



# Foth & Van Dyke

November 22, 2005

Mr. Lawrence J. Lynch  
Mine Reclamation Unit  
Bureau of Solid and Hazardous Waste Management  
101 S. Webster Street  
P. O. Box 792  
Madison, WI 53707

Dear Mr. Lynch:

RE: Flambeau Industrial Outlot Action Plan

This letter is being submitted on behalf of Flambeau Mining Company (Flambeau) and provides a work plan to address the concern related to the surface water run-off at the Outlot area adjacent to the reclaimed Flambeau Mine property.

Monitoring of surface water at the site since the completion of the reclamation project has indicated that the Industrial Outlot biofilter is working well in lowering copper levels of surface water runoff flowing from the Outlot Area. The biofilter typically removes 95% of the copper when inlet and outlot surface water samples are compared. During 2003 and 2004 the former rail spur was reclaimed in an effort to reduce the concentration of copper in surface water runoff. Flambeau wants to reduce further sources of copper from the outlot area to the biofilter.

This work plan addresses additional measures that will be implemented in the Industrial Outlot Area such that copper levels in runoff to the biofilter will be further reduced. This work plan is an action plan that will involve a combination of grading, removal of surficial materials and replacement of the collection ditch.

## Introduction

As part of an ongoing review of site conditions at the Outlot Area, surface soil samples were collected on August 9, 2005 to determine copper concentrations. The sample locations are shown on the attached Figure 1. The concentrations of copper in the soil samples varied from 23 mg/kg to 1500 mg/kg. It is likely that the copper levels in these surficial soils are contributing to the copper levels in the surface water runoff to the biofilter.

## Work Plan

The proposed approach to reducing the copper levels in surface water runoff involves a combination of removal of surficial material and separation of sub-grade and new surficial materials of riprap and limestone gravel. The buffer zone of crushed  $\frac{3}{4}$  inch limestone is planned for the north ditch that drains into the biofilter pond. Each of these techniques is described below. These techniques will be applied to selective areas of the gravel surface of the Outlot Area.

The gravel surface areas designated for action have been selected based on the soil sample test results for copper concentration. The area around sample locations with copper concentrations greater than 700 mg/kg will be excavated. A 50 foot by 50 foot area will be excavated to a minimum of 4 inches below the existing surface. The excavated soil will be disposed of off site at a licensed solid waste disposal landfill as a special waste. A geotextile will be placed on the bottom of the excavation then covered with a minimum of 4 inches of  $\frac{3}{4}$  inch crushed limestone aggregate.

A total of five areas along with the ditch will be excavated. These five areas are centered on the following soils sample locations:

**Table 1**  
**Selected Soil Removal Locations**

Sample Number	Copper Concentration mg/kg	Depth below the surface of the sample
SS-3	910	0 to 4 inches
SS-7	820	0 to 4 inches
SS-12	1500	0 to 4 inches
SS-15	1300	0 to 4 inches
SS-17	700	0 to 4 inches

The drainage ditch between the Outlot buildings area and the reclaimed west rail spur area will be excavated and lined with the geotextile and covered with  $\frac{3}{4}$  inch limestone aggregate (gravel). The entire run of the ditch from the west end of the Outlot Area near the water storage tank to the biofilter pond will be treated with this action

It is estimated that approximately 155 C.Y of material will be removed from the five locations in the gravel portion of the Outlot Area. Approximately 210 C.Y. of material will need to be removed from the ditches.

Mr. Lawrence J. Lynch  
Mine Reclamation Unit  
Bureau of Solid and Hazardous Waste Management  
November 22, 2005  
Page 3

## Design Concepts

Each of the proposed elements of the remedial action plan has one or more purposes.

The purpose of the geotextile is to provide separation between the in-situ material and the ¾ inch crushed aggregate. Separation should minimize the potential for upward migration of deeper material toward the surface by frost action.

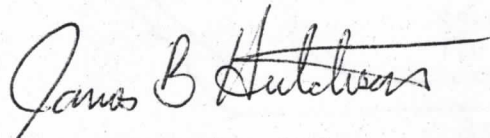
The purpose of ¾ inch crushed limestone in the north ditch and outlot is to provide buffering capacity of surface water from selected areas in the outlot area. The buffering will reduce the mobility of residual copper in the shallow subgrade soils in these areas.

Removal of surface soil with 700 mg/kg copper or above will be performed to a depth of approximately four inches. The excavation of the surface four inches will allow removal of the observed copper (soil) concentrations and allow a cover layer of new, limestone aggregate to hold the separation filter fabric in place.

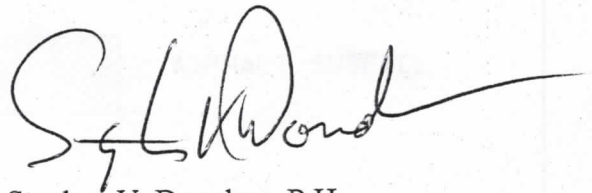
Please call Jim Hutchison at Foth & Van Dyke (920 497-2500) or Jana Murphy at Flambeau (715-532-6690), should you have any questions.

Sincerely,

Foth & Van Dyke and Associates, Inc.

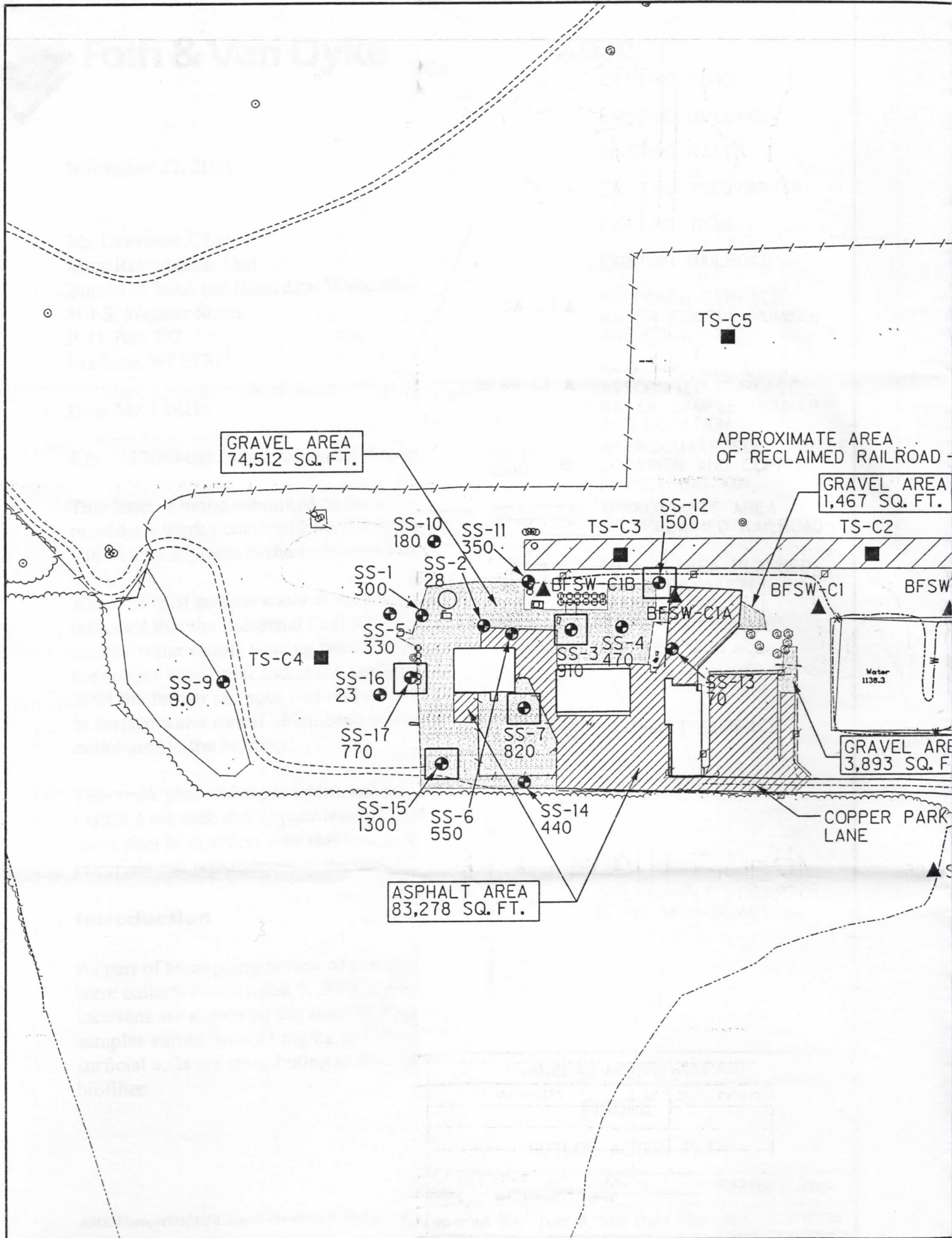


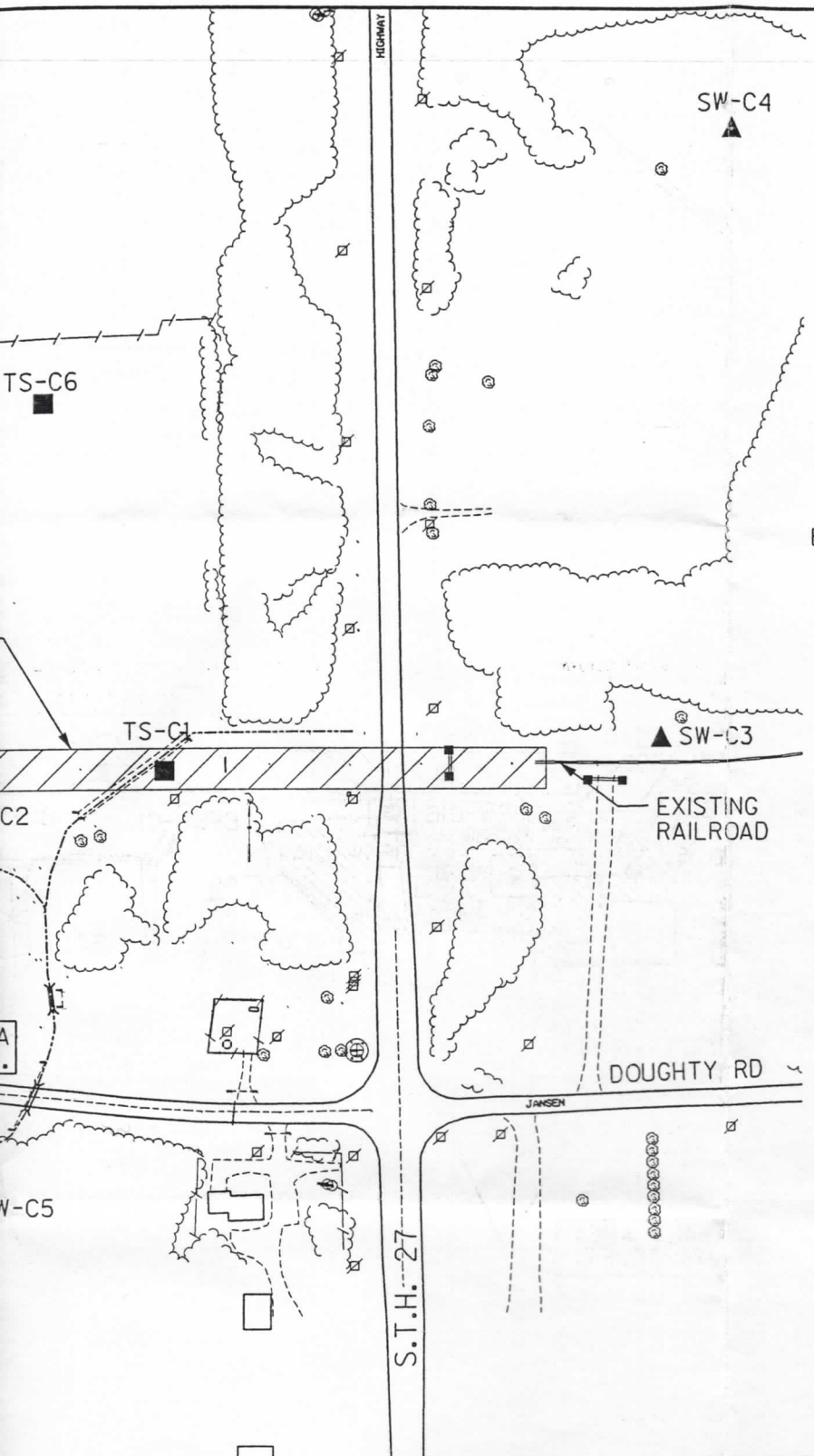
James B. Hutchison, P.E.  
*Lead Environmental Engineer*



Stephen V. Donohue, P.H.  
*Senior Project Manager*

cc: Jana Murphy, Flambeau Mining Company  
Ken Markart, WDNR (Rhinelander)  
Jon Kleist, WDNR (Ladysmith)  
Al Christianson, City of Ladysmith  
Randy Tatur, Rusk County  
Mark Steward, Rusk County Zoning  
Tom Riegel, Town of Grant  
Hank Handzel, DeWitt, Ross & Stevens  
Fred Fox, Kennecott Minerals  
Marten Cieslik, Foth & Van Dyke





**LEGEND**

- EXISTING ROAD
- EXISTING BUILDING
- EXISTING WATER
- EXISTING TREE/BRUSH
- EXISTING TRAIL
- EXISTING RAILROAD
- SW-C4 ▲ PROPOSED SURFACE WATER SAMPLE NUMBER AND LOCATION
- BFSW-C1 ▲ PROPOSED BIOFILTER ASSOCIATED SURFACE WATER SAMPLE NUMBER AND LOCATION
- SS-12 1500 ● APPROXIMATE SOIL SAMPLE LOCATION AND COPPER RESULT (MG/KG)
- [Hatched Box] APPROXIMATE AREA OF RECLAIMED RAILROAD
- [Square with Circle] 50'x50' AREA PLANNED FOR EXCAVATION
- [Dotted Box] GRAVEL SURFACE
- [Diagonal Line Box] ASPHALT SURFACE

**NOTE:**

1. SOIL SAMPLE LOCATION IS AN APPROXIMATION.



Foth & Van Dyke			
REVISED	DATE	BY	DESCRIPTION
CHECKED BY:	GJB1	DATE:	JULY 04'
APPROVED BY:	SVD1	DATE:	JULY 04'
APPROVED BY:		DATE:	JULY 04'

FLAMBEAU MINING COMPANY			
<b>FIGURE 1</b>			
<b>OUTLOT ACTION PLAN</b>			
Scale:		Date:	NOVEMBER, 2005
Prepared By:	Foth & Van Dyke	By:	DAT 04F003