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FEASIBILITY STUDY ON THE
PROPOSED DRAINAGE DITCH RELOCATION
AT SUNRAY SERVICES SITE 3
TONTITOWN, ARKANSAS

Submitted to:

Solid Waste Division
Arkansas Department of Pollution Control and Ecology

on behalf of:

Sunray Services, Inc.
Springdale, Arkansas

September, 1989

Woodward-Clyde Consultants



Consulting Engineers, Geologists and Environmental Scientists
Three Financial Centre, 900 South Shackleford, Suite 412
Little Rock, Arkansas 72211 (501) 223-2582

Three Financial Centre
900 S. Shackleford
Suite 412
Little Rock, Arkansas 72211
(501) 223-2582
Telecopy (501) 223-2996

Woodward-Clyde Consultants

29958

September 27, 1989

Mr. Joe C. Doughty
Engineering Supervisor, Solid Waste Division
Arkansas Department of Pollution Control and Ecology
8001 National Drive
Little Rock, AR 72219

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Re: Drainage Ditch Modification, Sunray site 3.

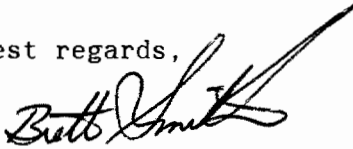
Dear Joe:

As you requested in the September 6, 1989 meeting with Jake Cox and myself, please note our findings regarding relocation of the western drainage ditch, Sunray site 3.

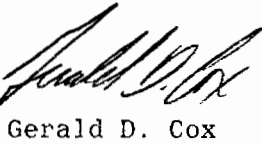
As discussed in our meeting, you and Tony Morris had concerns regarding the impact of the proposed modification upon landfill air-space, the existing soil budget and adequacy of surface water drainage.

Please call if you have any questions or comments.

Best regards,



Brett Smith
Senior Staff Engineer



Gerald D. Cox
Senior Staff Scientist

cc Miller Mathews, Sunray Services
Ray Quick, Project Manager, WCC

ENCLOSURE

Consulting Engineers, Geologists
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1.0 INTRODUCTION

Recently, Sunray Services, Inc. encountered pre-existing trash south of station 7+00 in the area where the approved (May, 1989) western drainage ditch was to be excavated. Sunray Services, Inc. is requesting that a minor permit modification be granted by ADPC&E regarding the western drainage ditch at Sunray site 3.

The requested modification involves relocation of the southernmost 700 feet of the western drainage ditch to an area immediately west of the presently approved location (see Sheet 1). Kevin Hodges, Engineer for Sunray Services, Inc. has determined from field observations that the proposed location (between the Class I and Class IV landfills) consists only of virgin soil. A maximum westward shift of 70 feet would be made, increasing the landfill area approximately 0.60 acres, as shown on Sheet 1.

Three critical components of the presently approved landfill operation could be affected by the proposed modification; namely air-space, soil budget, and surface water drainage capacity. To determine the significance of the proposed modification, an analysis was made as follows:

2.0 AIR-SPACE

The western slopes south of station 7+50 would be decreased by ~1 percent, in order to reach the proposed drainage ditch location, as shown in Appendix A. As mentioned, the proposed modification would increase the lateral extent of the landfill by ~0.60 acres; approximately 0.42 acres would receive additional trash (see Sheet 1).

The above reduction in slopes would create additional air-space over existing slopes and in the 0.42 acre expansion, as shown in Appendix A. Voids ≤ 1 foot would occur over an area of ~0.78 acres (see Sheet 2) and would be filled in with soil only. All remaining voids (≥ 1 foot) would occur over

~1.25 acres (see Sheet 2) and would be filled in with an average 1.5 foot thickness of trash and a 6 inch daily soil cover.

2.1 Additional Waste

The above infilling of air-space would require the placement of ~3,025 compacted cubic yards (CCY) of trash. Sunray Services, Inc. typically receives 1,100 loose cubic yards (LCY) daily or 23,100 LCY per 21-day month. Sunray has been routinely achieving high compaction factors of two to three, and is therefore placing into the existing landfill ~9240 CCY per month. *It should be noted that 9,240 CCY/month is 38 percent less than the 15,000 CCY/month volume estimate currently used by ADPC&E.*

The proposed placement of 3,025 CCY trash represents less than 7 days additional landfill life.

Shifting of the landfill berm (to be discussed later) would generate no additional air-space, as shown on Sheet 2.

3.0 SOIL BUDGET

The proposed drainage ditch modification would require additional soil as shown below:

3.1 Daily Cover

As previously mentioned, infilling of the additional air-space would require 6 inches daily cover over trash placed in an area of ~1.25 acres, and soil only in ~0.78 acres, as shown on Sheet 2 and in Appendix A. The average infill thickness in the latter area is also 6 inches. Therefore, ~2.03 acres would require 6 inches soil, which is equivalent to ~1,638 CY.

KEVIN HODGES
361-2926

Shifting of the landfill berm (to be discussed later) would generate no additional air-space and will therefore not require additional daily cover soil (see Sheet 2).

3.2 Final Cover

Approximately 0.42 acres (see Sheet 1) would require an additional 2.5 foot thick final cover, which is equivalent to 1,694 CY.

Shifting the landfill berm (to be discussed next) does not alter existing final cover requirements (see Sheet 2).

3.3 Landfill Toe Berm

To accommodate the drainage ditch modification, the landfill toe berm would be enlarged from 0.52 acres to 0.80 acres (see Sheet 3). Given an average berm thickness of 4 feet, the resultant 0.28 acre increase would require an additional 1,807 CY soil.

The total additional quantity of soil required to facilitate the proposed modification is 5,139 CY.

In addition to the permitted borrow area that exists south and west of the non-putrescible waste site, another borrow area is currently being used (see Sheet 4). This additional source of soil has resulted from the need to reduce the steep slope presently adjacent to the southeastern segment of drainage ditch. This temporary borrow area is outside the landfill boundary yet still on Sunray Services, Inc. property.

In this area, at least 10 feet of soil must be removed from 0.69 acres (see Sheet 4), in order to properly grade the slope down to the drainage ditch.

The slope reduction process would yield an additional 11,132 CY of soil.

It is readily evident from the above information, that the additional soil demands of the proposed modification would easily be met by the much greater quantity of soil generated from the additional borrow area. As a result, the proposed modification would have no net effect upon the soil budget that was approved in the May, 1989 modification.

4.0 DRAINAGE

An analysis was made to estimate the ability of the proposed drainage ditch to carry the runoff resulting from a 25-year storm event.

The Drainage Manual, prepared by the Hydraulics Section of the Arkansas State Highway and Transportation Department in July, 1982, recommends six runoff estimation methods. For drainage areas less than 200 acres, the Rational Method (p. 3-11) is applied, using the rational formula:

$$Q = CIA$$

where

Q = peak discharge in cubic feet per second (cfs).

C = a coefficient representing the ratio of runoff to rainfall.

I = rainfall intensity in inches per hour (in/hr).

A = drainage area in acres.

A runoff coefficient (C) of 0.79 was used in all estimations, and obtained from the Drainage Manual (p. 3-32). The soils at the existing landfill have a Soil Conservation Service classification CIG, Clarksville cherty silt loam, and belong in hydrologic soil group B. The definition of group C soils (p. 3-27) best fits the compacted final cover of the landfill. It was also assumed that the landfill has fair vegetation; namely a grass cover on 50% to 75% of the final cap. Both assumptions have higher associated runoff

coefficients, which in turn generate a higher (more conservative) peak discharge value.

A rainfall intensity (I) of 3.1 in/hr was used in all estimations, and obtained from Technical Paper 40 (p. 31), prepared by the U.S. Weather Bureau in May, 1961. This value represents the maximum rainfall occurring over a one hour period during a 25 year maximum storm event, and is needless to say, highly conservative.

To estimate the quantity of flow that a particular ditch can handle, the Manning Equation (Drainage Manual, p. 6-13) is used:

$$Q = KS^{1/2}$$

where

Q = discharge in cfs.

S = slope of water surface in feet per feet.

K = conveyance factor (see below).

Conveyance is the ability of a water course (ie, drainage ditch) to transport flow, and is expressed as follows:

$$K = (1.486 / n) \times AR^{2/3}$$

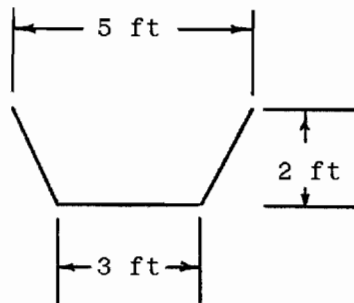
where

n = a coefficient representing the roughness of the ditch lining.

A = cross-sectional flow area in square feet (ft²).

R = hydraulic radius in feet (flow area / wetted ditch perimeter).

The configuration of the existing drainage ditch was used throughout all estimations, and is shown below:



Cross-sectional flow area = 8 ft²

Wetted ditch perimeter = 7.5 ft

In order to use Manning's equation, it is assumed that flow is uniform and in turn, water depth is constant over the course of the ditch.

Peak discharge was compared with discharge capability for 5 drainage areas and associated segments of drainage ditch (see Sheet 5). The above assumption is valid, since each ditch segment is reasonably uniform in slope. A listing of comparisons is found in Table 1 (next page).

TABLE 1

PEAK DISCHARGE VS DISCHARGE CAPABILITY

Ditch segment, Slope	Cumulative Drainage Area (acres)	Peak Discharge of Drainage Area (cfs)	Discharge Capability (cfs)
12+00 to 8+00, 3.3%	3.9	9.6	77.8
8+00 to 6+00, 4.8%	5.7	14.0	93.8
6+00 to 4+00, 4.9%	7.4	18.1	94.7
4+00 to 2+00, 11.4%	8.9	21.8	144.5
2+00 to Pond, 3.8%	9.6	23.5	83.4

It is readily evident from Table 1 that the proposed drainage ditch could easily handle a 25 year maximum storm event, given the above configuration and proposed slopes.

5.0 CONCLUSIONS

The estimates and calculations demonstrate that the proposed minor modification would have no significant impact upon the presently approved landfill operation. Futhermore, relocation of the drainage ditch into virgin soil would provide obvious advantages from an operational and environmental viewpoint.

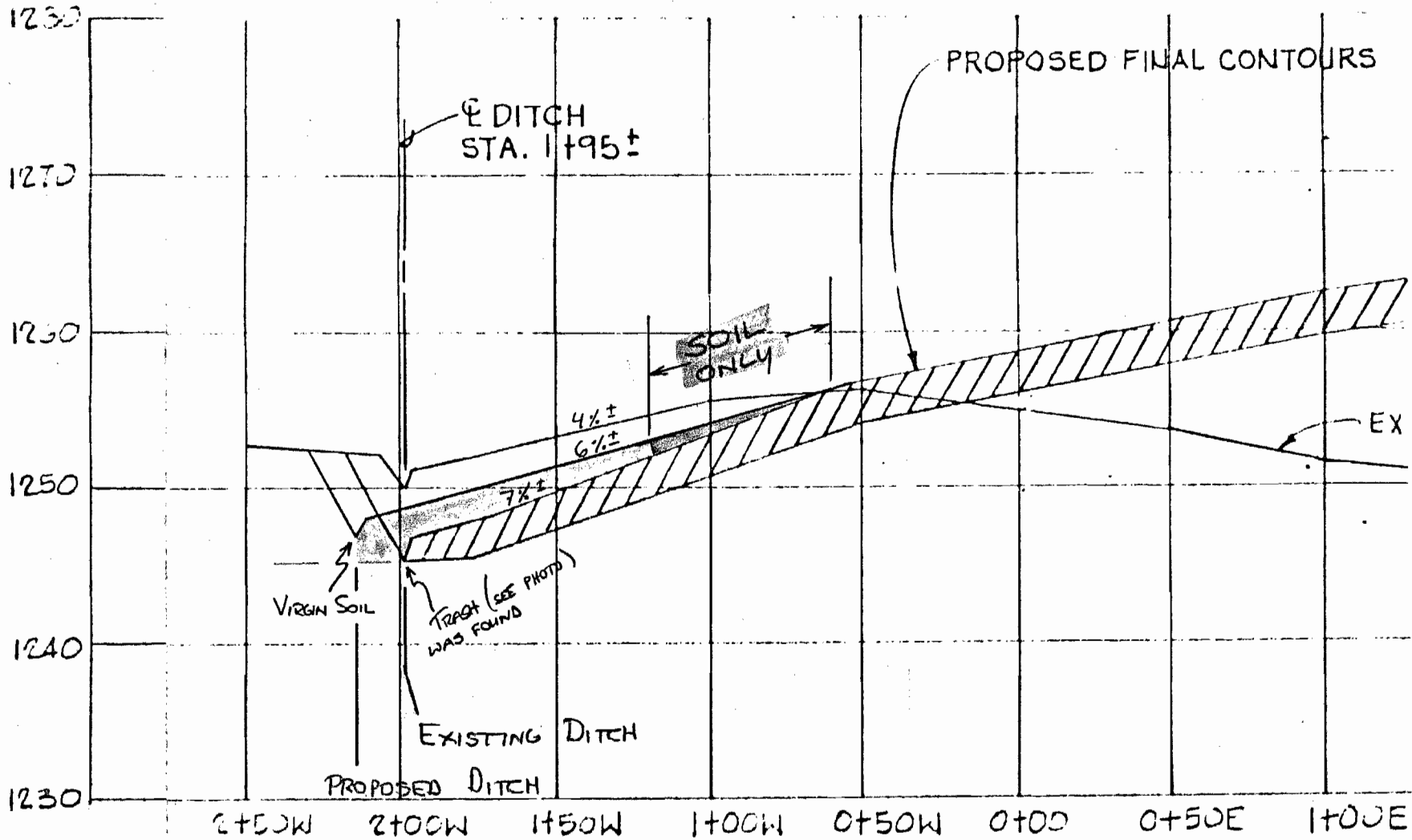
APPENDIX A

LANDFILL CROSS-SECTIONS



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Checked by BAA Date 9-21-89

FOR SUNRAY SITE 3

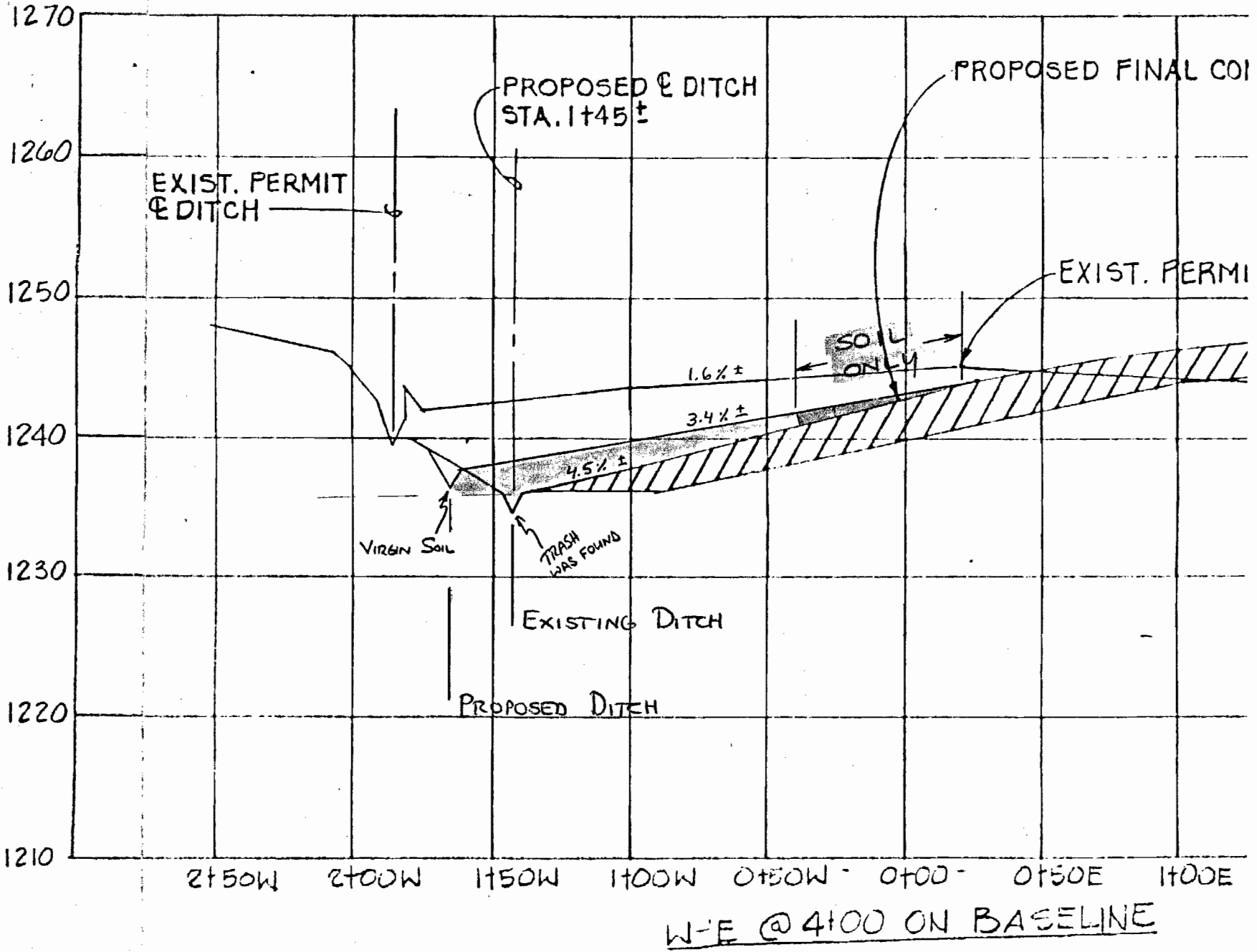


W-E @ 6+00 ON BASELINE



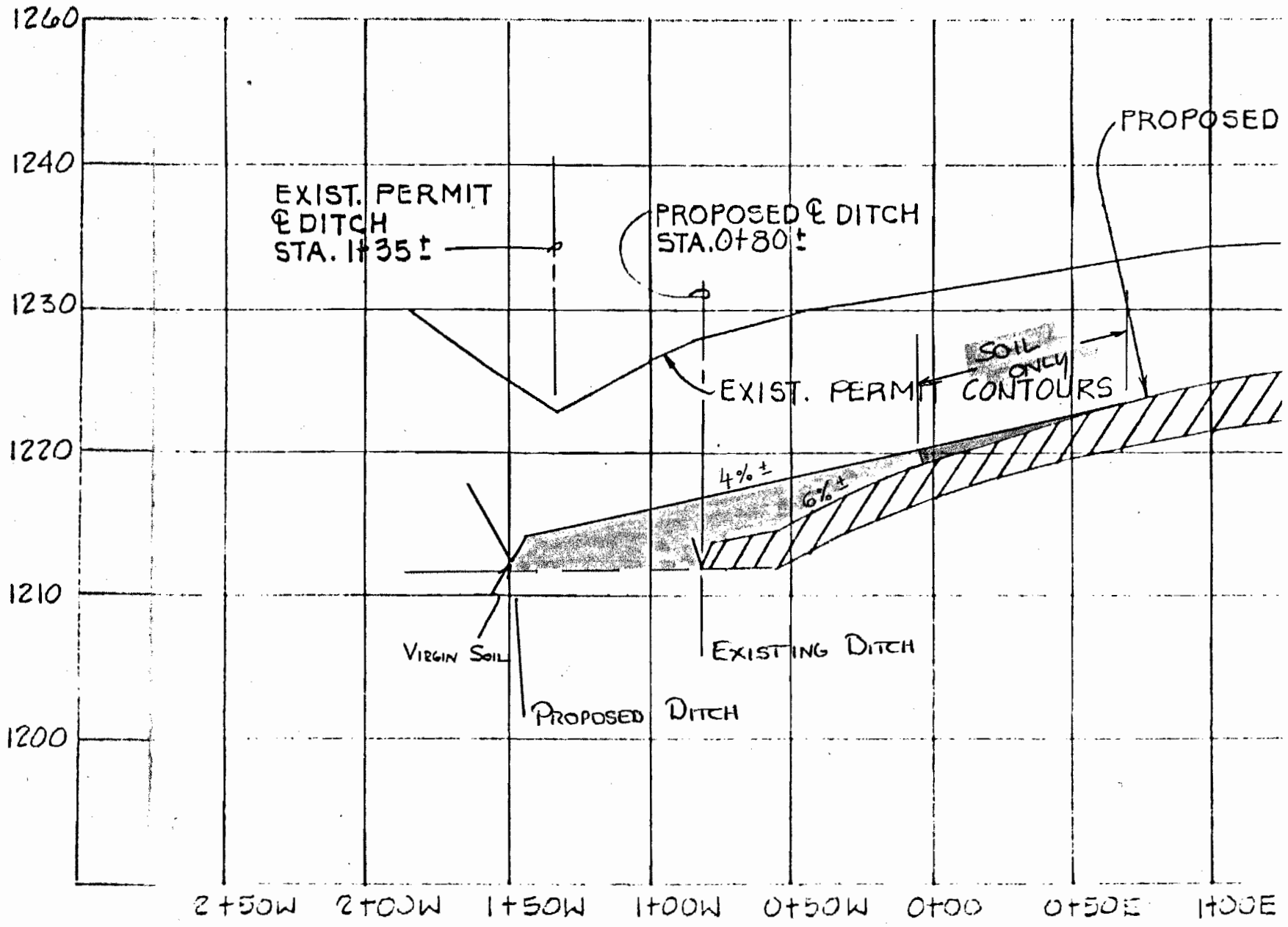
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FOR SUNTRAY SITE 3



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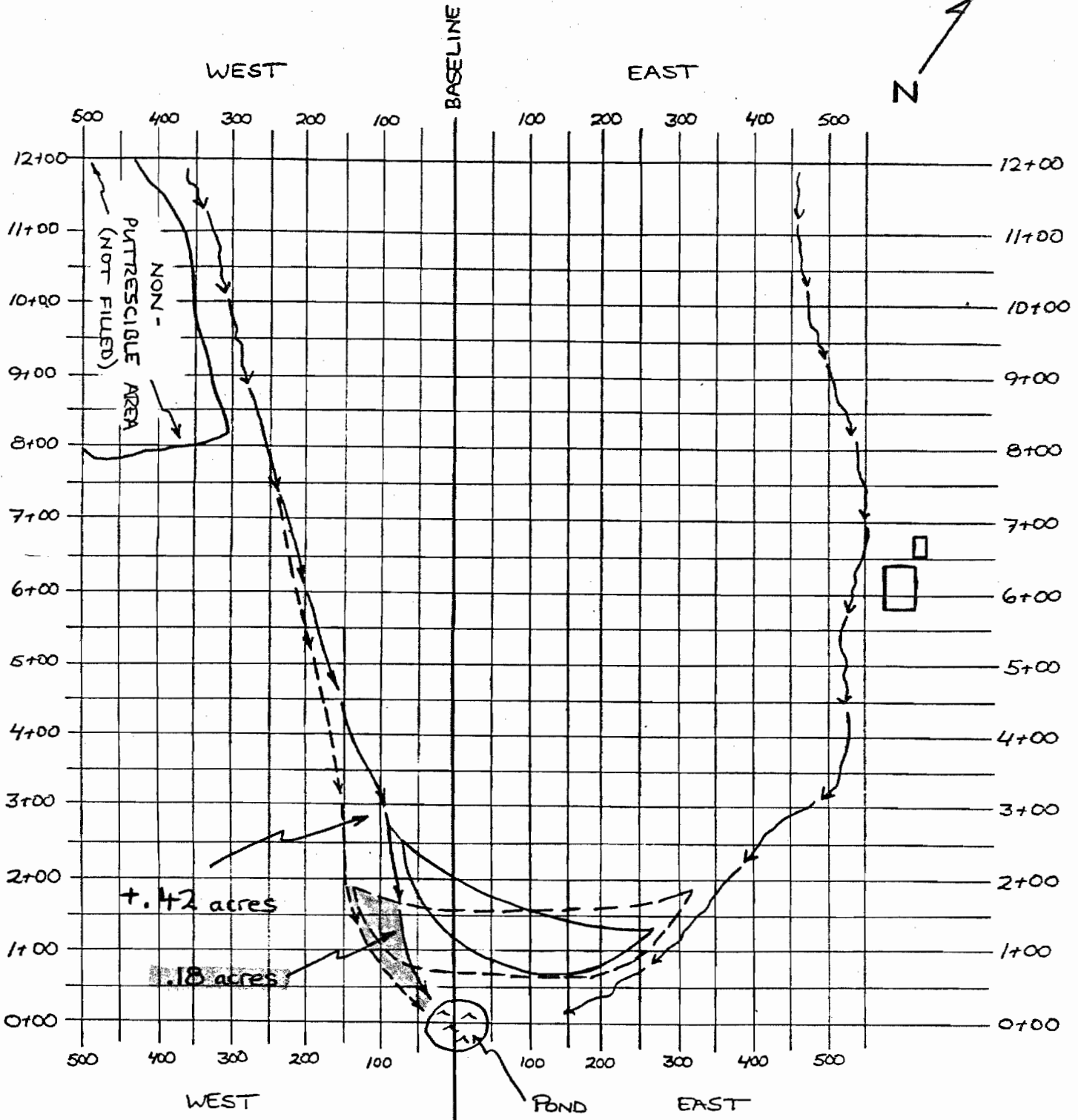






W-E @ 2+00 ON BASELINE

APPENDIX B

SHEETS 1 through 5

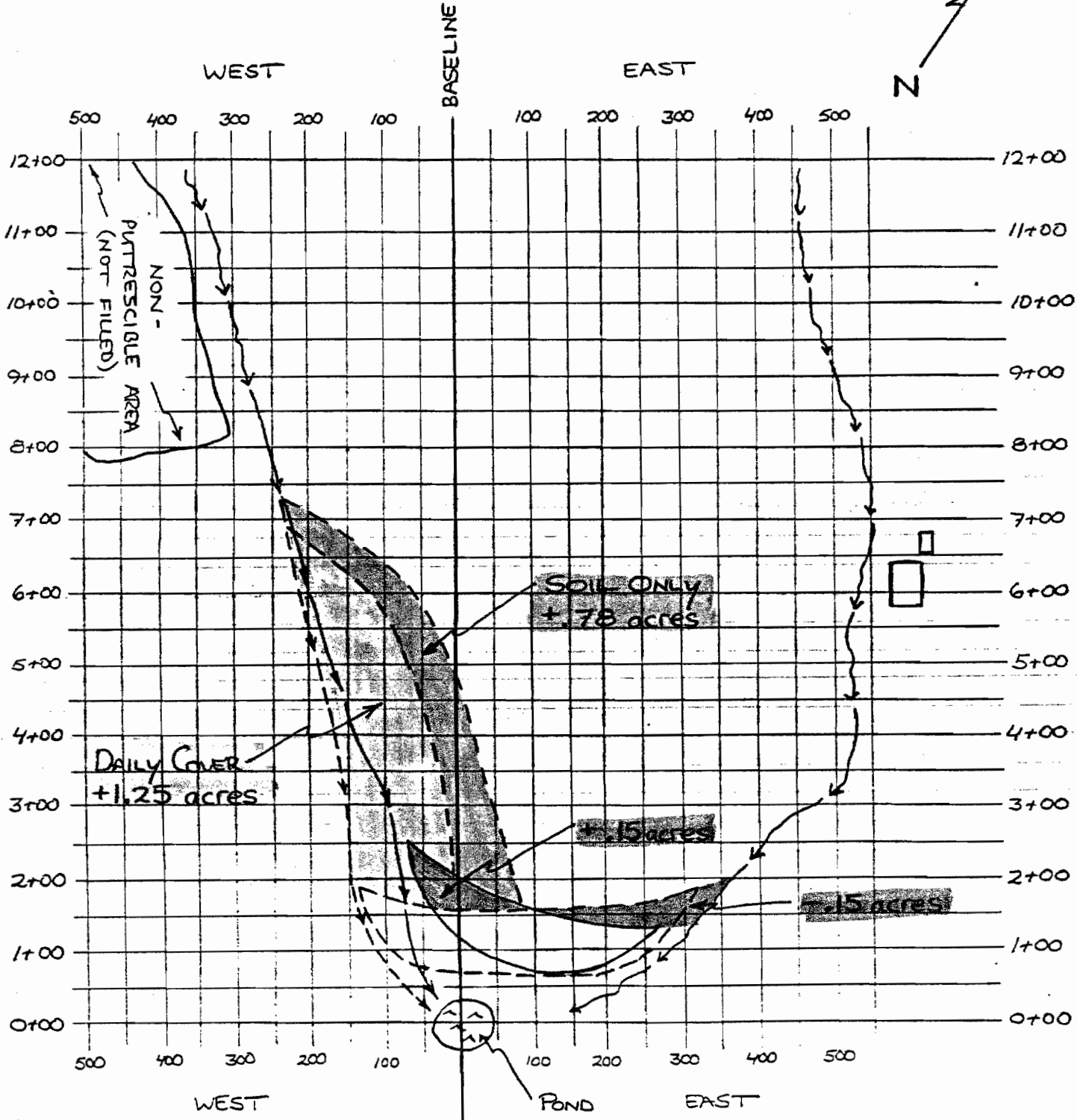
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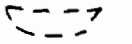


-  EXISTING (APPROVED) DITCH
-  PROPOSED DITCH
-  EXISTING (APPROVED) BERM
-  PROPOSED BERM

SOURCE: KEVIN HODGES, E.I.T.
SUNRAY SERVICES

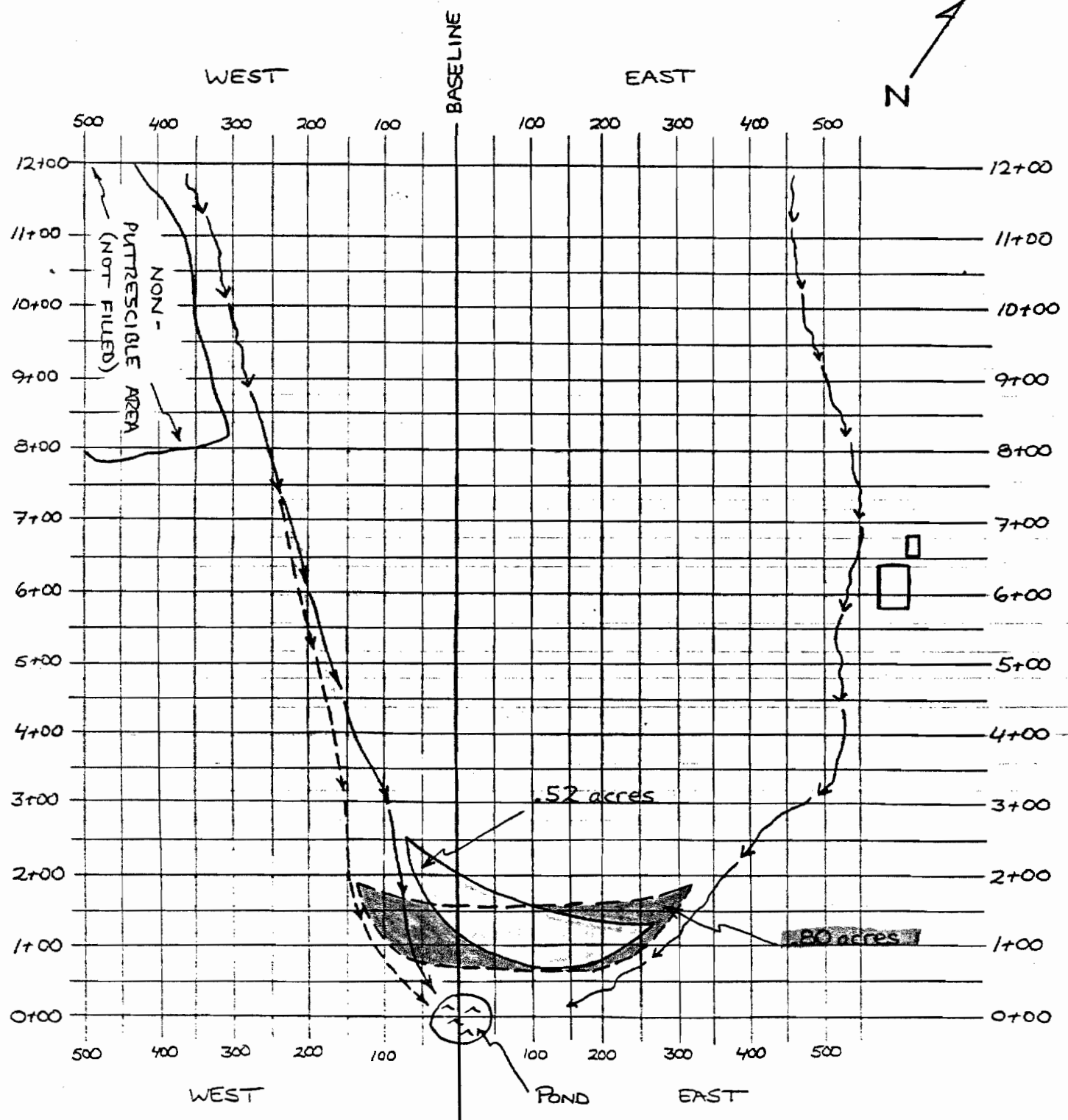
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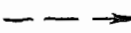
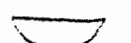



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FOR SUNRAY SITE 3

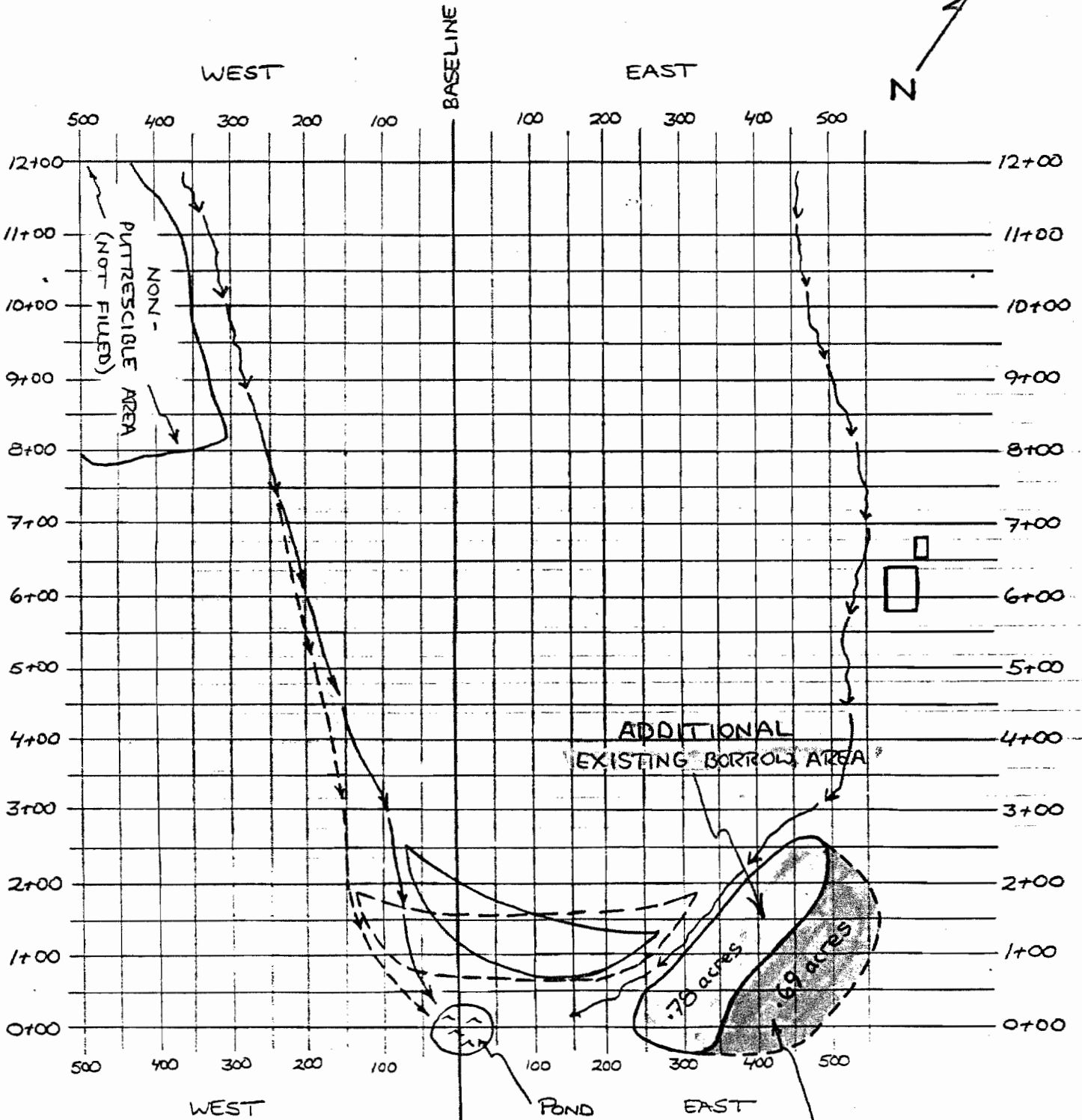


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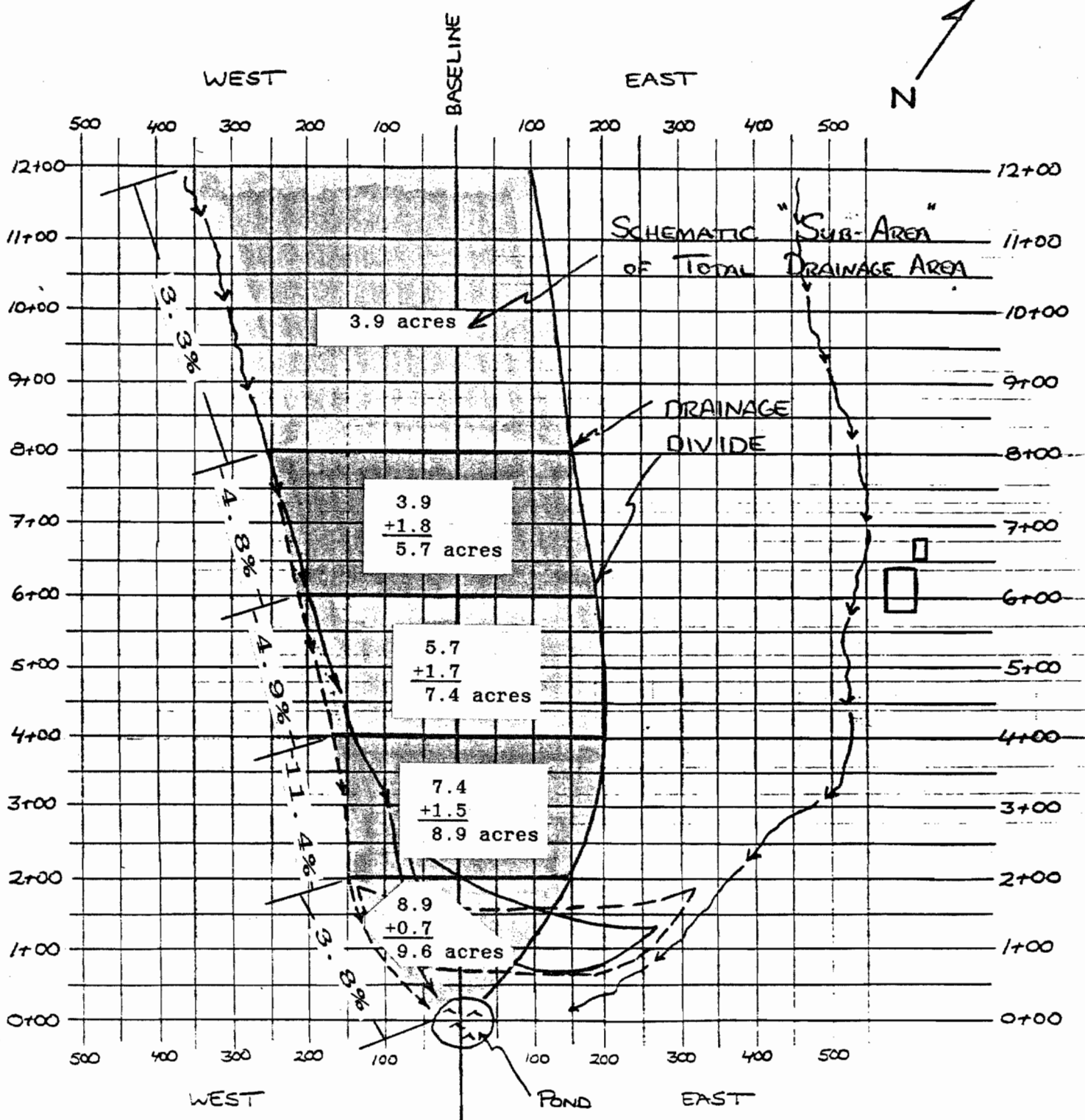
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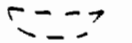


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- - - - - PROPOSED DITCH
- ⌒ EXISTING (APPROVED) BERM
- - - - - PROPOSED BERM

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-  EXISTING (APPROVED) DITCH
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-  EXISTING (APPROVED) BERM
-  PROPOSED BERM

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