceptible to contamination. Spill prevention for all construction areas will be maintained through constant inspections and monitoring of construction activity. Strict adherence to spill prevention and control BMPs will be enforced during construction. Once the Project is operational, spill responses will continue to be coordinated by the UPM/Blandin Paper Mill Spill Response Team. The spill team is trained and the mill maintains adequate spill response materials to address any spill of fuels or other petroleum products.

7.1.2 IMPACTS

No geologic hazards exist on the UPM/Blandin Paper Mill site or the warehouse locations. No adverse effect to the soil conditions is anticipated to result from the proposed Project.

7.1.3 MITIGATION

No impacts are anticipated, thus no mitigation is needed.

CHAPTER 8.0
PUBLIC AND AGENCY INVOLVEMENT

8.1 AGENCY MEETINGS/PUBLIC HEARING

UPM/Blandin Paper proposes to increase production capacity at its existing paper mill located in Grand Rapids, Itasca County, Minnesota. UPM/Blandin Paper Mill volunteered to conduct an Environmental Impact Statement under Minnesota Rules 4410.2000, subpart 3.8. The Department of Natural Resources is the designated RGU for preparing the EIS. Early coordination with agencies and the public began with the DNR preparing a Scoping Environmental Assessment Worksheet and Draft Scoping Decision Document (DSDD); see Appendix A. Both scoping documents were developed to identify the proposed Project's setting, potentially significant effects, and to determine what issues and alternatives would be addressed in the DEIS (or intended EIS scope).

The DNR released a Notice of Availability for review of the scoping EAW and DSDD. This was published in the Environmental Quality Board's Monitor on December 20, 2004. This initiated a 30-day comment period that concluded on January 19, 2005. In addition, the DNR held a public scoping meeting on January 12, 2005. Approximately 45 people attended the meeting. The attendees received information about the Minnesota Environmental Review Program, the proposed Project, and the proposed DEIS contents. They were given an opportunity to ask questions about the proposed Project and the DEIS process. The DNR provided a comment form for submitting written comments on the proposed DEIS scope. Comments were recorded and became part of the scoping record. The DNR considered the comments received during the scoping period, made revisions to the DSDD as warranted, and issued the Final Scoping Decision on February 9, 2005. The Final Scoping Decision served as the blueprint for DEIS scope preparation; see Appendix B.

A 30-day comment period will be available once the DEIS is released to ensure continuing agency and public involvement. In addition, a public information meeting will take place during the comment period. The DNR will invite public and agency comments during the 30-day comment period and at the public hearing. Comments received will be used to further analyze potentially significant effects. Following the comment period, responses to comments will be generated and a Final Environmental Impact Statement will be issued.

8.2 SUMMARY OF PUBLIC AND AGENCY COMMENTS

The DNR received 40 comment letters on the Scoping EAW and DSDD during the 30-day review and comment period. Comments were received from citizens, business owners, MPCA, the City of Grand Rapids, Grand Rapids Chamber of Commerce, Itasca County, Itasca Community College, Union Representatives, State Senators, State Representatives, public advocacy groups, non-profit organizations, Planning Committees, and Resource Councils.

The number of comments relating to the EIS scope are summarized below. In some cases, similar comments were submitted in multiple letters, thus these are treated as one. The comments primarily address issues already proposed for some degree of DEIS inclusion in the Draft Scoping Decision. Other comments necessitated additions to, or clarification of, information in both scoping documents. Copies of the comment letters are on public record and available through the DNR.

8.2.1 COMMENTS RELATING TO THE PROPOSED EIS SCOPE

Draft Scoping Decision Document Section 1.0 – Introduction and Purpose

The DNR received no comments regarding this section.

Draft Scoping Decision Document Section 2.0 – Project Alternatives

Three general comments were received

2.1 Proposed Alternative – The DNR received no comments regarding this section.

2.2 No-Build Alternative – The DNR received no comments regarding this section.

2.3 Site Alternatives – Two comments received

2.4 Technology Alternatives – Two comments received

- 2.4.1 Paper Production Technologies – One comment received
- 2.4.2 Fiber Sources – Five comments received
- 2.4.3 Forest Management – Three comments received

2.5 Modified Designs or Layouts – The DNR received no comments regarding this section.

- 2.5.1 New Paper Machine and Onsite Infrastructure – The DNR received no comments regarding this section.
- 2.5.2 Paper Warehouse Options – Eight comments received

2.6 Scale or Magnitude Alternatives – The DNR received no comments regarding this section.

- 2.6.1 Operational Change in Project Scale or Magnitude – One comment received.
- 2.6.2 Statewide Timber Harvest Levels – Two comments received

2.7 Incorporation of Mitigation Measures Identified through Public Comments – Two comments received

Draft Scoping Decision Document Section 3.0 – EIS Issues

3.1 Topic has been adequately analyzed in the EAW. Topic is not relevant or is so minor that it will not be addressed in the EIS. The Scoping EAW will be appended to the DEIS for reference. Ten general comments received.

3.2 Significant impacts are not expected; topic will be discussed briefly in the DEIS using the same information as the EAW. The DNR received no comments regarding this section.

3.3 Significant impacts are not expected but information beyond that in the EAW will be included in the EIS.

- 3.3.1 Potential conflicts with past and surrounding land uses (EAW Item 9) – One comment received
- 3.3.2 Cover types (EAW Item 10) – The DNR received no comments regarding this section.

3.3.3 Physical impacts on water resources (EAW Item 12) – The DNR received no comments regarding this section.

3.3.4 Water use (EAW Item 13) – One comment received

3.3.5 Erosion and sedimentation (EAW Item 16) – One comment received

3.3.6 Water quality: surface water runoff (EAW Item 17) – One comment received

3.3.7 Water quality: wastewaters (EAW Item 18) – Six comments received

3.3.8 Solid wastes, hazardous wastes, storage tanks (EAW Item 20) – Six comments received

3.3.9 Stationary source air emissions (EAW Item 23) – Four comments received

3.3.10 Archaeological, historical, or architectural resources (EAW Item 25a) – One comment received

3.3.11 Infrastructure and public services – Streets (EAW Item 28) – The DNR received no comments regarding this section.

3.4 Potentially significant impacts may result; information beyond what was in the EAW will be included in the EIS. One general comment received

3.4.1 Traffic (EAW Item 21) – One comment received

3.4.2 Noise (EAW Item 24) – Four comments received

3.4.3 Timber Harvest (EAW Item 29) – Eleven general comments received

- Modeling – two comments received
- Use of the New FIA Dataset – one comment received
- Use of the Forestry GEIS Implementation Progress and Accuracy Assessment Project – three comments received
- Impact Assessment – seven comments received
- Scale of Analysis – four comments received
- Precision of Analysis – two comments received
- Other factors – four comments received

3.4.3.1 GEIS Base Harvest Scenario comparison to No-Build Alternative

3.4.3.2 Build Alternative comparison to No-Build Alternative – Two comments received

3.4.3.3 Build Alternative with Mitigations – Nine comments received

3.4.3.4 Build Alternative Alternatives – The DNR received no comments regarding this section.

3.4.4 Regional Transportation Impacts (EAW Item 29) – The DNR received no comments regarding this section.

3.5 Socioeconomic Effects – Four comments received

<u>Draft Scoping Decision Document Section 4.0 – Identification of Phased or Connected Actions</u>

The DNR received no comments regarding this section.

4.1 Paper Warehouse Option 5 – The DNR received no comments regarding this section.

4.2 Precipitated Calcium Carbonate Facility – The DNR received no comments regarding this section.

4.3 Energy-Related Infrastructure – The DNR received no comments regarding this section.

4.4 Grand Rapids Wastewater Treatment Facility – The DNR received no comments regarding this section.

Draft Scoping Decision Document Section 5.0 – EIS Schedule (Tentative)

Two comments received

Draft Scoping Decision Document Section 6.0 – Special Studies or Research

6.1 Traffic Analysis – The DNR received no comments regarding this section.

6.2 Wastewater Treatment Facility Modifications Study – One comment were received

6.3 Generic Environmental Impact Study on the Timber Harvesting and Forest Management – The DNR received no comments regarding this section.

6.4 Future Forest Condition Analysis – One comment received

6.5 Forestry GEIS Implementation Progress and Accuracy Assessment Project – The DNR received no comments regarding this section.

6.6 Noise Analysis – One comment received

Draft Scoping Decision Document Section 7.0 – Government Permits or Approvals

The DNR received no comments regarding this section.

General comments:

Forty-nine general comments were received.

CHAPTER 9.0
LIST OF PREPARERS

NAME / PROJECT ROLE	EDUCATION AND PROFESSIONAL EXPERIENCE
	HDR ENGINEERING, INC.
DENNIS BRUCE Socio-economics	Mr. Bruce has a diversified range of experience in both the private and public sectors. Specializing in finance and economics, his exceptional analytical skills have enabled him to develop innovative solutions in the areas of risk analysis, business case development, and cost benefit analysis. In his time in private industry, he transformed the manner in which organizations approach investment decisions and evaluate organizational performance. Mr. Bruce holds a graduate degree in Economics. M.A., Economics, University of Western Ontario, 1987 B.S., Mathematics, Memorial University of Newfoundland, 1986
TIM CASEY, QEP Noise	Mr. Casey is HDR's Environmental Acoustics Program Manager and has over 10 years of experience leading HDR's Environmental Acoustics efforts. He specializes in noise and vibration monitoring and modeling for stationary and mobile sources including railroads, highways, combustion turbines, diesel generators, pumps, industrial and municipal installations, etc. Extensive use of the FHWA Stamina 2.0/Optima model, FTA transit noise and vibration analysis methodologies, and PC-based GIS technology. Additional training and experience on FHWA Traffic Noise Model (TNM) 1.0. Mr. Casey's experience includes presentations at public meetings, before city councils, and expert witness testimony for projects in locations throughout the United States and Puerto Rico. Mr. Casey holds the professional certification of Qualified Environmental Professional (QEP). B.S., Biological/Life Sciences, Saint Xavier University, 1988 A.S., Science, Valley Community College, 1986
NATE DALAGER, P.E. Water Resources	Mr. Dalager has more than 11 years experience in the areas of water resources engineering, hydrology, environmental and regulatory compliance, and civil engineering. His experience includes permitting, environmental review, storm drainage projects, flood studies, civil site design, preparation of plans and specifications, construction inspection, surveying, ditch improvement reports, erosion control, impoundments, and hydrologic and hydraulic modeling. B.S., Civil Engineering, University of North Dakota, 1992
KIRK DUNBAR Air Quality	Mr. Dunbar is an environmental engineer specializing in air quality modeling and permitting. His experience includes developing PSD and Title V permit applications, emission rate reviews, TRI reports, pollution prevention plan reports, QA/QC plans, performing air dispersion modeling, operating plans and negotiating permits with state agencies. Mr. Dunbar has reviewed numerous state and federal regulations and evaluated their applicability and impacts. B.S., Aeronautical/Astronautical Engineering, Iowa State University, 1989
JANE GORDEN Technical Editing, Document Production	Ms. Gorden has over 24 years of administrative experience. She has experience in assisting with research, data collection, landowner interviews, technical editing and document production for Phase I Environmental Site Assessments and Worksheets, Environmental Impact Statements, noise, air, and water quality technical memorandums, and various other environmental reports. B.A., English Language & Literature, University of Minnesota, 1980

NAME / PROJECT ROLE	EDUCATION AND PROFESSIONAL EXPERIENCE
CONNIE HEITZ Technical Editing, QA/QC	Ms. Heitz has 14 years of NEPA and planning document writing, coordination and management experience. In addition, Ms. Heitz has 17 years experience as a Planning Professional specializing in Environmental Studies. She has demonstrated ability as a project manager working with multi-disciplinary teams of engineering and environmental science professionals. M.S., Public Affairs (Environmental and Natural Resource Management), Indiana University, 1990 B.S., Public Affairs, Indiana University, 1985
BRIAN HUNKER Project Coordination, Environmental Studies	Mr. Hunker is an Environmental Scientist with a diverse project background in environmental documentation and wetland services. He has been involved in the preparation of Environmental Assessments, Environmental Assessment Worksheets, sections of EIS documents, wetland delineation, and evaluation of wetland functions and values. He has some experience in federal, state, and local permit processes. B.S., Environmental Sciences/Studies (Zoology and Biological Aspects of Conservation), University of Wisconsin-Madison, 1999
DAVID JOHNSON Water Resources	Mr. Johnson is a senior water resources project manager and section manager with more than 11 years experience in areas of water resources, hydrology, environmental and regulatory compliance, land use and watershed planning. His experience includes permitting, environmental review, sustainable design and development, storm drainage projects, flood studies, review of plans and specifications, construction inspection, ditch improvement reports, erosion control, impoundments, comprehensive wetland and watershed planning, and hydrologic modeling. M.S., Biological/Life Sciences, University of Minnesota Duluth, 1989 B.A., Biological/Life Sciences, Gustavus Adolphus College, 1987
ED LIEBSCH Air Quality, QA/QC	Mr. Liebsch serves as a project manager and technical leader for HDR's air quality efforts. His capabilities include dispersion modeling of air pollution, preparation of air quality permit (including PSD) applications, development of facility permitting strategies and regulatory evaluations with respect to local, state, and federal air pollution regulations and statutes (Clean Air Act), and preparation of air quality analyses under National Environmental Policy Act (NEPA) and state environmental review programs. During his tenure with HDR, Mr. Liebsch has also served as an adjunct faculty member (part-time, 1992-1998) in the Department of Earth Sciences, St. Cloud State University, St. Cloud, MN. In this capacity, he has taught upper-level undergraduate courses in micrometeorology, including fundamentals of air pollution meteorology and dispersion modeling. M.S., Meteorology, The Pennsylvania State University, 1981 B.A., Earth Science, with Chemistry Minor, St. Cloud State University, 1978
BRUCE MOREIRA GIS	Mr. Moreira has three years of experience in wetland delineation, GIS systems, regulatory documentation, and project management. He specializes in wetland delineation, GIS mapping and data collection, plant ecology, database construction/support, and natural resource management. He has a basic knowledge of AutoCAD systems and file transfer between GIS and CAD programs. He has field experience with Trimble, Leica, CMT, and Garmin GPS units and their maintenance. M.S., Forestry, Department of Forest Resources, University of Minnesota, 2001 B.A., Biology, Reed College, Portland, Oregon, 1997

NAME / PROJECT ROLE	EDUCATION AND PROFESSIONAL EXPERIENCE
PAUL NELSON Water Resources	Mr. Nelson has over 20 years of professional experience in the natural resources field, particularly in water quality planning, public involvement, watershed management, non-point source pollution prevention, and aquatic ecosystem restoration. He has negotiated the development of numerous implementation partnerships, raised matching local funds, and helped obtain over $1 million in grants for water resource projects. Mr. Nelson is responsible for studies of over 60 lakes, reservoirs, wetlands, and streams; and for the planning and development of 15 watershed management plans. He is experienced with both urban and agricultural water quality Best Management Practices, water supply watershed protection planning, TMDLs, and aquatic habitat issues. He is frequently given a leadership role for communicating complex scientific issues to the public and assisting with informed decision-making. M.S. Forestry; Minor Agricultural/Biological Eng., North Carolina State University, 1986 Additional post-graduate studies in Urban Storm Water Hydraulics and Hydrology B.S., Biology, Central Michigan University, 1981
CRAIG RASMUSSEN, P.E., PTOE Traffic/Transportation	Mr. Rasmussen specializes in traffic engineering with emphasis on operations analyses / capacity modeling, multi-agency studies, safety studies, and preparation of construction documents. He has gained increasingly progressive responsibility with project delivery on a variety of projects often combining transportation elements of highway and rail. B.S., Civil Engineering, University of North Dakota, 1999
BETH REGAN, CIH Noise	Ms. Regan has more than 14 years professional consulting experience in the environmental health and safety field. This includes 12 years of environmental laboratory management and analytical quality control experience. Ms. Regan has project experience in mobile and stationary source noise monitoring and modeling. Her experience includes extensive use of the Federal Transit Authority (FTA) and the Federal Railroad Administration (FRA) Noise and Vibration Impact Assessment Methodologies, the Federal Highway Administration Traffic Noise Model (TNM) and spreadsheet models for stationary noise source assessment. Certified Industrial Hygienist, No. 8779 CP, 2004 B. A., Biology, Augustana College, Sioux Falls, South Dakota, 1987
DAN SCHMIDT GIS Manager	Mr. Schmidt is responsible for Geographic Information Systems (GIS) development in civil, environmental, and architectural areas. He works with ArcGIS, ArcView, and a variety of system support software. He provides development of GIS databases, spatial analysis, GPS data collection and analysis, and mapping services. Mr. Schmidt has extensive experience in GIS evaluation and micrositing of utility-scale wind projects. M.A., Geography – Geographic Information Systems, Western Illinois University, 1994 B.A., Geography, University of Illinois at Chicago, 1991
DARRYL SHOEMAKER QA/QC	Dr. Shoemaker has a doctorate specializing in environmental resources management. Darryl is the national program manager for HDR's Power and Energy sector. His responsibilities include work coordination, program direction, client solutions, personnel actions, and market presence. He has extensive experience managing environmental reviews and compliance programs for infrastructure, utility and industrial facility siting. He has taught courses on and managed public involvement programs for siting projects. He has also authored a book on cumulative environmental effects. Ph.D., Faculty of Environmental Studies, University of Waterloo, 1994 B.E.S., Faculty of Environmental Studies, University of Waterloo, 1991 B.R.S., Department of Theology, Concord College, 1989

NAME / PROJECT ROLE	EDUCATION AND PROFESSIONAL EXPERIENCE
EVA TOMASZEWSKA Socio-economics	Dr. Tomaszewska is an applied economist with experience in policy and data analysis, economic modeling, and business case model development. Her exceptional analytical skills, experience, and academic credentials provide a basis for outstanding support and input to projects in many areas of cost-benefit analysis, financial analysis, and policy impact assessment. Ph.D., Economics, University of Alberta, Edmonton, 1997 M.A., Economics, University of Windsor, Windsor, 1992 Master, Economics of Foreign Trade, Lodz University, Poland, 1987
MICHAEL TRUEBLOOD Traffic/Transportation	Mr. Trueblood has experience as a Transportation Engineer with experience in the areas of traffic operations, transportation planning, roadway and traffic design. He has also served as a Project Engineer for transportation corridor studies, route location studies and traffic impact studies for residential, commercial and mixed-use centers. Mr. Trueblood has experience working on MIS/EIS/EA projects. M.S., Civil Engineering, University of Missouri Rolla, 1997 B.S., Civil Engineering, University of Nebraska Omaha, 1991
JEFFREY TURNER QA/QC	Mr. Turner has extensive project management experience preparation of environmental review documentation, quality assurance reviews and conducting public involvement programs. He has conducted planning and feasibility studies and been responsible for resource recovery facility procurement and implementation. Mr. Turner has a strong background in working with county boards, joint commissions, and city councils, and representing their interests in dealing with public groups and regulatory agencies. M.S., Geography, University of Nebraska Omaha, 1978 B.S., Biology/Chemistry/Earth Science, Peru State College, 1975
MARK WOLLSCHLAGER EIS Manager	Mr. Wollschlager is technical director for environmental review and permitting with HDR. He is responsible for strategy, coordination, guidance, reviewing, analyzing, and interpreting federal and state environmental and energy laws and regulations affecting various types of projects and facilities. He interacts with federal and state regulatory agencies on environmental, air quality and energy issues to expedite and secure project permits and approvals. He has prepared and managed preparation of numerous state and federal environmental reviews and impact analyses over the past 25 years in connection with projects such as railroad merger and construction, flood control, hospital and municipal waste resource recovery facilities, landfill siting studies, industrial facilities, pulp and paper plants, mining and processing facilities, hydroelectric projects, electric power plants, and cogeneration facilities. He has prepared federal and state licenses, exemptions ,and permits for projects. J.D., Law, William Mitchell College of Law, 1979 (*General legal education with substantial focus on environmental law)* B.S., Biology, University of Minnesota, 1975
SUBCONSULTANTS	
TERRY BROWN Forestry	Mr. Brown is a Research Associate at the Natural Resources Research Institute, University of Minnesota, Duluth. He has designed and implemented schema based multi-project multi-site on-line database (data entry and retrieval) with integrated GIS functions, designed and implemented prototype on-line EML metadata entry system, and produced various reports on Range of Natural Variation issues for forest management in Northern Minnesota. Ph.D., Biological Systems Simulation, University of Minnesota B.S., Microbiology

NAME / PROJECT ROLE	EDUCATION AND PROFESSIONAL EXPERIENCE
THOMAS BURK Forestry	Dr. Burk is a professor in the College of Natural Resources and holds the primary instructional responsibility for undergraduate forest measurements course and upper division/graduate courses in forest sampling, computer applications and modeling and simulation. He was elected National Chairman, Biometrics Working Group, for the Society of American Foresters, and sits on the editorial board for *Forest Science*. Ph.D., Forestry Biometrics, University of Minnesota (industry fellowship recipient) M.S., Statistics, University of Minnesota B.S., Forestry Management, Iowa State University
CHRISTOPHER EDGAR Forestry	Mr. Edgar is a research fellow, instructor and graduate assistance in the College of Natural Resources. He is a forest resource modeler with skill in computer modeling of forest systems, forest inventory and resource assessment, and natural resources and environmental monitoring. M.S., Forest Biometrics, University of Minnesota, 1997 B.S., Forestry Management, North Carolina State University, 1994
ALAN EK Forestry	Dr. Ek is a professor and Head of the Department of Forest Resources in the College of Natural Resources, University of Minnesota. The department administers three undergraduate curricula (forest resources, recreation resource management, and urban forestry), participates in conducting the natural resources and environmental studies curriculum, and its faculty serve as members of the forestry, water resources science, conservation biology and related graduate programs. Ph.D., Forestry, Oregon State University, School of Forestry, 1969 M.S., Forestry, University of Minnesota, School of Forestry, 1965 B.S., Forestry, University of Minnesota, School of Forestry, 1964
LEE FRELICH Forestry	Dr. Frelich is Director of the University of Minnesota Center for Hardwood Ecology, Senior Member of the Graduate Faculty in Forestry, Ecology, Evolution and Behavior, and Conservation Biology Programs, as well as Research Associate in the Department of Forest Resources, College of Natural Resources, at the University of Minnesota. Areas of expertise include boreal forest dynamics (jack pine, spruce, fir, white and red pine); disturbance ecology, including fire and wind; ecosystem management in forests; hardwood forests (oak and maple), invasive species (European earthworm) impacts in forests; modeling of growth and dynamics of vegetation and landscapes; neighborhood effects and species coexistence in plant communities; old growth forest and natural area evaluation, restoration and management; paleoecology and long-term dynamics of vegetation; and urban forestry. Ph.D., Forestry, University of Wisconsin, Madison, 1986 B.S., Bacteriology, University of Wisconsin, Madison, 1980 B.S., Botany, University of Wisconsin, Madison, 1979
JOANN HANOWSKI Forestry	Ms. Hanowski has 25 years experience in avian ecology. She is a Senior Research Fellow, Avian Ecologist, at the Center for Water and the Environment, Natural Resources Research Institute, University of Minnesota, Duluth. Ms. Hanowski is experienced in monitoring/analyzing breeding bird response to riparian forest harvest, landscape ecology, wildlife habitat assessment, and land-use management activities. M.S., Environmental Biology, University of Minnesota, Duluth, 1982 B.S., Biology and General Science, University of Minnesota, Duluth, 1979

NAME / PROJECT ROLE	EDUCATION AND PROFESSIONAL EXPERIENCE
HOWARD HOGANSON Forestry	Dr. Hoganson is an Associate Professor in the Department of Forest Resources, and associate editor of *Forest Science* for the area of forest management and planning. He has developed forest management models, integrated timber production and environmental quality, and served as lead analyst for the 2004 Forest Plans for both the Chippewa and Superior National Forests, for which he has received a USDA Forest Service Regional Forester's Honor Award. Ph.D., Forestry Management, University of Minnesota, 1981 M.S., Operations Research, University of Minnesota, 1980 M.S., Forestry Management, University of Washington, 1978 B.S., Forestry, University of Minnesota, 1977
GEORGE HOST Habitat / Biodiversity	Dr. Host is a Senior Research Associate and Director of the Natural Resources Geographic Information System Laboratory, Natural Resources Research Institute, for the University of Minnesota Duluth. He holds grants for the development of environmental indications of condition, integrity and sustainability in the Great Lakes basin, and development of sampling framework and key protocols for monitoring natural resources of the Great Lakes Network. Ph.D., Forestry Ecology, Michigan State University, East Lansing, 1987 M.S., Botany, Kent State, Ohio, 1982 B.S., Botany, Miami University, Oxford, Ohio, 1977
MICHAEL KILGORE Forestry	Dr. Kilgore is Assistant Professor, Department of Forest Resources, University of Minnesota, and Director of the Center for Environment and Natural Resources Policy in the Department of Forest Resources, University of Minnesota. Previously, he was Executive Director of the Minnesota Forest Resources Council from 1995 through 2001. He has also served as Forest and Environmental Policy Specialist, Minnesota DNR; State Planning Director, Minnesota EQB; Agricultural Economist, Minnesota DNR; and Research Associate and Assistant, Department of Forest Resources, University of Minnesota. Ph.D., Forest Resources Economics and Policy, University of Minnesota, 1990 M.S., Forest Resources Economics and Policy, University of Minnesota, 1984 B.S., Recreation Resource Management, University of Minnesota, 1982
JOHN MCCOY Forestry	Mr. McCoy is a consultant with 35 years experience in forestry. He has held various position with UPM-Kymmene/Blandin, and was once a District Forester with DNR. He has extensive experience in timber/forestland valuation, wood supply analysis, timber utilization and marketing, harvesting systems, and forestland investments. Graduate courses in forest appraisals and finance, Duke University, North Carolina M.S., Management, College of St. Scholastica, Duluth, Minnesota B.S., Forest Management, Michigan State University

CHAPTER 10.0
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