

CRWMS/M&O

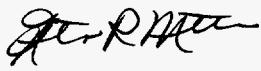
Non-Q Design Analysis Cover Sheet

Complete only applicable items.

(1.)

QA: N/A

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2. DESIGN ANALYSIS TITLE Muck Storage Pad Analysis			
3. DOCUMENT IDENTIFIER (Including Rev. No.) BABCC0000-01717-0200-00001 REV 02		4. REV. NO. 02	5. TOTAL PAGES 7
6. TOTAL ATTACHMENTS 3	7. ATTACHMENT NUMBERS - NO. OF PAGES IN EACH I-26, II-10, III-10		8. SYSTEM ELEMENT MGDS
	Print Name	Signature	Date
9. Originator	Hector R. Montalvo		5/14/96
10. Checker	Matthew J. Gomez		5/14/96
11. Lead Design Engineer	Hector R. Montalvo		5/14/96
12. Department Manager	Gene N. Kimura		5/15/96
13. Remarks			

Design Analysis Revision Record*Complete only applicable items.*

1.

QA : N/A *GRM*
5/14/96

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2. DESIGN ANALYSIS TITLE**Muck Storage Pad Analysis****3. DOCUMENT IDENTIFIER (Including Rev. No.)****BABCC0000-01717-0200-00001 REV 02**

4. Revision No.	5. Description of Revision
00	Issued on 01/18/95.
01	Revised to include DIE requirements, to calculate volume for Optional Muck Storage Area, and to change format.
02	Revised to replace Volumetric calculations for Area 1, Area 2 and Optional Muck Storage Area, and include new calculations based on new modifications. Revised Sections 2, 4, 5, 6, 7, and 8 to incorporate these modifications and to reflect revisions to the ESFDR and the new Determination of Importance Evaluation. Added Attachment III for increased Optional Muck Storage Area.

1. PURPOSE

The purpose of this analysis is to define the spatial requirements of the area (pad) for storage of muck removed from the tunnel area during the construction of the Exploratory Studies Facility (ESF). This analysis uses the estimate for the amount of material to be removed and determines the required area of the storage pad. Two different areas, Areas 1 and 2, considered as primarily suitable areas, will be analyzed (see Attachment I). An Optional Muck Storage Area, to be located to the east of the ESF pad, will also be analyzed for available volume, with an option of raising the stockpile of muck to 49 feet (see Attachments II and III).

2. QUALITY ASSURANCE

The items in this analysis are permanent but non-Q based on the QA classification analysis (Reference 5.4). There are no Quality Assurance Controls identified in the QA classification analysis or the Determination of Importance Evaluation (DIE) (Reference 5.6) that are applicable to this analysis.

3. METHOD

The method used in this analysis is a combination of descriptive narrative analysis and calculations.

4. DESIGN INPUTS

4.1 DESIGN PARAMETERS

It is estimated that 1,087,000 cubic yards (829,768 cubic meters) of material are to be removed from the tunnel (Reference 5.3).

4.2 CRITERIA

4.2.1 Exploratory Studies Facility Requirements (ESFDR) Requirements

- 4.2.1.1 The ESF Muck Storage Pad shall be designed to be protected from the 100-year probable maximum flood local storm identified in Reference 5.2. [ESFDR 3.2.1.2.1.1.I, 3.5.1.2.B]
- 4.2.1.2 The Muck Storage Area is a permanent item and shall be designed for a 150-year maintainable life. [ESFDR 3.2.1.2.2.B]
- 4.2.1.3 The Muck Storage Area shall be sized to accommodate the calculated worst-case excavated muck transported from the subsurface, as transmitted by the Construction Management Organization. [ESFDR 3.5.1.2.A, 3.5.4.1.A]

4.3 ASSUMPTIONS

A bulking factor of 50 percent is assumed for the muck. No confirmation is required.

4.4 CODES AND STANDARDS

Not used.

5. REFERENCES

- | 5.1 YMP Baseline Document. *Exploratory Studies Facility Design Requirements Document*, YMP/CM-0019, Rev. 02.
- | 5.2 *Flood Potential of Forty-mile Wash and its Principal Southwestern Tributaries, Nevada Test Site, Southern Nevada*, by U.S. Geological Survey, Water Resources Investigation Report 83-400, 1984.
- | 5.3 Design Analysis No. B00000000-01717-0200-00089 REV 01, *Description and Rationale for Enhancement to the Baseline ESF Configuration*.
- | 5.4 Design Analysis No. BABCC0000-01717-2200-00019 REV 00, *QA Classification Analysis of the ESF Muck Storage Area (CI: BABCC0000)*.
- | 5.5 Not used.
- | 5.6 Design Analysis No. BAB000000-01717-2200-00106 REV 00, *Determination of Importance Evaluation for Surface Exploratory Studies Facility*.

6. USE OF COMPUTER SOFTWARE

The engineering software used in this analysis is *InRoads*, Intergraph Corporation's civil engineering site and highway design software, Version 5.0. *InRoads* is used to survey, analyze, plan, design, and create detailed three-dimensional models of general civil sites and/or transportation projects. This software was appropriate for the application because it generates detailed cross sections, with exact area and volume calculations. The computer hardware used was Intergraph's Interpro 2400 Series workstation running Microstation 32, version 5.0. The work was documented under input files, topographic maps delivered by Raytheon Services Nevada to the Management and Operating Contractor, ALT1MUCK.DTM, MUCKAREA.DTM, ZMUCKTOP.DTM, and OPTMUCK.DTM, and output files MUCKSTDY.DGM, MUCKSTUDY2.DGN, OPTSTUDY.DGN, SPLITOPT.DGN, and SPLITMCK.DGN.

7. DESIGN ANALYSIS

7.1 DESCRIPTIVE NARRATIVE ANALYSIS

7.1.1 Storage Area Requirements

Under Title I design, a storage area adjacent to the Topsoil and Rock Storage areas was selected. During Title II design it was decided that this area was not the most suitable storage area and a pad closer to the tunnel was needed. This would lower the cost of conveyor construction by shortening the distance between the tunnel and the pad, and would result in lower maintenance costs in the future. Two areas close to the ESF pad were selected and studied to determine the most suitable alternative. Both areas were selected outside the probable maximum flood (PMF) zone (reference Page 1 of 26, Attachment I, and reference Section 5.2). Alternative 1 is a triangular shaped area, bounded by the access road to the North Portal Pad on the west, an existing power line and its service road on the south, and the limits of PMF on the northeast side. Alternative 2 is a rectangular shaped area, bounded by the access road to the North Portal Pad on the east, an existing power line and its associated service road on the south, another existing power line and access road on the west, and with the northern boundary close to the culvert crossing on the access road to the North Portal Pad. Several meetings and discussions were conducted to select the best alternative. Area 1 was slightly farther away and the conveyor alignment had to cross the access road to the North Portal Pad. Area 2 was closer to the tunnel, but was bounded by the access road, the power lines, and the site of the proposed potential repository facilities, with minimal potential for future expansion. Either area could be selected and used for storage.

An Optional Muck Storage Area to be used as an interim storage in case the conveyor is not functional is also to be considered. This area is bounded on the west side by the North Portal Pad and on the east and north sides by the access road to the North Portal Pad, and on the south side by the conveyor access road.

7.1.2 Drainage Requirements

Both Area 1 and Area 2 are on relatively high ground and outside the PMF and 100-year flood zones. Both areas are also protected from local flooding by the adjacent access roads. Minimal flood protection in the form of drainage ditches around the pads is sufficient to protect them from any local flooding. Area 1 must be protected from a 100-year flood. The access road to the North Portal Pad is designed to handle the 100-year stormwater on its west side, from H-Road to the culvert crossing. At the culvert crossing the stormwater will flow to the east side of the access road and to the northeast side of the proposed storage pad. This effectively protects the west and northeast sides of the pad. The south side of the pad is protected from 100-year flooding by the H-Road and the existing service road for the power line. Therefore, Area 1 has existing 100-year flood protection and only needs a perimeter drainage ditch system to protect it against local flooding. To

protect Area 2 from 100-year stormwater, a perimeter drainage ditch on the west side of the pad, along with existing power line access road, will be needed.

Optional Muck Storage Area is located outside the PMF and 100-year flood zones. This area is protected from local flooding by the existing flood control channel on the west side of the North Portal Pad. The flood control system of the North Portal Pad will be perpetuated to this area. This includes keeping a minimum of 2% grade away from the portal and extending the underground storm drain system to the vicinity of the existing culvert under the North Portal access road. This area is proposed to be graded so the drainage is controlled to flow in a westward direction and all water to be directed to the existing culvert under the North Portal access road. This will provide for one point of discharge for the stormwater for the North Portal Pad and the Optional Muck Storage Area.

7.2 CALCULATIONS

Area 1 is a triangular shaped area with approximate dimensions of 2,440 ft x 1,150 ft. Area 2 is a rectangular shaped area with approximate dimensions of 1,300 ft x 600 ft. Detailed area and volume calculations, using the average-end-area method, and Intergraph's InRoads Version 5.0, were performed for each area (for Area 1 calculations reference Pages I-2 through I-17, and for Area 2 calculations reference Pages I-18 through I-26, Attachment I). These calculations show an average height of 25 feet for Area 1 and 50 feet for Area 2. The lower height of the pile for Area 1 is another factor in its advantage over Area 2. This shows that in addition to the potential area expansion, Area 1 has height expansion potential. Combining these two factors shows that potential volume expansion is a better possibility at Area 1. Additional storage volume would be provided at Areas 1 and 2 due to removal of topsoil. Alternate 1 has a larger area and will provide more storage capacity than Alternate 2. Total volume for Alternate Areas 1 and 2 calculated at 1,600,669 and 1,108,826 cubic yards, respectively.

Total area for the Optional Muck Storage Area is calculated to be about 398,000 square feet (9 acres). An average height of approximately 30 feet is calculated. The height varies between about 40 feet at the maximum to 20 feet at the lowest point. This will provide storage space for 268,876 cubic yards of the excavated muck (for calculations reference Attachment II, Pages II-1 through II-10). This height could be increased up to 49 feet, providing additional storage capacity for 254,583 cubic yards of excavated material (for calculations reference Attachment III, Pages III-1 through III-10). The area directly over the sewer pipe should not increase in height to prevent additional dead loading of the sewer pipe.

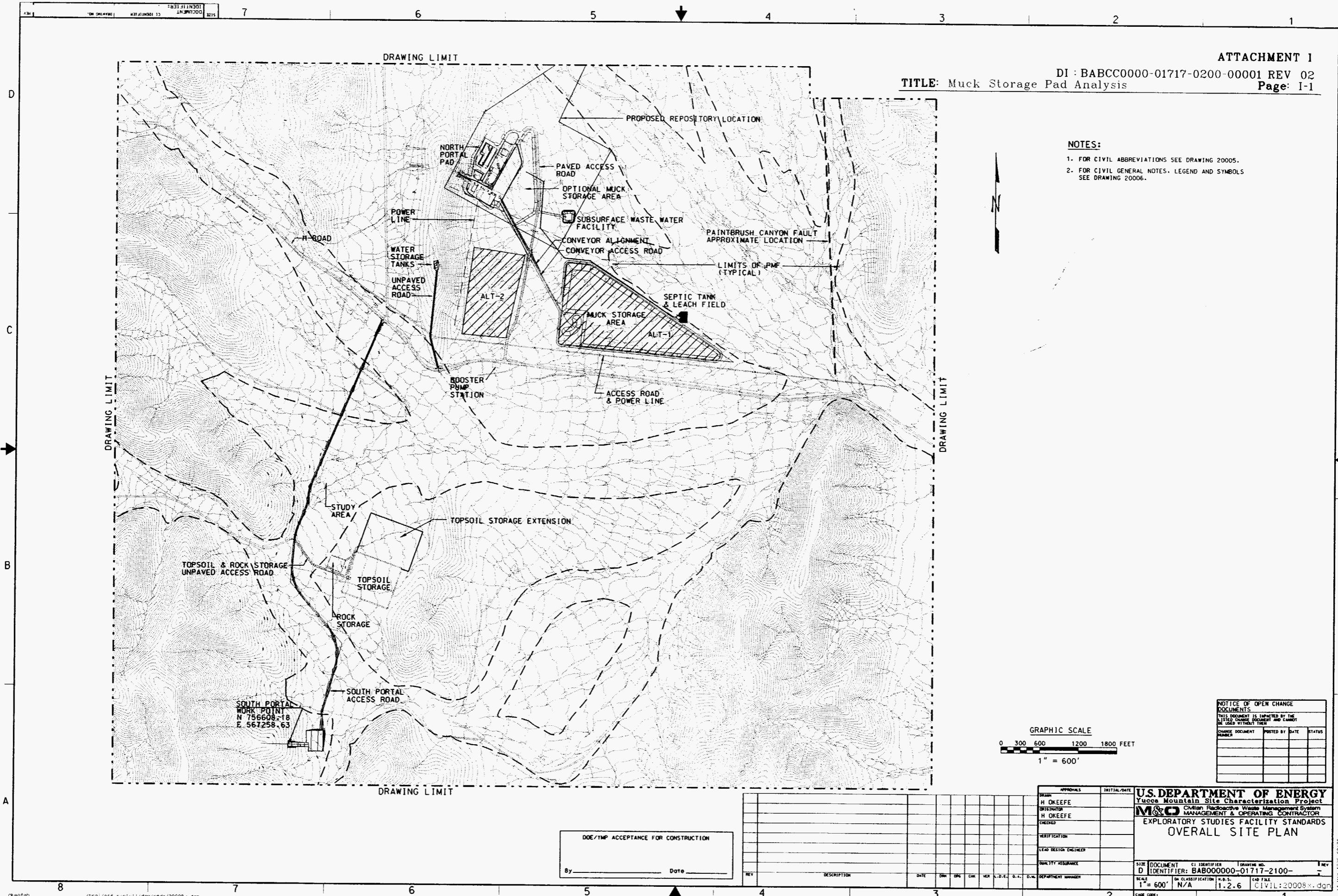
8. CONCLUSIONS

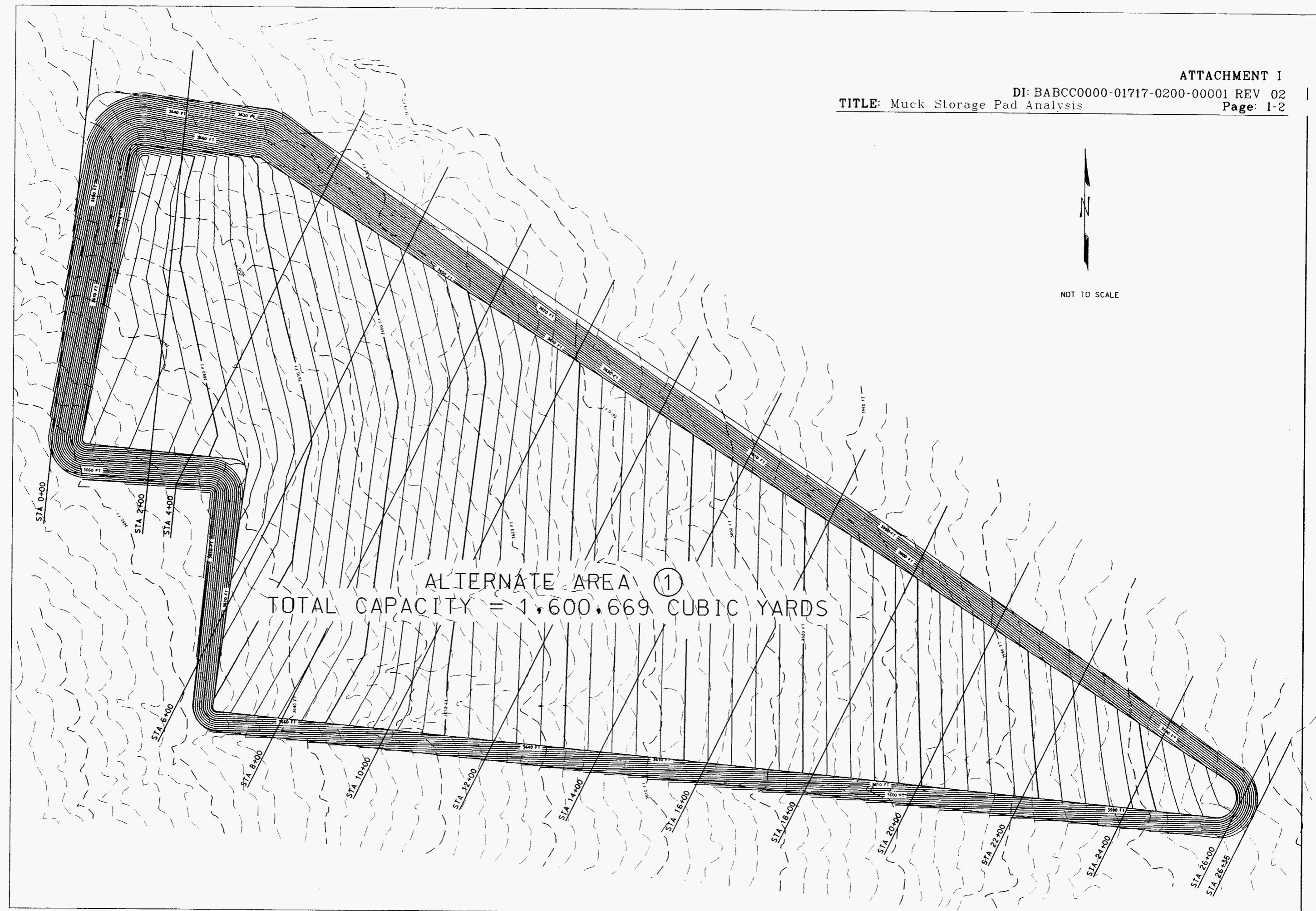
Based upon the calculations, analysis, and discussions with other participant organizations, Area 1 is the selected area for the muck storage pad. This area is in close proximity to the North Portal Pad, is outside 100-year flood zone, has the capacity for the present requirements, and has the capacity for any future expansion. It also has economic advantage over the area selected under Title I design. Area 2 could also be utilized as a storage area with no adverse economic or environmental effects.

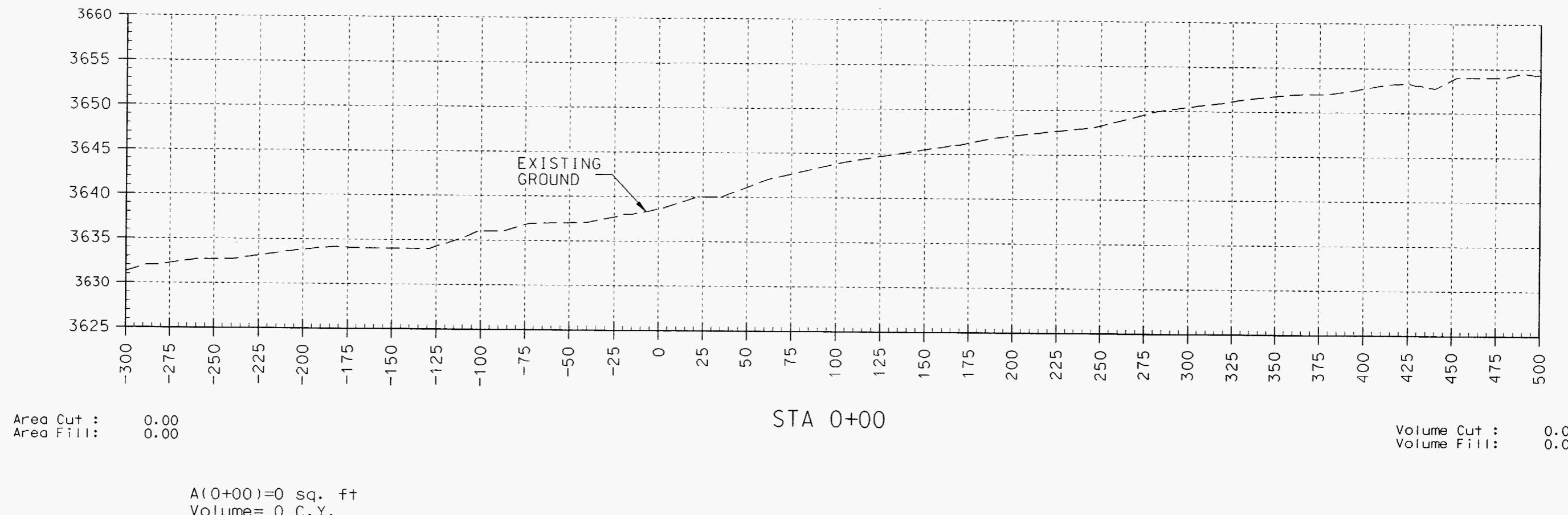
The Optional Muck Storage Area will provide 268,876 cubic yards of storage capacity and can be utilized while the construction of the conveyor system is not complete. Raising the height of the muck to 49 feet will provide for 254,583 cubic yards of additional storage capacity at lower costs.

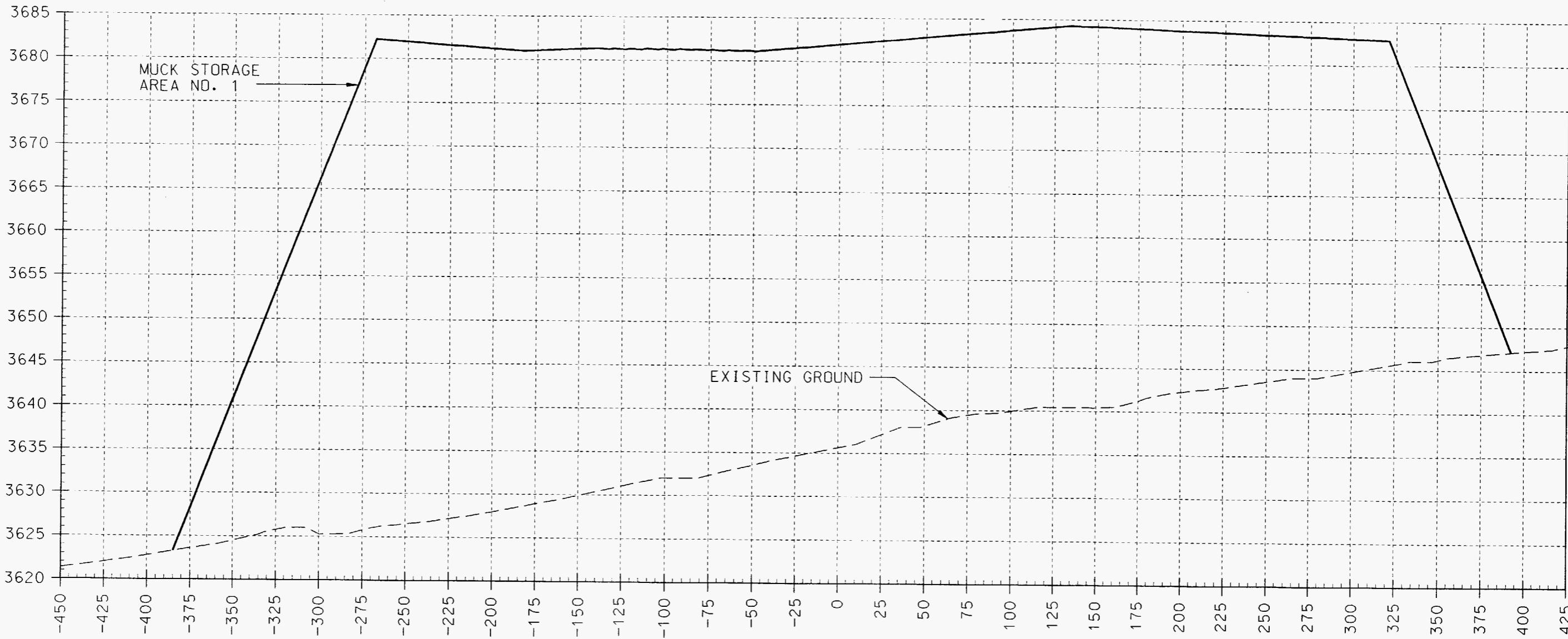
9. ATTACHMENTS

ATTACHMENT	TITLE
I	Determining Volume of Muck That Can Be Stored in Areas 1 and 2
II	Determining Volume of Muck That Can Be Stored in Optional Muck Storage Area
III	Determining Volume of Additional Muck That Can Be Stored in Optional Muck Storage Area by Raising the Height of the Stockpile





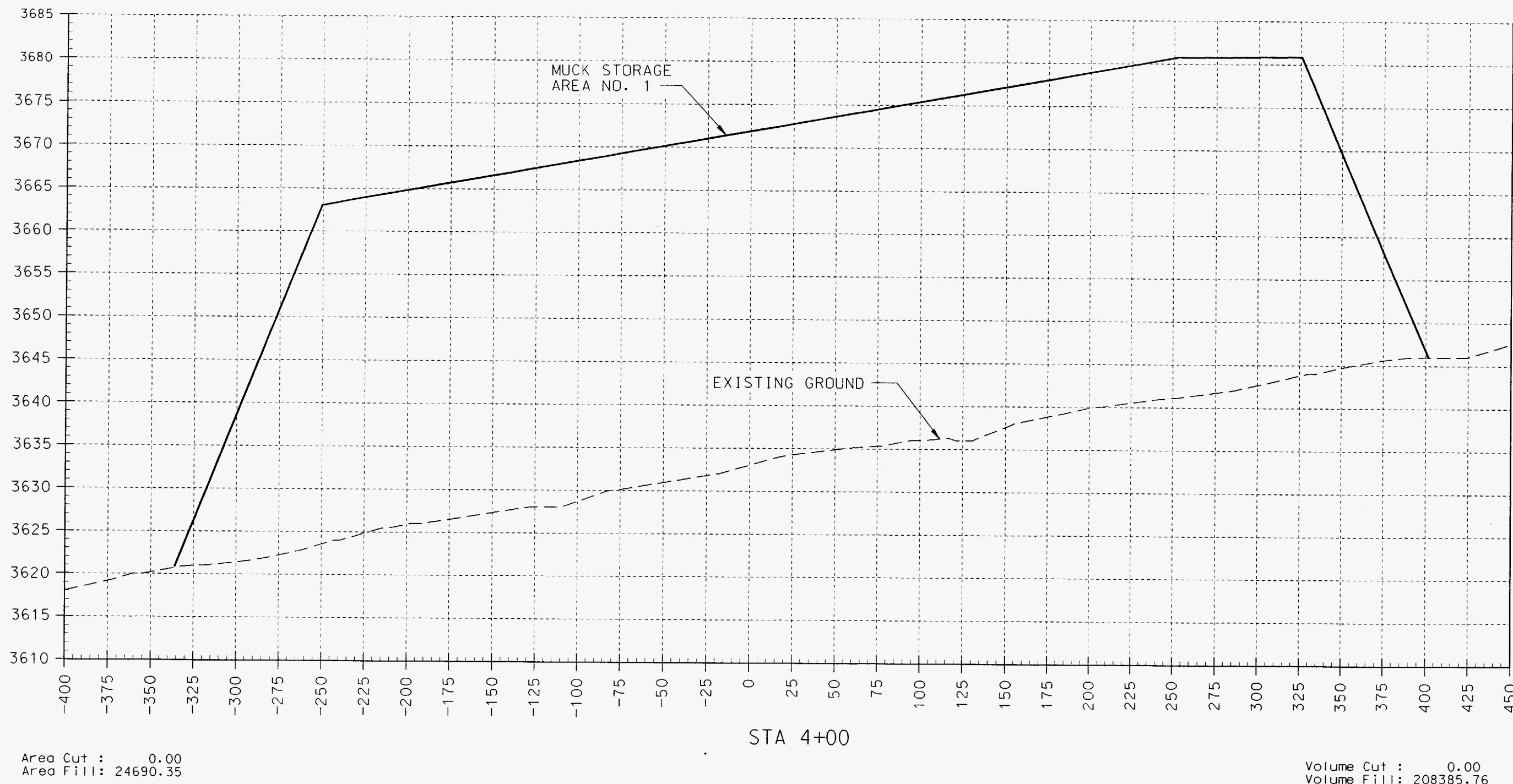




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STA 2+00

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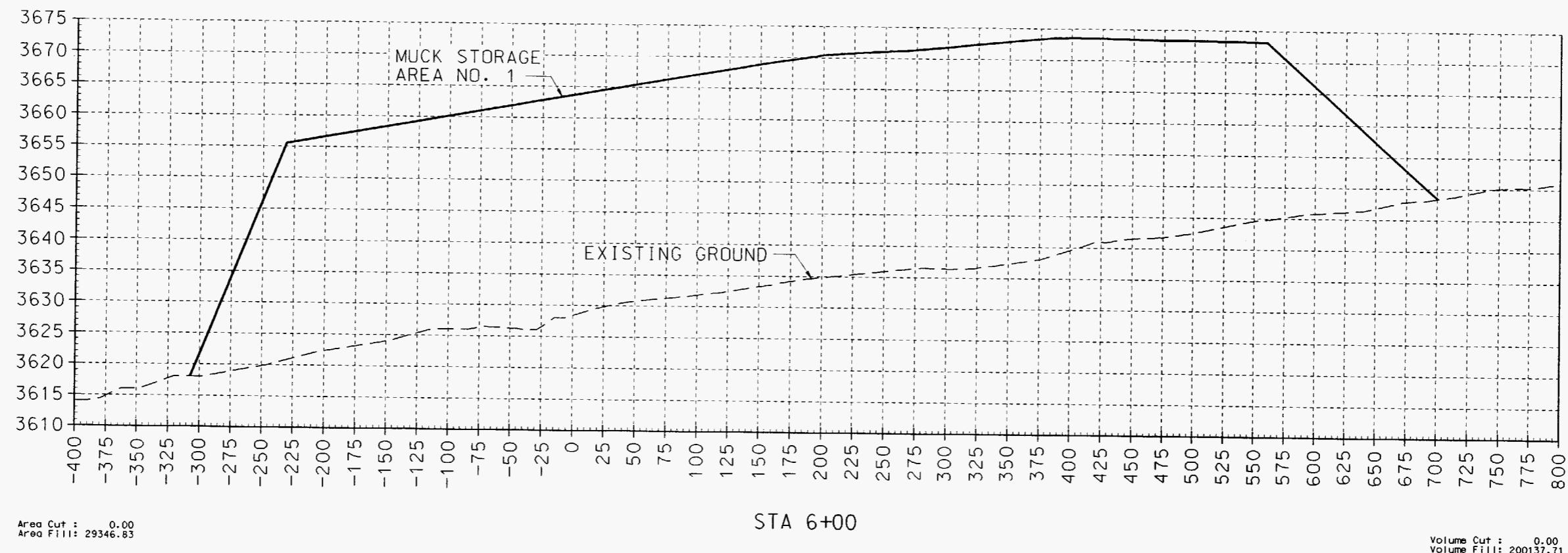


ATTACHMENT I

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TITLE: Muck Storage Pad Analysis

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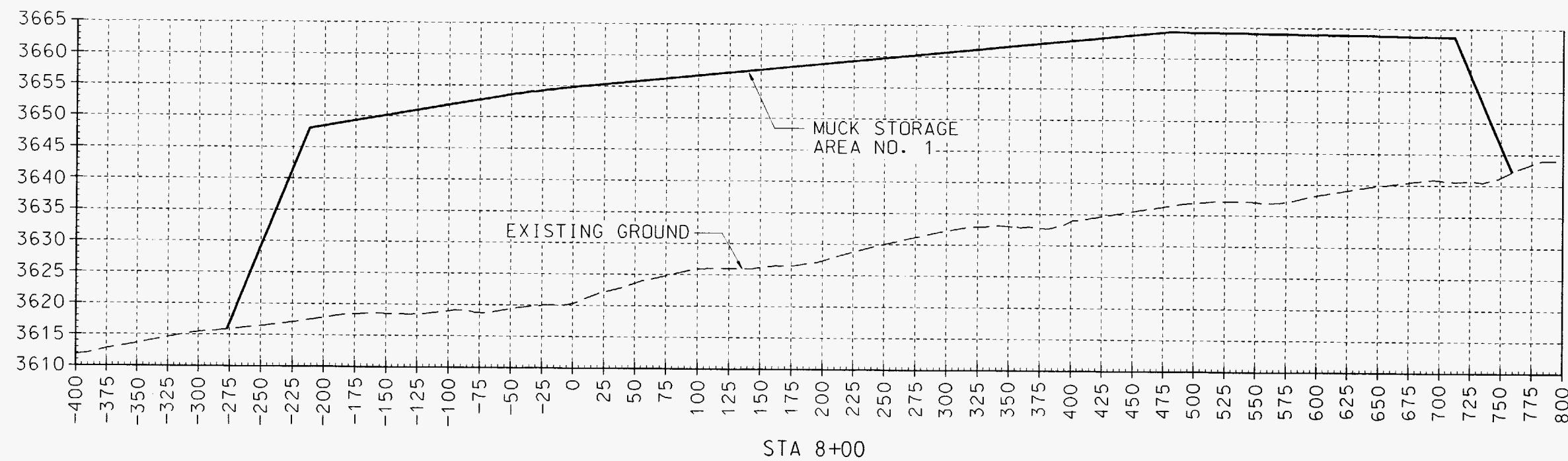


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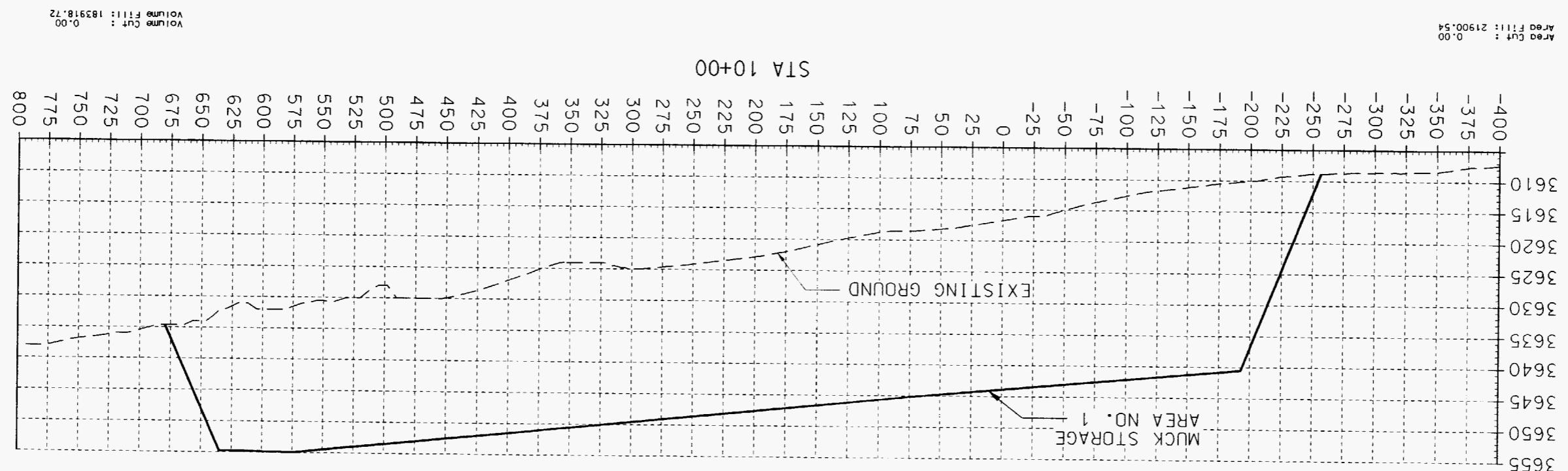
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TITLE: MUCK Storage Pad Analysis
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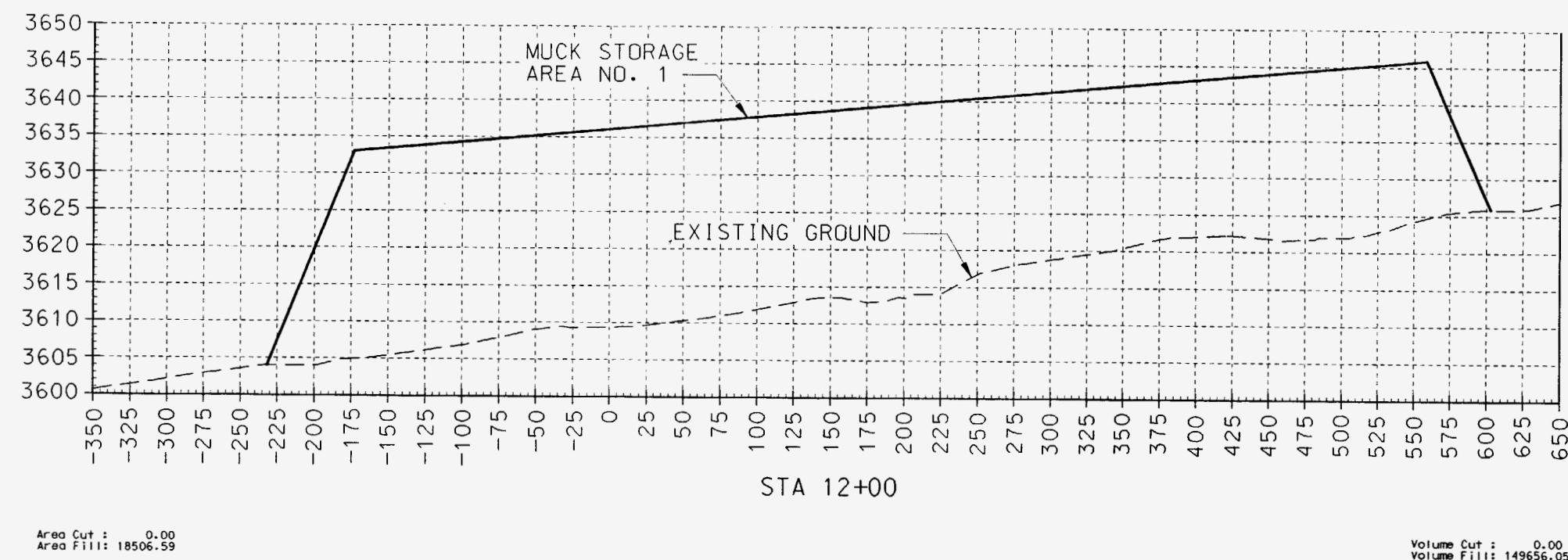


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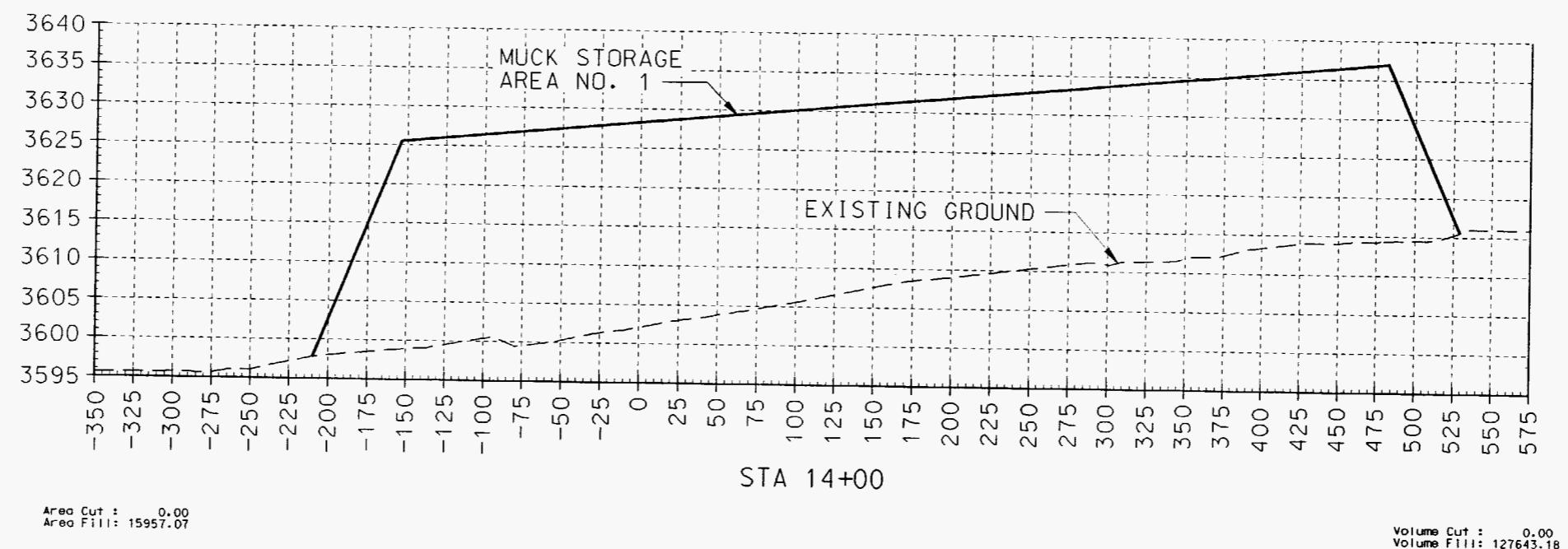


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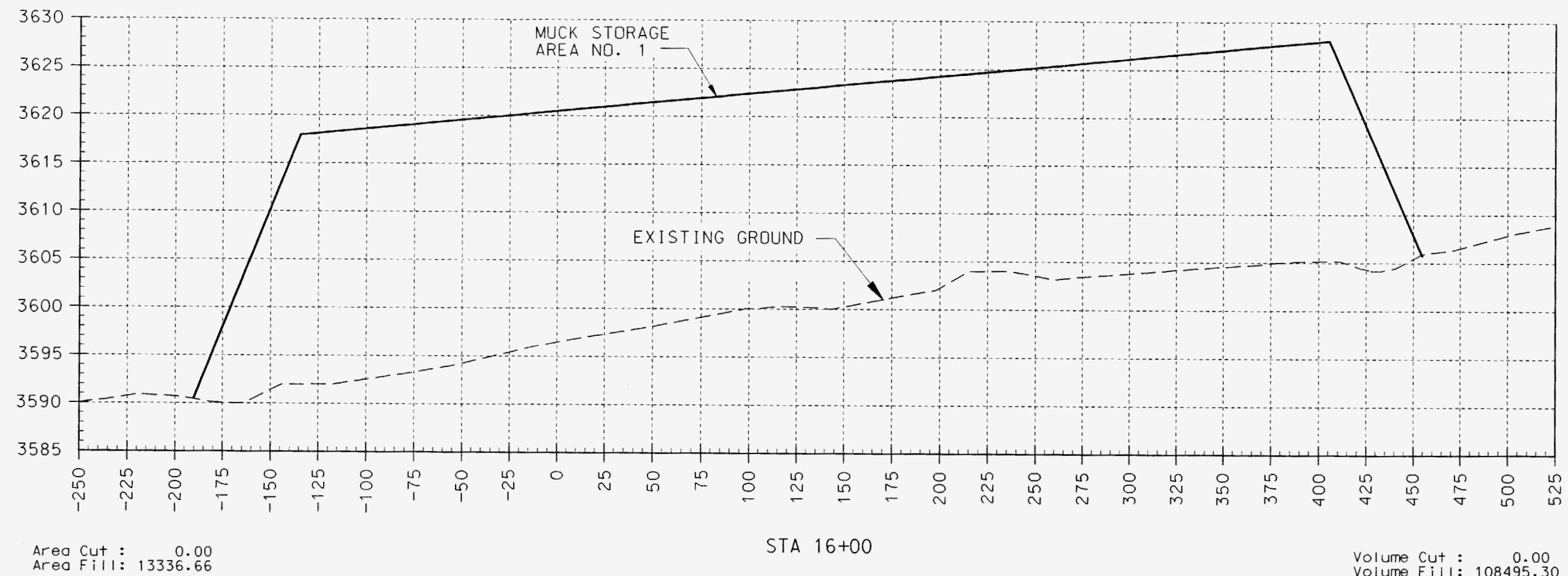


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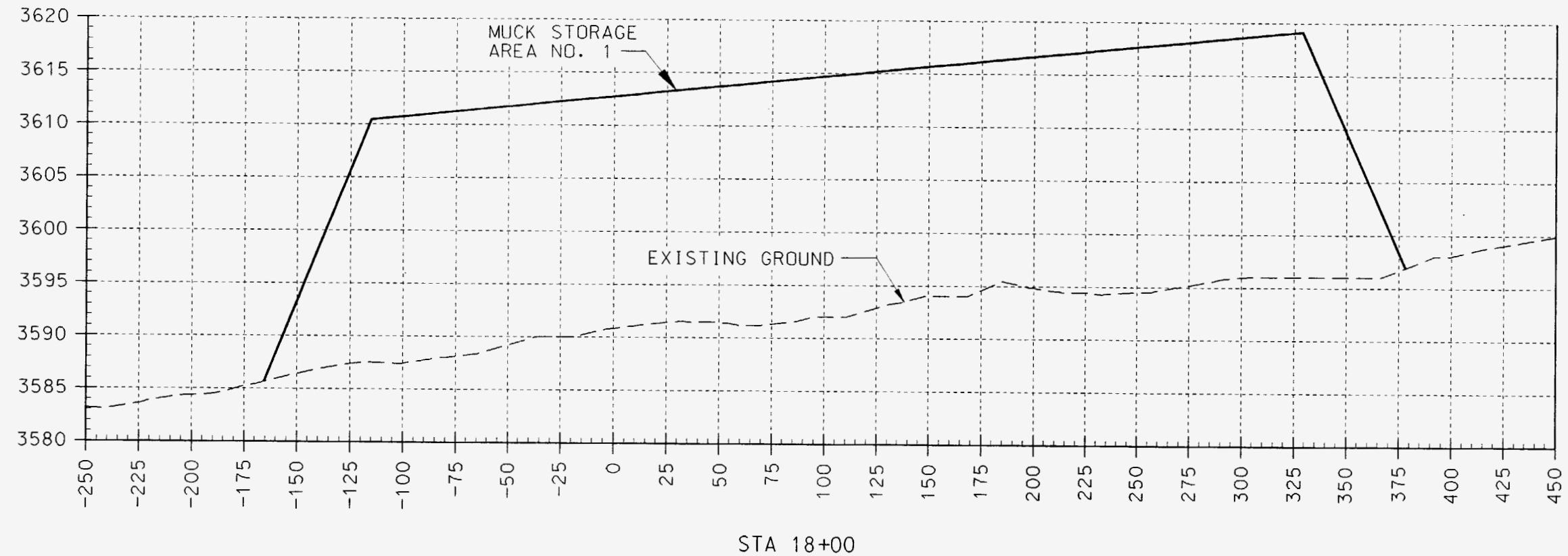


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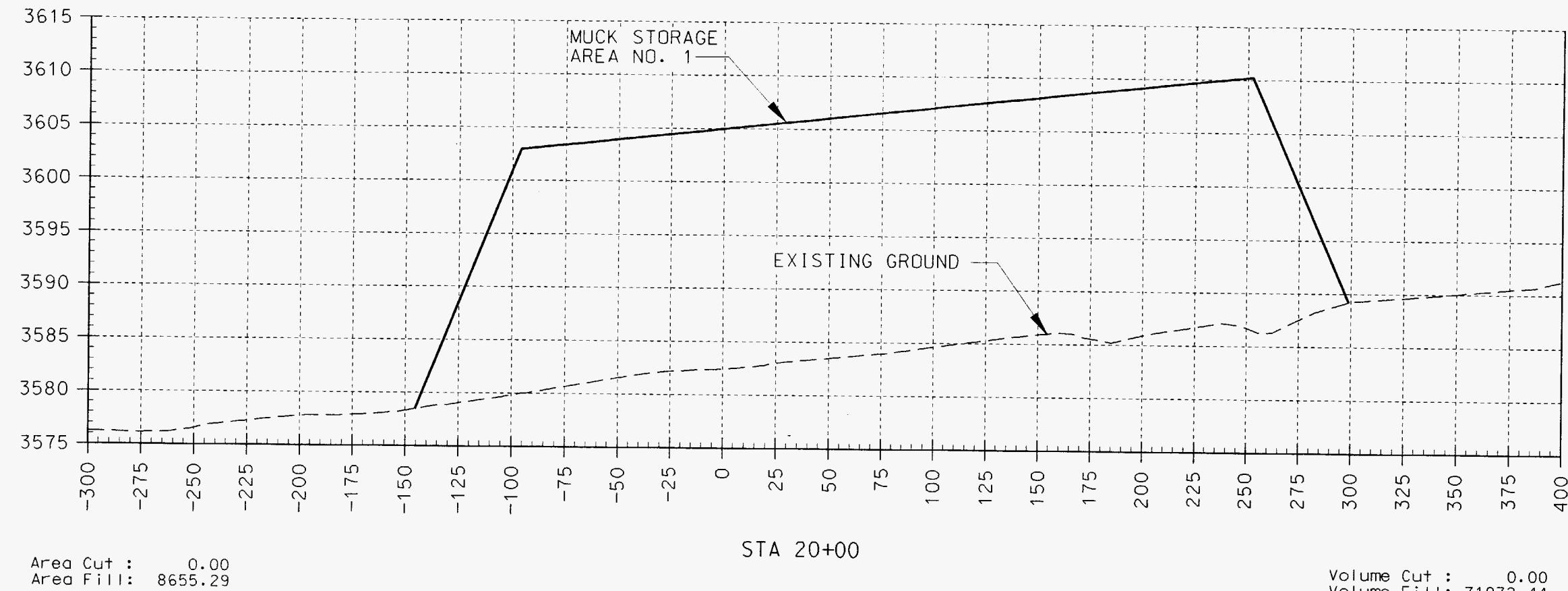


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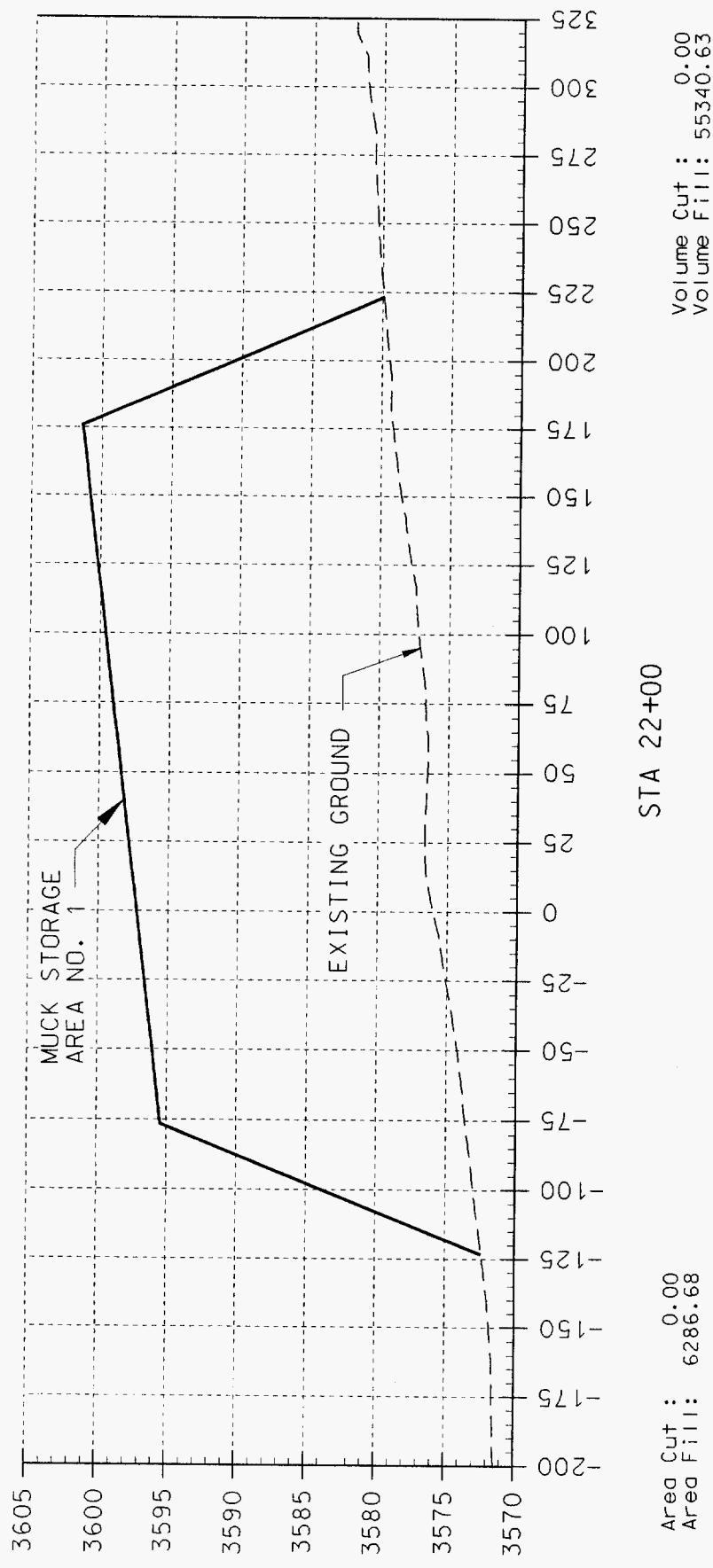
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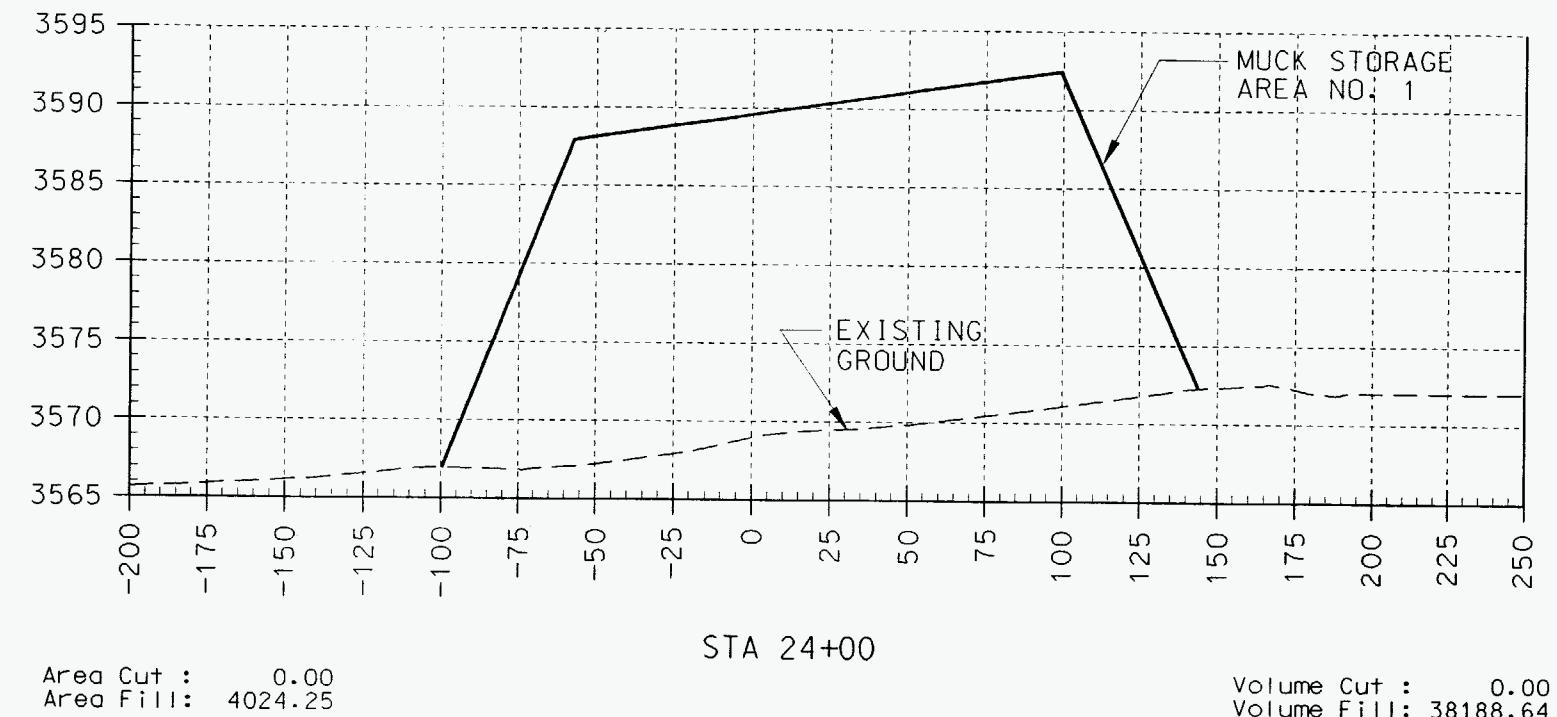


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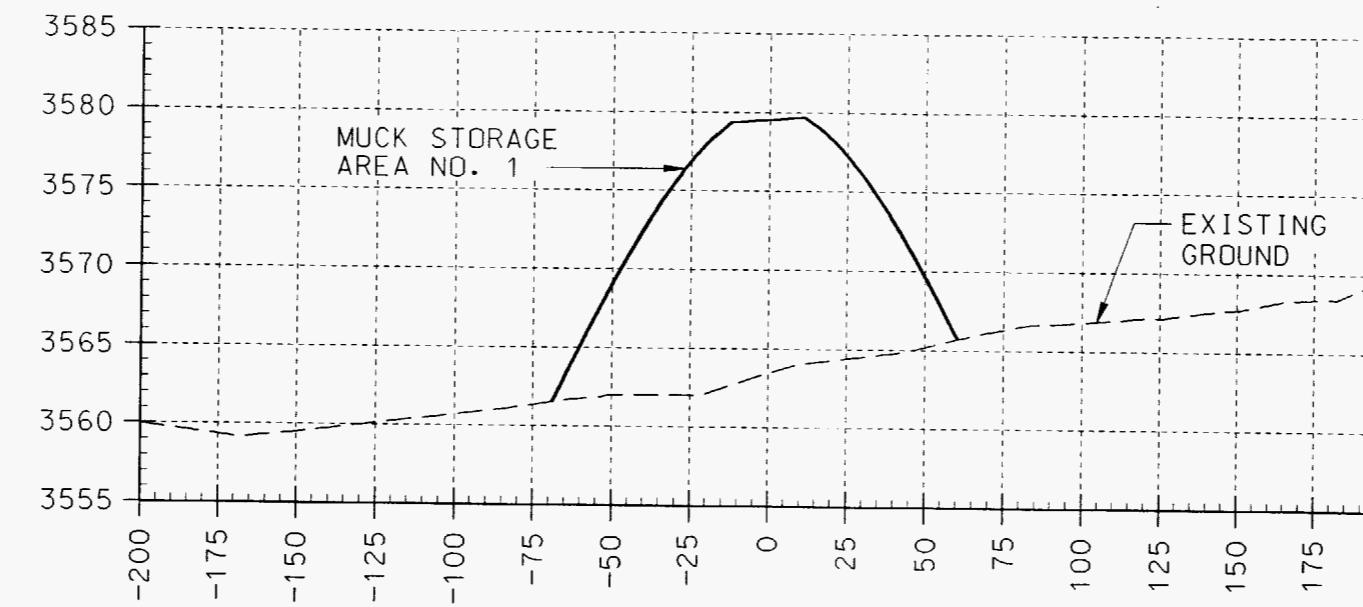


ATTACHMENT I

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TITLE: Muck Storage Pad Analysis

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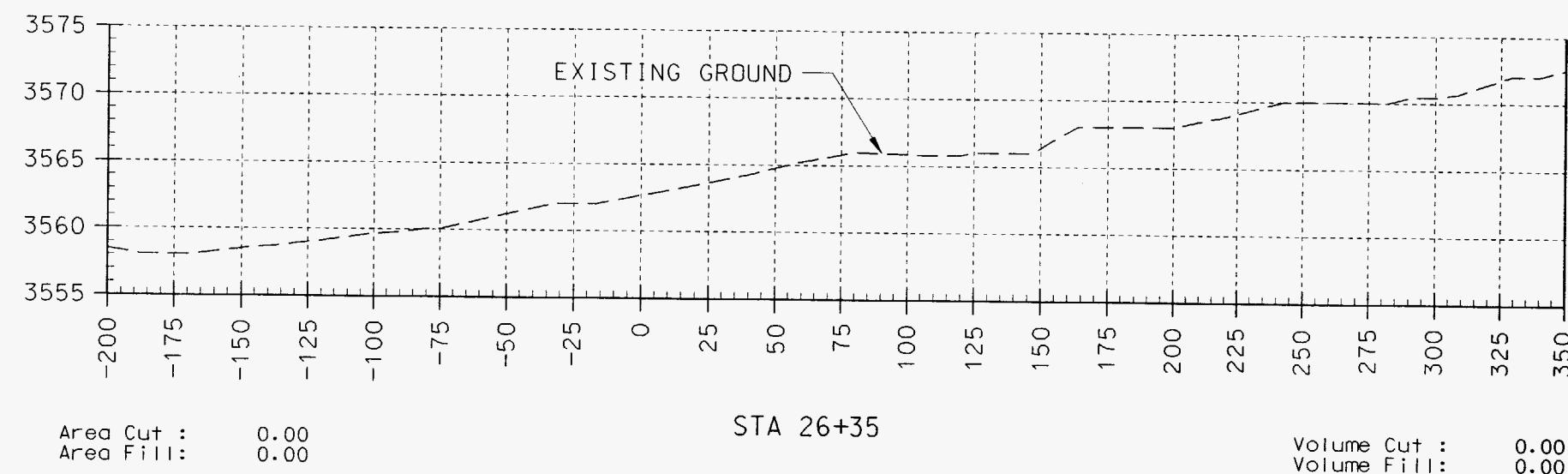
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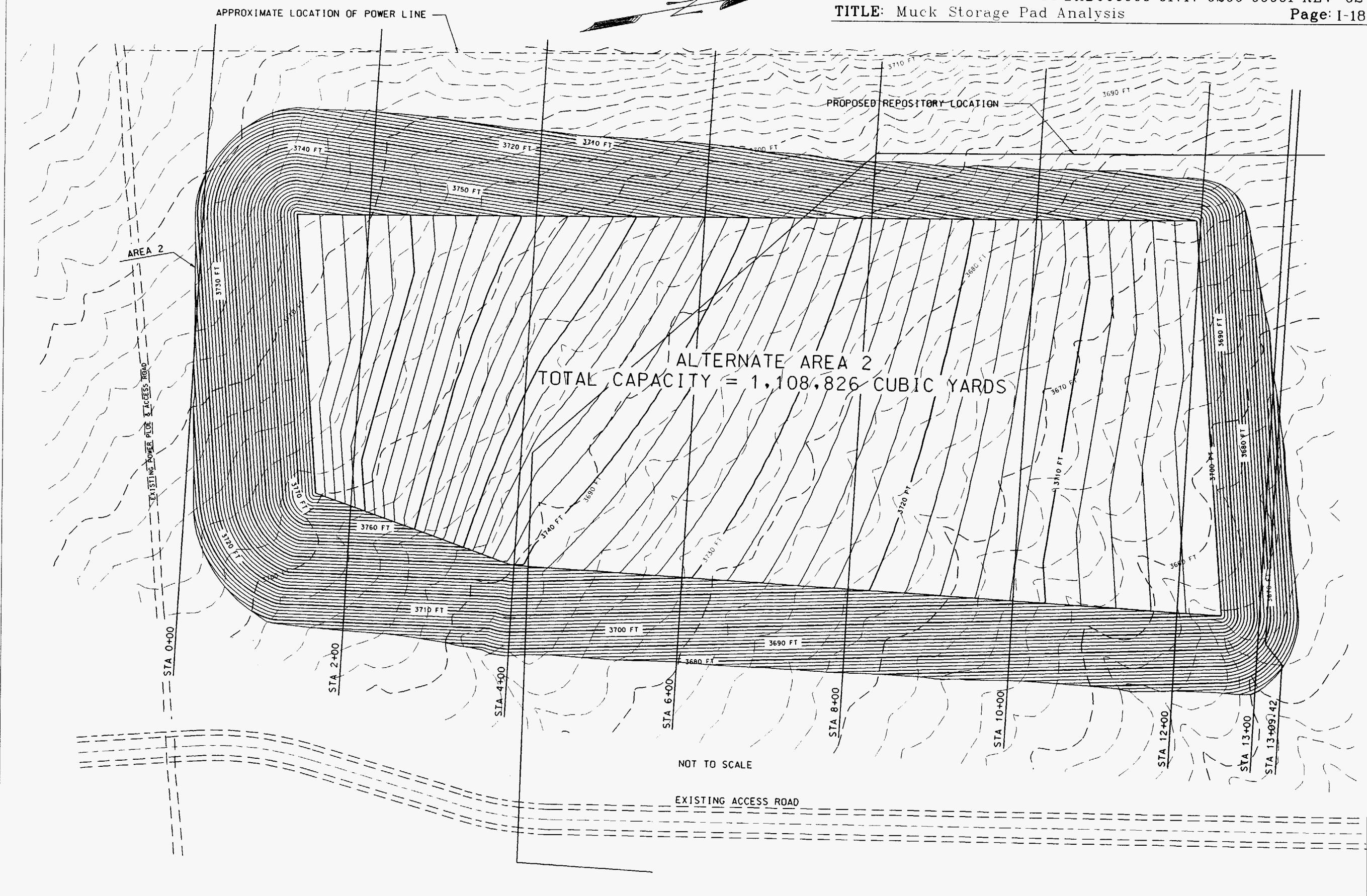
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TOTAL QUANTITIES

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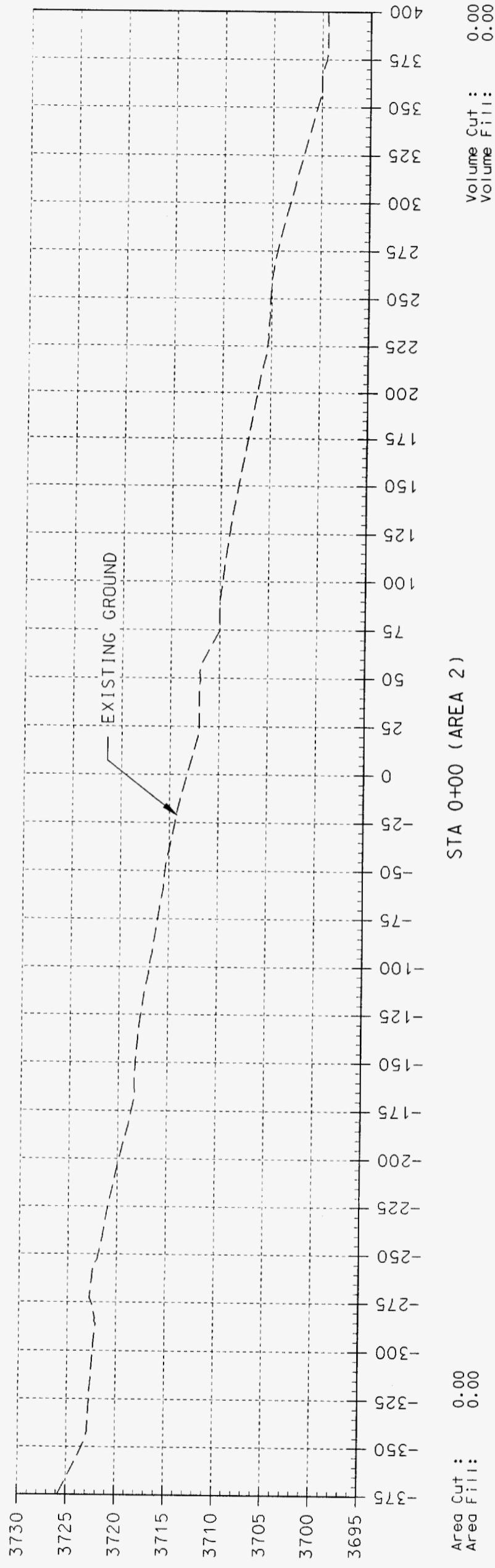
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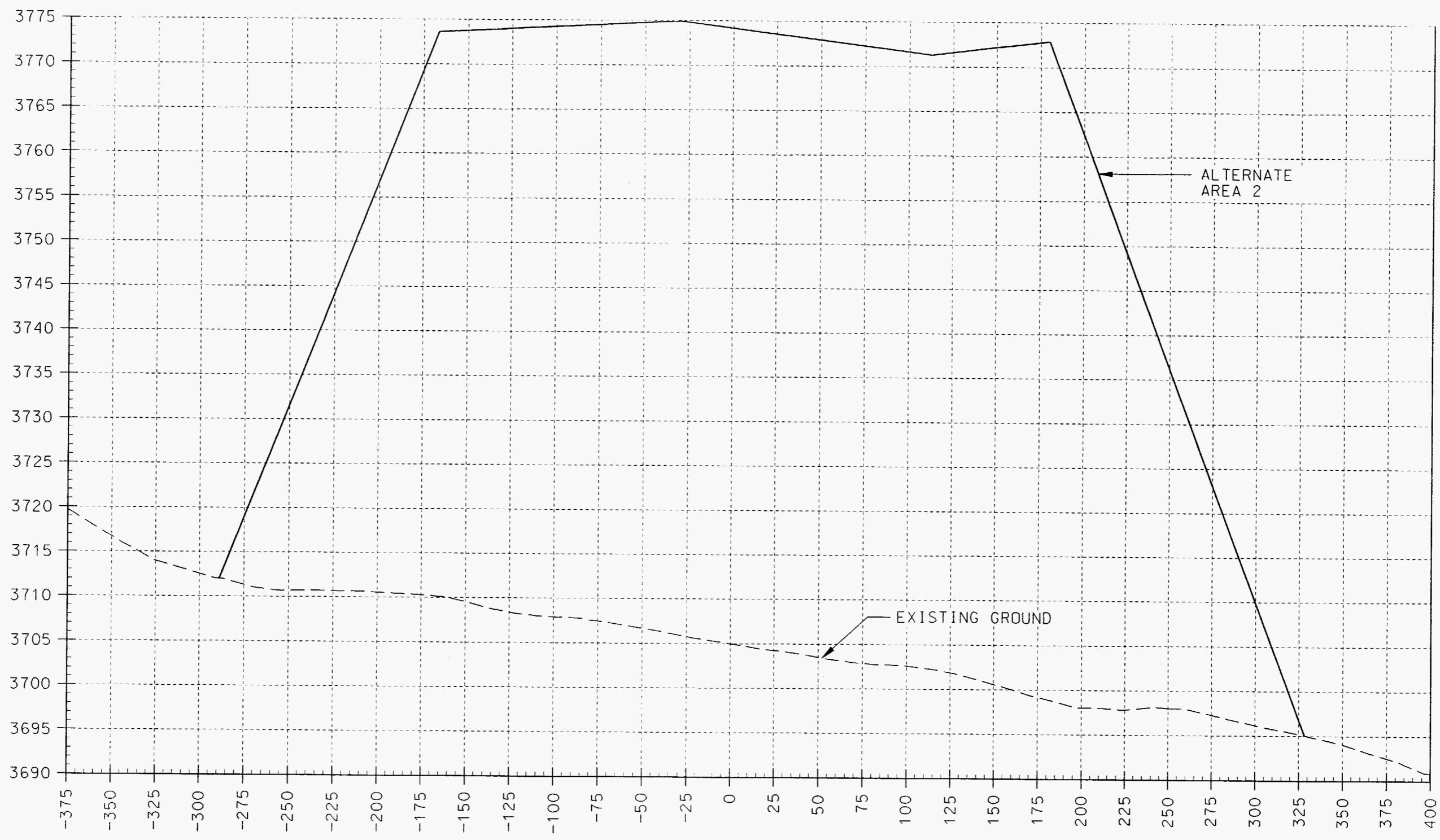


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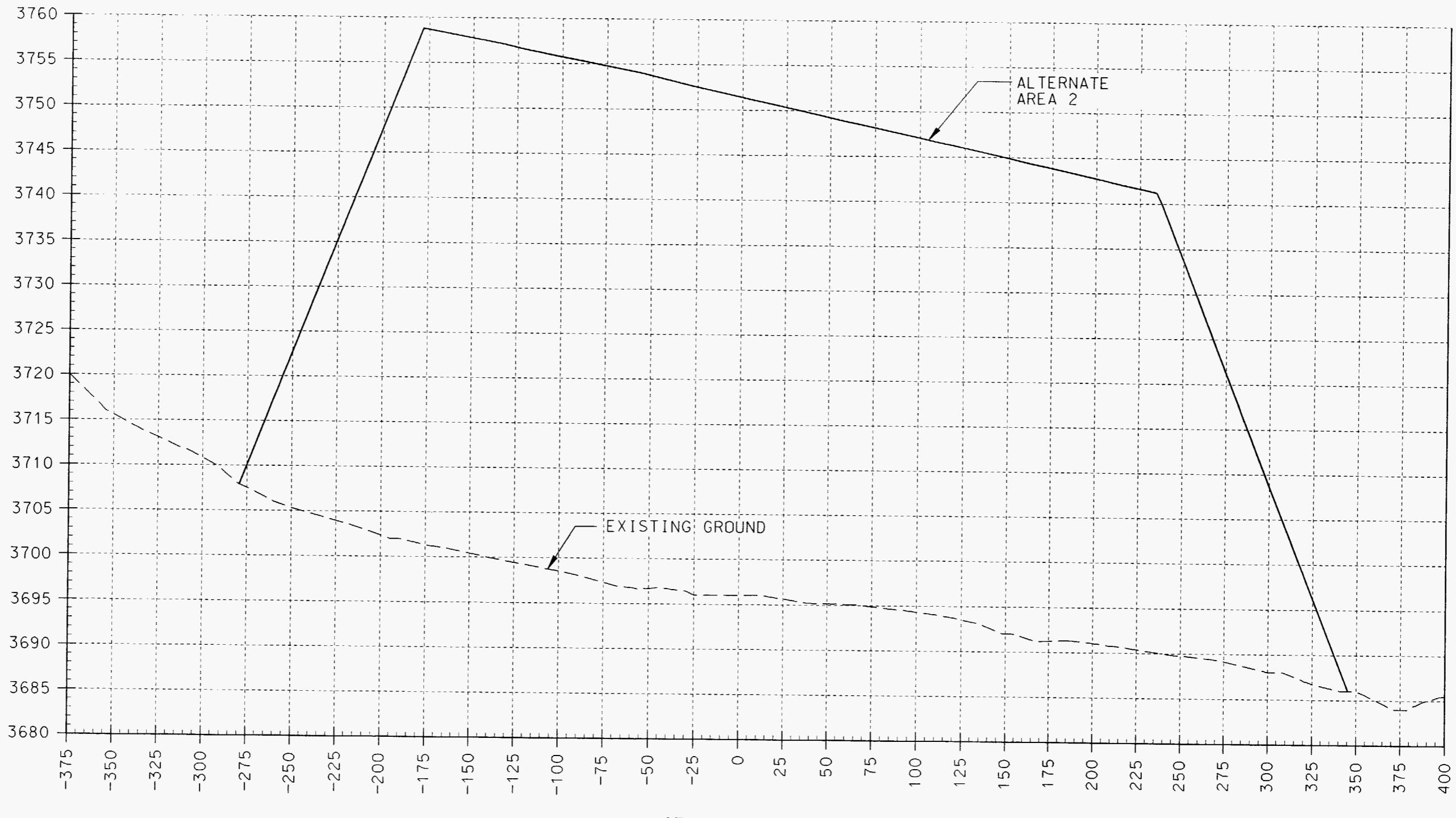




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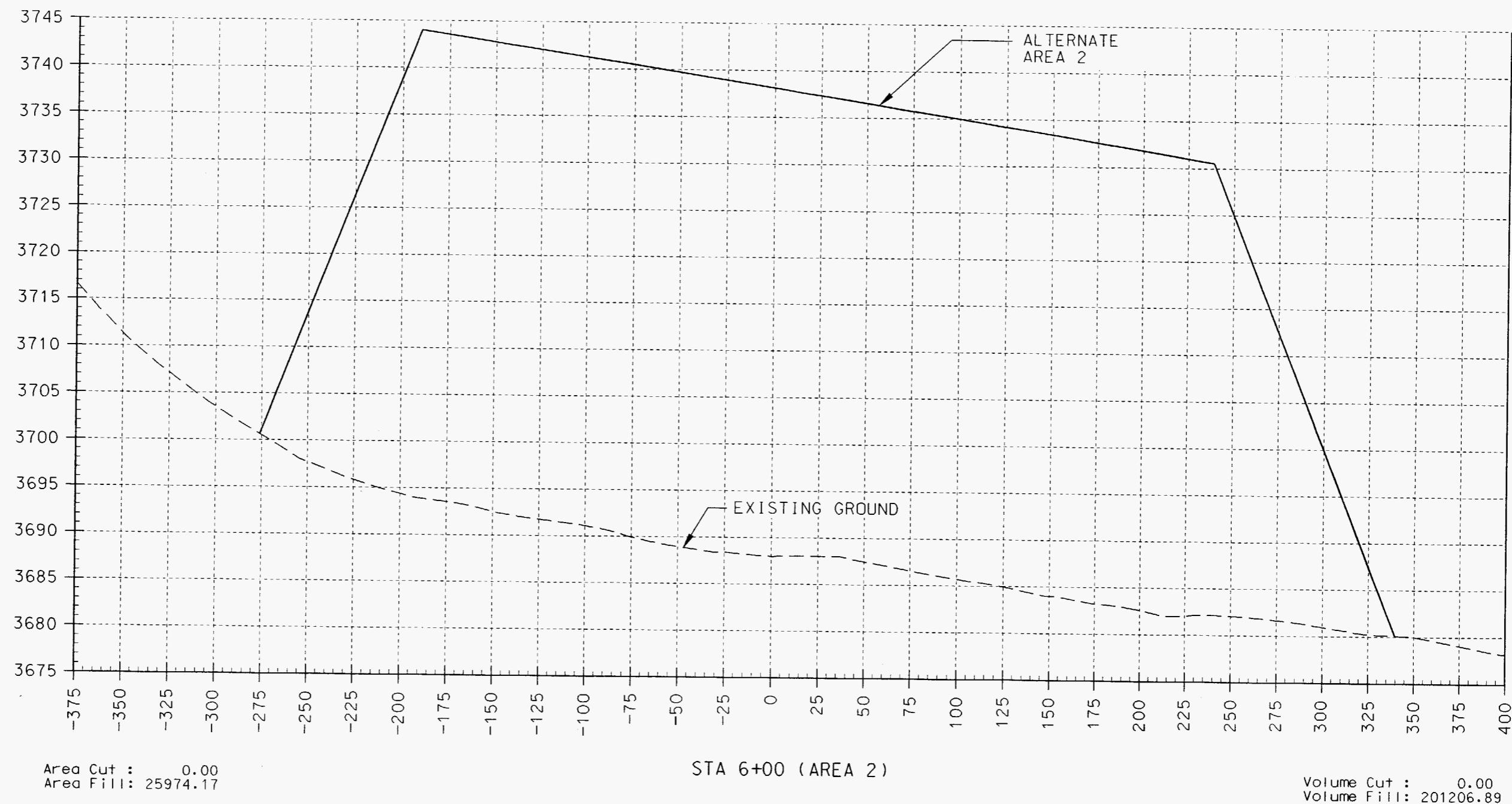
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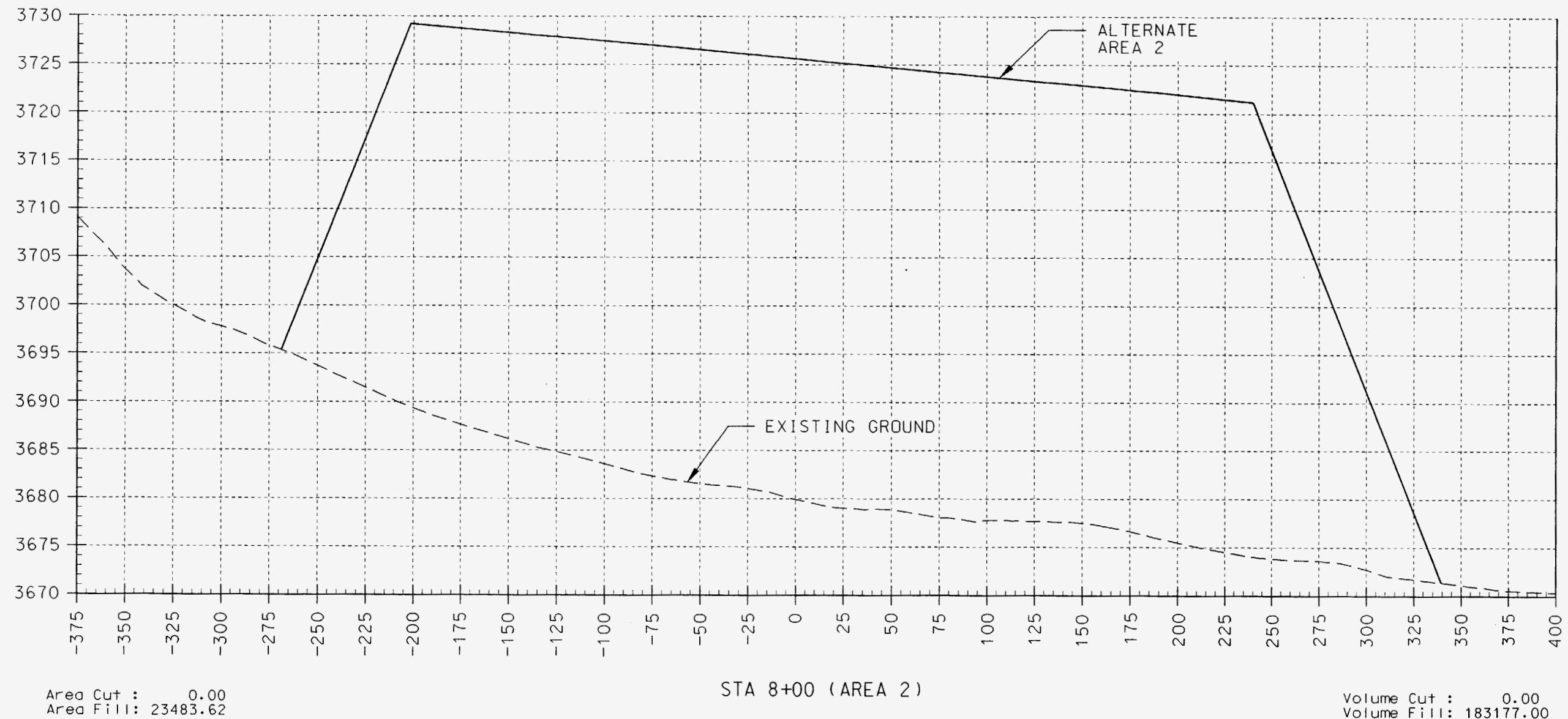


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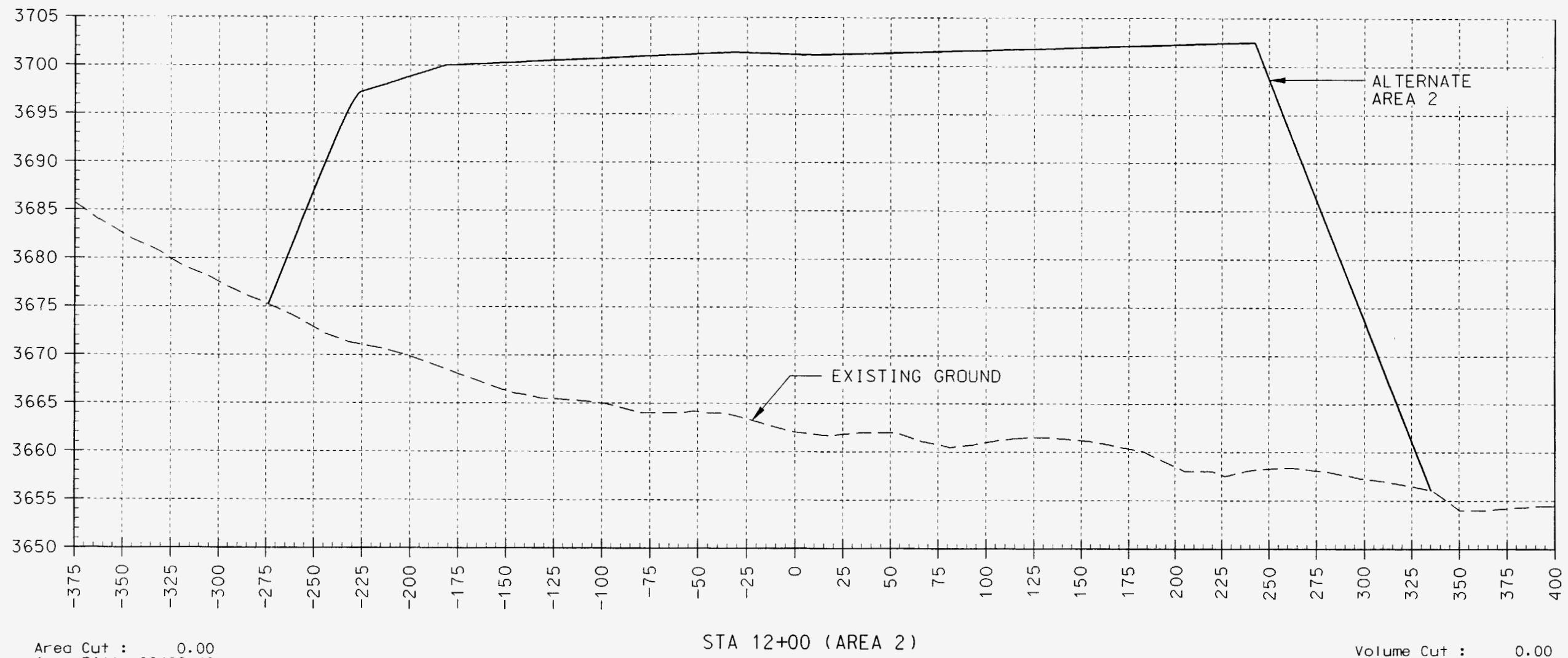


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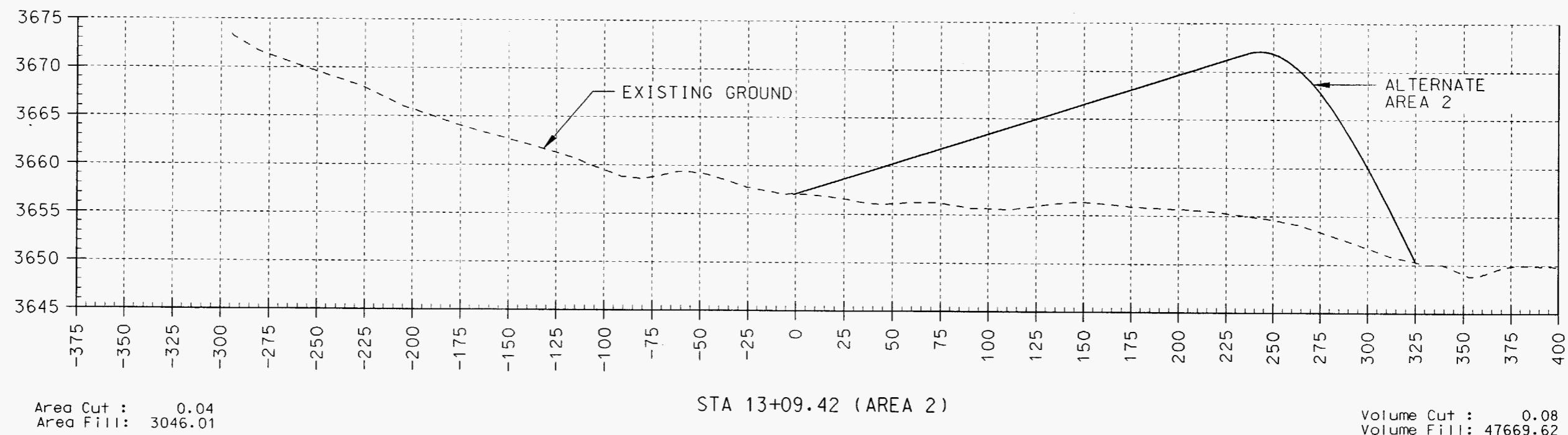


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TOTAL QUANTITIES

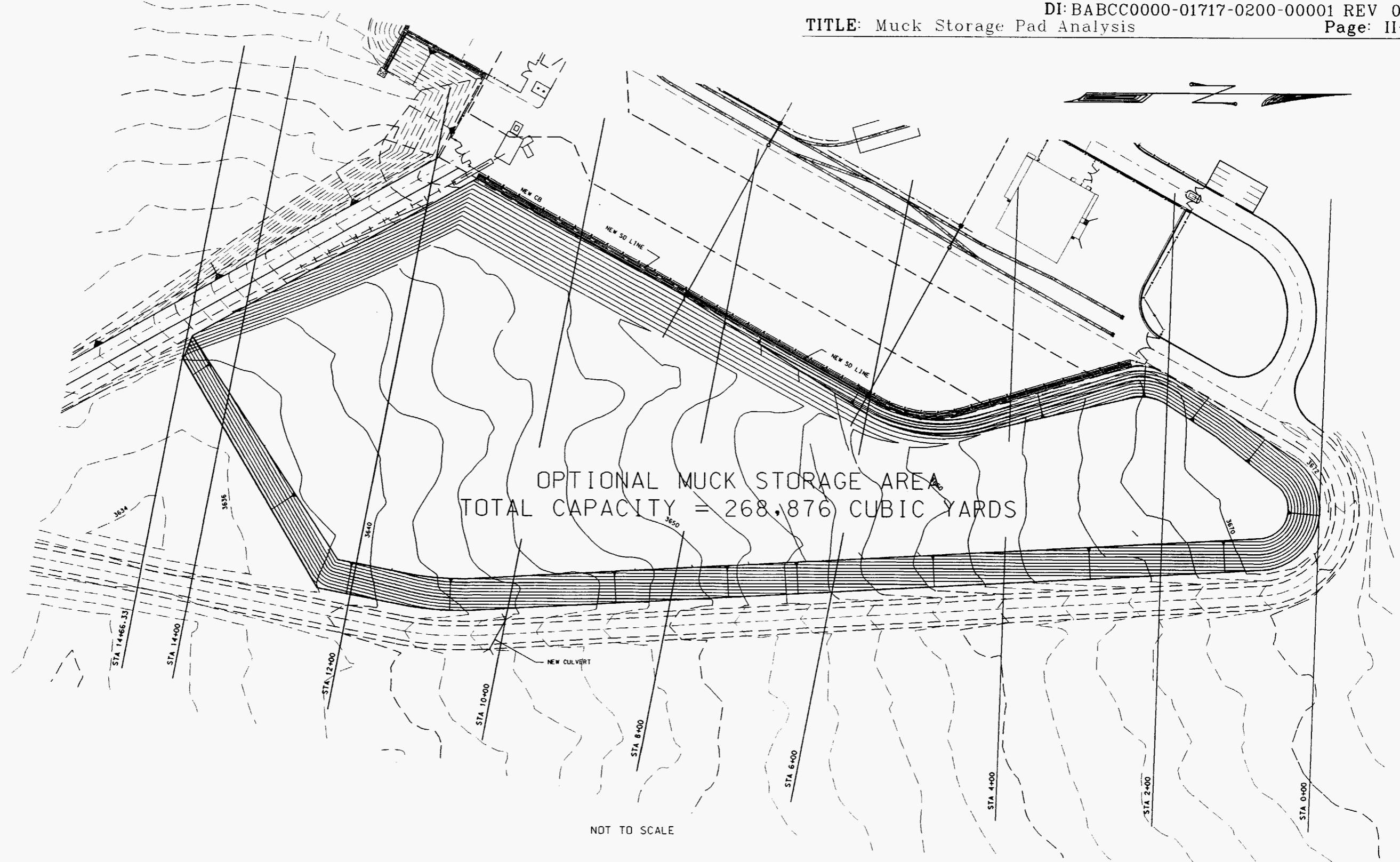
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ATTACHMENT II

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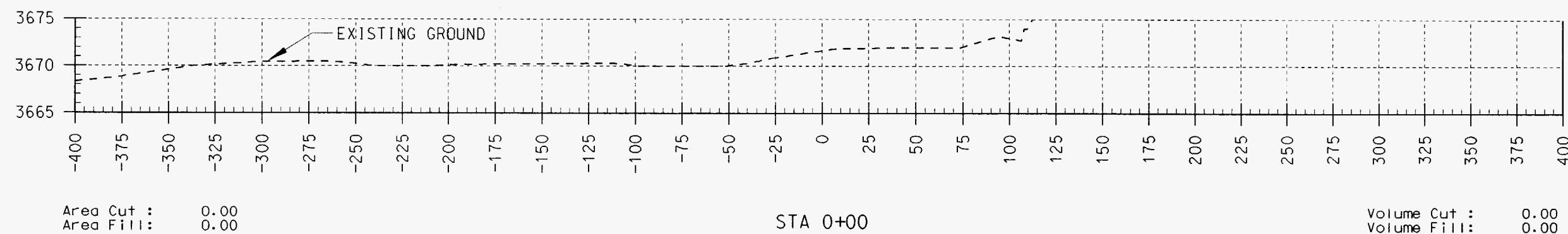


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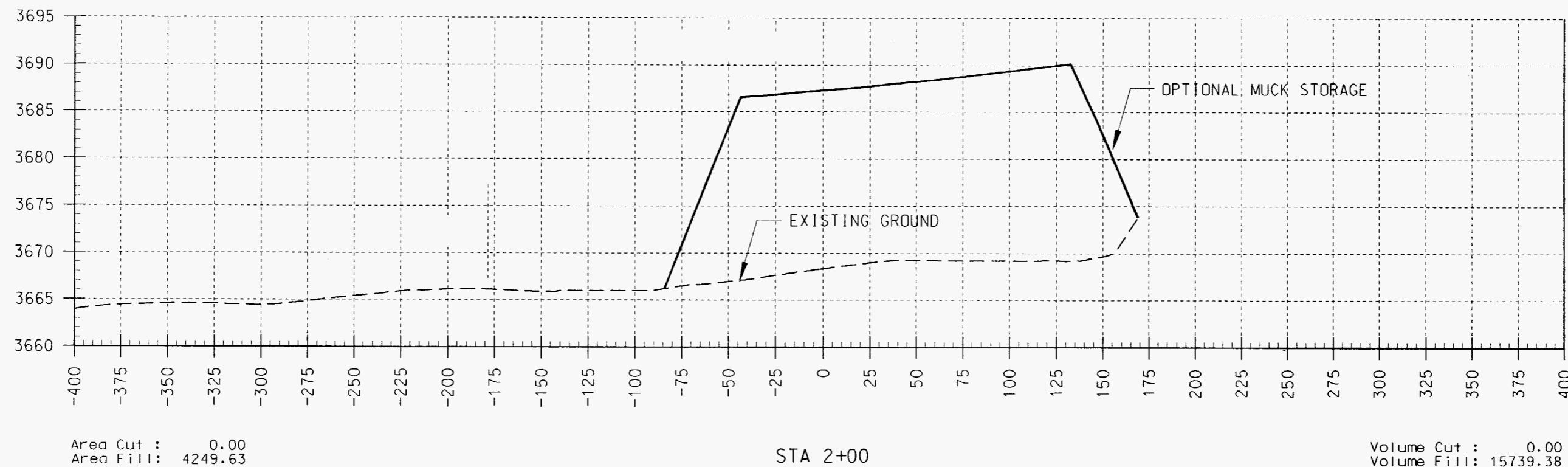


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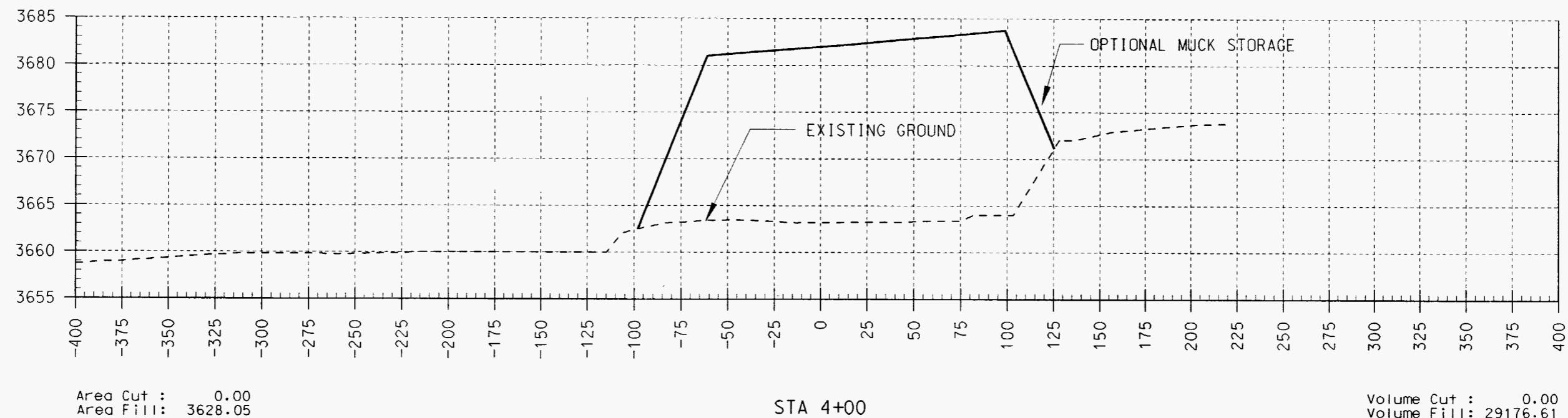


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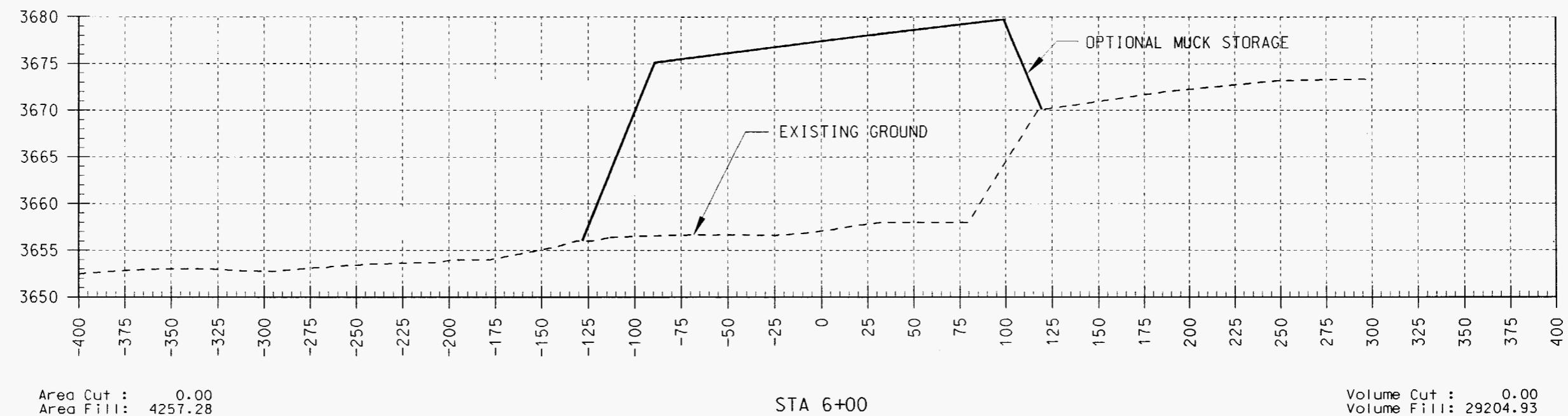


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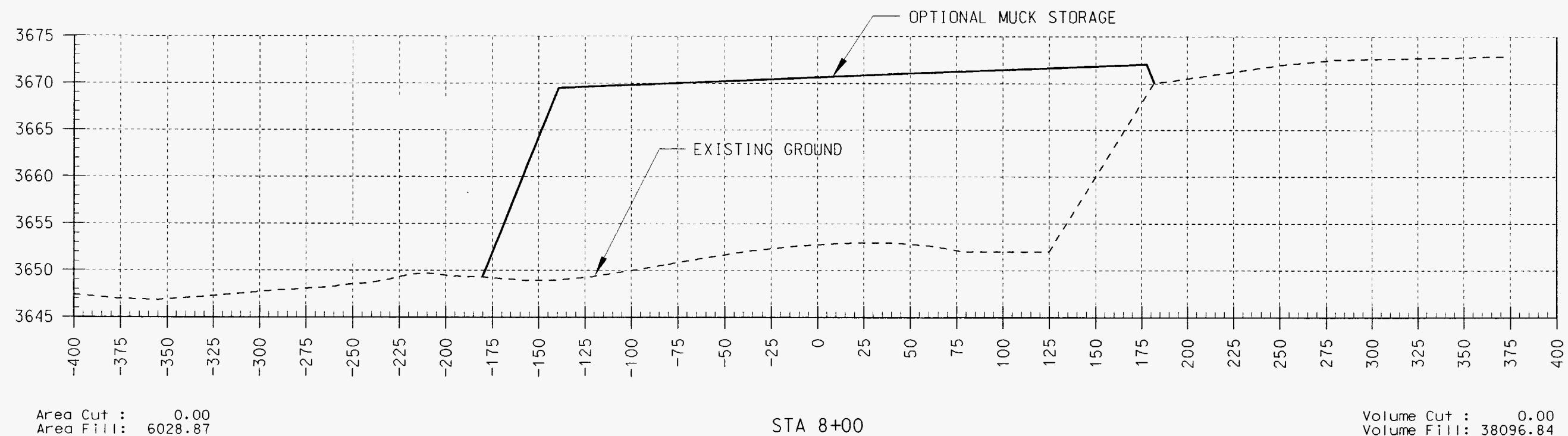


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TITLE: Muck Storage Pad Analysis

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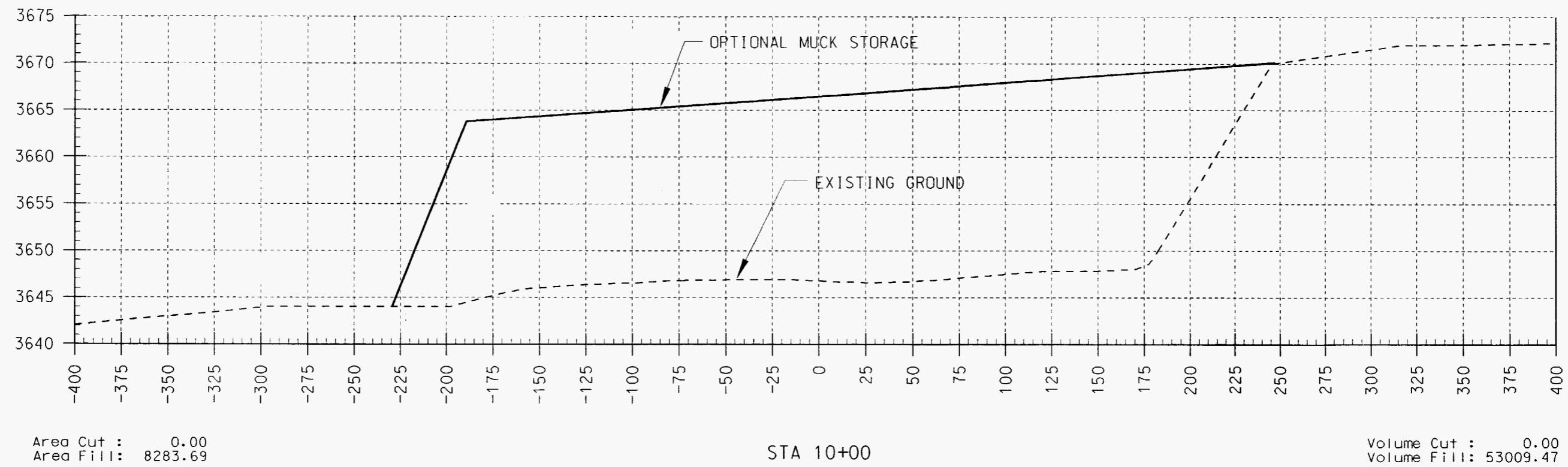


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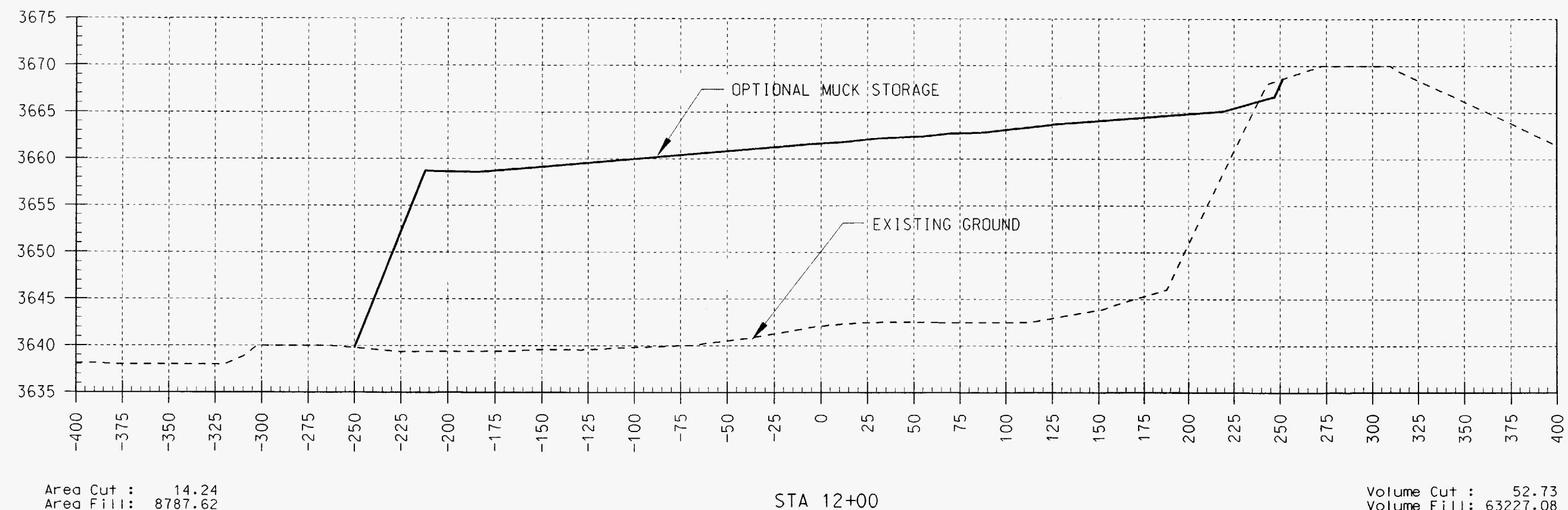


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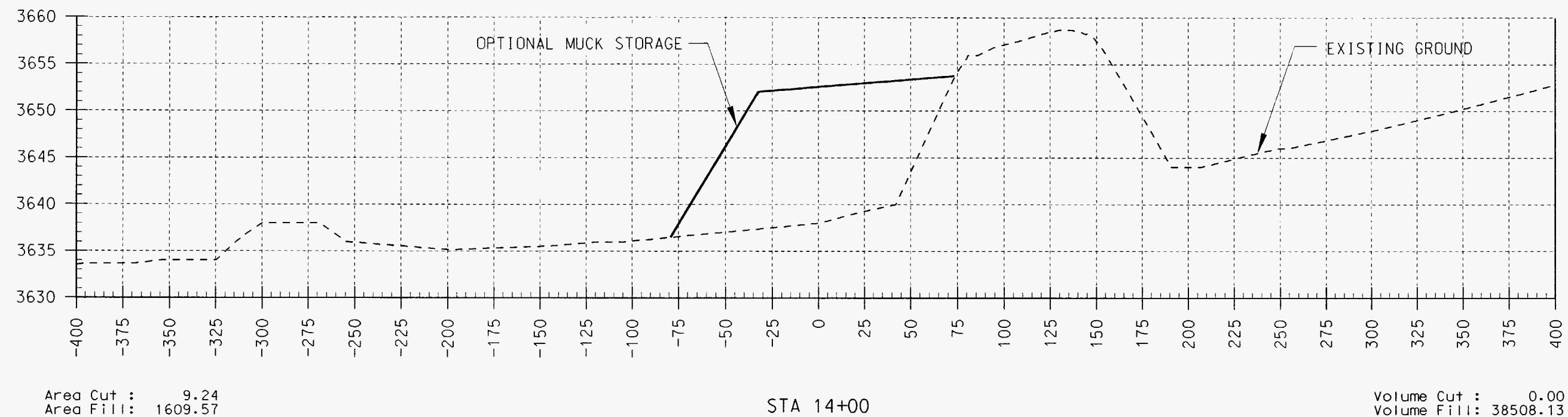


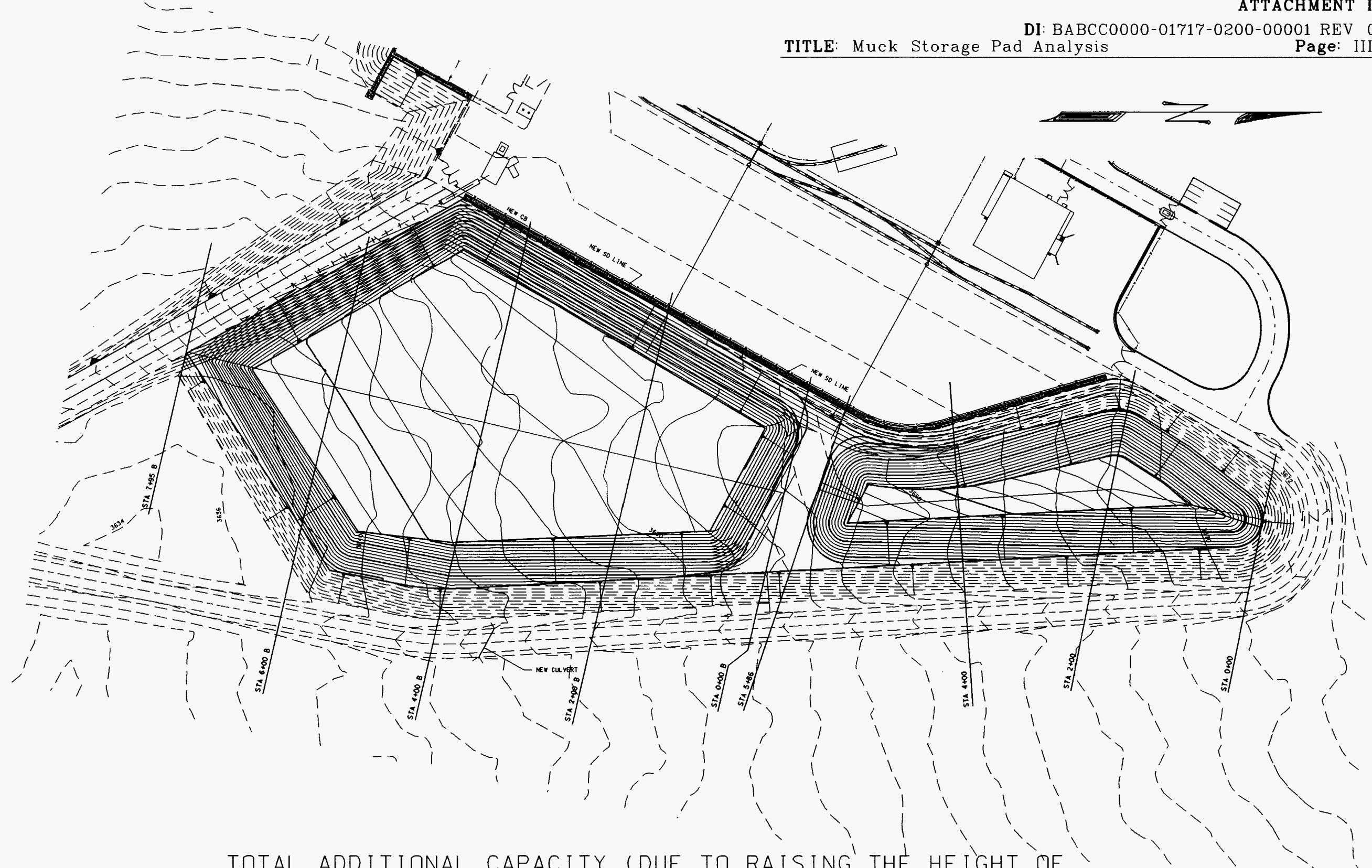
ATTACHMENT II

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TOTAL ADDITIONAL CAPACITY (DUE TO RAISING THE HEIGHT OF
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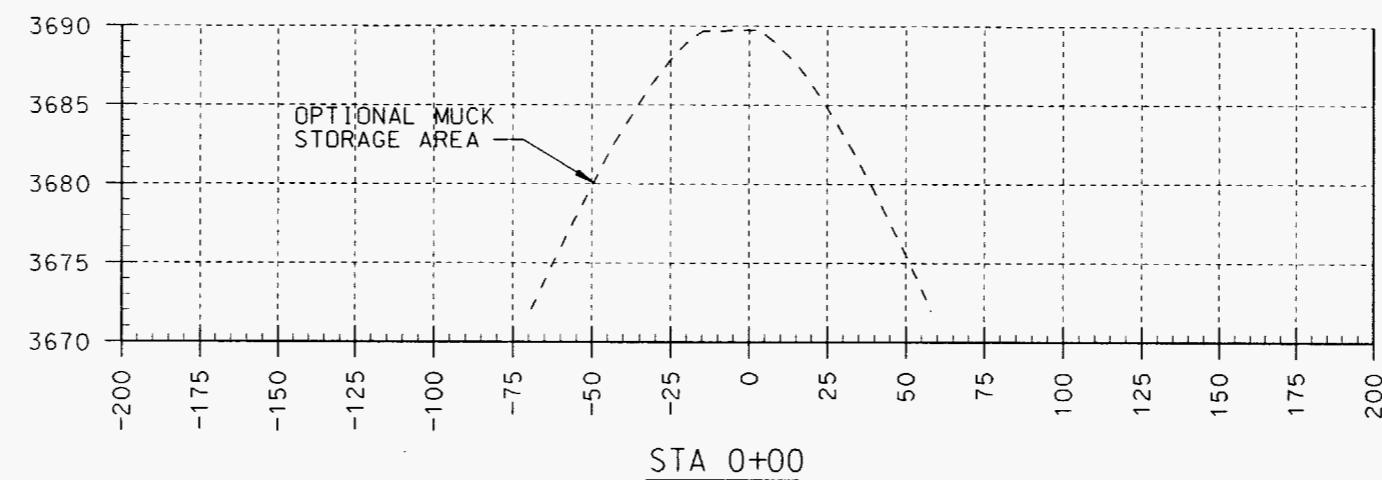
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ATTACHMENT III

DI: BABCC0000-01717-0200-00001 REV 02

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Page: III-2



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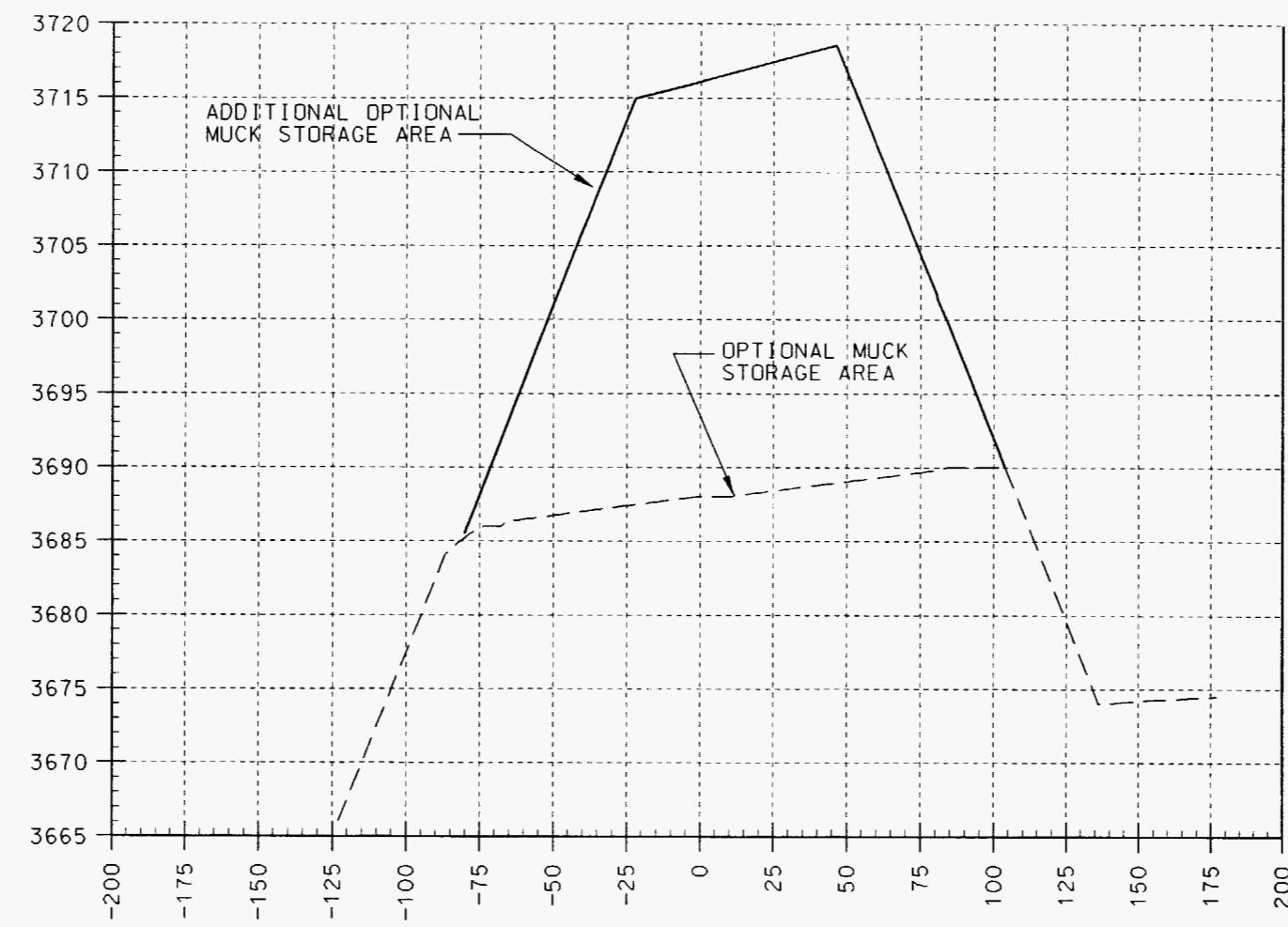
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ATTACHMENT III

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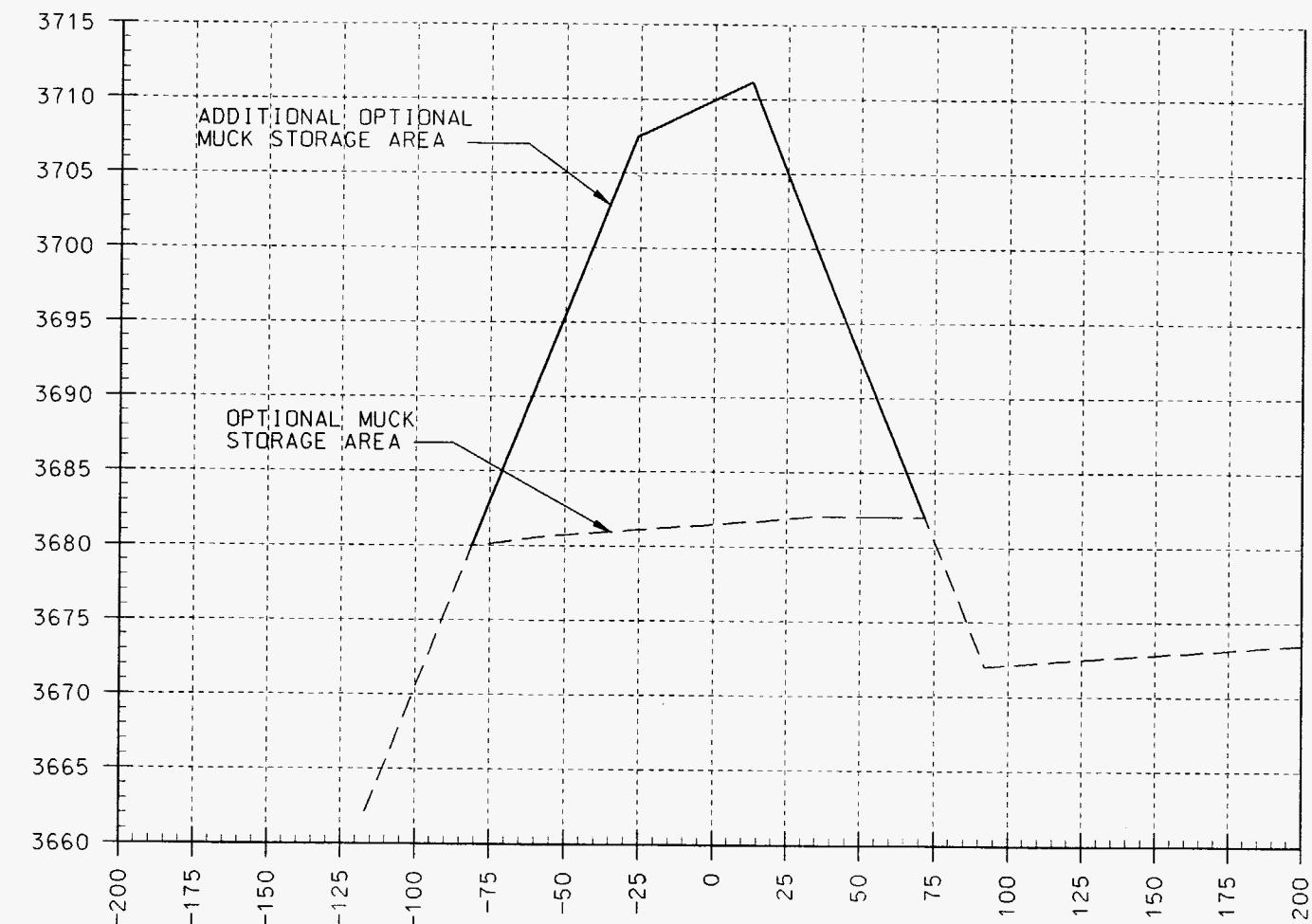
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ATTACHMENT III

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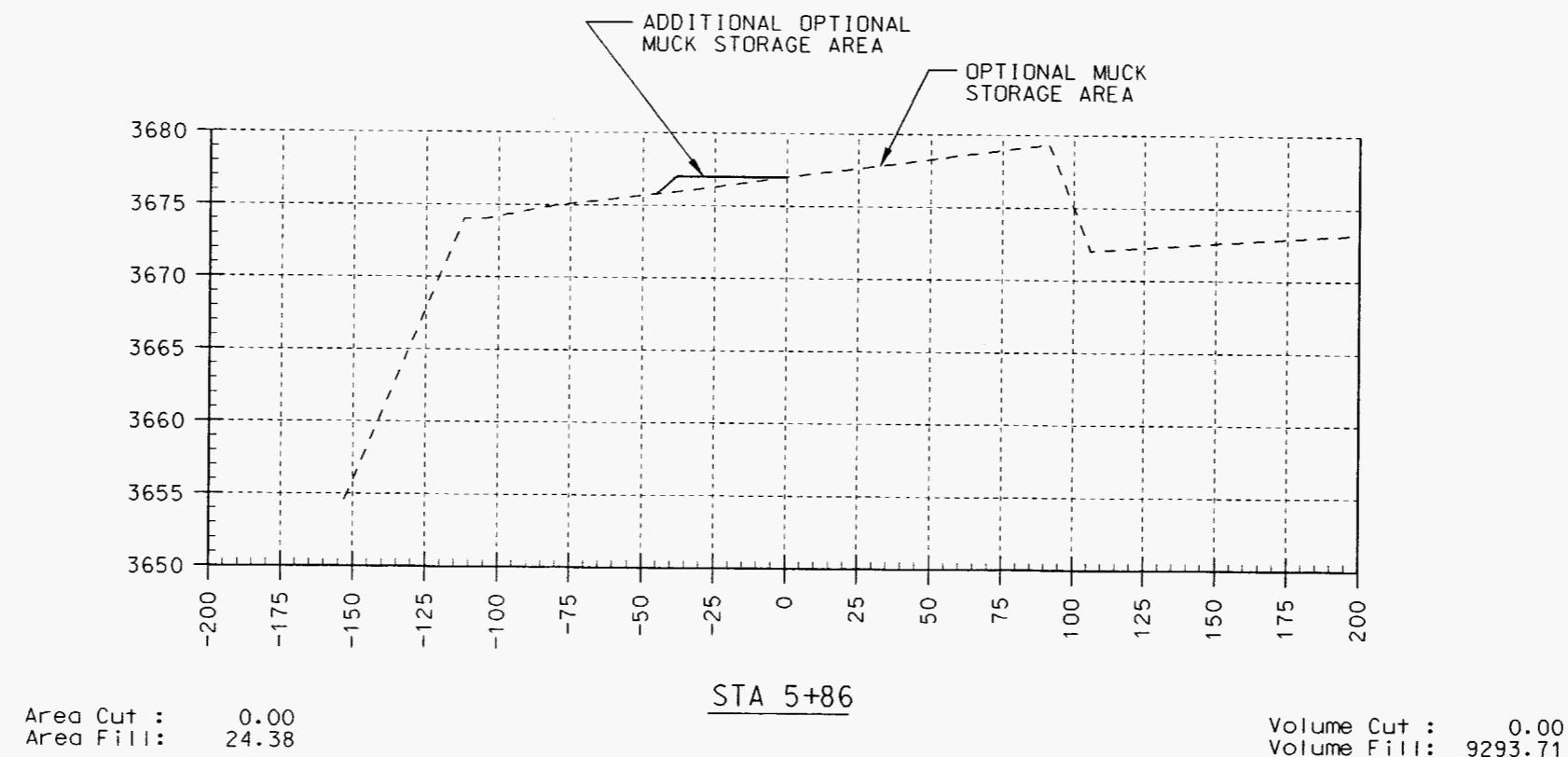
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ATTACHMENT III

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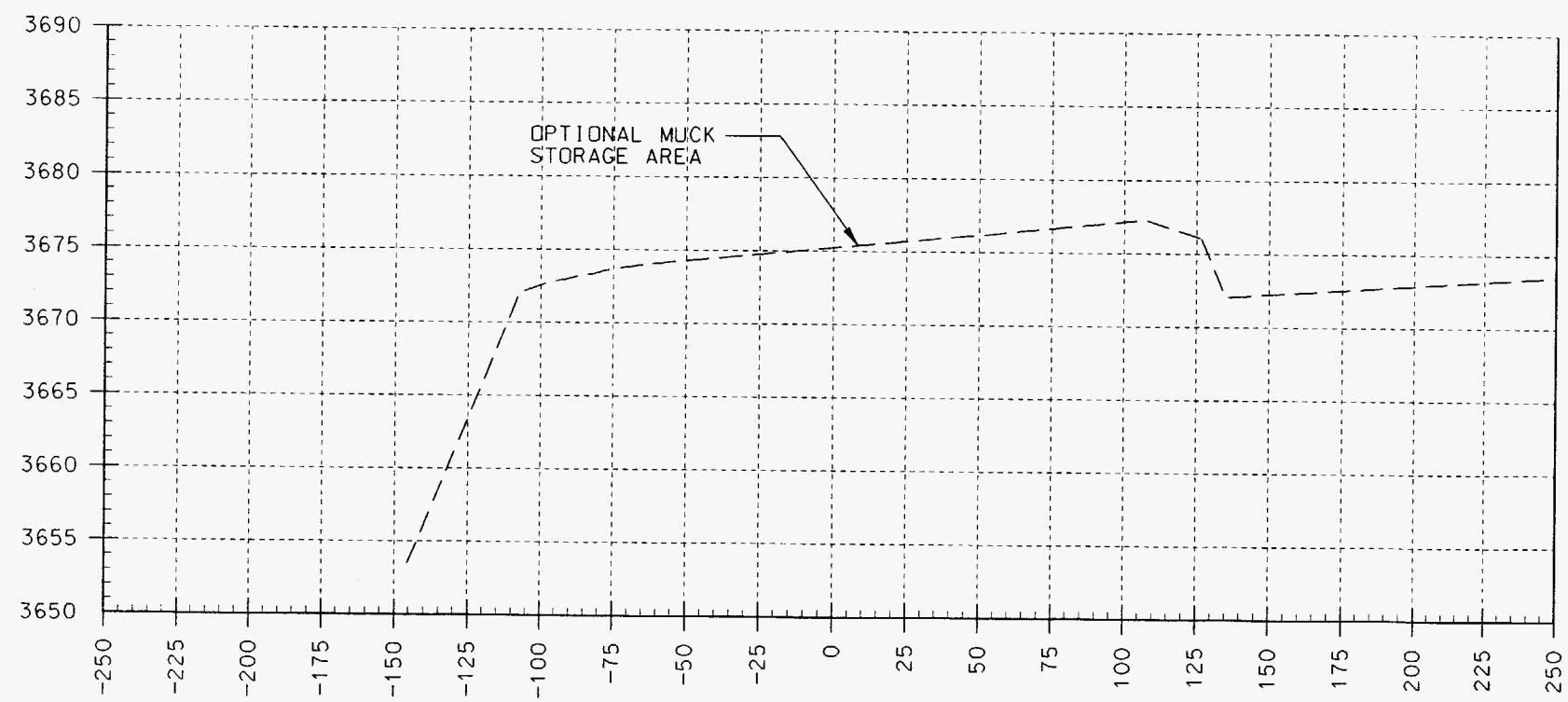


ATTACHMENT III

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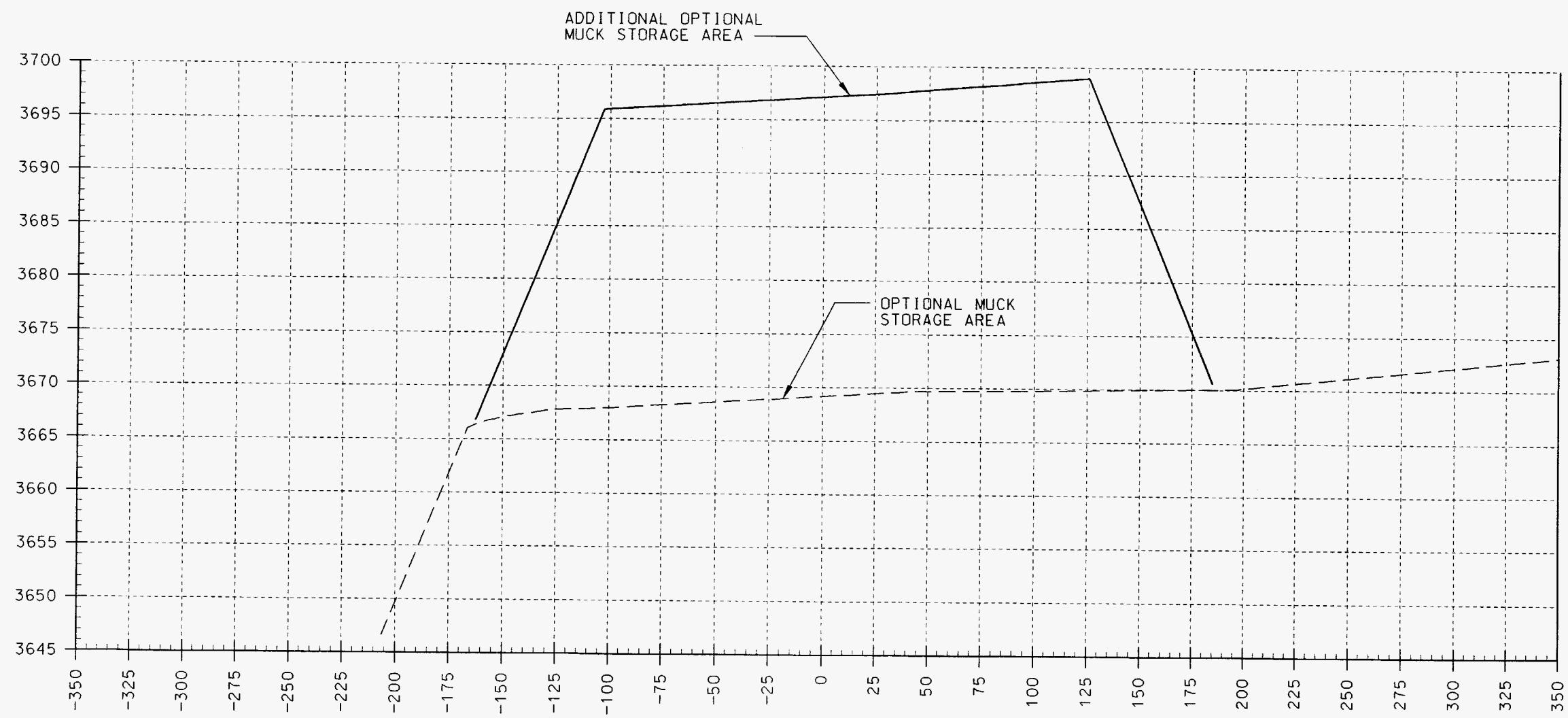
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Volume Fill: 0.00

ATTACHMENT III

DI: BABCC0000-01717-0200-00001 REV 02

TITLE: Muck Storage Pad Analysis

Page: III-7



Area Cut : 0.00
Area Fill: 8147.21

STA 2+00 B

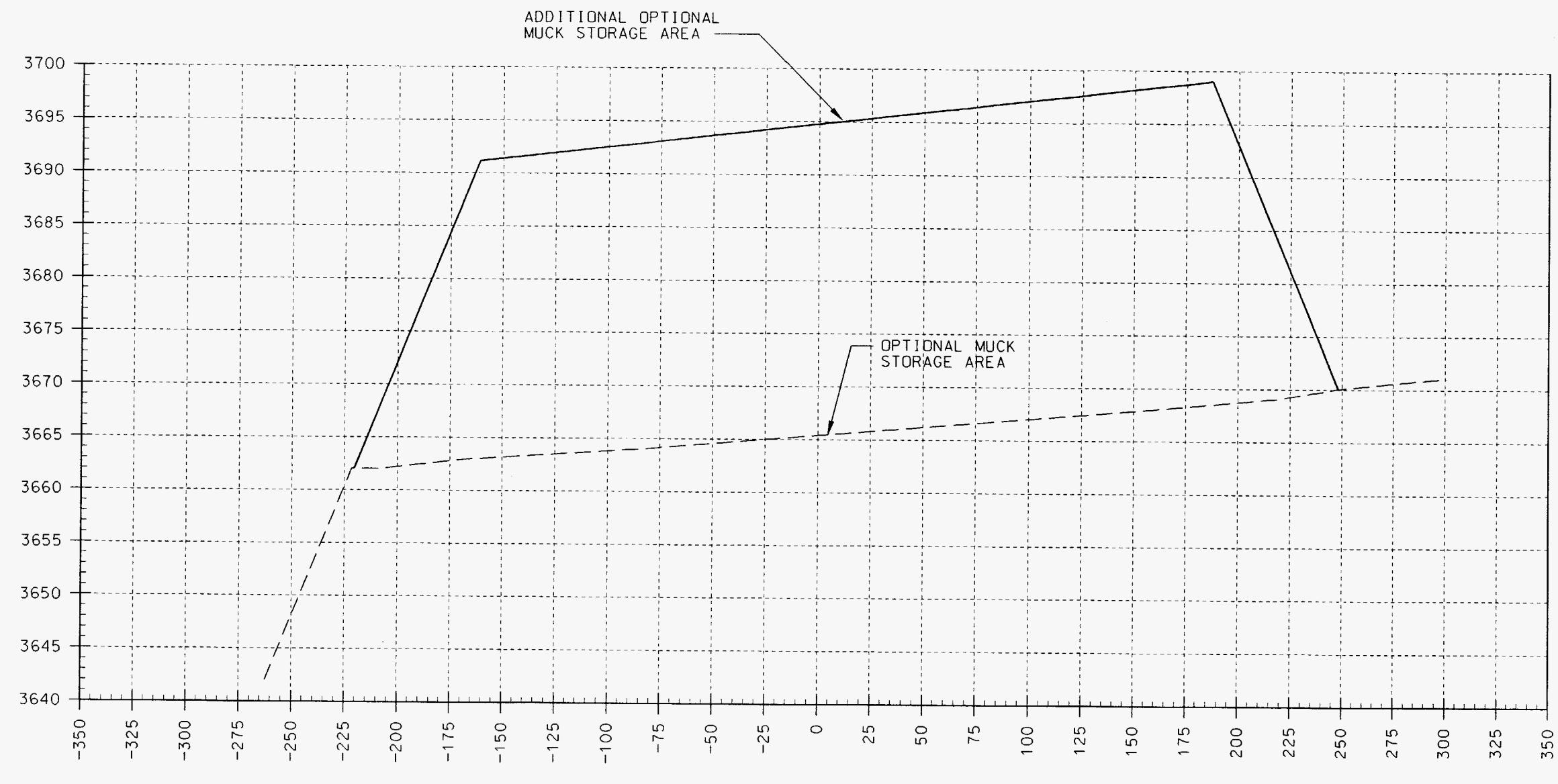
Volume Cut : 0.00
Volume Fill: 32160.27

ATTACHMENT III

DI: BABCC0000-01717-0200-00001 REV 02

TITLE: Muck Storage Pad Analysis

Page: III-8

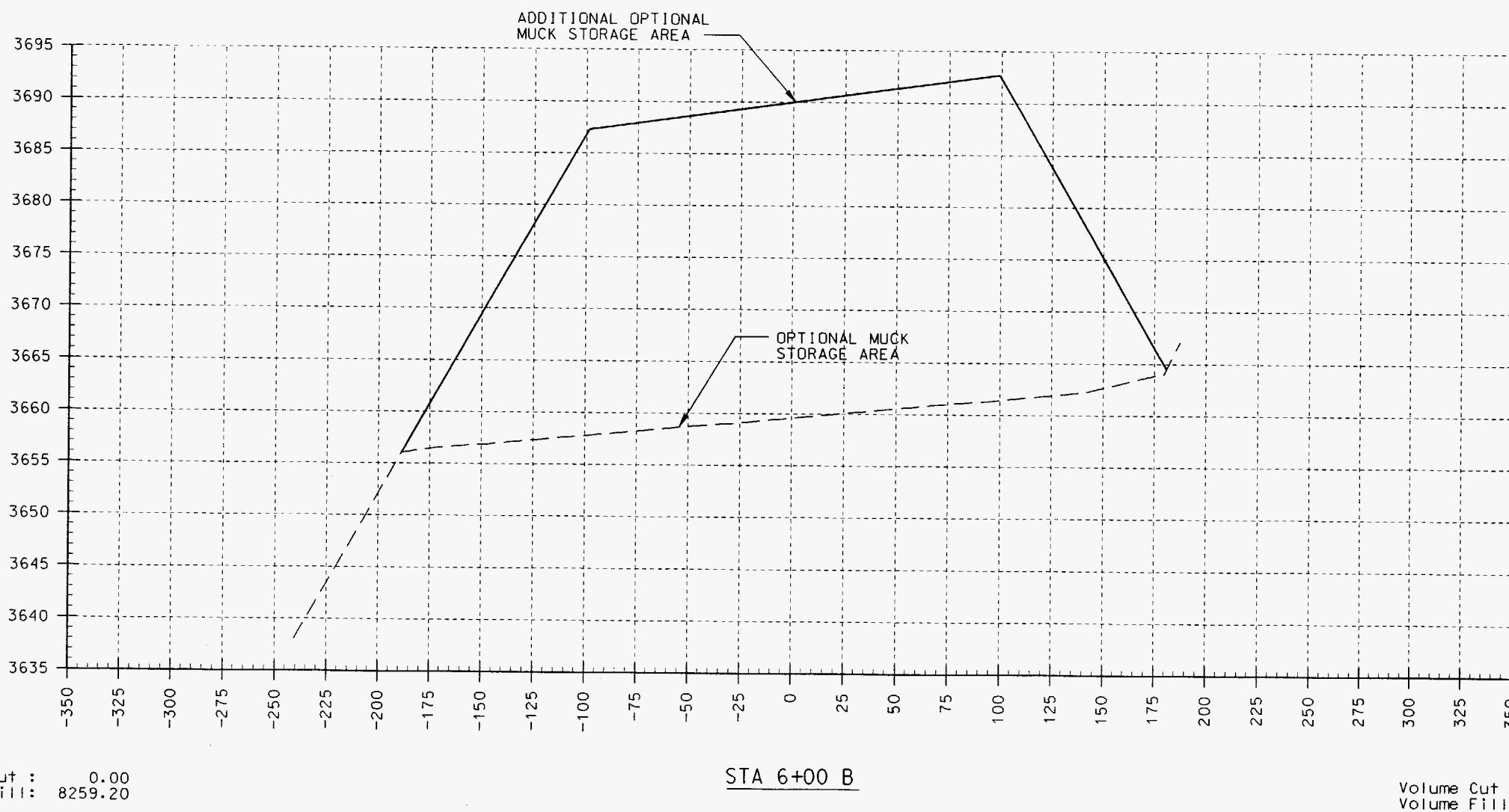


ATTACHMENT III

DI: BABCC0000-01717-0200-00001 REV 02

TITLE: Muck Storage Pad Analysis

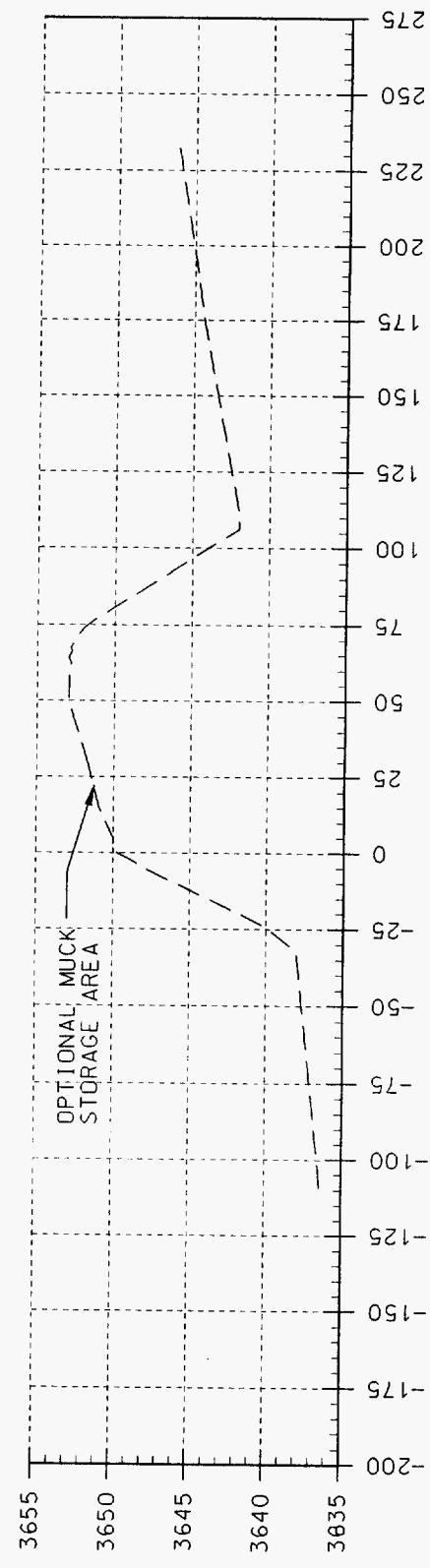
Page: III-9



ATTACHMENT III

DI: BABCC00000-01717-0200-00001 REV 02
Page: III-10

TITLE: Muck Storage Pad Analysis



Area Cut : 0.00
Area Fill : 0.00

Volume Cut : 0.00
Volume Fill : 27403.69

STA 7+95 B
SCALE:

TOTAL VOLUME = 254,583