



# **Foreshore Protection Works**

## **Bermuda Aquarium Museum and Zoo**

Bermuda

### **Annex D Drawings**

Date: February 6, 2017

Project No. 60-04-75



## MINISTRY OF PUBLIC WORKS

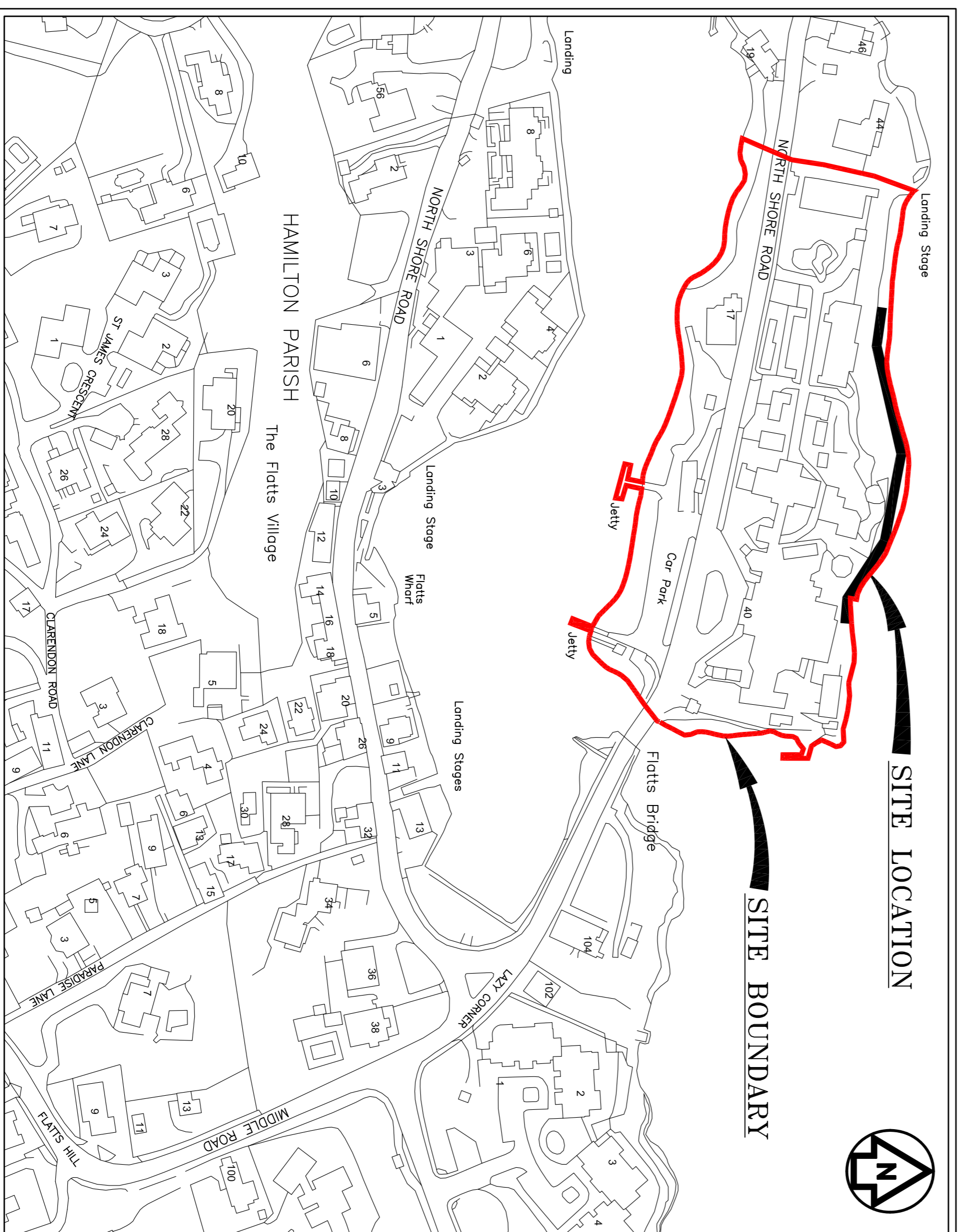
# BERMUDA AQUARIUM, MUSEUM AND ZOO

## FORESHORE REMEDIAL WORKS ALONG HARRINGTON SOUND

40 North Shore Road, Flatts Inlet, Hamilton Parish

### DRAWING LIST

S0	COVER
5135/004/05	TOPOGRAPHIC SURVEY
S01	SITE PLAN
S02	WORKS AREA 'A' & WORKS AREA 'B'
S03	WORKS AREA 'C' & CONSTRUCTION NOTES



KEY MAP

ISSUED FOR: TENDER 12/03/15

AMENDMENTS:	NO	REVISION	BY	APPL DATE

SCALE: .

SURVEY  
PREPARED BY: SM/SP/CD DATE: 09/01/15

DESIGN  
PREPARED BY: T. HARMER DATE: 21/01/15  
CHECKED BY: C. TROTT DATE: 22/01/15

DRAWING  
PREPARED BY: T. HARMER DATE: 21/01/15  
CHECKED BY: C. TROTT DATE: 22/01/15

APPROVED BY: R. CROSSLEY DATE: 23/01/15  
PROJECT NUMBER:

PROJECT NAME:  
**BAMZ FORESHORE  
REHABILITATION**

40 North Shore Road  
Flatts Inlet  
Hamilton Parish

SHEET TITLE:  
**COVER**

SHEET NUMBER: S0 REVISION

THE MINISTRY OF  
PUBLIC WORKS

P.O. Box HM525 Hamilton, HM CX, Bermuda  
Phone: (441)295-5151

DEPARTMENT OF  
WORKS & ENGINEERING  
Fax: (441)294-9087

*Structures Section*

NOTE:  
- NO LIVING VEGETATION WILL BE DISTURBED DURING THE WORK.  
- ALL CONCRETE TO BE POURED FROM SHORE.  
- ALL REQUIRED FORMWORK TO HAVE MINIMAL IMPACT ON SURROUNDING ENVIRONMENT.

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AMENDMENTS:

NO	REVISION	BY	APPL DATE


SCALE: .

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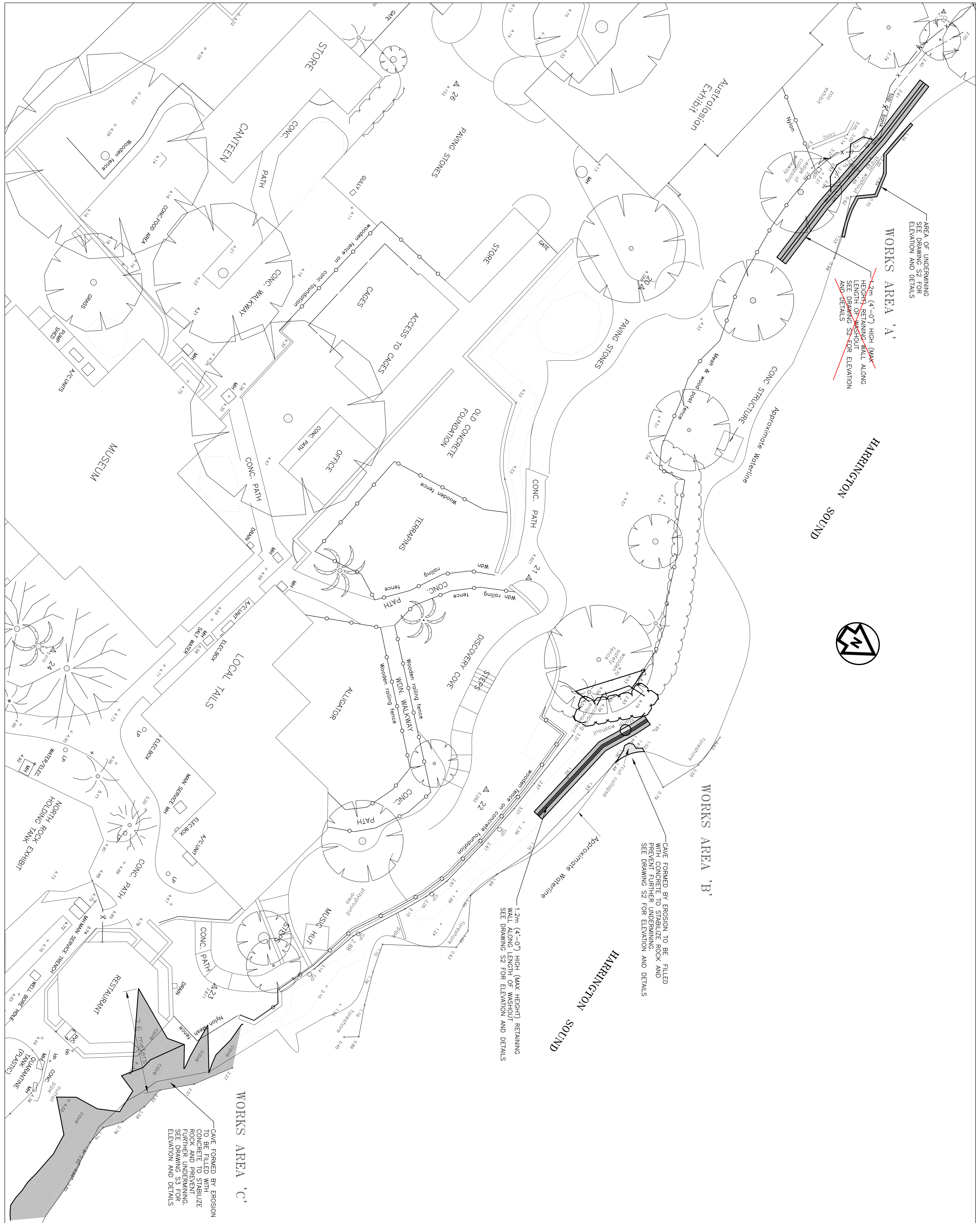
PROJECT NUMBER:  
PROJECT NAME:  
**BAMZ FORESHORE  
REHABILITATION**

40 North Shore Road  
Platt's Inlet  
Hamilton Parish

SHEET TITLE:  
**SITE PLAN**

SHEET NUMBER: S1

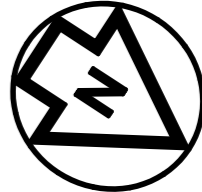
REVISION



WORKS AREA 'A'  
1.2m (4'-0") HIGH (MAX) HEIGHT RETAINING WALL ALONG LENGTH OF WASHOUT  
SEE DRAWING S2 FOR ELEVATION AND DETAILS

WORKS AREA 'B'  
CAVE FORMED BY EROSION TO BE FILLED WITH CONCRETE TO STABILIZE ROCK AND PREVENT FURTHER UNDERMINING.  
SEE DRAWING S2 FOR ELEVATION AND DETAILS

WORKS AREA 'C'  
CAVE FORMED BY EROSION TO BE FILLED WITH CONCRETE TO STABILIZE ROCK AND PREVENT FURTHER UNDERMINING.  
SEE DRAWING S3 FOR ELEVATION AND DETAILS



ISSUED FOR: TENDER 12/03/15

AMENDMENTS:

NO	REVISION	BY	APP'D	DATE

SCALE: 1:50

SURVEY PREPARED BY: DATE: 09/01/15

DESIGN PREPARED BY: DATE: 21/01/15

CHECKED BY: DATE: 22/01/15

DRAWING PREPARED BY: DATE: 21/01/15

T. HARMER DATE: 22/01/15

CHECKED BY: DATE: 22/01/15

C. TROTT

APPROVED BY: DATE: 23/01/15

R. CROSSLEY

PROJECT NUMBER:

PROJECT NAME:  
**BAMZ FORESHORE  
REHABILITATION**

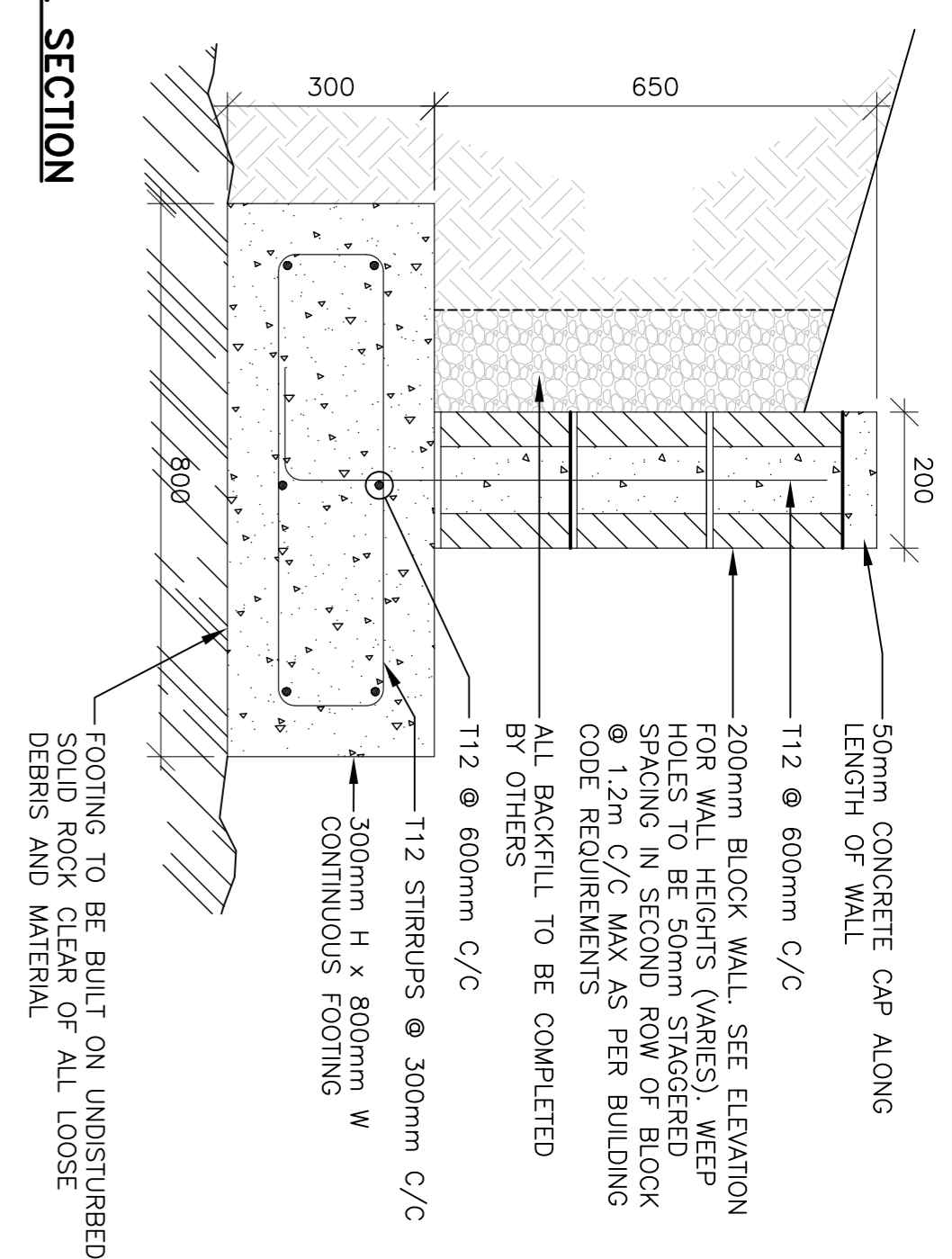
40 North Shore Road  
Platt's Inlet  
Hamilton Parish

SHEET TITLE:  
**WORKS AREA 'A,' &  
WORKS AREA 'B,'**

SHEET NUMBER: S2

NOTE:  
RETAINING WALL TO BE BUILT ACCORDING TO BEHND REQUIREMENTS.  
ALL REINFORCING TO HAVE A MINIMUM 75 (3") CONCRETE COVER.

1 RETAINING WALL SECTION



50mm CONCRETE CAP ALONG LENGTH OF WALL

T12 @ 600mm C/C

200mm BLOCK WALL. SEE ELEVATION FOR WALL HEIGHTS (VARIES). KEEP HOLES TO BE 50mm STAGGERED @ 1.2m C/C MAX AS PER BUILDING CODE REQUIREMENTS

ALL BACKFILL TO BE COMPLETED BY OTHERS

T12 @ 600mm C/C

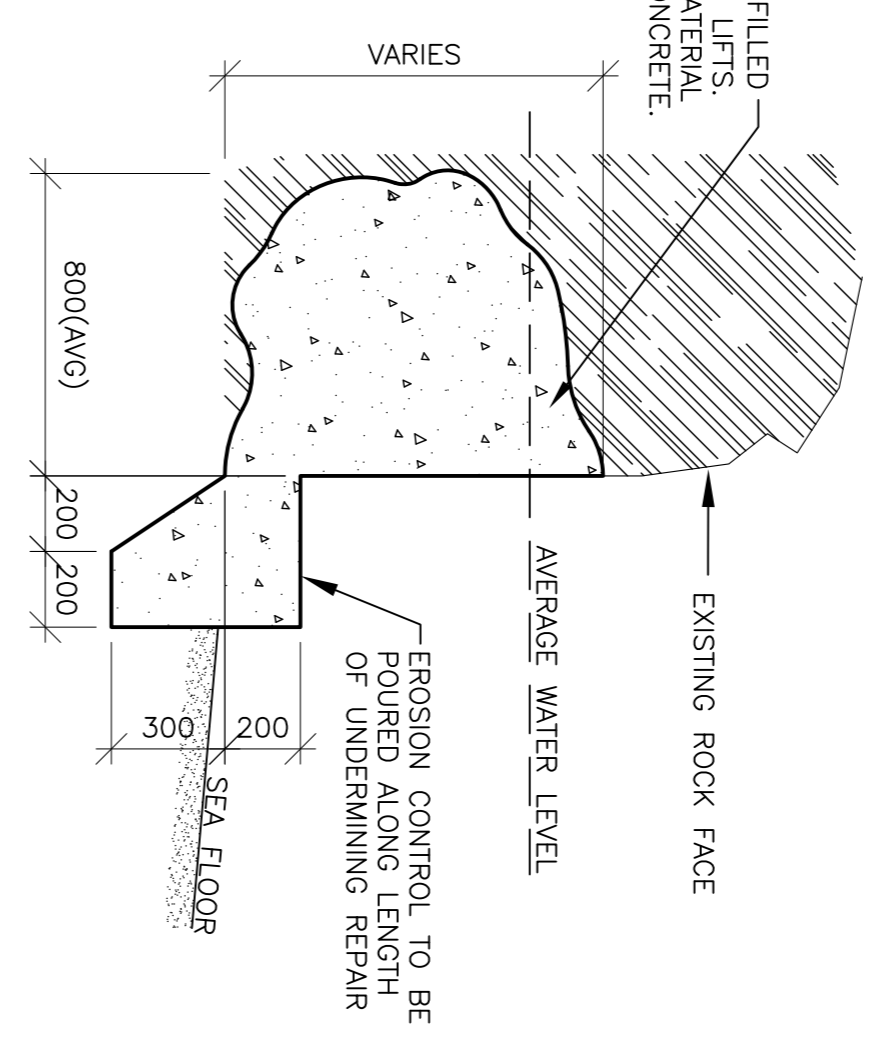
T12 STIRRUPS @ 300mm C/C

300mm H x 800mm W CONTINUOUS FOOTING

FOOTING TO BE BUILT ON UNDISTURBED SOLID ROCK CLEAR OF ALL LOOSE DEBRIS AND MATERIAL

AREA OF ERODED MATERIAL TO BE FILLED WITH CONCRETE IN 600mm (2'-0") LIFTS. AREA TO BE CLEARED OF LOOSE MATERIAL AND DEBRIS PRIOR TO POURING CONCRETE.

2 UNDERMINING REPAIR DETAIL (SMALL)



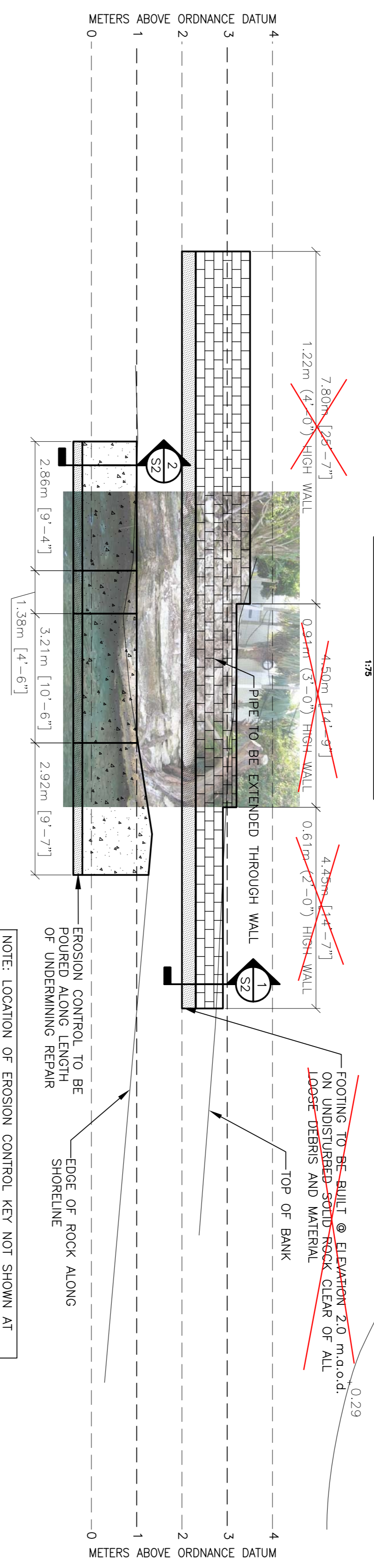
EXISTING ROCK FACE

AVERAGE WATER LEVEL

EROSION CONTROL TO BE POURED ALONG LENGTH OF UNDERMINING REPAIR

SEA FLOOR

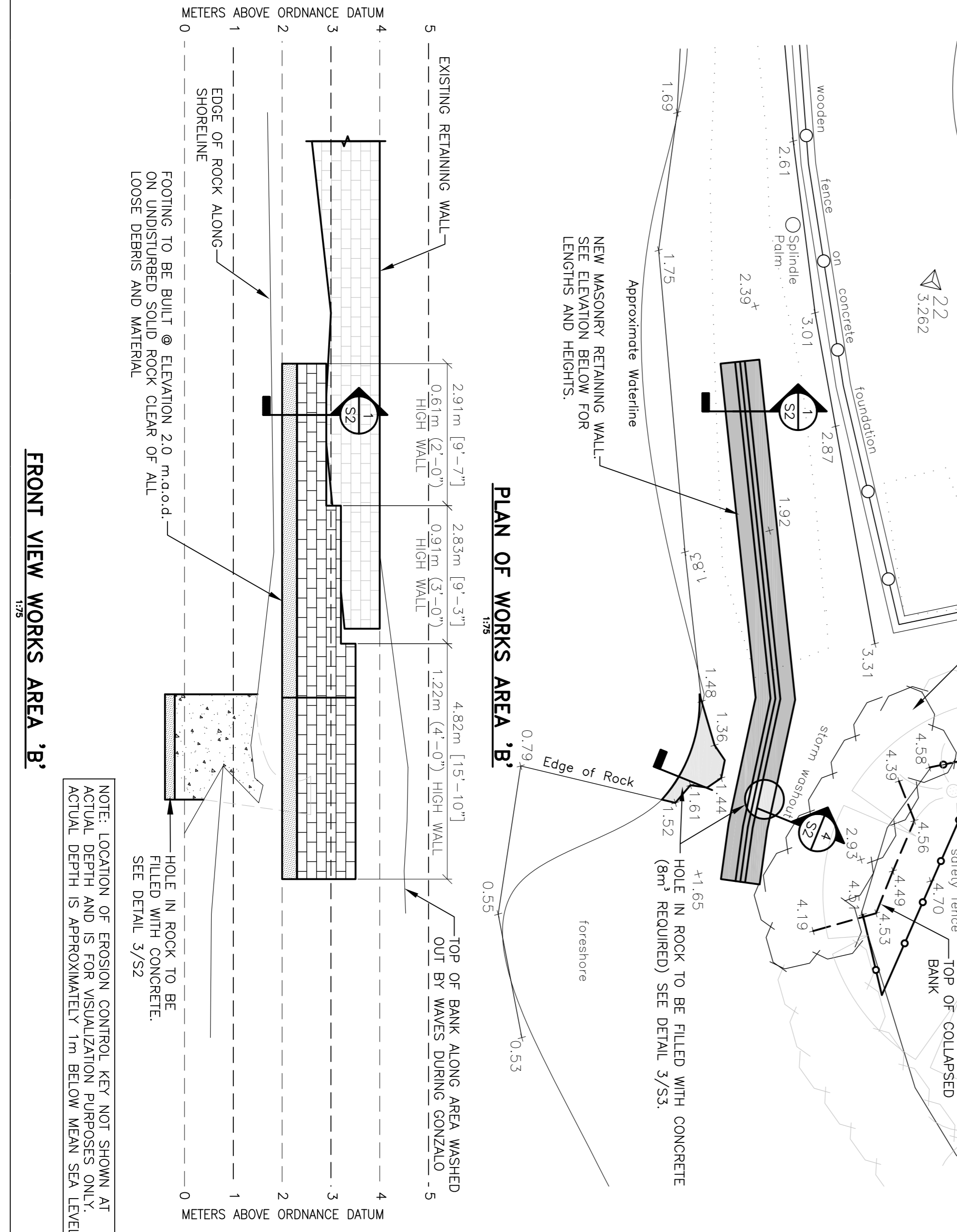
PLAN OF WORKS AREA 'A'



NOTE: LOCATION OF EROSION CONTROL KEY NOT SHOWN AT ACTUAL DEPTH AND IS FOR VISUALIZATION PURPOSES ONLY. ACTUAL DEPTH IS APPROXIMATELY 1m BELOW MEAN SEA LEVEL.

FRONT VIEW WORKS AREA 'A'

DEAD PITSPORUM HEDGE DESTROYED BY GONZALO TO BE REMOVED BY CONSERVATION SERVICES. EXISTING LIVING BUTTON WOODS TO REMAIN UNDISTURBED.



NOTE: LOCATION OF EROSION CONTROL KEY NOT SHOWN AT ACTUAL DEPTH AND IS FOR VISUALIZATION PURPOSES ONLY. ACTUAL DEPTH IS APPROXIMATELY 1m BELOW MEAN SEA LEVEL.

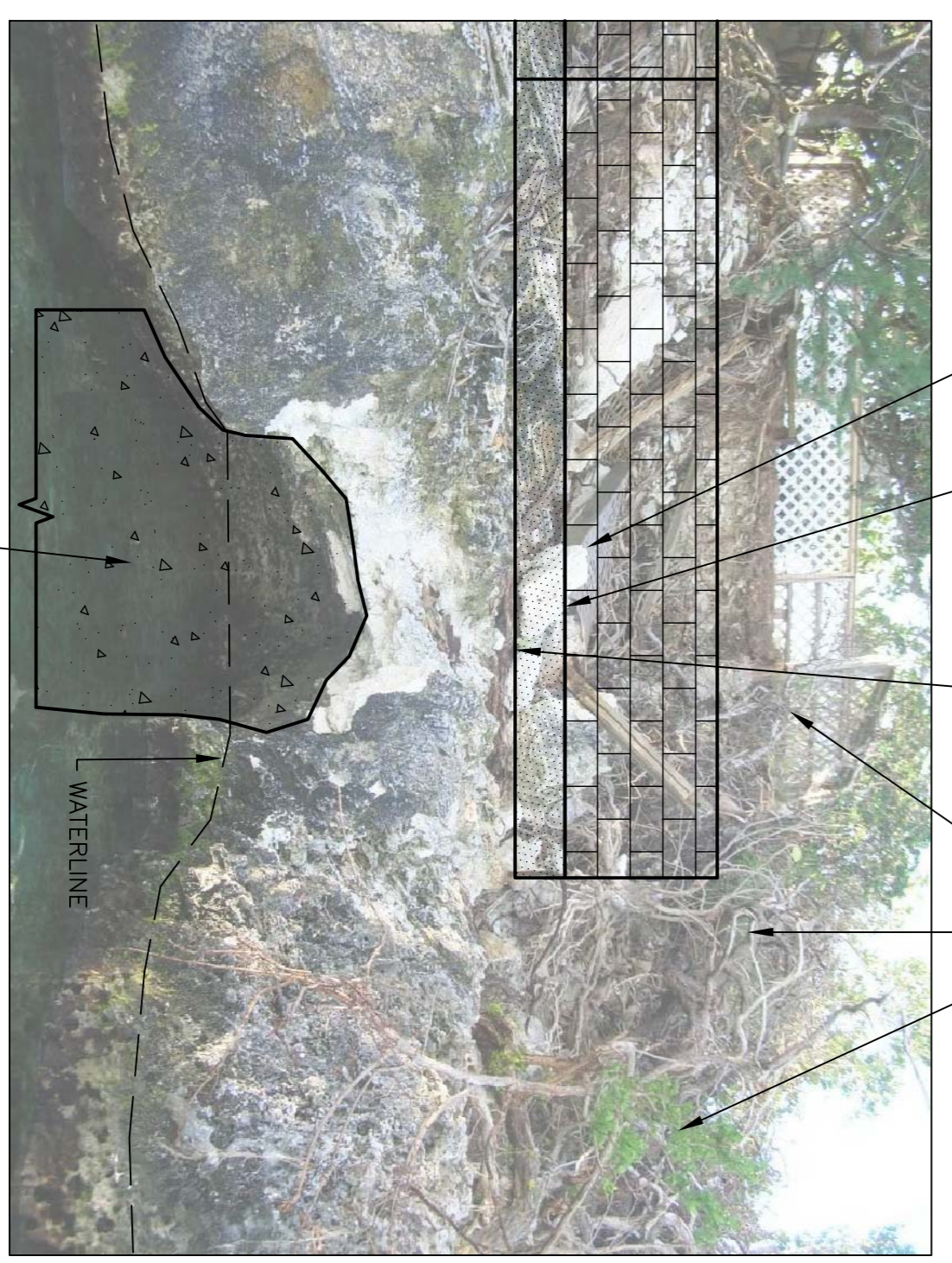
FRONT VIEW WORKS AREA 'B'

HOLE IN ROCK CREATED BY WAVE PRESSURE DURING GONZALO TO BE MASS FILLED WITH CONCRETE AND BURIED UNDER FILL BEHIND NEW RETAINING WALL.

DEBRIS TO BE REMOVED FOR LANDSCAPING

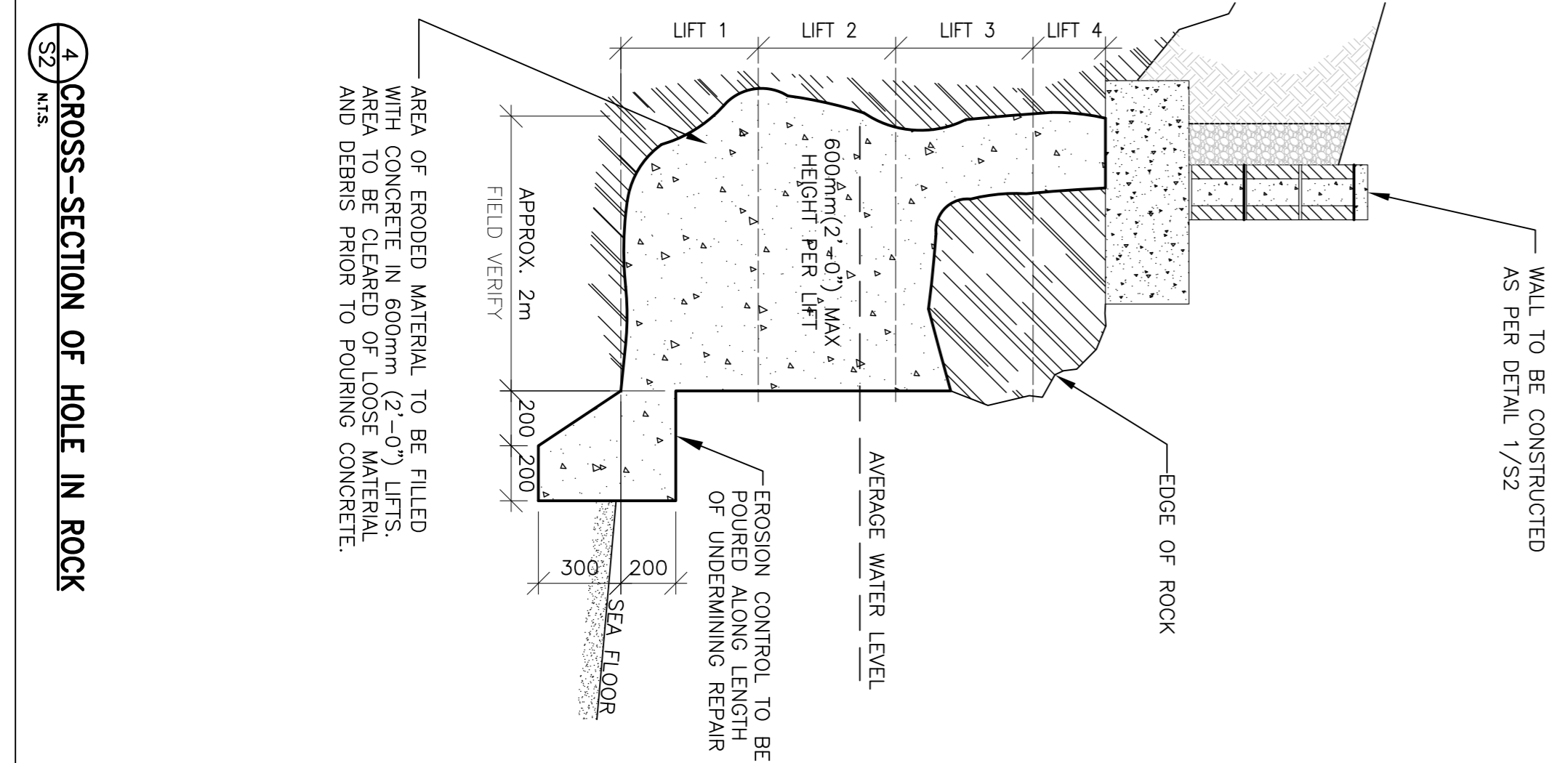
FOOTING TO BE BUILT @ ELEVATION 2.0 m.a.o.d. ON UNDISTURBED SOLID ROCK CLEAR OF ALL LOOSE DEBRIS AND MATERIAL

DEAD PITSPORUM HEDGE DESTROYED BY GONZALO TO BE REMOVED BY CONSERVATION SERVICES. EXISTING LIVING BUTTON WOODS TO REMAIN UNDISTURBED.



3 ELEVATION OF HOLE IN ROCK

4 CROSS-SECTION OF HOLE IN ROCK



ISSUED FOR: TENDER 12/03/15

AMENDMENTS:	NO	REVISION	BY	APPL DATE

SCALE: 1:1

SURVEY PREPARED BY: DATE: 09/01/15

DESIGN CHECKED BY: DATE: 22/01/15

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WORKS AREA 'C'

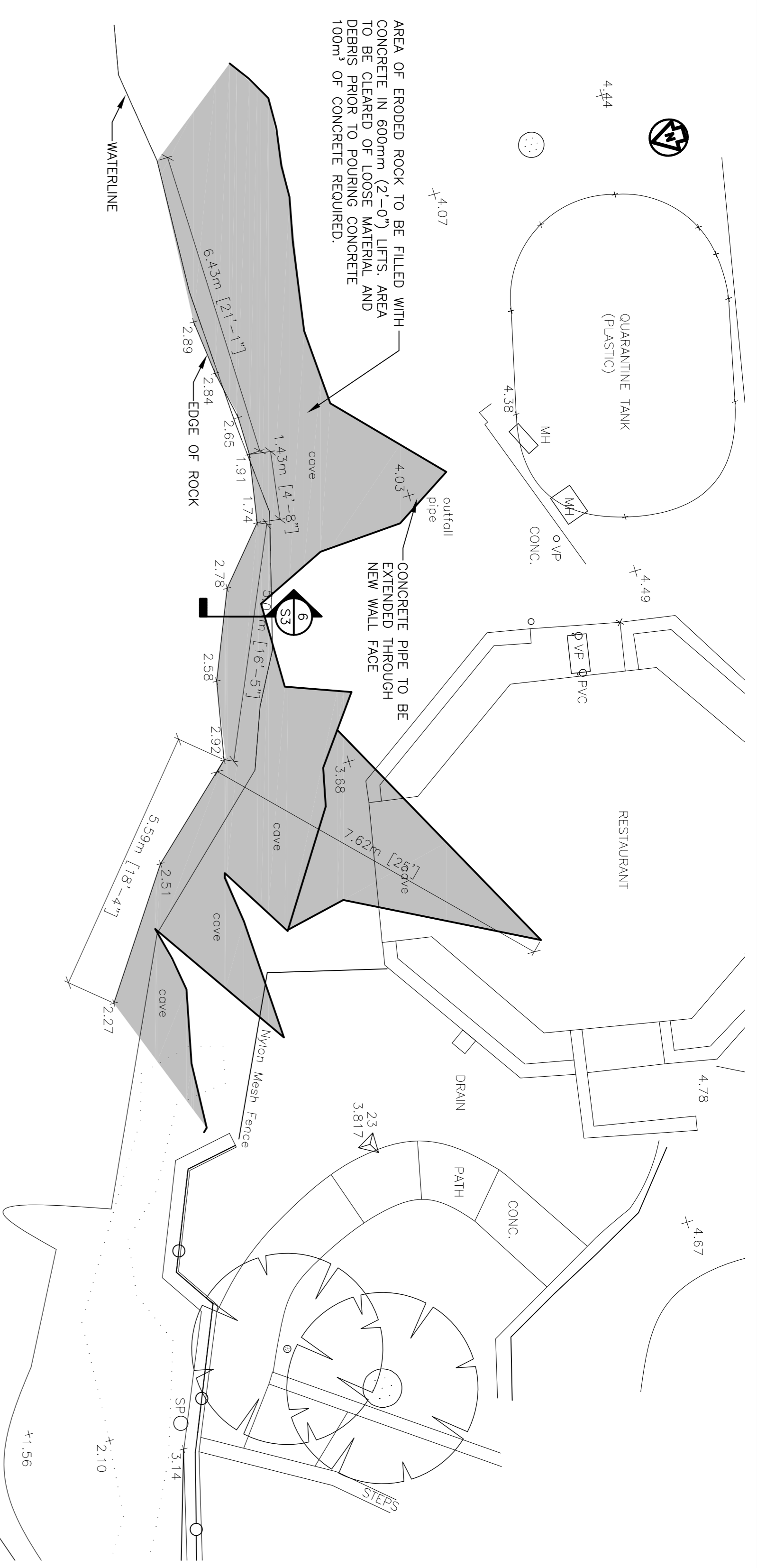
SHEET NUMBER: S3 REVISION

**NOTES**

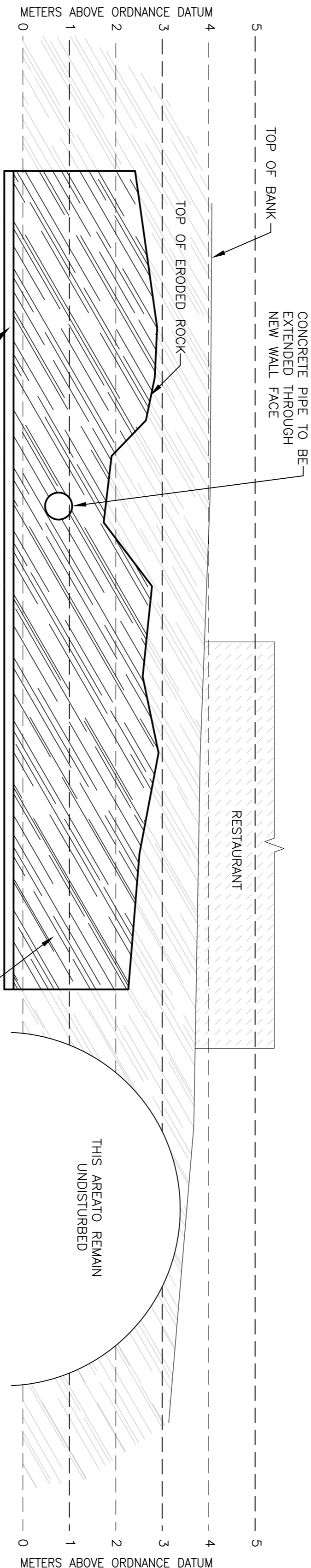
- 1.0 **GENERAL**
- 1.1 THESE NOTES APPLY TO STRUCTURAL DRAWINGS SO-53.
- 1.2 ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE AND ELEVATIONS ARE IN METERS ABOVE ORDNANCE DATUM.
- 1.3 ALL WORK IS TO BE DONE IN ACCORDANCE WITH THE MINISTRY OF WORKS AND ENGINEERING STANDARD SPECIFICATION, DATED 1993.
- 1.4 ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATIONS FOR THIS PACKAGE. WHERE A DISCREPANCY EXISTS BETWEEN THE DRAWINGS AND SPECIFICATIONS IT SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION.
- 1.5 DO NOT SCALE THE DRAWINGS. DIMENSIONS ARE TO BE USED AS A GUIDE ONLY. CONTRACTOR TO FIELD MEASURE FOR ALL DIMENSIONAL REQUIREMENTS.
- 1.6 ALL DETAILS AND ARRANGEMENTS OF EXISTING CONDITIONS, DIMENSIONS, ETC. TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION.
- 1.7 CONTRACTOR TO MAKE GOOD ANY DAMAGES CAUSED ON SITE, REGARDING TO MATCH EXISTING OR AS APPROVED BY THE MINISTRY OF WORKS AND ENGINEERING.
- 2.0 **SCOPE OF WORK**
- 2.1 UNLESS NOTED OTHERWISE THE CONTRACTOR SHALL SUPPLY ALL THE NECESSARY MATERIALS TO COMPLETE THE WORK.
- 2.2 THE WORK INVOLVES:
  - CONSTRUCTION OF EROSION PROTECTION,
  - CONSTRUCTION OF A RETAINING WALL,
  - PLACEMENT OF MASS CONCRETE IN CAVE/FORESHORE AREAS OF ROCK COLLAPSE.
- 3.0 **EXCAVATION AND BATHWORK**
- 3.1 ALL EXCAVATION AND BATHWORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATIONS FOR THIS PACKAGE.
- 5.0 **CONCRETE**
- 5.1 ALL CONCRETE IS TO BE IN ACCORDANCE WITH THE SPECIFICATION.
- 5.2 CONCRETE MIX DESIGNS TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
- 5.3 CONCRETE MIXES TO BE DESIGNED ACCORDING TO TABLE C.2, SECTION 03300, PART 3.2 OF THE SPECIFICATION WHERE APPLICABLE.
- 5.4 CONCRETE STRENGTHS AND SLUMPS TO BE AS FOLLOWS:
 

LOCATION	MIN. SPECIFIED 28 DAY STRENGTH	SLUMP
ALL REINFORCED CONCRETE	40 MPa	75mm ± 35mm
CONCRETE FILL	15 MPa	75mm ± 35mm
- 5.5 CONCRETE COVER ON REINFORCING STEEL TO BE AS FOLLOWS:
 

LOCATION	CLEAR COVER
RETAINING WALL	75 mm
- 5.6 REINFORCING CHAIRS TO BE PLASTIC, OR CONCRETE.
- 5.7 NO ADDITIVES TO BE USED WITHOUT THE PRIOR APPROVAL OF THE ENGINEER. NO WATER SHALL BE ADDED TO THE MIX ON SITE WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.
- 5.8 THE CONTRACTOR SHALL GIVE A MINIMUM OF 24 HOURS NOTICE TO THE ENGINEER PRIOR TO POURING ANY CONCRETE.
- 5.9 THE MIX DESIGN FOR FORMED CONCRETE SHALL BE AS SPECIFIED BY EXPRESSOFC LIGHTWEIGHT FORMED CONCRETE FOR A DRY DENSITY OF 1200 kg/m<sup>3</sup>. ALL UNLIFTED CONCRETE TO BE COMPLETED WITH AN M/M ENGINEER ON SITE. ON-SITE TRIALS FOR EACH BATCH WILL BE REQUIRED AND APPROVED BY M/M ENGINEER PRIOR TO FOCUSMENT.
- 6.0 **MASONRY**
- 6.1 MORTAR TO BE TYPE (i), SECTION 04100 PART 3.1 OF THE SPECIFICATION.
- 7.0 **REINFORCING STEEL**
- 7.1 REINFORCING STEEL SHALL CONFORM TO CAN/CSA G30.18-M92(R1999) GRADE 400 DEFORMED BILLET STEEL WITH A MINIMUM COMPRESSIVE STRENGTH OF 400 MPa (OR APPROVED EQUAL).
- 7.2 REINFORCING STEEL TO BE GALVANISED IN ACCORDANCE WITH PART 1.1, SECTION 03200 OF THE SPECIFICATION.



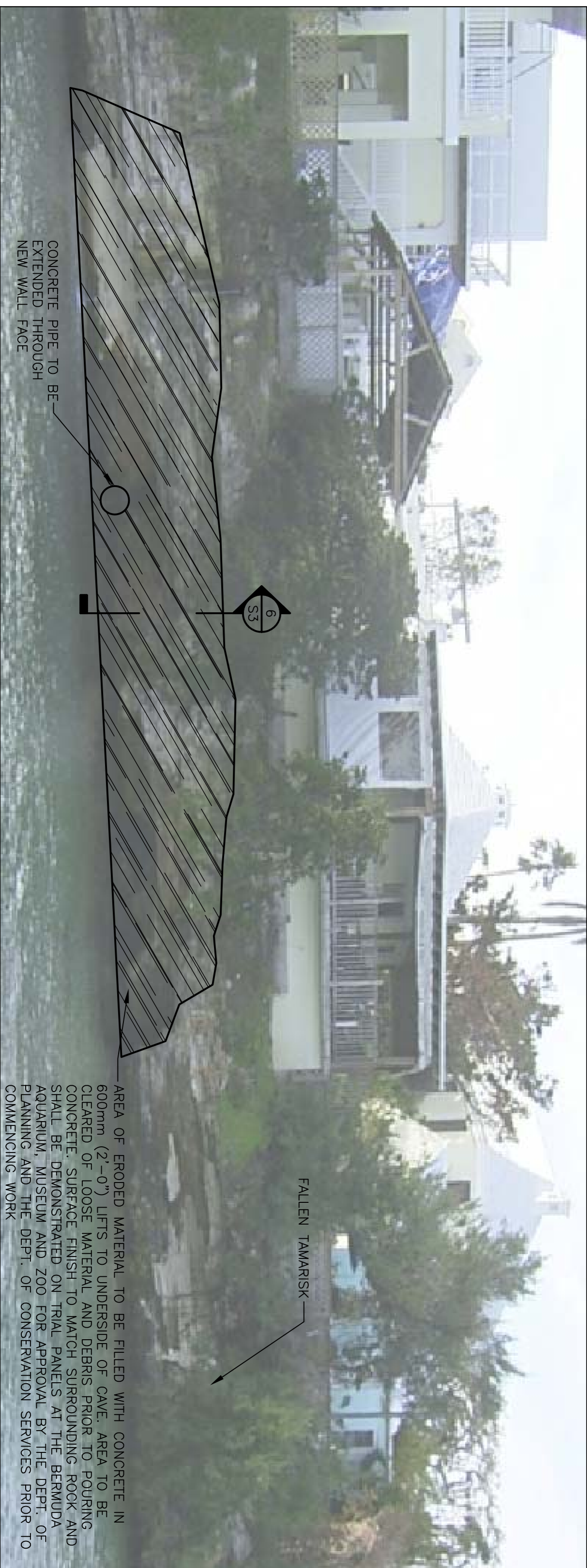
**PLAN OF WORKS AREA 'C'**



**FRONT VIEW WORKS AREA 'C'**

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**UNDERMINING REPAIR ELEVATION**

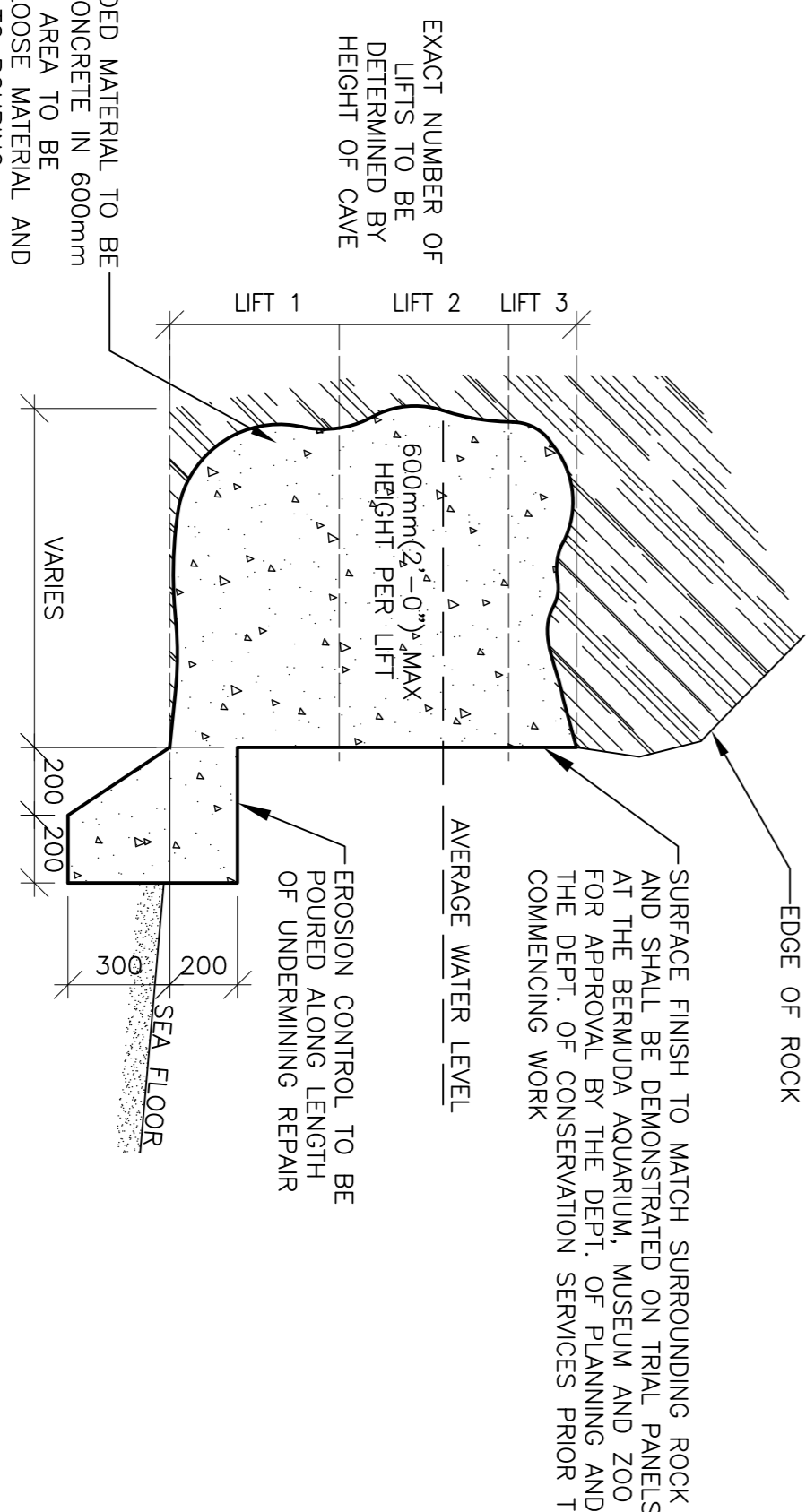
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- 7.2 REINFORCING STEEL TO BE GALVANISED IN ACCORDANCE WITH PART 1.1, SECTION 03200 OF THE SPECIFICATION.



NOTE: CONCRETE PLACED IN WORKS AREA 'C' TO BE FORMED CONCRETE WITH A DRY DENSITY OF 1200 kg/m<sup>3</sup>. MIX DESIGN, FOAMING AGENT AND MIXING MACHINE TO BE SUPPLIED BY M/W ENGINEERS. CONTRACTOR TO SUPPLY AIR COMPRESSOR.

**CROSS-SECTION OF CAVE**