



OIL & GAS DEVELOPMENT COMPANY LTD.

**TERMS OF REFERENCE FOR HIRING OF
SERVICES FOR TOPOGRAPHIC SURVEY AND SOIL
INVESTIGATION FOR
KPD-TAY COMPRESSION PROJECT**

Rev.	Date	Description	Prepared By	Checked By	Approved By
0	13-09-2021	Issued for Tender	MU/IM	MAM	MIM

TOR / SCOPE OF WORK

Table of Contents

GENERAL.....	3
INTRODUCTION	4
BRIEF	4
OBJECTIVE	5
APPLICABLE CODES & STANDARDS	6
QA/QC & HSE MANAGEMENT.....	6
WORK CLOSE OUT & REPORT	7
COTRACTOR DELIVERABLE DOCUMENT LIST	7
PROJECT TIMELINE	7
PROJECT KICK-OFF	7
GENERAL TERMS & CONDITIONS	7
BID PRICE SCHEDULE	9
ELIGIBILITY CRITERIA.....	10
EVALUATION CRITERIA	11
FINANCIAL EVALUATION	12

Attachments:

Scope of Work for Topographic Survey-----	Annexure “A”
Scope of Work for Soil Investigation-----	Annexure “B”
Wells Locations / Gathering Network Diagram -----	Annexure “C”

TOR / SCOPE OF WORK

GENERAL

1. DEFINITIONS:

COMPANY / OWNER	OIL & GAS DEVELOPMENT COMPANY LTD. (OGDCL)
CONSULTANT:	ENAR Petrotech Pvt. Ltd.
CONTRACTOR:	“CONTRACTOR” means the person or persons, firm or Proprietor, whose proposal, has been/ shall be accepted by the COMPANY for providing the required services and support, testing and survey. It also includes the CONTRACTOR's representative(s), legal successors and permitted assignees.
WORKS:	CONTRACTOR is required to execute, provide, expedite testing, investigation, survey related activities and services in relation to civil & geotechnical parameters as described in the contents of this Terms of Reference.
DOCUMENT:	Any form, letter, facsimile, contract, subcontract, specification, requisition, or record of any kind transmitting information from one party to another. It also includes the underlying data used to produce documents, software, computer generated drawings, calculations, designs, lists, charts, etc., and other data used to form a permanent record of the execution and completion of the WORKS.

2. ERRORS OR OMISSIONS:

Any errors or omissions noted by the Contractor in this document shall be immediately brought to the attention of the Company.

3. DEVIATIONS:

All deviations to this document shall be brought to the knowledge of the Company as a section in the bid. All deviations made during the execution of this activity shall be with written approval of the Company prior to undertaking any kind of activities or execution of works. Such deviation shall be shown in the documents provided by the Contractor.

4. DOCUMENTATION:

- All documents to be submitted by the Contractor to the Company shall be in the English language.
- The S.I. system of units shall be used in documents and drawings, except for the pipe sizes shall be indicated in inches; unless otherwise specified by the Company.
- Drawings and all required documents shall be submitted by the Contractor to the Company for approval. But such approval of the Company shall in no way relieve the Contractor of his obligations with respect to such documents.

TOR / SCOPE OF WORK

INTRODUCTION

Oil and Gas Development Company Ltd (OGDCL) is Pakistan's National Oil & Gas Exploration and Production Company. OGDCL is currently operating Country's largest Oil & Gas sector and is listed on both LONDON Stock Exchange and Pakistan Stock Exchange. More details about the Company can be obtained from its website www.ogdcl.com.

BRIEF

Kunnar-Pasakhi-Deep (KPD) & Tando-Allah-Yar (TAY) are two separate concession / leases with Oil & Gas reserves in both fields. KPD is 100 % owned by OGDCL, while TAY is a JV concession with working interest of OGDCL (77.5%) and GHPL (22.5%).

Kunnar Oil field was established in early 1990's. However, Kunnar-Pasakhi-Deep and Tando-Allah-Yar (KPD-TAY) is an Integrated Development Project for processing of Gas and Condensate of both KPD & TAY. Facility is located in TandoJam adjacent to Kunnar oil field about 25 km away from Hyderabad and approx. 195 km from Karachi, Sindh Province of Pakistan.



Figure 1: Location of the Plant

Processing facilities under KPD-TAY Integrated Facility mainly includes Gas gathering, Separation system, Gas Sweetening through Amine Unit, Gas Dehydration through Molecular Sieve process, LPG & Condensate Stabilization Unit, Sales Gas Compressors and Allied utilities, etc.

OGDCL intends to install compression facility in order to cater the depleting reservoir pressure with passage of time and optimize both KPD & TAY reservoir life. For the abovementioned purpose, a conceptual study has been carried out with various options / combinations for gas compression of depleting wells at KPD TAY Plant and to develop compression philosophy considering the overall compression requirement of Field for optimum production over the field life.

The conceptual study carried out in Phase-I concluded that compression facility is required at following locations of KPD and TAY blocks:

- Nodal Compression at existing TAY-3 Gas Gathering Station (GGS).

TOR / SCOPE OF WORK

- Nodal Compression for TAY individual wells at Gas Processing Plant (GPP).
- Nodal Compression for Thora Wells at New Thora Deep-3 GGS.
- Front End Compression for KPD wells at GPP.

OBJECTIVE:

OGDCL intends to hire services of surveyor/contractor for Soil Investigation, Plot Survey and Topography Survey for following 03 locations as listed below:

1. Compression Area - GPP (KPD & TAY)

The estimated area required for the installation of these Compression Facilities (both KPD and TAY Wells) is 200m x 175m (35,000 m²).

2. Compression Area - GGS (TAY-03)

The estimated area required for the installation of this Compression Facility is 190m x 125m (23,750.00 m²).

3. Compression Area - GGS (TD-03)

The estimated area required for the installation of this Compression Facility is 150m x 130m (19,500 m²).

Tay-03 GGS (gas gathering system) is located at a distance of 25.07 km away from KPD GPP (gas processing plant). Moreover, Thora Deep-03 GGS is located at around 9.56 km away from KPD GPP (gas processing plant). The works shall involve following activities:

Topography Survey:

A site topographical shall be carried out by the Contractor to develop Grading layout of proposed area of installation and estimate required cut and fill volume. For detailed SOW please refer to Annexure-A.

Soil Investigation:

A site topographical and geotechnical survey should be carried out by the Contractor in order to acquire information regarding the physical characteristics of soil, assess the site situation for planning civil works to be carried out for setting up new Compression Facility for KPD-TAY Compression Project. For detailed SOW please refer to Annexure-B.

The description of the services is given as a minimum and shall not be considered as exhaustive definition, and does not relieve the Contractor from his duty to provide competent services with due diligence required. The objective of this project is successful performance of all activities related to soil investigation, plot survey and topographical survey, at the locations mentioned above.

The Contractor shall execute all testing, survey activities required for soil investigation, Plot survey and Topographical survey in accordance with the Project Schedule and in the timeline specified.

TOR / SCOPE OF WORK

Contractor shall assume full responsibility to complete the Works in compliance with the requirements listed below, standards, and other applicable local regulations.

Note: It is advised for the bidders to visit site before bid submission for clarity of scope and understanding of existing installed facilities as well as the locations. The contractor shall also conform to the requirements as given in the relevant master set of documents provided at <https://ogdcl.com/download-tenders> in addition to requirements of this TOR, with attachments.

APPLICABLE CODES & STANDARDS

The latest edition and published addenda of the following publications in effect on the date of Contract award are a part of this Scope of work. The codes and standards listed as following are not exhaustive and should be used as a guide to the codes and standards Company would expect Contractor to use.

American Society for Testing and Materials

ASTM D422	Standard Test method for particle size analysis of soil.
ASTM D1557	Test Method for Laboratory Compaction Characteristics of Soil using modified effort
ASTM D1586	Standard test method for penetration test and split-barrel sampling of soils
ASTM D2167	Standard Test Method for density and unit weight of soil in place by the Rubber Balloon method.
ASTM D2487	Classification of soils for Engineering purpose.
ASTM D3740	Standard Practice for minimum requirements for agencies engaged in the Testing and for Inspection of soil and rock used in Engineering design and construction.
ASTM D4318	Standard Test method for Liquid limit, Plastic limit and Plastic index of soils.
ASTM 4253	Standard Test methods for maximum index density and unit weight of soils using vibratory table
ASTM 4254	Standard Test methods for minimum index density and unit weight of soils and calculation of relative density

QA / QC & HSE MANAGEMENT

- i. The contractor shall have primary responsibility to ensure all the work is carried out in accordance with the Scope of Works, applicable design and QA/ QC codes, standards and industry norms/ standards.

TOR / SCOPE OF WORK

- ii. The contractor shall follow the COMPANY's HSE Policy in letter & spirit. The contractor shall ensure that all the requisite resources are provided during activities for effective implementation of HSE Management System.
- iii. The contractor must comply all HSE requirements under Oil & Gas industry best practices & prevailing local legislations. Moreover, the contractor must also comply COMPANY's HSE guidelines for the contractor.
- iv. COMPANY has right to inspect / audit on as & when required basis to check the implementation of HSE Management System & may propose measures which will be binding on the contractor to follow in true letter & spirit.

WORK CLOSE OUT & REPORT

The contractor will be responsible for work close-out and all related documents necessary for close out report, submit for approval complete dossier containing all relevant data as per SOW.

Note: The contractor to include any missing milestone deliverable in final reports to complete the project objective in true spirit.

COTRACTOR DELIVERABLE DOCUMENT LIST

Contractor shall essentially provide required stage wise deliverables / documents as mentioned in the SOW. However, OGDCL may ask for any other Project related document as per industrial practice.

PROJECT TIMELINE

After award of contract / service order, the contractor shall complete the SOW and submit the required reports / documents within 15 days. This time indicates calendar days (including all weekends) and NOT ONLY WORKING DAYS. Timeline is not to be linked with performance bond submission.

The Contractor shall ensure that its workforce remains engaged in; but not limited to all activities related to and required for soil investigation, plot survey and topographical survey, round the clock and during the course of all calendar days (this includes all weekends, public holidays and the like) to expedite the work required for works completion. Contractor shall be responsible to plan all activities and manage the progress accordingly, while taking into account the restrictions of Pandemic/Epidemic lockdowns and the like of which may cause delay in the works completion.

Contractor shall be responsible to plan all activities and manage the progress accordingly, as time delays will not be accepted. The Contractor shall be held accountable for all the delays.

PROJECT KICK-OFF

- Project Kick-off meeting shall be held immediately at KPD-TAY Field.

GENERAL TERMS & CONDITIONS

- Contractor shall be responsible for movement of its manpower and equipment / machinery to the field and to the workplace and its safety & security accordingly.
- Contractor shall use his own transportation at site.

TOR / SCOPE OF WORK

- Contractor will be required to follow all OGDCL field instructions and procedures in vogue related to Covid-19 pandemic.
- OGDCL will provide boarding / lodging facilities to contractor's deputed professionals at project site as per their designation / availability in officer and / or staff residential accommodation at the Field. The contractor personnel can avail the facility of messing at field during the job.
- Contractor will submit site supervision manpower deployment schedule & OGDCL will approve manpower deployment schedule.
- Contractor shall organize a qualified and competent survey team headed by a survey Manager for survey and investigation work.
- Contractor shall be responsible to provide personnel safety apparel to all its personnel. Contractor's personnel shall be fully equipped with personal safety protection equipment, as required, during performance of work at site. No loose clothing and normal shoes shall be allowed.
- Contractor shall strictly comply with all local, municipal, territorial, provincial and federal laws, orders, and regulations which are applicable to the location where the Works are being performed.
- The Contractor shall be responsible for providing adequate testing arrangement to enable him to perform the work in accordance with approved test & inspection practices, codes & standards.

TOR / SCOPE OF WORK

BID PRICE SCHEDULE

The Contractor shall fill in the price as per the following format:

PRICE SCHEDULE		
S. No.	Item	Cost (PKR)
1.	Mobilization of Equipment and Machinery	
2.	Soil investigation	
3.	Topography Survey	
4.	Demobilization of Equipment and Machinery	
	Sub-Total	
	Provincial Sales Tax @ _____%	
	Total Cost Including All Sales Tax	

Costs for all works, direct or indirect, mentioned or otherwise, shall be deemed to be included in the Contractor's total bid price. The mentioned works in the document shall be considered as non-exhaustive and Contractor shall be responsible to include/build all such costs in the bid price.

TOR / SCOPE OF WORK

ELIGIBILITY CRITERIA

Only those applications shall be considered for evaluations which meet following minimum eligibility requirement:

- i. Applicants must be incorporated in Pakistan or in a country recognized by Pakistan and not prohibited to have commercial dealings with Pakistan under any Pakistani or International laws, regulations, resolutions, etc.
- ii. Applicant(s) must be registered with Pakistan Engineering Council (PEC).
- iii. Applicant shall have experience of similar works of at least 05 Projects of Gas Processing Facility / Field from PPEPCA companies within last 07 years in Pakistan.
- iv. The applicant must undertake to comply with the Pakistan Engineering Council registration requirements.
- v. Bidder including any of its directors, employees, partners, associated company or affiliated company has not been blacklisted by the Government / Semi-Government / Autonomous body shall be considered ineligible (affidavit confirming this shall be provided with the proposal).
- vi. In case of JV Consortium, the leading partner must fulfill the required criteria, the other partners experience etc. will not be considered for minimum requirement / Eligibility criteria.
- vii. The applicant not meeting any of the above eligibility criteria shall not be considered for further evaluation.
- viii. Bidder shall be obligated to produce the typical key Deliverables (minimum but not limited to) as listed in the TOR/Scope of Work document.
- ix. The company must be engaged in providing similar services for the past 05 years.
- x. Bidder shall provide duly signed & stamped affidavit conforming that all the documents, particulars and information given with this document are true.

Experience and Track Record of the Company

The applicant must possess adequate experience and track record of providing services.

- i. The applicant must possess the financial soundness and strength to execute the projects.
- ii. In order to qualify, the applicants are required to meet all the following minimum qualification criteria regarding applicants general and particular experience personnel and equipment (computer aids etc.) capabilities, software's and financial position as demonstrated by the applicant's response through the Technical Qualifications basis and Eligibility requirements provided in this document.

TOR / SCOPE OF WORK

EVALUATION CRITERIA

Evaluation Criteria is an integral part of TOR and shall be the basis for Technical qualification of bidders. Evaluation criteria shall be completely filled by the bidder giving proper references of the bid document in respective column against each item. Bidders to note that the bids of only those bidders shall be further evaluated who meet the Eligibility Requirements Criteria.

Evaluation cum Compliance Sheet

Bidder is to provide serial wise documents in the following order in its BID for clarity:

Sr. #	Description	Compliance by the Bidder
1.	Registration with PEC w.e.f FIRST registration to ascertain number of valid years (with certificate copy).	
2	Registration with FBR and provisional services tax authority with valid certifications w.e.f FIRST registration to ascertain number of valid years (with certificate copy)	
3	Compliance of Training of Surveyor(s) from <u>SURVEY of Pakistan</u> (with certificate copy)	
4	All figures in the Financial Tables must be properly filled in.	
5	CV's of all the involved teams for the required works.	
6	NTN number to be provided with valid certificate copy	
7	The bidder company must have a VALID office in PAKISTAN.	
8	The Contractor shall have a minimum of Five (05) years of experience in the same domain for eligibility. (Bidder must submit details of its experience with relevant client information and documentary evidence for their successful completion)	
9	Applicant must not be black listed with any agency or organization or/ and applicant has never indulged in corrupt, fraudulent or collusive practices for procuring contracts. (An affidavit confirming this shall be provided with the proposal.)	
10	Completion time of Two (02) Weeks is mandatory requirement, bids submitted with completion time beyond Two (02) Weeks shall not be considered for evaluation.	
11	Compliance to entire OGDCL scope by submitting signed & stamped copy of entire technical scope (as above)	

TOR / SCOPE OF WORK

FINANCIAL EVALUATION

- Financial Evaluation will be done based on complete package basis. Following shall govern during financial evaluation:
 - Arithmetic errors in computation and summation shall be checked. The errors shall be corrected in the following manner;
 - a) Where there is discrepancy between amounts in figures and in words, the amount in words shall govern &
 - b) Where there is discrepancy between the unit rate and the total amount derived from the multiplication of the unit rate and the quantity, the unit rate as quoted shall govern.
- Bid to be accompanied with the Bid Bond amounting to PKR 60,000/-.
- Service orders shall be issued to the technically qualified financially lowest bidder.
- 10% equivalent amount to be submitted as Performance bond by lowest evaluated bidder. This bank guarantee to be valid for six (06) months against completion period of works.
- On successful completion and satisfactory performance, the performance bond shall be released.
- Cost to be provided as fix/ lump sum against the works.
- Each cost must include all applicable taxes of Provincial/ Federal Government; however, Sales Tax should be quoted as separate line item.
- COMPANY reserves the right to revoke the consultancy services contract at any stage by making payment of completed jobs only, as per payment terms.

PAYMENT TERMS

- Quoted price shall be valid for 120 days from the opening date of the Financial Bid.
- The quote should be in Pak Rupees and all payment shall be made in Pak Rupees after deduction of all applicable taxes at prevailing rates. The invoice to be accompanied with annexure-C duly issued by FBR against provincial Sales Tax on Services.
- 100 % payment will be made after completion of works, submission of report / deliverables and approval by OGDCL of the same.

TOR / SCOPE OF WORK

ATTACHMENTS:

Scope of Work for Topographic Survey----- Annexure “A”

Scope of Work for Soil Investigation----- Annexure “B”

Wells Locations / Gathering Network Diagram ----- Annexure “C”

ANNEXURE - A

Scope of Work for Topographic Survey

TOR / SCOPE OF WORK

KPD-TAY COMPRESSION PROJECT

SCOPE OF TOPOGRAPHIC SURVEY

1.0 SCOPE OF WORK

The survey work shall be carried out with respect to the following broad guidelines:

- i. Coordination and levels of the nearest existing Road(s).
- ii. Descriptions of Terrain of the survey area.
- iii. Coordination and alignment of existing features falling within 50-m (fifty meters) of survey area like boundary wall of other plots, towers for high-tension line, electricity plots, all buried and exposed utility lines, hills and rock etc.
- iv. Survey of all manmade and naturally occurring drains, nalas, ditches etc, indicating the direction of flow.

1.1 Detail Survey

The detail survey of the selected site shall provide sufficient recorded data and information required for plotting of grading and drainage plans, establishing the finished ground elevations, acquisitions/purchase process of plots and prepare material estimates etc.

2.0 HORIZONTAL CONTROL

The coordinates of control points will be given in time of national grid and shall be connected to survey of Pakistan (SOP) GTS Control point marker will be constructed.

2.1 Vertical Control

Vertical Control Station shall be established and tied to the nearest Survey of Pakistan (SOP) GTS and Benchmark \Datum.

All bench Marks including Temporary Bench Marks shall be established beyond the area of construction in protected places.

2.2 Survey For Selected Area

The detail survey of the proposed site shall be carried out to establish the boundary limits / bearings of the site boundaries with respect to true North and the ground profile etc.

At the start of detail survey the contractor shall construct a permanent bench Mark at an appropriate location, within the selected site. The coordinates and levels of Bench Mark shall be tied with the Survey of Pakistan (SOP) GTS and Datum.

The survey contractor shall record accurate measurement of plan and profile, including but not limited to following.

- i. Precise demarcation of the selected site from the Revenue Maps and marking on SOP and Revenue maps showing survey numbers and property lines (The SOP maps and revenue maps will be provided by Contractor/surveyor).

TOR / SCOPE OF WORK

- ii. Elevation with reference to Benchmark at every 10-m (ten meters) grid interval on both axis and at every change in slope to depict a real profile of the land.
- iii. Any permanent structure / feature within 50-m (fifty meters) from the plot boundary shall be measured and shown on the drawings.
- iv. Fixing wooden pegs at 50M (fifty meter) interval and each change in direction of plot area.
- v. Installation of permanent makers/posts at 250-m (two hundred and fifty meters) interval and at each corner / change in direction of plant area.
- vi. Horizontal distance along with the boundary limit of plant area.
- vii. Topographic and contour survey.
- viii. Features like flood problem bunds, channels, drain / nals and hills etc, which could influence the design and / or construction, shall be noted.
- ix. Special attention shall be given to Rain watercourses passing through or within 50-m (fifty meters) from the plot limits. The contractor shall record the rain watercourse bed contours 100-m (hundred meters) upstream and 100-m (hundred meters) downstream from the plot boundary limits.
- x. Spot levels within the distance of 20-m (twenty meters) outside the plot limits.

3.0 **ACCURACY**

Survey contractor shall take every possible care in producing most accurate results. The minimum standards of accuracy to be attained shall be as under.

Traverse line	:	1:50,000
Angles observation	:	5 secs, 360 degree system. Spot
levels	:	0.01 meters.

4.0 **DOCUMENTS**

All documents i.e. maps, detailed drawings etc, prepared by the survey contractors shall be submitted to OGDCL in original along with four copies each of the final survey maps, including but not limited to:

- i. The levels and field data shall be provided on electronic files and submitted in CD-ROM suitable for use on desktop computers. The CD-ROM should be readable in AutoCAD release 2000 or latest (under windows). Field books shall be submitted where required.
- ii. Survey of Pakistan (SOP) map duly marked with selected site with necessary updating for important Developments like new villages/towns, roads, etc. subsequent to original SOP map preparation, scale: 1:50,000 (SOP maps will be arranged by the surveyor).
- iii. Overall layout of the area showing selected site and existing constructions/ features, showing coordinates and bearing of boundary limits, location of Benchmark and related information, ground elevations at 10 meter grids etc. provided in A0 size on scale 1:1000.
- iv. Plan of the selected location for plant area showing coordinates and bearing of

TOR / SCOPE OF WORK

boundary limits, location of bench mark and related information ground elevations at 10-meters grids etc, provided in A-1 size, appear on Scale 1:500.

- v. Any other documents, which may be required or may prove useful in design or construction of the said site.
- vi. Overhead electricity & telephone lines running along or crossing the selected site route shall also be clearly indicated on maps / drawings.

5.0 **DEMARCATIION OF SITE**

Demarcation of selected site shall include but not be limited to the following.

5.1 **Wooden Pegging**

The boundary limits of the surveyed area shall be physically marked by fixing 2"x2"x24" wooden pegs into ground (18" deep) at 50m (fifty meter) interval.

5.2 **Bench Mark**

Contraction and installation of permanent Horizontal and vertical control Bench Mark at selected site or is directed by OGDCL. The Bench Mark shall be correlated and tied with survey of Pakistan SOP datum. The Reduce level shall be expressed in meters.

5.3 **Permanent Markers**

Permanent markers made in reinforced concrete with dimensions 200mm X 200mm X 1000mm long with a square base of 600mm X 600 X 150mm thick shall be provided, installed white washed and marked and shall be erected at every 250 Meters, and at all points of intersection (PI) along boundary limit of selected location for plant area.

6.0 **APPROVALS**

Upon completion of fieldwork, the contractor shall prepare first issue of survey drawings and submit two (02) sets of the same for review approval by OGDCL. The survey drawings will be in accordance with graphic format approved by OGDCL.

7.0 **DELIVERABLES**

The survey Contractor shall provide the following deliverables.

7.1 **Survey Drawings**

The Survey Contractor shall submit four (04) copies of approved survey drawings along with two (02) CD'S of electronic files readable on Auto Cad.

7.2 **Maps**

- i. Four (04) copies of SOP map duly marked with approved layout of selected

TOR / SCOPE OF WORK

site

- ii. Four (04) copies of Revenue maps duly marked with approved layout of selected site.

(NOTE: The SOP maps and Revenue maps will be provided by contractor/Surveyor).

7.3 **Survey Notes and Data**

One (01) original and two (02) copies of the following shall be submitted.

- i. Level and field data.
- ii. Survey notes/data.
- iii. List of Bench Marks.
- iv. List of Markers/Posts.
- v. Coordinates and elevation of control point.
- vi. Control and leveling computations.
- vii. Provide two (02) sets of soft copies for all documents / drawings. All soft copies shall be in editable format (Word, Excel, Auto CAD).
- viii. Each set shall comprise of two compact discs. The contents of Disc-1 shall include survey drawings and Scanned maps (SOP & Revenue) whereas the contents of Disc-2 shall include the remaining data/documents.

ANNEXURE - B

Scope of Work for Soil Investigation

TOR / SCOPE OF WORK

KPD-TAY COMPRESSION PROJECT

SCOPE OF SOIL INVESTIGATIONS

1. SCOPE OF WORK

The Scope of Soil Investigation shall include following as minimum;

- i. Drilling of bore holes.
- ii. Collection of samples and carrying out field / laboratory tests.
- iii. Soil Resistivity Survey.
- iv. Geotechnical Results & Recommendations shall include soil type, allowable bearing capacity along with recommended depth & sub-grade reaction, settlement/ shear curve & recommended foundation type and type of cement to be used for foundation.
- v. Submission of Soil Investigation & Resistivity Report(s) including all the test results, bore logs, foundation design recommendations and calculations etc.

2. FIELD / LABORATORY TESTS

The Soil Investigation work for laboratory / field testing shall include but not limited to following:

- i. Sieve Analysis
- ii. Hydrometer Analysis
- iii. Atterberg Limits
- iv. Natural Moisture Content
- v. Bulk and Dry density
- vi. Specific Gravity
- vii. Unconfined Compressive
- viii. Direct Shear
- ix. Compaction / CBR Tests
- x. Standard Penetration Test (SPT)
- xi. Unconfined Compression
- xii. Consolidation
- xiii. Chemical Test
- xiv. Water tests such as TDS, Sulphate Chlorides and pH etc. (if required)

TOR / SCOPE OF WORK

3.0 **BORE HOLES**

The Contractor shall be required to drill three (03) bore holes upto fifteen meter (15m) depth.

4.0 **GEOTECHNICAL RESULTS / RECOMMENDATIONS**

The Contractor shall include (as minimum) the following items in the geotechnical results / recommendations. Separate results / recommendations shall be required subject to soil characteristics.

- i. Soil types
- ii. Recommended foundation type including recommended depth.
- iii. Recommended allowable bearing capacity for various depths and modulus of sub-grade reaction.
- iv. Recommended methodology for excavation of foundations and pit.
- v. Compaction / CBR
- vi. Type of Cement

5.0 **EARTH RESISTIVITY SURVEY**

The Contractor shall conduct the earth resistivity survey of the Plant Area Project to assess the corrosion potential of the subsoil for the buried pipe lines.

The earth resistivity test shall be made at ten (10) observation points suitably located by the contractor in accordance with the locations of project items.

The Contractor shall be required to mention resistivity values for various depths below surface upto a maximum depth of five (05) meter. The resistivity values shall be given for all observation points also highlighting the location of observation points.

Based on the resistivity tests, the Contractor shall prepare and submit a report which shall include but not limited to following:

- Methodology
- Results
- Soil Corrosion Potential
- Recommended value (indicating depth also)
- Description and location of observation points.

6.0 SOIL INVESTIGATION REPORT

The Contractor shall submit four (04) hard copies and two (02) soft copies (in the form of CD's) of the OGDCL's approved Soil Investigation report. The Soil Investigation report shall include but not limited to following:

- i. Location plan and number of bore holes at each location.
- ii. Recommendations for design of roadways.
- iii. Ground water level variations.
- iv. Detail of the depth and sequence of subsurface strata.
- v. Recommendation for foundation design.
- vi. Recommendation for excavation methodology.
- vii. Recommendation for type of cement.
- viii. Earth resistivity survey report.
- ix. Bore logs & pit logs.
- x. All laboratory and field test results.

For approval of OGDCL, the contractor shall submit, two (02) hard copies of thereport.

ANNEXURE - C

Wells Locations / Gathering Network Diagram

KPD-TAY INTEGRATED DEVELOPMENT PROJECT (Phase- I & II).

SITE LOCATION MAP.

