UCH COMPRESSION PROJECT

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

Tender Enquiry No. PROC-FC/CB/PROJ/UCH(COM)-4462/2019

Pre-Bid Clarification-05

Item No.	discipline	Reference of ITB Document				Query	Response
		Document No.	Page No.	Clause No.	Subject		
1	Process	0221-DS-1706	5	Note 17	Specification of Pressure Vessel	In Note 17 : The Instrument Air Reliever and Nitrogen Reciever need to be designed as per Specification of Pressure Vessel（0221-VA-001). But the specification was not found in the tender documents. Please provide.	Bidder to refer Doc.No.0221-PA-2005-A (Specification for Unfired Pressure Vessel) of Vol-II (Mechanical) of tender document. There is typo error in 'Note-17' of referred datasheet.
2	Process	0221-DS-1706	5	Note 18	Specification For Rotary Screw Compressor Package	In Note 18: The Air Compressor need to be designed as per Specification For Rotary Screw Compressor Package（0221-MA-3503). But in ITB, Specification For Rotary Screw Compressor Package with the document code 0221-PA-2011 is provided. The document number is not same. Please clarify.	Bidder to refer Doc.No. 0221-PA-2011-B (Specification For Rotary Screw Compressor Package) of Vol-II (Mechanical) of tender document. There is typo error in 'Note-18' of referred datasheet.
3	Process	0221-DS-1709	4	Tank Data Sheet	Design Code	Please kindly provide the design code of tank.	Bidder to consider standard UL-142 for the subject tank.
4	Process	0221-DS-1709	3	Note 4	Drive type of pump	In Note 4 : The Methanol Injection Pump is gas driven. But in the Mechanical Design, the Available Voltage of Motor is " EPCC to advise". Please confirm the drive type of the pump. Due to the low rated power of the pump, EPCC Bidder proposes to use electric drive injection pump.Please confirm or clarify.	The methanol Injection Pump is Gas Driven. Furthermore, please note that Methanol Injection Skids are to be installed at wellheads, injection pumps have to be Gas Driven.
5	Process	0221-DS-1705-0	3		material	In 0221-DS-1705-0（Coolling Water System） page 3 : Fills Material is HDGS (S235JR). Bidder hope that the PVC ccould be accepted for fills material based on the same cooling efficiency. Please confirm whether the fills material could be PVC.	Not acceptable. Bidder to adhere with the requirements as stipulated in tender document.
6	Process	SEC - III Scope of Work	98	12.5	ENVIRONMENTAL IMPACT ASSESSMENT	Please kindly provide the EIA for bidding reference.	The study will be carryout by OGDCL and report will be shared to successful bidder.

7	PIPING	0221-PA-2000-A (Specification for Piping design and Material)	8,18,26	3.1 General-b. 4. MATERIALS-a. 8.	3.1 General b. All piping and its components and systems shall compliance with NACE MR-0175/ISO 15156. 4. MATERIALS a. It is imperative that all materials selected and purchased for use in sour gas systems are resistant to sulfide-stress cracking (SSC). Hydrogen-induced cracking (HIC), and stress-oriented hydrogen induced cracking (SOHIC). 8. PIPING MATERIAL SPECIFICATIONS All piping materials shall be compliance with NACE MR-	BIDDER found that the descriptions about the requirements of NACE MR-0175 are different in 0221-PA-2000-A (for example, paragraph 3.1-b, 4-a, and 8); besides, there is not any descriptions about “NACE MR-0175 or Sour service” displayed in any spec. BIDDER think only materials for use in sour gas systems should compliance with NACE MR-0175/ISO 15156. Kindly please confirm below items: (1) Which piping spec should compliance with NACE MR-0175/ISO 15156? (2) Whether the HIC, SSC and SOHIC tests are mandatory requirements for all of piping materials which compliance with NACE MR-0175/ISO 15156. Whether the test are all mandatory for the other materials which contact with sour service (for example, instrument materials and equipment materials etc.) also. Please provide a more clear scope about these tests requirements due to the big impact.	All piping and its components and systems (of sour service) shall be complied with NACE MR-0175/ISO 15156. Also, HIC, SSC, and SOHIC tests are mandatory tests for NACE pipe and fittings.
8	Process	0221-DS-1701	2		Certified/Guarantee point	Typically Client should specify one normal operating point which is also the certified point. Additionally, ONLY ONE certified/guarantee point can be specified. But both Case 2 and 3 are certified points in the data sheet. Please confirm which point is the certified point.	The compressor package shall be designed in such a way that all casese shall be met under the performance curve of the compressor package.
9	Process	0221-DS-1701	2		PROCESS CONTROL(1-3.4.2.1)	Client has specified both suction throttling and speed variation as process control method. But the specified suction throttling pressure is higher than the suction pressure of any operating point. For control purposes which control method shall take precedent? In addition, only speed variation is mentioned in the design basis.	Suction throttling valve shall be required for initial compression scenarios as stipulated in the referred datasheet i.e. 835 to 500 Psig. Furthermore, EPCC shall propose or provide viable and optimum controlling method for overall operating envelope.
10	Process	0221-DS-1701	2	Note 7	Additional run at 250 PSIG	Additional run at 250 PSIG is specified, what is the gas composition and target discharge pressure for this run?	Composition of Case-03 is to be considered for additional case, however, the discharge pressure would be the same i.e. 865 Psig.

11	Equipment	0221-DS-1707(tag:251-v-205)	2	22	Rating & Facing:300 #, RF	300# flange can not meet the requirement of design pressure and temperature. Bidder propose and select 600#,RF to replace 300# flange for this equipment. Please confirm.	600# flange with it's impact on associated piping shall be considered . However, these engineering details will be finalized and approved by OGDCL/ENAR during detailed engineering phase.
12	Equipment	0221-DS-1703(tag:251-v-201ABC); 0221-PB-2102/3/4	2; 1		Design Pressure:650psig; Design Pressure:700psig	Please kindly confirm which design pressure is correct..	Please note that the design pressure is to be calculated and confirmed by EPCC as already mentioned in both referred documents.
13	Equipment	0221-DS-1704(tag:251-E-201ABC); 0221-PB-2102/3/4	2; 3		Design Pressure(tube side):1015psig; Design Pressure(tube side):865psig	Please kindly confirm which design pressure is correct..	Please note that the design pressure is to be calculated and confirmed by EPCC as already mentioned in both referred documents.
14	Equipment	0221-PA-2005-0 (Specification for Unfired Pressure Vesse; 0221-PA-2001-0 (Specification for Shell & Tube Heat Exchanger)	7; 6	3.1The vessel shall be U-Stamp or shall be manufacturer U-Stamp facility; 2.1However, U-stamp is also required.	The requirements are ambiguous	Vessel and heat exchangers shall be manufactured by U-stamp Certificate factory, however U-stamp is required only for heat exchangers. Please confirm.	U-stamp shall be required for both vessels and heat exchangers. However, the manufacturing facility will also be U stamp facility.
15	Equipment	0221-DS-1707(tag:251-v-205)	2	Painting shall be as per specification No.0221-GS-001.	0221-GS-001	Bidder have not found the specification (No.0221-GS-001).Please kindly provide it.	Bidder to refer Doc.No. 0221-PA-2002-A (General Specification for Painting) of Vol-II (Mechanical) of tender document. Typo error in referred datasheet.

16	Equipment	SFC-III Scope of Work Section 4.16	35	4.16	Relocation of existing Diesel Tank, pumps and its associated systems.	Additional equipment/material that are not suitable for further use shall be supplied by EPCC without any additional cost.. Tenderer's Query: 1, Bidder should consider the cost for additional materials in bidding stage, and the dismantled utilize evaluate report totally depends client or his consultant, so we are request client share the Bill of Quantity of additional materials. 2, Please provide P&ID, piping layout and related design documents of existing Diesel Tank, pumps and its associated systems.	1. Since the project is of EPCC nature, it is the responsibility of Contractor/bidder to evaluate the exising CP system and if it is suitable for re-use/re-utilize, as far as reasonable, shall be installed accordingly, otherwise new material shall be deisgned and provided accordingly as required. Regarding Bill of quantity, please note that it is the responsibility of bidder to visit site before submission of proposal and obtain all the information at their own and ascertain & consider all the anticipated/additional material in their scope that may require at the time of detail engineering or during execution phase. Material to be designed and shall be supplied in accordance with requirment stipulated in project/tender specifications. Deviation at later stage shall not acceptable.
17	Equipment	0221-GS-9510-3 (Spec for Centrifugal Compressors)	56	8.2.1(f)	Gas turbine output power margin	Please confirm if the Gas Turbine shall be capable of developing at least 110% of the power input requirement at 110% compressor flowrate(264MMSCFD) condition.	Referring to Sec 8.2.1(f); "The Gas Turbine shall be capable of developing at least 110% of the power input requirement, at site rated conditions, when the compressor is working rated compression scenario i.e. maximum flow and compression ratio." Bidder to adhere with stipulated the tender requirements.
18	Equipment	0221-GS-9510-3 (Spec for Centrifugal Compressors)	77	9.3.2.9	Performance tests	Performance tests will be carried out at **SHOP** as per API 617 and ASME PTC 10 Type II. Tests carried out at **SITE** will follow requirements of *0221-GS-9510-3 (Spec for Centrifugal Compressors)_9.4 FUNCTIONAL TESTS/ RELIABILITY RUN/ONSITE PERFORMANCE TEST* and *SEC - III _Scope of Work_12.4.4 Commissioning and Performance Testing,* please confirm.	Bidder to adhere all the requirements as stipulated in referred documents and any other documents of tender (as applicable).
19	Instrumentation	SFC-III Scope of Work Section 5.12	38	5.12	1、Have enough spares space of the existing ESD & DCS syetem for installation new I/O module 2、The ESD system brand and model	The existing installed DCS system is of ABB 800XA and therefore same Make/Model shall be preferred for new extension panel. 1, Please confirm that If there have the enough spares space of the existing ESD and DCS system for new I/O modules, please provide the related information. 2, Please provide the brand and model of the existing ESD system. 3, Please provide original ESD and DCS system design drawings.	1-Each Compressor UCP shall interface with existing DCS for alarm/indication/status signals & ESD System for triping signals and Spares are available for mentioned signals only, kindly refer project document 0221-LT-6000-0 (Instrument List) for termination detail. The detail information shall be shared with the successful bidder after contract award. 2-The ICSS installed at UCH-II is ABB 800XA. 3-The detail information shall be shared with the successful bidder after contract award. Kindly also note that the I/O List shall be further finalized during detail engineering stage by EPC Contractor with client consultation.

20	Instrumentation	0221-GS-9510-3 (Spec for centrifugal compressors Section 8.9.4)	73	8.9.4	Fire & Gas System	All fire and Gas detectors shall be monitored by a dedicated F&G system which shall be integrated with the turbine control system. 1,Please confirm that all the fire and gas detecots/equipment should be hardwired into the new F&G system or the respective compressor PLC system for control and monitor.	All fire and gas detectors along with manual call points (MAC) and Sounder/Beacon of compressor area shall interface, controlled and monitored by Compressor Package Control Systems for initiating packages trips, shutdown and alarm generation.
21	Instrumentation	SFC-III_scope of work section 5.7	37	5.7	2OO2(2 out of 2) voting system	EPCC Contractor shall consider 2OO2(2 out of 2) voting system and configuration for all Instruments(transmitters & switches) sering process shutdown in compressor package. 1, Please confirm that all instruments(stransmitters & switches) serving process shutdown in compressor package is 2OO2, or only the compressor PLC system is 2OO2 voting system.	all instruments(transmitters & switches) serving process shutdown in compressor package is 2OO2
22	Electrical	0221-ELA-6501	6,7	3.3 and 3.4	Classification of areas	Please kindly confirm Company's certification requirement for the electrical equipment/instruments in hazardous areas, ATEX certification or IECEX certification?	It is clearly mentioned in the tender that "All equipment and materials installed in hazardous areas on the plant shall be certified by an internationally recognized certifying authority (e.g. BASEEFA, PT, CENELEC, FM, UL, LCIE etc.) for use in the respective "Classified Area" and shall be ATEX approved." IECEX certification is also acceptable.
23	Electrical	0221-ELA-6501 seciton 5.3	10	5.3	Existing Power Generation and distribution philosophy	Please let bidder know the brand of existing MV switchgear?	Existing MV Switchgear is Schneider Electric Pakistan.
24	Civil & Structure				Equivalent Material for steel structure	The material of steel structure,S235JR of En10025 or A36 of ASTM, is advised to be replaced by Q235B of GB/T700-2006 carbon structural steel which is equivalent to S235JR and A36. Q235B steel will be made of fully killed steel. Q235B steel's minimum yield strength will be equal to 235MPa. The minimum tensile strength will be equal to 370MPa. Q235B steels will have a max Carbon content of 0.20%, a max sulfur content of 0.045% and a max phosphorus content of 0.045%. CHARRY Impact energy will meet with Min. Avge 34 Joules and Min. Single 27 Joules at a temperature of +20℃. The thickness of plates or rolled section will be no more than 25mm. By comparison, Mechanical properties and Chemical Properties of Q235B fully meets the requirements of the project and using Q235-B can also cut down the procurement duration. Bidder wishes that above proposal could be accepted.Please confirm.	Not acceptable. Bidder to adhere with the requirements as stipulated in tender document.

25	Civil & Structure				Geotechnical investigation report	If any data for bearing capacity of soil nearby this site is available for reference in bid stage.Please kindly provide. If possible,Please provide geotechnical investigation report.	Please see attached geotechnicla investigation report for your reference only.
26	Electrical	SEC - III	33	4.16	Scope of work	Please provide cable type specification (including new power control, lighting and earthing cables) for relocation Diesel pumps. Please provide MTO of relocation scope.	Please refer Doc# 0221-ELA-6503-0 Specification for LV Power & Control Cable for cable type / specification (including new power, control, lighting and earthing cables). Further, detailed relocation scope is already mentioned in section # 4.16.Regarding the MTO, please refer our response against the serial no. 16.
27	Corrosion	0221-ELA-6501 Electrical Design Basis	27	9.2	Scope of work for CP system	It mentions that in the absence of existing philosophy, impressed current method shall be applied to tanks, vessels and underground pipings. So pls provide existing CP system for diesel tank, such as ICCP or SACP, type of anodes. Meanwhile, if CP is required for tank internal, pls provide water content of diesel and operating temperature of tank.	No internal CP is required, however, external CP shall be provided, and it is the responsibility of Contractor/bidder to evaluate the exising CP system and if it is suitable for re-use/re-utilize, as far as reasonable, shall be installed accordingly, otherwise new material shall be deisgned and provided accordingly as required. Further note that in the absence of existing philosophy, impressed current method shall be applied to tanks and underground piping's. Impressed current system based on closely distributed anode system shall be applied to underground piping and conductive polymeric anodes (Anode flex) for on-grade Storage tanks. .
28	Corrosion	0221-PA-2002-0 (General Specification for Painting) 0221-PA-2007-0 (Specification for Coating and	N/A	section 7.2.1	Coating system for buried piping	Section 7.2.1 of 0221-PA-2002-0 gives the coating structure with 1500 µm Polyurethane for buried piping, but 0221-PA-2007-0 advises the coating structure shall be wrapped coating system, Bidder suggests to use wrapped coating system for buried piping.pls clarify.	Bidder to refer Doc.No.0221-PA-2007-A (Specification for Coating and Wrapping Piping) of Vol-II (Mechanical) of tender document and adhere the tender requirements.
29	Fire Fighting				Fire protection for MCC Room	Whether to use Clean Agent Fire Extinguishing System to protect the MCC room?	Bidder Undertanding is correct, FM-200 based fire alarm & suppression system shall be installed for new MCC.
30	Fire Fighting				UL List /FM Approval	Whether to need UL/FM approval for the fire equipment?	Fire equipments shall be UL/FM listed.
31	Water supply	SEC - III Scope of	74	12.3.16.6	Oily Water Drainage	In section 12.3.16.6 of SOW, oily water drainage is included in Bidder's scope. Company is kindly requested to provide P&ID and layout drawing for existing oily water system or tie in point.	Bidder to finalize tie-in point during site visit. Further, exisitng drainage layout will be shared with the successful bidder.

32	elecommunicati	SEC - III Scope of '	36	5	Telecommunication system	There is not description about telecommunication system in ITB. Whether telecommunication system be in Bidder's work of scope, for example, telephone system, LAN system, CCTV system etc. Pls confirm.	As per Scope of work Clause: 12.3.12.5; LAN and Telephone System shall be considrered for new MCC room. Also CCTV System is required.
33	Piping	UCH Compression Project P&IDs Binder # 005 (IFB)	7		Tie-in point	The location of tie-ins 017&018 connected to the existing pipe "30"-F-AB2-2010" are not clearly for preparing piping bulk material, please kindly indicate the two tie-ins (017&018) position on GA drawing.	For TP-018&017, please refer GA drawing no.0221-PD-1006-B (part of VOL-II of tender document).
34	Piping	SEC - III Scope of '	4,74	1.1.2, 12.3.13.	Tie-in point	***Page 4,*** "EPCC Bidder shall provide proper double block & bleed and positive isolation for all process piping tie-ins." ***Page 74,*** e, Tie-ins (every Tie-in should be flanged with double block and bleed arrangement). According to above description, Bidder understand that double block & bleed and positive isolation will be used only for process piping tie-ins but not the others system, like utility, vent and discharge piping. Please confirm bidder's understanding is correct or not?	Minimum requirement of double block & bleed and positive isolation are mentioned in P&IDs. However, bidder to check the requirement of double block & bleed valves in all services (gas, liquid and water) with respect to their pressure, criticality etc. in continuous operation and startup.
35	Piping	0221-LS-9336-0 (Tie-In List)			Conneciton type	Please kindly provide the information of tie-ins list referring to hot tapping connection.	Since the project is of EPCC nature, bidder to finalize the connections type during detailed engineering.

36	Procurement	SEC - III Scope of Work SEC - II (INSTRUCTIONS TO BIDDERS)	Page 59 in SOW Page 10 in ITB Page 21 in ITB		Regarding the OEM letter head submission	Page 59 in SOW, EPCC Bidder shall also submit the price list of two (02) years OEM recommended operating/maintenance spares (optional) on OEM letter head along with the bid. Page 10 in ITB, EPCC Bidder shall provide a “Affirmation Certification” that OEMs names of Gas Turbines, Centrifugal Compressors and Packager name quoted in bid proposal shall not be changed after award of contract and during the execution of project. Page 21 in ITB, b) Item-wised price list of OEM recommended Consumables &spare parts for one (01) year operation, on OEM letter head Regarding the submission document with OEM letter head in proposal, bidder understand that if we has qualified with 3 OEMs and all of them in Approved vendor list, bidder shall provide all the involved vendor’s list/affirmation certification of 3 OEMs duiring bidding stage. Please confirm bidder’s understanding is correct or not?	Bidder has to select the vendor from approved vendor list (AVL) as already given and accordingly quote from one of the selected vendor from AVL and further relevant technical details shall be provided alongwith the technical bid.
37	Procurement	APPENDIX – N	4	1.05	Approval vendor list	For Instrument Air Nitrogen Generation Package, whether only the key equipment, Air Commpressor, should be purchased from the AVL, or the whole Package should be purchased from the AVL, Please confirm.	Whole package shall be required to be purchased from AVL as per tender requirement.
38	Procurement	APPENDIX – N	5	1.06	Approval vendor list	For Methanol Injection Skids, whether the key equipment,Plunger pump, should be purchased from the AVL, or the whole Skid should be purchased from AVL, Please confirm.	Whole package shall be required to be purchased from AVL as per tender requirement.
39	Procurement					Please kindly indicate the allowable shipment size of skid.	maximum suitable size of package shall be considered L-53’ W-16’ H-14’
40	Procurement	APPENDIX – N	5	1.06	Approval vendor list	For Methanol Injection Skids, Only three vendor in AVL, due to the Coronavirus outbreak, we can’t got feedback from those 3 vendors, so new vendor were recommand for this Skid, detail qualification documentations attached, Attachement 1, for your review, please confirm if it’s acceptable.	Not acceptable. Bidder to adhere with the requirements as stipulated in tender document.

41	Procurement	SEC - II (INSTRUC	9	1.5 e)	Packager and OEM requirements	In Case of the packager and OEM is the same renowned company, Bidder think the OEM is Not applicable. Please confirm.	OEM requirements as stipulated in tender document shall be applicable in any case.
42	Security	SEC-IV CONDITIO	19	11.11	security resource	In SEC-IV CONDITIONS OF CONTRACT section 11.11 : In UCH parameter security provided by FC within the existing camp area compression installation area be earmarked and fence. Could the Bidder hire the security company of its' choice or FC must be the only choice should be selected by the Bidder?	Please refer section IV Conditions of Contract clause 11.11
43	Cost control	SEC - III Scope of Work SEC-IV CONDITIONS OF CONTRACT	Page 59 of 116 Page 32 of 76	11.8 Bulk Materials 23.1 Contract Price	Custom duties, import taxes and any other cost in custom	SEC - III Scope of Work k. Marine Insurance (from Port of loading to Project site) Custom Duties, Custom Clearance and Inland Transportation will be done by OGDCL,……. SEC-IV CONDITIONS OF CONTRACT The payment of custom duties, taxes, etc. as applicable on import of the Compression Facility and materials of Project shall be on the Bidder's account. Tenderer's Query: According to above description, There are some different between《Scope of Work》 and 《CONDITIONS OF CONTRACT》, Please clarify Who will responsible for custom clearance and inland transportation, Who will pay the custom duties, import taxes and any other cost in custom?	Foreign supply component needs to be qouted on CFR basis, only for the purpose of processing letter of credit. However the payment of custom duties taxes, marine insurance, port charges (delivery order, de-stuffing, terminal, container retention, clearing/brokerage, demurrage (if any) and any allied charges), custom clearance, inland transportation & insurance, unloading & storage at site or any other shall be sole responsibility of the bidder, these charges shall qouted & paid in Pak Rupees only. These charges are already covered in bidder scope in Appendix-C2 under head of 6.0 Insurance (6.4) and 7.0 General Services (7.3 & 7.4).
44	Cost control	Appendix C (Bid Price Schedule) ITB Annexures-Ann-IX	N.A	N.A	Editable version of "Appendix-C " and "Annexure-IX"	For the commercial bid preparation, could bidder get the editable version of "Appendix-C(bid price schedule) " and "Annexure-IX (schedule of rates for additional supplies/works)" from OGDCL?	No editable version will be shared with the bidder.

45	Cost control	Appendix C (Bid Price Schedule)	1	11	Sale Tax	The NOTE under the table of Appendix-C1 as the following: "Note:1) Commercial Evaluation of bids will be undertaken based on quoted cost in Appendix C1. The prices should be inclusive of all taxes." So the price of item(1-10) in the table will include all taxes. But the bidder is required to put the sales tax in item 11-Sales Tax. Bidder think : "The price of item(1-10) in the table should include all taxes(also include sales tax). Bidder shall ignore the item 11. And bidder does not need to fill the blank in the row of Item 11, 11a, 11b, 11c." Is bidder right or not? If bidder's think is not right, How bidder should do?	Bidder understanding is correct. However in Appendix-C1 break-up of Sales tax as item # 11 is mandatory requirement. Bidder should follow a mechanism in Appendix-C1 to avoid dulplication in sum of Sales Tax.
46	Cost control	Appendix C (Bid Price Schedule)	1	2	PROCUREMENT (SUPPLY) OF EQUIPMENT AND MATERIAL	Bidder think that the price of the item "2 PROCUREMENT (SUPPLY) OF EQUIPMENT AND MATERIAL" does not include "the Two years (After defect liability Period) recommended spares Parts". Is bidder's understanding right or not?	Bidder understanding is correct. Bidder to quote separately for the referred items as per tender requirements.
47	Cost control	Appendix C (Bid Price Schedule)	2	1.1.20	Two years (After defect liability Period) recommended spares Parts	Because bidder will provide the "Item-wised price list of OEM recommended spare parts supply for two (02) years operation. " So bidder does not need to fill the blank in the row of Item 1.1.20., or "SEE OEM'S SEPARATE QUOTATION" Is bidder's understanding right or not?	Bidder to follow/fill the requisite fields as per tender requirements.
48	Cost control	Appendix C (Bid Price Schedule)	5	1- Bidder must provide item-wise and quantity wise cost	Quantity wise cost	The NOTE under appendix-C2 says: "1- Bidder must provide item-wise and quantity wise cost (break-up) and BOQ for all the items and equipments mentioned in Sr. No. 1 as per the format." But there is no "Quantity column" in the table of Appendix-C2. Need bidder add the "Quantity column" in the table of appendix-C2?	Bidder can add "Quantity" column (in case of missing) in the table of Appendix-C2 OGDCL to confirm
49	Cost control	SEC-II INSTRUCTIONS TO BIDDERS	21	3.2.2.1 a)	Contents of Commercial Bid	Can Chinese Bidder be quoted in US$?	Chinese bidder can only quote foreign component in Chinese currency which is already mentioned in Appendix C. Payment of foreign component to Chinese bidder under the contract shall also be in Chinese currency.
50	Construction	SEC - III Scope of Work	63	12.2.3-a	Bidder Furnished Site Facilities of Temporary Camp	Due to the risk of security in Balochistan,Whether the foreign Bidders(Chinese) are allowed to establish a temporary camp in the OGDCL living area?	Please refer section IV Conditions of Contract clause 11.11 (b)

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

&

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.

CONTENTS

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 split-spoon samples in jars ensured retention of natural moisture of the samples which were later determined in the laboratory.

4. LABORATORY TESTING

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 (mg/L)	Cement Type
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.

6.1 ALLOWABLE BEARING PRESSURE – SHALLOW FOOTINGS

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 **"S_C"** *i.e.* stiff soil for design of structures.

6.2.3 SEISMIC COEFFICIENTS

Seismic coefficients are as under:

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

6.3 TYPE OF CEMENT – UNDERGROUND CONCRETING

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.

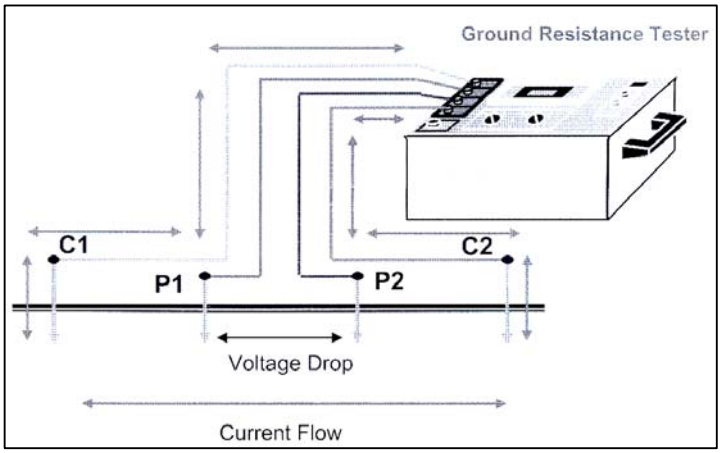


Fig. 6.1 Schematic Diagram of a Wenner Array

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 C_1, P_1, P_2 and C_2 terminals to the electrodes. The electrodes must be connected in order from the end, to the C_1, P_1, P_2 and C_2 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

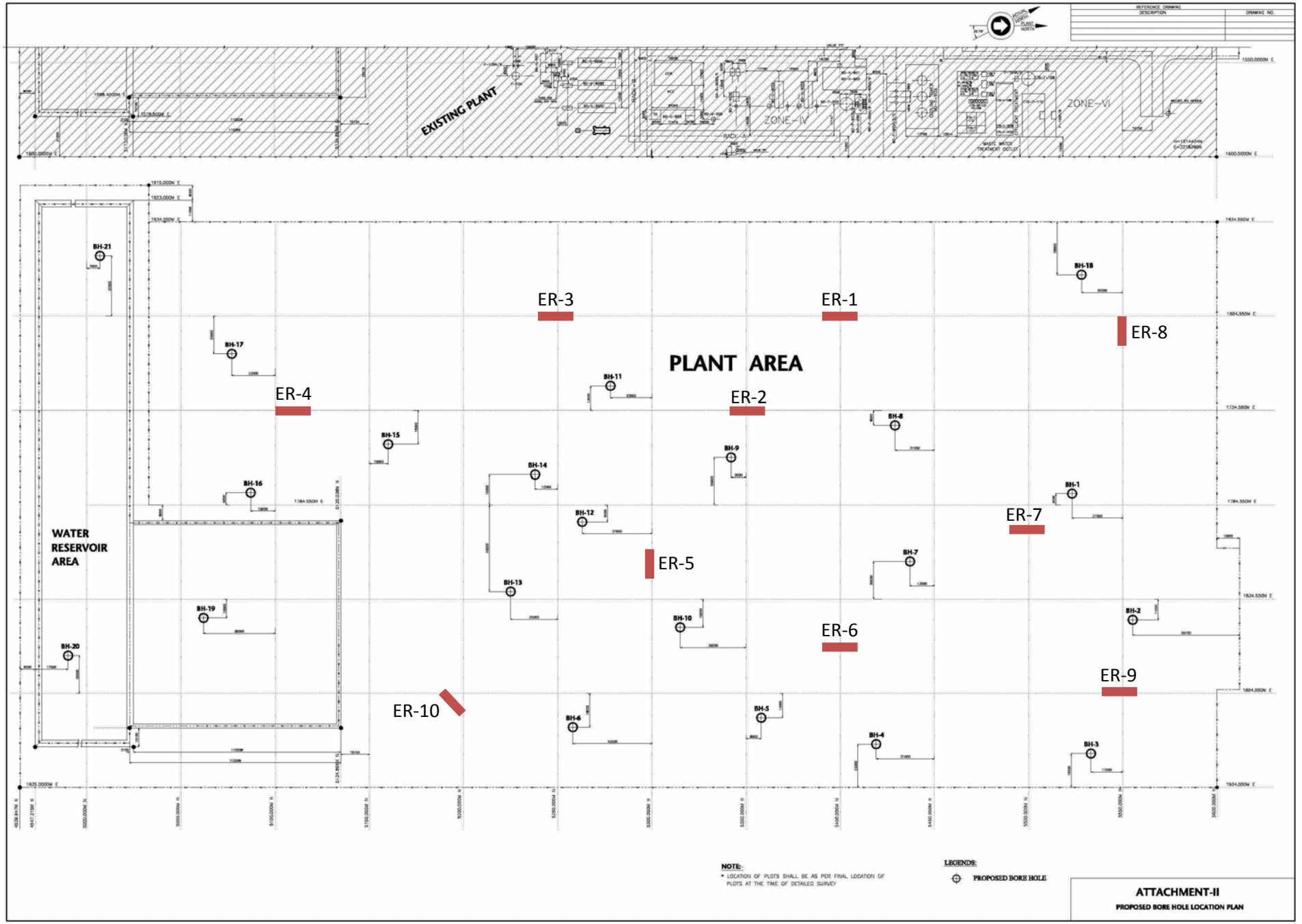
Geotechnical Investigation for UCH-II Development Project, Dera Bugti was carried out in the period of December 2011 to January 2012. Twenty-five boreholes were drilled and ten electrical resistivity tests were carried out as part of the field investigation. Soil and samples were also collected during 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.

Appendix A

Boreholes Location Plan


EXISTING PLANT
ZONE-IV
ZONE-VI
PLANT AREA
WATER RESERVOIR AREA
ER-1
ER-2
ER-3
ER-4
ER-5
ER-6
ER-7
ER-8
ER-9
ER-10
BH-1
BH-2
BH-3
BH-4
BH-5
BH-6
BH-7
BH-8
BH-9
BH-10
BH-11
BH-12
BH-13
BH-14
BH-15
BH-16
BH-17
BH-18
BH-19
BH-20
BH-21
NOTE:
* LOCATION OF PLOTS SHALL BE AS PER FINAL LOCATION OF PLOTS AT THE TIME OF DETAILED SURVEY
LEGENDS:
PROPOSED BORE HOLE
ATTACHMENT-II
PROPOSED BORE HOLE LOCATION PLAN

Appendix B

Borehole Logs

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 23, 2011** End date: **December 23, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-1**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
23.12.11 8:00 AM	N/A	N/E	1	SPT	1	27	450	**Brown, medium dense, silty fine SAND**		
8:50 AM			2	SPT	2	24	450	**Brown, medium dense, dense to very dense, silty fine SAND, interlayer with coarse sand at places**		
9:35 AM			3	SPT	3	40	450			
10:25 AM			4	SPT	4	20	450			
11:05 AM			5	SPT	5	28	450			
11:50 AM			6	SPT	6	39	450			
12:40 PM			7	SPT	7	47	450			
1:40 PM			8	SPT	8	Refusal	100			
3:10 PM			9	SPT	9	Refusal	100			
4:00 PM			10	SPT	10	Refusal	100	**Bottom of BH-1 at 10-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 29, 2011** End date: **December 29, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-2**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
29.12.11 9:00 AM	N/A	N/E	1	SPT	1	33	450	**Yellowish brown, medium dense, silty fine SAND with interlayer of fine gravel 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			5	SPT	5	30	450	**Yellowish brown, dense to very dense, silty fine SAND with coarse sand at places**		
2:00 PM			6	SPT	6	33	450			
2:35 PM			7	SPT	7	39	450			
3:20 PM			8	SPT	8	43	450			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 29, 2011** End date: **December 29, 2011**		Casing diameter: **-**	BOREHOLE No. **BH-2**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level** Water Table **Not encountered**
Driller: **Mr. Zafar**			

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
29.12.11 4:25 PM	N/A	N/E	11	SPT	9	Refusal	100	**Yellowish brown, dense to very dense, silty fine SAND with coarse sand at places**		
5:10 PM			12	SPT	10	Refusal	100			
5:35 PM			13	SPT	11	Refusal	100			
5:55 PM			14	SPT	12	Refusal	100			
			15					**Bottom of BH-2 at 15-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 26, 2011** End date: **December 26, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-3**
Drilling Method: **Rotary Wash** Equipment: Driller: **Mr. Zafar**	Borehole Diameter: **100 mm**	Ground level: Water Table	**Natural surface level** **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
26.12.11 9:10 AM	N/A	N/E	1	SPT	1	21	450	**Yellowish brown, medium dense, silty fine SAND**		
10:00 AM			2	SPT	2	25	450			
10:35 AM			3	SPT	3	29	450	**Yellowish brown, medium dense, silty medium coarse SAND**		
11:15 AM			4	SPT	4	28	450			
12:00 PM			5	SPT	5	30	450			
12:40 PM			6	SPT	6	29	450			
1:15 PM			7	SPT	7	43	450	**Yellowish brown, dense to very dense, silty fine to medium coarse SAND**		
2:00 PM			8	SPT	8	Refusal	100			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 26, 2011** End date: **December 26, 2011**		Casing diameter: **-**	BOREHOLE No. **BH-3**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level** Water Table **Not encountered**
Driller: **Mr. Zafar**			

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
26.12.11										
2:35 PM			11	SPT	9	Refusal	100			
3:15 PM			12	SPT	10	Refusal	100	**Yellowish brown, dense to very dense, silty fine to medium coarse SAND**		
	N/A	**N/E**	13							
4:00 PM			14	SPT	11	Refusal	100			
4:40 PM			15	SPT	12	Refusal	100			
								Bottom of BH-3 at 15-meter		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 26, 2011** End date: **December 26, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-4**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Munir**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
26.12.11 9:20 AM	N/A	N/E	1	SPT	1	25	450	**Brown, medium dense to dense, silty fine SAND**		
10:10 AM			2	SPT	2	42	450			
10:45 AM			3	SPT	3	42	450			
11:30 AM			4	SPT	4	46	450			
12:15 PM			5	SPT	5	Refusal	100	**Brown, dense to very dense, silty fine SAND, interlayer coarse sand at places**		
12:55 PM			6	SPT	6	45	450			
2:10 PM			7	SPT	7	47	450			
2:50 PM			8	SPT	8	Refusal	100			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 26, 2011** End date: **December 26, 2011**		Casing diameter: **-**	BOREHOLE No. **BH-4**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level**
Driller: **Mr. Munir**			Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
26.12.11 3:15 PM	N/A	N/E	11	SPT	9	Refusal	100	**Brown, dense to very dense, silty fine SAND, interlayer coarse sand at places**		
4:10 PM			12	SPT	10	Refusal	100			
4:55 PM			13	SPT	11	Refusal	100			
5:40 PM			14 15	SPT	12	Refusal	100			
								Bottom of BH-4 at 15-meter		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 27, 2011** End date: **December 27, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-5**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Munir**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
27.12.11 8:40 AM	N/A	N/E	1	SPT	1	18	450	**Brown, medium dense silty fine SAND**		
9:20 AM			2	SPT	2	22	450			
10:00 AM			3	SPT	3	24	450			
10:35 AM			4	SPT	4	30	450			
11:10 AM			5	SPT	5	35	100	**Brown, medium dense, dense to very dense, silty fine SAND, interlayer coarse sand at places**		
11:45 AM			6	SPT	6	40	450			
12:30 PM			7	SPT	7	47	450			
1:05 PM			8	SPT	8	Refusal	100			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 27, 2011** End date: **December 27, 2011**		Casing diameter: **-**	BOREHOLE No. **BH-5**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level** Water Table **Not encountered**
Driller: **Mr. Munir**			

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
27.12.11 2:00 PM	N/A	N/E	11	SPT	9	Refusal	100	**Brown, medium dense, dense to very dense, silty fine SAND, interlayer coarse sand at places**		
2:25 PM			12	SPT	10	Refusal	100			
3:10 PM			13	SPT	11	Refusal	100			
4:05 PM			14 15	SPT	12	Refusal	100			
								Bottom of BH-5 at 15-meter		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: Ali Zaidi

Project : **Soil Investigation of the Site for UCH-II Development Project, Baluchistan**
Client : **ENAR Petrotech Services (Pvt) Limited**

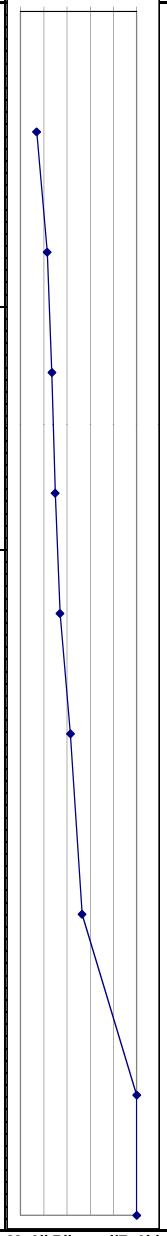
Contract No. KGI-2011-268
Sheet No. 1 of 1

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 28, 2011** End date: **December 28, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-6**
Drilling Method: **Rotary Wash** Equipment: Driller: **Mr. Zafar**	Borehole Diameter: **100 mm**	Ground level: Water Table	**Natural surface level** **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
28.12.11 9:10 AM	N/A	N/E	1	SPT	1	14	450	**Yellowish brown, medium dense, silty fine SAND with fine gravel at places**		
9:50 AM			2	SPT	2	23	450			
10:20 AM			3	SPT	3	27	450	**Yellowish brown, dense, silty fine SAND**		
11:10 AM			4	SPT	4	30	450			
12:00 PM			5	SPT	5	34	100	**Yellowish brown, dense to very dense, silty fine SAND with coarse sand at places**		
1:00 PM			6	SPT	6	43	450			
1:45 PM			7	SPT	7	53	450			
2:30 PM			8	SPT	8	Refusal	100			
			9							
			10							



Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 28, 2011** End date: **December 28, 2011**		Casing diameter: **-**	BOREHOLE No. **BH-6**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level** Water Table **Not encountered**
Driller: **Mr. Zafar**			

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
28.12.11 3:10 PM	N/A	N/E	11	SPT	9	Refusal	100	**Yellowish brown, dense to very dense, silty fine SAND with coarse sand at places**		
3:55 PM			12	SPT	10	Refusal	100			
4:35 PM			13	SPT	11	Refusal	100			
5:05 PM			14	SPT	12	Refusal	100			
			15					**Bottom of BH-6 at 15-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 30, 2011** End date: **December 30, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-7**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
30.12.11 8:35 AM	N/A	N/E	1	SPT	1	16	450	**Yellowish brown, medium dense to dense, silty fine SAND with interlayer of fine gravel at places**		
9:20 AM			2	SPT	2	17	450			
10:10 AM			3	SPT	3	20	450			
11:00 AM			4	SPT	4	23	450			
11:40 AM			5	SPT	5	34	100			
12:15 PM			6	SPT	6	30	450			
12:50 PM			7	SPT	7	40	450	**Yellowish brown, dense to very dense, silty fine SAND**		
1:45 PM			8	SPT	8	47	100			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 30, 2011** End date: **December 30, 2011**		Casing diameter: **-**	BOREHOLE No. **BH-7**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level**
Driller: **Mr. Zafar**			Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
30.12.11										
2:30 PM			11	SPT	9	Refusal	100			
3:35 PM			12	SPT	10	Refusal	100	**Yellowish brown, dense to very dense, silty fine SAND**		
	N/A	**N/E**	13							
4:25 PM			14	SPT	11	Refusal	100			
5:10 PM			15	SPT	12	Refusal	100			
								Bottom of BH-7 at 15-meter		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 30, 2011** End date: **December 30, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-8**
Drilling Method: **Rotary Wash** Equipment: Driller: **Mr. Zafar**	Borehole Diameter: **100 mm**	Ground level: Water Table	**Natural surface level** **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
30.12.11 8:10 AM	N/A	N/E	1	SPT	1	25	450	**Yellowish brown, medium dense, silty fine SAND**		
8:45 AM			2	SPT	2	29	450			
9:15 AM			3	SPT	3	36	450	**Yellowish brown, dense to very dense, silty fine SAND with interlayer of coarse sand, trace little gravel at place**		
10:00 AM			4	SPT	4	42	450			
10:30 AM			5	SPT	5	49	100			
11:05 AM			6	SPT	6	Refusal	100			
11:30 AM			7	SPT	7	Refusal	100			
12:10 PM			8	SPT	8	Refusal	100	**Yellowish brown, very dense, silty fine SAND**		
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 30, 2011** End date: **December 30, 2011**		Casing diameter: **-**	BOREHOLE No. **BH-8**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level**
Driller: **Mr. Zafar**			Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
30.12.11										
1:00 PM			11	SPT	9	Refusal	100			
1:40 PM			12	SPT	10	Refusal	100	**Yellowish brown, very dense, silty fine SAND**		
	N/A	**N/E**	13							
2:30 PM			14	SPT	11	Refusal	100			
3:20 PM			15	SPT	12	Refusal	100			
								Bottom of BH-8 at 15-meter		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 31, 2011** End date: **December 31, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-9**
Drilling Method: **Rotary Wash** Equipment: Driller: **Mr. Zafar**	Borehole Diameter: **100 mm**	Ground level: Water Table	**Natural surface level** **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
31.12.11 9:10 AM	**N/A**	**N/E**	1	SPT	1	22	450	**Yellowish brown, medium dense, silty fine SAND**		
9:50 AM			2	SPT	2	27	450			
10:35 AM			3	SPT	3	80	450	**Yellowish brown, very dense, silty fine SAND with interlayer of coarse sand**		
11:05 AM			4	SPT	4	80	450			
11:35 AM			5	SPT	5	89	100			
12:15 PM			6	SPT	6	Refusal	100			
12:55 PM			7	SPT	7	Refusal	100			
1:40 PM			8	SPT	8	Refusal	100	**Yellowish brown, very dense, silty fine SAND**		
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 31, 2011** End date: **December 31, 2011**		Casing diameter: **-**	BOREHOLE No. **BH-9**
Drilling Method: **Rotary Wash** Equipment: Driller: **Mr. Zafar**		Borehole Diameter: **100 mm**	Ground level: **Natural surface level** Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
31.12.11 2:40 PM	N/A	N/E	11	SPT	9	Refusal	100			
3:25 PM			12	SPT	10	Refusal	100	**Yellowish brown, very dense, silty fine SAND**		
4:25 PM			13	SPT	11	Refusal	100			
5:10 PM			14	SPT	12	Refusal	100			
			15					**Bottom of BH-9 at 15-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 31, 2011** End date: **December 31, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-10**
Drilling Method: **Rotary Wash** Equipment: Driller: **Mr. Zafar**	Borehole Diameter: **100 mm**	Ground level: Water Table	**Natural surface level** **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
31.12.11 8:25 AM	N/A	N/E	1	SPT	1	14	450	**Yellowish brown, medium dense to dense, silty fine SAND with interlayer of coarse sand**		
9:10 AM			2	SPT	2	22	450			
9:45 AM			3	SPT	3	28	450			
10:20 AM			4	SPT	4	34	450			
11:00 AM			5	SPT	5	33	450			
11:35 AM			6	SPT	6	43	450			
12:15 PM			7	SPT	7	Refusal	100	**Yellowish brown, very dense, silty fine SAND**		
1:00 PM			8	SPT	8	Refusal	100			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 31, 2011** End date: **December 31, 2011**		Casing diameter: **-**	BOREHOLE No. **BH-10**
Drilling Method: **Rotary Wash** Equipment: Driller: **Mr. Zafar**		Borehole Diameter: **100 mm**	Ground level: **Natural surface level** Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Sample details: Type	Sample details: No.	Standard Penetration Test: Blows/N	Standard Penetration Test: Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
31.12.11 1:40 PM	N/A	N/E	11	SPT	9	Refusal	100			
2:20 PM			12	SPT	10	Refusal	100	**Yellowish brown, very dense, silty fine SAND**		
3:00 PM			13	SPT	11	Refusal	100			
3:45 PM			14	SPT	12	Refusal	100			
			15					**Bottom of BH-10 at 15-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 24, 2011** End date: **December 24, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-11**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Munir**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
24.12.11 8:50 AM	N/A	N/E	1	SPT	1	12	450	**Yellowish brown, medium dense, silty fine SAND**		
9:40 AM			2	SPT	2	18	450			
10:10 AM			3	SPT	3	25	450			
10:45 AM			4	SPT	4	30	450			
11:20 AM			5	SPT	5	19	450	**Yellowish brown, medium dense, silty fine to medium coarse SAND**		
12:00 PM			6	SPT	6	21	450			
12:30 PM			7	SPT	7	39	450	**Yellowish brown, dense to very dense, silty fine to coarse SAND**		
1:15 PM			8	SPT	8	Refusal	100			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 24, 2011** End date: **December 24, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-11**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Munir**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Sample details: Type	Sample details: No.	Standard Penetration Test: Blows/N	Standard Penetration Test: Penetration (mm)	Description of strata
24.12.11								
1:50 PM				SPT	9	Refusal	100	**Yellowish brown, dense to very dense, silty fine to coarse SAND**
			11					
			12					
2:35 PM	**N/A**	**N/E**		SPT	10	Refusal	100	
			13					**Yellowish brown, very dense, silty fine SAND**
3:10 PM				SPT	11	Refusal	100	
			14					
3:55 PM			15	SPT	12	Refusal	100	
								Bottom of BH-11 at 15-meter

"N" Count Graph: 0 20 40 60 80 100

Legend

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 01, 2012** End date: **January 01, 2012**		Casing diameter: **-**	BOREHOLE No. **BH-12**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level**
Driller: **Mr. Zafar**			Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
01.01.12 9:10 AM	N/A	N/E	1	SPT	1	13	450	**Yellowish brown, medium dense, silty fine SAND little fine gravel**		
9:50 AM			2	SPT	2	28	450			
10:30 AM			3	SPT	3	32	450	**Yellowish brown, dense, silty fine SAND**		
11:15 AM			4	SPT	4	31	450			
12:05 PM			5	SPT	5	48	450	**Yellowish brown, very dense, silty fine to medium SAND**		
12:45 PM			6	SPT	6	55	450			
1:35 PM			7	SPT	7	58	450			
2:25 PM			8	SPT	8	56	450			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 01, 2012** End date: **January 01, 2012**		Casing diameter: **-**	BOREHOLE No. **BH-12**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level**
Driller: **Mr. Zafar**			Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata
01.01.12								
3:30 PM			11	SPT	9	Refusal	100	
4:00 PM			12	SPT	10	Refusal	100	
	N/A	**N/E**						**Yellowish brown, very dense, silty fine to medium SAND**
4:40 PM			13	SPT	11	Refusal	100	
5:10 PM			14	SPT	12	Refusal	100	
			15					**Bottom of BH-12 at 15-meter**

"N" Count Graph: 0 20 40 60 80 100

Legend

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 01, 2012** End date: **January 01, 2012**	Casing diameter: **-**	BOREHOLE No.	**BH-13**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
01.01.12 8:20 AM	N/A	N/E	1	SPT	1	21	450	**Yellowish brown, medium dense, silty fine SAND little fine gravel**		
9:00 AM			2	SPT	2	27	450			
9:40 AM			3	SPT	3	24	450	**Yellowish brown, dense to very dense, silty fine to medium SAND**		
10:15 AM			4	SPT	4	31	450			
10:55 AM			5	SPT	5	33	450			
11:30 AM			6	SPT	6	40	450			
12:15 PM			7	SPT	7	43	450			
1:05 PM			8	SPT	8	46	450			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 01, 2012** End date: **January 01, 2012**		Casing diameter: **-**	BOREHOLE No. **BH-13**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level**
Driller: **Mr. Zafar**			Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Sample details: Type	Sample details: No.	Standard Penetration Test: Blows/N	Standard Penetration Test: Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
01.01.12 1:50 PM	N/A	N/E	11	SPT	9	Refusal	100	**Yellowish brown, dense to very dense, silty fine to medium SAND**		
2:40 PM			12	SPT	10	Refusal	100			
			13							
3:35 PM			14	SPT	11	Refusal	100			
4:20 PM			15	SPT	12	Refusal	100			
								Bottom of BH-13 at 15-meter		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 02, 2012** End date: **January 02, 2012**	Casing diameter: **-**	BOREHOLE No.	**BH-14**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
02.01.12 8:10 AM	N/A	N/E	1	SPT	1	21	450	**Yellowish brown, medium dense, silty fine SAND little fine gravel**		
8:45 AM			2	SPT	2	26	450			
9:20 AM			3	SPT	3	32	450			
10:00 AM			4	SPT	4	35	450			
10:35 AM			5	SPT	5	46	450			
11:05 AM			6	SPT	6	64	450	**Yellowish brown, dense to very dense, silty fine SAND**		
11:40 AM			7	SPT	7	62	450			
12:15 PM			8	SPT	8	67	450			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 02, 2012** End date: **January 02, 2012**		Casing diameter: **-**	BOREHOLE No. **BH-14**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level**
Driller: **Mr. Zafar**			Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
01.01.12 12:40 PM	N/A	N/E	11	SPT	9	Refusal	100	**Yellowish brown, dense to very dense, silty fine SAND**		
1:00 PM			12	SPT	10	Refusal	100			
			13							
1:30 PM			14	SPT	11	Refusal	100			
2:00 PM			15	SPT	12	Refusal	100			
								Bottom of BH-14 at 15-meter		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 04, 2012** End date: **January 04, 2012**	Casing diameter: **-**	BOREHOLE No.	**BH-15**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
04.01.12 7:55 AM	N/A	N/E	1	SPT	1	29	450	**Yellowish brown, medium dense to dense, silty fine SAND with little fine gravel (rounded to sub angular)**		
8:25 AM			2	SPT	2	33	450			
9:05 AM			3	SPT	3	36	450			
9:35 AM			4	SPT	4	40	450			
10:15 AM			5	SPT	5	52	450	**Yellowish brown, very dense, silty fine to medium coarse SAND**		
10:45 AM			6	SPT	6	Refusal	100			
11:10 AM			7	SPT	7	Refusal	100			
11:40 AM			8	SPT	8	Refusal	100	**Yellowish brown, very dense, silty fine SAND**		
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 04, 2012** End date: **January 04, 2012**		Casing diameter: **-**	BOREHOLE No. **BH-15**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level**
Driller: **Mr. Zafar**			Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
04.01.12 12:30 PM	N/A	N/E	11	SPT	9	Refusal	100	**Yellowish brown, very dense, silty fine SAND**		
12:55 PM			12	SPT	10	Refusal	100			
1:30 PM			13	SPT	11	Refusal	100			
2:15 PM			14 15	SPT	12	Refusal	100			
								Bottom of BH-15 at 15-meter		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 03, 2012** End date: **January 03, 2012**	Casing diameter: **-**	BOREHOLE No.	**BH-16**
Drilling Method: **Rotary Wash** Equipment: Driller: **Mr. Zafar**	Borehole Diameter: **100 mm**	Ground level: Water Table	**Natural surface level** **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
03.01.12 9:10 AM	N/A	N/E	1	SPT	1	36	450	**Yellowish brown, medium dense to dense, silty fine SAND with little fine gravel (rounded to sub angular)**		
9:35 AM			2	SPT	2	22	450			
10:15 AM			3	SPT	3	21	450			
11:00 AM			4	SPT	4	23	450			
11:40 AM			5	SPT	5	28	450			
12:35 PM			6	SPT	6	33	100	**Yellowish brown, medium dense to very dense, silty fine SAND**		
1:30 PM			7	SPT	7	38	100			
2:15 PM			8	SPT	8	48	100			
			9							
			10							

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 03, 2012** End date: **January 03, 2012**		Casing diameter: **-**	BOREHOLE No. **BH-16**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level**
Driller: **Mr. Zafar**			Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
04.01.12 3:05 PM			11	SPT	9	51	100			
3:50 PM	**N/A**	**N/E**	12	SPT	10	Refusal	100	**Yellowish brown, medium dense to very dense, silty fine SAND**		
4:40 PM			13	SPT	11	Refusal	100			
5:25 PM			14	SPT	12	Refusal	100			
			15					**Bottom of BH-16 at 15-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: Ali Zaidi

Project : **Soil Investigation of the Site for UCH-II Development Project, Baluchistan**
Client : **ENAR Petrotech Services (Pvt) Limited**

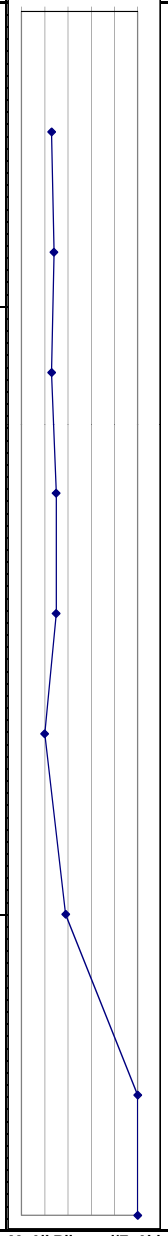
Contract No. KGI-2011-268
Sheet No. 1 of 1

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 25, 2011** End date: **December 25, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-17**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Munir**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
25.12.11 9:15 AM	N/A	N/E	1	SPT	1	26	450	**Yellowish brown, medium dense, silty fine SAND**		
9:55 AM			2	SPT	2	28	450			
10:35 AM			3	SPT	3	26	450	**Yellowish brown, medium dense to dense, silty fine SAND with interlayer of coarse sand at places**		
11:10 AM			4	SPT	4	30	450			
11:45 AM			5	SPT	5	30	450			
12:25 PM			6	SPT	6	20	100			
1:05 PM			7	SPT	7	38	100			
1:45 PM			8	SPT	8	Refusal	100	**Yellowish brown, very dense, silty fine SAND with interlayer of coarse sand at places**		
			9							
			10							



Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 25, 2011** End date: **December 25, 2011**		Casing diameter: **-**	BOREHOLE No. **BH-17**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level** Water Table **Not encountered**
Driller: **Mr. Munir**			

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
25.12.11 2:10 PM	N/A	N/E	11	SPT	9	Refusal	100	**Yellowish brown, very dense, silty fine SAND with interlayer of coarse sand at places**		
3:00 PM			12	SPT	10	Refusal	100			
3:30 PM			13	SPT	11	Refusal	100			
4:20 PM			14	SPT	12	Refusal	100			
			15					**Bottom of BH-17 at 15-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 23, 2011** End date: **December 23, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-18**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
23.12.11 8:20 AM	N/A	N/E	1	SPT	1	18	450	**Top Soil** **Yellowish brown, medium dense to dense, silty fine SAND with interlayer of coarse sand**		
9:00 AM			2	SPT	2	30	450			
9:35 AM			3	SPT	3	16	450			
10:20 AM			4	SPT	4	18	450			
11:00 AM			5	SPT	5	50	450			
11:40 AM			6	SPT	6	Refusal	100	**Yellowish brown, very dense, very coarse SAND**		
12:15 PM			7	SPT	7	Refusal	100			
1:10 PM			8	SPT	8	Refusal	100	**Yellowish brown, very dense, silty fine to medium coarse SAND with interbedded of clay**		
2:20 PM			9	SPT	9	Refusal	100			
3:30 PM			10	SPT	10	Refusal	100	**Bottom of BH-18 at 10-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 04, 2012** End date: **January 04, 2012**		Casing diameter: **-**	BOREHOLE No. **BH-19**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level** Water Table **Not encountered**
Driller: **Mr. Zafar**			

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata
04.01.12 8:15 AM	N/A	N/E	1	SPT	1	32	450	**Yellowish brown, medium dense to dense, silty fine to medium coarse SAND**
8:55 AM			2	SPT	2	25	450	
9:20 AM			3	SPT	3	44	450	**Yellowish brown, dense, silty SAND/sandy SILT**
10:00 AM			4	SPT	4	49	450	
10:35 AM			5	SPT	5	71	450	**Yellowish brown, very dense, silty fine SAND with interlayer of coarse SAND**
11:10 AM			6	SPT	6	Refusal	100	
12:00 PM			7	SPT	7	Refusal	100	
12:45 PM			8	SPT	8	Refusal	100	**Yellowish brown, very dense, silty fine SAND**
			9					
			10					

"N" Count Graph: 0 20 40 60 80 100

Legend

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 04, 2012** End date: **January 04, 2012**		Casing diameter: **-**	BOREHOLE No. **BH-19**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level**
Driller: **Mr. Zafar**			Water Table **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
04.01.12 1:25 PM	N/A	N/E	11	SPT	9	Refusal	100			
2:20 PM			12	SPT	10	Refusal	100	**Yellowish brown, very dense, silty fine SAND**		
3:00 PM			13	SPT	11	Refusal	100			
3:45 PM			14	SPT	12	Refusal	100			
			15					**Bottom of BH-19 at 15-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 03, 2012** End date: **January 03, 2012**	Casing diameter: **-**	BOREHOLE No.	**BH-20**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
03.01.12 8:30 AM	N/A	N/E	1	SPT	1	14	450	**Top Soil**		
9:10 AM			2	SPT	2	17	450	**Yellowish brown, medium dense, silty fine SAND with interlayer of coarse SAND**		
9:50 AM			3	SPT	3	16	450			
10:40 AM			4	SPT	4	23	450			
11:15 AM			5	SPT	5	34	450	**Yellowish brown, dense, silty fine SAND**		
12:00 PM			6	SPT	6	50	450			
12:45 PM			7	SPT	7	Refusal	125	**Yellowish brown, very dense, silty SAND/sandy SILT**		
1:30 PM			8							
2:15 PM			9	SPT	8	Refusal	100			
3:00 PM			10	SPT	9	Refusal	100	**Bottom of BH-20 at 10-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**M. Ali Bilgrami/F. Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**Ali Zaidi**

Project : Soil Investigation of the Site for UCH-II Development Project, Baluchistan
Client : ENAR Petrotech Services (Pvt) Limited

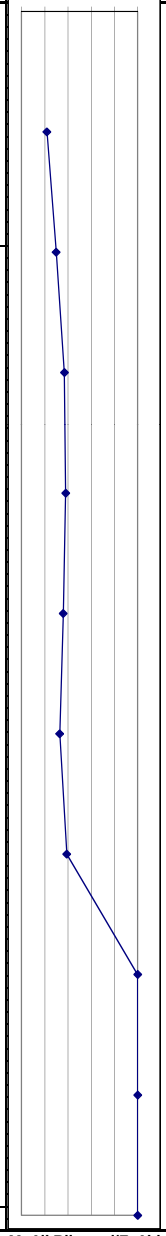
Contract No.	**KGI-2011-268**
Sheet No.	**1 of 1**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **December 25, 2011** End date: **December 25, 2011**	Casing diameter: **-**	BOREHOLE No.	**BH-21**
Drilling Method: **Rotary Wash** Equipment: Driller: **Mr. Zafar**	Borehole Diameter: **100 mm**	Ground level: Water Table	**Natural surface level** **Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
25.12.11 9:30 AM	N/A	N/E	1	SPT	1	22	450	**Brown, medium dense, silty fine SAND**		
10:15 AM			2	SPT	2	30	450			
11:00 AM			3	SPT	3	37	450			
11:50 AM			4	SPT	4	38	450			
12:45 PM			5	SPT	5	36	450	**Brown, dense to very dense, silty fine SAND, interlayer coarse sand at places**		
1:30 PM			6	SPT	6	33	450			
2:35 PM			7	SPT	7	39	450			
3:45 PM			8	SPT	8	Refusal	125			
4:10 PM			9	SPT	9	Refusal	100			
5:10 PM			10	SPT	10	Refusal	125	**Bottom of BH-21 at 10-meter**		



Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: M. Ali Bilgrami/F. Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 05, 2012** End date: **January 05, 2012**		Casing diameter: **-**	BOREHOLE No. **BH-1 (Well-27)**
Drilling Method: **Rotary Wash** Equipment:		Borehole Diameter: **100 mm**	Ground level: **Natural surface level** Water Table **Not encountered**
Driller: **Mr. Zafar**			

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
05.01.12 9:30 AM	N/A	N/E	1	SPT	1	21	450	**Top Soil** **Yellowish brown, hard, clayey SILT**		
10:10 AM			2	SPT	2	53	450			
11:00 AM			3	SPT	3	Refusal	100			
11:40 AM			4	SPT	4	Refusal	100			
12:15 PM			5	SPT	5	Refusal	100			
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	8	Refusal	100			
4:10 PM			10	SPT	9	Refusal	100	**Bottom of BH-1 at 10-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by: Fazal Abbas
Compiled by: Syed Irfan Shah
Checked by: 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

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 06, 2012** End date: **January 06, 2012**	Casing diameter: **-**	BOREHOLE No.	**BH-2 (Well-20)**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
06.01.12 9:45 AM	N/A	N/E	1	SPT	1	17	450	**Yellowish brown, medium dense, silty fine to medium coarse SAND**		
10:25 AM			2	SPT	2	20	450			
10:50 AM			3	SPT	3	Refusal	100	**Yellowish brown, hard, clayey SILT**		
11:25 AM			4	SPT	4	Refusal	100			
12:00 PM			5	SPT	5	Refusal	100			
12:45 PM			6	SPT	6	Refusal	100			
1:30 PM			7	SPT	7	Refusal	100			
2:05 PM			8							
3:00 PM			9	SPT	8	Refusal	100			
3:40 PM			10	SPT	9	Refusal	100	**Bottom of BH-2 at 10-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**Fazal Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 08, 2012** End date: **January 08, 2012**	Casing diameter: **-**	BOREHOLE No.	**BH-3 (Well 29)**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
08.01.12 9:10 AM	N/A	N/E	1	SPT	1	16	450	**Greyish brown, medium dense, silty fine to medium SAND**		
9:45 AM			2	SPT	2	20	450			
10:25 AM			3	SPT	3	26	450			
11:00 AM			4	SPT	4	34	450			
11:35 AM			5	SPT	5	44	450	**Greyish brown, very dense, silty fine to medium SAND**		
1:05 PM			6	SPT	6	41	450			
1:45 PM			7	SPT	7	55	450			
2:50 PM			8							
3:45 PM			9	SPT	8	64	450			
4:40 PM			10	SPT	9	Refusal	100	**Bottom of BH-3 at 10-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**Fazal Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**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**

Soil Testing Services

SUBSURFACE EXPLORATION LOG

Start date: **January 07, 2012** End date: **January 07, 2012**	Casing diameter: **-**	BOREHOLE No.	**BH-4 (Well-30)**
Drilling Method: **Rotary Wash** Equipment:	Borehole Diameter: **100 mm**	Ground level:	**Natural surface level**
Driller: **Mr. Zafar**		Water Table	**Not encountered**

Time & date	Casing depth (m)	Depth to water (m)	Sample details: Depth (m)	Type	No.	Standard Penetration Test: Blows/N	Penetration (mm)	Description of strata	"N" Count Graph (0 20 40 60 80 100)	Legend
07.01.12 8:35 AM	N/A	N/E	1	SPT	1	17	450	**Dark brown, hard, clayey SILT**		
9:45 AM			2	SPT	2	20	450			
11:05 AM			3	SPT	3	Refusal	100			
11:50 AM			4	SPT	4	Refusal	100			
12:45 PM			5	SPT	5	Refusal	100			
1:40 PM			6	SPT	6	Refusal	100			
3:10 PM			7	SPT	7	Refusal	100			
4:10 PM			8							
4:55 PM			9	SPT	8	Refusal	100			
						CR%	**RQD%**			
5:30 PM			10	R	1	25	10	**Bottom of BH-4 at 10-meter**		

Remarks:

- SPT — Standard Penetration Test
- SPT(C) — Standard Penetration Test with Cone
- UDS — Undisturbed Sample

Logged by:	**Fazal Abbas**
Compiled by:	**Syed Irfan Shah**
Checked by:	**Ali Zaidi**

Project : Soil Investigation of the Site for UCH-II Development Project, Baluchistan
Client : ENAR Petrotech Services (Pvt) Limited

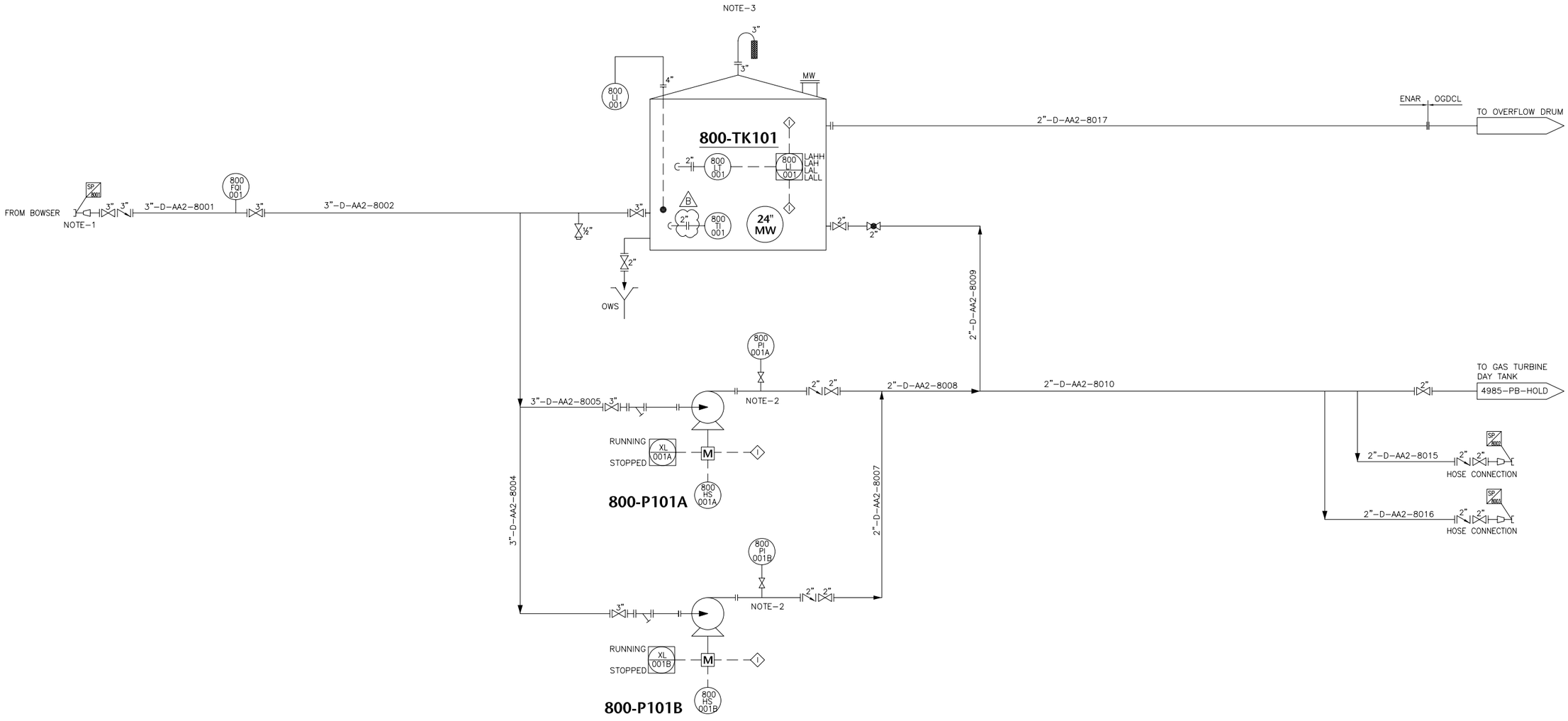
Contract No.	**KGI-2011-268**
Sheet No.	**1 of 1**

800-TK101

DIESEL TANK
CAPACITY : 2000 BBL.
SIZE : 31.49' ID x 30.87' H
DESIGN PRESSURE : ATM PSIG.
DESIGN TEMPRATURE : 180 °F

800-P101A/B

DIESEL LOADING/DECANTING PUMPS
CAPACITY : 50 GPM.
DIFFERENTIAL HEAD : 102 FT.



NOTES:

1. HOSE CONNECTION FOR TANK UNLOADING.
2. PUMP DISCHARGE LINE SHALL BE DESIGNED ON PUMP SHUT OFF PRESSURE (MINIMUM) UPTO THE ISOLATION VALVE OF PUMP.
3. BIRD SCREEN.

REV.	DATE	DESCRIPTION OF REVISION	DRAWN	DESIGNED	CHECKED	APPR.
0	08-05-2013	ISSUED FOR CONSTRUCTION	KI	OIB	MAM/SAF	FS
B	24-01-2013	INTERNAL COMMENTS INCORPORATED	NA	OIB	MAM/SAF	FS
A	07-03-2012	ISSUED FOR REVIEW & APPROVAL	NA	SGM	MAM/SAF	FS

ENAR PETROTECH SERVICES (PRIVATE) LIMITED
7-B, Sector 7-A Korangi Industrial Area, Karachi Pakistan
TEL: (9221) 5062791 E-mail: info@enar.com.pk
URL:www.enar.com.pk

Job No. 14-4985

Dwg. No. 4985-PB-2217

OIL & GAS DEVELOPMENT COMPANY LTD.

UCH-II DEVELOPMENT PROJECT

TITLE: PIPING & INSTRUMENT DIAGRAM FOR DIESEL SYSTEM

COMPUTER CODE	4985-PB-2217-0
SHEET SIZE	A3
SCALE	NTS
REPLACES DWG. NO.	