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CLOSURE AND POST-CLOSURE PLAN J.H. BAXTER SOUTH WOODWASTE LANDFILL

ARLINGTON, WASHINGTON

January 1989

Prepared For:

J. H. Baxter Company
P.O. Box 305
6520 188th N.E.
Arlington, WA 98223

Prepared By:

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Project No. S91-01.02

Sweet-Edwards/EMCON, Inc.
Ground Water, Engineering, Waste Management, & Drilling Services

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January 17, 1988

Mr. Jeff Defenbach
Snohomish County Health District
Snohomish County Courthouse
Everett, Washington 98201

RE: J.H. BAXTER SOUTH WOODWASTE LANDFILL HYDROGEOLOGIC, CLOSURE AND POST-CLOSURE PLAN
ARLINGTON, WASHINGTON

Dear Mr. Defenbach:

Sweet-Edwards/EMCON, Inc. (SE/E) is pleased to submit the Hydrogeologic Report and the Closure and Post-Closure Plan for the above referenced site. The hydrogeologic investigation and the closure plan have been developed in compliance with the Minimum Functional Standards for Solid Waste Handling (Chapter 173-304-462).

We would be pleased to discuss the contents of these documents, or other aspects of the site, with you at your convenience.

Very truly yours,

Sweet-Edwards/EMCON, Inc.

David M. Pioli, P.E.
Project Engineer

(for)
Lee Fortier
Branch Manager

encl.
cc: Mike Spies, J.H. Baxter Company

TABLE OF CONTENTS

List of Figures

List of Tables

CERTIFICATE OF ENGINEER

J.H. BAXTER SOUTH WOODWASTE LANDFILL
CLOSURE AND POST-CLOSURE PLAN

The technical material and data contained in this report were prepared under the supervision and direction of the undersigned professional engineer registered to practice in the state of Washington.

David M. Pioli, P.E.
Project Engineer
Sweet-Edwards/EMCON, Inc.

1.0 INTRODUCTION

This report presents the Closure and Post-Closure Plan for the J.H. Baxter South Woodwaste Landfill, located in Arlington, Washington. The currently inactive landfill is a private facility owned by J.H. Baxter Company and was used to dispose of woodwaste generated at the adjacent wood preserving facility. The landfill is 4.7 acres and was previously utilized as a sand and gravel pit. The woodwaste in the landfill consists of nearly 100 percent untreated wood debris (wood shavings and bark). The existing capacity of this landfill is estimated to be over 150,000 cubic yards. Granular soil was previously placed on the landfill as cover material.

The purpose of this study was to develop a Closure and Post-Closure Plan for the landfill in compliance with the Washington State Minimum Functional Standards for solid waste handling (MFS); Washington Administrative Code (WAC) Chapter 173-304-462, Woodwaste Landfilling Facility Requirements. This study was based largely on the findings of the Hydrogeologic Report completed by Sweet-Edwards/EMCON, Inc. (SE/E) in October 1988.

This report has been prepared for the exclusive use of J.H. Baxter Company and their agents, for specific application to this site in accordance with generally accepted engineering practices.

2.0 SITE CONDITIONS

2.1 SURFACE CONDITIONS

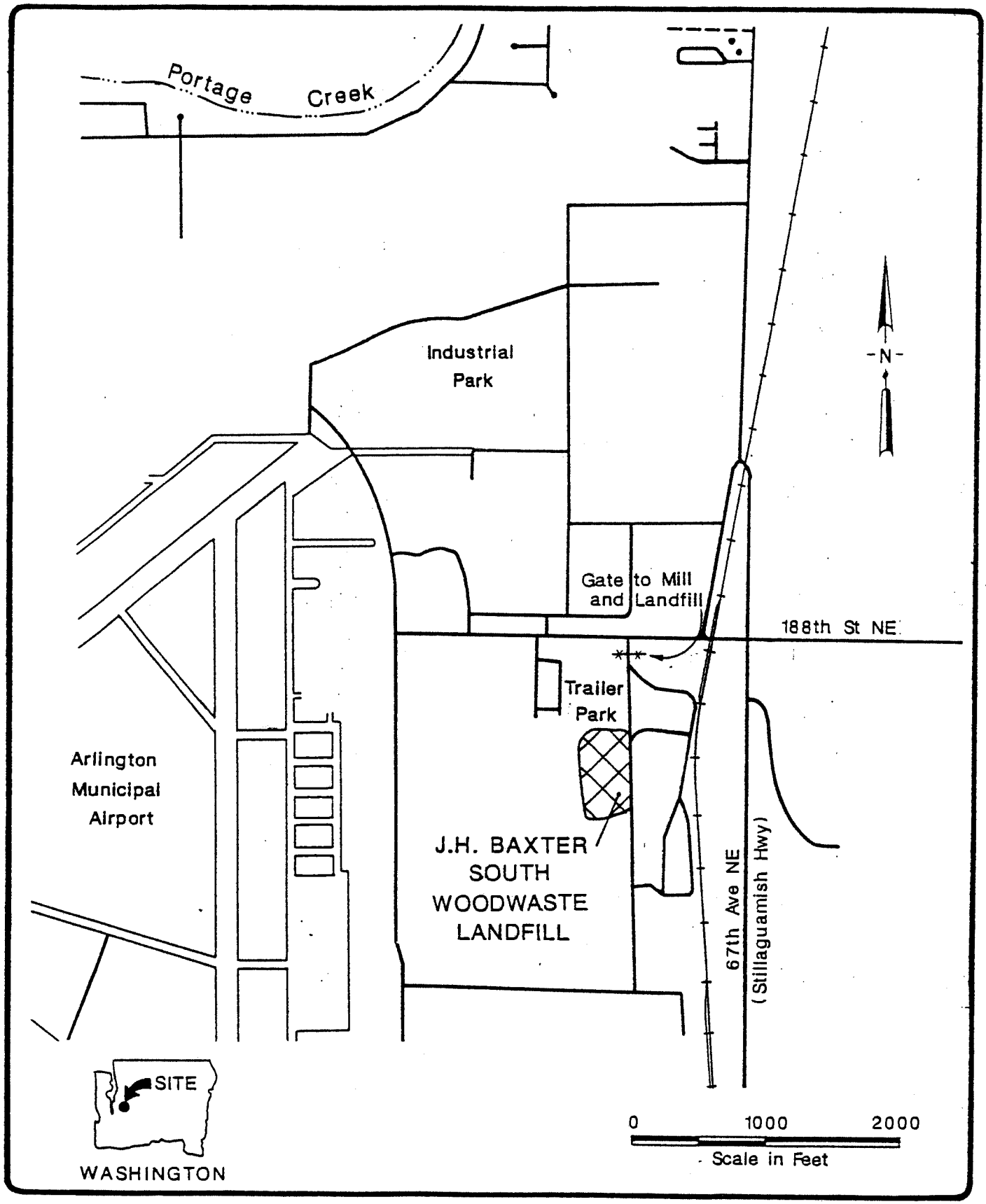
The J.H. Baxter South Woodwaste Landfill is located approximately 1,000 feet south of 188th Street N.E. and 1,000 feet west of 67th Avenue N.E. (Stillaguamish Highway) in Arlington, Washington (Snohomish County). Site access is from 188th Street N.E. and is controlled by a locking gate, as shown on the Vicinity Map, Figure 1.

The landfill is somewhat rectangular in shape measuring approximately 380 feet in the east/west direction and 600 feet in the north/south direction. The site is bounded by a private gravel road on the east and south, a fence on the west, and trees and brush on the north.

Site topography is relatively flat with elevations ranging from 96 to 100 feet (J.H. Baxter Mill Datum). There is a slight depression in the center of the landfill, where water ponds during wet weather. The majority of the landfill is covered with sparse grass and weeds.

2.2 SUBSURFACE CONDITIONS

The subsurface exploration program consisted of four hollow stem auger borings drilled to depths ranging from 44- to 54-feet below existing grade. Each boring was completed as a ground water monitoring well consisting of 2-inch I.D. PVC riser pipe, a select washed silica sand filter pack, bentonite seals, and a locking steel monument cover. The screened interval was 10-feet in length with 0.020-inch perforations.



Sweet-Edwards EMCON

Figure 1

J.H. BAXTER SOUTH WOODWASTE LANDFILL

VICINITY MAP

DATE 11-88
DWN. TMC
APPR. DMP
REVIS.
PROJECT NO. S9101.02

The subsurface explorations revealed glacial recessional deposits. All four borings encountered loose to medium dense, stratified to massively bedded, fine to coarse sand with some gravel, silt and clay. The recessional outwash deposits correlate with the Marysville Sand Member, as described by the U.S. Geological Survey (USGS), and are reported to extend to depths of over 100-feet in the vicinity of the project site.

Approximately 13 feet of silty clay was encountered in upgradient ground water monitoring well BXS-4, located approximately 560 feet southeast of the landfill site. The clay was very soft to soft and moderately plastic. The clay is believed to correlate with clay units of the Marysville Sand member.[1]

Ground water was encountered in all four borings, ranging in depth from 37- to 39-feet below existing grade. Ground water levels may fluctuate with seasonal changes in rainfall, and temperature, and other factors. A more complete description of the subsurface conditions can be found in the SE/E Hydrogeologic Report.

2.3 HYDROGEOLOGY

The subsurface materials encountered at the J.H. Baxter South Woodwaste Landfill site generally consist of fine to coarse sand with some gravel, silt and clay (recessional outwash). These sediments are believed to form a shallow unconfined aquifer overlying glacial till at depth. A USGS regional ground water study of the Arlington area indicates that a confined, artisan

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1 Minard, J.P., 1985, Geologic Map of the Arlington West 7.5 Minute Quadrangle, Snohomish County, Washington; U.S. Geological Survey Miscellaneous Field Studies Map MF-1740

aquifer underlies the site at depths in excess of 100-feet.[2] The glacial till layer which separates the two aquifers has a very low permeability which minimizes hydraulic communication between the shallow and deep aquifers.

The hydraulic conductivity of the recessional outwash (shallow aquifer) was estimated to be 2×10^{-3} cm/sec (centimeters per second), on the basis of instantaneous withdrawal (bail) tests on two of the monitoring wells.

In the immediate vicinity of the landfill site, the ground water flow direction in the shallow aquifer is to the northwest, based on water level measurements taken on July 14, 1988. Infiltration from precipitation and surface water bodies are believed to be the sources of recharge to the shallow aquifer.

A Beneficial Use Survey was completed within a radius of one mile of the site. Fourteen private domestic wells which presently supply water were located within 2000 feet. Twelve of the fourteen wells are located upgradient and two are downgradient of the landfill. The well currently used by Airway Mobile Park is located approximately 200 feet downgradient and may supply up to 54 mobile homes.

A more complete description of the hydrogeology can be found in the SE/E Hydrogeologic Report.

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2 Newcomb, R.C., 1952, Ground Water Resources of Snohomish County, Washington; U.S. Geological Survey Water Supply Paper 1135.

3.0 CLOSURE PLAN

The landfill closure plan presented herein was developed to comply with Chapter 173-304-462 WAC, Woodwaste Landfilling Facility Requirements. The following design elements are discussed in this closure plan:

- Closure schedule
- Site preparation
- Final grading plan
- Final soil cover
- Stormwater drainage control
- Ground water monitoring activities
- Gas control
- Future site use

3.1 CLOSURE SCHEDULE

Closure of the landfill will take place during the comparatively dry summer and fall months of 1989, in order to facilitate final grading and soil cover placement. Closure construction will require a total 10 to 12 months, depending on the rate of woodwaste generation to establish final grades, as well as the type and amount of equipment used, location of the borrow source for soil cover, weather, and other factors.

In order to bring the landfill up to final grade, woodwaste that is currently being disposed of at the J.H. Baxter North Landfill will be diverted to the south landfill. The source of this material is the same as that material that currently exists in the south landfill. It will require approximately 7 1/2 months at the current woodwaste generation rates to accumulate the amount of material needed to bring the landfill up to the

proposed grade.

3.2 SITE PREPARATION

Site preparation will include the following:

- Stripping the existing interim soil cover and stockpiling it on-site for later use.
- Raise existing grade by importing woodwaste material to develop the proposed final grades.
- Compact the upper 12 inches of the woodwaste.

The landfill is currently covered with approximately 2 feet of soil cover. This material will be stripped and stockpiled on-site and later used as the final soil cover.

The existing grade should be raised to within 2 feet of final grade by placing approximately 19,000 cubic yards of additional woodwaste. Based on current generations rates of 100-150 cy per day, it will require 7 1/2 months to bring the landfill up to final grade. The fill should be spread in 2-foot lifts and compacted by track-walking with the construction equipment. The uppermost 12 inches should be thoroughly compacted prior to placement of the final cover soils.

Small amounts of existing woodwaste should be excavated in some areas along the east and south side of the site to allow for installation of the final soil cover. These areas are currently at final grade. The excavated material will be used to raise grade in other areas of the landfill.

3.3 FINAL GRADING PLAN

The Final Grading Plan, as shown on Drawing 1, illustrates the landfill after placement of the final soil cover. Final slopes

should be constructed no steeper than 4:1 (horizontal: vertical) to minimize the potential for erosion, and no flatter than 2 percent to provide sufficient slope for surface water runoff after anticipated settlement.

3.4 FINAL SOIL COVER

The proposed final soil cover consists of 24 inches of compacted soil placed directly over woodwaste. The interim soil cover, which will be stripped and later used in the final soil cover, consists of a gravelly sand. It is anticipated that the remainder of the final soil cover will be imported material of the same composition. The final soil cover profile is shown on Drawing 1, Detail 1.

The final cover soil should be placed in loose lifts not exceeding 12 inches, and track-walk compacted. The cover should then be seeded with a mixture of colonial bent-grass, red fescue, perennial ryegrass, and white dutch clover. The seeded soil cover should be mulched with straw or hay for moisture retention and erosion control. The vegetation will act to minimize erosion, maximize evapotranspiration of moisture from the soil cover, and present an aesthetic landform complementary with the surrounding terrain. The final soil cover should extend to the woodwaste fill boundary.

3.5 STORM WATER DRAINAGE CONTROL

Surface water control will consist of maximum 4:1 and minimum 2 percent grades for the final soil cover, and "v"-shaped conveyance ditches. The grades of the final slopes will promote overland sheet flow run-off, thereby reducing the development of erosion channels. The "v"-shaped ditch will serve to intercept the overland flow from the landfill and convey it to a storm water infiltration basin located at the southwest corner of the

site, as shown on Drawing 1.

The purpose of the infiltration basin is to allow the surface water to infiltrate through the native granular soils to the ground water. The local ground water flow direction at the landfill is toward the northwest. Therefore the water infiltrating through the basin will recharge the shallow aquifer cross-gradient from the woodwaste.

The size of the basin was set to accommodate the volume of surface water run-off from the 25-year, 24-hour storm event. The volume of run-off was determined based on Soil Conservation Service TR55 Methods. The basin has a maximum depth of 5 feet, and will impound a maximum of 4 feet of water. The basin is triangular in shape with approximately equal sides of 100 feet. The total capacity of the infiltration basis is approximately 15,000 cubic feet (112,000 gallons).

It is anticipated that the infiltration basin will require some routine maintenance. Sediment will accumulate in the basin as the water infiltrates into the ground. The basin should be excavated when the accumulated sediment reaches 25 percent of the basin capacity.

The bottom of the infiltration basin will be composed of native granular soils. In the event that woodwaste is found below the basin bottom, it will be excavated and replaced with imported sand and gravel.

3.6 GROUND WATER MONITORING ACTIVITIES

The J.H. Baxter South Landfill is subject to WAC 173-304-462 (2)(c), which states that all woodwaste landfills having a capacity of greater than 10,000 cubic yards at closure shall either (i) have a ground water monitoring system, or (ii) have a

leachate collection and treatment system. To bring this landfill into compliance, four ground water monitoring wells have been installed, as specified under WAC 173-304-490, Ground Water Monitoring Requirements. Ground water monitoring well BXS-4 is designated the background well, and wells BXS-1, BXS-2, and BXS-3 are designated downgradient wells (refer to the SE/E Hydrogeological Report).

The landfill owner will institute a quarterly ground water monitoring program to measure ground water surface elevations and test for the 14 sample constituents/parameters specified under WAC 173-304-490 (2)(d), plus tannin and lignin. In addition, the owner's representative will determine and report annually the ground water flow rate and direction in the uppermost aquifer. All other standards regarding reporting and corrective action programs will be met, in accordance with the MFS.

A more complete description of the ground water monitoring plan and proposed methods of statistical analysis to evaluate laboratory test results are included with the SE/E Hydrogeological Report.

3.7 FUTURE SITE USE

Any buildings, equipment, or other facilities located directly over the closed landfill will impose loads which will lead to large and perhaps unacceptable amounts of total and differential settlement. The impacts of settlement must be carefully evaluated prior to any construction.

It is anticipated that the landfill may be used as an equipment or log storage area. This use may require surfacing of some areas with a crushed rock aggregate. When settlement does occur due to the imposed loads, the area should be backfilled with a granular material to promote surface water drainage.

Prior to construction of any buildings or other enclosed facilities on or near the landfill, the potential for landfill gas migration must be evaluated. A passive or active venting system may be required to mitigate potential hazards to on-site facilities.

4.0 POST-CLOSURE PLAN

The post-closure land use will be consistent with the surrounding terrain. The closed site will be maintained as an unirrigated open space and will be seeded with grasses and allowed to re-vegetate with plant species indigenous to the area, excluding woody vegetation. The landfill may also be used as a log or equipment storage area for the adjacent wood preserving facility.

The post-closure maintenance program will be instituted mainly to verify that the landfill soil cover retains its integrity. Surface drainage ditches, final soil cover areas, and the access road will be inspected every other month, with additional inspections during periods of heavy or prolonged rainfall. All necessary repairs will be performed in a timely manner. Where excessive soil erosion occurs, temporary mitigative measures will be employed, such as soil berms, ditches, and erosion control fabrics. As weather conditions permit, more permanent solutions will be evaluated and instituted.

Sealing settlement cracks in the final soil cover, and repairing erosion damage caused by stormwater runoff will be primary concerns of the maintenance program. Such action, undertaken as part of routine site inspection, will minimize problems associated with infiltration of surface water.

5.0 CLOSURE AND POST-CLOSURE COST ESTIMATE

Cost estimates for closure and post-closure maintenance of the J.H. Baxter South Landfill are presented in Table 1 and Table 2, respectively. The following key assumptions were made in compiling these estimates:

- All costs are in 1988 dollars.
- Final soil cover thickness will be 2 feet (compacted).
- The existing soil cover will be stripped and used as final cover soil. A 50% recovery rate was assumed resulting in 7,000 CY of material.
- Final cover soil is readily available from off-site sources, and will consist of sand and sandy gravel. The quantity of material is estimated at 7,000 CY.
- Costs associated with excavation of Infiltration Basin and stripping of existing soil cover are taken into consideration under Regrading.
- All closure activities will be monitored and reviewed by a Civil Engineer registered in the State of Washington.
- Site inspection will be conducted every other month, with additional inspections during periods of heavy or prolonged rainfall (assume 9 inspections per year).
- Costs associated with the diversion of woodwaste from the J.H. Baxter North Landfill are not considered in this estimate.
- Does not include cost of construction or post-closure monitoring.

TABLE 1

CLOSURE COST ESTIMATES

Item Description	Unit*	Unit Cost	Quantity	Cost
Mobilization	Hour	$ 160	2	$ 320
Regrading	Hour	200	48	9,600
Final Soil Cover (in place)	CY	6.00	9,000	54,000
Diversion Ditch	LF	3.00	810	2,430
Seeding and Mulching	Ac	1,200	5	6,000
			Subtotal	$72,350
Administration/Legal Engineering, Surveying, Sales Tax and Contingencies at 20%				$14,470
			TOTAL	$86,820

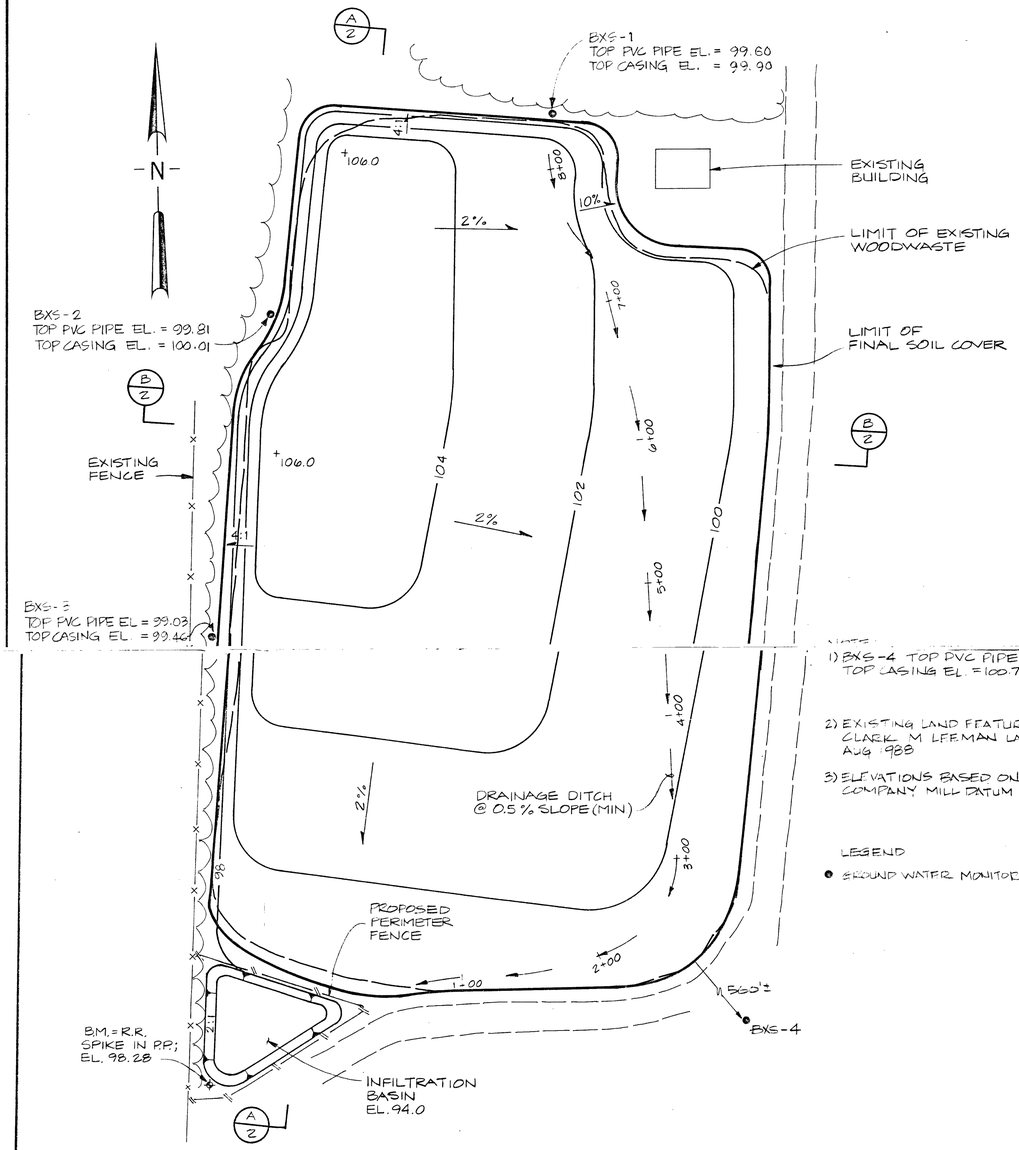
NOTE: Cost of cover soil includes excavation, transportation, placement and compaction.

CY = Cubic Yards
LF = Lineal Feet

TABLE 2

POST-CLOSURE COST ESTIMATE (ANNUAL)

Item Description	Unit	Unit Cost	Quantity	Cost
Final Cover Maintenance	Acre	$ 750	5	$ 3,750
Periodic Site Inspection	Each	$ 300	9	2,700
			TOTAL ANNUAL COST	$6,450



NOTES:

1) BXS-4 TOP PVC PIPE EL.
TOP CASING EL = 100.77

2) EXISTING LAND FEATURES F
CLARK M LEEMAN LAND
AUG 1988

3) ELEVATIONS BASED ON J.H
COMPANY MILL DATUM

LEGEND

● GROUND WATER MONITORING

KEED BY:
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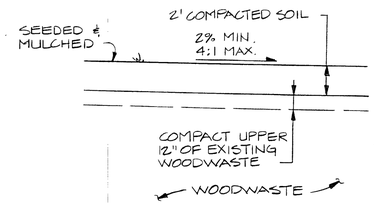
SITE GRADING AND DRAINAGE PLAN

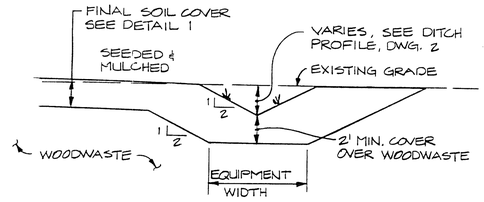
SCALE : 0 50 100 150 FEET



FINAL SOIL COVER

DETAIL 1

SCALE : 1"=5'



DRAINAGE DITCH OVER WOODWASTE

DETAIL 2

SCALE : 1"=5'

DAVID M. PION
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
0	11/19/89	FINAL				

DATE OF ISSUE 11-19-89
DWN BY TMC
DES BY DMP
CHK BY FRM
APP BY DMP

Sweet-Edwards EMCON

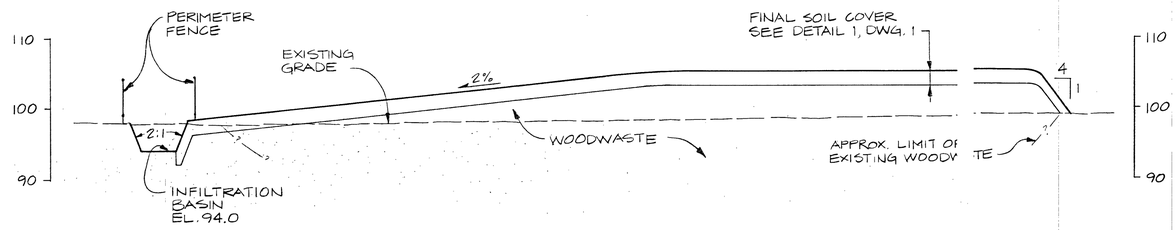
J.H. BAXTER COMPANY
J.H. BAXTER SOUTH WOODWASTE LANDFILL
ARLINGTON, WASHINGTON

FINAL GRADING AND DRAINAGE PLAN AND DETAILS

DRAWING NO. 1

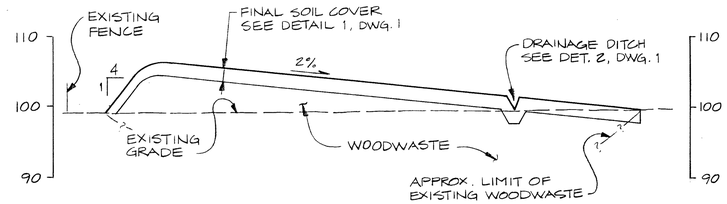
PROJECT NO. S9101.02

KUKER-RANKEN,INC./ 108857



SECTION (A/1)

HORIZ. : 1"= 50'
VERT. : 1"= 10'



SECTION (B/1)

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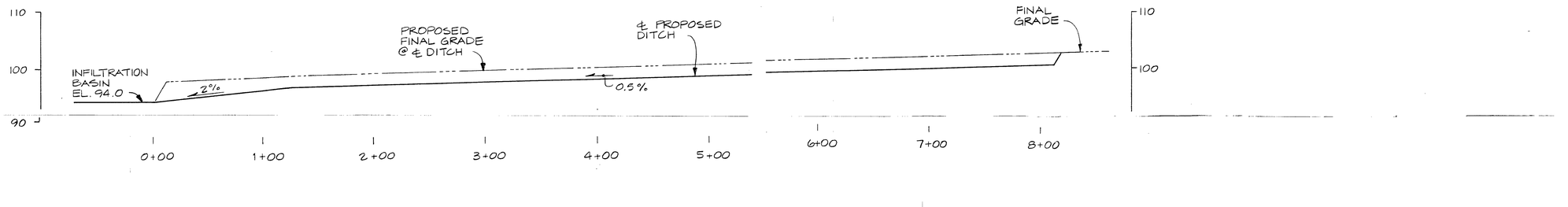
VERT. : 1"= 10'



DITCH PROFILE

HORIZ. : 1"= 50'
VERT. : 1"= 10'

DAVID M. PIOLI
STATE OF WASHINGTON
20578
REGISTERED
PROFESSIONAL ENGINEER

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
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DES BY DMP
CHK BY FRM
APP BY DMP

Sweet-Edwards EMCON

J.H. BAXTER COMPANY
J.H. BAXTER SOUTH WOODWASTE LANDFILL
ARLINGTON, WASHINGTON

SECTIONS AND PROFILE

DRAWING NO. 2
PROJECT NO. S9101.02

KUKER-RANKEN,INC./ 104857