別添 5:テクニカル・ノート(T/N)

JICA Survey Team
CTI Engineering International Co., Ltd.
Tachibana Annex Building
2-25-14 Kameido
Koto-ku, Tokyo 136-0071, Japan
Phone: +81-3-3638-2561
Fax: +81-3-3638-2560

TECHNICAL NOTES

ON

PREPARATORY SURVEY ON THE PROJECT

FOR THE DISASTER RESTORATION OF TEOUMA BRIDGE

IN REPUBLIC OF VANUATU

The Preparatory Survey Team (Team) commissioned to undertake the Outline Design, under Japan International Cooperation Agency (JICA) conducted field surveys and review of existing documents and held several discussions on the technical aspect with the implementing agency and other relevant agencies in relation to "The Project for the Disaster Restoration of Teouma Bridge in Republic of Vanuatu".

This note is signed between The Team and Ministry of Infrastructure and Public Utilities (MIPU) to share mutual understandings and agreement as mentioned in Appendix-1.

Port Vila, 22nd May, 2018

REPUBLIC OF VANUATU
MINISTRY OF INFRASTRUCTURE & PUBLIC UTILITIES
MINISTERE DE L'EQUIPEMENT ET DE L'AMENAGEMENT
REPUBLIQUE DE VANUATU

Mr. Sam Namuri
Acting Director General
Ministry of Infrastructure and Public Utilities (MIPU)

Mr. Yoshihisa NODA
Chief Consultant
JICA Preparatory Survey Team
CTI Engineering International Co., Ltd.

WITNESS:

REPUBLIC OF VANUATU
PUBLIC WORKS HEAD OFFICE
DIRECTOR
Travaux Publics
GOVERNMENT
REPUBLIQUE DE VANUATU

Mr. Gorge Junior
Acting Director
Public Works Department(PWD)
Ministry of Infrastructure and Public Utilities (MIPU)

Appendix -1

1. Project Background

Most of the residents of Efate island where the capital locates are living along the ring road. And the ring road is playing an important role of the inland transportation. Teouma bridge has been constructed on the Teouma river which is the biggest in the island. It is located at the entrance to the capital from an eastern part of island.

The bridge was completely destroyed by the earthquake whose magnitude was M7.2 and earthquake center was on the western ocean of the Efate island. To response to that, the bridge was reconstructed by the Japan's Grant Aid Program "THE PROJECT FOR REHABILITATION OF BRIDGES ON THE RING ROAD IN THE EFATE ISLAND IN THE REPUBLIC OF VANUATU" in 2003. However, the reconstructed Teouma bridge had been blocked for six days due to the damage of the approach road on right bank by Cyclone Pam in 2015. The damage was caused by the changing of river channel. The bridge is in the state of emergency restoration and at a risk being of destroyed and blocked by the flood now.

In this situation, JICA conducted the data collection survey for reconstruction of Teouma bridge to confirm the causes and measures of the bridge. 1. Stabilization of the river channel 2. Increase of the discharge capacity by extension of the bridge and 3. Overflow approach road have been proposed. And, the government of Vanuatu has requested the full-scale rehabilitation work for Teouma bridge to the government of Japan.

2. General Items

2.1 Interim Report

- MIPU has basically agreed regarding the contents of the Interim Report (IT/R) submitted by the Team on May 04, 2018.

2.2 Project Scope

Project Scope which was proposed in the interim report has been confirmed by MIPU as follows.

I. Bridge : Plate Girder Type, 2 spans, Road width 8m (Carriage way:3.0m × 2 + Shoulder:1.0m × 2)

II. Riverbank Protection: Reinforced Concrete Crib Type, 250m upstream, 110m downstream

III. Approach Road: Embankment approx. L=600m, Pipe Culvert ϕ 1.5 × 6nos or equivalent

2.3 Consistency with Future Plan

MIPU clarified that currently there are no plans/projects for rehabilitation of Teouma bridge. Therefore, any development plan to be implemented after this project that is anticipated to affect this project will make its plan consistent with the scope of this project.

2.4 Utilization of Existing Bridge

Existing Pony Truss bridge shall not be utilized for the project for the disaster restoration of

Teouma bridge due to the insufficient width to comply with the requirement of Vanuatu Resilient Road Manual.

2.5 Provision of Temporary Bridge

The Team confirmed that MIPU does not have any temporary bridges in its possession that could be used on detours during the construction period.

2.6 Removal/Demolition of Existing Bridges

Since the reconstructed bridge is aligned along the present alignment, the Project will include removal of existing bridges and installation/removal of temporary detour roads.

2.7 Design Obstacles

The following facilities/objects are likely to be affected for the implementation. These facilities shall be appropriately relocated by the MIPU if these are really affected in the design.

No.	Potential Obstacles	Pictures
1	Overhead Power Line	
2	Fences	

3. Technical Items

3.1 Road Category and Road Standard

- The road classification of the road around Teouma bridge in accordance with the Vanuatu Resilient Roads Manual -June 2014- (VRRM) is Arterial roads.
- The traffic class at Teouma bridge in accordance with VRRM is T4.

Table 1 Traffic Class

Traffic Classes	TRAFFIC Vehicle per day) (vpd)	Design Parameter
T4	＞500	2 lanes
T3	200 - 500	2 lanes
T2	50 - 200	2 lanes
T1	＜50	1 lane

3.2 Applicable Standards

The following Vanuatu Resilient Roads Manual and/or International Standards such as Austroads, Australian Manual, and Japanese Standards would be applied for planning and design of bridge/roads, structures and road ancillaries.

1) Vanuatu Resilient Roads Manual -JUNE 2014- (VRRM)
2) Austroads (2009)
3) Australian Standards
4) Specifications for Highway Bridges (Japan Road Association) / Japanese Standard
5) Other reference documents and standards

3.3 Design Speed

Design speed in accordance with the Vanuatu Resilient Roads Manual is 60km/h as per the table below.

Table-2 Design Speed

Traffic Classes	T4	T3	T2	T1
Rolling	40 km/h	30 km /h	30 km / h	10 km / h
Flat	60 km /h	40 km /h	40 km /h	30 km /h

3.4 Hydrological Designing Parameters

Element	Criteria	Source / Comments
ARI (Average Recurrence Interval)	100 years	
Free board	50cm	
HWL	8.4m	

3.5 Road Alignment

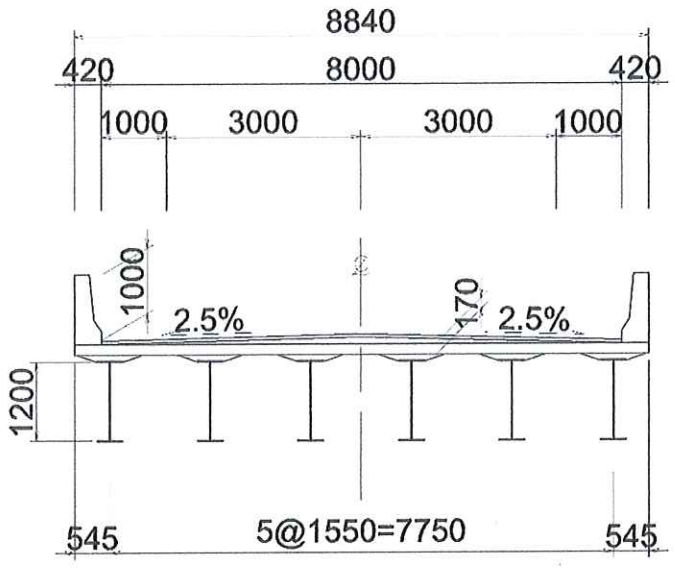
Element	Criteria	Source / Comments
Horizontal Alignment	To follow the existing alignment	
Longitudinal Alignment	To be adjusted according to the new elevation of the bridge	
Bridge	To be constructed on the existing alignment	
Detour road / bridge	To be constructed downstream of the existing bridge	

3.6 Geometric Condition and Others

Element	Criteria	Source / Comments
Stopping sight distance	85 m	Adopted highest value of: Section 9.2.1 (c), VRRM
Minimum Curve Radius	100m	Section 9.2.1 (c), VRRM
Cross Section	2 x 3.0 m wide traffic lanes with 2 x 1.0 m wide shoulders on both sides	VRRM Appendix B, Section 9.2.1 (a)
Pavement Surfacing	Sprayed bituminous seal	Road: VRRM
Pavement Layers	Minimum 250 mm thick base course over minimum 5% CBR subgrade	Section 9.2.2 (a), VRRM Subject to traffic loading design during detailed design
Road Side Drains	Trapezoidal shape with maximum 2H:1V side slopes	Section 9.2.3, VRRM
Slope of proposed embankment	1:1.5 ～ 1:2.0	Section 9.2.3, VRRM
Guard Rail	More than 3m embankment	JIS (Japanese Industrial Standards)
Line Marking	Double white lines (BB) applied to all new pavement surfacing Edge lines to bridges and where required to delineate footways	AS1742.2

3.7 Bridge Type and Width

The type of the bridge shall be plate girder type due to the easy maintenance. The typical cross section is shown in Figure-1. Mount up footpath shall not be provided for uniformity of the approach road.



3.8 Bridge Design Condition

Element	Criteria	Source/Comment
Applied Specification	SPECIFICATION FOR HIGHWAY BRIDGRES MARCH 2012 Issued by JAPAN ROAD ASSOCIATION	
Design	T20 Truck load, A-Live Load specified in SPECIFICATION FOR HIGHWAY BRIDGRES	Equivalent to T44 truck load and L44 lane load
Seismic Condition	SPECIFICATION FOR HIGHWAY BRIDGRES MARCH 2012	
Cross section	6.5m for carriage way (2×3m lane, 2×1.00m shoulders)	Following VRRM
Free Board	0.5m	In compliance with Australian Standard and Consistent with ADB project

3.9 Basic Condition of Riverbank Protection

Element	Description
Design horizontal alignment	The horizontal scoured alignment shall be improved. 250m upstream, 110m downstream shall be improved.
Design longitudinal alignment	1:1800 (vertical : horizontal)
Design Cross Section	Width at design flood level (8.4m) : 50m

	Design slope gradient : 1:1.5 Berm : 1.5m Maintenance road : 4m
Scoring depth	2m below the improved river bed
Right Bank	Bank protection shall be provided for the stabilization of the river. Elevation of the riverbank is the same as existing ground.
Left Bank	Elevation of the riverbank shall be EL 5.0m.

3.10 **Riverbank Protection**

Type : Reinforced Concrete Crib

Description : Concrete Crib (30cm) filled with concrete or concrete with cobble stone (grouted riprap) (20cm)

4. Temporary Yard

Temporary Yards shall be provided by MIPU side during the construction period. The Team confirmed that there should be one location, around 2km east side of Fletcher compound as shown in the Figure-1 in Attachment-1, approximately 10,000m2, for establishing offices (consultant office and contractor's office), batching plant and other material stocks.

5. Soil Disposal Yard

The Team confirmed that there should be two locations, one is Etas rubbish dump for the unsuitable materials such as soil coming out from the clearing and grubbing, and river bed excavation, another is the temporary yard mentioned in the former chapter the suitable material coming out from the river bed excavation and the removal of the detour road, etc. as shown in the Figure-1 and 2 in Attachment-1.

6. Stock yard for the dismantled steel members of the existing Teouma bridge

Stock yard for the dismantled steel member of the existing Teouma bridge shall be provided by MIPU side prior to the commencement of the project. The Team confirmed that there should be PWD sheaf division as shown in Figure-3 in Attachment-1. How to reuse of existing Teouma bridge will be studied by MIPU.

7. Detour road during construction

The plan for the detour road during construction as of May 2018 is shown in Figure-4 in Attachment-1. This plan might be revised according to the results of the survey.

Attachment 1: Temporary Yard

Figure-1 Temporary Yard / Soil Disposal Yard for Suitable materials

Figure-2 Temporary Yard / Soil Disposal Yard for suitable materials

Figure-3 Stock yard for the dismantled steel member of the existing Teouma bridge

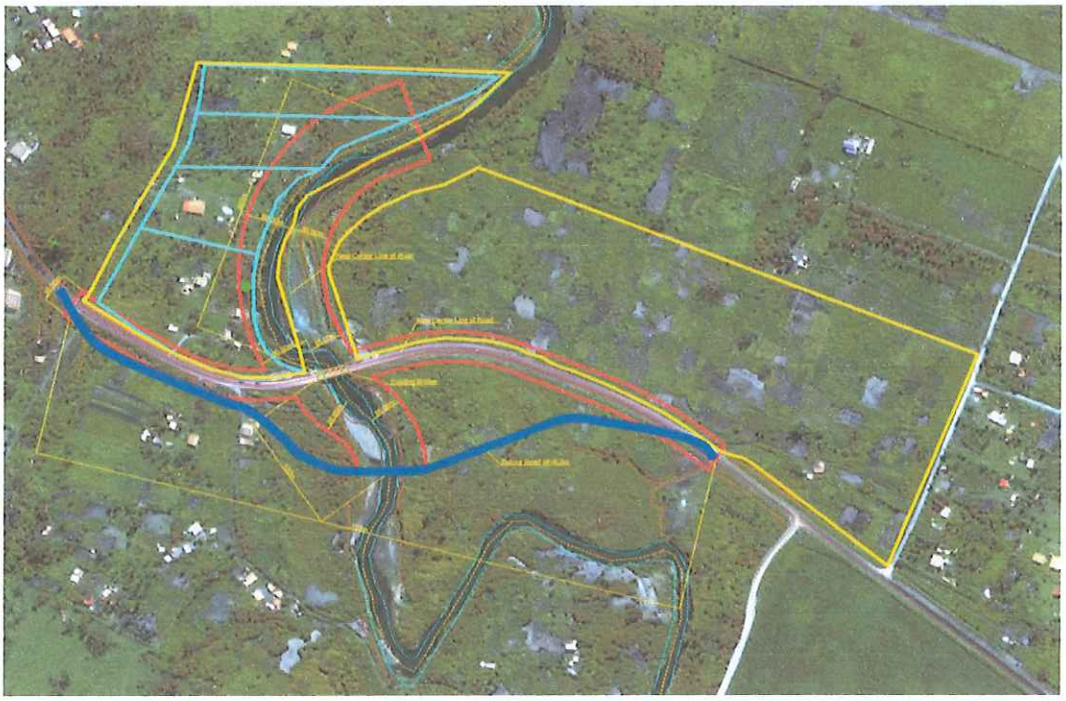
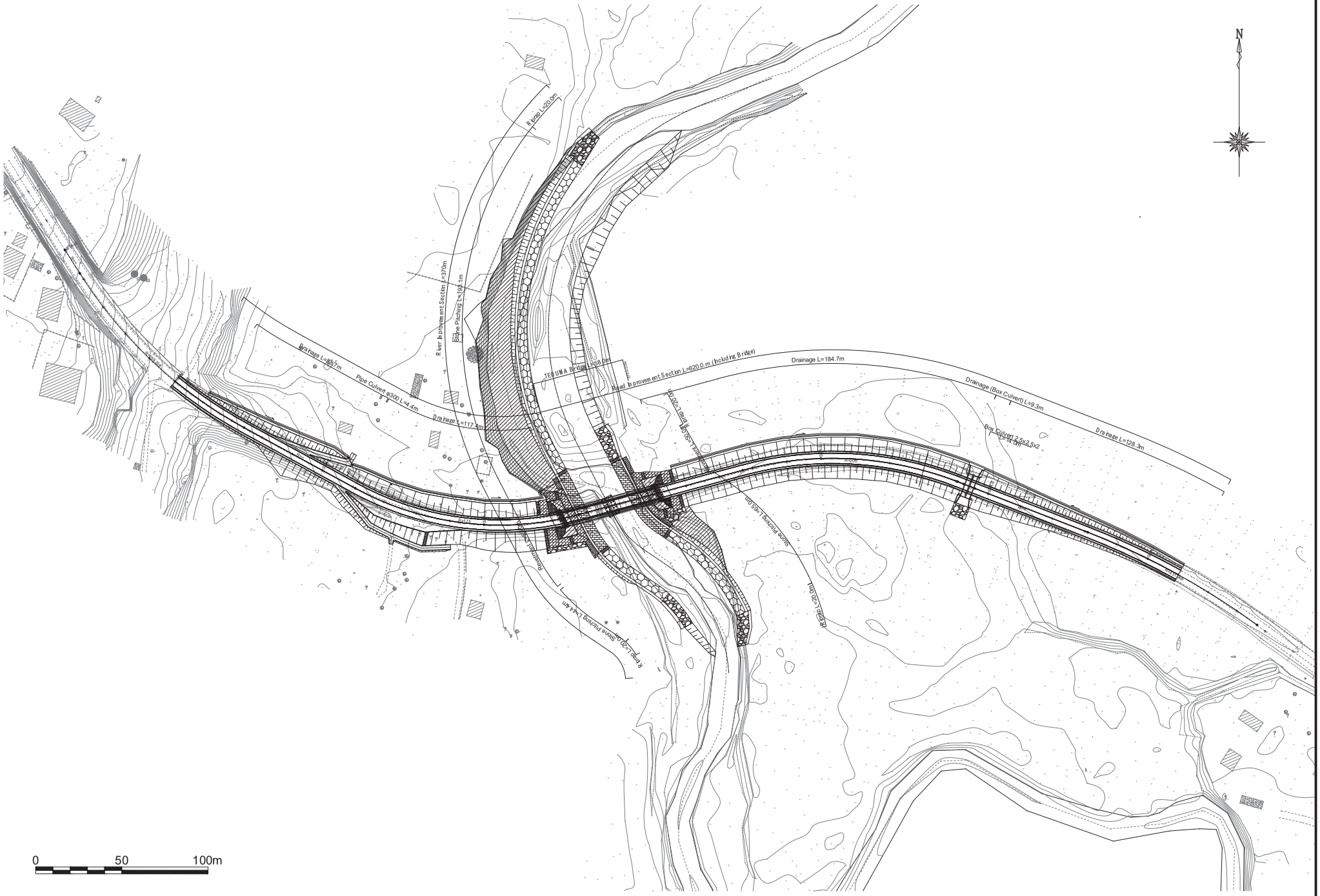


Figure-4 Plan for detour road during construction (Blue line)

別添 6：概略設計図

AP6-1



REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

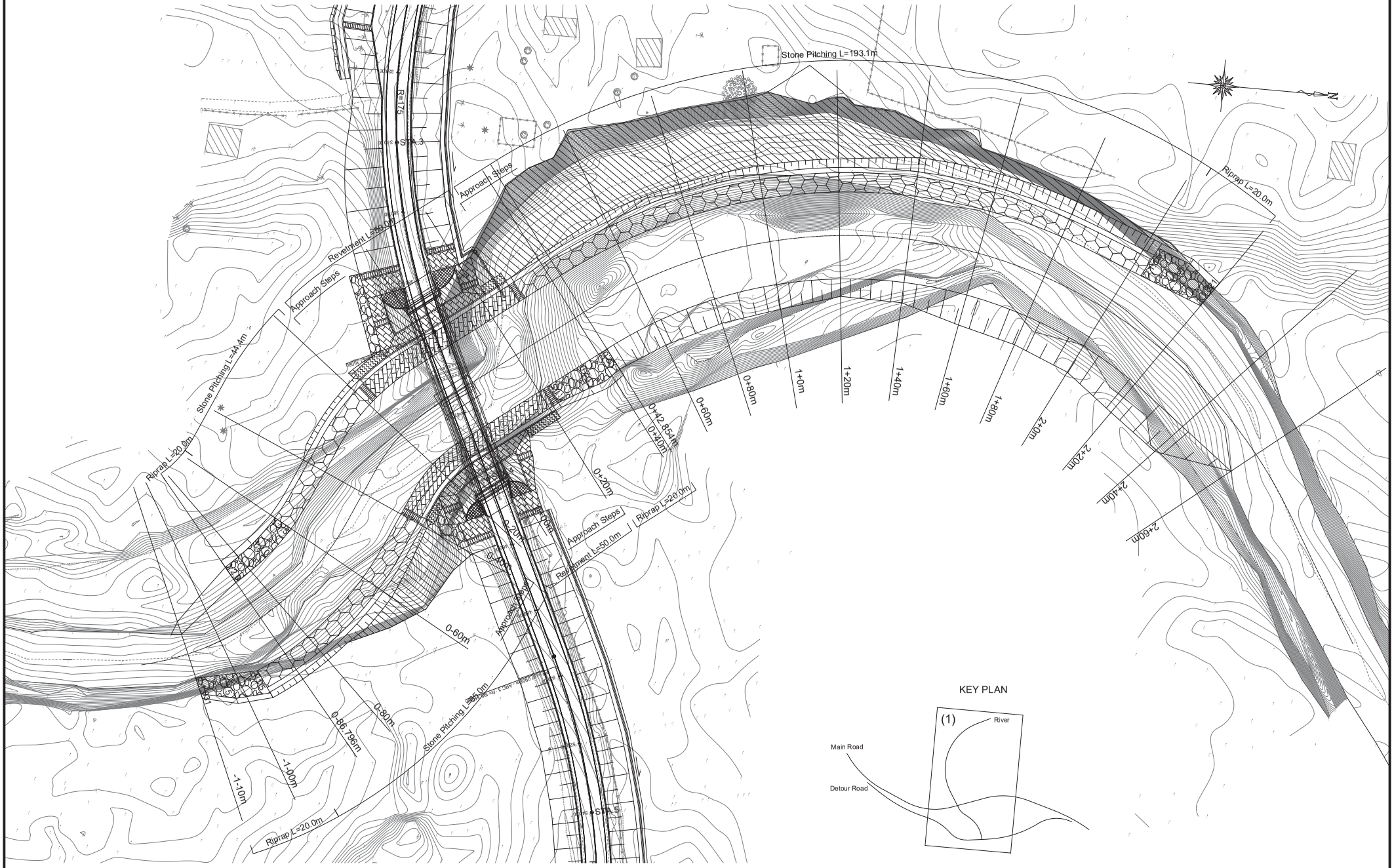
DESCRIPTION:
Overall Plan

CONSULTANTS REFERENCE	DRAWN	CHECKED	APPROVED
CTI ENGINEERING INTERNATIONAL CO., LTD.			
KOKUSAI KOGYO CO., LTD.			

P.W.D REFERENCE	CHECKED	APPROVED

SCALE (A3 SIZE)	DRAWING NO.	SHEET NO.
1:2000	1	

AP6-2



REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
PLAN
(REVETMENT)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

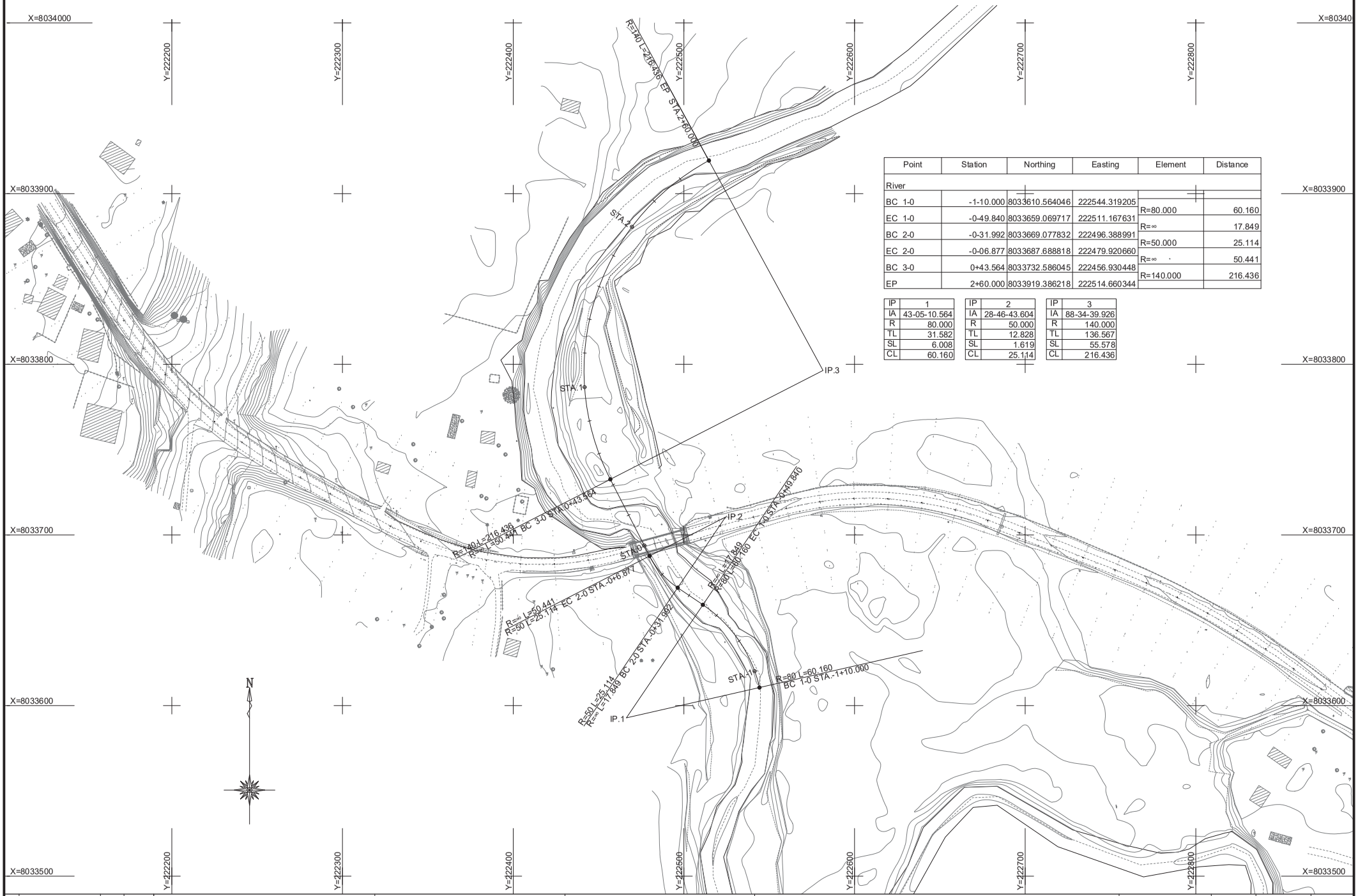
P.W.D REFERENCE

CHECKED	APPROVED

SCALE (A3 SIZE)
1:1000

DRAWING NO.
2

SHEET NO.



Point	Station	Northing	Easting	Element	Distance
River					
BC 1-0	-1-10.000	8033610.564046	222544.319205		
EC 1-0	-0-49.840	8033659.069717	222511.167631	R=80.000	60.160
BC 2-0	-0-31.992	8033669.077832	222496.388991	R=∞	17.849
EC 2-0	-0-06.877	8033687.688818	222479.920660	R=50.000	25.114
BC 3-0	0+43.564	8033732.586045	222456.930448	R=∞	50.441
EP	2+60.000	8033919.386218	222514.660344	R=140.000	216.436

IP	1
IA	43-05-10.564
R	80.000
TL	31.582
SL	6.008
CL	60.160

IP	2
IA	28-46-43.604
R	50.000
TL	12.828
SL	1.619
CL	25.114

IP	3
IA	88-34-39.926
R	140.000
TL	136.567
SL	55.578
CL	216.436

AP6-3

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

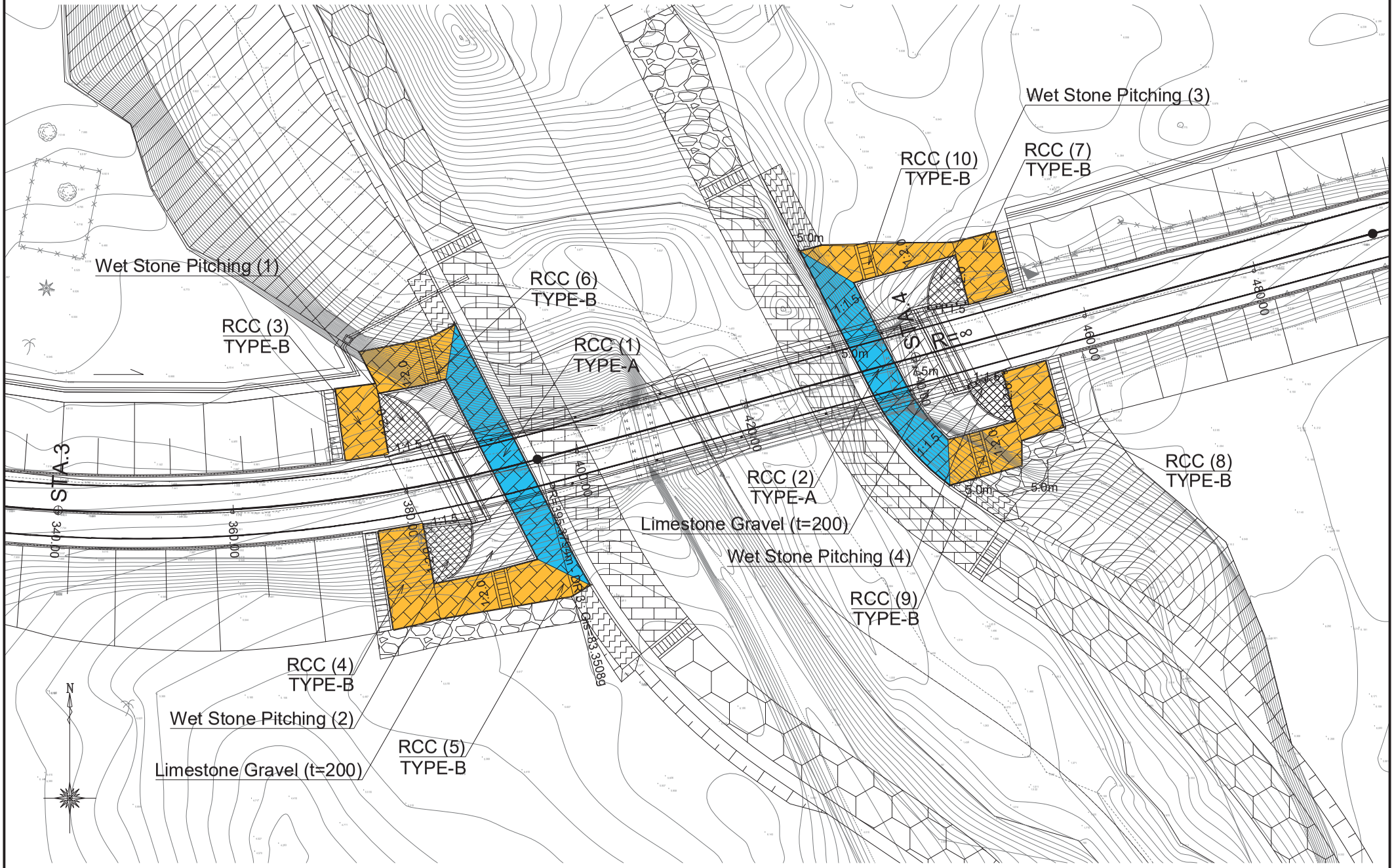
PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
RIVER ALIGNMENT

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED	SCALE (A3 SIZE)	DRAWING NO.	SHEET NO.
					1:2000	3	

RCC Reinforced Concrete Crib



AP6-4

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
DETAILED PLAN ARROUND ABUTMENT

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

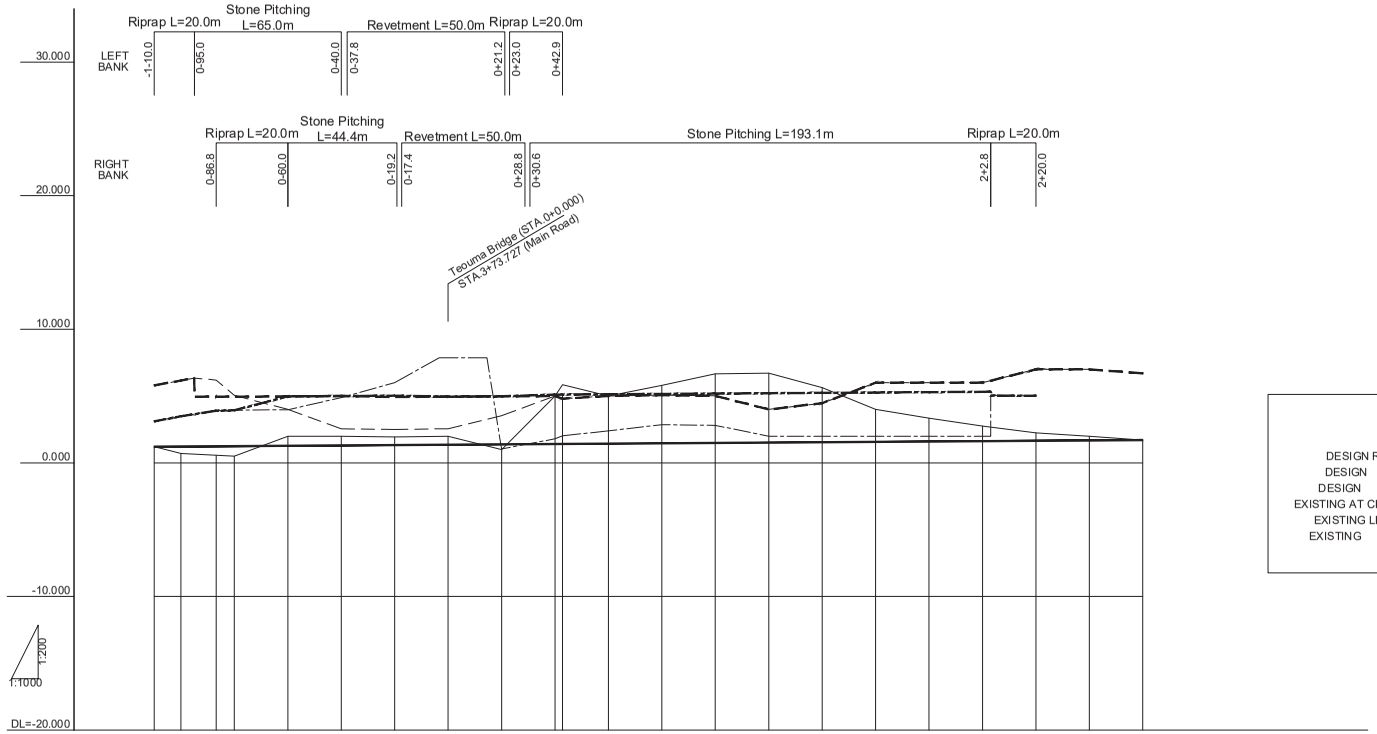
DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED

SCALE (A3 SIZE): 1:400

DRAWING NO.: 4

SHEET NO.:

AP6-5



LEGEND

- DESIGN RIVERBED
- DESIGN
- DESIGN
- EXISTING AT CENTERLINE
- EXISTING LEFT
- EXISTING

DESIGN RIVERBED SLOPE		1.213	I=1/760 L=370.000																						1.700
DESIGN ELEVATION	LEFT BANK (EL.m)	5.800	6.167	4.953	4.953	4.979	5.005	4.932	4.958	4.984	5.000 4.803	5.013	5.065	5.052	4.000	4.473	6.000	6.000	6.000	7.000	7.000	6.700			
	RIGHT BANK (EL.m)	3.114	3.487	3.903	3.940	4.979	5.005	5.032	4.958	4.984	5.111 5.114	5.137	5.163	5.189	5.216	5.242	5.268	5.295	5.321	5.019					
	RIVERBED (EL.m)	1.213	1.226	1.244	1.253	1.279	1.305	1.332	1.358	1.384	1.411 1.414	1.437	1.463	1.489	1.516	1.542	1.568	1.595	1.621	1.647	1.674	1.700			
EXISTING ELEVATION	LEFT BANK (EL.m)	5.80	6.17	6.20	5.05	4.00	2.55	2.50	2.56	3.54	5.00 4.80	5.01	5.07	5.05	4.00	4.47	6.00	6.00	6.00	7.00	7.00	6.70			
	RIGHT BANK (EL.m)	3.11	3.49	3.90	3.94	3.98	4.89	6.00	7.87	1.05	1.80 2.03	2.40	2.86	2.81	2.00	2.00	2.00	2.00	2.00	5.02					
	CENTERLINE (EL.m)	1.21	0.70	0.40	0.50	2.00	2.00	1.94	2.00	1.00	5.00 5.85	5.00	5.81	6.66	6.71	5.63	4.00	3.35	2.76	2.25	2.00	1.70			
DISTANCE	ACCUMULATED	-110.000	-100.000	-86.796	-80.000	-60.000	-40.000	-20.000	0.000	20.000	40.000 42.854	60.000	80.000	100.000	120.000	140.000	160.000	180.000	200.000	220.000	240.000	260.000			
	PARTIAL	-10.000	-13.204	-6.796	-20.000	-20.000	-20.000	-20.000	0.000	20.000	20.000 2.854	17.146	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000			
STATION NO.		-1+10.000	-1+0.000	0+86.796	0+80.000	0+60.000	0+40.000	0+20.000	0+0.000	0+20.000	0+40.000 0+42.854	0+60.000	0+80.000	1+0.000	1+20.000	1+40.000	1+60.000	1+80.000	2+0.000	2+20.000	2+40.000	2+60.000			

REV	DESCRIPTION	BY	DATE

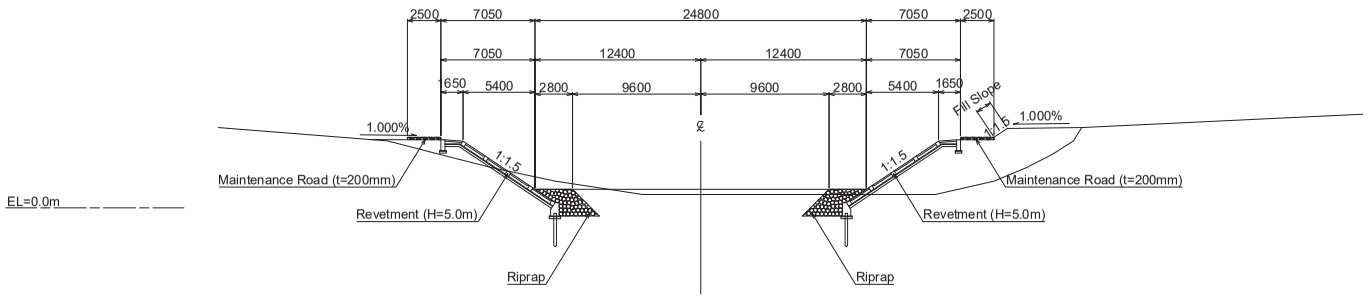
REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

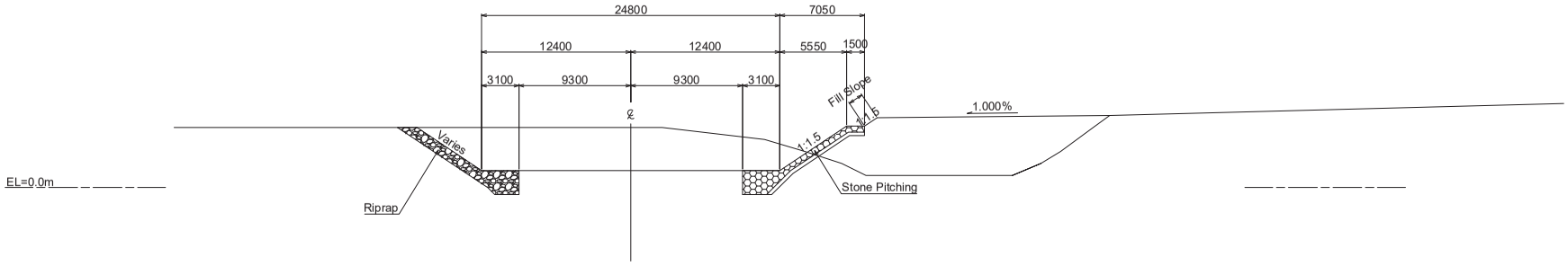
PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

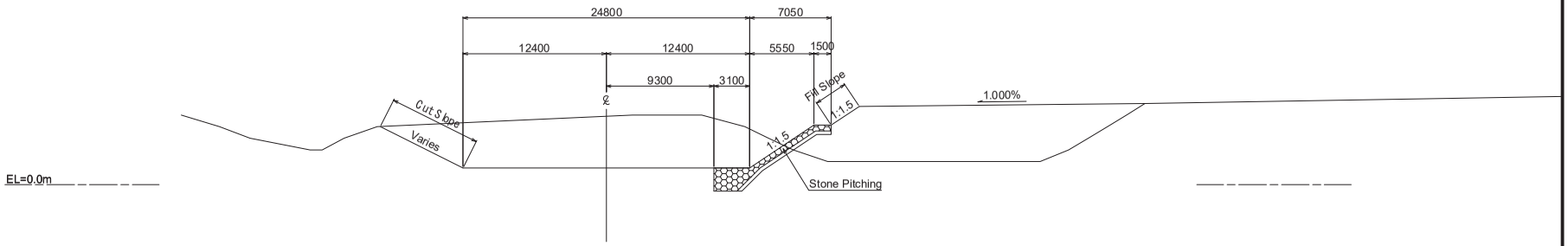
DESCRIPTION:
PROFILE (REVETMENT)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED	SCALE (A3 SIZE)	DRAWING NO.	SHEET NO.
					V=1:400 H=1:2,000	05	







REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
TYPICAL CROSS SECTION (REVETMENT)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

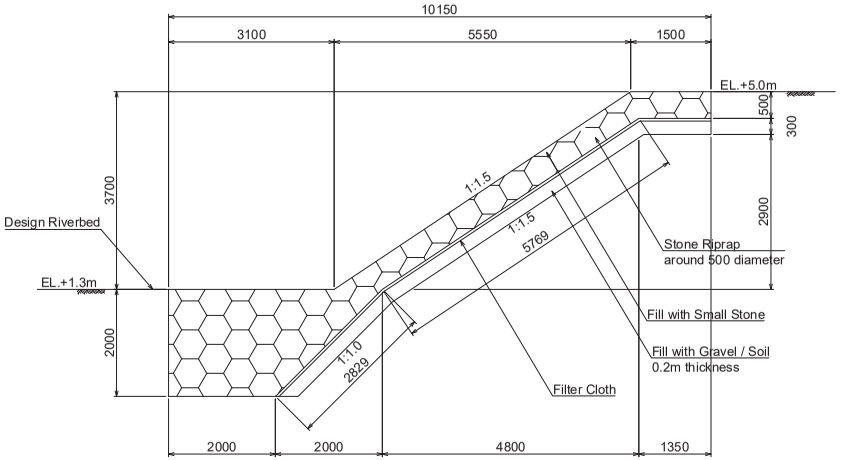
P.W.D REFERENCE

CHECKED	APPROVED

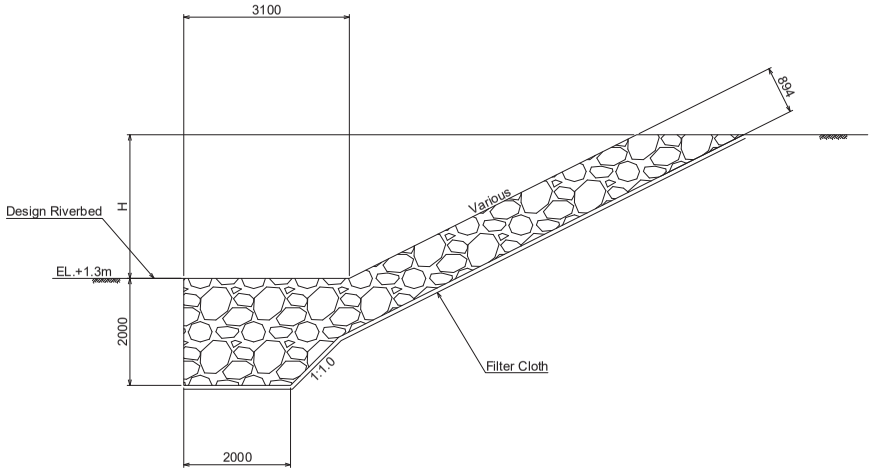
SCALE (A3 SIZE): 1:400

DRAWING NO.: 6

SHEET NO.:



Detail of Stone Pitching S=1:100



Detail of Riprap S=1:100

AP6-7

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
RIPRAP / STONE PITCHING

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

P.W.D REFERENCE

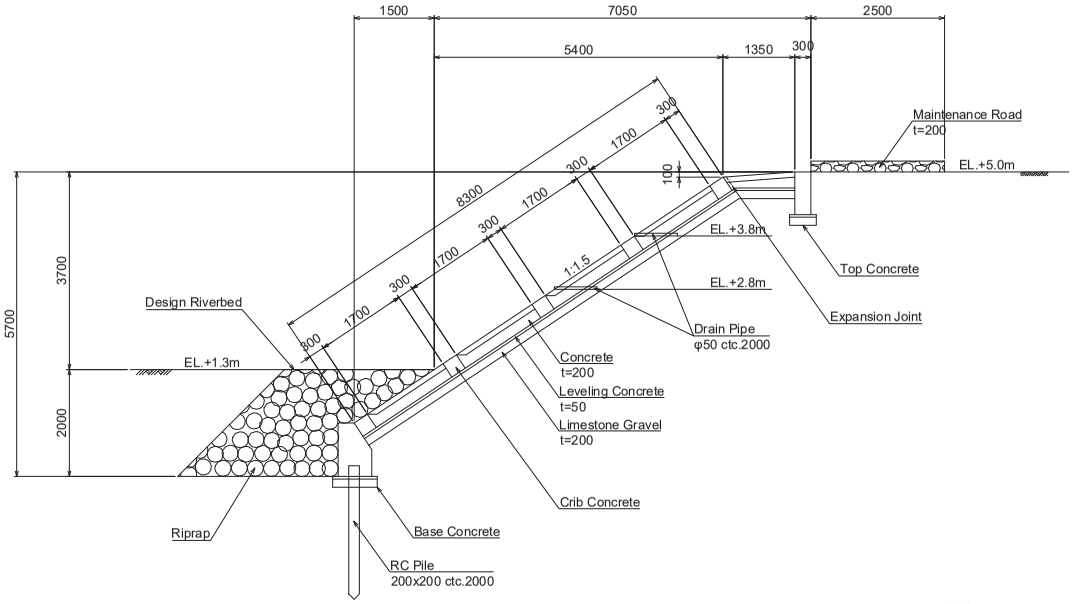
CHECKED	APPROVED

SCALE (A3 SIZE)
AS SHOWN

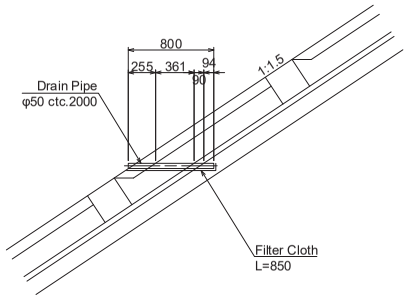
DRAWING NO.
7

SHEET NO.

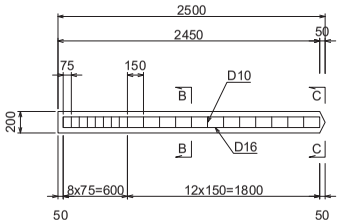
AP6-8



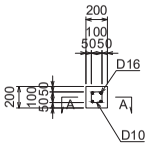
Side View S=1:100



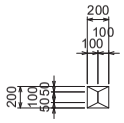
Detail of Drain Pipe S=1:50



Section A - A

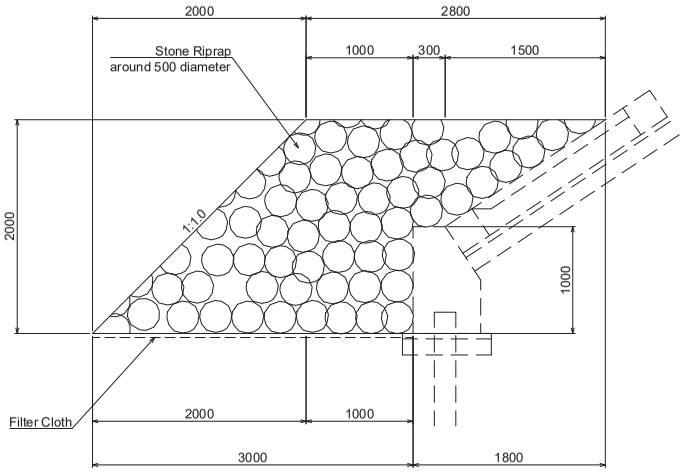


Section B - B

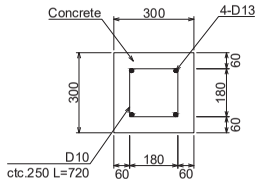


Section C - C

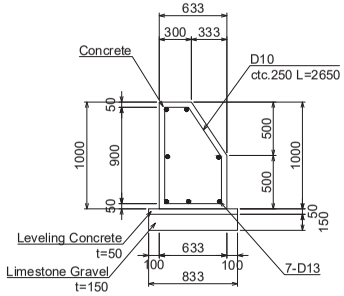
Detail of RC Pile S=1:50



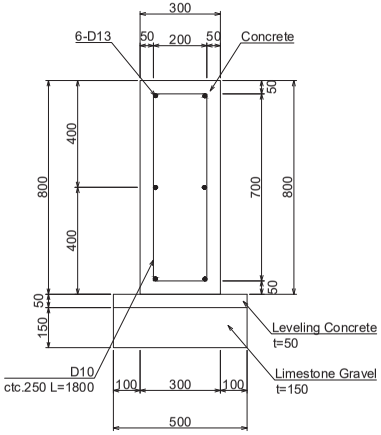
Detail of Riprap S=1:50



Detail of Crib Concrete S=1:20



Detail of Base Concrete S=1:50



Detail of Top Concrete S=1:20

REV	DESCRIPTION	BY	DATE

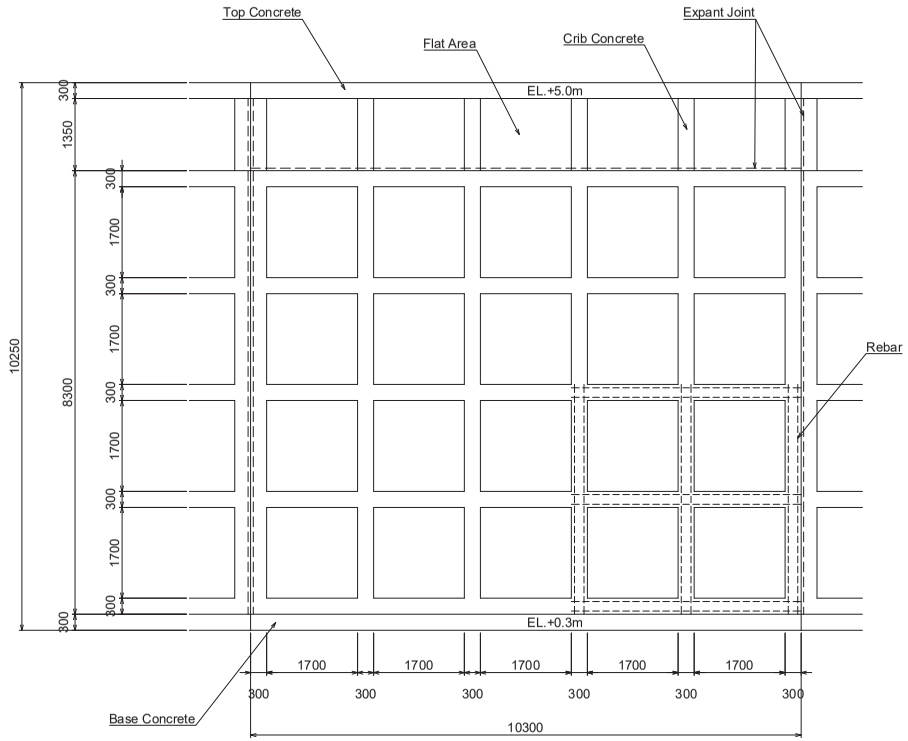
REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
REVETMENT(1)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED	SCALE (A3 SIZE)	DRAWING NO.	SHEET NO.
					AS SHOWN	8	



Plan S=1:100

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
REVETMENT(2)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

P.W.D REFERENCE

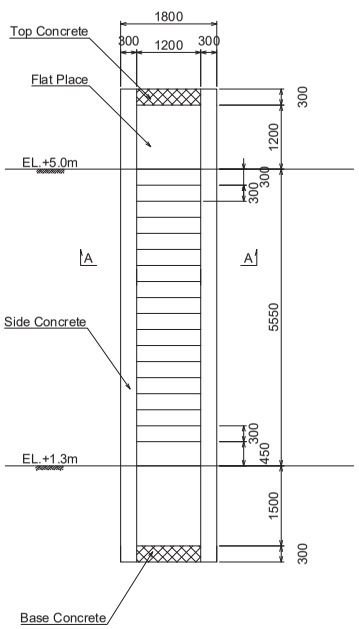
CHECKED	APPROVED

SCALE (A3 SIZE): AS SHOWN

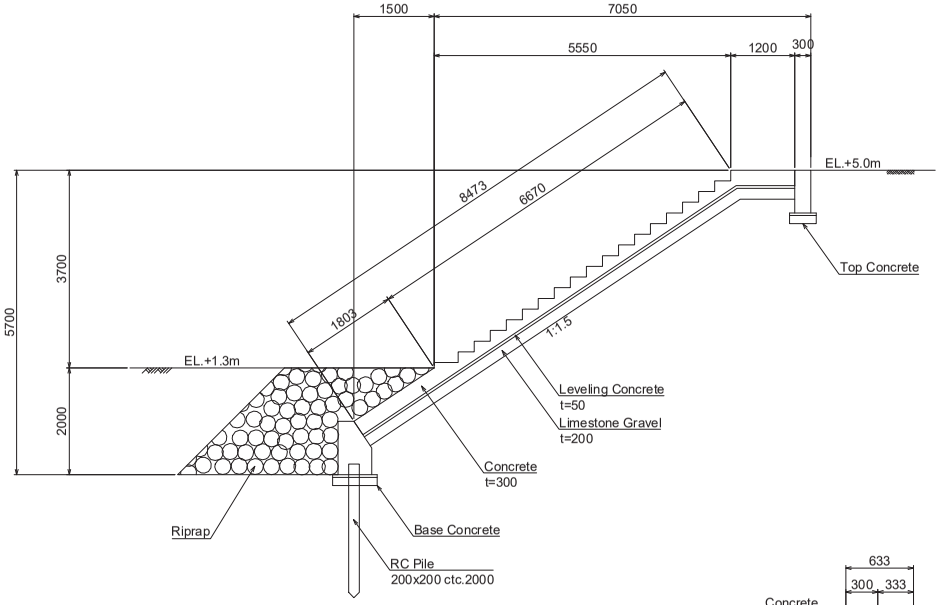
DRAWING NO.: 9

SHEET NO.:

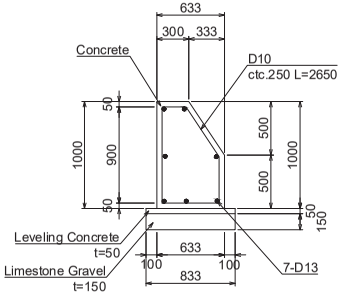
AP6-10



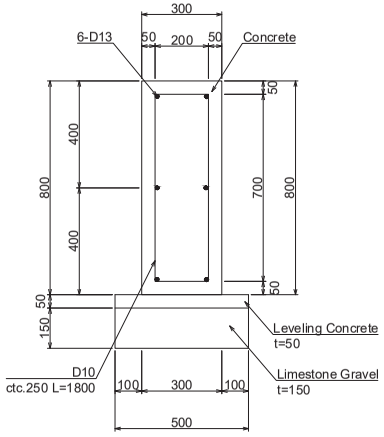
Plan S=1:100



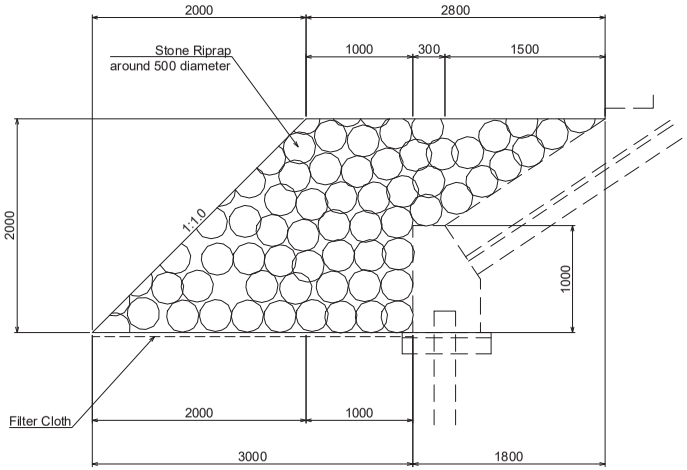
Side View S=1:100



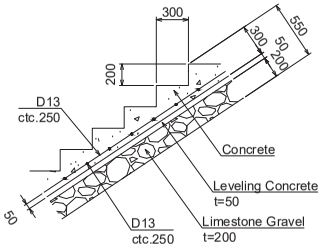
Detail of Base Concrete S=1:50



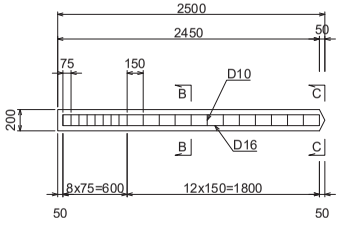
Detail of Top Concrete S=1:20



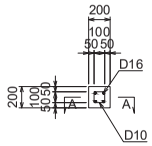
Detail of Riprap S=1:50



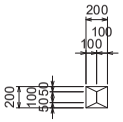
Detail of Steps S=1:50



Section A - A



Section B - B



Section C - C

Detail of RC Pile S=1:50

REV	DESCRIPTION	BY	DATE

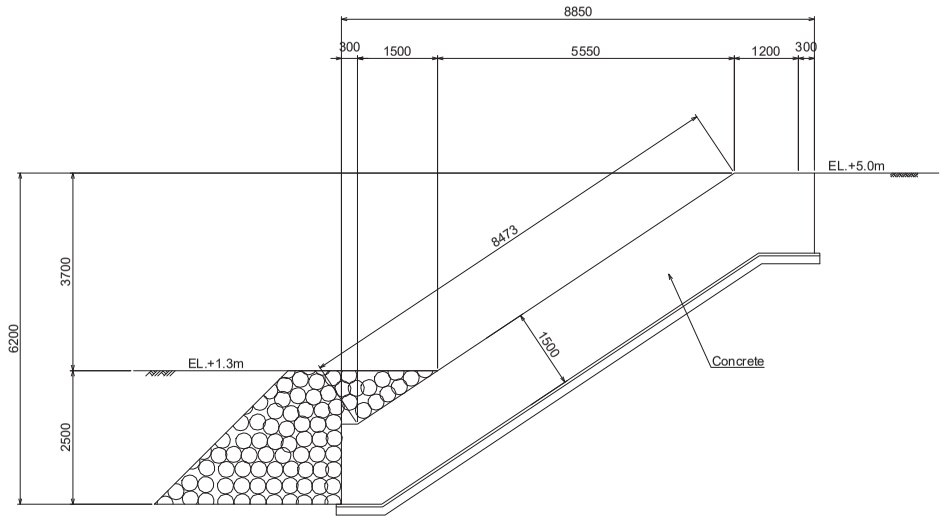
REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

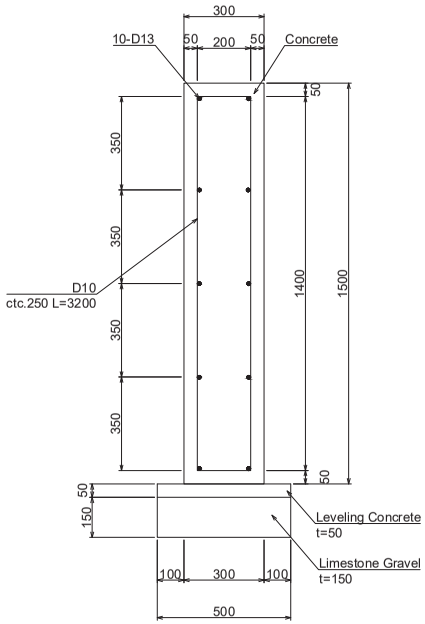
DESCRIPTION:
APPROACH STEPS(1)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

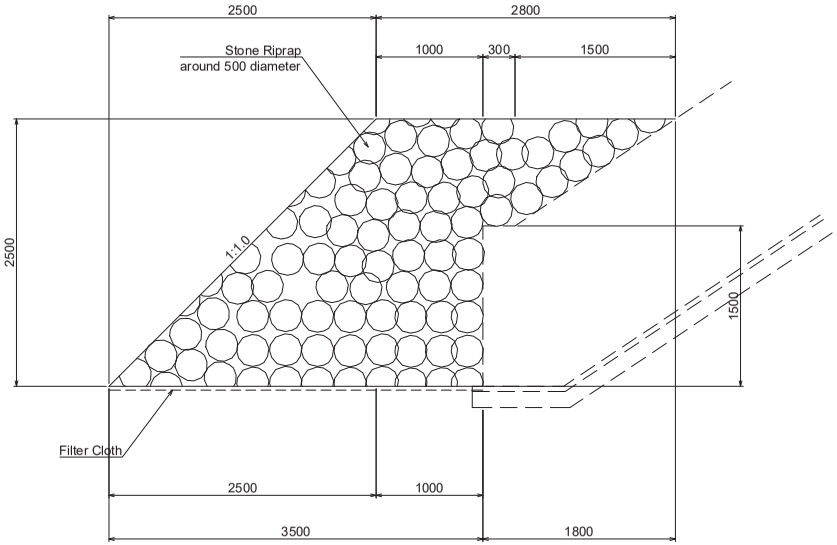
DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED	SCALE (A3 SIZE)	DRAWING NO.	SHEET NO.
					AS SHOWN	10	



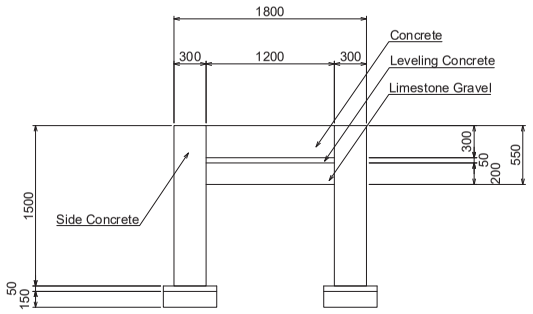
Side View (Side Concrete) S=1:100



Detail of Side Concrete S=1:20



Detail of Riprap (Side Concrete) S=1:50



Section A-A S=1:50

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

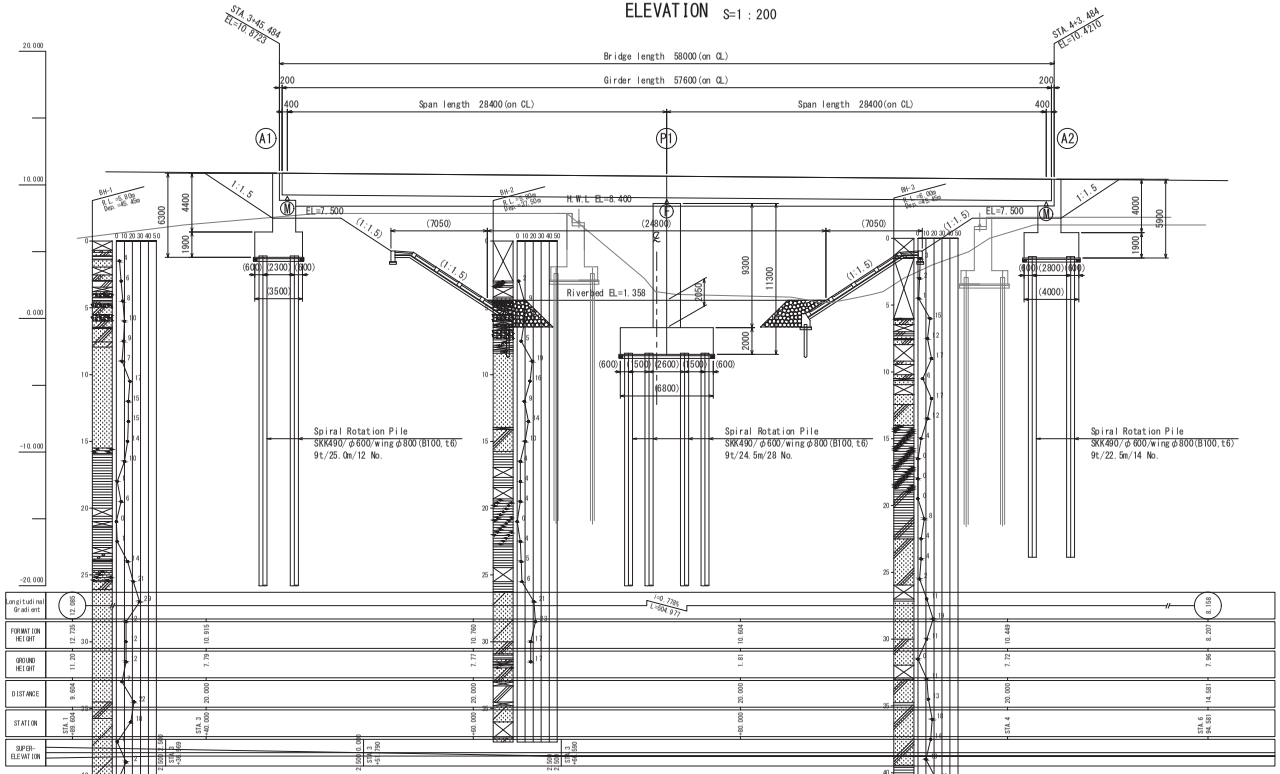
DESCRIPTION:
APPROACH STEPS(2)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

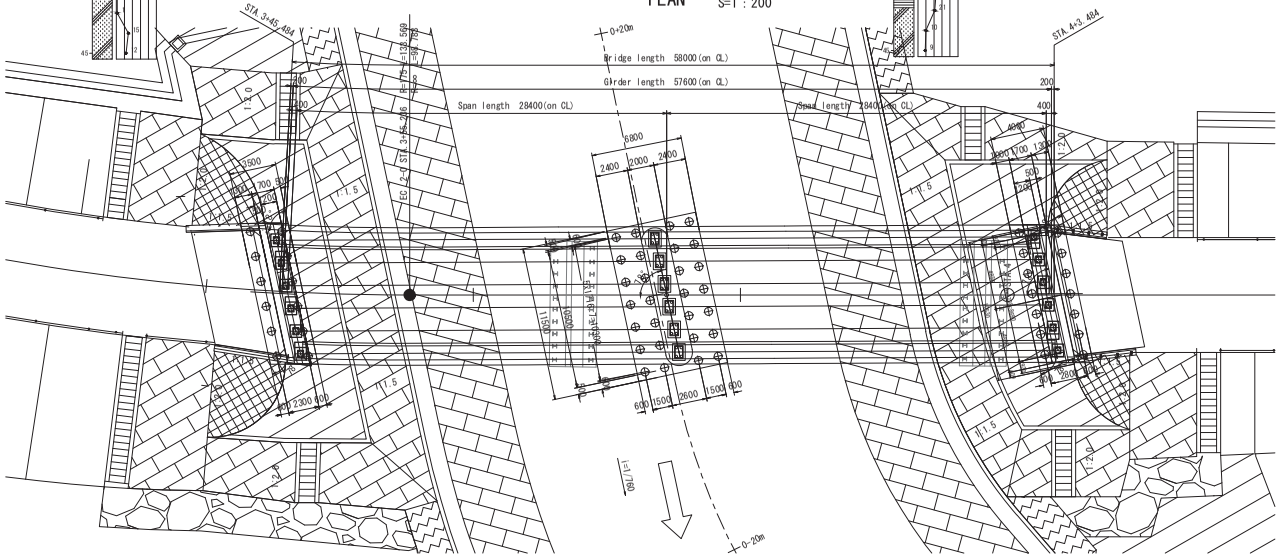
DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED	SCALE (A3 SIZE)	DRAWING NO.	SHEET NO.
					AS SHOWN	11	

GENERAL VIEW OF TEOUMA BRIDGE

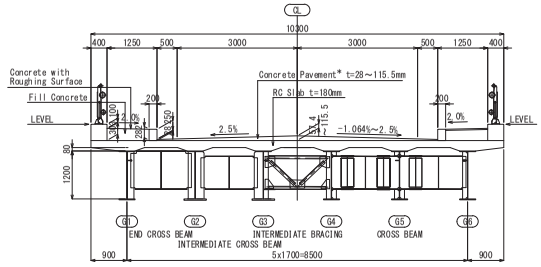
ELEVATION S=1 : 200



PLAN S=1 : 200



TYPICAL SECTION S=1:50



* Concrete for pavement shall be casted at the same time of deck concrete

Design Conditions

Bridge Length		58.000m
Girder Length		57.600m
Span Length		28.400m+28.400m
Width	Full Width	10.300m
	Effective Width	9.500m
Skew		A1=105° 11′ 35″ ,P1,A2=102° 00′ 00″
Curve Radius		R=175～R=∞
Longitudinal Gradient		0.778%
Superelevation		2.5% -1.064% ～ 2.5% 2.5%
Live Load		A Live Load-TL
Pavement		Concrete Pavement t=20～155mm
Seismic Coefficient		kh=0.3
Structural Type	Superstructure	2 Span Continuous Steel Plate Girder
	Substructure	T-Conversely Abutment(A1,A2), Wall type Pier(P1)
	Pile	Spiral Rotation Pile (NS ECO SPIRAL φ600)
Material for Superstructure	Steel	SS400, SM400, SM490Y, S10T (Japan Industrial Standards)
	Concrete	σck= 24N/mm2
	Re-Bar	SD345 (Japan Industrial Standards)
Material for Substructure	Concrete	σck= 24N/mm2
	Re-Bar	SD345 (Japan Industrial Standards)
	Pile	SKK490 (Japan Industrial Standards)
Bridge Grade		Grade A
Soil Type		Type III
Specification		Specifications for Highway Bridges I～V (2012)

AP6-12

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

P.W.D REFERENCE

CHECKED	APPROVED

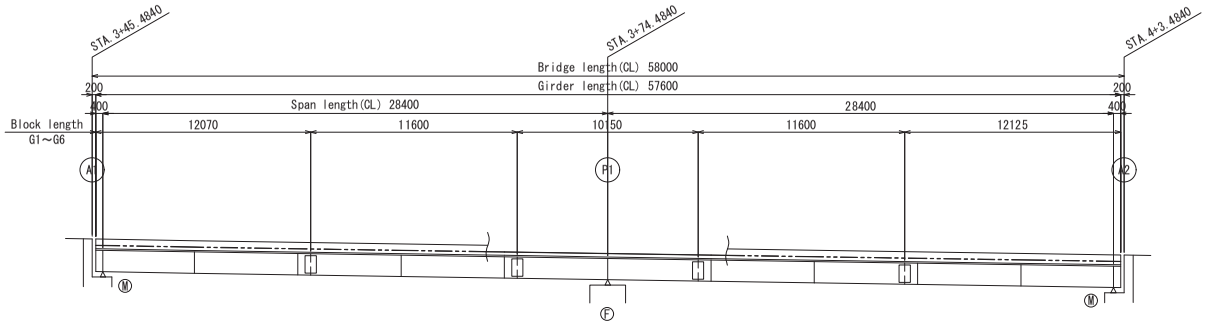
SCALE (A3 SIZE)

DRAWING NO. 12

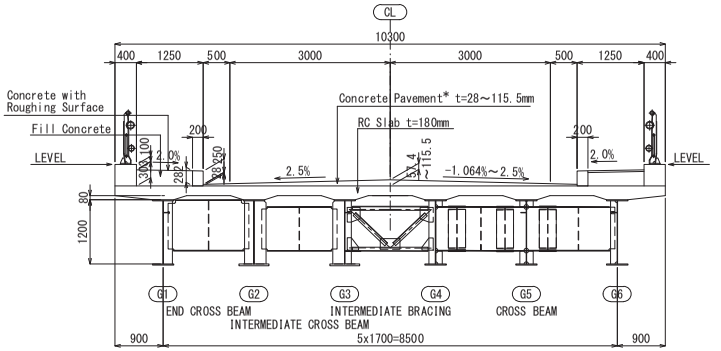
SHEET NO.

General View of Superstructure S=1:150

Elevation

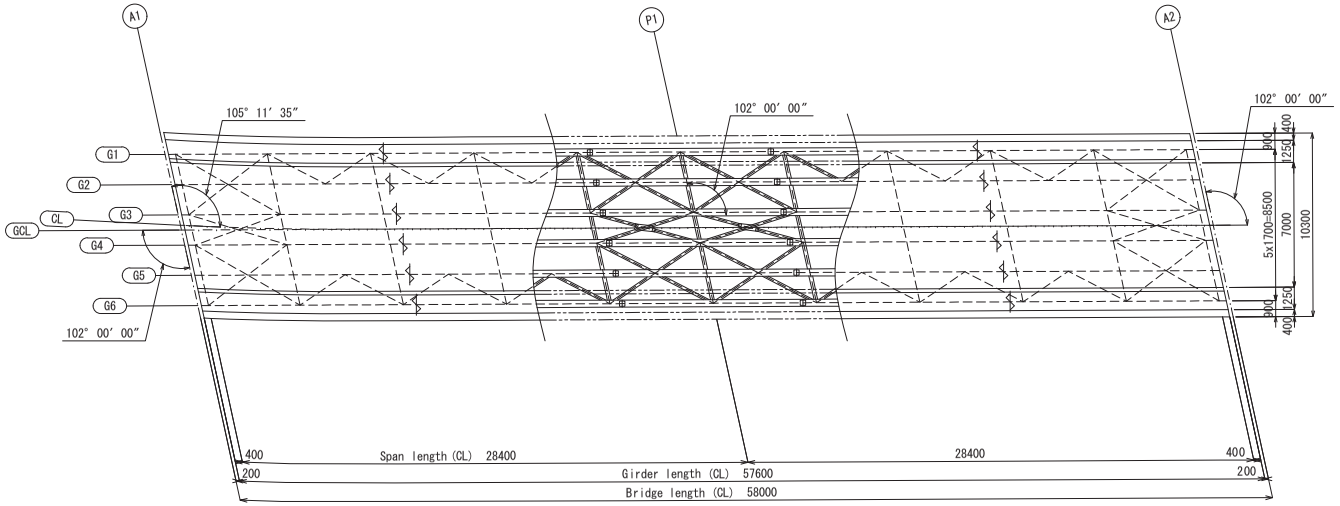


Typical Cross Section S=1:50



＊Concrete for pavement shall be casted at the same time of deck concrete

Plane



DESIGN CONDITIONS

Live Load		A Live Load-TL
Bridge Type		2 Span Continuous Steel Plate Girder
Bridge Length		58.000m
Girder Length		57.600m
Span Length		28.400m+28.400m
Width	Full Width	10.300m
	Effective Width	7.000m
Skew		A1=105° 11′ 35″, P1, A2=102° 00′ 00″
Curve Radius		R=175～R=∞
Longitudinal Gradient		0.778%
Superelevation		2.5% -1.064% ～ 2.5% 2.5%
Slab		RC Slab t=180mm
Pavement		Concrete Pavement t=28～115.5mm
Seismic Coefficient		kh=0.3(Level-1)
Material	Steel	SS400, SM400, SM490Y, S10T
	Concrete	σck=24N/mm2
	Re-Bar	SD345
Specification		Specifications for Highway Bridges I～V (2012)

AP6-13

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
STRUCTURE GENERAL VIEW OF SUPERSTRUCTURES

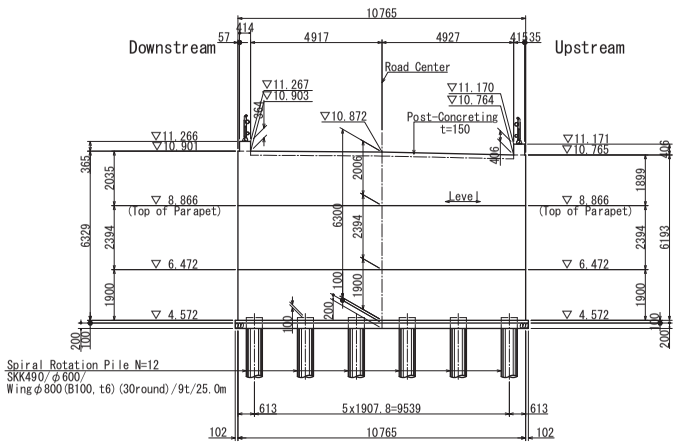
CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED

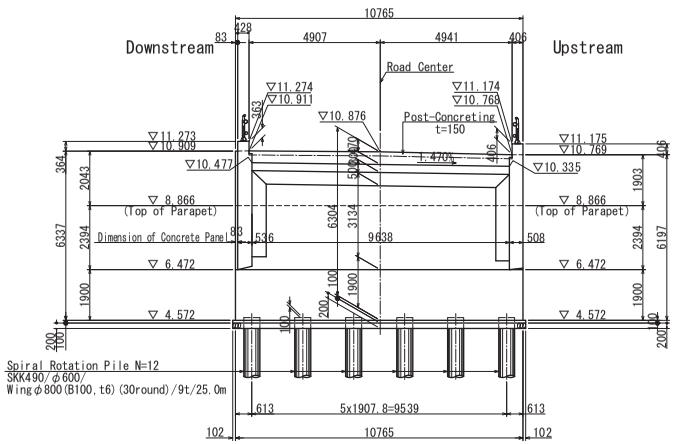
SCALE (A3 SIZE): 1:150 1:50
DRAWING NO.: 13
SHEET NO.:

General View of A1 (1/2) S=1:100
(M)

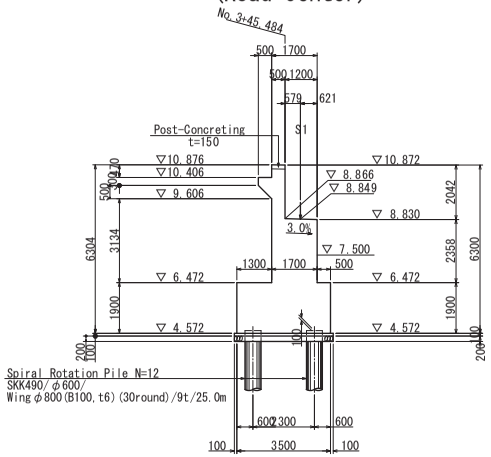
Front View



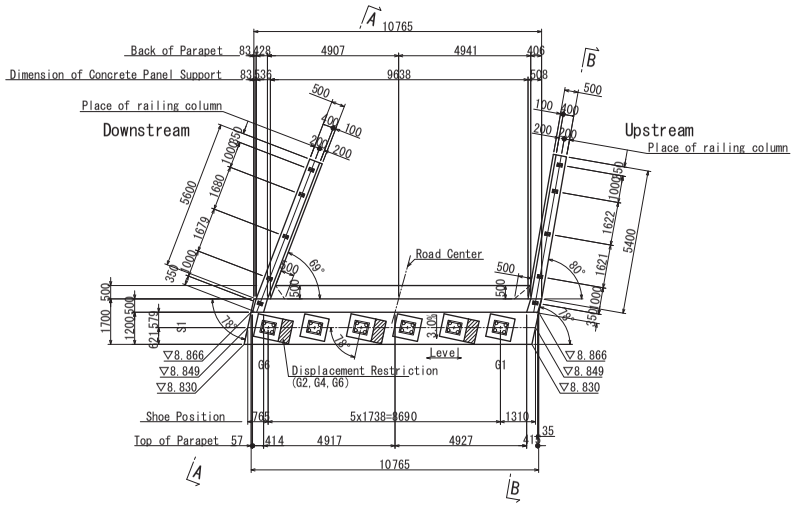
Back View



Side View (Road Center)



Plan of Shoe Position



Plan of Pile Cap

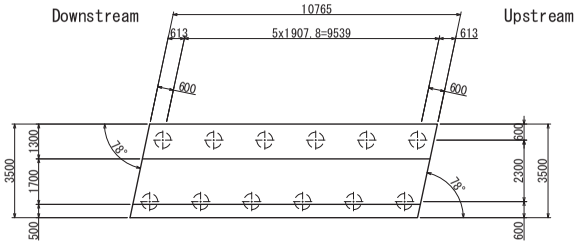


Table of Elevation

(Unit:m)

	A1(onS1)					
	G6	G5	G4	G3	G2	G1
Road Elevation	10.871	10.884	10.875	10.856	10.821	10.786
THK of Conc Surfacing	0.132	0.142	0.129	0.107	0.069	0.031
THK of Slab	0.180	0.180	0.180	0.180	0.180	0.180
Height of Haunch	0.080	0.080	0.080	0.080	0.080	0.080
Elev. of top of FLG.	10.479	10.482	10.486	10.489	10.492	10.495
Girder height	1.200	1.200	1.200	1.200	1.200	1.200
THK of Low FLG.	0.028	0.015	0.013	0.013	0.015	0.028
THK of Sole Plate	0.026	0.026	0.026	0.026	0.026	0.026
Height of Shoe	0.166	0.166	0.166	0.166	0.166	0.166
Shoe Elevation	9.059	9.075	9.081	9.084	9.085	9.075
Height of Mortar	0.030	0.030	0.030	0.030	0.030	0.030
Height of Shoe Bed	0.180	0.196	0.202	0.205	0.206	0.196
Elevation of Bridge Seat	8.849	8.849	8.849	8.849	8.849	8.849
Superelevation	Level					

Design Conditions

Title	Specification
Superstructure	2 Span Continuous Non Composite Steel Girder
Substructure	T-Conversely Abutment
Shoe Type	Mov
Specified Concrete Strength	24 N/mm²
Re-Bar Grade	SD 345 (Japan Industrial Standards)
Splice Length	31.25φ
Max.Re-Bar Length	12m
Pile Type	Spiral Rotation Pile (NS Eco Spiral Pile) φ600

AP6-14

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

P.W.D REFERENCE

CHECKED	APPROVED

SCALE (A3 SIZE)

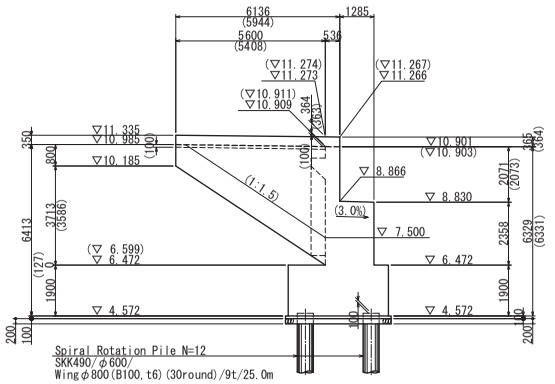
DRAWING NO. 14

SHEET NO.

General View of A1 (2/2) S=1:100
(M)

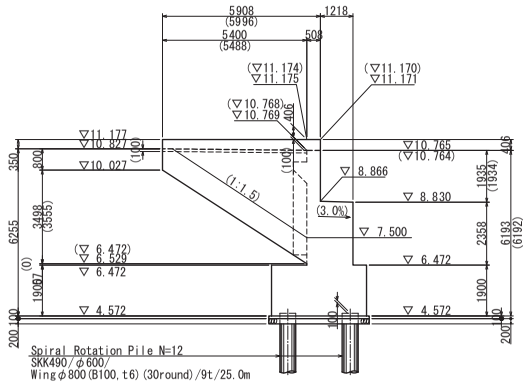
Wing Wall (Downstream)
A – A

Note) ( ) shows inside dimension.

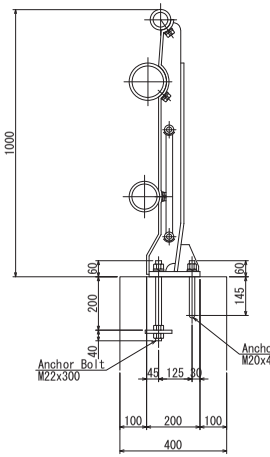


Wing Wall (Upstream)
B – B

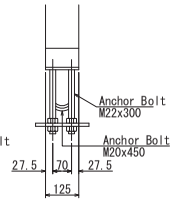
Note) ( ) shows inside dimension.



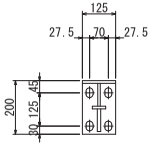
Railing Detail S=1:10



Side View

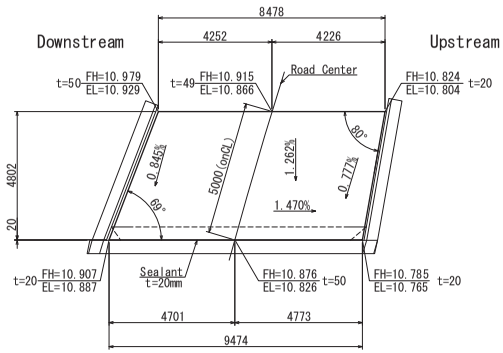


Base Plate

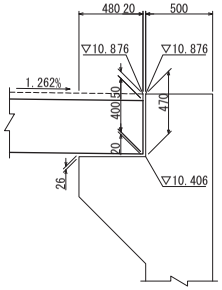


Plan of Approach Slab
(t=400)

Note) Elev. of Road Surface FH / Elev. of Arroach Slab Surface EL t=Thickness of Pavement

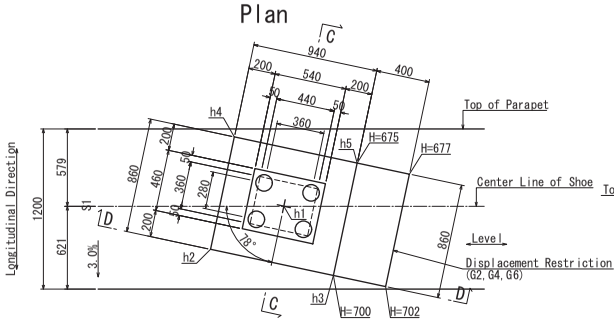


Support Detail S=1:20

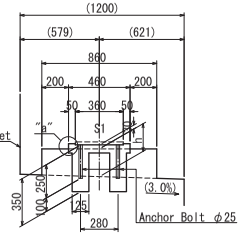


Shoe Bed Detail S=1:20

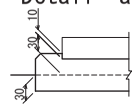
Plan



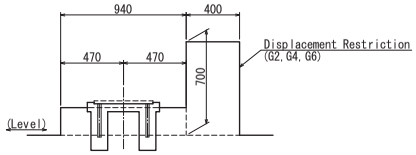
C – C
Longitudinal Direction



Detail "a" S=1:5



D – D
Transverse Direction



Height of Shoe Bed

	G6	G5	G4	G3	G2	G1
h1	180	196	202	205	206	196
h2	190	206	212	215	216	206
h3	196	212	218	221	222	212
h4	164	180	186	189	190	180
h5	170	186	192	195	196	186

AP6-15

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

P.W.D REFERENCE

CHECKED	APPROVED

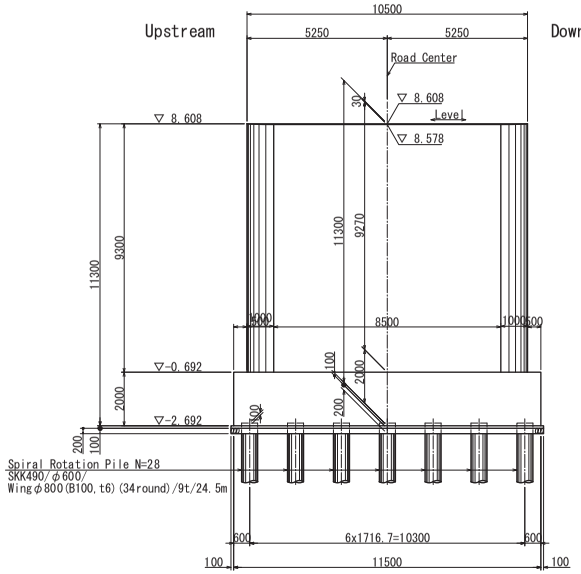
SCALE (A3 SIZE)

DRAWING NO. 15

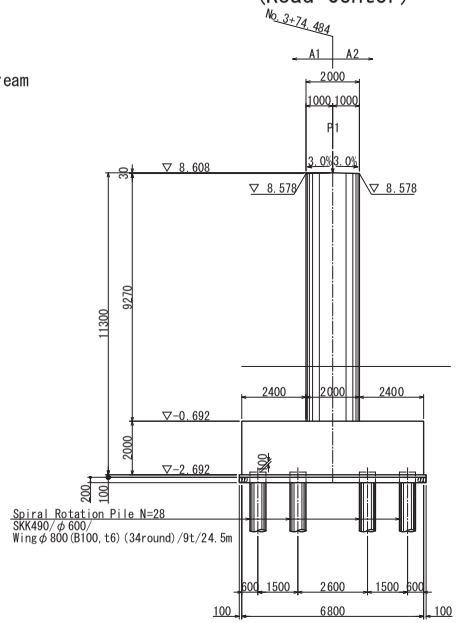
SHEET NO.

General View of P1 S=1:100
(F)

Front View

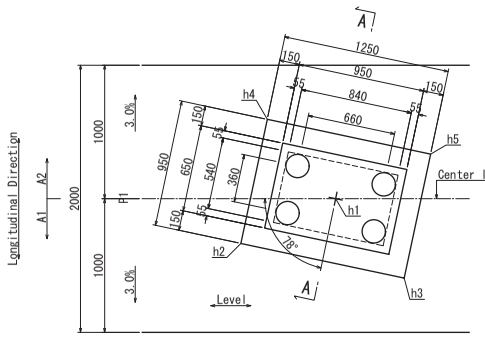


Side View (Road Center)

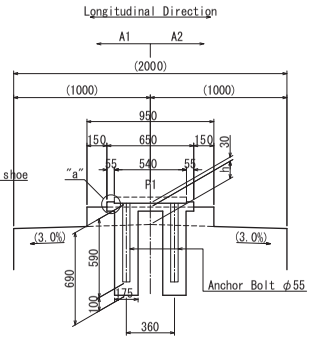


Shoe Bed Detail S=1:20

Plan



A - A



Height of Shoe Bed

	G1	G2	G3	G4	G5	G6
h1	123	130	127	124	122	110
h2	133	140	137	134	132	120
h3	141	148	145	142	140	128
h4	141	148	145	142	140	128
h5	133	140	137	134	132	120

Detail "a" S=1:5

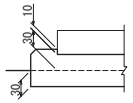
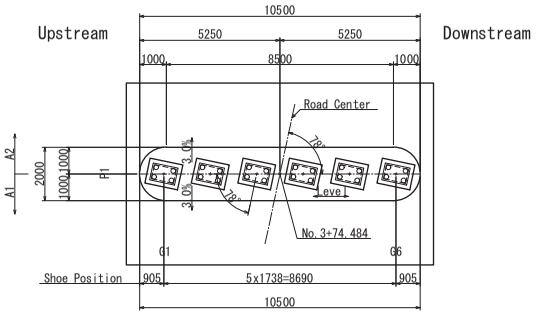


Table of Elevation

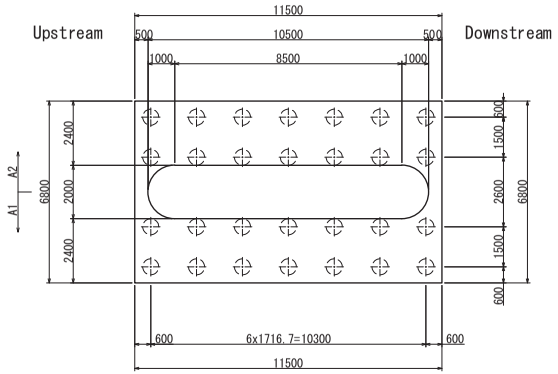
(Unit:m)

	P1					
	G1	G2	G3	G4	G5	G6
Road Elevation	10.556	10.592	10.629	10.626	10.585	10.543
THK of Conc Surfacing	0.023	0.061	0.101	0.101	0.062	0.023
THK of Slab	0.180	0.180	0.180	0.180	0.180	0.180
Height of Haunch	0.080	0.080	0.080	0.080	0.080	0.080
Elev. of top of FLG.	10.273	10.271	10.268	10.265	10.263	10.260
Girder height	1.200	1.200	1.200	1.200	1.200	1.200
THK of Low FLG.	0.039	0.030	0.030	0.030	0.030	0.039
THK of Sole Plate	0.026	0.026	0.026	0.026	0.026	0.026
Height of Shoe	0.247	0.247	0.247	0.247	0.247	0.247
Shoe Elevation	8.761	8.768	8.765	8.762	8.760	8.748
Height of Mortar	0.030	0.030	0.030	0.030	0.030	0.030
Height of Shoe Bed	0.123	0.130	0.127	0.124	0.122	0.110
Elevation of Bridge Seat	8.608	8.608	8.608	8.608	8.608	8.608
Superelevation	Level					

Plan of Shoe Position



Plan of Pile Cap



Design Conditions

Title	Specification
Superstructure	2 Span Continuous Non Composite Steel Girder
Substructure	Wall Type Pier
Shoe Type	Fix
Specified Concrite Strength	24 N/mm²
Re-Bar Grade	SD 345 (Japan Industrial Standards)
Splice Length	31.25φ
Max.Re-Bar Length	12m
Pile Type	Spiral Rotation Pile (NS Eco Spiral Pile) φ600

AP6-16

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

P.W.D REFERENCE

CHECKED	APPROVED

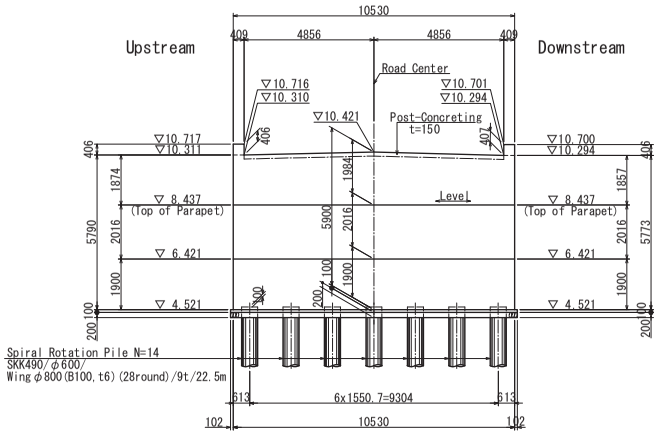
SCALE (A3 SIZE)

DRAWING NO. 16

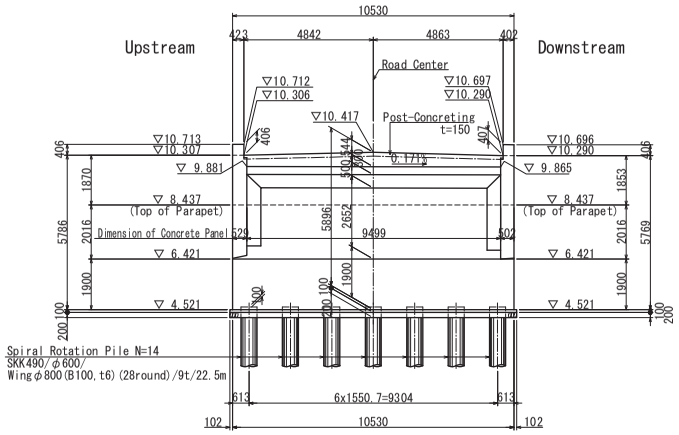
SHEET NO.

General View of A2 (1/2) S=1:100
(M)

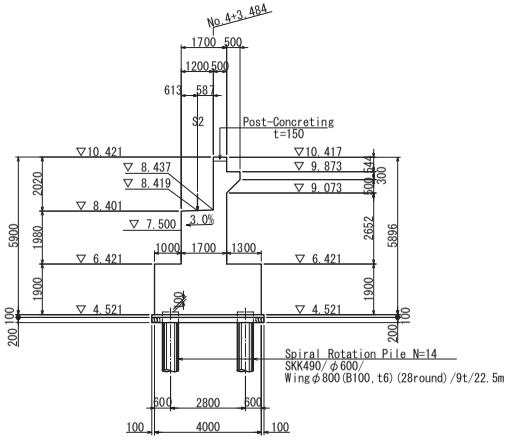
Front View



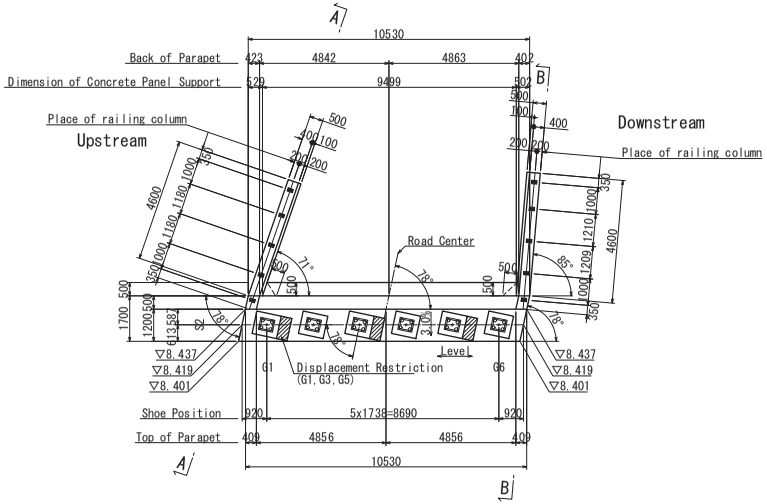
Back View



Side View (Road Center)



Plan of Shoe Position



Plan of Pile Cap

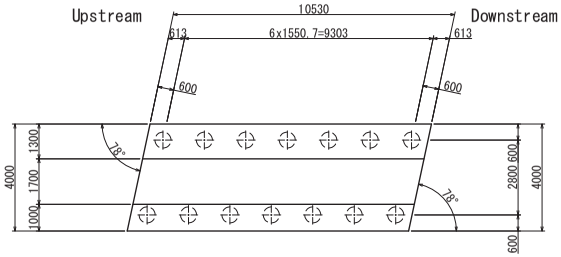


Table of Elevation

(Unit:m)

	A2(onS2)					
	G1	G2	G3	G4	G5	G6
Road Elevation	10.335	10.371	10.408	10.405	10.364	10.322
THK of Conc Surfacing	0.023	0.061	0.101	0.101	0.062	0.023
THK of Slab	0.180	0.180	0.180	0.180	0.180	0.180
Height of Haunch	0.080	0.080	0.080	0.080	0.080	0.080
Elev. of top of FLG.	10.052	10.050	10.047	10.044	10.042	10.039
Girder height	1.200	1.200	1.200	1.200	1.200	1.200
THK of Low FLG.	0.028	0.015	0.013	0.013	0.015	0.028
THK of Sole Plate	0.026	0.026	0.026	0.026	0.026	0.026
Height of Shoe	0.166	0.166	0.166	0.166	0.166	0.166
Shoe Elevation	8.632	8.643	8.642	8.639	8.635	8.619
Height of Mortar	0.030	0.030	0.030	0.030	0.030	0.030
Height of Shoe Bed	0.183	0.194	0.193	0.190	0.186	0.170
Elevation of Bridge Seat	8.419	8.419	8.419	8.419	8.419	8.419
Superelevation	Level					

Design Conditions

Title	Specification
Superstructure	2 Span Continuous Non Composite Steel Girder
Substructure	T-Conversely Abutment
Shoe Type	Mov
Specified Concrite Strength	24 N/mm²
Re-Bar Grade	SD 345 (Japan Industrial Standards)
Splice Length	31.25φ
Max.Re-Bar Length	12m
Pile Type	Spiral Rotation Pile (NS Eco Spiral Pile) φ600

AP6-17

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

P.W.D REFERENCE

CHECKED	APPROVED

SCALE (A3 SIZE)

DRAWING NO. 17

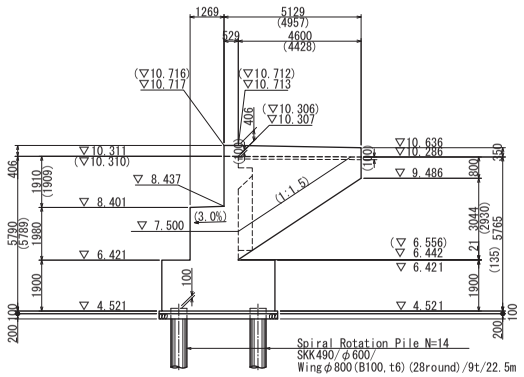
SHEET NO.

General View of A2 (2/2) S=1:100

(M)

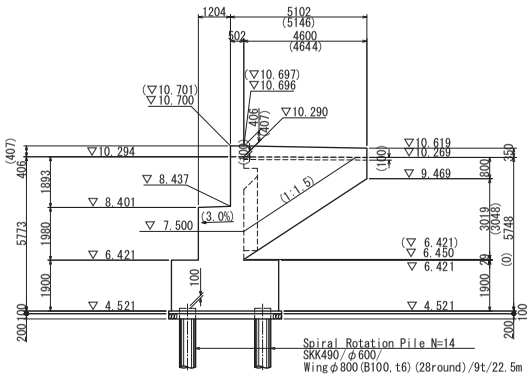
Wing Wall (Upstream)
A – A

Note) ( ) shows inside dimension.

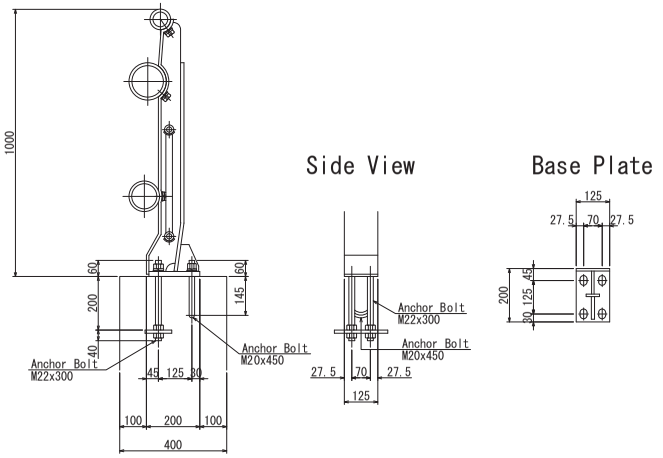


Wing Wall (Downstream)
B – B

Note) ( ) shows inside dimension.

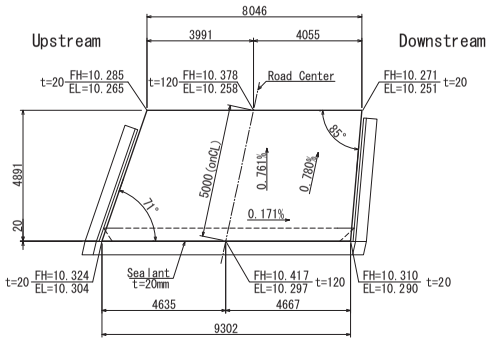


Railing Detail S=1:10

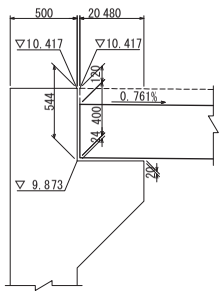


Plan of Approach Slab
(t=400)

Note) Elev. of Road Surface FH / Elev. of Arroach Slab Surface EL — t=Thickness of Pavement

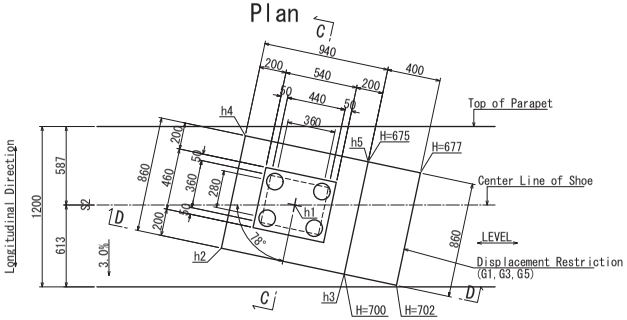


Support Detail S=1:20



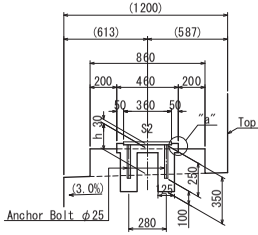
Shoe Bed Detail S=1:20

Plan

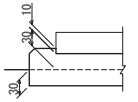


C – C

Longitudinal Direction

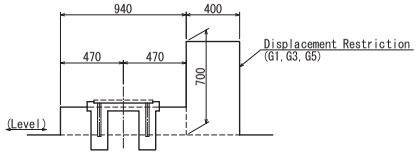


Detail "a"



D – D

Transverse Direction

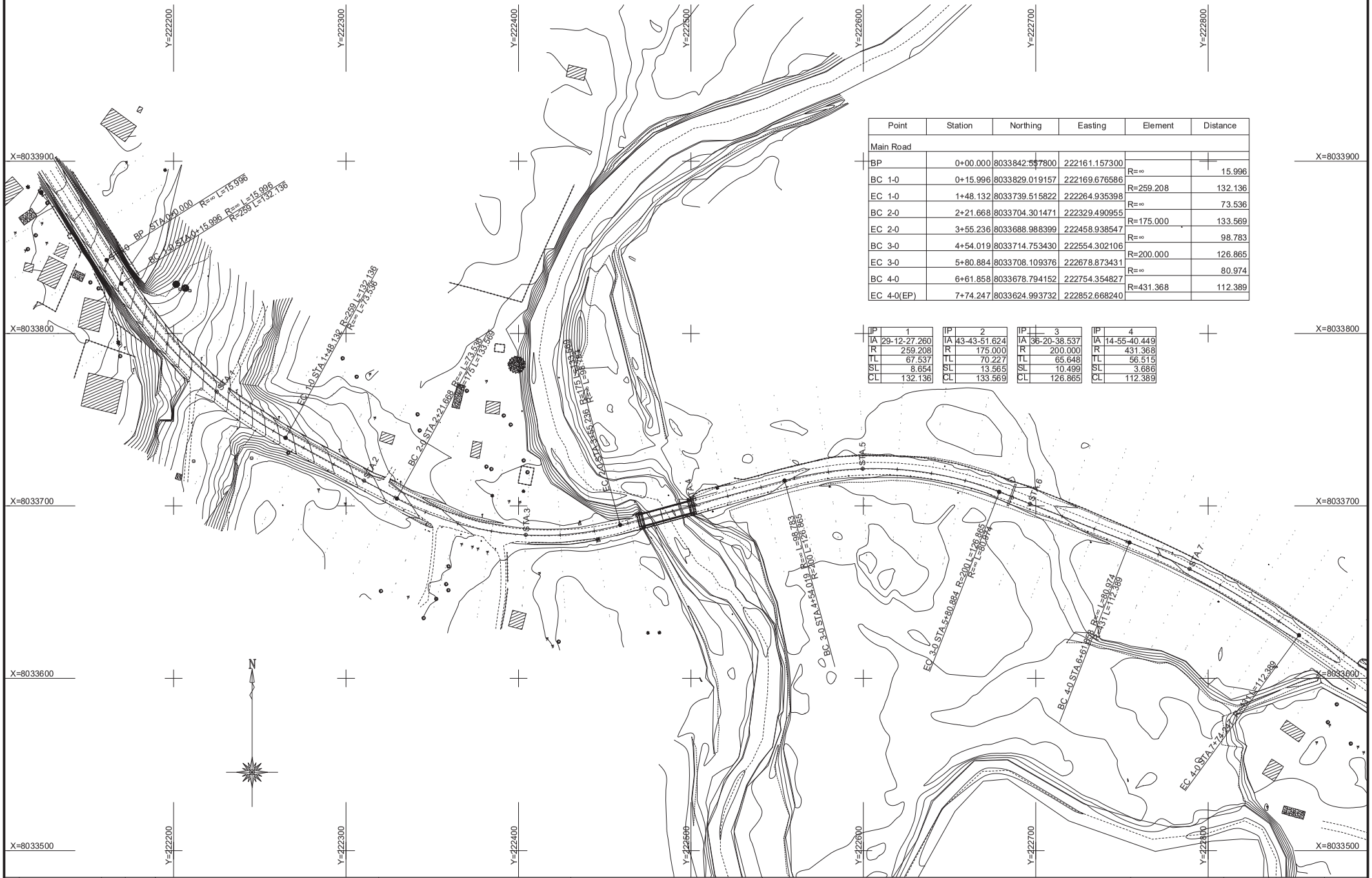


Height of Shoe Bed

	G1	G2	G3	G4	G5	G6
h1	183	194	193	190	186	170
h2	193	204	203	200	196	180
h3	199	210	209	206	202	186
h4	167	178	177	174	170	154
h5	173	184	183	180	176	160

AP6-18

REV	DESCRIPTION	BY	DATE		PROJECT:	DESCRIPTION:	CONSULTANTS REFERENCE			P.W.D REFERENCE		SCALE	DRAWING NO.	SHEET NO.
				REPUBLIC OF VANUATU PUBLIC WORKS DEPARTMENT MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES	PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU		CTI ENGINEERING INTERNATIONAL CO., LTD. KOKUSAI KOGYO CO., LTD.	DRAWN	CHECKED / APPROVED	CHECKED	APPROVED	(A3 SIZE)	18	



Point	Station	Northing	Easting	Element	Distance
Main Road					
BP	0+00.000	8033842.557800	222161.157300		
				R=∞	15.996
BC 1-0	0+15.996	8033829.019157	222169.676586		
				R=259.208	132.136
EC 1-0	1+48.132	8033739.515822	222264.935398		
				R=∞	73.536
BC 2-0	2+21.668	8033704.301471	222329.490955		
				R=175.000	133.569
EC 2-0	3+55.236	8033688.988399	222458.938547		
				R=∞	98.783
BC 3-0	4+54.019	8033714.753430	222554.302106		
				R=200.000	126.865
EC 3-0	5+80.884	8033708.109376	222678.873431		
				R=∞	80.974
BC 4-0	6+61.858	8033678.794152	222754.354827		
				R=431.368	112.389
EC 4-0(EP)	7+74.247	8033624.993732	222852.668240		

IP	1
IA	29-12-27.260
R	259.208
TL	67.537
SL	8.654
CL	132.136

IP	2
IA	43-43-51.624
R	175.000
TL	70.227
SL	13.565
CL	133.569

IP	3
IA	36-20-38.537
R	200.000
TL	65.648
SL	10.499
CL	126.865

IP	4
IA	14-55-40.449
R	431.368
TL	56.515
SL	3.686
CL	112.389

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

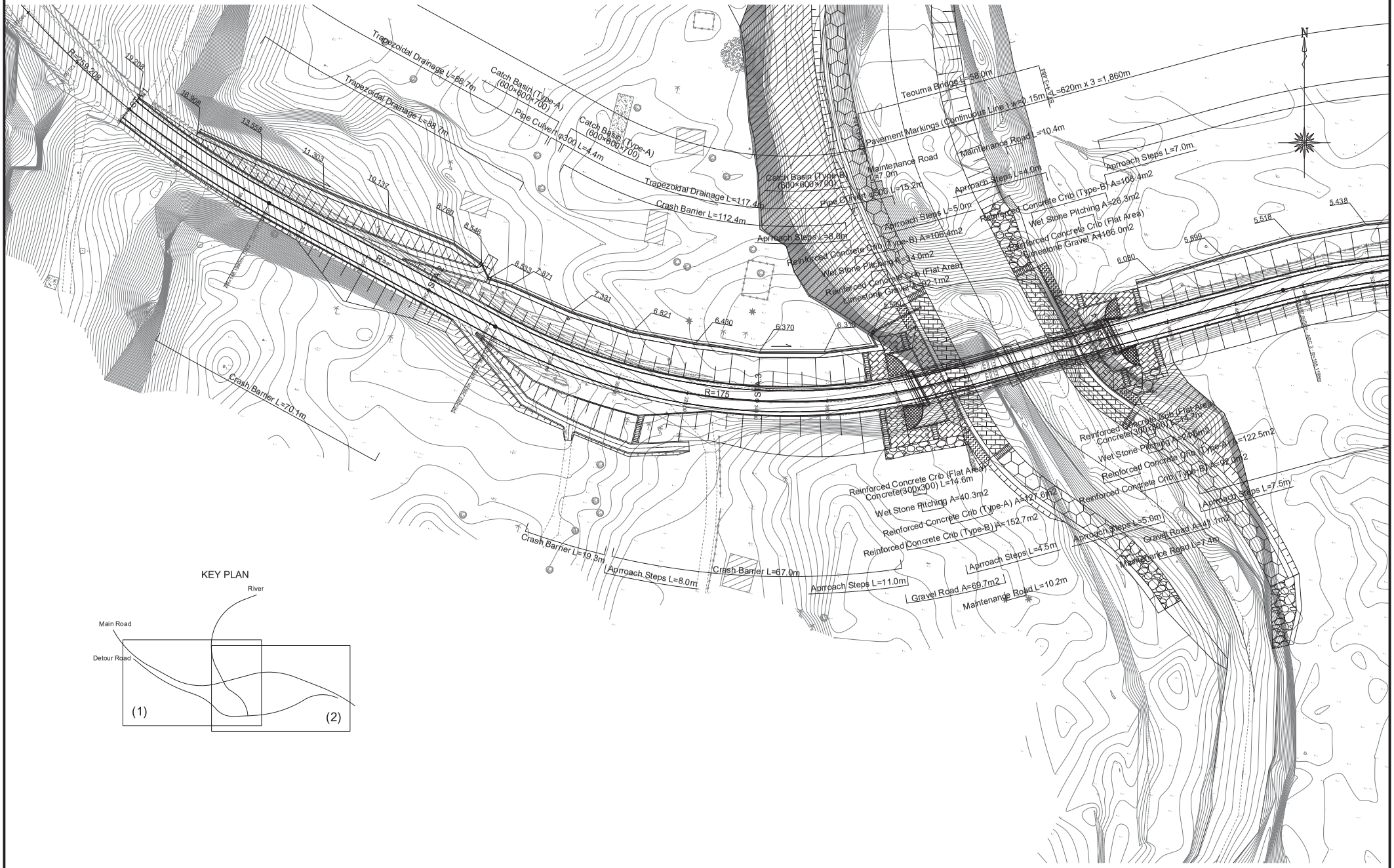
PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
MAIN ROAD ALIGNMENT

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED	SCALE (A3 SIZE)	DRAWING NO.	SHEET NO.
					1:2000	19	

AP6-20



REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
PLAN(1)
(MAIN ROAD)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

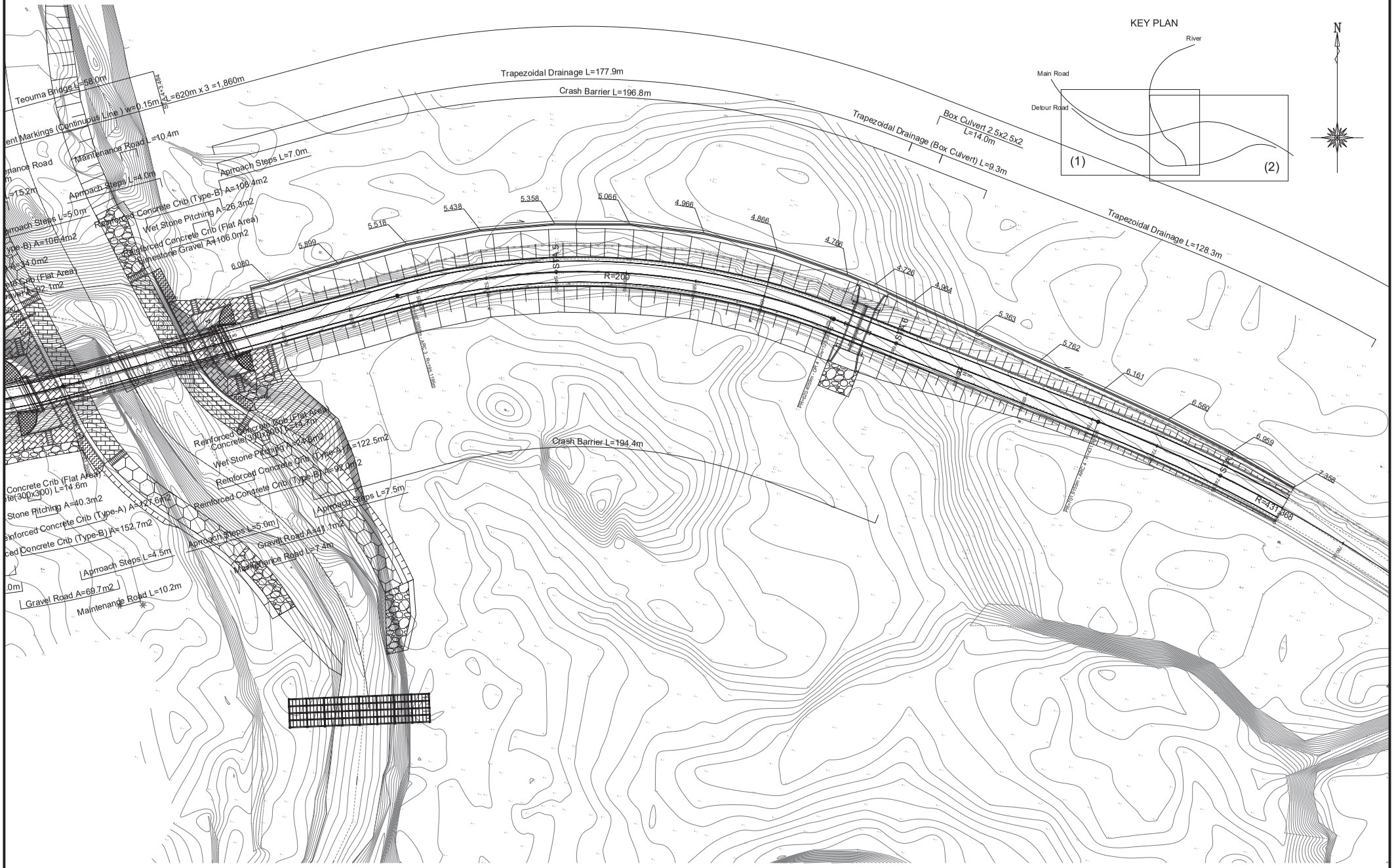
P.W.D REFERENCE

CHECKED	APPROVED

SCALE (A3 SIZE)
1:1000

DRAWING NO.
20

SHEET NO.



AP6-21

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
PLAN(2)
(MAIN ROAD)

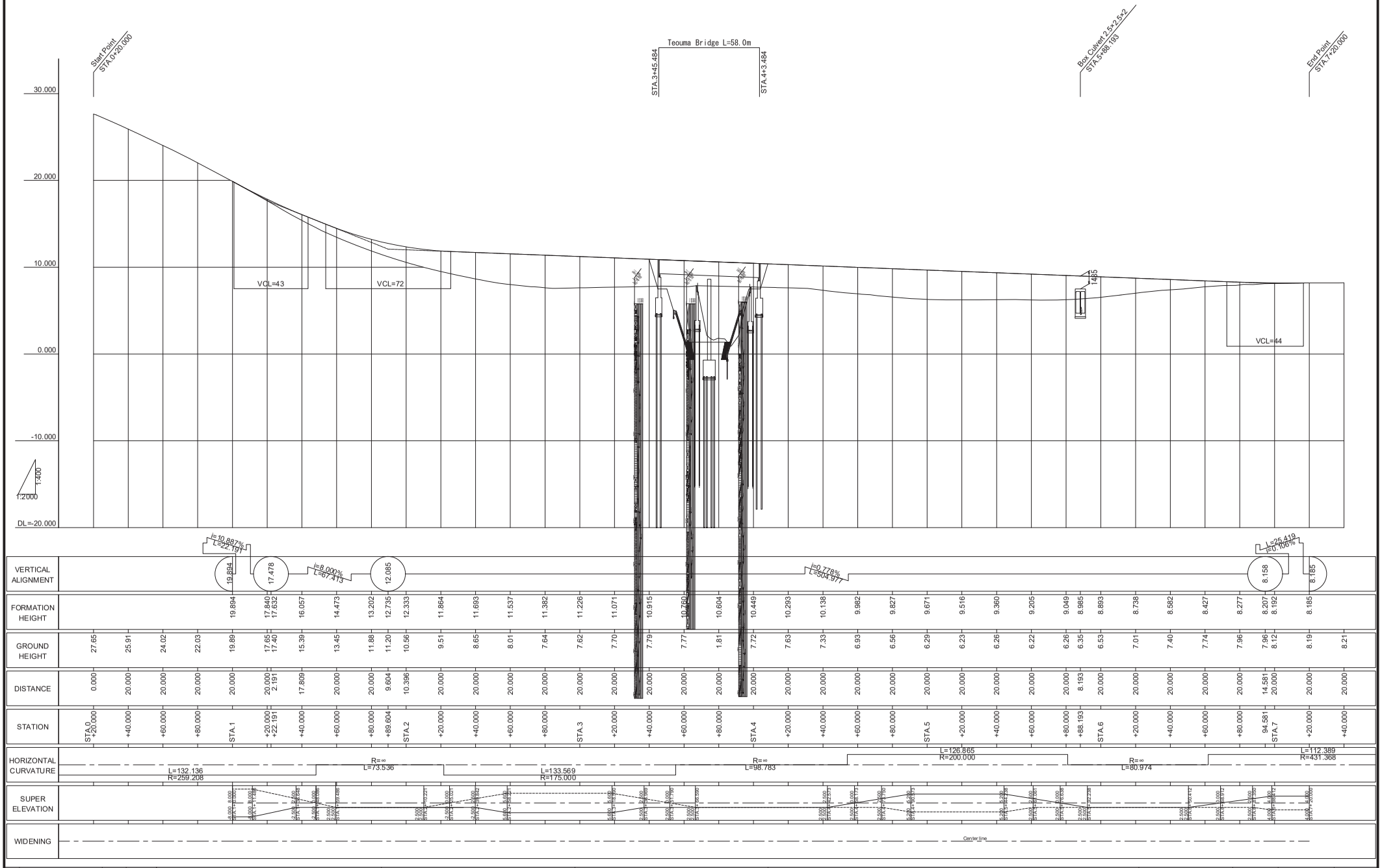
CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED

SCALE (A3 SIZE): 1:1000

DRAWING NO.: 21

SHEET NO.:



REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
PROFILE
(MAIN ROAD)

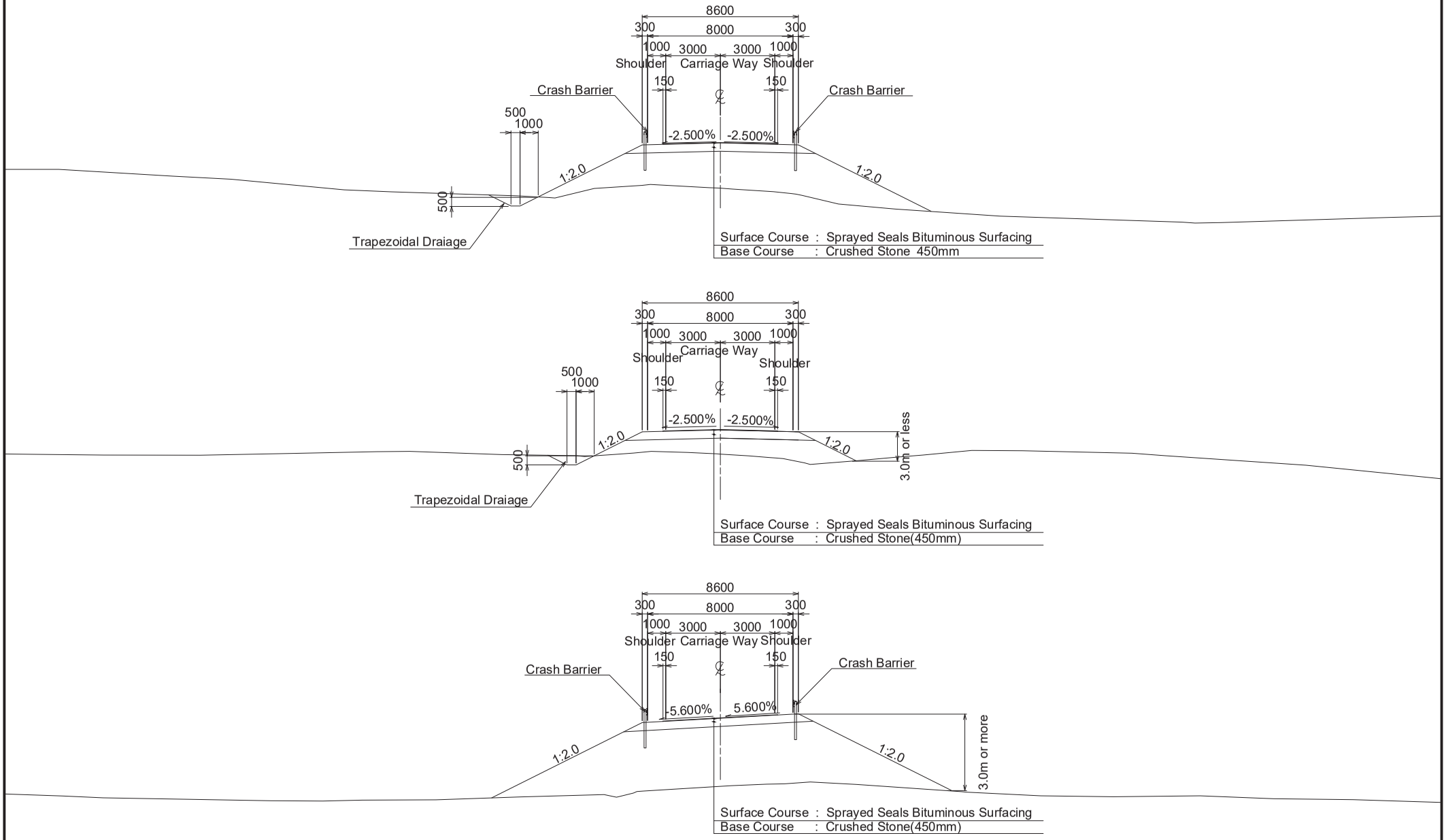
CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED

SCALE (A3 SIZE)
V=1:400
H=1:2,000

DRAWING NO.
22

SHEET NO.



REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
TYPICAL CROSS SECTION

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

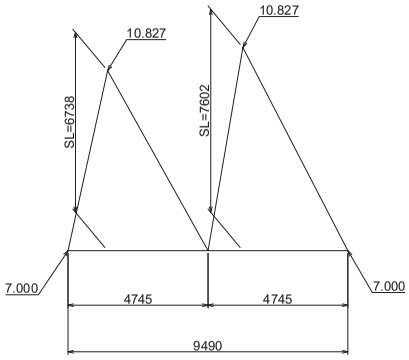
P.W.D REFERENCE

CHECKED	APPROVED

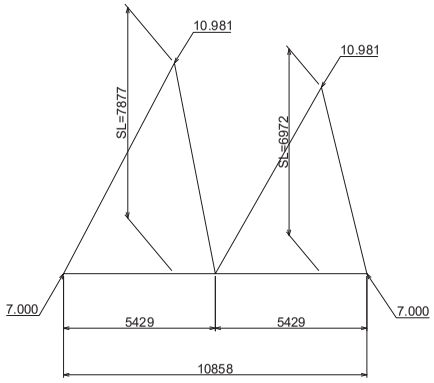
SCALE (A3 SIZE): 1:200

DRAWING NO.: 23

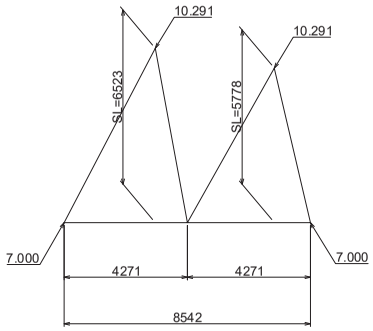
SHEET NO.:



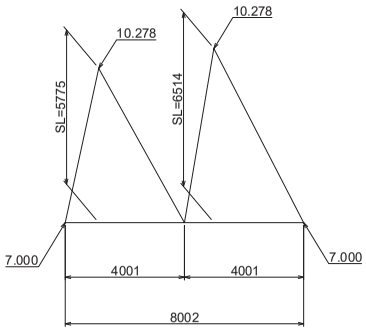
Wet Stone Pitching (1)



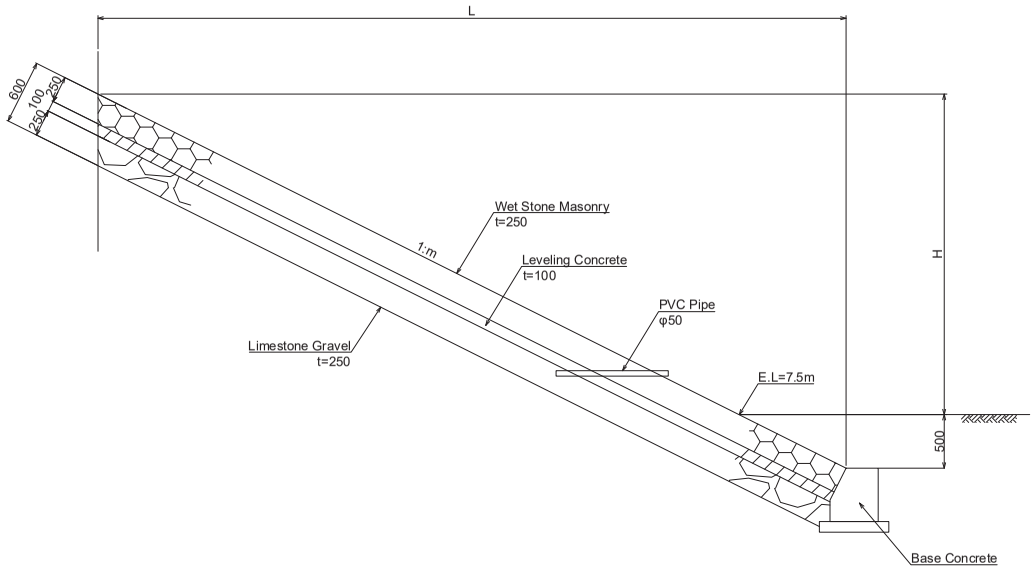
Wet Stone Pitching (2)



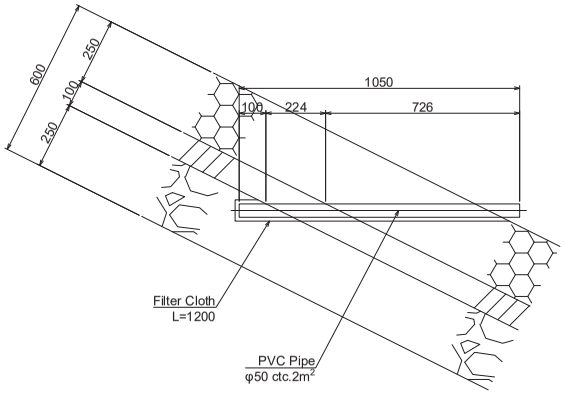
Wet Stone Pitching (3)



Wet Stone Pitching (4)

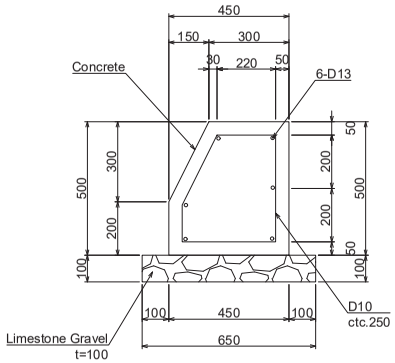


Side View S=1:50



Development View S=1:200

Detail of PVC Pipe Drain S=1:20



Detail of Base Concrete S=1:20

AP6-24

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
WET STONE PITCHING

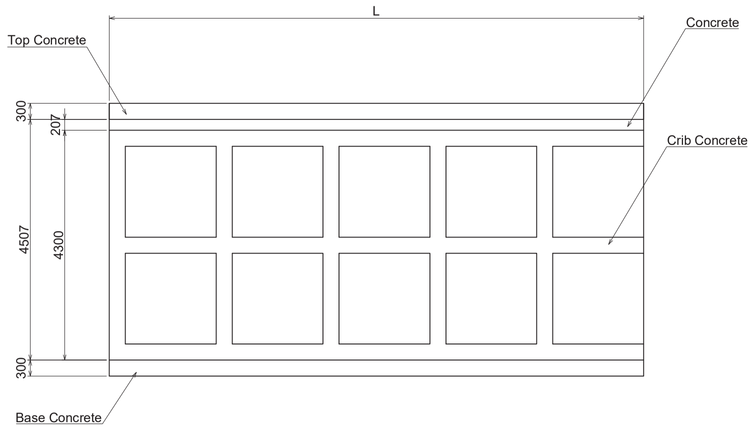
CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED

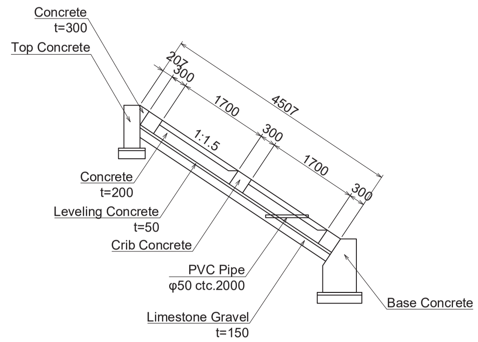
SCALE (A3 SIZE): AS SHOWN

DRAWING NO.: 24

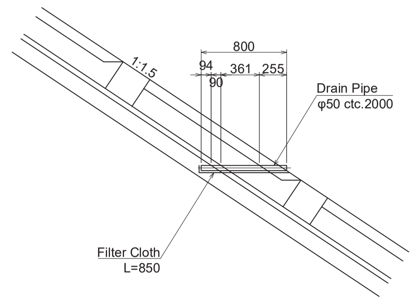
SHEET NO.:



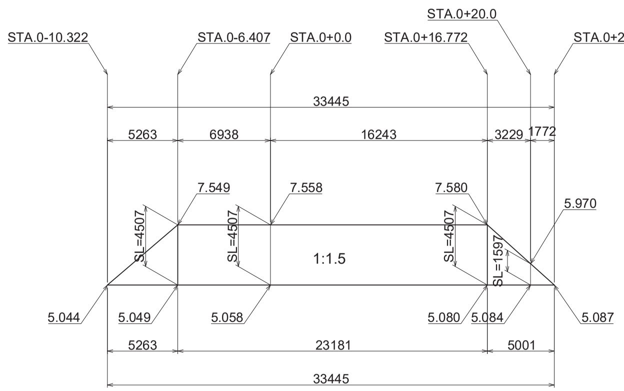
Plan S=1:100



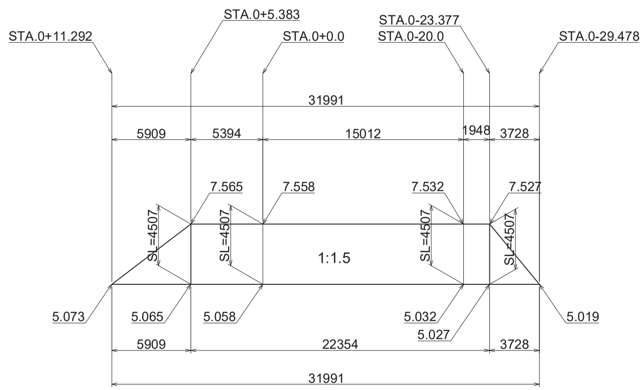
Side View S=1:100



Detail of Drain Pipe S=1:50

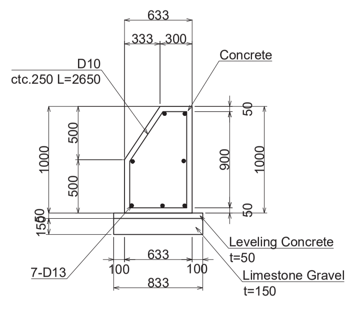


RCC (1)

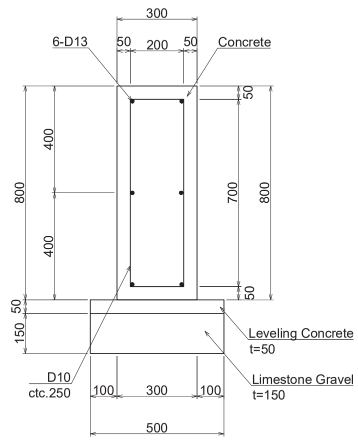


RCC(2)

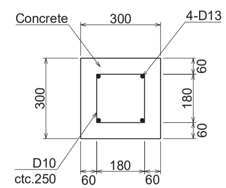
Development View S=1:400



Detail of Base Concrete S=1:50

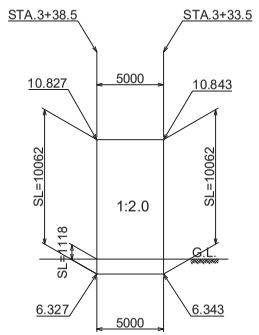


Detail of Top Concrete S=1:20

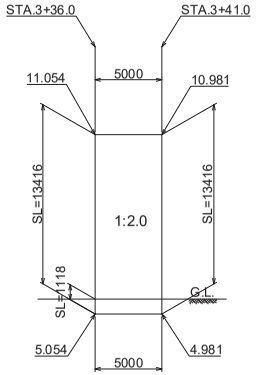


Detail of Crib Concrete S=1:20

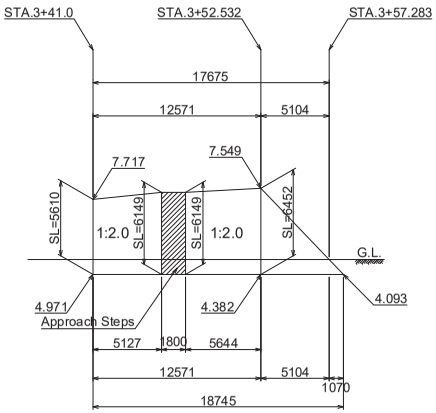
REV	DESCRIPTION	BY	DATE		PROJECT:	DESCRIPTION:	CONSULTANTS REFERENCE	P.W.D REFERENCE	SCALE	DRAWING NO.	SHEET NO.
				REPUBLIC OF VANUATU PUBLIC WORKS DEPARTMENT MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES	PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU	REINFORCED CONCRETE CRIB (TYPE-A)	CTI ENGINEERING INTERNATIONAL CO., LTD. KOKUSAI KOGYO CO., LTD. DRAWN / CHECKED / APPROVED	CHECKED / APPROVED	(A3 SIZE) AS SHOWN	25	



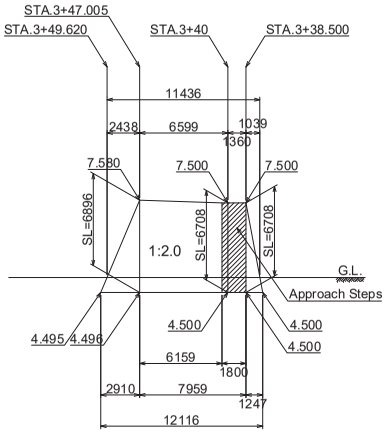
RCC (3)



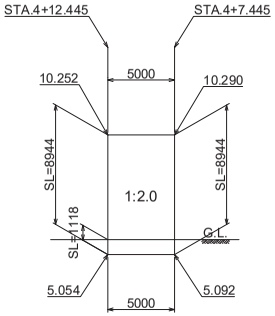
RCC (4)



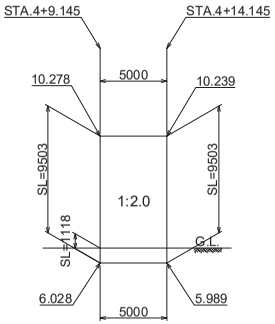
RCC (5)



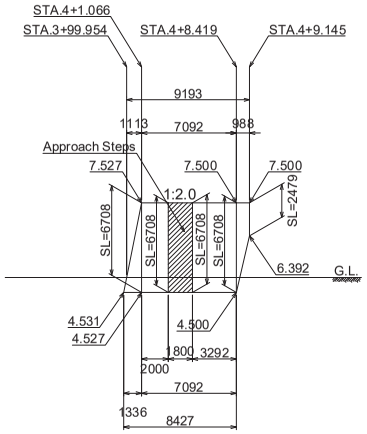
RCC (6)



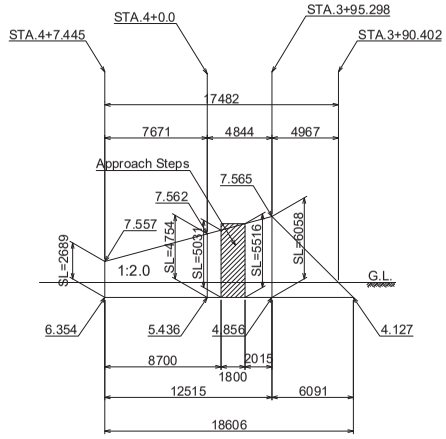
RCC (7)



RCC (8)



RCC (9)



RCC (10)

Development View S=1:400

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
REINFORCED CONCRETE CRIB (TYPE-B) (1)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

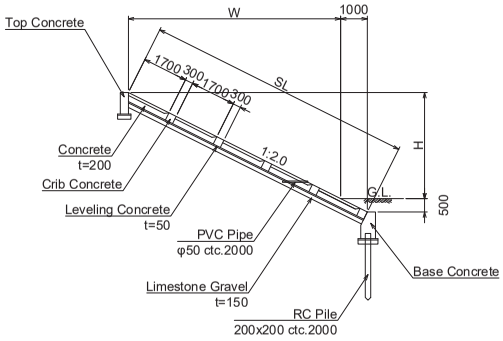
P.W.D REFERENCE

CHECKED	APPROVED

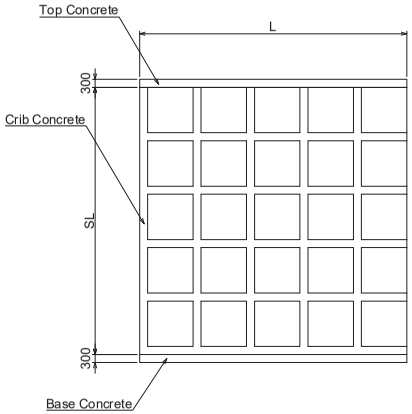
SCALE (A3 SIZE): AS SHOWN

DRAWING NO.: 26

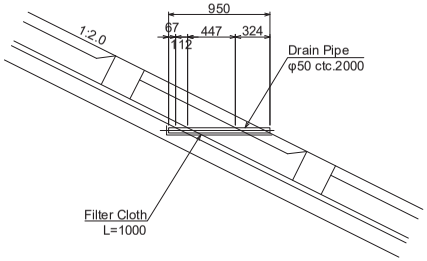
SHEET NO.:



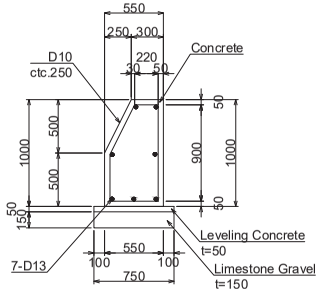
Side View S=1:200



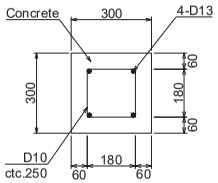
Plan S=1:200



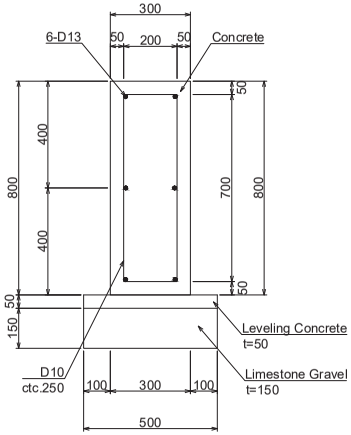
Detail of Drain Pipe S=1:50



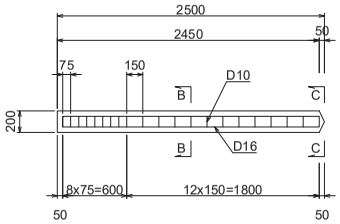
Detail of Base Concrete S=1:50



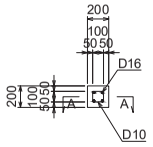
Detail of Crib Concrete S=1:20



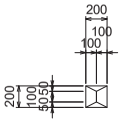
Detail of Top Concrete S=1:20



Section A - A



Section B - B



Section C - C

Detail of RC Pile S=1:50

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
REINFORCED CONCRETE CRIB (TYPE-B) (2)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

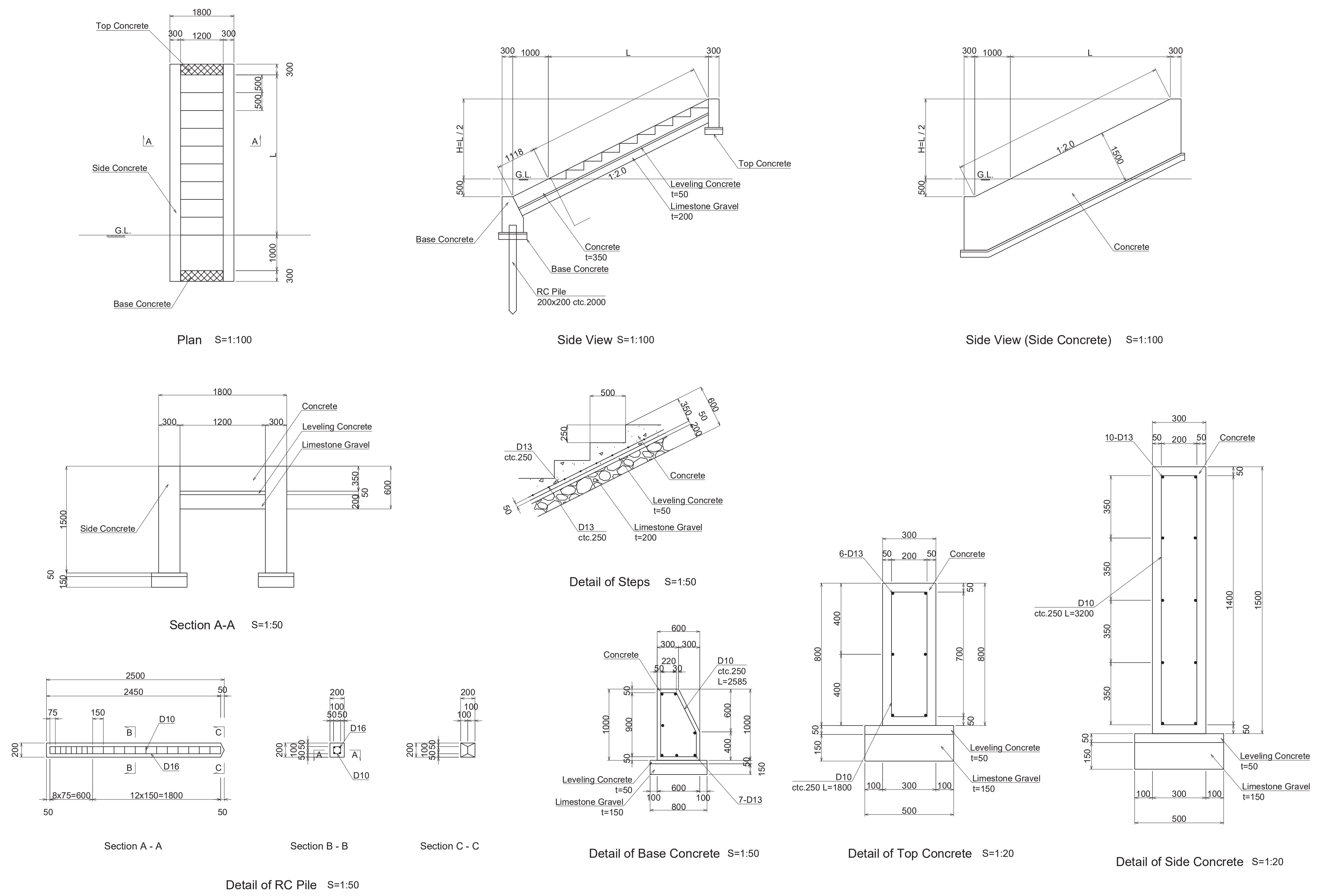
P.W.D REFERENCE

CHECKED	APPROVED

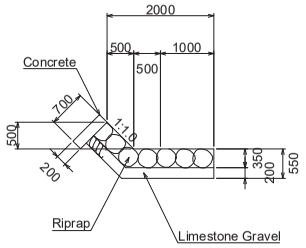
SCALE (A3 SIZE)
AS SHOWN

DRAWING NO.
27

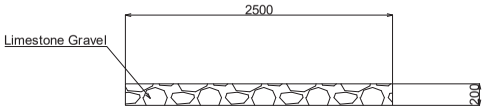
SHEET NO.



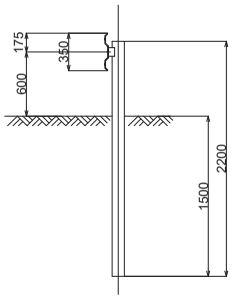
REV	DESCRIPTION	BY	DATE		PROJECT:	DESCRIPTION:	CONSULTANTS REFERENCE		P.W.D REFERENCE	SCALE	DRAWING NO.	SHEET NO.
				REPUBLIC OF VANUATU PUBLIC WORKS DEPARTMENT MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES	PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU	APPROACH STEPS AT ROAD EMBANKMENT	CTI ENGINEERING INTERNATIONAL CO., LTD. KOKUSAI KOGYO CO., LTD.	DRAWN / CHECKED / APPROVED	CHECKED / APPROVED	(A3 SIZE) AS SHOWN	28	



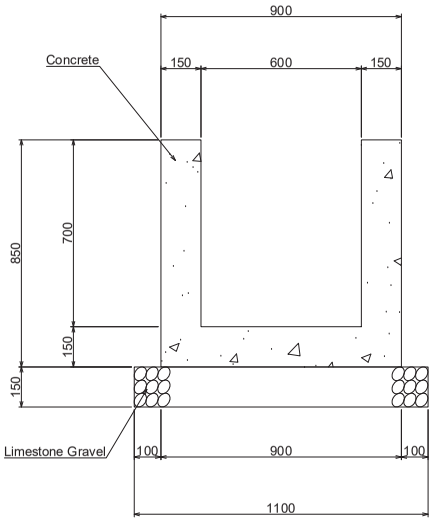
Trapezoidal Drainage at Box Culvert S=1:100



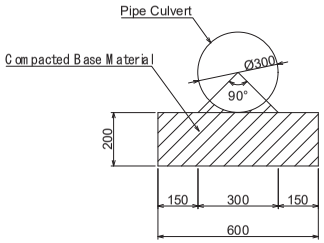
Maintenance Road S=1:50



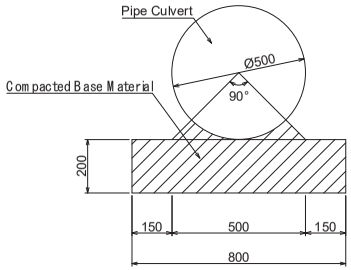
Crash Barrier S=1:50



Catch Basin (600x600x700) S=1:20



Pipe Culvert φ300 S=1:20



Pipe Culvert φ500 S=1:20

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
STRUCTURE

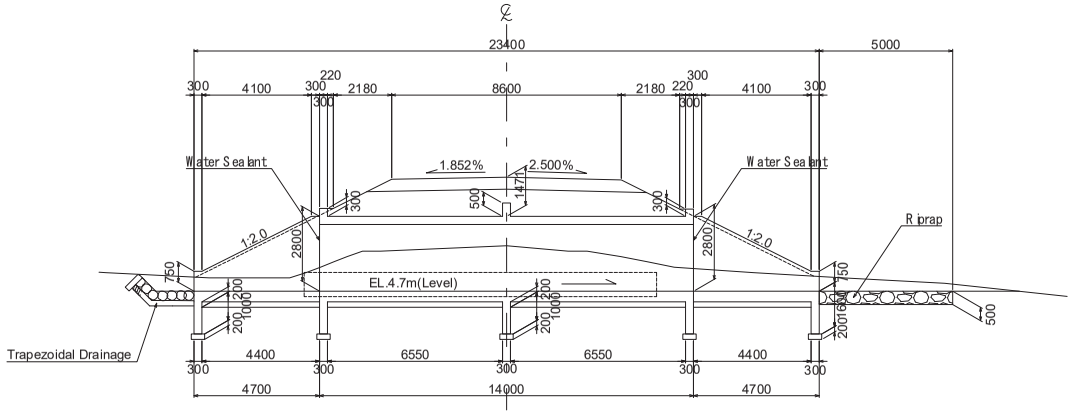
CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED

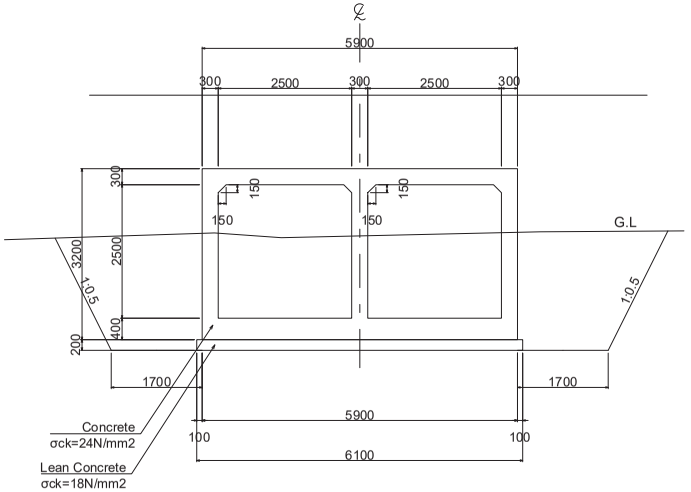
SCALE (A3 SIZE): AS SHOWN

DRAWING NO.: 29

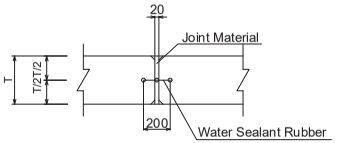
SHEET NO.:



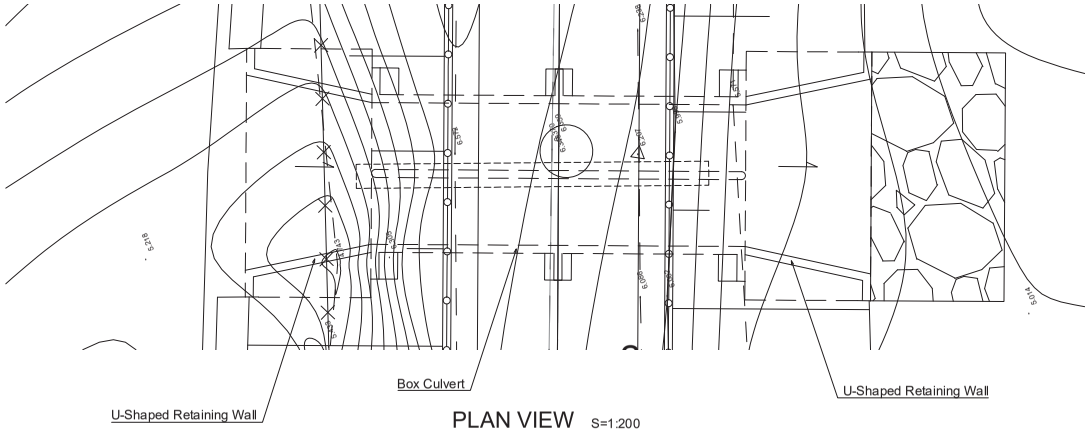
SIDE VIEW S=1:200



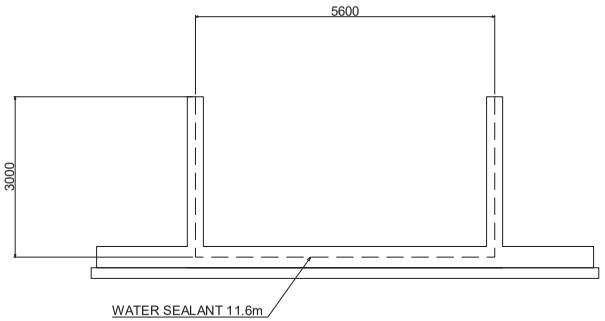
STANDARD SECTION OF BOX CULVERT S=1:100



DETAIL OF WATER SEALANT S=1:40



PLAN VIEW S=1:200



JOINT SECTION S=1:100

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
GENERAL VIEW OF BOX CULVERT (1)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

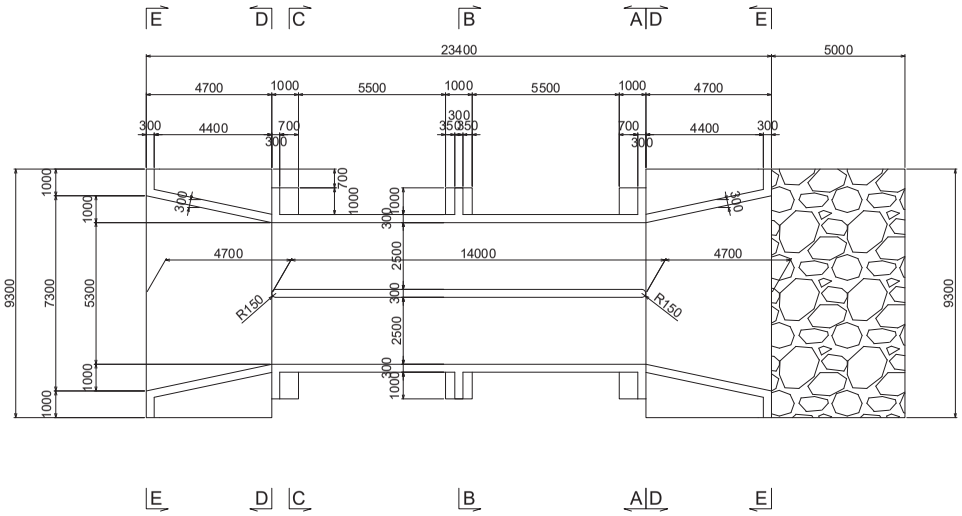
P.W.D REFERENCE

CHECKED	APPROVED

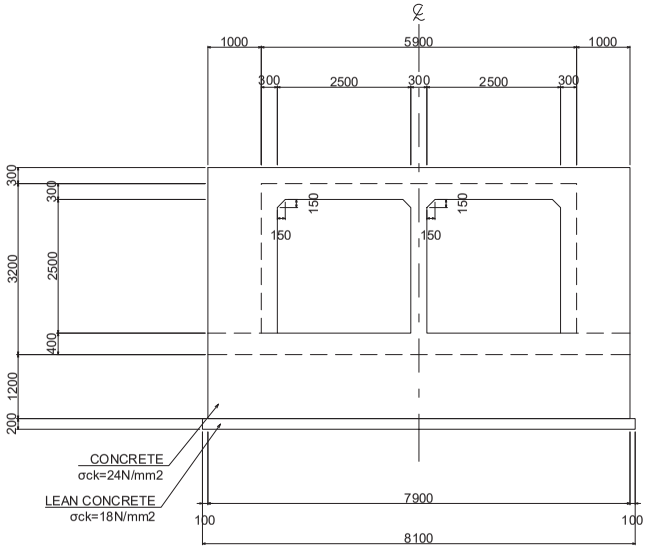
SCALE (A3 SIZE): AS SHOWN

DRAWING NO.: 30

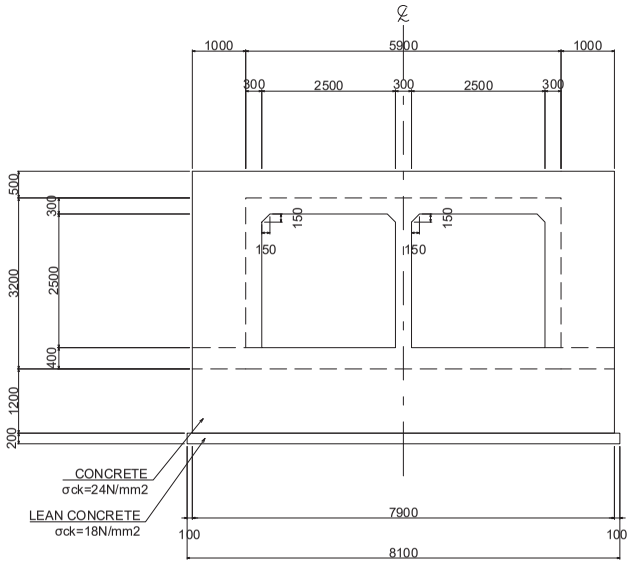
SHEET NO.:



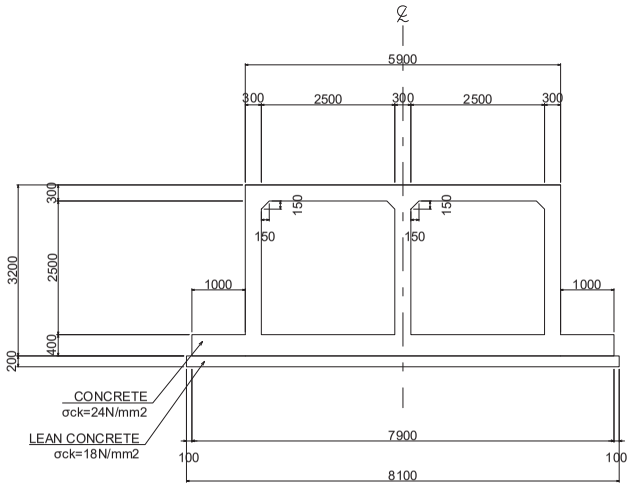
PLAN S=1:200



A-A SECTION S=1:100



B-B SECTION S=1:100



C-C SECTION S=1:100

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
GENERAL VIEW OF BOX CULVERT (2)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED

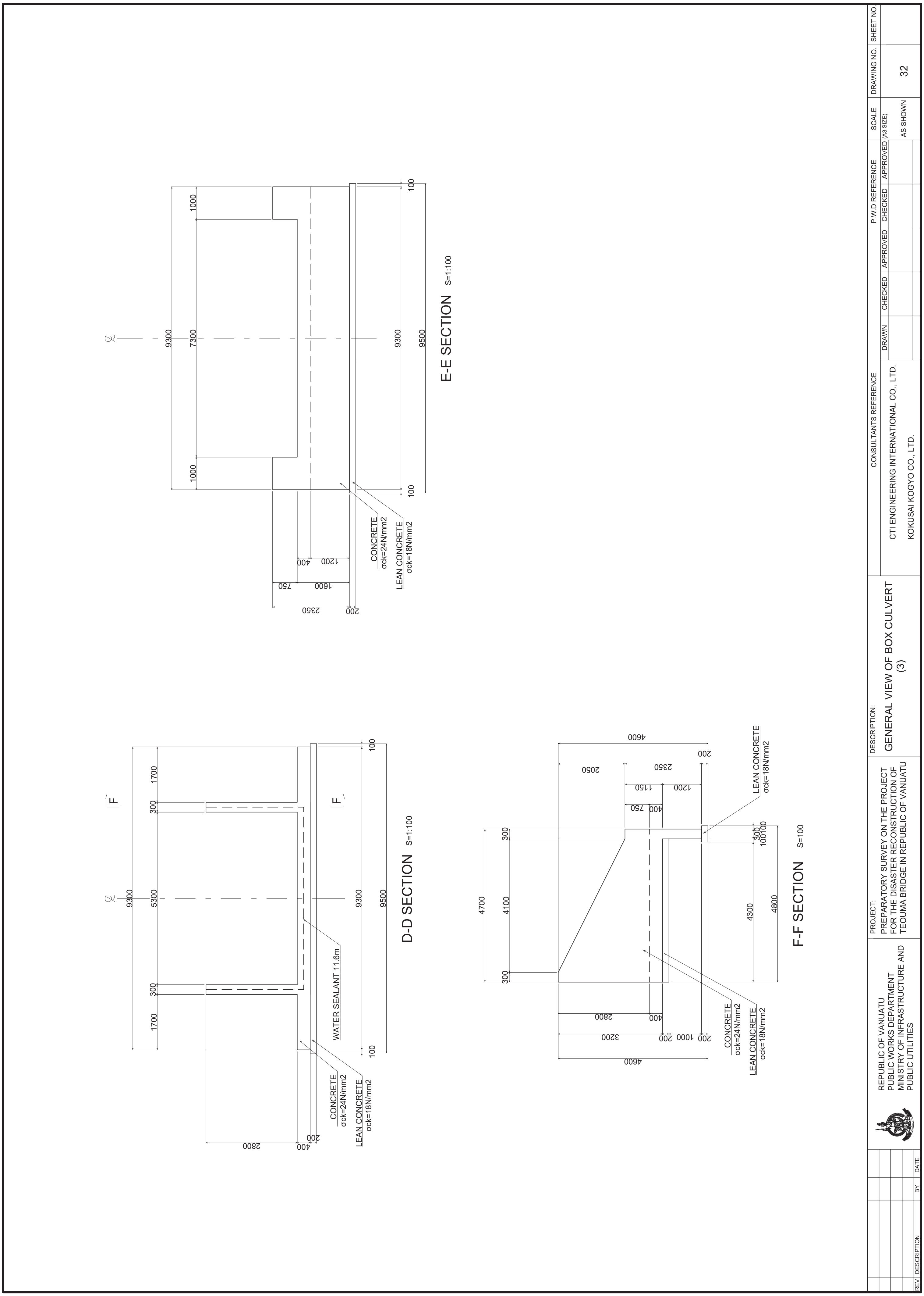
P.W.D REFERENCE

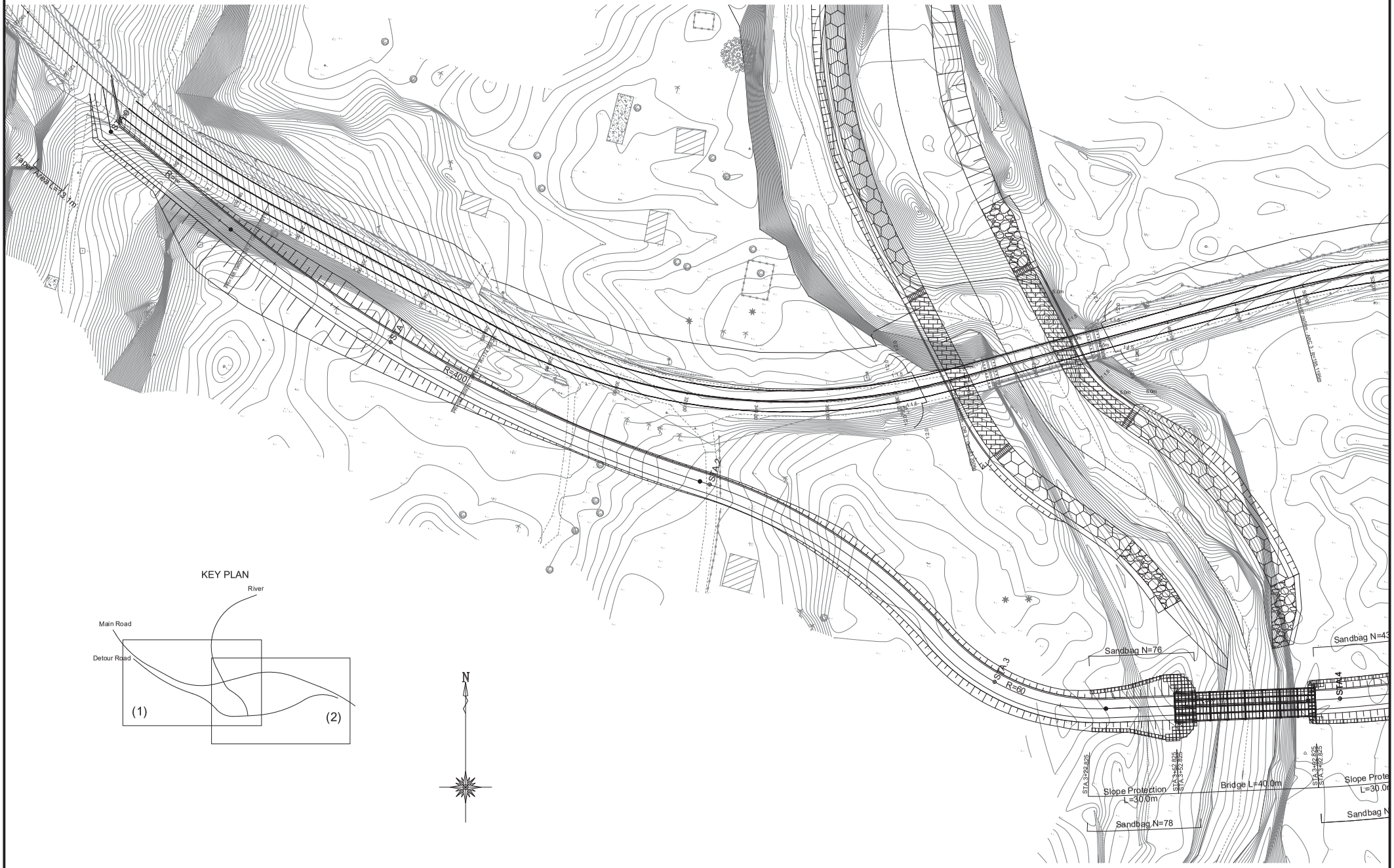
CHECKED	APPROVED

SCALE (A3 SIZE): AS SHOWN

DRAWING NO.: 31

SHEET NO.:


E-E SECTION S=1:100
D-D SECTION S=1:100
F-F SECTION S=100
CONCRETE σck=24N/mm2
LEAN CONCRETE σck=18N/mm2
WATER SEALANT 11.6m
9300
7300
9500
1000
100
2350
200
750
1600
400
1200
5300
1700
300
2800
4600
2050
1150
4700
4100
4300
4800
3200
1000
REV DESCRIPTION BY DATE
REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES
PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU
DESCRIPTION:
GENERAL VIEW OF BOX CULVERT (3)
CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.
DRAWN
CHECKED
APPROVED
P.W.D REFERENCE
CHECKED
APPROVED
SCALE (A3 SIZE)
AS SHOWN
DRAWING NO.
32
SHEET NO.



REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
PLAN(1)
(DETOUR ROAD)

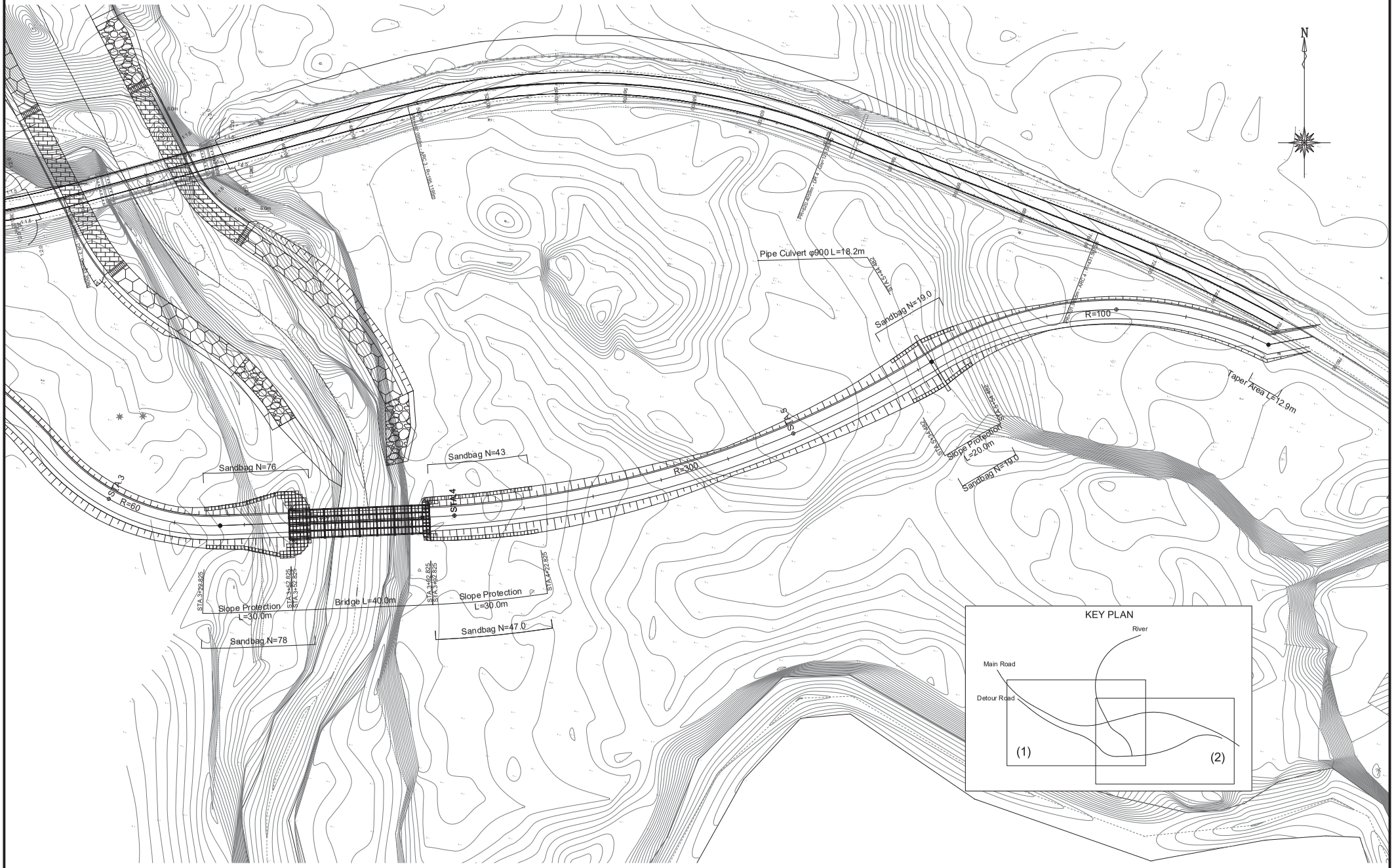
CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED

SCALE (A3 SIZE): 1:1000

DRAWING NO.: 33

SHEET NO.:



REV	DESCRIPTION	BY	DATE

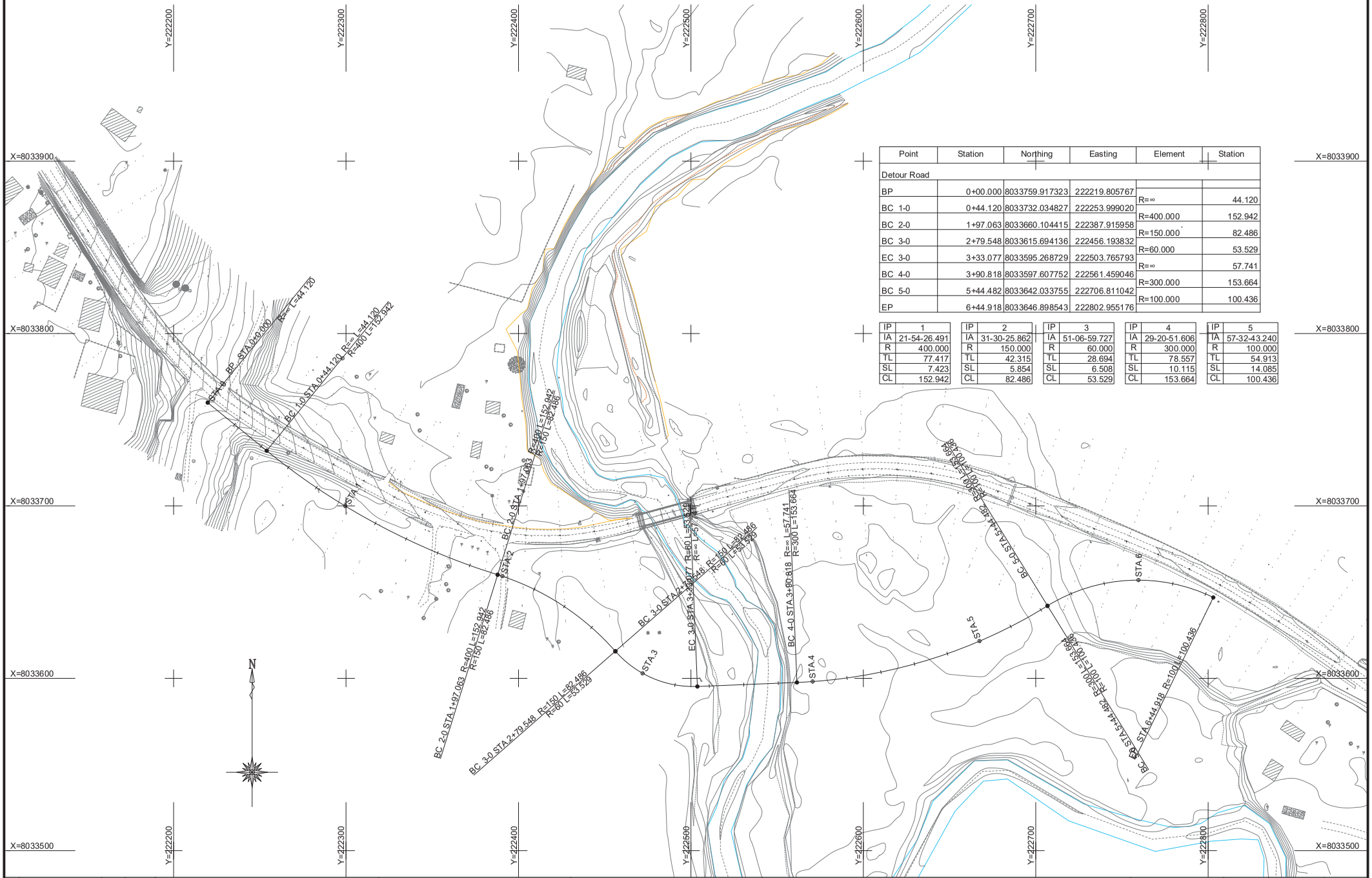
REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
PLAN(2)
(DETOUR ROAD)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED	SCALE (A3 SIZE)	DRAWING NO.	SHEET NO.
					1:1000	34	



Point	Station	Northing	Easting	Element	Station
Detour Road					
BP	0+00.000	8033759.917323	222219.805767		
BC 1-0	0+44.120	8033732.034827	222253.999020	R=∞	44.120
BC 2-0	1+97.063	8033660.104415	222387.915958	R=400.000	152.942
BC 3-0	2+79.548	8033615.694136	222456.193832	R=150.000	82.486
EC 3-0	3+33.077	8033595.268729	222503.765793	R=60.000	53.529
BC 4-0	3+90.818	8033597.607752	222561.459046	R=∞	57.741
BC 5-0	5+44.482	8033642.033755	222706.811042	R=300.000	153.664
EP	6+44.918	8033646.898543	222802.955176	R=100.000	100.436

IP	1
IA	21-54-26.491
R	400.000
TL	77.417
SL	7.423
CL	152.942

IP	2
IA	31-30-25.862
R	150.000
TL	42.315
SL	5.854
CL	82.486

IP	3
IA	51-06-59.727
R	60.000
TL	28.694
SL	6.508
CL	53.529

IP	4
IA	29-20-51.606
R	300.000
TL	78.557
SL	10.115
CL	153.664

IP	5
IA	57-32-43.240
R	100.000
TL	54.913
SL	14.085
CL	100.436

REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
DETOUR ROAD ALIGNMENT

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

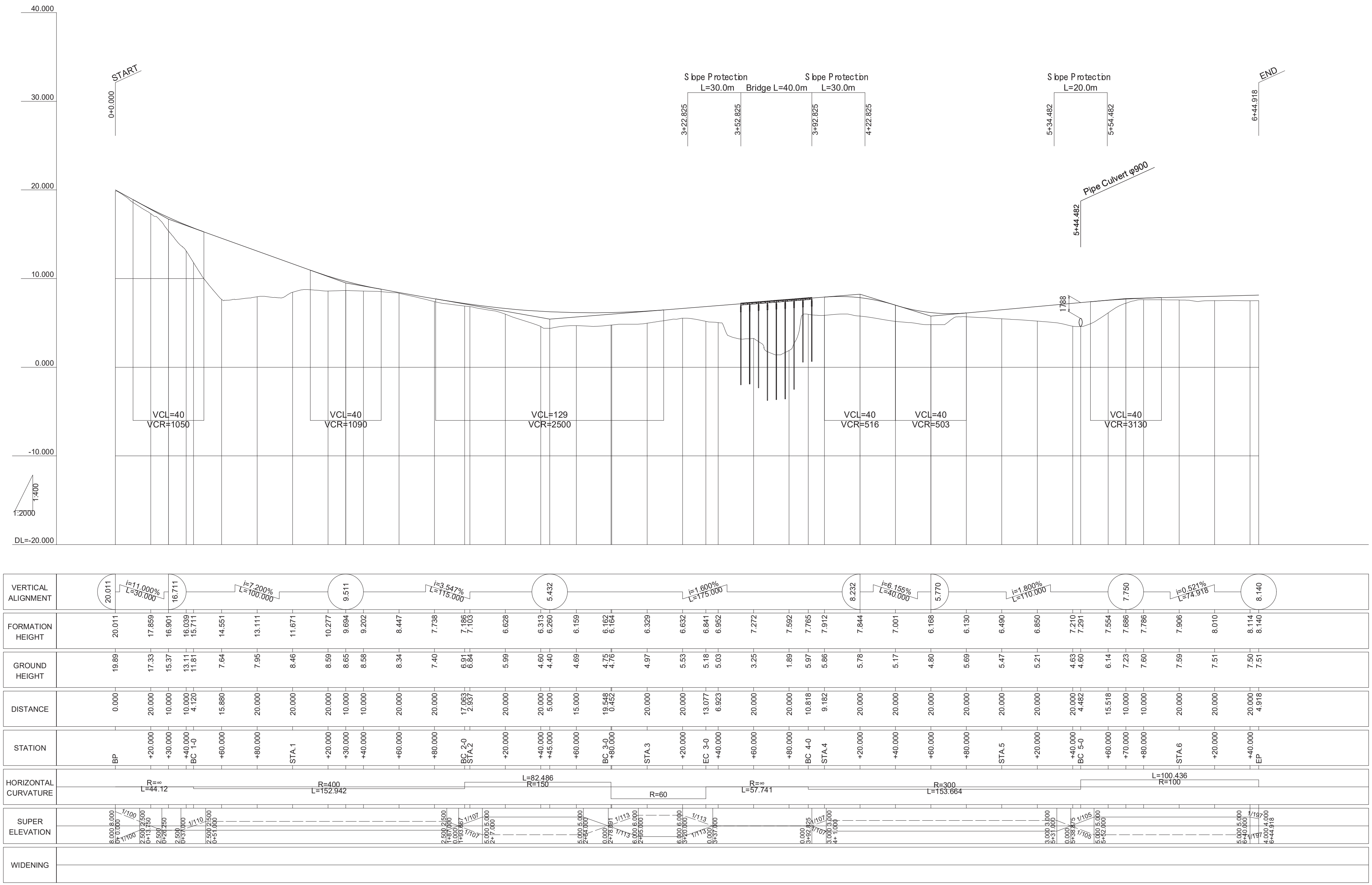
DRAWN	CHECKED	APPROVED

P.W.D REFERENCE	
CHECKED	APPROVED

SCALE (A3 SIZE): 1:2000

DRAWING NO.: 35

SHEET NO.:



REV	DESCRIPTION	BY	DATE

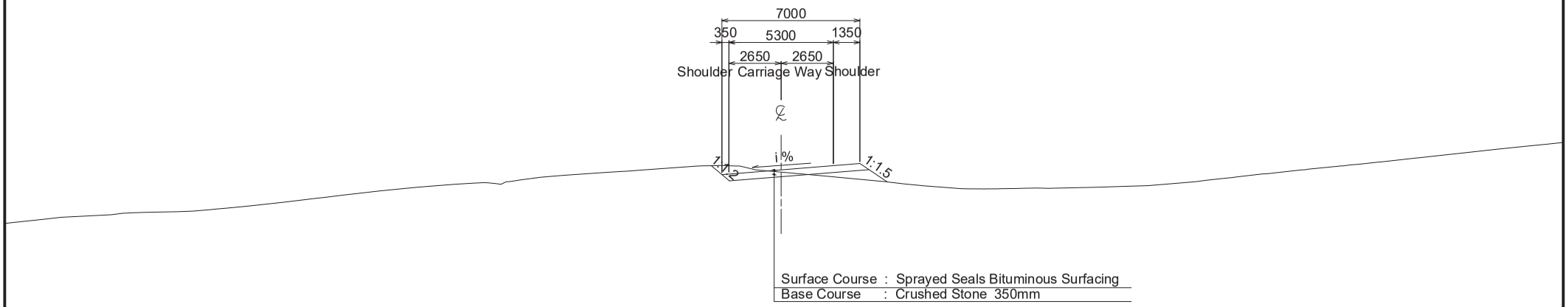
REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

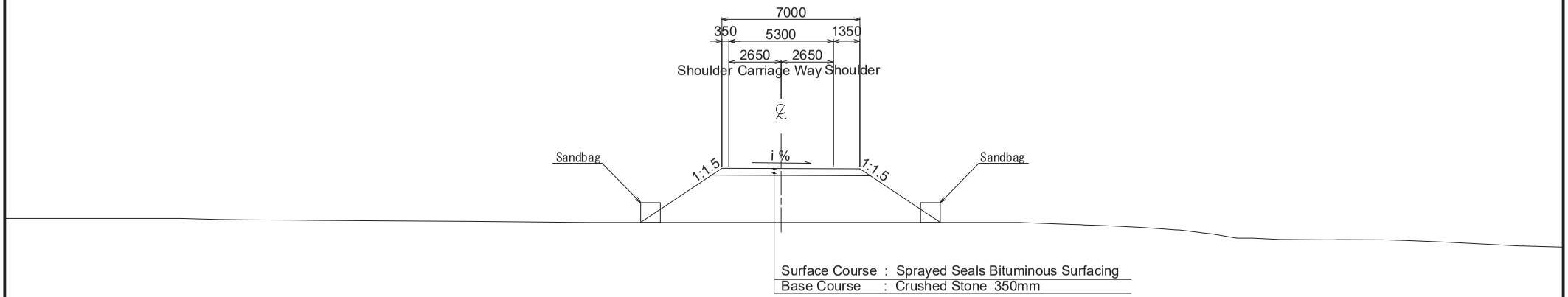
PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

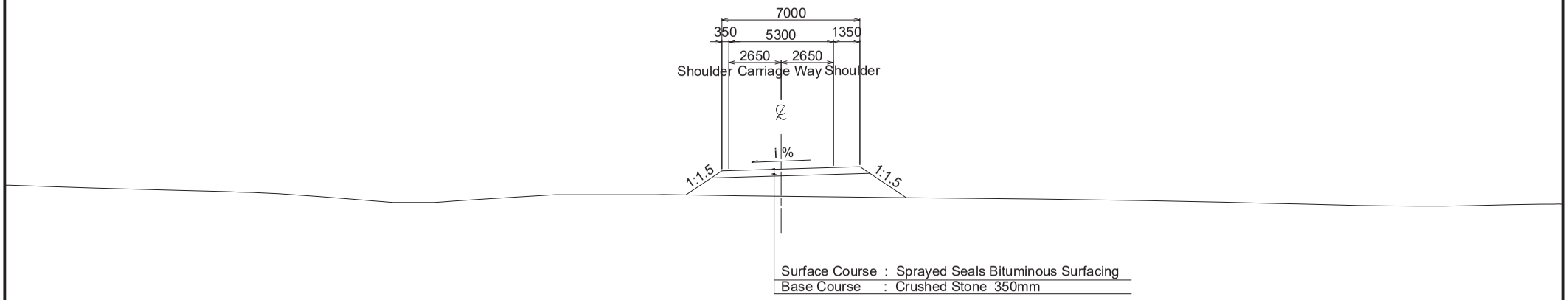
DESCRIPTION:
PROFILE
(DETOUR ROAD)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED	SCALE (A3 SIZE)	DRAWING NO.	SHEET NO.
					V=1:400 H=1:2,000	36	







REV	DESCRIPTION	BY	DATE

REPUBLIC OF VANUATU
PUBLIC WORKS DEPARTMENT
MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES

PROJECT:
PREPARATORY SURVEY ON THE PROJECT FOR THE DISASTER RECONSTRUCTION OF TEOUMA BRIDGE IN REPUBLIC OF VANUATU

DESCRIPTION:
TYPICAL CROSS SECTION (DETOUR ROAD)

CONSULTANTS REFERENCE
CTI ENGINEERING INTERNATIONAL CO., LTD.
KOKUSAI KOGYO CO., LTD.

DRAWN	CHECKED	APPROVED	P.W.D REFERENCE CHECKED	P.W.D REFERENCE APPROVED	SCALE (A3 SIZE)	DRAWING NO.	SHEET NO.
					1:200	37	

別添 7：環境モニタリングフォーム（案）

Proposed Monitoring Form

Environmental Management Plan

Proposed monitoring forms, based on Table 1.3-19 Environmental Management and Monitoring Plan (EMMP), are shown below.

1. Response/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Number and contents of formal comments made by the public	
Number and contents of responses from Government agencies	

2. Pollution

1) Air Quality

Item	Unit	Situations of Dust Based on the observation	Measurement Point	Frequency
Dust	-	1. good 2. Acceptable level 3. bad	Construction site	Daily

2) Surface Water Quality

Item	Unit	Down-stream	Main point	Up-stream	Country Standards	Standards for Contract	Referred National Standards	Frequency
pH	-				-	6.5-9.5	NF T 90-008	weekly
Temperature	degree				-	<3		
Turbidity	NTU				-	≦2	standards for tap water in japan	
DO	mg/l				-	≧7.5	rivers categorized as AA, which water can be used as drinking water with simple filtering method in Japan	
Oil & grease	Yes/No				-	observed		

Result of the baseline survey and standards

Analysis	Sample 1	Sample 2	Sample 3	Unit	Standard
pH	8.03	8.01	8.27		>6.5 & < 9.5 (NF T 90-008)
Turbidity	2.74	1.98	0.5	NTU	(≦2 standards for tap water in japan)
Conductivity	455	462	457	μS/cm	

Source: Baseline survey (JICA study)

3) Noise and Vibrations

Item	Unit	Measured Value (mean)	Measured Value (Max)	Country Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
Noise LAeq	dB(A)					70 (Japan)	Construction site/edge of the construction area (near houses)	Monthly
Vibrations	dB(A)					75 (Japan)	Construction site/edge of the construction area (near houses)	Monthly

Ambient noise standards in Japan

No	Area	Time During Day (hours)	Limits, dB(a)
1.	Commercial/Industrial Noise	6:00 – 22:00	70 dB or less
2.	Neighborhood Noise	6:00 – 22:00	55 dB or less

Result of the baseline survey

No	Area	Time During Day (hours)	Limits, dB(a)
1.			
2.			

4) Waste (Construction waste)

Date: Item: Waste Management Mark: "✔" if management is done as required

Location	Kind of waste	Volume of waste (m3)	Final disposal or reuse	Stored at designated place	Waste separation	Remark

5) Mitigation measures

Date: Mark: "✔" if mitigation measure is done

No	item	Monitoring Site	Mitigation measure is done or not Conditions of facilities	Remarks
1	Check the conditions of vehicles (dust control)			
2	Watering (dust control)			
3	Covering truck load with a sheet (dust control)			
4	Using oil pan (water/soil pollution prevention)			
5	Temporary cofferdam			
6	Sedimentation pond/drainage			

3. Natural Environment

1) Biota and ecosystems

Item	Monitoring Results during Report Period	Measures to be Taken	Frequency
Clearance activities (visual inspection)			Weekly
Management of top soil (visual inspection)			Weekly

2) Hydrological Situation

Item	Monitoring Results during Report Period	Measures to be Taken	Frequency
Impact of construction work on steep slope (visual inspection)	*Soil erosion*		Weekly

4. Social Environment

1) Land acquisition

Pre-Construction phase

Resettlement, Land expropriation, and compensation for assets and crops (monthly report)

		Planned Total	Unit	2020.1		2020.2		2020.3						Expected completion date	Responsible organization
				Qty	%	Qty	%	Qty	%	Qty	%				
1.Update PAPs list and Final Asset Valuation															DOL
1-1	Identification of final PAHs	6 101	HH Business												
1-2	Announcement to Affected people	2	Time												
1-3	Inventory survey and final cost estimation for expropriation	1	Time												
1-4	Consultation meeting times	4	Time												
1-5	Agreement signed by PAHs	6 101	HH Business												
2. Progress of land acquisition															DOL
2-1	Permanent land acquisition Customary land	8,438	m2												
2-2	Permanent land acquisition Leased farm land	4,143	m2												
2-3	Temporary land acquisition Customary land	10,936	m2												
3.Progress of compensation in cash															DOL
3-1	Structure	6	structure												
	Crop/trees	6	HH												
	Compensation for loss of business	101	business												

4. Complain and Grievance Redress N/A Cases			Case												
4-1	Solved cases		Case												
4-2	Unsolved cases		Case												

Record of Complain and Grievance Management

No	Date	Complain and Grievance from PAPs	Solution / Result / Any actions to be taken

Consultation meetings

No	Date	Sector	Nos of Participants	Key agenda and result of discussion

During Construction

No monitoring (No resettlement is needed)

2) Livelihood

Before Construction

Item	Monitoring Results during Report Period	Measures to be Taken	Frequency
Priority in Employment			Monthly
Other employment			Monthly

3) Safety Management (Health and Occupational Safety)

Safety management plan

Pre-construction phase

	Safety management plan is prepared and submitted	Approved by the Consultant	

Date			

Training programs

No		Date	Training	Agenda	Participant
1					
2					

During Construction

Safety management

Date:

No	item	Result	Remarks
1	Number of meetings organized since the previous monitoring		
2	Safety gear distribution (%)		
3	Keep records of accidents and injuries properly (Yes/No)		
4	Installation of fences, assignment of guards (Yes/No)		

Record of Accidents

No	Date	Details of accidents	Solution / Result / Any actions to be taken

4) Other checklist

Date: Mark: "✔" if mitigation measure is done

No	item	Monitoring Site **	Mitigation measure is done or not	Remarks
1	Communities get the information on the construction schedule			
2	Communities know get the information of traffic management			
3	Installation of signboard			
4				

5) Record of Complains

No	Date	Complains	Solution / Result / Any actions to be taken

別添 8：地質調査結果
ボーリング調査結果報告書
（Tonking + Taylor Limited）

REPORT

Tonkin+Taylor

Geotechnical Investigation to Support the Project for the Preparatory Survey for the Disaster Restoration of Teouma Bridge on Efate Ring Road

First Phase of Geotechnical Investigations

Prepared for
CTI Engineering International Co., Ltd.
Prepared by
Tonkin & Taylor International Ltd
Date
August 2018

Exceptional thinking together
www.tonkintaylor.co.nz

Document Control

Title: Geotechnical Investigation: Teouma Bridge, Vanuatu					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
09/08/2018	Draft	Draft report	M Nugent	A Pomfret	C Freer
31/08/2018	Final	Final report	M Nugent	N Hickman	C Freer

Distribution:

CTI Engineering International Co., Ltd.	Electronic
Tonkin & Taylor International Ltd (FILE)	1 copy

Table of contents

Table of abbreviations

Report

Bgl	Below ground level
BH	Machine drilled borehole
CBR	California Bearing Ratio
CTI	CTI Engineering International
HQTT	HQ Triple Tube
SPT	Standard Penetration Testing
T+TI	Tonkin + Taylor International

Borehole Logs

D	Damp
F	Firm
L	Loose
M	Moist
MD	Medium dense
RC	Rotary cored
S	Soft
St	Stiff
VL	Very loose
W	Wet

1 Introduction

1.1 General

Tonkin and Taylor International (T+TI) was engaged by CTI Engineering International Co., Ltd. (CTI) to undertake geotechnical investigations to support The Project for the Preparatory Survey for Disaster Restoration of Teouma Bridge on Efate Ring Road, Port Vila, Vanuatu. The investigations have been carried out in accordance with the 'Technical Specifications[1] provided to T+TI by CTI. The geotechnical assessment was undertaken in accordance with our proposal dated 24 May 2018[2].

Geotechnical investigations were completed at Teouma Bridge, Efate Ring Road, located east of Port Vila, on the island of Efate, Vanuatu to support the proposed construction of a new bridge to replace the existing Teouma Bridge and associated river rehabilitation works.

The scope of work for the geotechnical investigations included:

- A site walkover by an engineering geologist from T+TI;
- Four machine boreholes to a maximum depth specified by CTI (19.95 – 45.45 m below ground level (bgl)) with Standard Penetration Testing (SPT) at regular intervals;
- Five California Bearing Ratio (CBR) tests
- Laboratory testing on selected samples;
- Preparation of this report outlining the geology, site subsurface conditions and presenting geotechnical information.

This report summarises the results of the soils investigations carried out at the sites and laboratory test results.

[1] CTI Engineering International Co., Ltd. (1 May 2018), Contract Agreement for Geo-Technical Survey for The Preparatory Survey for The Disaster Restoration of Teouma Bridge in Republic of Vanuatu

[2] Tonkin and Taylor International Ltd. (27 March 2018), The Project for the Preparatory Survey for Reconstruction of Teouma Bridge on Efate Ring Road. Proposal for Consultancy Services.

2 Project and Site Description

The Republic of Vanuatu is an archipelago of approximately 80 islands, stretching over a distance of approximately 1,300 km in the South Pacific Ocean. The national capital of Vanuatu is Port Vila, which is located on the island of Efate.

We understand that CTI propose to design a bridge to replace the Teouma Bridge that crosses the Teouma River and which was damaged during Cyclone Pam.

Geotechnical investigations were completed at sites on and adjoining Efate Ring Road near the Teouma Bridge.

The drill sites are situated on the banks of the Teouma River southwest and northeast of Teouma Bridge, which is located within a narrow alluvial valley, near the base of a coral bedrock escarpment approximately 7 km feast of Port Vila (shown in Figure 2.1). The sites comprise vegetated and open, gently to moderately sloping land.

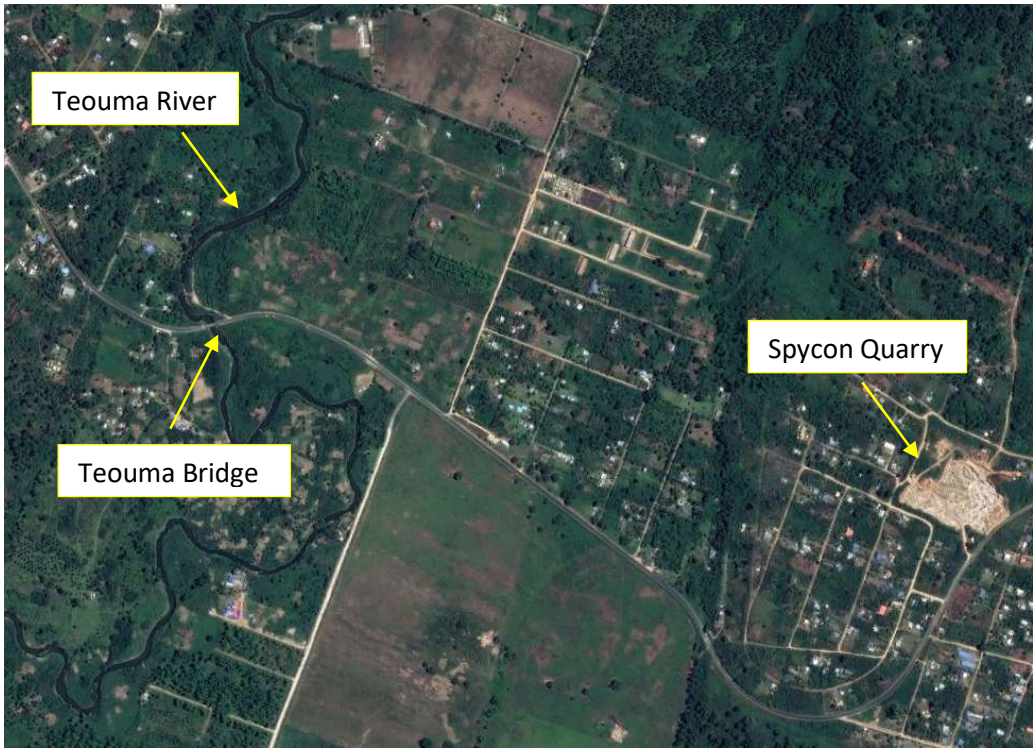


Figure 2.1: Aerial photograph of the geotechnical investigation sites, Efate Ring Road, east of Port Vila, Vanuatu.

3 Summary of the Soils investigations

3.1 Geotechnical investigation equipment

The geotechnical investigations were undertaken by means of machine drilled boreholes (BH). California Bearing Ratio (CBR) excavations were completed manually by T+TI and Spycon Quarry staff.

The machine drilled boreholes were undertaken by Vanuatu Drilling Ltd. under the supervision of T+TI. The machine drilled (rotary cored) boreholes were performed using a trailer mounted rig using HQTT (HQ Triple Tube) wireline techniques with Standard Penetration Testing (SPT) performed at regular intervals using an unlined Raymond-type split-spoon sampler. A photo of the machine drilling equipment used is shown in Figure 3.1 below.

Figure 3.1: Photo of the Vanuatu Drilling Ltd drill rig used during the investigations.

3.2 General

The soils investigations were carried out in May and June 2018 and the scope of work was completed in accordance with the "Contract of The Soil Survey Work" – presented in Appendix A with exceptions noted below. Machine drilled boreholes were terminated at either the depth specified by CTI, or to the maximum sampling depth attainable by the drilling rig; SPTs were completed at 1.5 m centres starting at 1. 5 m or 3.0 m bgl (depending on the ability to advance the sampler through the near surface materials) to either the competed depth of the borehole or to the maximum depth attainable by the drilling rig as configured. Bedrock was not encountered in any of the boreholes.

The following tasks were completed for the soils investigation at the Teouma Bridge sites:

- Borehole drilling
  - 4 No. machine drilled boreholes (BH-1 – BH-4) to between 19.95 m and 45.45 m bgl, with SPTs conducted at 1.5 m intervals to a maximum depth of 45.45 m bgl.

  - BH-2 was sampled to 37.5 m bgl (maximum depth possible); SPTs were completed from 1.5 m bgl to 31.95 m (maximum depth possible).
  - BH-4 was drilled and sampled to the depth specified by CTI (19.95 m bgl); SPTs were completed from 3.0 m to 19.95 m.
- CBR testing
  - 7 No. samples were collected for CBR testing from locations adjoining Efate Ring Road and within Spycon Quarry as specified by CTI.

A geotechnical investigation site plan is presented in Appendix B, machine borehole logs presented in Appendix C, and laboratory test results presented in Appendix D.

3.3 Machine Borehole Investigations

The machine borehole investigations at the Teouma Bridge site were undertaken over two mobilisations, between 27 May – 1 June 2018 and 25 – 30 June 2018. The second mobilisation was required to complete drilling and sampling of BH-1, BH-2, and BH-3 to the depths specified by CTI. The subsurface soils were described in accordance with NZ Geotechnical Society guidelines. SPT's were conducted in the boreholes within the primarily alluvial deposits encountered. A summary of borehole details is presented in Table 3.1.

Table 3.1 – Machine drilled borehole summary

BH ID	Location (Lat/Long)		Depth (m)
	Latitude (degrees)	Longitude (degrees)	
BH-1	-17.76678	-168.38239	45.45
BH-2	-17.76670	-168.38258	37.5
BH-3	-17.76645	-168.38284	45.45
BH-4	-17.76600	-168.38226	20.0

3.4 California Bearing Ratio Testing

Seven soil samples were collected for CBR testing from locations selected by CTI on Efate Ring Road (no. 3) and in the Spycon Quarry (no 4), located 1.8 km east of the Teouma Bridge.

Table 3.2 – CBR Test summary

CBR ID	Location (Lat/Long)	
	Latitude (deg)	Longitude (deg)
CBR-1 (Efate Ring Road)	-17.766350	-168.380840
CBR-2 (Efate Ring Road)	-17.766476	-168.383056
CBR-3 (Efate Ring Road)	-17.766445	-168.384391
CBR-4 (Spycon Quarry)	-17.770822	-168.399190
CBR-5 (Spycon Quarry)	-17.77058	-168.399085
CBR-6 (Spycon Quarry)	Not obtained	Not obtained
CBR-7 (Spycon Quarry)	Not obtained	Not obtained

4 Subsurface Conditions

4.1 Geological Setting

Efate is part of a chain of islands where lagoonal and reefal limestones have been deposited on and around submerged and subareal volcanic basement rock.

Published geological information[3] and previous investigations conducted in the vicinity suggest that the surface geology at the location of the site consists of Quaternary limestone and recent (Holocene) alluvium.

The Holocene alluvial deposits are found within a narrow (approximately 1.5 km wide), roughly north-south trending valley and is generally a mixture of fine sands (some pumiceous), silts, and reworked terrestrial volcanic ash.

The site is located at the base of a coral limestone escarpment to the east. The location of the sites (Teouma Bridge) in context of the regional geology is presented in Figure 4.1 below.

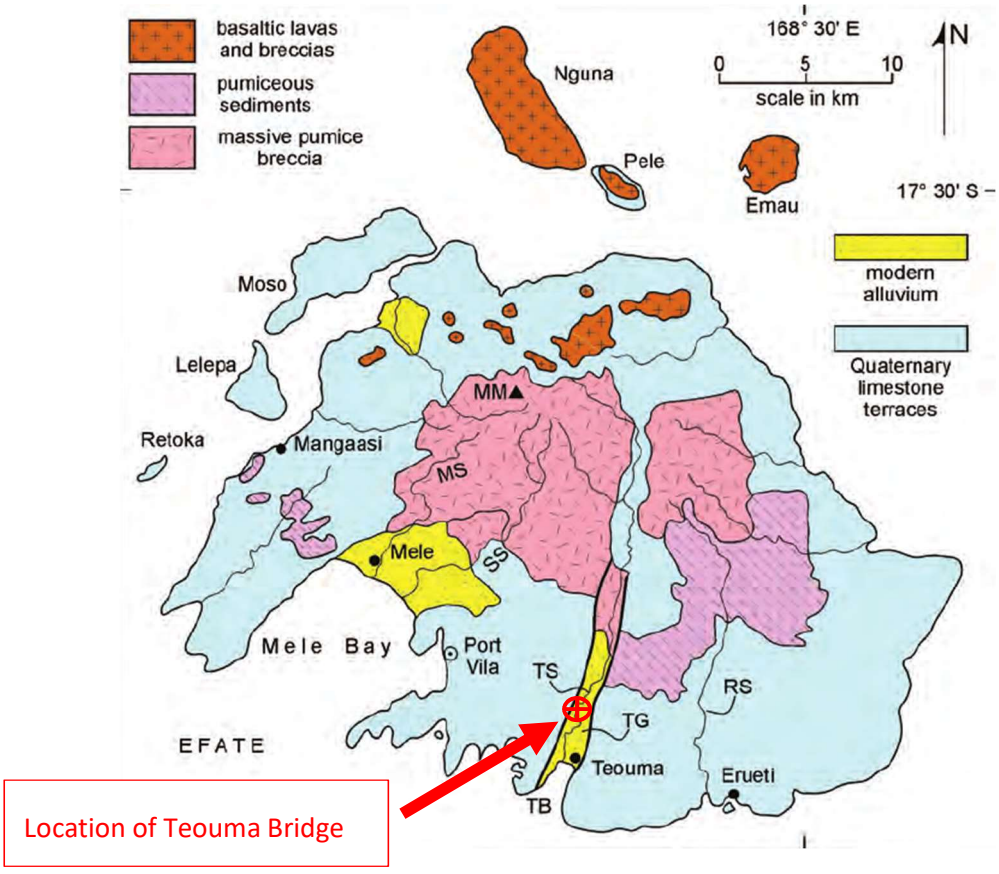


Figure 4.1: Geological map of Efate, Vanuatu (Reproduced from Ash et al. 1978)

4.2 General

The ground conditions at the Teouma Bridge site were generally consistent with the geological map. The subsurface conditions encountered can be generalised into the following geological units:

- Disturbed colluvium/fill;

[3] Ash, et al., (1978). Geology of Efate and Offshore Islands. New Hebrides Condominium Geological Survey Regional Report Series.

- Alluvial silts and sands

Bedrock was not encountered during the investigations and, due to the proximity of the site to a steep fault escarpment, may be significantly deeper than the depth of the investigations undertaken by T+TI. A summary of the geological units is provided in Sections 4.3-4.5.

4.3 Colluvium

Disturbed colluvium was encountered in all investigations across the site, extending to depths of between 0.2 m to approximately 1.5 m bgl. The colluvium material typically comprised fine sand and silt with coral limestone gravel and cobbles.

4.4 Alluvial silts and sands

Colluvium transitions into fine to medium sands and silts of undetermined depth. All boreholes were terminated within the alluvial sands and silts (maximum depth 45.45 m bgl).

4.5 Summary of ground and ground water conditions at Teouma Bridge

4.5.1 BH-1

The subsurface conditions for BH-1, located southwest of Teouma Bridge, are summarised in Table 4.1 below. Soils were sampled to 45.45 m below existing ground level and SPTs were completed to 45.45 m bgl over two visits to the site. No bedrock was encountered. Ground water was encountered at 4.0 m bgl.

Table 4.1: BH-1– Summary of the ground conditions

Depth (Below ground level)	Geological Unit	Soil Description	Typical SPT 'N' value
0-1.1m (Core loss 0-0.7m)	Colluvium	Fine SAND and cobbly angular coral GRAVEL with minor silt; brownish. Loose, moist. Sand is poorly graded.	Not collected
1.1-1.4m	Alluvium	SILT with some fine sand; brownish. Soft, low plasticity, moist, poorly graded.	Not collected
1.4-4.5m (Core loss 1.95-2.55m and 3.45-3.8m)		Fine SAND and silty sand, trace medium sand; brownish. Loose to medium dense, moist to wet. Layer of soft low plasticity silt 2.95-3.0m.	4-6
4.5-6.0m (Core loss 4.5-5.2m, 6-6.2m and 6.45-6.7m)		Silty SAND and medium to coarse SAND and GRAVEL; greenish grey. Loose, wet, well graded.	6
6.0-15.5m (Core loss 6.45-6.55m)		Fine to medium SAND; greenish grey, trace med-coarse sand; silty from 6.0-7.5m. Medium dense, moist to wet, poorly graded with occasional silty layers.	7-17
15.5-25.5m (Core loss 20.0-20.6m, 21.0-22.35m, and 22.95-23.4m		SILT with trace to some sand; greyish brown, soft to firm, dry to moist, poorly graded. Layer of silt with some rounded volcanic medium gravel from 23.4-23.9m.	0-10
25.5-34.5		Fine SAND with some silt and trace medium rounded gravel; greenish grey. Medium dense, moist to wet uniformly graded. Two thin layers of slightly plastic clay	7-29

	Alluvium	between 25.65-26.1m. Occasional silty layers, trace shell material, trace silt nodules.	
34.5-40.0m		SAND with some silt and trace rounded medium gravel; greenish grey. Medium dense/low plasticity, moist to wet. Silty in bottom 150mm.	1-18
40.0-45.45m		Silty fine SAND with some fine rounded gravel, and trace shell material.	1-15

4.5.2 BH-2

The subsurface conditions for BH-2, located southwest of Teouma Bridge, are summarised in Table 4.2 below. Soils were sampled to 37.5 m below existing ground level and SPTs were completed to 31.95 m bgl over two visits to the site. The borehole was drilled to 3.0 m bgl before sampling commenced due to hard/cobbly soils being encountered. Flowing sands were encountered during the second visit to the site, which prohibited additional soil or SPT sampling below 31.95 m bgl. No bedrock was encountered. Ground water was encountered at 3.5 m bgl.

Table 4.2: BH-2 – Summary of the ground conditions

Depth (Below ground level)	Geological Unit	Soil Description	Typical SPT 'N' value
0-3.0m (not logged)	Colluvium	Hard/cobbly soils inferred	Not collected
3.0-4.5m (Core loss 3.45-4.1m)	Alluvium	Fine SAND and SILT with trace gravel; greyish brown. Loose to medium dense, low plasticity, moist to wet, well graded	2-9
4.5-7.4m (Core loss 4.5-5.2m, 6-6.2m and 6.45-6.7m)		Fine to coarse SAND and GRAVEL; greenish grey. Loose, wet, well graded.	5
7.4-8.4m		SILT with some fine sand and minor gravel; low plasticity; poorly graded.	5
8.4-15.75m (Core loss 13.95-14.1m)		Fine to medium SAND; greenish grey; becoming silty at 14.0m. Medium dense, moist to wet, poorly graded.	10-19
15.75-26.3m (Core loss 16.95-17.7m, 18.45-19.3m, 21.95-22.75m, and 24.45-25.5m)		SILT with trace to some sand. Dark brown to greyish brown, medium dense, damp to wet, poorly graded.	0-6
26.3-30.5 (Core loss 30.0-30.5m)		Fine SAND with some silt and trace medium rounded gravel; greenish grey. Medium dense, moist to wet poorly graded. Occasional silty layers, trace shell material.	21-23
30.5-31.95 (Core loss 31.5-31.7m)		Silty fine SAND and SILT; greenish grey. Medium dense/low plasticity, moist to wet. Silt is blocky/crumbly in places. Trace shell material; pocket of uniform fine sand at 31.8m.	17

31.95-34.5 (Core loss 33.0-33.3m)		Silty fine-medium SAND; greenish grey. Medium dense/low plasticity, moist to wet. Becomes finer 35.8-36.0m. Some shell material; occasional bedding present.	Not collected
34.5-36.0m (Core loss 34.5-34.8m)		Uniform medium SAND; greenish grey. Medium dense, moist to wet. Uniform fine sand from 34.8-35.0m	Not collected
36.0-37.5m (Core loss 36.0-37.2m)		Fine SAND and minor silt; greenish grey. Loose, wet. Wood material present.	Not collected

4.5.3 BH-3

The subsurface conditions for BH-3, located northeast of Teouma Bridge, are summarised in Table 4.3 below. Soils were sampled to 45.45m bgl and SPTs were conducted to 45.45m bgl over two visits to the site. Soil recovery was poor between 0 m and 12 m bgl. Flowing sands were encountered below 12 m bgl during the first visit, which prevented soil and SPT sampling. Soil sampling and SPT testing were completed to 45.45 m bgl during a second visit to the site. No bedrock was encountered. Ground water was encountered at 3 m below existing ground level.

Table 4.3: BH-3 - Summary of ground conditions

Depth (Below ground level)	Geological Unit	Soil Description	Typical SPT 'N' value
0-6.0m (minimal recovery)	Colluvium + Alluvium	200 mm thickness of coral GRAVEL with trace brown silt and sand recovered from 0-1.5m	
6.0-10.95m (Core loss 6.45-7.0m, 7.95-9.2m, 9.45-10.2m, and 10.5-10.65)	Alluvium	Silty fine-medium SAND and clayey SILT, trace rounded coral gravels; organic material. Grey- greenish grey. Loose, soft, low plasticity; moist-wet.	3-15
10.95-12.0m (Core loss 10.95-11.7m)		Layers of fine to medium, uniform SAND and silty sand, with some gravel; grey; medium dense.	6-17
12.0 – 14.0m		Silty fine to medium SAND, brown-grey with organic fragments/pockets	12
14.0-22.5m		Sandy and clayey SILT, occaisional shell/organic fragments and organic fragments; brown mottling from 19-22m	1-8
22.5-39.45m (core loss 25.95-27m and 31.95–33m)		SAND and silty SAND; fine-medium; occasional fine gravels and shell/organic/wood fragments	2-19
39.45-41.8m		Stiff SILT; brown grey; occasional wood fragments.	23
41.8-45.45		Silty fine-medium SAND; occasional layer of coarse sand; occasional fine gravel and shell fragments	9-23

4.5.4 BH-4

The subsurface conditions for BH-4, located north of Teouma Bridge, are summarised in Table 4.4 below. Soils were sampled to 19.95 m bgl and SPTs were completed to 19.95 m bgl. No bedrock was encountered. Ground water was encountered at 3 m below existing ground level.

Table 4.4: BH-4 - Summary of ground conditions

Depth (Below ground level)	Geological Unit	Soil Description	Typical SPT 'N' value
0-1.3m (core loss)	Colluvium + Alluvium (?)	Not logged	N/A
1.3- 3.95m (Core loss 3.45-3.8m)	Alluvium	Silty SAND with trace gravel; minor silt layer 2.95m; brownish. Loose to medium dense sand, low plasticity silt, moist to wet, well graded. Clayey from 1.3-1.5 m; some gravel from 3.8-3.95	1
3.95-6.0m (Core loss 4.95-5.85 and 6.45-7.15m)		Fine to coarse SAND and GRAVEL; brownish to greenish grey. Loose, wet, well graded.	1
6.0-6.45m		Fine SAND with minor silt, trace clay. Loose, wet; some organic mottling.	17
6.45-11.0m (Core loss 6.45-7.15m)		Soft to firm greenish grey SILT from 7.15-7.35m. Fine to medium SAND to 7.35-11m; greenish grey. Medium dense, moist to wet, occasional wood/shell material.	7-11
11.0-19.95m (Core loss 13.95-14.35m, 15.45-15.9m, and 18.45-18.9m)		Soft SILT with trace sand and trace rounded coral gravel. Greenish grey, non-plastic, crumbly, damp to wet, uniformly graded; organic material present. Silty, dark grey, fine SAND layer 16.95-17.25m; slightly quick.	1-8

5 Geotechnical Laboratory Testing Results

Based on instructions from CTI, soil samples were sent for laboratory analysis from each of the machine drilled boreholes and each of the seven CBR sampling locations on Efate Ring Road (CBR-1, CBR-2, CBR-3) and within Spycon Quarry (CBR-4, CBR-6, and CBR-7 – base course, and CBR-5 – embankment fill). Note that CBR-1 to CBR-3 are referred to as "S-1602", "S-1603", and "S-1604", and CBR-4 and CBR-5 are referred to as "Sample #1" and "Sample #2", respectively, in the laboratory reports; CBR-6 and CBR7 are also referred to as "Sample #1" and "Sample #2" in the respective laboratory reports (refer Appendix D).

We note that the soils sampled from Efate Ring Road were similar in appearance to those tested at Spycon Quarry and we consider it to be likely that the base course material for Efate Ring Road was sourced from the Spycon Quarry. Based on this, Atterberg limits were not tested for samples CBR-1, CBR-2, CBR-3, because no results for these tests were obtainable from the Spycon Quarry samples (CBR-4 and CBR-5), which had been collected/tested before the Efate Ring Road samples. Spycon Quarry samples CBR-6 and CBR-7 were collected by Spycon Quarry staff after the Efate Ring Road samples.

The results of the:

- Moisture Content tests are presented in Table 5.1;
- Moisture Density Relationship tests are presented in Table 5.2;
- CBR tests and Atterberg Limits are presented in Table 5.3 ;and
- Particle Size Distribution tests are presented in Appendix D.

Table 5.1: Laboratory testing summary –Moisture Content

Sample location	Sample Depth (m)	Moisture Content (%)
BH-1	0.00	47.2
BH-1	7.95	92.5
BH-1	9.00	49.2
BH-1	15.45	89.0
BH-1	16.50	66.0
BH-1	25.50	51.5
BH-1	24.50	64.5
BH-1	27.45	53.0
BH-1	30.00	64.5
BH-1	34.50	63.0
BH-1	39.00	67.5
BH-1	40.50	71.0
BH-2	3.00	76.0
BH-2	4.95	54.0
BH-2	7.50	72.0
BH-2	9.45	53.5
BH-2	10.95	62.5
BH-2	15.45	85.0
BH-2	19.50	74.5

BH-2	19.95	82.0
BH-2	28.95	64.5
BH-2	30.00	66.5
BH-2	31.50	68.5
BH-3	6.00	54.0
BH-3	7.50	60.5
BH-3	10.00	39.2
BH-3	12.00	46.4
BH-3	16.50	88.0
BH-3	19.50	34.8
BH-3	21.00	40.4
BH-3	22.50	75.5
BH-3	30.00	69.0
BH-3	36.00	42.2
BH-3	39.00	64.5
BH-3	45.00	58.5
BH-4	1.50	67.0
BH-4	1.95	40.6
BH-4	3.45	76.0
BH-4	4.50	43.2
BH-4	7.50	74.5
BH-4	7.95	81.0
BH-4	12.00	76.0
BH-4	12.50	94.5
BH-4	15.45	93.0
BH-4	16.50	87.0
CBR-1 (Efate Ring Road)	Base course	14.3
CBR-2 (Efate Ring Road)	Base course	11.7
CBR-3 (Efate Ring Road)	Base course	10.4
CBR-4 (Spycon Quarry)	Base course	12.4
CBR-5 (Spycon Quarry)	Embankment fill	11.7
CBR-6 (Spycon Quarry)	Base course	10.9*
CBR-7 (Spycon Quarry)	Base course	11.8*

* Field moisture content sourced from CBR test results

Table 5.2: Laboratory testing summary – Moisture Density Relationship

Sample location	Maximum Dry Density (t/m^3)	Optimum Moisture Content (%)
CBR-1 (Efate Ring Road)	1.78	15.5
CBR-2 (Efate Ring Road)	1.97	11.5
CBR-3 (Efate Ring Road)	2.01	11.0
CBR-4 (Spycon Quarry)	1.93	15.5
CBR-5 (Spycon Quarry)	1.90	15.5
CBR-6 (Spycon Quarry)	1.96	14.0
CBR-7 (Spycon Quarry)	1.90	13.0

Table 5.3: Laboratory testing summary – CBR Test and Atterberg Limits

Sample	CBR Value (%)	Liquid Limit	Plastic Limit	Plasticity Index
CBR-1 (Efate Ring Road)	100	Not tested	Not tested	Not tested
CBR-2 (Efate Ring Road)	110	Not tested	Not tested	Not tested
CBR-3 (Efate Ring Road)	120	Not tested	Not tested	Not tested
CBR-4 (Spycon Quarry)	45	Not Obtainable	Not Obtainable	Non-plastic
CBR-5 (Spycon Quarry)	50	Not Obtainable	Not Obtainable	Non-plastic
CBR-6 (Spycon Quarry)	60	Not tested	Not tested	Not tested
CBR-7 (Spycon Quarry)	160	Not tested	Not tested	Not tested

6 Applicability

This report has been prepared for the exclusive use of our client CTI Engineering International Co., Ltd., with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor International Ltd

Report prepared by:

.....

Michael Nugent
Geologist

Authorised for Tonkin & Taylor International Ltd by:

.....

Chris Freer
Project Director

Report reviewed by:

.....

Nathan Hickman
Geotechnical Consultant

MPPN
\\ttgroup.local\corporate\auckland\projects\1004626\workingmaterial\report\t+t_geotechnical investigation report_teouma bridge_vanuatu.docx

Appendix A: Contract of Geotechnical Investigations

- **Contract of Geotechnical Survey Works**

AMENDMENT of CONTRACT AGREEMENT

FOR

GEO-TECHNICAL SURVEY

FOR

THE PREPARATORY SURVEY

FOR

THE DISASTER RETORATION OF TEOUMA BRIDGE

IN

REPUBLIC OF VANUATU

August 2018

BETWEEN

CTI ENGINEERING INTERNATIONAL Co., LTD
KOKUSAI KOGYO CO., LTD.

AND

Tonkin & Taylor International Ltd.

This amendment of agreement made and entered into this 31st **of August 2018** by and between

CTI Engineering International Co., LTD having its head office at 2-25-14 Kameido, Koto-ku, Tokyo 136-0071, JAPAN; hereinafter referred to as the "First Party".

- and -

Tonkin & Taylor International Ltd. Having its head office in 105 Carlton Gore Road Newmarket, Auckland, New Zealand (headquarters), hereinafter referred to as the "Second Party"

WITNESSETH THAT:

WHEREAS, the First Party is awarded by the Japan International Cooperation Agency to undertake Preparatory Survey on the Project for the Disaster Restoration of TEOUMA bridge in Republic of Vanuatu;

AND, the First Party requires a local engineering company, which can conduct Geo-Technical Survey for the Restoration of Teouma Bridge as specified in the specifications set forth in Appendix-(B) attached hereto.

AND, the Second Party represents itself to be able to undertake such services and offered the provision of the services to the First Party;

AND, the First Party has accepted this offer;

NOW, THEREFORE, the First Party and the Second Party, hereinafter referred to as the Parties, hereby agree as follows:

ARTICLE 1: THE SERVICES

The Second Party shall perform the Services in accordance with the Bill of Quantity set forth in Appendix-(A) and Technical Specifications set forth in Appendix-(B) attached hereto.

ARTICLE 2 OBLIGATION OF THE SECOND PARTY

In the conduct of the Services, the Second Party shall cooperate fully with the First Party and shall always work in the best interests of the First Party and the Government of the Republic of Vanuatu.

ARTICLE 3 Contract PERIOD

The duration of the Contract Period shall be from 01**/May/2018** until 15**/November/2018**.

ARTICLE 4 WORK PERIOD

The duration of work for BoQ Items 2.1 with Documentation and Report shall be from 01**/May/2018** until 15**/November/2018**.

ARTICLE 5 COST OF THE SERVICES

The cost of the Services shall be **Ninety Five thousand eight hundred twenty six US dollars only (US$ 95,826.00)** including all taxes. The Second Party shall submit his final invoice approved by the First Party for the actual work performed by the Second Party. The amount of such invoice shall be ascertained based on the unit prices specified in the Bill of Quantities.

ARTICLE 6 PAYMENT FOR THE SERVICES

Payment shall be made as follows:

First Payment

The first payment shall be made in the amount of Thirty thousand eight hundred thirty-two and 80/100 US dollars only (**US$ 30,832.80**) which is **30%** of the contract amount within fourteen (14) days after the mobilization of staff and equipment on site, subject to timely submission of invoice.

Second Payment

The Second payment shall be made in the amount of Fifty-one thousand three hundred eighty-eight US dollars only (**US$ 51,388.00**) which is **50%** of the contract amount within fourteen (14) days after the submission of DRAFT report, subject to timely submission of invoice.

Final Payment

The Final payment shall be made in the amount of Thirteen thousand six hundred five and 20/100 US dollars only (**US$ 13,605.20**) within fourteen (14) days after the submission of DRAFT report, subject to timely submission of invoice.

ARTICLE 7 FORCE MAJEURE

The Second Party shall promptly notify the First Party in writing of the occurrence of any event of Force Majeure. As used herein, the term "Force Majeure" shall mean attributable to the causes specified hereunder:

1) Natural causes, such as earthquakes, epidemics and other similar causes affecting the work, to the extent that would make it impossible or impracticable.
2) Human causes, such as war, armed invasion, revolution, insurrection, blockages, riots, civil disturbances, strikes or other analogous or similar causes, including the occurrence of a national banking moratorium, to such extent that would make it impossible or impracticable for the Second Party to carry out, in whole or in part, its obligations under this Agreement.

The Second Party as of the day of the giving such notice, shall be relieved from liability for the failure to carry out its obligation due to the occurrence of such events of Force Majeure.

In such event, either party may terminate this Agreement by giving ten (10) days notice in writing to the other; upon the giving or receipt of such notice of termination, the Second Party shall take immediate steps to bring the work to a close in a prompt and orderly manner.

Upon termination of this Agreement pursuant to the foregoing provisions, the First Party shall not be liable to make any payment to the Second Party, except for the works performed or expenditures incurred prior to the date of such termination of its work and settlement of its obligations incurred by the Second Party as a result of Force Majeure, which costs and expenses may not have been incurred but for such Force Majeure.

ARTICLE 8 LIABILITY

(a) The Second Party shall, at his/her own expense, employ the necessary measures to ensure the security of the work site and the protection of its employees, sub-contractors and third persons within the work site. The First Party shall be exempted from or kept free and harmless from any claim or liability for any accident or injury incurred during the execution of the work and for any loss or damages to the Second Party's properties and those of sub-contractors, arising out of any cause whatsoever, including but not limited to the perils mentioned in Article 8.

(b) The Second Party shall comply with all labor laws such as Minimum Wage Law, Social Security System, National Health Insurance, Maternity Contribution and other laws relating to employers and employees. It is hereby expressly understood and agreed that the First Party shall not be liable in any manner whatsoever for non-compliance with any requirements involving employer-employee relationship and other matters relative to labor laws, and the Second Party hereby renders the First Party free and harmless from any responsibility whatsoever for non-compliance with any such requirements and for violation of any laws, rules and regulations.

ARTICLE 9 INSURANCE

The Second Party shall, at his/her own expense, obtain and maintain for the duration of this contract, the following insurance coverage:

(a) Insurance for any injury or death which may occur to his/her employees, his/her sub-contractors and third parties, regardless of their status, arising during the execution of their work for any cause whatsoever, as a direct consequence of the execution of this work;

(b) Other form of insurance that the Second Party may deem necessary to protect his interest and that of the First Party in connection with the work.

The Second Party should secure the above-mentioned insurance policies from a reputable insurance company acceptable to the First Party and shall submit them to the First Party immediately upon the signing of this contract.

ARTICLE 10: REPRESENTATIVE

Upon conclusion of the Agreement, the Second Party shall assign a representative satisfactory to the First Party in writing. The representative shall be responsible for handling all the important matters on behalf of the Second Party.

The engineers appointed by the First Party, whose names shall be notified to the Second Party, shall have powers to control and supervise the Services.

ARTICLE 11: TERMINATION OF THE SERVICES

The First Party may terminate the Services of the Second Party under this Agreement for good and sufficient causes by giving ten (10) days notice in writing to the Second Party; upon termination of this Agreement, the Second Party shall be entitled to receive remuneration for services performed under this Agreement up to such termination.

Should the Second Party fail to comply with its obligations under Article 2 herein, or with any other requirements under this Agreement, this Agreement shall be terminated.

Should the work be stopped under order of any court or other public authority through no fault or act of the Second Party, or if the First Party fails to comply with the provisions of Article 5 herein, then the Second Party may, on giving notice of such occurrence, and unless further Agreement is reached, stop work or terminate this Agreement and recover payment from the First Party for all fees earned to date of termination, all costs incurred by the Second Party for services performed, all items procured for the work, and for any or all losses sustained by the reason for the work stoppage and termination.

ARTICLE 12: LANGUAGE

The English language shall be used in all written communication between the Parties with respect to this Agreement.

ARTICLE 13: OBTAINING OF GOVERNMENTAL PERMISSION AND APPROVAL

The Second Party shall obtain, for itself, all the necessary permissions and approvals of the Government and other competent authorities concerned required for the work, and shall acquire all the rights and privileges for access to and use of the work site necessary for the execution of the Services.

ARTICLE 14: APPLICABLE LAW

This Agreement shall be deemed to be a contract made under, and shall be governed solely and construed in accordance with the laws of the Republic of Vanuatu.

ARTICLE 15: PRESERVATION OF PEACE

The Second Party shall take all reasonable precautions for preventing any unlawful, riotous, or disorder conduct which may be caused by the Second Party's employees or may occur among them, and for the preservation of peace and the protection of persons and property in the work site and in the area adjacent thereto.

ARTICLE 16: INCOME TAX AND OTHER DUTIES

For the purpose of this Agreement, the Second Party shall be liable for its Corporation Tax, Income Tax, duties, contributions and other taxes or charges which may be levied both on the Second Party and its local staff according to the laws and regulations of the Republic of Vanuatu.

ARTICLE 17: ALTERNATION OF THE SERVICES

At any time during execution of the work, the First Party shall have the right to make any modification in the work to the Second Party. In the event of substantial

changed, the date of completion of the work may be adjusted by prior agreement by both parties.

ARTICLE 18: DISPUTES

In the event of any disputes arising between the Parties with respect to the Agreement and/or the performance of the Services, the Parties shall endeavor to take prompt steps amicably to settle the same.

ARTICLE 19: REPRESENTATION AND WARRANTIES

The Second Party hereby represents and warrants to the First Party as follows:

(a) The Second Party is a corporation duly organized, validly existing and in good standing under the laws of the Republic of Vanuatu, and full corporate power to conduct the business presently being conducted by it and is duly qualified to transact business with the First Party.
(b) The execution, delivery and performance of this Agreement by the Second Party have been duly authorized and approved by requisite corporate action of the Second Party.
(c) The person signing this Agreement is fully authorized to represent the Second Party. This Agreement when signed, shall be binding on the Second Party.

ARTICLE 20: ASSIGNMENT AND SUBCONTRACTS

The Second Party shall not assign the contract nor sublet any portion of the work without prior consent of the First Party. Should the Second Party sublet any portion of the work to any third party after obtaining the consent of the First Party, the Second Party shall still be responsible for the acts and omissions of his subcontractors and of his persons. The Second Party shall neither be relieved nor releases from any obligation and responsibility under this Agreement.

ARTICLE 21: CONFIDENTIALITY

The Second Party shall not, during the term of this Agreement and within the specified maintenance period after its expiration, disclose any propriety or confidential information relating to the Services, this Agreement or the First Party's business or operations without the prior written consent of the First Party.

ARTICLE 22: OWNERSHIP OF MATERIAL AND COPYRIGHT

Any report or other material, graphic, software or otherwise, prepared by the Second Party for the First Party or the First Party's engineer(s) under the Agreement shall belong to and remain the property of Japan International Cooperation Agency (JICA). The First Party or the First Party's engineer(s) may retain a copy of such documents and software. Copyright of software developed by the Second Party including copyright of reports and other materials shall be transferred to and retained by JICA.

ARTICLE 23: SAFEGUARD OF PERSONAL PRIVACY

In the light of the importance of safeguarding personal information, any information that is acquired through the Services will be properly handled. The purpose of collecting such information will be identified, and any disclosures will be limited to the cases stipulated below and be accompanied by a notification of names and contact numbers of parties to whom the information is provided.

The Second Party shall never willfully provide information able to identify individuals to any third party, with the following two exceptions.

(1) In cases of legally mandated disclosure requests.

(2) In cases of where the provider of information grants permission for its disclosure to a third party.

ARTICLE 24: SAFEGUARDING OF DATA PROVIDED BY THE FIRST PARTY

The Second Party is prohibited to use the information provided by the First party, either hard copy or digital copy of files, maps, images, photos, worksheets, diagrams, or any kind of information, for other purpose than the contracted works. The Second Party is not allowed to copy, transfer, sell, distribute, make backups, images, print outs, files, other applications, transfer by e-mail, FTP, or other Internet On Line Services, also to save this information in any storage devices (Hard Disks, raids, USB Devices, CDs, DVDs, other storage media) for purposes different than the one for which the Second Party is not allowed to disclose this information to any other person, institution, company, media, other government agencies, ministries and autonomous and decentralized governmental institutions, municipalities and other entities related to the government or private sector. The non fulfillment of this clause, will force to make the correspondent legal and penal process where corresponds and the company and its legal representative will be fully responsible legally, penal and administrative as is settled down in the law.

IN WITNESS WHEREOF, the Parties hereto have signed this Agreement in their respective names in duplicate, each party retaining one (1) copy thereof, as of the day and year first above written.

For and on behalf of
The First Party

Yoshihisa NODA
Chief Consultant, JICA Study Team
CTI Engineering International Co., LTD

For and in behalf of
The Second Party

p/p **Mr. Chris FREER**
Project Director
Tonkin & Taylor International Ltd.

Appendix-(A)

The Preparatory Survey on the Project for the Disaster Restoration of Teouma Bridge

Geotechnical Investigation Work
Bill of Quantities

	Description	Unit	Qty	Unit Price (US$)	Amount (US$)
1	Mobilization/Demobilization	LS	1	5,000	5,000
	Subtotal of 1				5,000
2	Geotechnical Investigation				
2-1	Boring Survey				
	•Drilling soil - 20m/hole x 1 hole	m	20	403.75	8,075
	•Drilling soil - 30m/hole x 3 holes	m	128.4	403.75	51,842
	•Drilling rock - 5m/hole x 3 hole	m	0	500.00	0
	•SPTat 1m interval x 20mx 1 holes	each	13	76.00	988
	•SPTat 1m interval x 35mx 3 holes	each	66	76.00	5,016
	•SPTat deeper than 35m	each	14	152.00	2,128
	Subtotal of 2-1				68,049
2-2	Laboratory Tests for Boring Soil				
	Soil: 5 samples (River)				
	•Moisture/water content	nos	45	23.75	1,069
	•Specific Gravity	nos.	0	55.00	0
	•Grading/Sieve Analysis	nos	25	40.00	1,000
	•Atterberg Limits	nos	0	80.00	0
	•Consolidation Analysis	nos	rate only	650.00	
	•UU 3 Stage Triaxial Compresion Test - NZ Bases testing	nos	0	350.00	0
	Soil: 21 samples (Road)				
	•Natural Moisture/water content	nos	0	23.75	0
	•Specific Gravity	nos	0	55.00	0
	•Grading/Sieve Analysis	nos	0	40.00	0
	•Atterberg Limits	nos	0	80.00	0
	•UU Triaxial Compresion Test	nos	0	350.00	0
	•Unconfined Compression Test for Rock	nos.	0	180.00	0
	Subtotal of 2-2				2,069
	Subtotal of 2				75,117
3	CBR Tests				
3-1	CBR Tests				
	•Test Pitting and Sampling -(Sub-grade(3), Embankment(2), Base Cours	samples	7	950.00	6,650
	•Compaction Test	samples	5	100.00	500
	•Natural Moisture/Water Content-3x14	samples	5	23.70	119
	•Atterberg Limits	samples	2	80.00	160
	•Grading/Sieve Analysis	samples	2	40.00	80
	•CBR Test	samples	7	100.00	700
	Subtotal of 3				8,209
4	Documentation and Report				
	•Documentation and Report	ls	1	7500	7,500
	Subtotal of 4				7,500
	Total Amount in USD (without IVA Tax)				95,826
	TAX				0.00
	Total Amount in USD (Include IVA Tax)				95,826
	Total Contract Period Required (in calendar days)	Days	60		

Undertaken by NZ Laboratory in Auckland

Date Aug. 31, 2018

Company Name CTII Yoshizawa Noda

Stamp

CTII Nathan Hickman

Appendix-(B)

Technical Specifications

Appendix-(B)

Technical Specifications

Appendix B: Site Plan

- **Site plan**
  - **Teouma Bridge site**

NOTE:

1. Aerial photo sourced from Google Earth. Copyright 2018 Imagery Date: 28/09/2017

Tonkin+Taylor
Tonkin & Taylor International Ltd
105 Carlton Gore Road, Auckland, NEW ZEALAND
www.tonkintaylor.co.nz

DRAWN	JC	Aug. 18
DRAFTING CHECKED		
APPROVED		
CADFILE : \\1004626.1000–F 1.dwg		
SCALES (AT A3 SIZE)	1: 1500	
PROJECT No.	1004626	

CTI ENGINEERING INTERNATIONAL

TEOUMA BRIDGE, EFATE RING ROAD, PORT VILA, VANUATU

Geotechnical Investigation Plan

FIG. No. Figure 1

REV. 0

Appendix C: Soils Exploration Logs

- **Machine drilled boreholes**
  - **BH-1 - BH-4**
- **Core photographs**
  - **BH-1 - BH-4**
  - **CBR-1 – CBR-3**

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-1**

Hole Location: Teouma Bridge

SHEET: 1 OF 10

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38239 -17.76678 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Colluvium Deposits		53	HQTT				0.5					Core loss.
									M	L		Cobbly GRAVEL, with some silt; brownish. Gravel, medium to coarse, angular; cobbles, angular; Gravel+cobbles are coral.
							1.0					SAND (SP), with minor silt; brownish. Loose; low plasticity; moist; poorly graded.
										S-F		SILT, with some sand; brownish. Soft; low plasticity; moist; poorly graded; sand, fine.
		100	SPT	2 2 2 N=4			1.5		M-W	L		SAND; brownish. Medium dense; moist; sand, fine.
												SAND; brownish. Moist to wet; sand, fine.
		42	HQTT				2.0					Core loss.
Alluvial Deposits							2.5		W			Silty SAND; brownish. Loose; low plasticity; sand, fine to medium.
							3.0		M-W	S		SILT, with minor sand. Soft; low plasticity; sand, fine.
		100	SPT	1 3 3 N=6						L		Silty SAND; brownish. Loose; low plasticity; sand, fine; trace med sand.
							3.5					Core loss.
	01/06/2018	66	HQTT							L-MD		SAND, with some gravel, with trace silt; greenish grey. Loose to medium dense; sand, fine to medium; gravel, fine to medium.
							4.0		W	L		SAND & GRAVEL; light brown. Loose; wet; sand, fine to medium, gravel, fine to medium, rounded, slightly weathered; very thin clay/silt layers 4.0-4.1 m.
										S		SILT; light brown. Soft; low plasticity; wet.
		100	SPT	4 4 4 N=6			4.5			L		Silty SAND; bedded. Loose; low plasticity; wet; sand, fine.
												SAND & GRAVEL; greenish grey. Loose; wet; well graded; sand, fine to medium, gravel, fine to medium, rounded.

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-33

Scale 1:25

Rev.: A

BOREHOLE LOG

HOLE Id: **BH-1**

Hole Location: Teouma Bridge

SHEET: 2 OF 10

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38239 -17.76678 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100	HQTT				5.5		W	L		Silty SAND; greenish grey. Loose; low plasticity; wet; sand, fine; trace medium sand, 50 mm silty clay layer.
									M-W			SAND & GRAVEL, with some silt; greenish grey. Loose; non-plastic; moist to wet; poorly graded; sand, medium to coarse, gravel, fine to coarse, rounded; siltier from 5.8-6.0m.
		100	SPT	5 4 6 **N=10**			6.0					Silty SAND; greenish grey. Loose; low plasticity; moist to wet; sand, fine; trace medium-coarse sand.
							6.5					Core loss.
		90	HQTT									Silty SAND; greenish grey. Soft; low plasticity; moist to wet; sand, fine; trace medium-coarse sand.
		100	SPT	2 4 5 **N=9**			7.5		M			SAND, with some silt; greenish grey. Loose; low plasticity; moist; sand, fine to medium.
		100	HQTT				8.0		M-W	L-MD		SAND, with trace silt; greenish grey. Medium dense; non-plastic; moist; poorly graded; sand, fine to medium; trace very fine sand, occasional silty layers.
							8.5					
		100	SPT	3 3 4 **N=7**			9.0					
			HQTT				9.5					

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-34

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-1**

Hole Location: Teouma Bridge

SHEET: 3 OF 10

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38239 -17.76678 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m) / DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100	HQTT			10.5					[CONT] SAND, with trace silt; greenish grey. Medium dense; non-plastic; moist; poorly graded; sand, fine to medium; trace very fine sand, occasional silty layers.
		100	SPT	8 8 9 **N=17**		11.0					
		100	HQTT			11.5					
		100	SPT	5 7 8 **N=15**		12.0					
		100	HQTT			12.5					
		100	SPT	4 7 8 **N=15**		13.0					
		100	HQTT			13.5					
						14.0					
						14.5					

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-35

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-1**

Hole Location: Teouma Bridge

SHEET: 4 OF 10

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38239 -17.76678 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100	SPT	4 7 7 **N=14**			15.5		M-W	S-F		[CONT] SAND, with trace silt; greenish grey. Medium dense; non-plastic; moist; poorly graded; sand, fine to medium; trace very fine sand, occasional silty layers.
		100	HQTT									SILT, with some sand; greenish grey to dark brown. Soft to firm; low plasticity; moist to wet; sand, fine; thin layers of fine sand and wood material 15.9-16.0.
		100	SPT	2 4 6 **N=10**			16.0 16.5					SILT, with trace sand; dark greyish-brown. Soft to firm; low plasticity; moist to wet; sand, fine to medium; trace organic materils/shells, occaisional fine bedding,.
		76	HQTT				17.0 17.5					
		100	SPT	0 0 1 **N=1**			18.0					
		100	HQTT				18.5 19.0					
		100	SPT	1 2 4 **N=6**			19.5					

CPT

Friction Ration (%)

Sleeve Friction (kPa)

Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-36

Scale 1:25

Rev.: A

BOREHOLE LOG

HOLE Id: **BH-1**

Hole Location: Teouma Bridge

SHEET: 5 OF 10

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38239 -17.76678 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
		57	HQTT				20.5					Core loss.
									M-W	S-F		SILT, with trace sand; greyish brown. Soft to firm; non-plastic; moist to wet; sand, fine to medium; trace organic materials/shells, occaisional wood material.
		22	SPT	0 0 0 **N=0**			21.0					
		100	HQTT				21.5					SILT, with trace sand. Soft to firm; low plasticity; moist to wet; sand, fine to medium; tarce organic materials/shells, layer of coral medium gravels from 22.75-22.85.
Alluvial Deposits							22.0					
		100	SPT	0 0 1 **N=1**			22.5					
		80	HQTT				23.0					
							23.5		D-M			SILT, with some gravel, with trace sand; dark grey to grey, reddish gravels. Soft to firm; low plasticity; dry to moist; gravel, fine to medium, rounded, slightly weathered; sand, fine to medium; Gravels are volcanic.
										L		Silty SAND; grey . Loose; non-plastic; dry to moist; sand, fine to medium.
		100	SPT	4 6 8 **N=14**			24.0		M	S-F		SILT; grey . Soft to firm; low plasticity; moist; silt, massive; trace wood fragments.
			HQTT				24.5		D-M	F		SILT, with minor sand; gray. Firm; non-plastic; dry to moist; sand, fine; massive.

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-37

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-1**

Hole Location: Teouma Bridge

SHEET: 6 OF 10

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38239 -17.76678 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
		100					25.5					[CONT] SILT, with minor sand; gray. Firm; non-plastic; dry to moist; sand, fine; massive.
		100	SPT	3 8 13 **N=21**					M-W	MD		Silty SAND, with some clay; dark grey. Medium dense; non-plastic; moist to wet; sand, fine; Slightly plastic clay layers 25.65-25.70 and 26.0-26.1 m.
		100	HQTT				26.0					
		100	SPT	6 14 15 **N=29**			26.5					SAND, with trace silt and gravel; greenish grey. Medium dense; moist; sand, fine; gravel, medium, rounded; sand is uniformly graded, trace shell material, occaisional thin siltier+very fine sand layers, trace silt nodules.
Alluvial Deposits		100	HQTT				27.0					
		100	SPT	4 4 8 **N=12**			27.5					
			HQTT				28.0					
							28.5					
							29.0					
							29.5					

CPT

Friction Ration (%)

Sleeve Friction (kPa)

Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-38

Scale 1:25

Rev.: A

Borehole+CPT - 1/08/2018 4:01:05 p.m. - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-1**

Hole Location: Teouma Bridge

SHEET: 7 OF 10

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38239, -17.76678 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		67		2 4 8 **N=12**			30.5					[CONT] SAND, with trace silt and gravel; greenish grey. Medium dense; moist; sand, fine; gravel, medium, rounded; sand is uniformly graded, trace shell material, occaisional thin siltier+very fine sand layers, trace silt nodules.
		150	HQTT				31.0					
				2 4 8 **N=12**			31.5					
		83	HQTT				32.0					
							32.5					
				1 2 5 **N=7**			33.0					
		83	HQTT				33.5					
							34.0					
				4 8 14 **N=22**			34.5					Silty SAND; grey . Sand, medium to coarse; occasional fine, rounded gravel and shell fragments.
			HQTT									

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-39

Scale 1:25

Rev.: A

BOREHOLE LOG

HOLE Id: **BH-1**

Hole Location: Teouma Bridge

SHEET: 8 OF 10

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38239 -17.76678 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
		16					35.5					[CONT] Silty SAND; grey . Sand, medium to coarse; occasional fine, rounded gravel and shell fragments.
									M-W	MD		SAND, with some silt, with trace gravel; grayish green. Medium dense; moist; poorly graded; gravel, fine, rounded, slightly weathered; Occaisonal pocket of coarse sand.
		90	HQTT	7 7 11 **N=18**			36.0					
							36.5					
							37.0					
Alluvial Deposits		100	SPT	1 0 0 **N=1**			37.5					
		100	HQTT				38.0					
							38.5					
		100	SPT	4 6 6 **N=12**			39.0					
			HQTT				39.5					

CPT

Friction Ration (%) 10 9 8 7 6 5 4 3 2 1

Sleeve Friction (kPa) 2 4 6 8 10 12 14 16 18 20

Cone Resistance (MPa) 2 4 6 8 10 12 14 16 18 20

COMMENTS

Hole Depth 45.45m

AP8-40

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-1**

Hole Location: Teouma Bridge

SHEET: 9 OF 10

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38239 -17.76678 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100					40.5		M-W	MD		Silty SAND; grey . Sand, fine to medium; some shells;occaisional pockets of coarse sand..
		100	SPT	0 0 1 **N=1**								
		100	HQTT				41.0					
							41.5					
		100	SPT	0 0 0 **N=1**			42.0					Silty SAND, with some gravel; greyish. Sand, fine; gravel, fine, rounded; some shells.
		100	HQTT				42.5					
							43.0					
		100	SPT	2 4 11 **N=15**			43.5					
		100	HQTT				44.0					
							44.5					

CPT

Friction Ration (%) 10 9 8 7 6 5 4 3 2 1

Sleeve Friction (kPa) 2 4 6 8 10 12 14 16 18 20

Cone Resistance (MPa) 2 4 6 8 10 12 14 16 18 20

COMMENTS

Hole Depth 45.45m

AP8-41

Scale 1:25

Rev.: A

Borehole+CPT - 1/08/2018 4:01:05 p.m. - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-1**

Hole Location: Teouma Bridge

SHEET: 10 OF 10

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38239 -17.76678 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100	SPT	1 4 8 **N=12**								[CONT] Silty SAND, with some gravel; greyish. Sand, fine; gravel, fine, rounded; some shells.
							45.5					45.45m: END OF BOREHOLE
							46.0					
							46.5					
							47.0					
							47.5					
							48.0					
							48.5					
							49.0					
							49.5					

CPT: Friction Ration (%) 10 9 8 7 6 5 4 3 2 1 | Sleeve Friction (kPa) 2 4 6 8 10 12 14 16 18 20 | Cone Resistance (MPa) 2 4 6 8 10 12 14 16 18 20

COMMENTS

Hole Depth 45.45m

AP8-42

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-2**

Hole Location: Teouma Bridge

SHEET: 1 OF 8

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38258 -17.76670 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 31/05/2018

HOLE FINISHED: 31/05/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Colluvium Deposits							0.5 1.0 1.5 2.0 2.5 3.0					No recovery. Drilled through cobbles to 3m with tri-cone bit.
				0 0 2 N=2					M			Sandy SILT; greyish brown. Soft to firm; low plasticity; moist; sand, fine; Trace shell material, dark brown mottling.
	31/05/2018	100	SPT				3.5					Core loss.
Alluvial Deposits		66	HQTT				4.0		W	L-MD		SILT & SAND; greenish grey. Low plasticity; Interbedded fine loose-medium dense sand and soft-firm, slightly plastic silt.
				3 4 5 N=9			4.5					Core loss.
		77	SPT									SAND & GRAVEL; greenish grey. Loose; wet; well graded; sand, fine to coarse, gravel, fine to coarse, rounded.

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 37.5m

AP8-43

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-2**

Hole Location: Teouma Bridge

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Vanuatu | JOB No.: 1004626

CO-ORDINATES: 168.38258 -17.76670 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 31/05/2018

HOLE FINISHED: 31/05/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
												Core loss.
		76	HQTT				5.5		M-W	MD		Silty SAND, with trace gravel; greenish grey. Medium dense; non-plastic; moist to wet; sand, medium to coarse; gravel, fine to medium, rounded; thin silt layers from 5.35-
									W	L		SAND & GRAVEL, with some silt; tan becoming greenish. Loose; low plasticity; wet; poorly graded; sand, fine to medium, gravel, medium, rounded.
		66	SPT	3 4 5 **N=9**			6.0		M-W			SAND & GRAVEL as above
		76	HQTT				6.5		M-W	L-MD		SAND & GRAVEL as above, broken cobble in bottom 100 mm.
Alluvial Deposits		100	SPT	2 1 4 **N=5**			7.5			S-F		SILT, with some sand, with minor gravel; greenish grey . Soft to firm; low plasticity; moist to wet; well graded; sand, fine to medium; gravel, medium, rounded.
		80	HQTT				8.0		M-W	S-F		SILT, with some sand, with minor gravel; greenish grey. Soft to firm; low plasticity; moist to wet; well graded; sand, fine; gravel, medium, rounded.
							8.5			L-MD		SAND, with trace silt; greenish grey. Loose to medium dense; non-plastic; moist to wet; sand, fine to medium; occaisional siltier layers.
		100	SPT	6 9 10 **N=19**			9.0					
			HQTT				9.5					

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 37.5m

AP8-44

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-2**

Hole Location: Teouma Bridge

SHEET: 3 OF 8

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: WGS84 168.38258 -17.76670

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 31/05/2018

HOLE FINISHED: 31/05/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m) / DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100				10.5					[CONT] SAND, with trace silt; greenish grey. Loose to medium dense; non-plastic; moist to wet; sand, fine to medium; occaisional siltier layers.
		100	SPT	5 7 9 **N=16**							
		100	HQTT			11.0					
		100	SPT	3 4 5 **N=9**		11.5					
		100	HQTT			12.0					
		100	SPT	5 7 7 **N=14**		12.5					
		85	HQTT			13.0					
						13.5					
						14.0					Core loss.
								M-W	MD		Silty SAND; greyish green. Medium dense; low plasticity; dry to moist; poorly graded; sand, fine to medium; trace organic materials/shells, rare silt layer.
						14.5					

CPT

Friction Ration (%)

Sleeve Friction (kPa)

Cone Resistance (MPa)

COMMENTS

Hole Depth 37.5m

AP8-45

Scale 1:25

Rev.: A

Borehole+CPT - 1/08/2018 3:54:33 p.m. - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-2**

Hole Location: Teouma Bridge

SHEET: 4 OF 8

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38258 -17.76670 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 31/05/2018

HOLE FINISHED: 31/05/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100	SPT	5 4 6 **N=10**			15.5					[CONT] Silty SAND; greyish green. Medium dense; low plasticity; dry to moist; poorly graded; sand, fine to medium; trace organic materials/shells, rare silt layer.
		100	HQTT						M-W	S-F		SILT, with trace sand. Dark brown; Soft to firm; low-med plasticity; moist to wet; sand, fine to medium; trace organic materials/shells
		100	SPT	10 1 3 **N=4**			16.5					
		38	HQTT				17.0					Core loss.
							17.5		M-W			As above, dark brown SILT.
		100	SPT	0 1 3 **N=4**			18.0					
		19	HQTT				18.5					Core loss.
							19.0		M-W	S-F		SILT, with minor sand; dark greyish brown. Soft to firm; low plasticity; moist to wet; sand, fine; Trace organic material/sshells, rare v. fine sand + silt layers.
		100	SPT	0 1 3 **N=4**			19.5					

CPT

Friction Ration (%)

Sleeve Friction (kPa)

Cone Resistance (MPa)

COMMENTS

Hole Depth 37.5m

AP8-46

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-2**

Hole Location: Teouma Bridge

SHEET: 5 OF 8

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38258 -17.76670 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 31/05/2018

HOLE FINISHED: 31/05/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100	HQTT				20.5					[CONT] SILT, with minor sand; dark greyish brown. Soft to firm; low plasticity; moist to wet; sand, fine; Trace organic material/sshells, rare v. fine sand + silt layers.
		100	SPT	0 0 0 N=0			21.0					
		100	HQTT				21.5					
		100	SPT	0 1 3 N=4			22.0					Core loss.
		23	HQTT				22.5		M-W			SILT, with trace sand; dark grey. Soft; low plasticity; dry to moist; sand, fine; trace shell material, thin layer of fine sand 24.3-24.4m.
		100	SPT	0 1 4 N=5			23.0					
			HQTT				23.5					
							24.0					
							24.5					Core loss.

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 37.5m

AP8-47

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-2**

Hole Location: Teouma Bridge

SHEET: 6 OF 8

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38258 -17.76670 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 31/05/2018

HOLE FINISHED: 31/05/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
		0										[CONT] Core loss.
		100	SPT	0 2 4 **N=6**			25.5		M-W			Dark grey SILT as above, slightly firmer.
		100	HQTT				26.0			MD		
Alluvial Deposits		100	SPT	7 9 12 **N=21**			26.5					SAND, with some silt, with trace gravel; greenish grey. Medium dense; low plasticity; poorly graded; sand, fine to medium; gravel, medium, rounded; Occasional thin beds of v. fine sand+silt; trace shell material.
		100	HQTT				27.0					
		100	SPT	8 10 13 **N=23**			27.5					
		100	HQTT				28.0					
							28.5					
							29.0					
							29.5					

CPT

Friction Ration (%) 10 9 8 7 6 5 4 3 2 1

Sleeve Friction (kPa) 2 4 6 8 10 12 14 16 18 20

Cone Resistance (MPa) 2 4 6 8 10 12 14 16 18 20

COMMENTS

Hole Depth 37.5m

AP8-48

Scale 1:25

Rev.: A

BOREHOLE LOG

HOLE Id: **BH-2**

Hole Location: Teouma Bridge

SHEET: 7 OF 8

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38258 -17.76670 WGS84

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 31/05/2018

HOLE FINISHED: 31/05/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Observbvations
		222	SPT	5 8 9 **N=17**								Silty SAND; greenish grey. Medium dense; low plasticity; wet; sand, fine; trace organic material/shells.
							30.5		W	MD		As above.
		123	HQTT				31.0		M-W	S-F		SILT, with trace sand; greenish grey. Soft to firm; non-plastic; moist; sand, fine; blocky, crumbly.
									W	MD		Silty SAND. Medium dense; low plasticity; wet; sand, fine.
							31.5					Core loss.
				2 6 11 **N=17**					M	S-F		SILT, with some sand; greenish grey. Soft to firm; non-plastic; moist; sand, fine; pocket of uniform fine sand 31.8m.
Alluvial Deposits		80	HQTT				32.0		W	MD		Silty SAND; greenish grey. Medium dense; low plasticity; wet; sand, fine to medium; bedding in lowest 200 mm. Unable to collect SPT samples below due to flowing sands during re-drilling..
							32.5					
							33.0					Core loss.
									M-W			Silty SAND; greenish grey. Medium dense; low plasticity; sand, fine to medium; some shell material, sand becomes finer 34.2-34.5 m.
		80	HQTT				33.5					
							34.0					
							34.5					Core loss.
			HQTT									SAND, with minor silt; greenish grey. Medium dense; moist to wet; uniformly graded; sand,

CPT

Friction Ration (%)

Sleeve Friction (kPa)

Cone Resistance (MPa)

COMMENTS

Hole Depth 37.5m

AP8-49

Scale 1:25

Rev.: A

Borehole+CPT - 1/08/2018 3:54:33 p.m. - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-2**

Hole Location: Teouma Bridge

SHEET: 8 OF 8

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: WGS84 168.38258 -17.76670

R.L.: 5.80m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 31/05/2018

HOLE FINISHED: 31/05/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m) / DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		20				35.5					fine to medium; clean medium sand 34.8-35.0m.
		30	HQTT			36.0					Core loss.
						36.5					
						37.0		W	L		SAND, with minor silt; greenish grey. Loose; wet; sand, fine; wood material present.
						37.5					37.5m: END OF BOREHOLE
						38.0					
						38.5					
						39.0					
						39.5					

CPT

Friction Ration (%)

Sleeve Friction (kPa)

Cone Resistance (MPa)

COMMENTS

Hole Depth 37.5m

AP8-50

Scale 1:25

Rev.: A

Borehole+CPT - 1/08/2018 3:54:33 p.m. - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-3**

Hole Location: Teouma Bridge

SHEET: 1 OF 5

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38284 -17.76645 WGS84

R.L.: 6.00m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Observbations
		13	HQTT				1					Core loss.
		0	SPT	1 1 2 N=3					M-W	VL		Recovered as very loose, coral GRAVEL, medium to coarse, with trace brown silt and fine sand..
		0	HQTT				2					Core loss.
	29/05/2018	0	SPT	1 1 1 N=2			3					
		0	HQTT				4					
		0	SPT	0 0 1 N=1			5					
		0	HQTT				6					
		100	SPT	4 7 8 N=15					W	L		Sandy SILT; dark grey. Soft; low plasticity; wet; well graded; trace coral gravel.
		47	HQTT				7					Silty SAND; dark grey. Loose; low plasticity; sand, fine; black organic mottling. Core loss.
		100	SPT	6 7 5 N=12					M			Clayey SILT, with trace sand; grey . Soft; low plasticity; wet; sand, medium to coarse; organic material; trace coral gravel, subangular.
Alluvial Deposits									W	F		SAND, with some silt; greenish grey. Loose; low plasticity; moist; sand, fine to medium.
		0	HQTT				8					Clayey SILT; greenish grey; well graded; minor sand and trace rounded gravel.
		44	SPT	2 7 10 N=17			9		M-W	MD		Sandy SILT, with trace clay; greyish. Firm; low plasticity; wet; sand, fine. Core loss.
			HQTT									Silty SAND; grey. Medium dense; low plasticity; moist to wet; sand, fine. Core loss.

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-51

Scale 1:50

Rev.: A

Borehole+CPT - 1/08/2018 3:58:59 p.m. - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-3**

Hole Location: Teouma Bridge

SHEET: 2 OF 5

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38284 -17.76645 WGS84

R.L.: 6.00m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Observbvations
		28							W	L		[CONT] Core loss.
		77	SPT	1 1 5 N=6								Silty SAND, with some gravel. Loose; wet; sand, fine; gravel, fine to medium.
									M	MD		Core loss.
		28	HQTT				11					SAND, with trace silt; gray. Medium dense; moist; poorly graded; sand, fine; single very thin organic layer .
												Core loss.
									D-M	L		SAND, with trace silt; grey. Medium dense; moist; poorly graded; sand, fine; trace med. sand.
		66	SPT	6 8 9 N=17			12		W	VL		SAND; grey . Very loose; wet; sand, fine; flowing sands filled SPT sample tube without blows from hammer.
		100	HQTT									Silty SAND; grrey. Sand, fine to medium.
		100	SPT	5 6 6 N=12			13					
		100	HQTT				14					Sandy SILT; greyish brown. Organic fragments and shells.
Alluvial Deposits		100	SPT	1 2 2 N=4			15					
		100	HQTT				16					
		100	SPT	1 0 0 N=0			17					Sandy SILT. Sand, fine; occasional shell fragments; minor organics.
		100	HQTT				18					
		100	SPT	1 0 0 N=0								
		100	HQTT				19					Clayey SILT; grey + brown mottling. Occasional shells and organic pockets.
		100	SPT	1 0 0								

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-52

Scale 1:50

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-3**

Hole Location: Teouma Bridge

SHEET: 3 OF 5

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38284 -17.76645 WGS84

R.L.: 6.00m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100	HQTT	N=0			21					[CONT] Clayey SILT; grey + brown mottling. Occasional shells and organic pockets.
		100	SPT	3 5 3 N=8								
		100	HQTT				22					
		100	SPT	2 2 2 N=4								Silty SAND; greyish. Sand, fine; some shell fragments + pockets of organics.
		100	HQTT				23					
		100	SPT	1 2 2 N=4			24					
		100	HQTT				25					
		100	SPT	1 1 1 N=2								
		0	HQTT				26					Core loss.
		100	SPT	1 1 10 N=11			27					As above. SAND; greyish. Sand, medium to coarse; some shell fragments.
		100	HQTT				28					
		100	SPT	1 6 13 N=19								
		100	HQTT				29					

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-53

Scale 1:50

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-3**

Hole Location: Teouma Bridge

SHEET: 4 OF 5

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38284 -17.76645 WGS84

R.L.: 6.00m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100	SPT	3 4 7 N=11			31					Silty SAND; greyish. Sand, fine to coarse; occaisional shell fragments.
		100	HQTT									
		100	SPT	1 0 0 N=0			32					Core loss .
		0	HQTT									
		100	SPT	3 5 6 N=11			33					Silty SAND; dark grey. Sand, fine to coarse; occasional shell fragments; brown organic pockets.
		100	HQTT				34					
		100	SPT	3 4 9 N=13								200 mm of wood.
		100	HQTT				35					Silty SAND; dark grey. Sand, fine; occasional shells; occasional band of fine gravel.
		100	SPT	8 7 11 N=18			36					
		100	HQTT				37					
		100	SPT	6 8 8 N=16			38					
		100	HQTT									
		100	SPT	3 3 7 N=10			39			St		SILT; brown-grey. Stiff; Occasional wood fragments.
			HQTT									

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-54

Scale 1:50

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-3**

Hole Location: Teouma Bridge

SHEET: 5 OF 5

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38284 -17.76645 WGS84

R.L.: 6.00m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Observbvations
Alluvial Deposits		100					41					[CONT] SILT; brown-grey. Stiff; Occasional wood fragments.
		100	SPT	3 8 15 **N=23**								
		100	HQTT									
		100	SPT	6 10 11 **N=21**			42					Silty SAND; grey-brown. Sand, fine to medium; Some shell fragments; occasional 100mm layer of coarse sand; occasional fine gravel.
		100	HQTT				43					
		100	SPT	3 4 6 **N=10**			44					
		100	HQTT									
		100	SPT	2 3 6 **N=9**			45					45.45m: Other - see notes
							46					
							47					
							48					
							49					

CPT

Friction Ration (%)

Sleeve Friction (kPa)

Cone Resistance (MPa)

COMMENTS

Hole Depth 45.45m

AP8-55

Scale 1:50

Rev.: A

Borehole+CPT - 1/08/2018 3:58:59 p.m. - Produced with Core-GS by GeRoc

BOREHOLE LOG

HOLE Id: **BH-4**

Hole Location: Teouma Bridge

SHEET: 1 OF 5

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38226 -17.76600 WGS84

R.L.: 5.50m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
		13	HQTT				0.5					Core loss.
							1.0					
Alluvial Deposits		100	SPT	1 0 0 N=0			1.5		M	L		Clayey silty SAND; brownish. Loose and firm; low plasticity; sand, fine to medium; black organics.
									M-W			SAND; brownish. Moist to wet; sand, fine.
		42	HQTT				2.0					Core loss.
	30/05/2018						2.5		W			Silty SAND; brownish. Loose; low plasticity; wet; sand, fine to medium.
		44	SPT	0 0 1 N=1			3.0		M-W	S L		SILT, with minor sand. Soft; low plasticity; sand, fine. Silty SAND; brownish. Loose; low plasticity; sand, fine; trace med sand.
							3.5					Core loss.
		57	HQTT				4.0		W	L-MD L S		SAND, with some gravel, with trace silt; greenish grey. Loose to medium dense; wet; sand, fine to medium; gravel, fine to medium. SAND & GRAVEL; light brown. Loose; wet; sand, fine to medium, gravel, fine to medium, rounded, slightly weathered; very thin clay/silt layers 4.0-4.1 m. SILT; light brown. Soft; low plasticity; wet.
		100	SPT	0 1 0 N=1			4.5			L		SAND & GRAVEL; greenish grey. Loose; wet; well graded; sand, fine to medium, gravel, fine to medium, rounded.

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 19.95m

AP8-56

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-4**

Hole Location: Teouma Bridge

SHEET: 2 OF 5

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38226 -17.76600 WGS84

R.L.: 5.50m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
		14	HQTT				5.5					Core loss.
									W	L		SAND & GRAVEL. As above.
		100	SPT	5 8 9 **N=17**			6.0		M-W			SAND, with minor silt, with trace clay; greenish grey. Loose; wet; sand, fine; some organic mottling.
		66	HQTT				6.5					Core loss.
							7.0					SILT, with minor sand; greenish grey. Soft to firm; low plasticity; moist to wet; sand, fine to medium; sands are reddish black.
Alluvial Deposits		100	SPT	4 2 5 **N=7**			7.5		M	L		Silty SAND; greenish grey. Medium dense; low plasticity; moist to wet; sand, fine to medium; oocaisional wood and shell material.
		100	HQTT				8.0					
		100	SPT	5 3 8 **N=11**			8.5					
			HQTT				9.0					
							9.5					

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 19.95m

AP8-57

Scale 1:25

Rev.: A

BOREHOLE LOG

HOLE Id: **BH-4**

Hole Location: Teouma Bridge

SHEET: 3 OF 5

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: WGS84 168.38226 -17.76600

R.L.: 5.50m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m) / DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100				10.5					[CONT] Silty SAND; greenish grey. Medium dense; low plasticity; moist to wet; sand, fine to medium; oocaisional wood and shell material.
		100	SPT	2 2 5 N=7							
		100	HQTT			11.0		M-W			SILT, with some sand; greenish grey. Very soft to soft; moist; poorly graded; sand, fine to medium; low plasticity to quick in places; occaisional brown mottling; some shell material.
		100	SPT	0 0 1 N=1		11.5					
		100	HQTT			12.0					
		100	SPT	0 0 1 N=1		12.5					
		100	HQTT			13.0					
						13.5					
		71	HQTT			14.0					Core loss.
						14.5		M	F		SILT, with some clay; greenish grey. Firm; low plasticity; moist; some wood material.
									L-MD		Silty SAND; greenish grey. Loose to medium dense; wet; sand, fine; slightly quick.
								D-M	F		Clayey SILT; greenish grey. Firm; non-plastic; dry to moist; crumbly; organic mottling.

CPT

Friction Ration (%)

Sleeve Friction (kPa)

Cone Resistance (MPa)

COMMENTS

Hole Depth 19.95m

AP8-58

Scale 1:25

Rev.: A

Borehole+CPT - 1/08/2018 3:59:36 p.m. - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-4**

Hole Location: Teouma Bridge

SHEET: 4 OF 5

PROJECT: Teouma | LOCATION: Teouma Bridge, Port Vila, Efate, Va | JOB No.: 1004626

CO-ORDINATES: 168.38226 -17.76600 WGS84

R.L.: 5.50m

DATUM Site

DRILL TYPE: Trailer mounted coring rig

DRILL METHOD: RC

DRILL FLUID:

HOLE STARTED: 01/06/2018

HOLE FINISHED: 01/06/2018

DRILLED BY: Vanuatu Drilling

LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL | ENGINEERING DESCRIPTION | CPT

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations
Alluvial Deposits		100	SPT	2 2 5 N=7					M	F		SILT; dark grey. Firm; non-plastic; moist; uniformly graded; crumbly; occasional thin layers of dark organic material; occasional shall material.
		66	HQTT				15.5					Core loss.
									M	F		Unifrom SILT as above.
		100	SPT	3 3 5 N=8			16.0					
							16.5					
		100	HQTT				17.0		W	VL		Silty SAND; dark grey. Very loose; non-plastic; wet; sand, fine; slightly quick.
									D-M	L		SILT; grey . Firm; non-plastic; moist; uniformly graded; crumbly; trace shell and black organic material.
		100	SPT	0 0 0 N=0			17.5					
							18.0					
		66	HQTT				18.5					Core loss.
							19.0		W	S		SILT; dark grey. Soft; non-plastic; wet.
									D-M			SILT; greenish grey. Firm; non-plastic; dry to moist; organic material; trace rounded coral pieces up to 30mm.
		100	SPT	0 0 2 N=2			19.5					SILT; greenish grey. Firm; low plasticity; moist; uniformly graded; trace shell material.

CPT: Friction Ration (%); Sleeve Friction (kPa); Cone Resistance (MPa)

COMMENTS

Hole Depth 19.95m

AP8-59

Scale 1:25

Rev.: A

Tonkin+Taylor

BOREHOLE LOG

HOLE Id: **BH-4**

Hole Location: Teouma Bridge

SHEET: 5 OF 5

PROJECT: Teouma		LOCATION: Teouma Bridge, Port Vila, Efate, Va	JOB No.: 1004626
CO-ORDINATES: WGS84	168.38226 -17.76600	DRILL TYPE: Trailer mounted coring rig	HOLE STARTED: 01/06/2018 HOLE FINISHED: 01/06/2018
R.L.:	5.50m	DRILL METHOD: RC	DRILLED BY: Vanuatu Drilling
DATUM	Site	DRILL FLUID:	LOGGED BY: MPPN CHECKED: ADP

GEOLOGICAL								ENGINEERING DESCRIPTION				CPT
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	TESTS	SAMPLES	RL (m) / DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	Description and Additional Obserbvations	Friction Ration (%) / Sleeve Friction (kPa) / Cone Resistance (MPa)
											19.95m: Target depth	

COMMENTS

Hole Depth 19.95m

AP8-60

Scale 1:25

Rev.: A