



Design Engineering, Procurement (Supply), Construction, Installation/Erection,
Pre-Commissioning, Commissioning & Start-up (including performance testing and Reliability Guarantee Test) of UCH Front End
Compression Project

Tender Enquiry No. PROC-FC/CB/PROJ/UCH (COM)-5155/2021

Pre-Bid Clarification-04

Sr. No.	Reference Tender Clause	Bidder Query (15-Nov-2021)	OGDCL / ENAR Response (17-Nov-2021)
1	SEC - III (Scope of Work) Rev.2 6.5 MCC Room & Transformer Yard	Bidder understood that there shall be fence or brick wall, gate for transformer yard. Kindly please provide the typical drawing for fence or brick wall.	Drawing # 0221-CD-7101 is already provided in Vol-IIE of tender document.
2	Case-5155-Vol-II\Vol-II\ IIE Civil\ SEC - III (Scope of Work) Rev.2 6.11 Culverts The design & construction of Culverts for the Project should be compatible with the Culverts of existing facility.	Bidder found that there was no any typical drawing for electrical & instrument cable road crossing. Kindly please provide the typical drawing for cable road crossing.	Please refer Volume IIC Electrical Package for road crossing typical drawing. Refer drawing no. 0221-ELF-6809 (already part of Vol-IIC of Tender Document) for road crossing typical drawing.
3	Case-5155-Vol-II\Vol-II\ IIE Civil	Kindly please provide the master document index for Civil.	List of Drawings and Specifications is attached for ready reference.
4	SEC - III (Scope of Work) Rev.2 6.10 Drainage	Kindly please provide the storm water drain layout	Refer Drawings # 4985-CD-7342 (Sh. 1&2 of 7). Final Layout is EPCC responsibility.
5	SEC - III (Scope of Work) Rev.2 6.9 Roads, Concrete Paving and Gravel Paving 4985-CD-7301 R5 LAYOUT PLAN APPROACH ROAD	Bidder couldn't find any approach or road for the new building or facilities. Kindly please provide the road & paving layout for the modification under project #14-0221.	Refer Drawing # 4985-CD-7301 (already part of Vol-IIE of tender document). Final design is EPCC responsibility
6	Case-5155-Vol-II\Vol-II\ IIE Civil\	Kindly please provide the geotechnical investigation during FEED phase or pre-detail design for reference. Bidder understood that the geotechnical investigation shall be carried out during detail design.	Soil Investigation Report of UCH-II Plant is attached. (Appendix-I of SEC-III_Scope of Work) Further investigation (if required) would be EPCC Scope.





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Pre-Bid Clarification-04 Sr. No. **Reference Tender Clause** Bidder Query (15-Nov-2021) OGDCL / ENAR Response (17-Nov-2021) Kindly please provide the topographical survey report for FGL's are already available on drawings. Further Survey would be EPCC 7 Case-5155-Vol-II\Vol-II\ IIE Civil\ the project during FEED phase Scope There is a misunderstanding in the file of 0221-DS-1709-There are no misunderstanding in documents as the hydrate requirements 1(D/1 and SCOPE DETAILS) are for the worst winter cases but the system must be designed in such as a 8 0221-DS-1709-1 (Hydrate Inhibitor Injection Skid) The Injection period of Hydrate Inhibitor in the document way that no maintenance (100% availability) shall be required for the of 0221-A-1001-2 is refer to the three months in winter or hydrate injection skid as the wellheads are in remote locations. the whole year, please offer the injected total time. Please supply the purity requirement of ethylene glycol. EPCC shall use purity of a Hydrate Inhibitor that is readily used and available 9 0221-DS-1709-1 (Hydrate Inhibitor Injection Skid) According to our previous experience, we recommend the within the oil & gas with proper justifications & reference 99.5% (mass fraction). Please find attached the required Diesel Loading pumps (800-P101A/B) datasheet. Whereas, P&ID for existing Diesel storage tank (800-TK101) and Kindly please provide data sheet and equipment drawing Diesel Loading pumps (800-P101A/B) have already been provided in Tender of existing Diesel storage tank (800-TK101) and Diesel document i.e. P&IDs (UCH Compression Project) **IIA Process- Datasheets** 10 Loading pumps (800-P101A/B), so that we can calculate Also, tentative location is already shown on overall plot plan (Doc. No. 4985-PC-2201). Bidder to evaluate the quantum of work on the basis of Plot plan, the cost of relocation diesel tank. P&ID and Datasheets. Also, any additional data/information may be gathered during pre-bid site visit.





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Pre-Bid Clarification-04 Sr. No. **Reference Tender Clause** Bidder Query (15-Nov-2021) OGDCL / ENAR Response (17-Nov-2021)

11		There is only layout drawing but not SLD information for newly added MV switchgear. Please confirm the interface between newly added and existing MV switchgear. There is only SLD drawing but not layout for the MV switchgear which shall be modified, please confirm the location of the modify MV switchgear, also the location for UCH-I and II MCC room. In order to cable material take off.	Please refer SLD drawing no. 0221-ELB-6600-2 (SH 1 of 3) for the requirement / details of added panel at UCH-I. Modification works shall be carried out in existing MV Switchgear which is located in existing UCH-II MCC Room. The location of UCH-I and UCH-II is already shown on plot plan. Also, please refer attached 4985-ELD-6701-8 (SH 1 of 4) Power & Control Cable Routing Layout. Note: All the referred above drawings are already submitted in Volume IIC Electrical Package.
12	0221-ELB-6600-2	Please provide 'Existing SLD and schematics A2678-S3 mentioned in SH1of 3, Note 4.	Please refer drawing no. (3) A2678 S13 for extension at UCH-I which is already submitted in Volume II-C of tender document.
13	4985-ELD-6701-8 (SH 1 of 4) Power & Control Cable Routing Layout	Such as the equipment no. are not clear. Please provide clear layout drawings.	Please find enclosed legible copy for your reference.



Compressor)

General

16

UCH COMPRESSION PROJECT



Design Engineering, Procurement (Supply), Construction, Installation/Erection,
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Compression Project

Tender Enquiry No. PROC-FC/CB/PROJ/UCH (COM)-5155/2021 Pre-Bid Clarification-04

Sr. No. **Reference Tender Clause** Bidder Query (15-Nov-2021) OGDCL / ENAR Response (17-Nov-2021) Please confirm and provide Proposed Cable Route Layout 0221-ELD-6700 which mentioned in design basis. And please confirm the cable routing while cable climb out the cable trench to equipment terminal or distribution board. The referred drawing no. in electrical design basis is typo error. Please refer 0221-ELA-6501 Electrical Design Basis drawing no. 4985-ELD-6701-8 for proposed cable route layout, which is 14 already submitted in Volume II-C of tender document. 5.2.6. The Contractor scope includes the design transformer yards and cable tray layout pla Switchgear/ MCC room has been developed Proposed Cable Route Layout 0221-ELD-6700. According to this document Page 12~13, state that "CO2 protection system" will be provided. For Gas turbine" 0221-GS-9510-4 (Specification for Centrifugal CO2 based Suppression System is required for Turbine enclosure; bidder to 15 Since the turbine unit is at open atmosphere, whether

CO2 protection system be needed. As we all know CO2

protection system should be enclosed space.

Please confirm the scope of work for telecom.

comply with the tender requirement.





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Pre-Bid Clarification-04 Sr. No. **Reference Tender Clause** Bidder Query (15-Nov-2021) OGDCL / ENAR Response (17-Nov-2021) Please provide relevant information of telephone / LAN Refer OGDCL/ENAR reply against S.No.16. system (such as work scope, Design Basis, Specification, 17 General Basic details / information already mentioned in Sec.5.0 "Scope of Work". Data Sheet, Layout, Installation position of core Detailed documents / drawings are in EPCC Scope. equipment etc.) New CCTV System shall be supplied and installed by the bidder for new MCC room at UCH-II. Bidder must carry out pre-bid site visit for more Please provide relevant information of CCTV system (such information and clarity 18 as work scope, Design Basis, Specification, Data Sheet, General Layout, Installation position of core equipment ect.) However; Basic details / information already mentioned in Sec.5.0 "Scope of Work". Detailed documents / drawings are in EPCC Scope New FM-200 based Combine Fire Detection & Suppression System with Combine Control Panel along with detection and suppression detectors and Please confirm whether there is a Fire alarm system, if so, please provide relevant information of CCTV system (such shall be supplied and installed for new MCC Room at UCH-II, the system 19 General as work scope, Design Basis, Specification, Data Sheet, shall be FM-200 based. Layout, Installation position of core equipment ect.) For CCTV System; please refer OGDCL/ENAR reply against Sr. No 18. Please confirm whether there is a PAGA system, if so, please provide relevant information of CCTV system (such No requirement for PAGA System. 20 General as work scope, Design Basis, Specification, Data Sheet, Layout, Installation position of core equipment ect.) Please confirm whether there is an Access control system, if so, please provide relevant information of CCTV system No requirement for Access Control System. 21 General (such as work scope, Design Basis, Specification, Data Sheet, Layout, Installation position of core equipment ect.)

Data sheet



Customer pos. no.: 800-P-101 A/B Purchase order date: 2013-01-09 Your P/O no.: LOI-444-KSB

Quantity: 2,000

Number: 9972322702 - 042

Line: 000300 Date: 2012-12-18 Page: 13 / 18

Version no.: 3

RPH S6 040-180

Heavy Duty Centrifugal Pump to API 610 11th edition

Operating data

Requested flow rate	63.00 US GPM	Efficiency	38.7 %
Operating data determined for r	naximum inlet pressure	Power absorbed	3.57 HP
Requested developed head	102.00 ft	Pump speed of rotation	2900 rpm
Pumped medium	Fuel, diesel oil	NPSH required	5.22 ft
	without further specification Not containing chemical and	Permissible operating pressure	283.038 psi.g
	mechanical substances which	Discharge press.	36.065 psi.g
	affect the materials	Differential pressure	37.599 psi
Ambient air temperature	104.0 °F	Shutoff pressure	43.801 psi.g
Fluid temperature	105.0 °F		
Fluid density	53.063800 lb/ft³	Min. allow. flow for continuous	20.73 US GPM
Fluid viscosity	0.0101 in ² /s	stable operation	
Suction pressure max.	-1.534 psi.g	Min. thermal flow rate	6.91 US GPM
Suction pressure min.	-1.534 psi.g	Shutoff head	123.03 ft
NPSH available	19.44 ft	Bypass	0.00 US GPM
Ratio Q/Qbep	91.2 %	Sound pressure level LpA for	67 dBa
Max. power on curve	3.98 HP	pump with motor	
		D (\ /

·		Performance test	Yes
Design			
Pump standard	API 610	Impeller diameter	6.57 in
Casing drain	Pipe connection with flange	Minimum impeller diameter	5.12 in
Venting:	Self venting	Full impeller diameter	7.09 in
Type of casing :	Single volute	Direction of rotation from drive	Clockwise
Casing Support : Design	Centerline Baseplate mounted, long-	Ex protection	to RL94/9EG: Ex II 2 G c T3
Orientation	coupled Horizontal	Bearing bracket construction Bearing bracket size	Standard (normal) B02S
Suction flange according to(DN1) Discharge flange according	ASME B 16.5 / NPS 2 / CL 150 / RF ASME B 16.5 / NPS 1½ / CL	Bearing seal Bearing type Lubrication type	Standard labyrinth ring Anti-friction bearings Oil
to(DN2)	150 / RF	Lubrication monitoring	Constant level oiler + Oil level
Flanged openings are provided			sight glass
	ets and at least four full-diameter	Constant level oiler manufacturer	KSB standard
		Fan cooling	Without
Shaft seal	Single acting mechanical seal	Temperature sensor PT100	Without

bolts.		manufacturer	
		Fan cooling	Without
Shaft seal	Single acting mechanical seal	Temperature sensor PT100	Without
Manufacturer	Burgmann	inboard	
Type	H75VNE80	Temperature sensor PT100	Without
Material code	AQ2KMG	outboard	
Shaft seal code	BSTIN	Vibration measurement	Without
Sealing plan	API plan 11+61: Single seal	tapping	
	cartridge with circulation from	Vibration measurement	None
	discharge and throttle bushing	accessory	
Seal chamber design	Standard seal chamber	Thrust bearing	7309BMUA
Contact guard	with	Radial bearing	NU211C3
	NA 101 11 11	Quantity of bearings in fixed	2
Impeller type	Multivane radial flow impeller	bearing assembly	_
	(K)		

(K)

Data sheet



Customer pos. no.: 800-P-101 A/B Purchase order date: 2013-01-09

Your P/O no.: LOI-444-KSB

Quantity: 2,000

Number: 9972322702 - 042

Line: 000300 Date: 2012-12-18 Page: 14 / 18

Version no.: 3

RPH S6 040-180

Heavy Duty Centrifugal Pump to API 610 11th edition

Driver, accessories

Manufacturer Crane Motor const. type ВЗ Coupling type Metastream TSK 132S Motor size 13

Eff2 acc. to CEMEP Nominal size Efficiency class Spacer length 5.51 in Frequency 50 Hz

Operating voltage 400 V Coupling guard type Tread-proof (ZN3230)

Rated Power P2 @ 55 °C 4,4 kW Guard size available reserve 80.30 % Guard material **Brass CUZN** Starting current ratio 6.5

Welded steel according to API Baseplate type Insulation class F to IEC 34-1

610 Explosion protection Exde II Baseplate size 1.5 **IP65** Motor enclosure

Baseplate drain Drain channel Cos phi at 4/4 load 0.88 Motor alignment bolts Without Temperature class T3

Baseplate fixing Foundation bolts galvanized Temperature sensor Without steel Standstill heater Without

Earthing connection with Terminal box position 0°/360° (top)

Viewed from the drive This coupling and coupling guard fulfills the ATEX requirements 400 / 690 V Motor winding

Earthing connection with 31M: 2 x Ø 11.5mm Number of poles 2 Driver type Electric motor

Connection mode Star Drive standard **IEC** Motor cooling method

Surface cooling Model (make) ABB

Motor material Grey cast iron GG/CAST Drive supplied by Spec. motor supplied by KSB **IRON**

- mounted by KSB

Materials S6

Volute casing (102) Carbon steel A216 WCB Joint ring (411.10) 1.4571 - Graphite CrNi steel VG434 Casing cover (161) Carbon steel A216 WCB Casing wear ring (502.1) Impeller wear ring (503.1) Shaft (210) Chrome steel 1.4021+QT800 Stainless Steel 1.4027+QT Impeller (230) Stainless Steel 1.4008 Throttle bush (542.2) Chrome steel 1.4021+QT800 Bearing bracket (330) Carbon steel A216 WCB Stud (902.1) Alloy steel (high temp)

Packaging

Outdoor Packaging category B1 Wooden or plywood Packaging for storage

case, cover provided with Outdoor storage at -40°C to +50°C for up to 3 months. Packet polyproylene cellular sheet, must be covered. No corrosion protection, only transport outdoor storage up to 3 protection.

1.7709+QT

months

Packaging for transport Ship

Data sheet



Customer pos. no.: 800-P-101 A/B Purchase order date: 2013-01-09 Your P/O no.: LOI-444-KSB

Quantity: 2,000

Number: 9972322702 - 042

Line: 000300 Date: 2012-12-18 Page: 15 / 18

Version no.: 3

RPH S6 040-180

Heavy Duty Centrifugal Pump to API 610 11th edition

Certifications

Hydraulic performance test

Acceptance standard API 610

Quantity meas. points Q-H 5

Certificate Inspection cert. 3.2 to EN

10204

Test participation Witnessed

Quantity, non-witnessed 0
Quantity, witnessed 2
Vibration test Yes
Bearing temperature test Yes

Balancing test: Impeller (230)

Balancing grade G 2,5

Certificate Inspection cert. 3.1 to EN

10204

Test participation Non-witnessed

Balancing test: Coupling (840)

Balancing grade G 2,5

Certificate Inspection cert. 3.1 to EN

10204

Test participation Non-witnessed

Hydrostatic test (room temp.)

Range Complete pump without shaft

seal

Test pressure 426.411 psi.g Test time 30.0 min

Certificate Inspection cert. 3.2 to EN

10204

Test participation Witnessed

Final visual inspection

Certificate Inspection cert. 3.2 to EN

10204

Test participation Witnessed

Material certificates: Volute casing (102)

Certificate Test report 2.2 to EN 10204

Material certificates: Casing cover (161)

Certificate Inspection cert. 3.1 to EN

10204

Material certificates: Impeller (230)

Certificate Inspection cert. 3.1 to EN

10204

Material certificates: Shaft (210)

Certificate Inspection cert. 3.1 to EN

10204

Order documentation

The following documents will be supplied with the order:

Technical data sheet Auxiliary connection plan Material certificates Performance curve Inspection reports/ certificates ATEX documentation

General arrangement drawing

Operating manual

Languages English

Coating

KSB coating code N1 to KSB AN 1865-1

Surface preparatory Blasting, surface treatment

quality SA 2 1/2

Primer Hydro primer, water based

Final coating 2-component polyurethane

(PUR)

Color Ültramarine blue (RAL 5002)

KSB-blue

Total film thickness approx. 0.0045 in

Performance curve



Customer pos. no.: 800-P-101 A/B Purchase order date: 2013-01-09 Your P/O no.: LOI-444-KSB

Quantity: 2,000

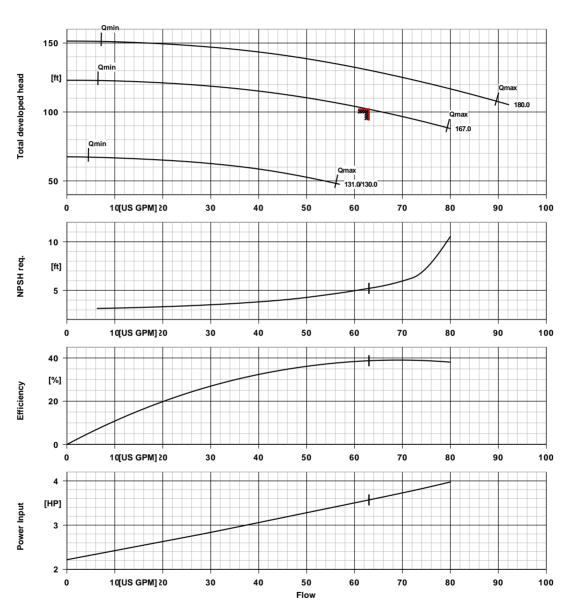
Number: 9972322702 - 042

Line: 000300 Date: 2012-12-18 Page: 16 / 18

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RPH S6 040-180

Heavy Duty Centrifugal Pump to API 610 11th edition



Curve data

Speed of rotation	2900 rpm
Fluid density	53.063800 lb/ft ³
Viscosity	0.0101 in ² /s
Flow rate	63.01 US GPM
Requested flow rate	63.00 US GPM
Total developed head	102.03 ft
Requested developed head	102.00 ft
Efficiency	38.7 %

Power absorbed	3.57 HP
NPSH required	5.22 ft
Curve number	K1316.452/142
Effective impeller diameter	6.57 in
Acceptance standard	API 610
Min. allow. flow for	20.73 US GPM
continuous stable operation	

Min. thermal flow rate 6.91 US GPM

Installation plan



Customer pos. no.: 800-P-101 A/B Purchase order date: 2013-01-09 Your P/O no.: LOI-444-KSB

Quantity: 2,000

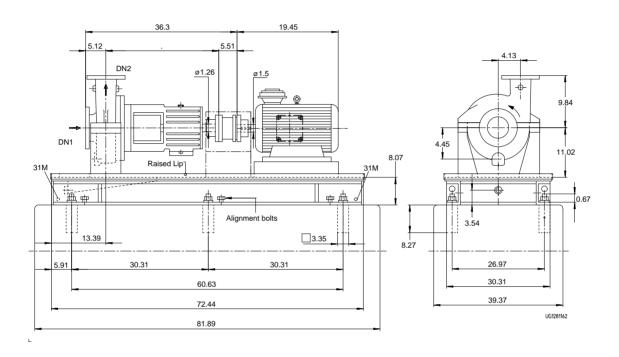
Number: 9972322702 - 042

Line: 000300 Date: 2012-12-18 Page: 17 / 18

Version no.: 3

RPH S6 040-180

Heavy Duty Centrifugal Pump to API 610 11th edition



Drawing is not to scale Dimensions in in

Motor

Motor manufacturer ABB
Motor size 132S
Motor power 6.44 HP
Number of poles 2
Speed of rotation 2900 rpm
Motor enclosure IP55
Position of terminal box 0°/360° (top)

Viewed from the drive

Connections

Suction flange according ASME B 16.5 / NPS 2 / CL to(DN1) 150 / RF

Discharge flange according ASME B 16.5 / NPS 1½ /

to(DN2) CL 150 / RF

Flanged openings are provided with metal closures at least 5 mm thick, with elastomer gaskets and at least four full-

diameter bolts.

Baseplate

Design Welded steel according to

API 610

Size 1.5 Material Steel ST

Leakage drain baseplate 2 NPT, Drain channel

(8B)

Foundation bolts M20x250

Coupling

Coupling manufacturer Crane

Coupling type Metastream TSK

Coupling size 13 Spacer 5.51 in

Weight net

Pump 269 lbm
Baseplate 948 lbm
Coupling 8 lbm
Coupling uard 11 lbm
Motor 187 lbm
Total 1423 lbm

Connect pipes without stress or strain!

For auxiliary connections see separate drawing.

Connection plan



Customer pos. no.: 800-P-101 A/B Purchase order date: 2013-01-09 Your P/O no.: LOI-444-KSB

Quantity: 2,000

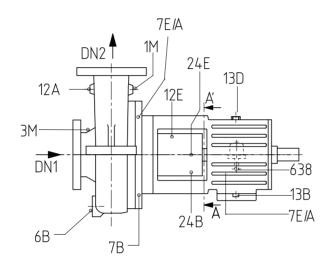
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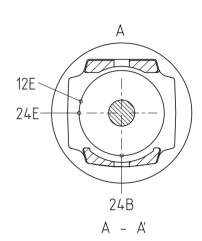
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RPH S6 040-180

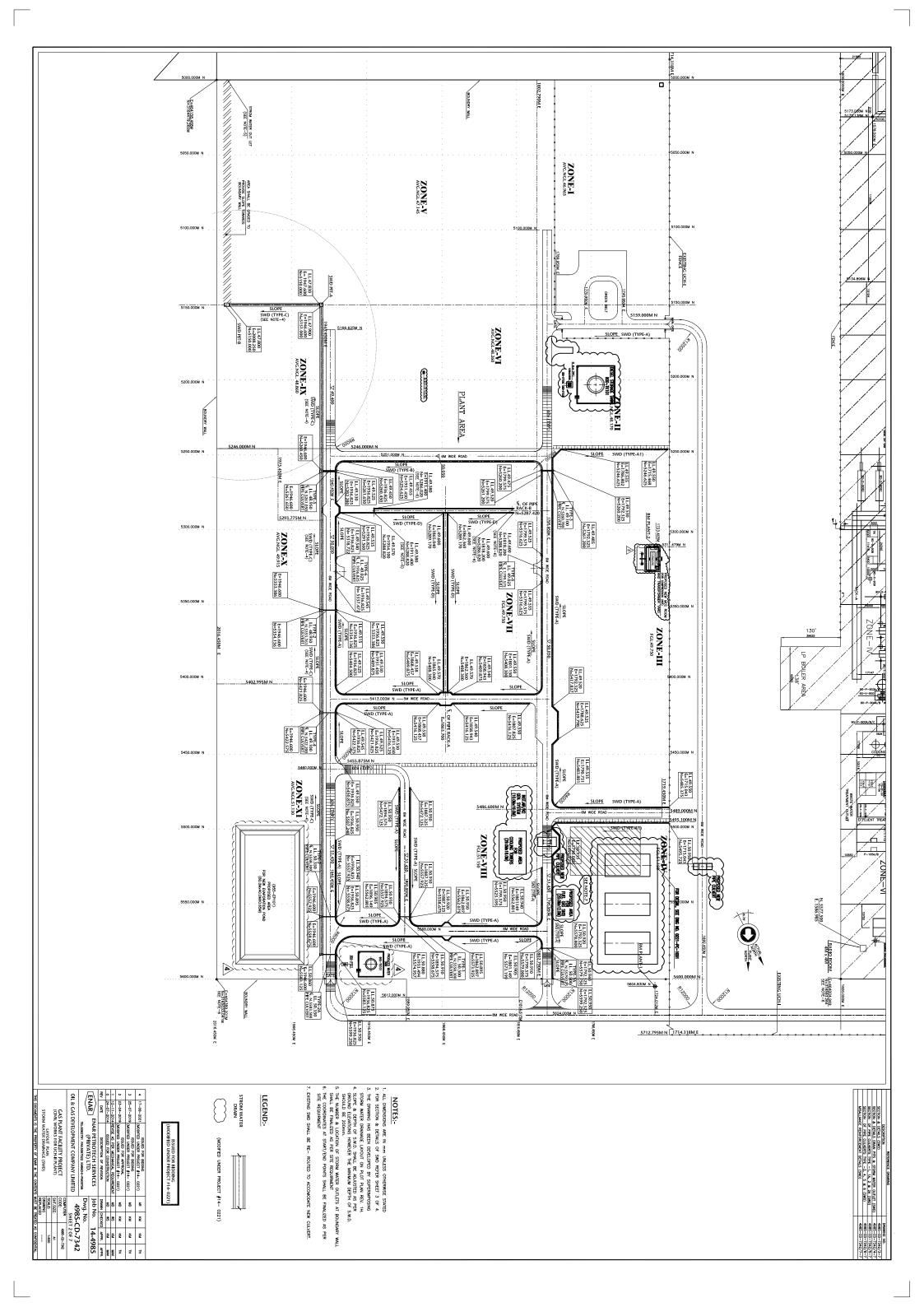
Heavy Duty Centrifugal Pump to API 610 11th edition

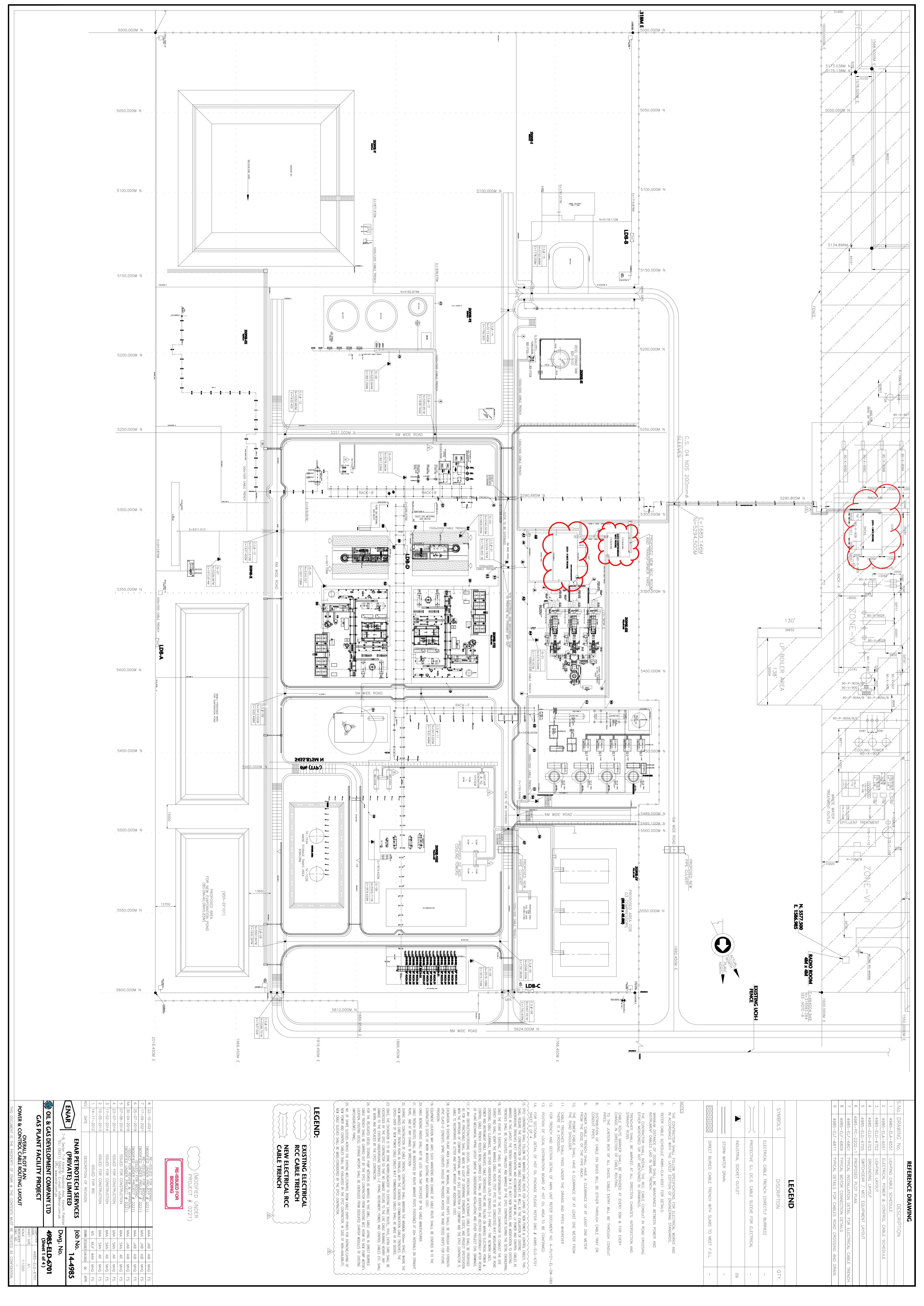




Connections

12E/12A Circulation in/out 7E/7A Cooling liquid in/out	NPS 1/2 / CL 300	Circulation line mounted by KSB Not executed
7B Cooling liquid drain casing cover	1/2" NPT	Not executed
6B Pumped liquid drain	NPS 1/2 / CL 150	Pipe connection with flange. Shutoff device - With valve and blind flange
24E Quench liquid in	3/8" NPT	Drilled and plugged.
24B Drain for quench liquid	3/8" NPT	Drilled and plugged.
1M Pressure gauge connection	1/2" NPT	Not executed
3M Pressure gauge connection	1/2" NPT	Not executed
13B Oil drain	1/2" NPT	Drilled and plugged.
13D Refill / venting	1/2" NPT	Closed with venting plug
638 Constant level oiler	1/4" NPT	Supplied unassembled with main equipment, to be installed by customer in acc. with operating instructions







SOIL TESTING SERVICES

KGI - 2011 - 268

SOIL INVESTIGATION FOR UCH-II DEVELOPMENT PROJECT



Client: Oil & Gas Development Corporation Limited



Consultant: ENAR Petrotech Services (Pvt.) Limited

| January 2012



SOIL TESTING SERVICES

GEOTECHNICAL ENGINEERS

8

MATERIAL TESTING LABORATORY

C-101/A KDA Scheme 1, Karachi

Pakistan. 75350

Tel: +92-21-4381117-8 Fax: +92-21-4525206 House # 25, Street # 17, Sector I-9/1 Islamabad. Pakistan

Tel: +92-51-4436379 Fax: +92-51-4434708

Email: info@sts.com.pk www.sts.com.pk

EXECUTIVE SUMMARY

Geotechnical Investigation for UCH-II Development Project, Dera Bugti was carried out in the period of December 2011 to January 2012. Twenty-five boreholes were drilled and ten electrical resistivity tests were carried out as part of the field investigation. Soil and groundwater samples were also collected during the field investigation. Laboratory testing of these samples has been carried out in the lab and includes determination of index properties through grain-size analysis, Atterberg limits, density and specific gravity tests.

The ground conditions observed at the site indicate the presence of very dense silty fine sand in the boreholes drilled in the plant area while very stiff to hard clayey silt has been encountered in three boreholes in the well head area. Groundwater table has not been encountered in any borehole drilled at the site.

Keeping these conditions under consideration allowable bearing pressures for isolated and raft footings have been given. Seismic soil profile has been taken as (S_c) in accordance with UBC-97.

Non-aggressive chemical characteristics of the subsurface soil have influenced the selection of cement for underground concreting and it is recommended to use Ordinary Portland Cement (OPC).

The corrosiveness of the ground up to 5 meters below existing ground has been determined through electrical resistivity tests and very high resistivity values indicate non- corrosiveness of the subsurface deposits.

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1. INTRODUCTION

Oil & Gas Development Corporation Limited (OGDCL) is planning the development of the UCH-II Project at Dera Bugti, Balochistan. In order to determine the geotechnical parameters of the subsurface deposits and to carryout foundation design of the structures, Soil Testing Services (STS) were hired by the consultants for this project. ENAR Petrotech Services (ENAR) entrusted to carry out the geotechnical investigation works.

The geotechnical field investigation and laboratory testing was conducted by STS in the period of December 2011 to January 2012. Scope of work included drilling of twenty-five boreholes and carrying out electrical resistivity tests at ten locations. In each borehole field tests, including standard penetration test, were carried out along with the collection of undisturbed soil samples, laboratory testing and preparation of report including recommendations for foundation design.

The report consists of seven chapters with Chapter 2 describing the site's existing condition, Chapter 3 discusses the on site testing and drilling activities, Chapter 4 describes the performance of laboratory tests, Chapter 5 describes the subsurface deposits in detail, Chapter 6 includes the recommendation for foundation design and Chapter 7 contains a summary of conclusions regarding the ground conditions, with respect to geotechnical engineering for this project.

2. THE SITE

The site is located in the tribal Dera Bugti Agency, Balochistan. UCH-II Development Project is located besides the UCH-I Power Plant. The project area lies on relatively flat area and there are no major elevation changes across the investigated area, either in the plant area or at the well head. Besides the existing power plant other major feature near the site is the OGDCL staff camp.

3. **DRILLING, FIELD TESTING & SAMPLING**

The field testing program consisted of drilling works, excavation of test pits, in-situ testing including Standard Penetration Tests (SPT) and collection of soil and water samples including undisturbed sampling through Shelby tubes from clay samples. The following sections describe these activities in further detail.

3.1 **DRILLING METHOD**

All the boreholes were drilled by rotary wash boring method. In rotary drilling following drilling bits were used with different kinds of subsurface conditions:

- Tricone Bit silty sands and clay
- Core Barrel hard clay

3.2 FIELD TESTING AND SAMPLING

Field testing was carried out in boreholes. The tests included:

Standard Penetration Test (SPT)

Soil samples were extracted from all the boreholes with the help of following tools:

- SPT sampler for all types of soils
- Rock coring for hard clay

Following sections indicate the processes carried out in each of the field tests and sampling.

3.2.1 STANDARD PENETRATION TESTS (SPT)

The standard penetration tests (SPT) were carried out at 1.5m interval in the overburden above the bedrock. The standard penetration test was carried out by "Safety" type sliding hammer. Split-spoon sampler was used in cohesive and fine granular soils to conduct SPT.

The standard penetration test was carried out by an assembly of the following parts:

- Drive-weight assembly, consisting of a drive-weight assembly that consists of a drive head and a 63.5kg impact hammer, a hammer fall guide and the drop system. The drop mechanism will ensure a constant free fall of 760mm.
- Drive rods connect the drive-weight assembly to the sampler.

• The split spoon sampler was used to carryout the test, along with retrieving disturbed samples.

The base of the borehole was made clean and reasonably undisturbed at the test elevation. Following precautions were taken during the testing sequence:

- The level of water or bentonite slurry was maintained at a sufficient level above the groundwater level, to ensure any entry of water through the bottom of the borehole.
- The casing was not driven below the level at which the test will start.

The test was executed in the following steps:

- The sampler and the drive rods were lowered in the borehole and the hammer assembly added to it.
- The sampler is penetrated over seating drive of 150mm and the numbers of blows are recorded.
- In the same way the sampler is driven over a test drive of 300mm in two increments of 150mm.
- The numbers of blows are recorded during each of the last two increments.
- · The test was deemed finished when total number of blows equal to 50 was reached.

3.3 **SAMPLING**

Sampling forms an essential part of the geotechnical investigation process and good sampling is essential for proper laboratory testing of samples for determining strength and compressibility characteristics of soil.

3.3.1 SPT SAMPLES

Samples were recovered from standard penetration testing. The samples were recovered in split-spoon sampler and then stored in plastic bags. The storage of splitspoon samples in jars ensured retention of natural moisture of the samples which were later determined in the laboratory.

LABORATORY TESTING 4.

Laboratory testing was carried out on the retrieved split-spoon samples and rock cores. The following section enlists and gives details of relevant tests carried out on select samples as required for determining the subsurface conditions and correlating with the information obtained from field testing and sampling.

4.1 **GRAIN SIZE ANALYSIS**

The purpose of grain size analysis is to determine the sizes of the assemblage of particles that make up the soil. The grain size analysis is conducted in two parts: for particles above the "# 200 US sieve", sieve analysis is carried out by passing the selected soil sample from various sieves. For particles finer than the "# 200 US sieve", hydrometer analysis is carried out. The combined process of determination of the size of particles is termed as the grain size analysis.

The subsurface deposits encountered at the project site up to the explored depth of 20m consist of fine to medium grained sands. The grain size analysis, of the samples retrieved from SPT, show very minute percentage of particles finer than 75µm (# 200 sieve). Therefore, hydrometer analysis was not carried out on the samples. The samples were prepared in accordance with ASTM D 420 and the grain size analysis was carried out in accordance ASTM D 422.

The results are appended with the report in Appendix C. Grainsize analysis of fifty-three (53) soil samples were carried out.

4.2 **LIQUID AND PLASTIC LIMITS**

The liquid and plastic limits of soil are parameters that define the state of the soil at different water content levels. The liquid limit is the water content above which the soil goes from solid phase to liquid phase and the plastic limit indicates the water content below which the soil mass makes the transition from a plastic, remouldable solid to a brittle mass which can not be remoulded any more. The difference in the water contents at Liquid and Plastic limits is termed as the plasticity index and it is a measure of the plasticity of the soil under consideration. The samples used for determining the limits are finer than the "#40 US sieve". The limits were determined in accordance with the ASTM D 4318.

Liquid and plastic limits of four (04) samples were carried out in accordance with the given procedure. The soils plot below the A-line and can be classified as low plasticity silts with minute percentage of clay minerals.

4.3 **CHEMICAL TESTS**

Sulphate in groundwater or soil can attack concrete placed in the ground or on surface. A reaction takes place between the sulphate and the aluminate compounds present in the cement, causing crystallisation of complex compounds. The expansion, which accompanies crystallisation, induces stresses in the concrete, which results in mechanical disintegration.

In moist conditions, such as exposure to seawater, the presence of chloride ion, Cl, presents a serious possibility of the corrosion of the reinforcement. The presence of Ca (OH) 2 provides a strong alkaline environment in which a thin film of iron oxide is formed on the metal surface which protects it against corrosion. However, if the concrete is permeable to the extent that the soluble chlorides can reach up to the reinforcing steel, then in the presence of water and oxygen, the corrosion of the reinforcement will take place. Rust occupies more volume than the original steel, and hence the ensuing expansion of concrete, results in cracking and spalling.

Due to adverse effect of sulphates and chlorides on the quality of concrete it is essential to conduct chemical tests on soil and groundwater. This helps in quantifying the expected exposure of concrete to these chemicals and in devising precautionary measures to ensure integrity of concrete.

The following chemical tests were carried out on soil samples:

- Total dissolved solids
- Chloride content
- Sulphate content
- pH

Chemical tests were carried out in accordance with BS 1377-3. Chemical characteristics of soil samples indicate negligible exposure of chloride and sulphate salts. The selection of cement for underground concreting and is discussed in Chapter 6.

Table 4.1: ACI standards for concrete for sulphate exposure

Sulphate Exposure	Water Soluble Sulphates in Soil	Sulphate in Water	Cement Type
	(%)	(mg/L)	
Negligible	0.00-0.10	0- 150	OPC
Moderate	0.10-0.20	150- 1500	Type II
Severe	0.20-2.00	1500-10000	Type V
Very Severe	Over 2.00	Over 10000	TypeV plus pozzolan

4.4 **UNCONFINED COMPRESSION TEST**

Unconfined compressive strength test involves axially loading a cylindrical soil sample to failure. The term unconfined is used because the lateral force on the sample is zero. While, unconfined compression test is a convenient method of determining strength, the results thus obtained can not be assumed to represent the actual strength of soil as the lateral confinement is not present and in its undisturbed state the soil is confined by lateral pressure. The unconfined compressive strength test was carried out in accordance with ASTM D 7012.

5. **GROUND CONDITIONS**

The subsurface deposits up to the explored depth of 15m consist of the following units:

- Medium stiff to hard clayey silt
- Medium to very dense silty fine Sand

Following sub-sections describe the strength characteristics of the geological units. Groundwater was not encountered in any borehole drilled at the site.

5.1 **CLAYEY SILT**

These soil deposits are found in three boreholes drilled in the Well Head Area of the project. The deposits are in a medium stiff to hard state of consistency as indicated by the SPT 'N' count data. Laboratory test results from the unconfined compression and direct shear test confirm the field data and the samples show unconfined undrained strength of 300 to 500 kPa. The soil has been classified in the 'ML' category of Unified Classification System.

5.2 **SILTY FINE SAND**

Silty fine sand was encountered in all the boreholes drilled in the Plant Area of the project. The SPT 'N' count data indicates medium to very dense state of compactness. The soil has been classified in the 'SP-SM' category of Unified Classification System.

5.3 **GROUNDWATER CONDITIONS**

Groundwater was not encountered in any borehole drilled at the site either in the Well Head or Plant Area.

6. **ENGINEERING DESIGN CONSIDERATIONS**

Foundation system has to be designed to prevent excessive settlement or shear failure of soil due to the structural loads. Therefore, considering the ground conditions and the size of structures it is recommended that the buildings be placed on either Pad or Mat Footings to fulfil the above mentioned design requirements.

ALLOWABLE BEARING PRESSURE - SHALLOW FOOTINGS 6.1

The allowable bearing pressure has been calculated following shear strength determination, through in-situ (SPT) and laboratory (unconfined compression and direct shear) tests. Table 6.1 gives allowable bearing pressure for shallow foundation placed at different depths.

Table 6.1 Allowable Bearing Pressures

Location	Depth (m)	Allowable Bearing Pressure Pad Footing (kPa)	Allowable Bearing Pressure Raft/Mat Footing (kPa)
Plant Area	1.5 – 2.5	200	240
Well Head	1.5 – 2.5	150	190

The settlement of pad and mat footings due to the net allowable bearing pressures has been estimated to be within the allowable limit of 25mm and 50mm respectively.

6.1.1 DRAINAGE

The foundation must be constructed under dry conditions and adequate drainage must be given to ensure that the soil at founding level is not exposed to water following foundation construction.

6.2 SEISMIC DESIGN COEFFICIENTS (ACCORDING TO UBC-97)

Chapter 16, Division V, Section 1636 of UBC-97 deals with the determination of Soil Profile Types. Design practice involves using seismic parameters of zone 3 for the area under consideration.

6.2.1 SEISMIC ZONE FACTOR

Table 16-I of UBC-97 defines the seismic zone factor to be used in choosing seismic coefficients for a location. The seismic zone factor "Z" will be taken as 0.30.

6.2.2 SOIL PROFILE TYPE

Table 16-J of UBC-97 defines the soil profile types to be used for determining seismic coefficients. Based on the field data obtained from sub-soil exploration, the soil profile will be taken as "Sc" i.e. stiff soil for design of structures.

6.2.3 SEISMIC COEFFICIENTS

Seismic coefficients are as under:

 S_C : $C_a = 0.33 \& C_V = 0.45$ For

TYPE OF CEMENT - UNDERGROUND CONCRETING 6.3

Tests on soil samples obtained from the borehole indicate 'negligible' Sulphate and chloride exposure. Under these conditions it is recommended to use Ordinary Portland Cement (OPC) for all under ground concrete works.

6.4 CORROSION POTENTIAL - ELECTRICAL RESISTIVITY TEST

Electrical resistivity tests were carried out at ten locations within the plant area. The depth of probes at each location was kept at 1m, 3m and 5m.

6.4.1 WENNER FOUR POINT METHOD

The most commonly used method for resistivity testing of soil is the *Wenner Four Point* method. *AEMC 6742* ground resistance tester was used to conduct this test. Accessories include insulated copper wires and metal rods used as electrodes.

It requires inserting four probes into the test area. The probes are installed in a straight line and equally spaced (See Figure 1-1). The probes establish an electrical contact with the earth.

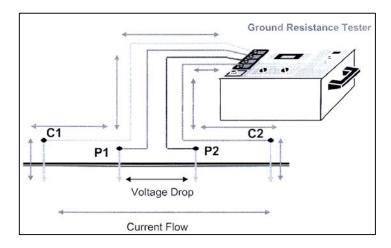


Fig. 6.1 Schematic Diagram of a Wenner Array

The four pole test meter injects a constant current through the ground via the tester and the outer two probes. The current flowing through the earth (a resistive material) develops a voltage / potential difference. This voltage drop resulting from the current flow is then measured between the two inner probes.

The meter then knows the amount of current that is flowing through the earth and the voltage drop across the two center probes. With this information the meter uses ohms law (R=E/1) to calculate and display the resistance in ohms.

This displayed resistance value is in ohms and must be converted to ohms-meter,

which are the units of measure for soil resistivity. Ohms-meter is the resistance of a volume of earth that is one meter by one meter by one meter, or one cubic meter. Readings were taken at probe spacing of 1, 3 and 5 meters.

The calculated soil resistivity is the average of the soil resistivity from the surface to a depth equivalent to the probe spacing. For example, a probe spacing of 5 meters between each probe will provide the average soil resistivity between the surface and a depth of 5 meters.

6.4.2 TESTING PROCEDURE

Equipment and accessories used for this test are as follows:

- A 4-Pole Digital Ground Resistance Tester
- Four probes
- Four insulated wire conductors
- Measuring tape
- Hammer (to drive probes)

Step 1. Install the 4 test probes in the ground equally spaced in a straight line. Generally the shorter spacing is done first (i.e. 1m).

Step 2. Using the conductors, connect the C₁, P₁, P₂ and C₂ terminals to the electrodes. The electrodes must be connected in order from the end, to the C₁, P₁, P₂ and C₂ terminals.

Step 3. Press the test button and read the digital display. Record the reading on the memory of the tester.

Step 5. Place the probes at each of the spacing indicated above and record the readings.

6.4.3 CORROSIVENESS OF SOIL

The corrosiveness of the soil is dependent on the resistance it offers to the flow of charges, lower the resistance higher the conductivity and consequently higher corrosiveness of the soil due to ease of charge flow. Table 6.2 gives generic values of ground resistance against corrosiveness.

The values of ground resistance for all the readings are greater than 100 Ωm and the ground conditions up to 5m depth below existing ground level can be classified as generally not corrosive.

Table 6.2 Resistivity versus Corrosiveness of Soil

Corrosivity	Resistivity (Ωm)
Very Corrosive	Below 5
Corrosive	5-10
Moderately Corrosive	10-20
Mildly Corrosive	20-100
Generally not Corrosive	> 100

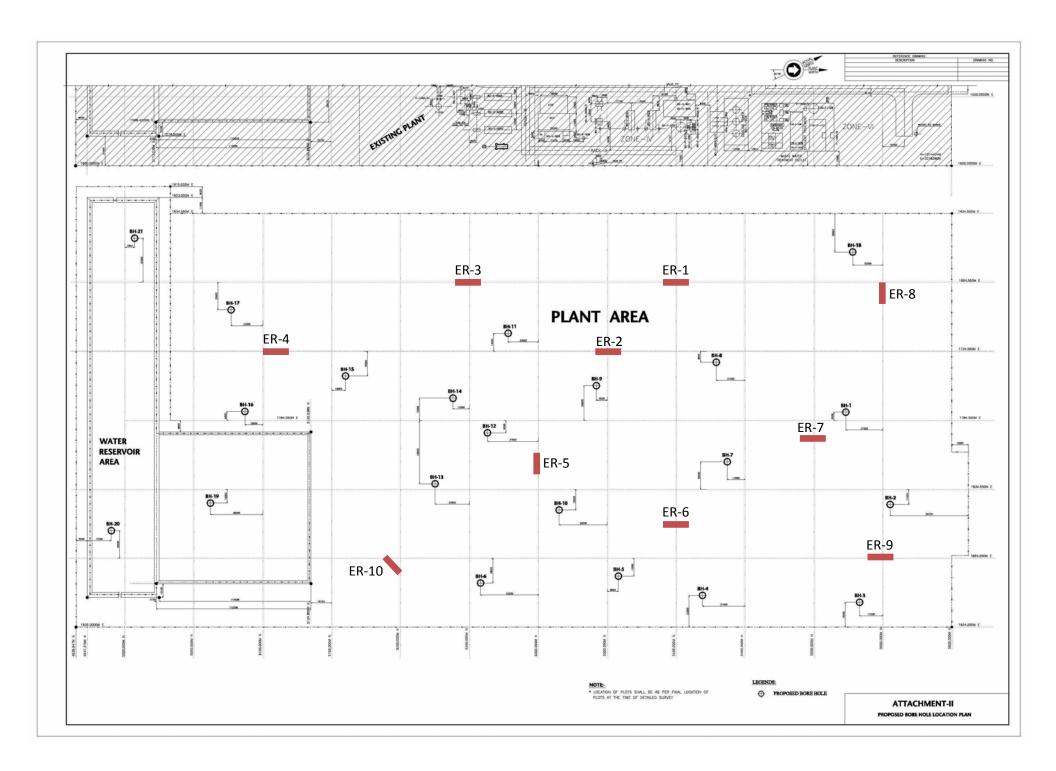
7. CONCLUSIONS

Geotechnical Investigation for UCH-II Development Project, Dera Bugti was carried out in the period of December 2011 to January 2012. Twenty-five boreholes were drilled and ten electrical resistivity tests were carried out as part of the field investigation. Soil and samples were also collected during the field investigation. Laboratory testing of these samples has been carried out in the lab and includes determination of index properties through grain-size analysis, Atterberg limits, density and specific gravity tests. Shearing characteristics of the soil samples has also been determined through direct shear tests and unconfined compression tests. Chemical characteristics of soil samples have also been assessed through determination of total dissolved solids, sulphate content, chloride content and pH.

Keeping in view the results from field and laboratory tests on soil samples and the expected loads being transferred to the founding stratum, allowable bearing pressures have been recommended for isolated and raft footings. Non-aggressive chemical characteristics of the subsurface soil mean that Ordinary Portland Cement (OPC) should be used for underground concreting.

The corrosiveness of the ground up to 5 meters below existing ground has been determined through electrical resistivity tests and very high resistivity values indicate non-corrosiveness of the subsurface deposits.

Boreholes Location Plan



Borehole Logs



Soil Testing Services

SUBSURFACE EXPLORATION LOG

Section Composition Comp	Start date: December 23, 2011								BOREHOLE No	o. BH-1	
Sample details	Drilling Method: Rotary Wash Equipment:					Bore	hole Diamete				
22.12.11 8.00 AM 9.35 AM 10.25 AM 11.50 AM 11.50 AM 12.40 PM 1.40 PM 1.40 PM 3.50 AM 3.50 AM 3.50 AM 3.50 AM 3.50 AM 3.50 AM 4.50 AM 3.50 AM 3		lepth (m)		Sample	e details		netration Test	Description of strata		"N" Count Graph	
SPT 1 27 450 Silty fine SAND	Time	Casing o	Depth to	Depth (m) Type		No. Blows/N	Penetration (mm)				
SPT 2 24 450					SPT	1 2	7 450	Brown, medium den silty fine SAND	se,	•	
9.35 AM 10.25 AM 11.05 AM 2	8:50 AM				SPT	2 24	4 450	dense to very dense silty fine SAND, interlay	e, yer with	-	
11:05 AM 11:05 AM 11:05 AM 11:05 AM 11:05 AM 11:05 AM 11:07 AM 11:08 AM 11:09 AM 11:09 AM 11:09 AM 11:09 AM 11:09 AM 11:09 AM 11:00	9:35 AM				SPT	3 40	0 450				
11:50 AM	10:25 AM			4	SPT	4 20	0 450				
11:50 AM 12:40 PM 1:40 PM 3:10 PM 4:00 PM To spr 10 Refusal 100 Spr 10 Refusal 100 Spr 10 Refusal 100 Bottom of BH-1 at 10-meter Logged by: Logged by: M. Ali Bilgrami/F. Abbas Syed Irfan Shah	11:05 AM	N/A	N/E	5	SPT	5 28	8 450				
1:40 PM 1:40 PM 3:10 PM 4:00 PM Remarks: - SPT Standard Penetration Test SPT 7	11:50 AM			6	SPT	6 39	9 450				
1:40 PM 3:10 PM 4:00 PM SPT Section Sec	12:40 PM			7	SPT	7 4	7 450				
3:10 PM	1:40 PM				SPT	8 Refu	usal 100				
Remarks: - SPT Standard Penetration Test Bottom of BH-1 at 10-meter Logged by: M. Ali Bilgrami/F. Abbas Compiled by: Syed Irfan Shah	3:10 PM			9	SPT	9 Refu	usal 100				
Remarks: - SPT Standard Penetration Test Logged by: M. Ali Bilgrami/F. Abbas Compiled by: Syed Irfan Shah	4:00 PM			10	SPT	10 Refu	usal 100	Bottom of BH-1 at 10-	meter		
	Remarks:								Logged by:	M. Ali Bilgrami/F. Abbas	
- UDS Undisturbed Sample Checked by: Ali Zaidi	- SPT(C) Standard Penetration Test with Cone										
Project : Soil Investigation of the Site for UCH-II Development Project, Baluchistan Client : ENAR Petrotech Services (Pvt) Limited Contract No. KGI-2011-268 Sheet No. 1 of 1										KGI-2011-268	_



Soil Testing Services

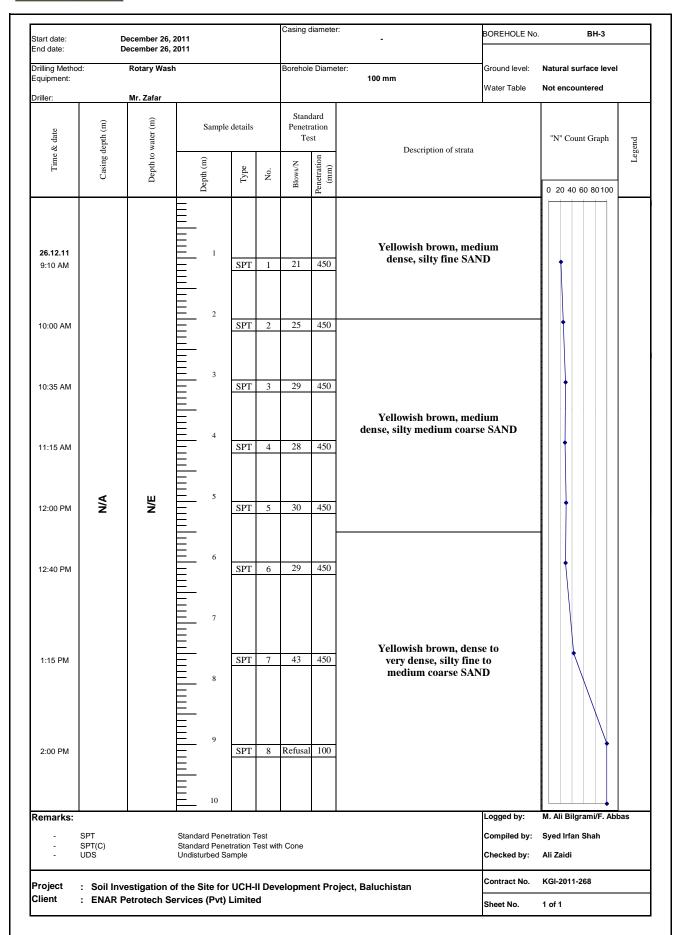
SUBSURFACE EXPLORATION LOG

ctart date: December 29, 2011									BOREHOLE No	. ВН-2		
End date: Drilling Method Equipment: Driller:	l:	Rotary Wasi			Во	rehole [Diameter:	100 mm	Ground level: Water Table	Natural surface level		
Time & date	Casing depth (m)	Depth to water (m)		le details	F	Standar Penetrati Test	tion	Description of strata	.1	"N" Count Graph		
Tir	Casir	Depth	Depth (m)	Type	Vo	Blows/N	Penetration (mm)			0 20 40 60 80100		
29.12.11 9:00 AM			1	SPT	1	33	450	Yellowish brown, med dense, silty fine SAND interlayer of fine gravel a Yellowish brown, den very dense, silty fine SAN coarse sand at place	O with at places at places	•		
9:40 AM			2	SPT	2	25	450					
10:50 AM			3	SPT	3	24	450					
11:30 AM			4	SPT	4	29	450					
1:15 PM	N/A	N/N	5	SPT	5	30	450					
2:00 PM			6	SPT	6	33	450					
2:35 PM			8	SPT	7	39	450					
3:20 PM			10	SPT	8	43	450					
- 5	SPT SPT(C) UDS			Logged by: Compiled by: Checked by:	M. Ali Bilgrami/F. Abbas Syed Irfan Shah Ali Zaidi							
Project : Soil Investigation of the Site for UCH-II Development Project, Baluchistan Client : ENAR Petrotech Services (Pvt) Limited									Contract No.	KGI-2011-268		



Start date:		December 29,				Casing	diameter:	-	BOREHOLE No	o. BH-2	
End date: Drilling Method Equipment: Driller:	od:	Rotary Wash Mr. Zafar				Borehole	e Diamet	er: 100 mm	Ground level: Water Table	Natural surface leve	ıl
Time & date	Casing depth (m)	Depth to water (m)	Sample	details		Stand Penetr Te	ration st	Description of strata		"N" Count Graph	Legend
Time	Casing	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)	·		0 20 40 60 80 100	Le
29.12.11 4:25 PM				SPT	9	Refusal	100			•	
5:10 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, den very dense, silty fine SAI coarse sand at plac	ND with	•	
5:35 PM			14	SPT	11	Refusal	100			•	
5:55 PM			15	SPT	12	Refusal	100	Bottom of BH-2 at 15-	meter	_	
Remarks:	SPT		Standard Pene						Logged by:	M. Ali Bilgrami/F. Ak Syed Irfan Shah	bas
-	SPT(C) UDS		Standard Pene Undisturbed Sa	tration 7		h Cone			Checked by:	Ali Zaidi	
Project Client		vestigation o				elopme	ent Pro	ect, Baluchistan	Contract No. Sheet No.	KGI-2011-268	







Start date: End date:		December 26, December 26,				Casing C	liameter:	-	BOREHOLE No). BH-3	
Drilling Method: Equipment: Driller:		Rotary Wasi	1			Borehole	Diameter:	100 mm	Ground level: Water Table	Natural surface level	
2 date	(m) thde	vater (m)	Sample	e details		Stand Penetra Tes	ation	D		"N" Count Graph	pue
Time & date	Casing depth (m)	Depth to water (m)	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of strata		0 20 40 60 80 100	Legend
26.12.11 2:35 PM				SPT	9	Refusal					
3:15 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, den very dense, silty fine medium coarse SAN	e to		
4:00 PM			13	SPT	11	Refusal	100				
4:40 PM			15	SPT	12	Refusal	100	Bottom of BH-3 at 15-	meter	-	
Remarks:			Standard Pene						Logged by:	M. Ali Bilgrami/F. Abbas Syed Irfan Shah	
	T(C)		Standard Pene Undisturbed S	etration 1		h Cone			Checked by:	Ali Zaidi	
			of the Site for ervices (Pvt)			elopme	nt Project	, Baluchistan	Contract No. Sheet No.	KGI-2011-268	



End date:		December 26, 2	2011							
Drilling Method Equipment: Driller:		Rotary Wash				Borehole	Diameter:	100 mm	Ground level: Water Table	Natural surface level
Time & date	Casing depth (m)	Depth to water (m)		e details		Stand Penetra Tes	ation st	Description of strata	,	"N" Count Graph
	చ్	Del	Depth (m)	Type	No.	Blows/N	Penetration (mm)			0 20 40 60 80 100
26.12.11 9:20 AM			1	SPT	1	25	450	Brown, medium den to dense, silty fine SA		
10:10 AM				SPT	2	42	450			-
10:45 AM			3	SPT	3	42	450			
11:30 AM			4	SPT	4	46	450			
12:15 PM	N/A	N/E	5	SPT	5	Refusal	100			
12:55 PM			6	SPT	6	45	450	Brown, dense to very d silty fine SAND, interl coarse sand at plac	ayer	
2:10 PM			8	SPT	7	47	450			
2:50 PM			9	SPT	8	Refusal	100			
Remarks:		<u> </u>				ļ Į			Logged by:	M. Ali Bilgrami/F. Abbas
- 8	SPT SPT(C) UDS		Standard Pend Standard Pend Undisturbed S	etration Te		n Cone			Compiled by: Checked by:	Syed Irfan Shah Ali Zaidi
			f the Site fo ervices (Pvt)			elopme	nt Project	, Baluchistan	Contract No.	KGI-2011-268



Start date: End date:		December 26, December 26,				Casing d	llameter:	-	BOREHOLE No). BH-4	
Drilling Method: Equipment: Driller:		Rotary Wasl	1			Borehole	Diameter:	100 mm	Ground level: Water Table	Natural surface level	
z date	epth (m)	vater (m)	Sample	details		Stand Penetra Tes	ation			"N" Count Graph	pua
Time & date	Casing depth (m)	Depth to water (m)	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of strata		0 20 40 60 80100	Legend
26.12.11 3:15 PM				SPT	9	Refusal					
4:10 PM	N/A	N/E	12	SPT	10	Refusal	100	Brown, dense to very d silty fine SAND, inter coarse sand at plac	layer	•	
4:55 PM			13	SPT	11	Refusal	100			•	
5:40 PM			15	SPT	12	Refusal	100	Bottom of BH-4 at 15-	meter	-	
Remarks:									Logged by:	M. Ali Bilgrami/F. Abbas	<u>, </u>
- SP - SP - UD	T(C)		Standard Pene Standard Pene Undisturbed S	etration 1		h Cone			Compiled by: Checked by:	Syed Irfan Shah Ali Zaidi	
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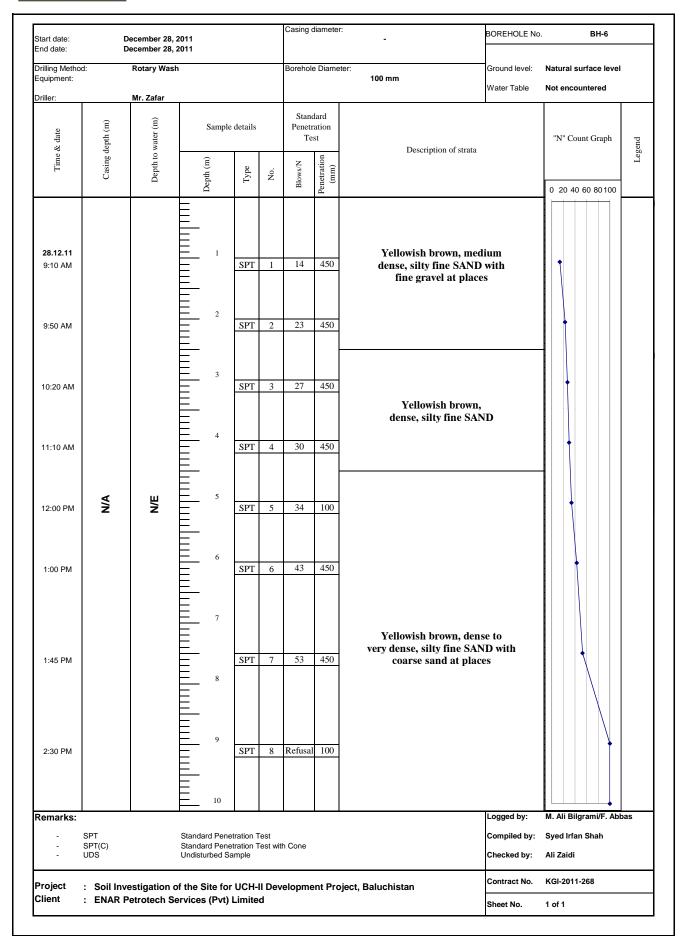


	rt date:		December 27, December 27,			Casing diar	meter:	-	BOREHOLE No	. ВН-5	
Sample details Standard Penetration Penetration Description of strain Penetration Pene	ling Method: uipment:		Rotary Was			Borehole D	iameter:	100 mm		Natural surface level	
27.12.11 8-40 AM 9-20 AM 10:00 AM 11:10 AM 2		ing depth (m)				Penetration Test	on	Description of strata	1	"N" Count Graph	Legend
9-20 AM 10:00 AM 10:35 AM 11:10 AM 11:45 AM 12:30 PM SPT 1 18 450 silty fine SAND		Cas	Dept	Depth (Type No.	Blows/	(mm)			0 20 40 60 80 100	
10:00 AM 10:35 AM 11:10 AM 2					SPT 1	18 4	150	Brown, medium de silty fine SAND	ense	•	
10:00 AM 10:35 AM 11:10 AM 2):20 AM				SPT 2	22 4	150			1	
11:10 AM SPT 4 30 450	D:00 AM			3	SPT 3	24 4	150			•	
11:45 AM SPT 5 35 100	D:35 AM			4	SPT 4	30 4	150			•	
11:45 AM SPT 6 40 450 silty fine SAND, interlayer coarse sand at places	1:10 AM	N/A	N/E	5	SPT 5	35 1	.00	Brown, medium de	nse.		
12:30 PM SPT 7 47 450	1:45 AM			7	SPT 6	40 4	150	dense to very den silty fine SAND, inte	se, rlayer		
	2:30 PM			8	SPT 7	47 4	150				
1:05 PM SPT 8 Refusal 100	:05 PM				SPT 8	Refusal 1	00				
		——— РТ		Standard Pens	etration Test		<u> </u>			M. Ali Bilgrami/F. Abbas Syed Irfan Shah	5
- SPT(C) Standard Penetration Test with Cone - UDS Undisturbed Sample Checked by: Ali Zaidi	- SPT	PT(C)		Standard Pene	etration Test wi	ith Cone					
Project : Soil Investigation of the Site for UCH-II Development Project, Baluchistan Client : ENAR Petrotech Services (Pvt) Limited Contract No. KGI-2011-268						velopment	Project,	Baluchistan	Contract No.	KGI-2011-268	



Start date: End date:		ecember 27, 2 ecember 27, 2				Casing d	liameter:	-	BOREHOLE No). BH-5
Drilling Method: Equipment: Driller:		Rotary Wash				Borehole	Diameter:	100 mm	Ground level: Water Table	Natural surface level
Time & date	Casing depth (m)	Depth to water (m)	Sample	details		Stand Penetra Tes	ation st	Description of strata		"N" Count Graph
Time	Casing of	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of situal		0 20 40 60 80100
27.12.11 2:00 PM			11	SPT	9	Refusal	100			•
2:25 PM	N/A	N/E	12	SPT	10	Refusal	100	Brown, medium den dense to very dense silty fine SAND, inter- coarse sand at plac	e, layer	•
3:10 PM			14	SPT	11	Refusal	100			•
4:05 PM			15	SPT	12	Refusal	100	Bottom of BH-5 at 15-1		<u> </u>
								Bottom of BIT-3 at 13-1		
Remarks:									Logged by:	M. Ali Bilgrami/F. Abbas
- S	SPT SPT(C) JDS		Standard Pene Standard Pene Undisturbed Sa	tration To		n Cone			Compiled by: Checked by:	Syed Irfan Shah Ali Zaidi
						elopme	nt Projec	t, Baluchistan	Contract No.	KGI-2011-268
			of the Site for ervices (Pvt)			elopme	nt Projec	t, Baluchistan	Contract No. Sheet No.	KGI-2011-268







Start date: End date:		December 28, 2 December 28, 2				Casing d	lameter:	-	BOREHOLE No). BH-6	
Drilling Method: Equipment: Driller:		Rotary Wash	1			Borehole	Diameter:	100 mm	Ground level: Water Table	Natural surface level	
	epth (m)		Sample	details		Stand Penetra Tes	ation			"N" Count Graph	pua
Time & date	Casing depth (m)	Depth to water (m)	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of strata		0 20 40 60 80100	Legend
28.12.11 3:10 PM				SPT	9	Refusal					
3:55 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, den very dense, silty fine SAN coarse sand at plac	ND with		
4:35 PM			13	SPT	11	Refusal	100				
5:05 PM			15	SPT	12	Refusal	100	Bottom of BH-6 at 15-1	meter	-	
Remarks:	т		Standard Pene	atration 3	-Act				Logged by:	M. Ali Bilgrami/F. Abbas	;
	T(C)		Standard Pene Standard Pene Undisturbed S	etration 1		h Cone			Compiled by: Checked by:	Syed Irfan Shah Ali Zaidi	
			of the Site for ervices (Pvt)			elopme	nt Project	t, Baluchistan	Contract No.	KGI-2011-268	

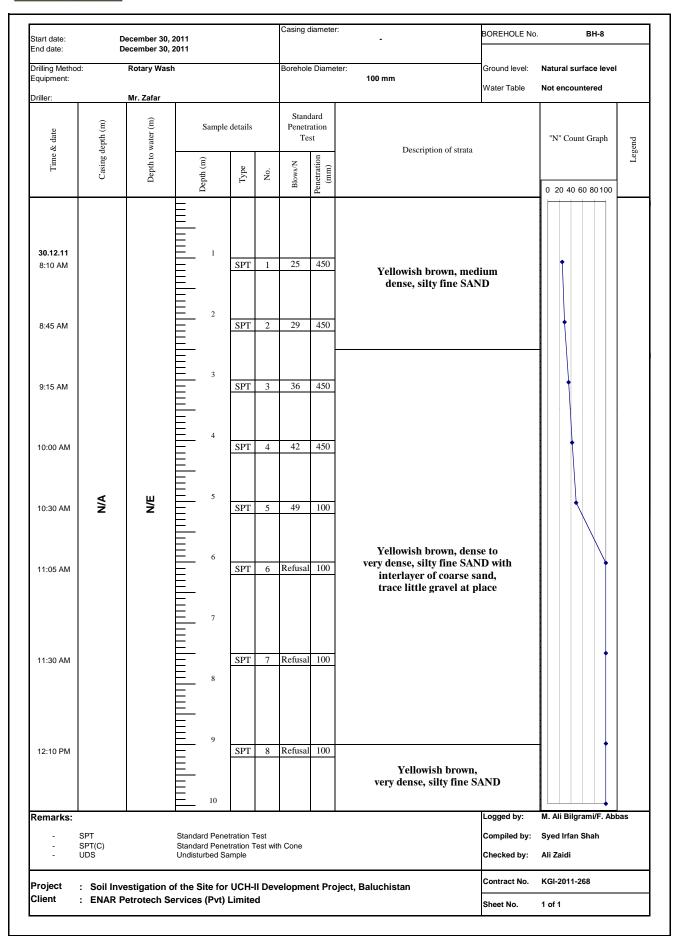


Start date: End date:		December 30, December 30,				Casing of		-	BOREHOLE No	o. BH-7
Orilling Metho Equipment:	d:	Rotary Wasl	h			Borehole	e Diamet	ter: 100 mm	Ground level: Water Table	Natural surface level
	epth (m)		Sample	details		Stand Penetr Te	ation		•	"N" Count Graph base of
Time & date	Casing depth (m)	Depth to water (m)	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of strata		0 20 40 60 80100
30.12.11 8:35 AM			1	SPT	1	16	450			
9:20 AM			2	SPT	2	17	450	Yellowish brown, med dense to dense, silty fine	lium SAND	
10:10 AM			3	SPT	3	20	450	with interlayer of fine grave	l at places	
11:00 AM			4	SPT	4	23	450			
11:40 AM	N/A	N/E	5	SPT	5	34	100			
12:15 PM				SPT	6	30	450			-
12:50 PM			8	SPT	7	40	450	Yellowish brown, dense to very dense silty fine SAND		
1:45 PM			9	SPT	8	47	100			
Remarks:		1		<u> </u>		l	<u> </u>		Logged by:	M. Ali Bilgrami/F. Abbas
- - -	SPT SPT(C) UDS		Standard Pene Standard Pene Undisturbed Sa	tration 1		h Cone			Compiled by: Checked by:	Syed Irfan Shah Ali Zaidi
		_	of the Site for			elopme	nt Pro	ject, Baluchistan	Contract No.	KGI-2011-268



Start date: End date:		December 30, 2 December 30, 2				Casing d	liameter:	-	BOREHOLE No	o. BH-7
Drilling Method Equipment: Driller:		Rotary Wash				Borehole	Diameter:	100 mm	Ground level: Water Table	Natural surface level
Time & date	Casing depth (m)	Depth to water (m)	Sample	details		Stand Penetra Tes	ation st	Description of strata		"N" Count Graph
Time	Casing	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of stude		0 20 40 60 80100
30.12.11 2:30 PM			11	SPT	9	Refusal	100			
3:35 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, dense to very dense silty fine SAND		
4:25 PM			13	SPT	11	Refusal	100			
5:10 PM		<u> </u>	15	SPT	12	Refusal	100			<u> </u>
								Bottom of BH-7 at 15-1	neter	
Remarks:									Logged by:	M. Ali Bilgrami/F. Abbas
-	SPT SPT(C) UDS		Standard Penet Standard Penet Undisturbed Sa	tration Te		Cone			Compiled by:	Syed Irfan Shah Ali Zaidi
Project	: Soil Inv	estigation o	of the Site for	UCH-II	Deve	elopme	nt Projec	t, Baluchistan	Contract No.	KGI-2011-268
Client	: ENAR F	Petrotech Se	ervices (Pvt) I	Limited	i				Sheet No.	1 of 1

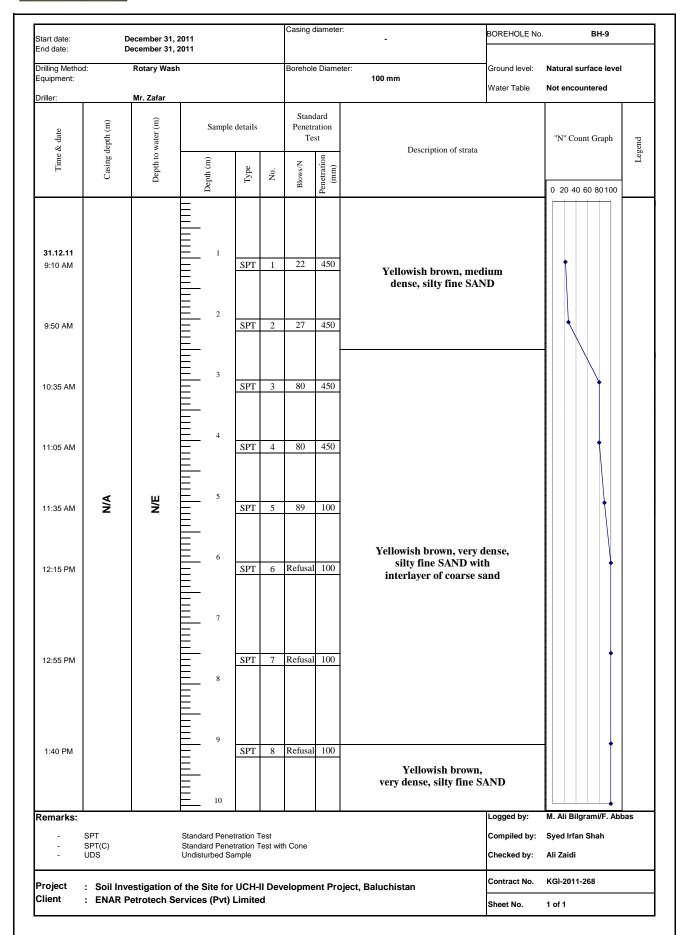






End date:		nber 30, 2 nber 30, 2						-		
Drilling Method: Equipment: Driller:	Rot	ary Wash				Borehole	e Diameter:	100 mm	Ground level: Water Table	Natural surface level
Time & date	Casing depth (m)	Depth to water (m)	Sample	details		Stand Penetra Tes	ation st	Description of strata		"N" Count Graph
Tim	Casing	Depth t	Depth (m)	Type	No.	Blows/N	Penetration (mm)			0 20 40 60 80100
30.12.11 1:00 PM			11	SPT	9	Refusal	100			•
1:40 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, very dense, silty fine S	AND	•
2:30 PM			13	SPT	11	Refusal	100			•
3:20 PM			15	SPT	12	Refusal	100			_
								Bottom of BH-8 at 15-1	neter	
Remarks:			 						Logged by:	M. Ali Bilgrami/F. Abbas
- SP - SP - UD	PT(C)		Standard Pene Standard Pene Undisturbed Sa	tration T		n Cone			Compiled by: Checked by:	Syed Irfan Shah Ali Zaidi
Project :	Soil Investi	gation o	f the Site for	UCH-I	I Dev	elopme	nt Project	, Baluchistan	Contract No.	KGI-2011-268

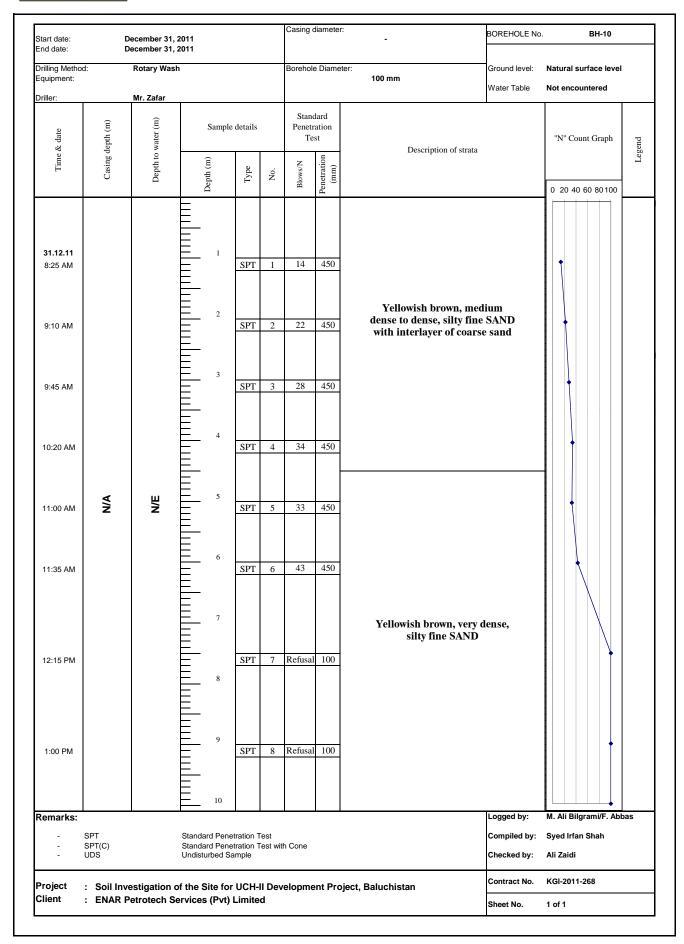






Start date:		December 31,				Casing	diameter:	-	BOREHOLE No	D. BH-9	
End date: Orilling Metho Equipment: Oriller:	od:	Rotary Wash Mr. Zafar				Borehol	e Diamete	r: 100 mm	Ground level: Water Table	Natural surface level	
Time & date	Casing depth (m)	Depth to water (m)	Sample	details		Stand Penetr Te	ration st	Description of strata		"N" Count Graph	Legend
Time	Casing	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)			0 20 40 60 80 100	Le
31.12.11 2:40 PM				SPT	9	Refusal	100			•	
3:25 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown very dense, silty fine S	, SAND	•	
4:25 PM			14	SPT	11	Refusal	100			•	
5:10 PM			15	SPT	12	Refusal	100	Bottom of BH-9 at 15	meter	-	
Remarks:	SPT		Standard Pene	etration 7	Test .				Logged by:	M. Ali Bilgrami/F. Abba	ıs
- - -	SPT(C) UDS		Standard Pene Standard Pene Undisturbed Sa	tration 7		h Cone			Checked by:	Ali Zaidi	
Project Client		vestigation o				elopme	ent Proje	ect, Baluchistan	Contract No.	KGI-2011-268	

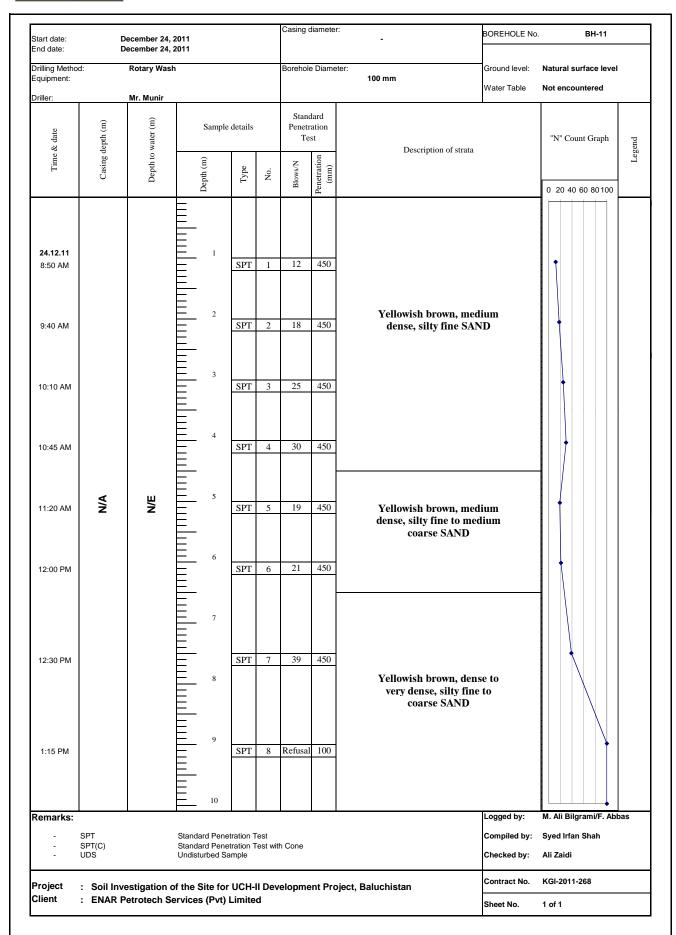






Start date: End date:		ecember 31, ecember 31,				Casing o	liameter:	-	BOREHOLE No). BH-10
Drilling Method: Equipment: Driller:		Rotary Wasi	h			Borehole	Diameter:	100 mm	Ground level: Water Table	Natural surface level
	epth (m)		Sample	e details		Stand Penetra Tes	ation			"N" Count Graph
Time & date	Casing depth (m)	Depth to water (m)	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of strata		"N" Count Graph 0 20 40 60 80 100
31.12.11 1:40 PM				SPT	9	Refusal				
2:20 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, very of silty fine SAND	dense,	•
3:00 PM			13	SPT	11	Refusal	100			
3:45 PM			15	SPT	12	Refusal	100	Bottom of BH-10 at 15-	meter	-
Bomoving.										M. Ali Bilgrami/F. Abbas
Remarks: - SPT - SPT - UD:	Γ(C)		Standard Pen- Standard Pen- Undisturbed S	etration 7		h Cone			Logged by: Compiled by: Checked by:	M. Ali Bilgrami/F. Abbas Syed Irfan Shah Ali Zaidi
			of the Site fo			elopme	nt Project	Baluchistan	Contract No.	KGI-2011-268

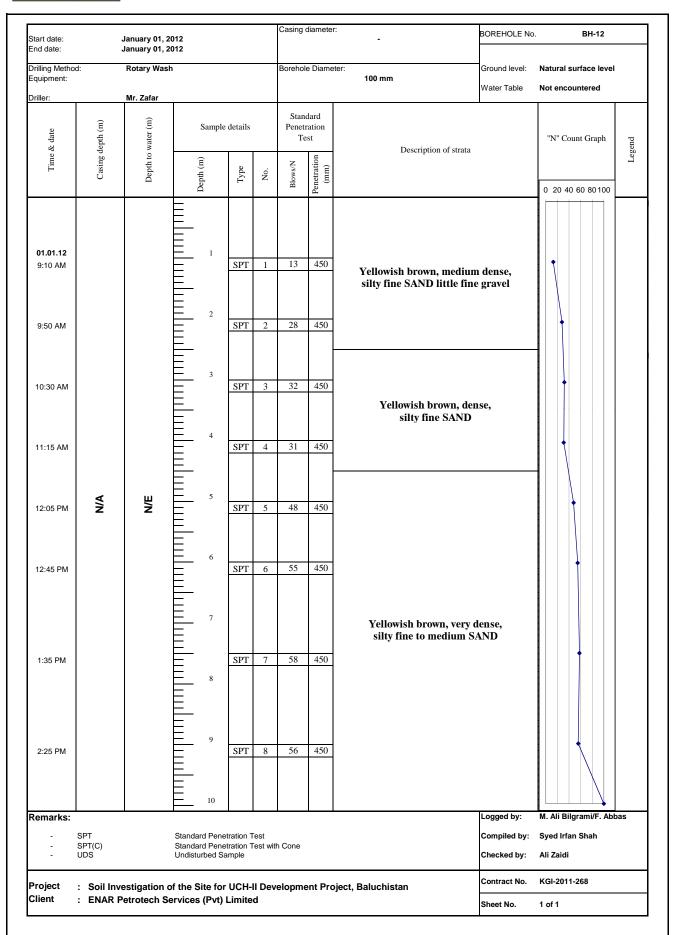






Online	tart date: nd date:		cember 24, 2 cember 24, 2				Casing d	liameter:	-	BOREHOLE No	o. BH-11	
Sample details September	quipment:			1			Borehole	Diameter:	100 mm		Natural surface level	
24.12.11 1:50 PM 236 PM 237				Sample	details		Penetra	ation st	Description of strata		"N" Count Graph	Legend
1.50 PM	Time	Casing 6	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of status		0 20 40 60 80100	Leg
SPT 10 Refusal 100 Yellowish brown, very dense, silty fine SAND SPT 11 Refusal 100 SPT 12 Refusal 100 Bottom of BH-11 at 15-meter SPT Slandard Penetration Test with Cone SpT Sp					SPT	9	Refusal	100	very dense, silty fine	se to		
3:10 PM SPT 11 Refusal 100	2:35 PM	N/A	N/E		SPT	10	Refusal	100			•	
Remarks: - SPT Standard Penetration Test Spri(C) Standard Penetration Test with Cone Spri Standard Penetration Test with Cone Compiled by: Syed Irfan Shah	3:10 PM				SPT	11	Refusal	100	Yellowish brown, very o silty fine SAND	dense,	•	
Remarks: - SPT Standard Penetration Test - SPT(C) Standard Penetration Test with Cone Logged by: M. Ali Bilgrami/F. Abl	3:55 PM			15	SPT	12	Refusal	100	Bottom of BH-11 at 15-	meter	-	
Remarks: - SPT Standard Penetration Test - SPT(C) Standard Penetration Test with Cone Logged by: M. Ali Bilgrami/F. Abl												
Remarks: - SPT Standard Penetration Test - SPT(C) Standard Penetration Test with Cone Logged by: M. Ali Bilgrami/F. Abi Compiled by: Syed Irfan Shah												
- SPT Standard Penetration Test - SPT(C) Standard Penetration Test with Cone Compiled by: Syed Irfan Shah												
- SPT(C) Standard Penetration Test with Cone												as
- UDS Undisturbed Sample Checked by: Ali Zaidi	- SP	PT(C)		Standard Pene	tration T		n Cone			Compiled by: Checked by:	Syed Irfan Shah Ali Zaidi	_
Project : Soil Investigation of the Site for UCH-II Development Project, Baluchistan Client : ENAR Petrotech Services (Pvt) Limited Contract No. KGI-2011-268 Sheet No. 1 of 1							elopme	nt Projec	t, Baluchistan	Contract No.	KGI-2011-268	







Start date: End date:		January 01, 2 January 01, 2				Casing d	паттечет:	-	BOREHOLE No	. BH-12	
Drilling Method: Equipment: Driller:		Rotary Was	h			Borehole	Diameter:	100 mm	Ground level: Water Table	Natural surface level	
c date	epth (m)	vater (m)	Sample	e details		Stand Penetra Tes	ation			"N" Count Graph	pue
Time & date	Casing depth (m)	Depth to water (m)	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of strata		0 20 40 60 80 100	Legend
01.01.12 3:30 PM				SPT	9	Refusal				•	
4:00 PM	ď		12	SPT	10	Refusal	100	Yellowish brown, very o	donso	•	
	N/A	N/E	13					silty fine to medium S	AND		
4:40 PM			14	SPT	11	Refusal	100			***************************************	
5:10 PM			15	SPT	12	Refusal	100	Bottom of BH-12 at 15-	meter	-	
Remarks:									Logged by:	M. Ali Bilgrami/F. Abba	as
- SP	T(C)		Standard Pene Standard Pene Undisturbed S	etration T		h Cone			Compiled by:	Syed Irfan Shah Ali Zaidi	
			of the Site for			elopme	nt Project	Baluchistan	Contract No.	KGI-2011-268	

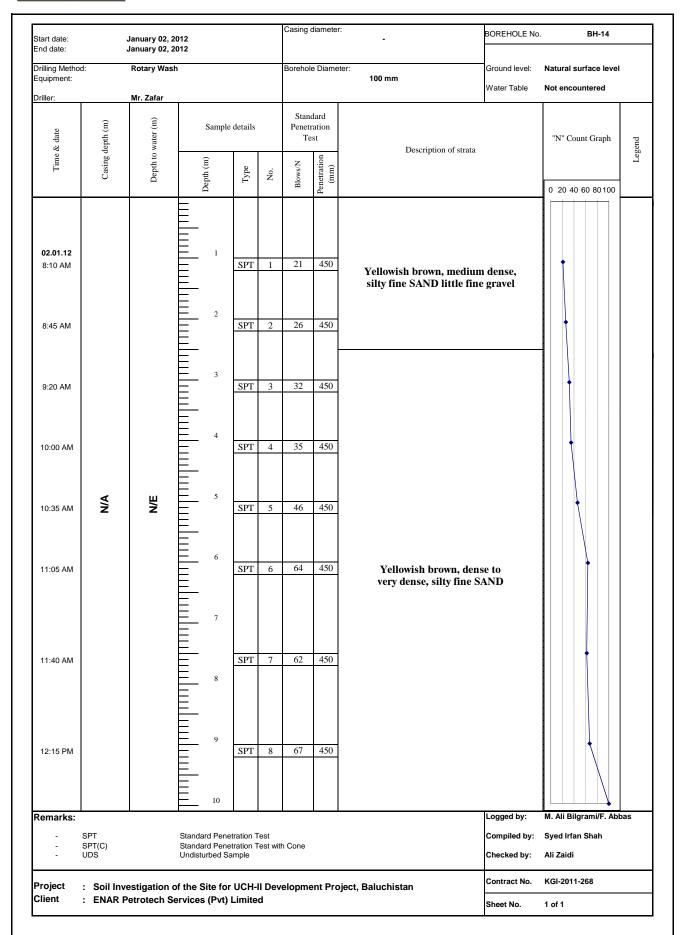


Start date: End date:		January 01, 2 January 01, 2				Casing o	diameter:	-	BOREHOLE No	. BH-13	
Drilling Method: Equipment: Driller:		Rotary Wasl	1			Borehole	e Diameter:	100 mm	Ground level: Water Table	Natural surface level	
Time & date	Casing depth (m)	Depth to water (m)		e details		Stand Penetr Te	ration st	Description of strata		"N" Count Graph	Legend
Tim	Casing	Depth	Depth (m)	Type	No.	Blows/N	Penetration (mm)			0 20 40 60 80 100	٦
01.01.12 8:20 AM			1	SPT	1	21	450	Yellowish brown, mediur silty fine SAND little fin	n dense, e gravel	•	
9:00 AM			2	SPT	2	27	450			_	
9:40 AM			3	SPT	3	24	450				
10:15 AM			4	SPT	4	31	450			•	
10:55 AM	N/A	N/E	5	SPT	5	33	450			•	
11:30 AM			6	SPT	6	40	450	Yellowish brown, den very dense, silty find medium SAND	se to		
12:15 PM			8	SPT	7	43	450			•	
1:05 PM			9	SPT	8	46	450				
- S	PT PT(C) DS		Standard Per Standard Per Undisturbed S	etration Te		h Cone			Logged by: Compiled by: Checked by:	M. Ali Bilgrami/F. Abba: Syed Irfan Shah Ali Zaidi	5
		vestigation o				elopme	ent Projec	t, Baluchistan	Contract No.	KGI-2011-268	



Start date: End date:		January 01, 20 January 01, 20				Casing d		-	BOREHOLE No	o. BH-13
Drilling Method: Equipment: Driller:		Rotary Wash Mr. Zafar				Borehole	e Diameter:	100 mm	Ground level: Water Table	Natural surface level
Time & date	Casing depth (m)	Depth to water (m)	Sample	e details		Stand Penetra Tes	ration est	Description of strata		"N" Count Graph
Time	Casing d	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of strata		0 20 40 60 80 100
01.01.12 1:50 PM			11	SPT	9	Refusal	1 100			
2:40 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, den very dense, silty fino medium SAND	ise to e to	•
3:35 PM			13	SPT	11	Refusal	. 100			
4:20 PM			15	SPT	12	Refusal	1 100			_
								Bottom of BH-13 at 15	·ineter	
Remarks: - SP - SP - UD	PT(C)		Standard Pene Standard Pene Undisturbed Sa	etration T		h Cone	<u> </u>		Logged by: Compiled by: Checked by:	M. Ali Bilgrami/F. Abbas Syed Irfan Shah Ali Zaidi
		vestigation o				elopme	ent Project	t, Baluchistan	Contract No.	KGI-2011-268







Start date:		January 02, 20					diameter:	-	BOREHOLE No	o. BH-14	
End date: Drilling Method: Equipment: Driller:	:	Rotary Wash Mr. Zafar				Borehole	e Diamete	:: 100 mm	Ground level: Water Table	Natural surface level	
Time & date	Casing depth (m)	Depth to water (m)	Sample	details		Stand Penetr Te	ration st	Description of strata		"N" Count Graph	Legend
Time	Casing	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)			0 20 40 60 80 100	3
01.01.12 12:40 PM			11	SPT	9	Refusal	100			•	
1:00 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, der very dense, silty fine s		•	
1:30 PM			14	SPT	11	Refusal	100			•	
2:00 PM			15	SPT	12	Refusal	100	Bottom of BH-14 at 15	-meter	_	
- 8	SPT SPT(C) JDS		Standard Pene Standard Pene Undisturbed Sa	tration 7		h Cone	<u> </u>		Logged by: Compiled by: Checked by:	M. Ali Bilgrami/F. Abbas Syed Irfan Shah Ali Zaidi	
		vestigation o				elopme	ent Proje	ct, Baluchistan	Contract No.	KGI-2011-268	_



Start date:		January 04, 2				Casing o		-	BOREHOLE No	o. BH-15
End date: Drilling Metho Equipment: Driller:	d:	January 04, 2 Rotary Wasl Mr. Zafar				Borehole	e Diamete	r: 100 mm	Ground level: Water Table	Natural surface level
Time & date	Casing depth (m)	Depth to water (m)	Sample	details		Stand Penetr Te	ration st	Description of strata	1	"N" Count Graph
Time	Casing of	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of stude		0 20 40 60 80 100
04.01.12 7:55 AM			1	SPT	1	29	450	Yellowish brown, mediur to dense, silty fine SAN little fine gravel	n dense D with	•
8:25 AM			2	SPT	2	33	450	(rounded to sub angu	lar)	
9:05 AM			3	SPT	3	36	450			
9:35 AM			4	SPT	4	40	450			
10:15 AM	N/A	N/E	5	SPT	5	52	450	Yellowish brown, very o silty fine to medium coars		
10:45 AM			6	SPT	6	Refusal	100			
11:10 AM			8	SPT	7	Refusal	100	Yellowish brown, very o silty fine SAND	dense,	•
11:40 AM			9	SPT	8	Refusal	100			
Remarks: - - -	SPT SPT(C) UDS	•	Standard Penet Standard Penet Undisturbed Sa	tration Te		h Cone			Logged by: Compiled by: Checked by:	M. Ali Bilgrami/F. Abbas Syed Irfan Shah Ali Zaidi
Project Client		vestigation o				elopme	ent Proje	ect, Baluchistan	Contract No.	KGI-2011-268



Start date: End date:		ary 04, 201 ary 04, 201				Casing of	Jianneter.	-	BOREHOLE No	o. BH-15	
Drilling Method: Equipment: Driller:	Rota	ary 04, 201 ary Wash Zafar				Borehole	e Diamete	r: 100 mm	Ground level: Water Table	Natural surface level	
Time & date	Casing depth (m)	Depth to water (m)	Sample	details		Stand Penetr Te	ration st	Description of strata		"N" Count Graph	Legend
Time	Casing o	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of studies		0 20 40 60 80100	Leg
04.01.12 12:30 PM				SPT	9	Refusal	100			•	
12:55 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, very silty fine SAND	dense,		
1:30 PM				SPT	11	Refusal	100				
2:15 PM			15	SPT	12	Refusal	100	Bottom of BH-15 at 15	-meter	-	
Remarks:			=						Logged by:	M. Ali Bilgrami/F. Abba	as
- SPT - SPT - UDS	Γ(C)	5	Standard Pene Standard Pene Undisturbed Sa	tration 1		h Cone			Compiled by:	Syed Irfan Shah Ali Zaidi	
			the Site for			elopme	nt Proj	ect, Baluchistan	Contract No.	KGI-2011-268	

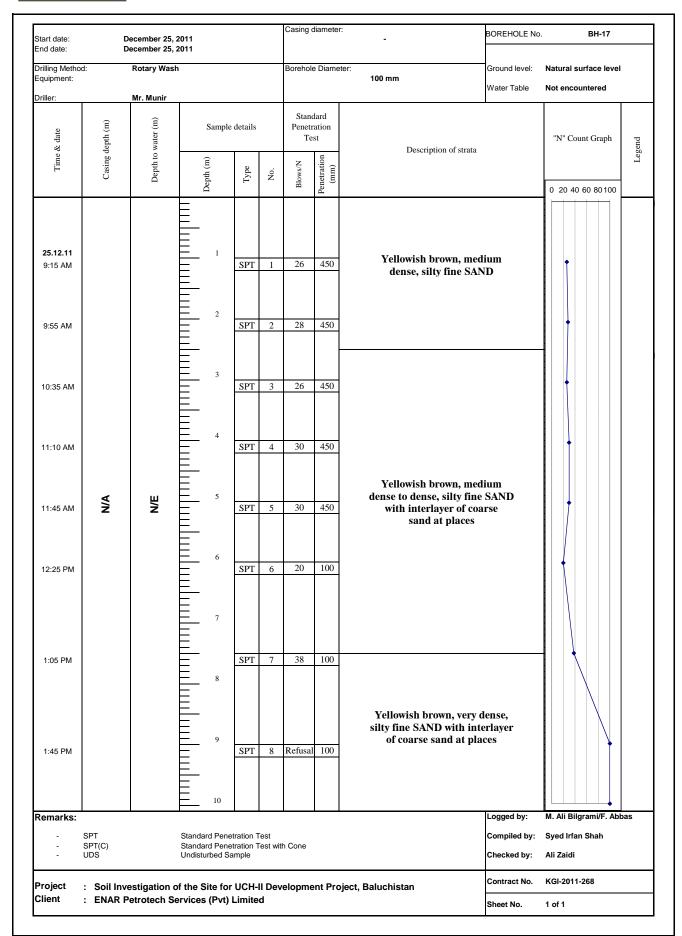


Start date:		January 03, 2			Casing o	nameter.	-	BOREHOLE No	o. BH-16
End date: Drilling Method Equipment: Driller:	d:	January 03, 2 Rotary Wash Mr. Zafar			Borehole	e Diameter:	100 mm	Ground level: Water Table	Natural surface level
Time & date	Casing depth (m)	Depth to water (m)	Sample detail	s	Stand Penetr Tes	ation st	Description of strata	1	"N" Count Graph
Time	Casing d	Depth to	Depth (m)	No.	Blows/N	Penetration (mm)	Description of strata		0 20 40 60 80 100
03.01.12 9:10 AM			l spi	2 1	36	450	Yellowish brown, mediun to dense, silty fine SAN little fine gravel	n dense D with	<u> </u>
9:35 AM			2 SPT	2	22	450	(rounded to sub angu	lar)	
10:15 AM			3 SPT	3	21	450			
11:00 AM			2 SP1 3 SP1 4 SP1	3 4	23	450			
11:40 AM	N/A	N/E	5 SP1	5	28	450			
12:35 PM			6 SP1	6	33	100	Yellowish brown, med dense to very dense	ium	•
1:30 PM			SP1	7	38	100	silty fine SAND		
2:15 PM			9 SPT	8	48	100			
-	SPT SPT(C) UDS	1	Standard Penetration Standard Penetration Undisturbed Sample		th Cone	<u> </u>		Logged by: Compiled by: Checked by:	M. Ali Bilgrami/F. Abbas Syed Irfan Shah Ali Zaidi
Project	: Soil In	vestigation o	of the Site for UCH	I-II Dev	/elopme	nt Project	Raluchistan	Contract No.	KGI-2011-268



Start date: End date:		January 03, 2 January 03, 2				Casing	alameter	· -	BOREHOLE No	o. BH-16	
Orilling Methor Equipment: Oriller:	d:	Rotary Wash	1			Borehole	e Diame	ter: 100 mm	Ground level: Water Table	Natural surface level Not encountered	
ż date	epth (m)	vater (m)	Sample	details		Stand Penetr Te	ation			"N" Count Graph	pue
Time & date	Casing depth (m)	Depth to water (m)	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of strata		0 20 40 60 80100	Legend
04.01.12 3:05 PM				SPT	9	51	100				
3:50 PM	N/A	N/E	11 12 12 13 13	SPT	10	Refusal	100	Yellowish brown, med dense to very dens silty fine SAND	lium e,		
4:40 PM			14	SPT	11	Refusal	100			•	
5:25 PM			15	SPT	12	Refusal	100			_	
								Bottom of BH-16 at 15	meter		
Remarks: - -	SPT SPT(C)		Standard Pene Standard Pene	tration 7		h Cone			Logged by: Compiled by:	M. Ali Bilgrami/F. Abba	as
Project	: Soil Inv		Undisturbed Sa	uch-	II Dev		ent Pro	ject, Baluchistan	Checked by:	Ali Zaidi KGI-2011-268	
			ervices (Pvt)			•			Sheet No.	1 of 1	

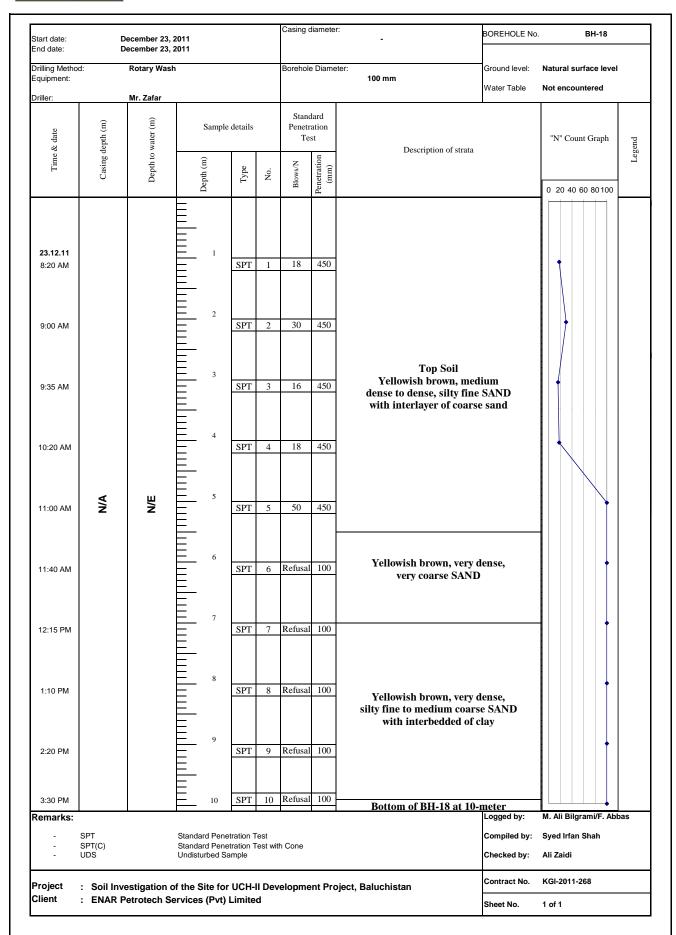




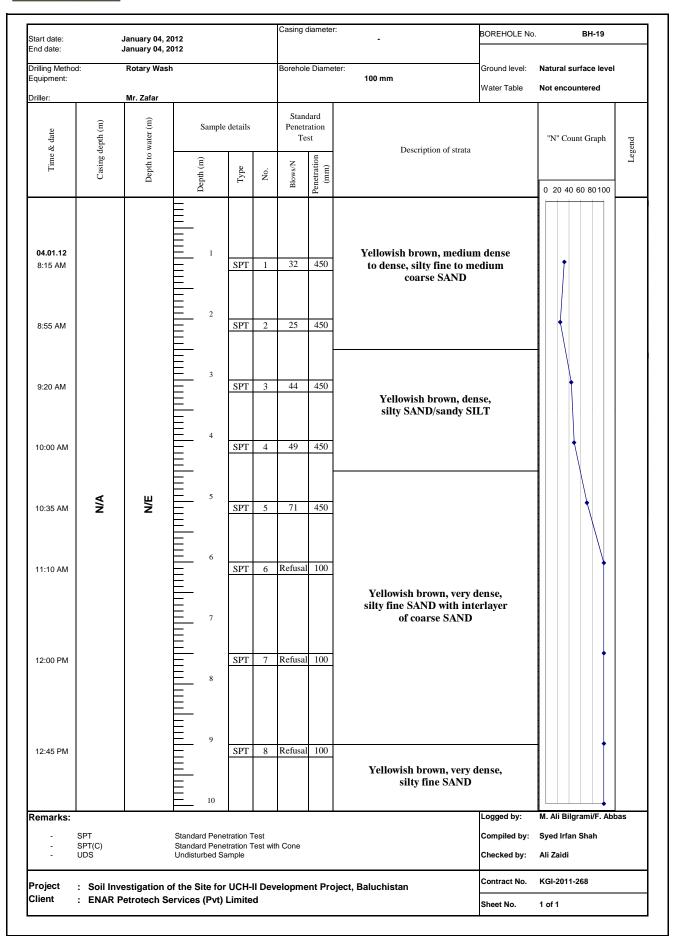


Start date:		December 25, 2				Casing d		•	BOREHOLE No	o. BH-17	
End date: Drilling Method: Equipment: Driller:		Rotary Wash Mr. Munir				Borehole	e Diameter:	100 mm	Ground level: Water Table	Natural surface level	
Time & date	Casing depth (m)	Depth to water (m)	Sample	e details		Stand Penetra Tes	ration est	Description of strata		"N" Count Graph	Legend
Time	Casing of	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of calling		0 20 40 60 80100	Leg
25.12.11 2:10 PM			11	SPT	9	Refusal					-
3:00 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, very silty fine SAND with in of coarse sand at pla	terlayer	•	
3:30 PM			13	SPT	11	Refusal	100	of coarse same at p.	AUCS	•	
4:20 PM			15	SPT	12	Refusal	1 100				
								Bottom of BH-17 at 15	-metci		
Remarks: - SP - SP - UD	PT(C)		Standard Pene Standard Pene Undisturbed Sa	etration T		h Cone			Logged by: Compiled by: Checked by:	M. Ali Bilgrami/F. Abbas Syed Irfan Shah Ali Zaidi	
Project :	Soil Inv			r UCH-l		relopme	ent Project	s, Baluchistan	Contract No.	KGI-2011-268	_









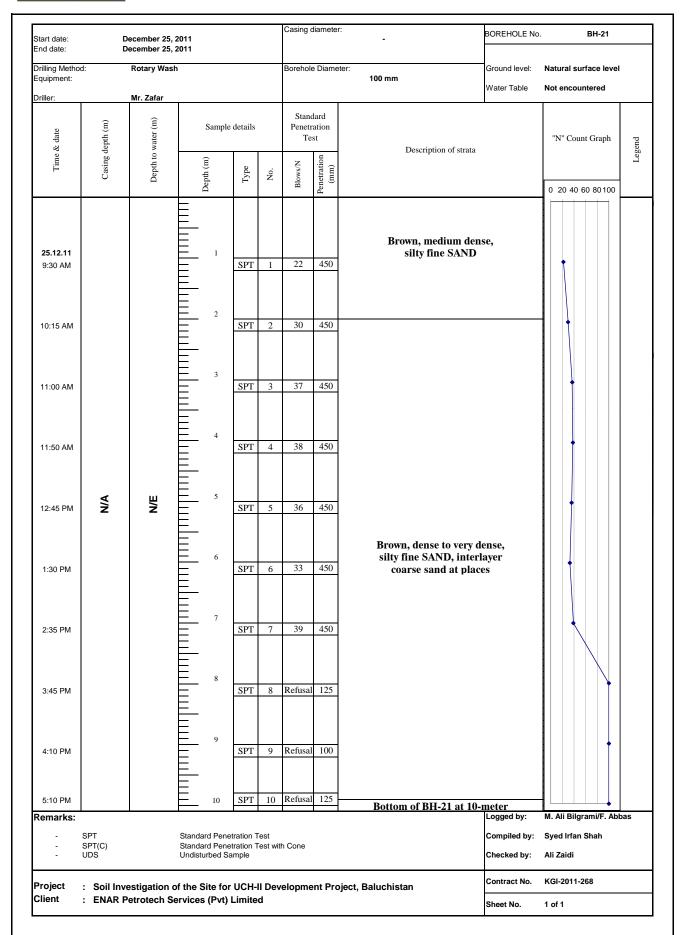


Start date: End date:		January 04, 2				Casing d	iameter:	-	BOREHOLE No	o. BH-19
Drilling Method Equipment: Driller:	d :	Rotary Wash				Borehole	Diameter:	100 mm	Ground level: Water Table	Natural surface level
Time & date	Casing depth (m)	Depth to water (m)	Sample	details		Stand Penetra Tes	ation st	Description of strata	1	"N" Count Graph
Time	Casing d	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)	Description of strata		0 20 40 60 80 100
04.01.12 1:25 PM			11	SPT	9	Refusal	100			
2:20 PM	N/A	N/E	12	SPT	10	Refusal	100	Yellowish brown, very o silty fine SAND	lense,	•
3:00 PM			13	SPT	11	Refusal	100			•
3:45 PM			15	SPT	12	Refusal	100	Bottom of BH-19 at 15-	meter	-
Remarks:									Logged by:	M. Ali Bilgrami/F. Abbas
-	SPT SPT(C) UDS		Standard Pener Standard Pener Undisturbed Sa	tration Te		n Cone			Compiled by: Checked by:	Syed Irfan Shah Ali Zaidi
Project	: Soil In	vestigation o	f the Site for	UCH-II	l Dev	elopme	nt Projec	t, Baluchistan	Contract No.	KGI-2011-268
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Start date: End date:		January 03, 2 January 03, 2			C	Casing diameter:	-	BOREHOLE No). BH-20
End date: Drilling Method Equipment: Driller:	i:	Rotary Wasi			E	Borehole Diameter	: 100 mm	Ground level: Water Table	Natural surface level
Time & date	Casing depth (m)	Depth to water (m)	Sample	e details		Standard Penetration Test	Description of strata		"N" Count Graph p
Time	Casing o	Depth to	Depth (m)	Type	No.	Blows/N Penetration (mm)	2000, patrici of state		0 20 40 60 80100
03.01.12 8:30 AM			1	SPT	1	14 450			•
9:10 AM			2	SPT	2	17 450	Top Soil Yellowish brown, med dense, silty fine SANE interlayer of coarse S) with	
9:50 AM			3	SPT	3	16 450	and any or or course of		
10:40 AM			4	SPT	4	23 450			
11:15 AM	N/A	N/E	5	SPT	5	34 450	Yellowish brown, de silty fine SAND	nse,	
12:00 PM			6	SPT	6	50 450			
12:45 PM			7	apm	-	2.6.1.105			
1:30 PM			8	SPT	7 F	Refusal 125	Yellowish brown, very silty SAND/sandy S		
2:15 PM			9	SPT	8 F	Refusal 100			
3:00 PM			10	SPT	9 F	Refusal 100	Bottom of BH-20 at 10	-meter	
- ;	SPT SPT(C) UDS		Standard Pene Standard Pene Undisturbed S	etration Te		Cone		Logged by: Compiled by: Checked by:	M. Ali Bilgrami/F. Abbas Syed Irfan Shah Ali Zaidi
	: Soil Ir	nvestigation (of the Site for	r UCH-II	Deve	lopment Proje	ct, Baluchistan	Contract No.	KGI-2011-268
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Start date: End date:		January 05, 2 January 05, 2				Casing d		-	BOREHOLE No	. BH-1 (Well-27)	
Drilling Method Equipment: Driller:	d:	Rotary Was	h			Borehole	Diameter:	100 mm	Ground level: Water Table	Natural surface level	
	epth (m)		Sample	Sample details		Penetra	Standard Penetration Test			"N" Count Graph	
Time & date	Casing depth (m)	Depth to water (m)	Depth (m) Type		No.	Blows/N Penetration (mm)		Description of strata		0 20 40 60 80100	Legend
05.01.12 9:30 AM			1	SPT	1	21	450				
10:10 AM			2	SPT	2	53	450				
11:00 AM		N/E		SPT	3	Refusal	100				
11:40 AM			4	SPT	4	Refusal	100			•	
12:15 PM	N/A		5	SPT	5	Refusal	100	Top Soil Yellowish brown, ha clayey SILT	rd,	•	
12:55 PM			6	SPT	6	Refusal	100			•	
1:45 PM			7	SPT	7	Refusal	100			•	
2:50 PM			8								
3:30 PM			9	SPT	SPT 8	Refusal	100				
4:10 PM			10	SPT	9	Refusal	100	Bottom of BH-1 at 10-	neter	4	
- :	SPT SPT(C) UDS	•	Standard Pen- Standard Pen- Undisturbed S	etration 1		n Cone	•	200000 01 201-1 00 10-1	Logged by: Compiled by: Checked by:	Fazal Abbas Syed Irfan Shah Ali Zaidi	
Project	: Soil In	vestigation	of the Site fo	r UCH-	II Dev	elonme	nt Project	, Baluchistan	Contract No.	KGI-2011-268	
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Start date: End date:		January 06, 2 January 06, 2						-	BOREHOLE No	b. BH-2 (Well-20)					
Drilling Metho Equipment: Driller:	d:	Rotary Was	h			Borehole	Diamete	r: 100 mm	Ground level: Water Table	Natural surface level					
c date	ppth (m)		Sample	Sample details Standard Penetration Test Description of strata O Description of strata			"N" Count Graph								
Time & date	Casing depth (m)	Depth to water (m)	Depth (m)			Description of strata		"N" Count Graph 0 20 40 60 80 100							
06.01.12 9:45 AM			1	SPT	1	Yellowish brown, me	Yellowish brown, med dense, silty fine to med coarse SAND	lium Hium							
10:25 AM			2	SPT	2	20	450								
10:50 AM		N/E		SPT	3	Refusal	100								
11:25 AM											Refusal	100			•
12:00 PM	N/A		5	SPT	5	Refusal	100	Yellowish brown, ha clayey SILT	rd,	•					
12:45 PM			6	SPT	6	Refusal	100			•					
1:30 PM			7	SPT	7	Refusal	100			•					
2:05 PM															
3:00 PM			9	SPT	8	Refusal	100								
3:40 PM			10	SPT	9	Refusal	100	Bottom of BH-2 at 10-	meter_						
-	SPT SPT(C) UDS		Standard Pend Standard Pend Undisturbed S	etration 1		h Cone			Logged by: Compiled by: Checked by:	Fazal Abbas Syed Irfan Shah Ali Zaidi					
		_				elopme	nt Proje	ect, Baluchistan	Contract No.	KGI-2011-268					
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Start date: End date:		January 08, 2 January 08, 2				Casing d	liameter:	-	BOREHOLE No	o. BH-3 (Well 29)			
Drilling Methor Equipment: Driller:	d:	Rotary Wash				Borehole	e Diameter	: 100 mm	Ground level: Water Table	Natural surface level			
Time & date	Casing depth (m)	Depth to water (m)	Sample	e details		Stand Penetra Tes	ation st	Description of strata		"N" Count Graph			
Time	Casing	Depth to	Depth (m)	Type	No.	Blows/N	Penetration (mm)			0 20 40 60 80 100			
08.01.12 9:10 AM			1	SPT	1	16	450	Greyish brown, medi	nm				
9:45 AM			2	SPT	2	20	450	dense, silty fine to mediur	um n SAND				
10:25 AM			3	SPT	3	26	450						
11:00 AM					4	SPT	4	34	450				
11:35 AM	N/A	N/E	5	SPT	5	44	450						
1:05 PM			6	SPT	6	41	450	Greyish brown, very dense, silty fine to medium S.	AND				
1:45 PM			7	SPT	7	55	450	sne, me to medium of		•			
2:50 PM			8	SI I	,	30							
3:45 PM			9	SPT	8	64	450						
4:40 PM			10	SPT	9	Refusal	100	Bottom of BH-3 at 10-1	neter	1			
Remarks:									Logged by:	Fazal Abbas			
-	SPT SPT(C) UDS		Standard Pene Standard Pene Undisturbed S	etration Te		n Cone			Compiled by: Checked by:	Syed Irfan Shah Ali Zaidi			
Project	: Soil In	vestigation o	of the Site fo	r UCH-II	Deve	elopme	nt Proje	ct, Baluchistan	Contract No.	KGI-2011-268			
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Start date: End date:		January 07, 2 January 07, 2				Casing	diameter:	-	BOREHOLE No	o. BH-4 (Well-30)	
Orilling Metho equipment:	od:	Rotary Wasi	1			Borehol	e Diameter	100 mm	Ground level: Water Table	Natural surface level	
& date	epth (m)	Depth to water (m)	Sample	details		Stand Penetr Te	ration	Decariation of state		"N" Count Graph	Legend
Time & date Time de date Casing depth (m)		Depth to 1	Depth (m) Type No.		No.	Blows/N Penetration (mm)		Description of strata		0 20 40 60 80 100	
07.01.12 8:35 AM			1	SPT	1	17	450				
9:45 AM			2	SPT	2	20	450	Dark brown, hard clayey SILT			
11:05 AM			2	SPT	3	Refusal	1 100				
11:50 AM		N/E	4	SPT	4	Refusal	1 100			•	
12:45 PM	N/A		5	SPT	5	Refusal	1 100		Ι,		
1:40 PM				SPT	6	Refusal	1 100				
3:10 PM			7	7 SPT 7 Refusal 100							
4:10 PM			8								
4:55 PM			9	SPT	8	Refusal					
5:30 PM			10	R	1	CR% 25	RQD% 10	Bottom of BH-4 at 10-	motor		
Remarks:	1	1	1	1	ı	l		Dottom of Dir-4 at 10-	Logged by:	Fazal Abbas	_
- - -	SPT SPT(C) UDS		Standard Pene Standard Pene Undisturbed Sa	tration 1		h Cone			Compiled by: Checked by:	Syed Irfan Shah Ali Zaidi	
Project						elopme	ent Proje	ct, Baluchistan	Contract No.	KGI-2011-268	_
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CIVIL DESIGN PACKAGE (VOLUME-IIE)

S.No.	DOCUMENT NO.	DOCUMENTS TITLE	Rev.	Status
PLOT P	LAN			
1	0221-CD-7101 RB	GENERAL ARRANGEMENT DRAWING OF MCC ROOM	В	RE-IFB
2	0221-CD-7102 RB SH (1-2)	GENERAL ARRANGEMENT DRAWING OF DYKED WALL AROUND DIESEL STORAGE TANK	В	RE-IFB
3	0221-CD-7102 RB SH (2-2)	GENERAL ARRANGEMENT DRAWING OF DYKED WALL AROUND DIESEL STORAGE TANK	В	RE-IFB
1	0221-CD-7103 RB	GENERAL ARRANGEMENT DRAWING OF DIESEL PUMP FOUNDATION (800-P101-A/B)	В	RE-IFB
2	0221-CD-7104	STANDARD DRAWING FOR CULVERT OF PIPING	В	RE-IFB
3	0221-CD-7105	STANDARD DRAWING FOR ROAD AND PAVING	В	RE-IFB
4	0221-CD-7106	STANDARD DRAWING FOR OILY WATER CATCH BASIN	В	RE-IFB
5	0221-CD-7107	STANDARD DRAWING FOR OILY WATER MANHOLE	В	RE-IFB
6	0221-CD-7108	STANDARD DRAWING FOR SWD & PIPE CULVERT	В	RE-IFB
7	0221-CD-7109	DISMANTLING PLAN	В	RE-IFB
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10	4985-CD-7301	LAYOUT PLAN APPROACH ROAD	5	RE-IFB
11	4985-CD-7342 (SH 1-7)	SANITARY SEWER LAYOUT	3	RE-IFB
SPECIF	ICATIONS		<u> </u>	
12	0221-CA-7001	Applicable Codes & Standards	В	RE-IFB
13	0221-CA-7002	Earthwork and Excavation Dewatering	В	RE-IFB
14	0221-CA-7003	Plain and Reinforced Concrete Works	В	RE-IFB
15	0221-CA-7004	Tank Foundation	В	RE-IFB
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17	0221-CA-7006	Floor and Wall Finishes	В	RE-IFB
18	0221-CA-7007	Roofing	В	RE-IFB
19	0221-CA-7008	Carpentry & Joinery and Steel Doors, Windows & Ventilator	В	RE-IFB
20	0221-CA-7009	Ironmongery	В	RE-IFB
21	0221-CA-7010	Glazing	В	RE-IFB
22	0221-CA-7011	Drainage	В	RE-IFB
23	0221-CA-7012	Painting	В	RE-IFB
24	0221-CA-7013	Stone Soling	В	RE-IFB
25	0221-CA-7014	Roads & Pavements	В	RE-IFB
26	0221-CA-7015	Block Masonry	В	RE-IFB
27	0221-CA-7016	Termite Control	В	RE-IFB
28	0221-CA-7017	HDPE Geomembrane	В	RE-IFB
29	0221-CA-7018	0221-CA-7018	В	RE-IFB