EAST AFRICAN CRUDE OIL PIPELINE PROJECT

EACOP FEED OVERVIEW – TANZANIA UPCOMING OPPORTUNITIES WORKSHOP 22-JANUARY-2018

EAST AFRICAN CRUDE OIL PIPELINE

GULF INTERSTATE ENGINEERING

TANZANIA UPCOMING OPPORTUNITIES WORKSHOP
22-JAN-2018 DAR ES SALAAM, TANZANIA
WORKSHOP AGENDA

- Opening comments:
  - MEM
- SAFETY MOMENT
- Introduction to Gulf Interstate Engineering & FEED
- FEED Technical Descriptions for the EACOP Export Pipeline and Pump Stations within the Tanzania area
- Codes and Standards requirements for the EACOP material, services and construction
- Break
- Overview of TIER 1 Contracts Scopes of Work
- Services and support required during the pre-construction phase of the Project
- Type of Labor Requirements
- Tier 1,2,3,4 structure examples for service providers
- Local Tanzania communities in close proximity of the EACOP permanent installation
- Closing Comments
- Lunch

STANDARDS FOR CONTRACTING OF GOODS & SERVICES

The EACOP Project and Contractors will be responsible for pre-qualifying the providers of goods and services for the construction of the EACOP Project. Standards they will require from each provider to meet:

- **Quality**
  - Goods and Services must meet specified ISO standards, international codes and standards, ”fit for purpose”, documented history of previous services for major projects and meets availability/reliability requirements.
- **Cost**
  - Provides the most economically competitive offering while meeting the other standards listed
- **National Content**
  - The level of use of Tanzanian labour, local expertise, goods and services, Tanzanian Companies, registered entities, Tanzanian citizens and proposals for technology transfer.
- **Planning**
  - Demonstrates the capability of developing and maintaining plans to meet the schedule requirements and history of successful compliance on other projects
- **Ethics and compliance**
  - Conduct all business matters in the highest of ethical standards and comply with Tanzania and IFC/World Bank guidelines
- **Safety**
  - Demonstrate established health and safety procedures use on previous projects and statiscal proof of safety incident history

SAFETY MOMENT

PROJECTS

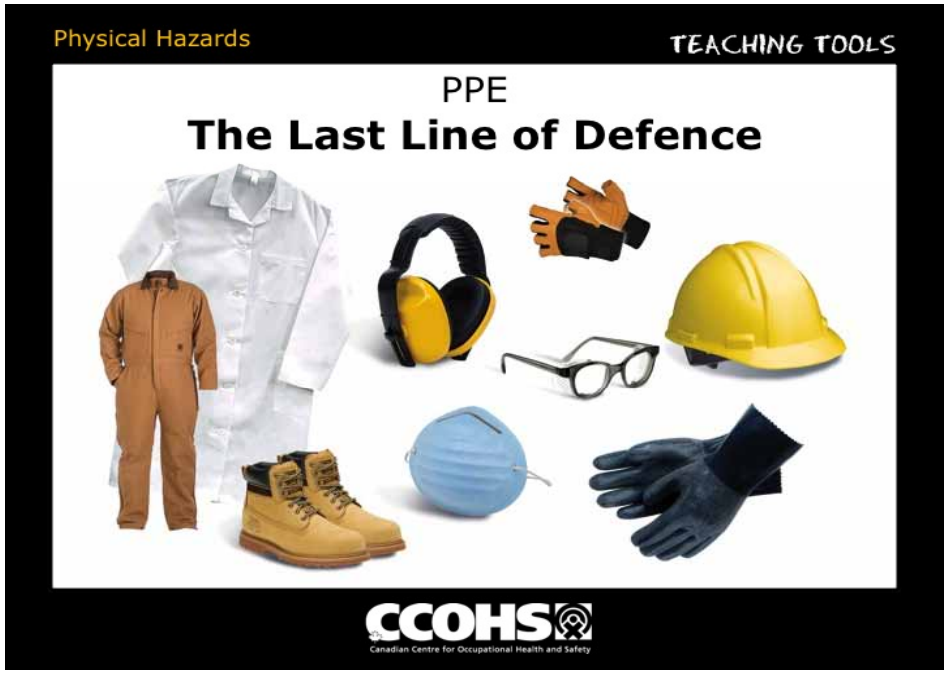
SAFETY COMMENCES BEFORE CONSTRUCTION

GULF INTERSTATE ENGINEERING

SPECIFIC CONSTRUCTION SAFETY

TRAINING – TRAINING – TRAINING "SAFETY FIRST"

- **Use proper personal protective equipment (PPE)** - Personal protective equipment includes any apparatus or garment intended to protect you from injury or illness. Eye and hearing protection, safety boots, gloves and hard hats should always be worn on pipeline jobsites. Each construction worker, vendor, supplier and site visitor will be required to undergo a site safety training session before access to the site(s) and comply with the PPE stipulations.



PIPELINE CONSTRUCTION TRAINING

- Site Construction crews will be provided training that includes all aspects and phases of the construction. As the pipeline has a boundary of approximately 1155km, the risk of safety incidents are far greater with the different stages of construction along the route.
- **Open Trench Training** – Thoroughly check subsurface conditions before digging, verifying that all underground utilities are marked and their depths noted. Before beginning work in an excavation, consider the hazards and ensure that a competent person has inspected the trench for proper sloping or benching and the use of protective systems. Secure warning tape/fencing along pedestrian openings

CONSTRUCTION EQUIPMENT TRAINING

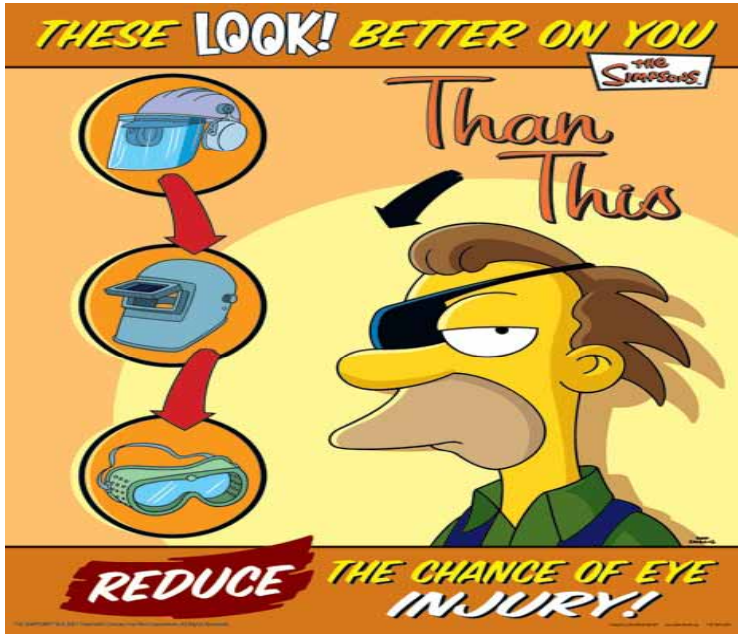
- **Heavy Equipment Training** - Equipment operators must read and understand the Operation and Maintenance Manuals (OMMs) of all equipment they operate on the jobsite. Tests will be given to ensure the operators have a full understanding and skills to operate the heavy equipment. Primarily the operator must ensure that load and reach limitations are obeyed and a spotter is positioned to provide information to the operator of clearance and potential blind spots.

A CLEAN SITE IS A SAFE SITE

- **Construction Laborers Training:** Laborers and helpers are key to maintaining a clean site free of debris and trip hazards. Slips, trips and falls are best avoided with good housekeeping. Keep walkways clear of tools (welding leads, extension cords, etc.) and debris; clean spills immediately; and, make it clear others are expected to do the same.

EYE PROTECTION TRAINING

- **Eye Protection Training** - Eye injuries related to grinding of welds, welding, cutting of materials and contact with chemicals are preventable with both the proper personal protective equipment and safe work practices. Construction personnel will have various eye and face protection available based on the kinds of hazards to be encountered. Each will be instructed to avoid touching their eyes without the thorough washing of their hands first.



LIFTING SAFETY

- **Lifting Training** – On most construction projects, manual labor is used to help set up work stations, moving of miscellaneous equipment and material and lifting of materials/equipment from containers or trucks. All construction personnel, office or field, will be provided training on the positions for proper lifting to avoid back strains that may last long after the project is completed.

HAND TOOL TRAINING

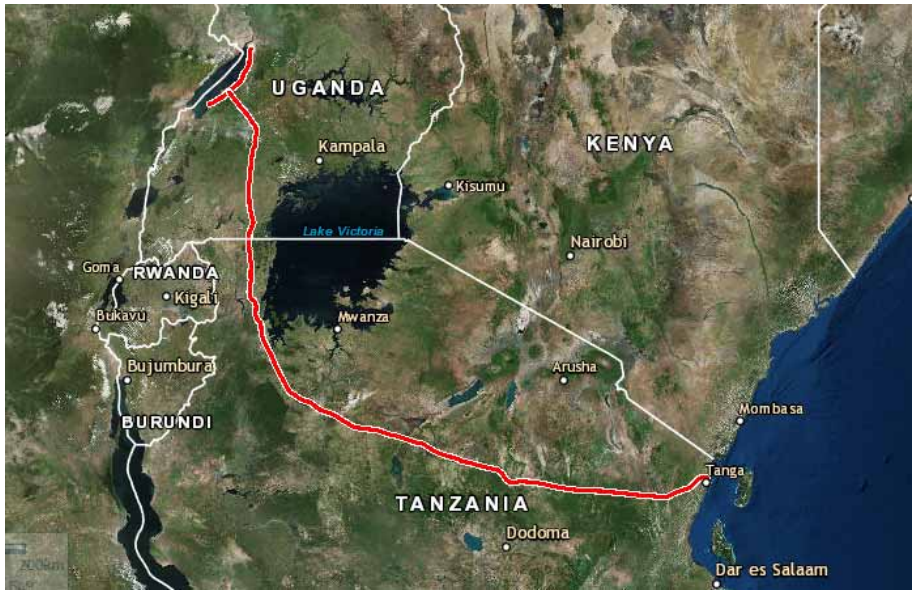
- **Hand and Power Tools Training** - Hand and power tools – from hammers and pipe wrenches to pneumatic, electrical and hydraulic equipment are essential on most construction projects. The training of the proper inspection and use of each type of tool will be provided to specific types of skilled trades personnel before they are allowed to use type of tool. Inspects of all components for cracks, leaks, cuts or excessive wear will be performed by designated individuals prior to and after each tool is used.

SPECIAL TEST TRAINING

- **Testing Procedures** - Special tests will be conducted for pipeline and pump station installations related to pipe pressure tests and HV cables phasing tests. Testing personnel will be trained to inspect all equipment and materials required by the written test procedure, ensuring it is in safe working order and confirm specified rating of the material/equipment limits. The Testing supervisor will ensure the the test area has been cleared of unauthorized personnel.



INTRODUCTION TO GULF INTERSTATE ENGINEERING



GULF INTERSTATE ENGINEERING

WHO IS GULF INTERSTATE ENGINEERING?

- **GULF**, a US based company that was formed in 1953, provides project management, engineering, procurement and construction management services to the worldwide pipeline industry.
- **GULF** focuses on pipelines and has worked on **every major pipeline** project in the world during the **past 20 years**.
- **GULF** has just completed one of the largest and most recent projects on an EPCM basis in the past 5 years:
  - The 825-kilometer, 36”-diameter **Sabal Trail Pipeline**, a **$3.5 billion** pipeline transporting over of 1 billion cubic feet per day of natural gas.
  - The Sabal Trail Pipeline was awarded Platt’s **Construction Project of the Year for 2017**.
- **GULF** has experience with **heated crude oil pipelines** in Africa, South America and with the **longest heat-traced pipeline** in India.

GULF INTERSTATE ENGINEERING

GULF INTERSTATE ENGINEERING EACOP INVOLVEMENT

- **GULF** was selected to assist with the **2015 Conceptual Engineering Study** and **2016 Feasibility Engineering Study** that concluded with the selection of the Uganda-Tanzania EACOP Pipeline Route.
- **GULF** was awarded the **Front-End Engineering Design** contract to advance the preliminary engineering and design for the EACOP project.
- **GULF** is currently competing for the **EPcm Contract** for the next phase of the EACOP project.



EACOP FRONT END ENGINEERING SCOPE & DELIVERABLES

EACOP ESSH OVERVIEW

- The EACOP Project will originate in Kabaale Uganda and be constructed to the Marine Terminal in the Chongoleani peninsula area in Tanzania
- The main 24” insulated and heat traced pipeline construction corridor (Right of Way) is 30m wide, each of the four pump stations located in Tanzania are approximately 300m x 370m in size, with two pressure reduction stations between the last pump station and the Marine Storage Terminal.
- While the physical construction is limited to these specific geographical areas, Environmental, Safety, Societal and Health management will be undertaken inside and outside these boundaries.
- All contracted parties will be expected to focus on the mandatory Tanzania, IFC and project specific ESSH procedures/requirements of the EACOP Project to mitigate the risks to the construction work force, the environment and the Tanzania citizens that will encounter the various aspects/activities of the undertaking.
- Qualified and trained Safety Inspectors will be assigned to each of the construction sites to monitor, report and participate in daily toolbox safety meetings – to keep a focus on SAFETY FIRST!!!!

FRONT-END ENGINEERING – WHAT DOES THIS INVOLVE?

- *A technical engineering and design phase of a project to:*
  - *Identify and apply codes and standards for the specified material, equipment and construction works to be used by the EPcm, epC Contractors and all material and equipment suppliers;*
  - *Advance the feasibility design for the final selection for the pipeline route and locations of the permanent operational facilities and temporary construction camps*;

GULF INTERSTATE ENGINEERING

FRONT-END ENGINEERING – WHAT DOES THIS INVOLVE?

- Investigate the environmental, societal and health related sensitivities of the recommended route and make adjustments to avoid protected areas;

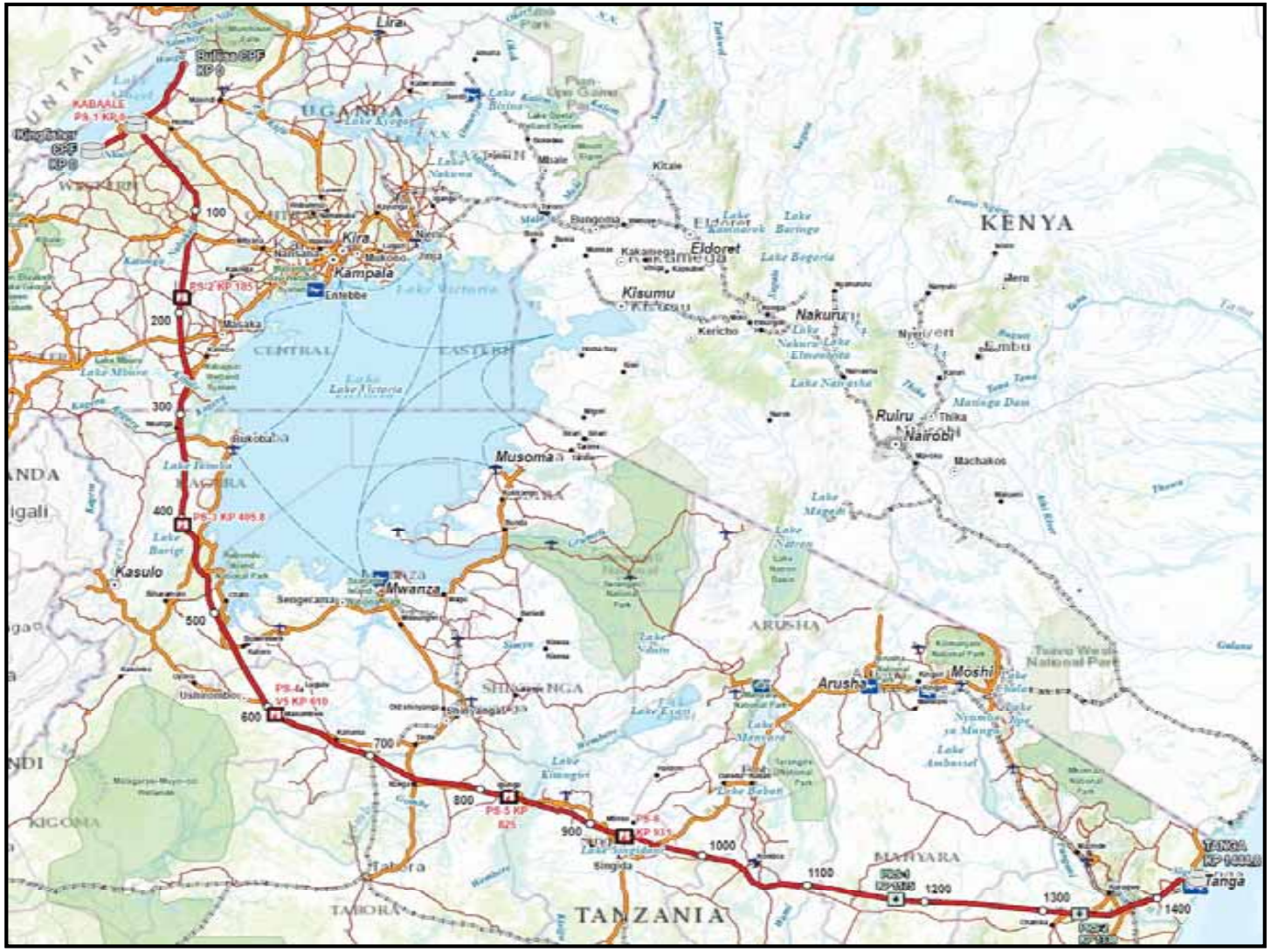
- Generate drawings and specifications to be used for the bidding and award of the various major contracts associated with the EACOP Project.

GULF INTERSTATE ENGINEERING

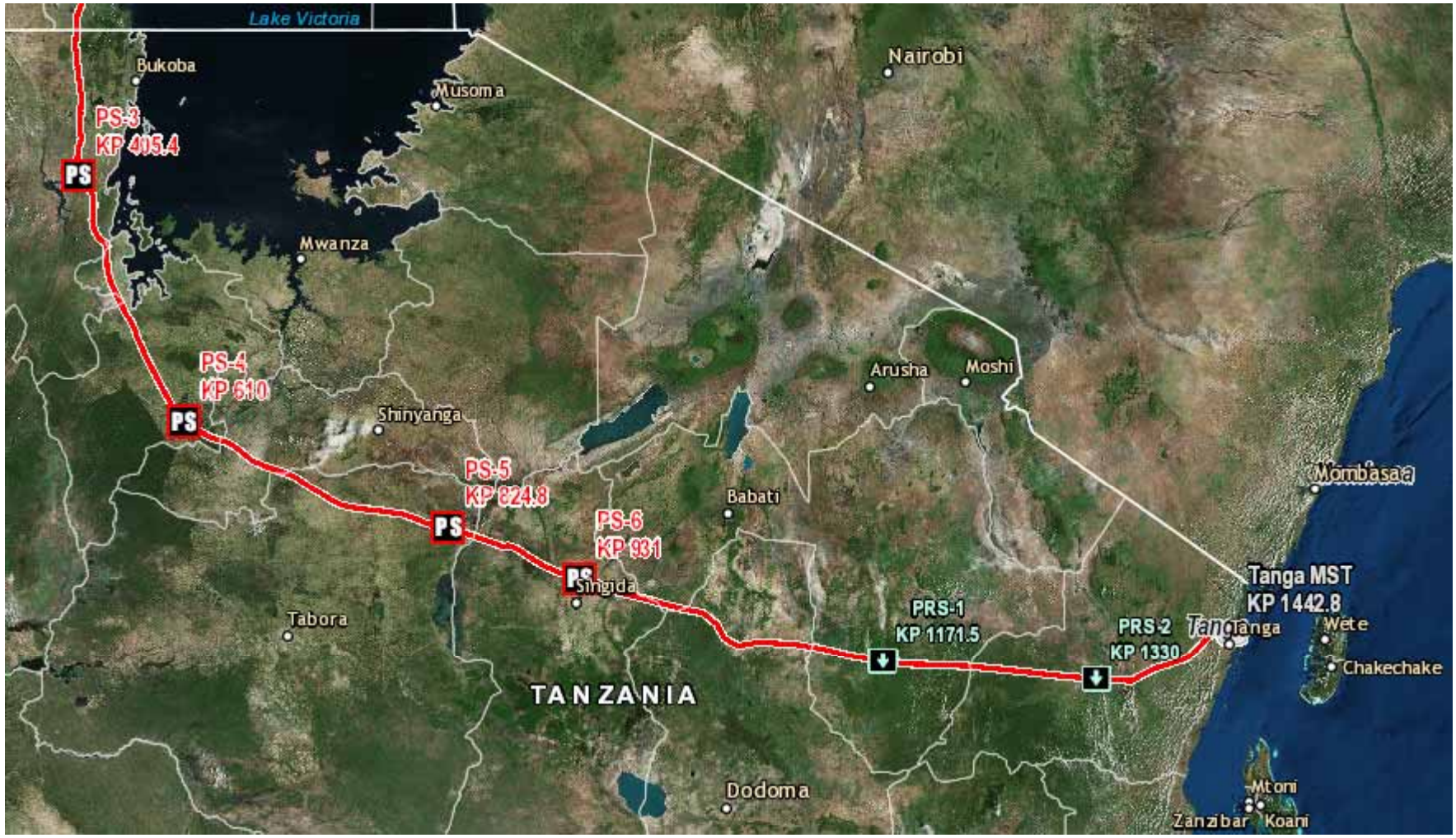
OVERVIEW OF FEED PROCESS

- Sanctioned by the Tanzania Ministry of Energy and Mineral Development with the official launching ceremony in January 2017 in Kampala Uganda
- Advanced the conceptual design and established a recommended route for the EACOP pipeline system that meets environmental, societal, safety, health and economic goals
- Engineered the pipeline system from a “safety first” philosophy with optimum availability and high reliability standards
- Utilized LiDAR generated data and multiple Ground Truthing missions to validate actual site conditions in the Two Lots of the EACOP Tanzania Route
- Focused on the primary execution challenges to be anticipated during the implementation related to transport of material, equipment and construction contractors
- Identified opportunities related to National Content involvement for qualified Tanzanian service providers

TECHNICAL DESCRIPTIONS EACOP PROJECT



EACOP TANZANIA ROUTE – UGANDA TO TANGA MST

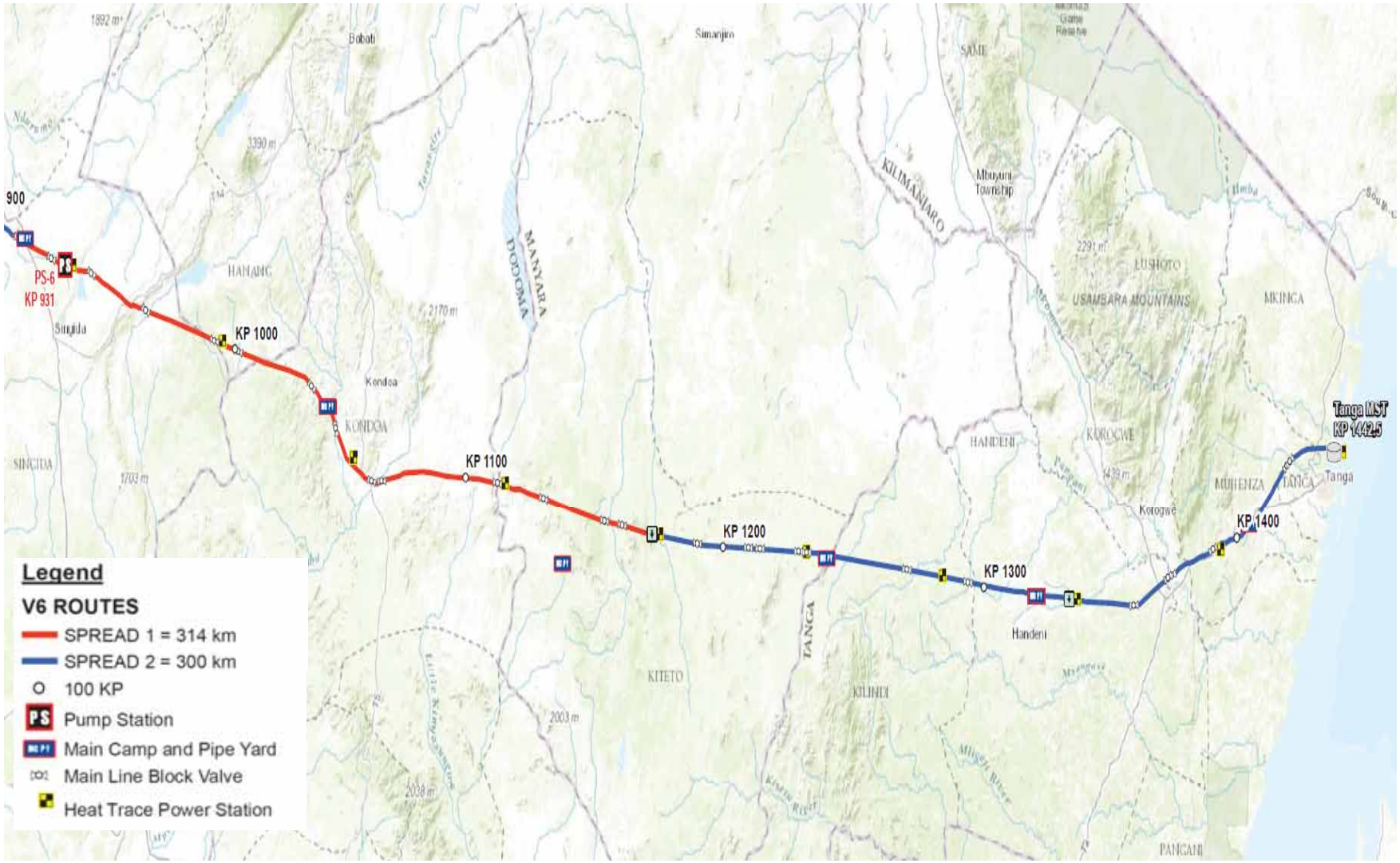


EACOP – VIEW OF ROADS DAR ES SALAAMTO TANGA

GULF INTERSTATE ENGINEERING

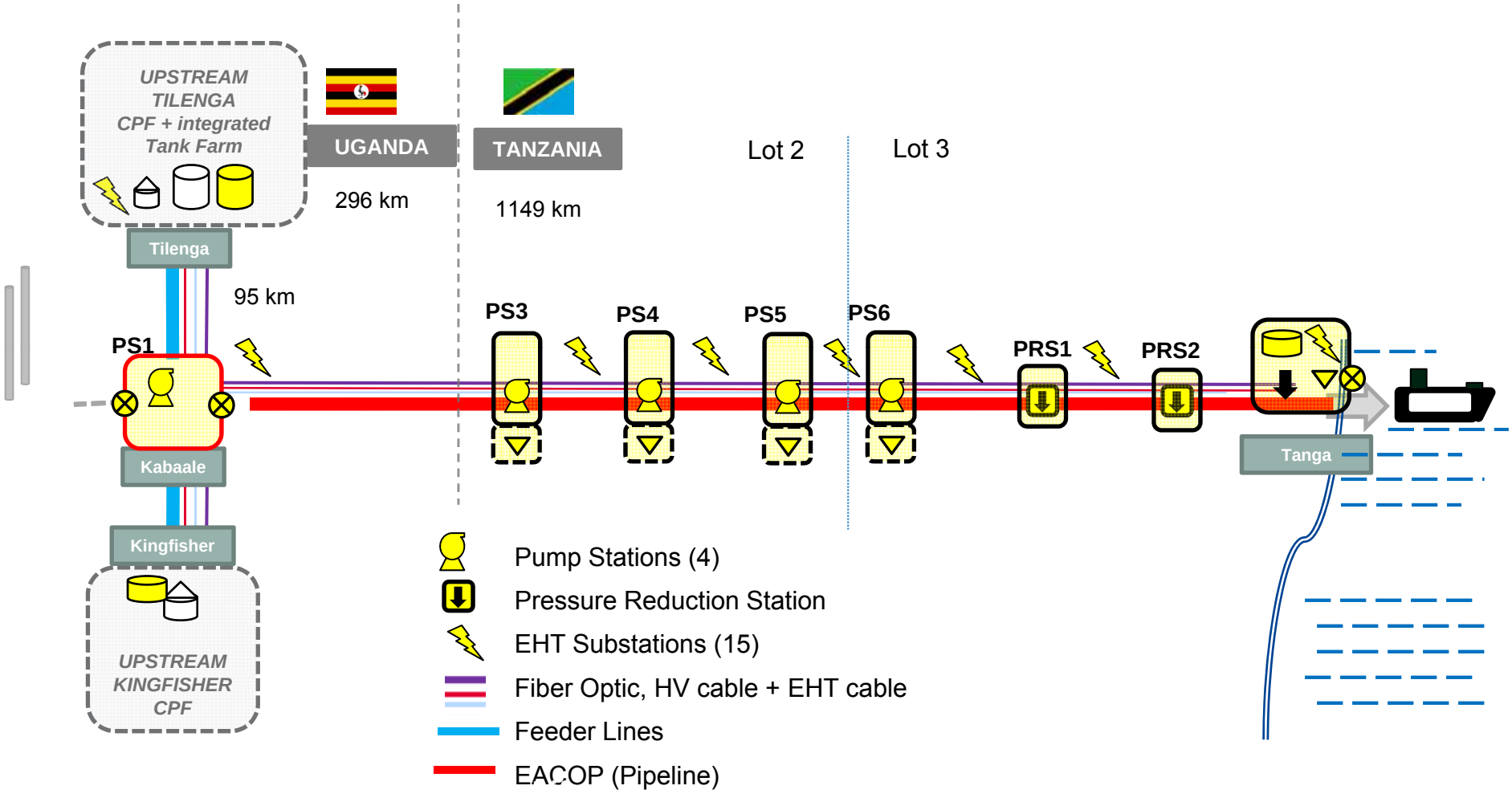
EACOP LOT 2– 614KM

EACOP LOT3 – 533KM



GULF INTERSTATE ENGINEERING

EACOP TANZANIA SCHEMATIC OVERVIEW



216 kbopd Design rate
Hot Export Concept ***(temperature maintained at 50°C)***

TECHNICAL ATTRIBUTES OF TANZANIA EACOP

- Tanzania Pipeline Segment – Uganda Border to Chongoleani peninsula in Tanzania Marine Storage Terminal
  - 1155 KM of 24” pipe = 96,250 joints : 177,627 Tons
  - Divided into two Lots: Lot 2 = 614 km Lot 3 = 533 km
  - 60 main line block valves for sectional isolation
  - 62.8 KM of Temporary Access Roads
  - 33.7 KM of Permanent Access Roads w/existing roads upgrades
  - Ten (10) Temporary Pipeline Construction Camps
  - 939 KM of 33 kV Power Cabling for Heat Trace power input
  - 1155 km of fiber optic cabling
  - 3465 KM of 6.6 kV single phase EHT Cabling

TECHNICAL ATTRIBUTES OF TANZANIA EACOP

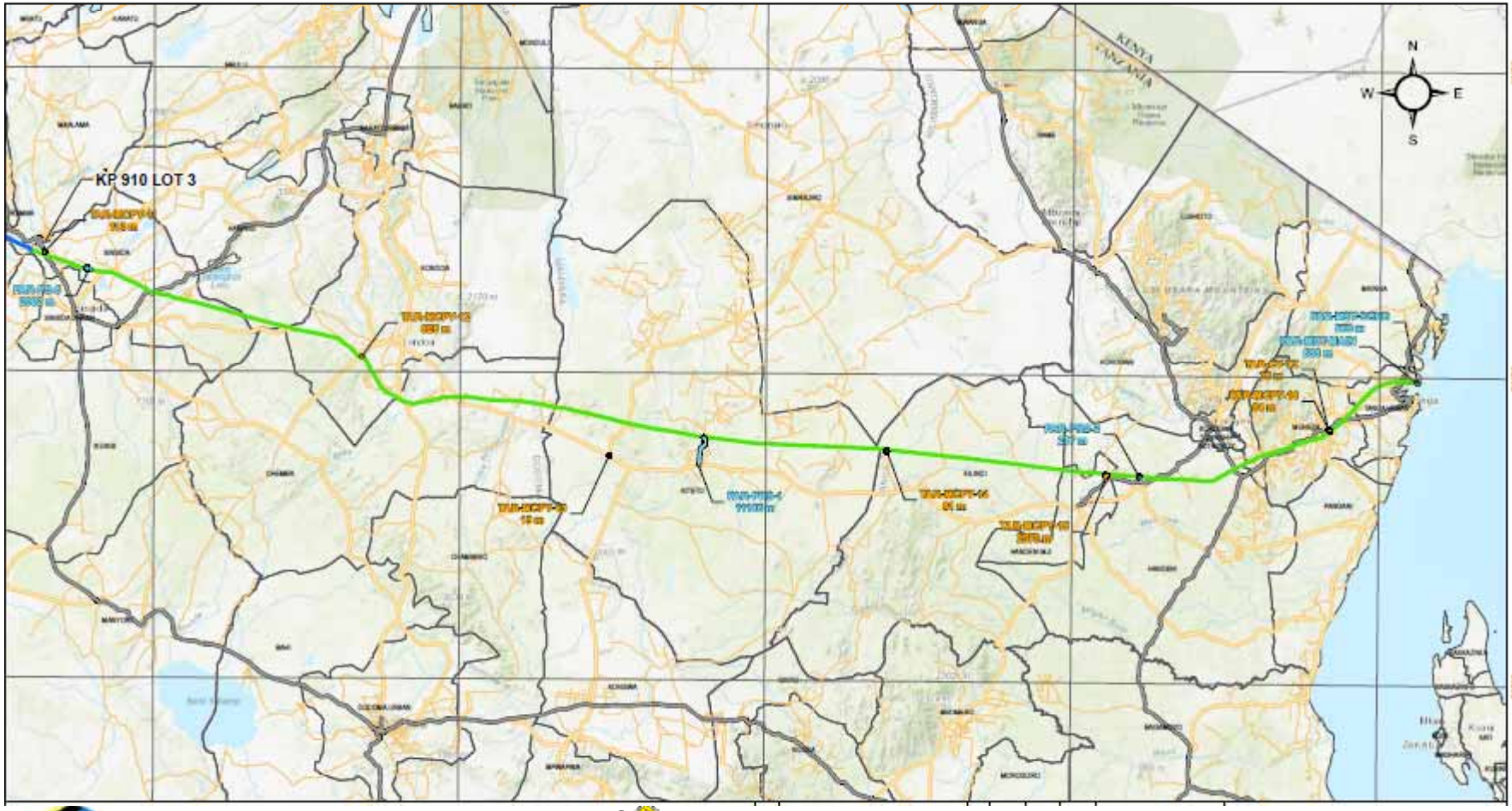
- Tanzania Pipeline Facilities
  - 4 Crude Oil Pump Stations with capability of 216 kbopd
  - 2 Pressure Reduction Stations
  - Four (4) Temporary Construction Camps at Pump Stations
  - One Temporary Construction Camp at the Marine Terminal
  - Fifteen (15) Pre-Fabricated Engineered Electrical Heat Trace Substations
  - Integrated SCADA/ICS system with redundant control functions at Tilenga and MST via fiber optic cabling & telecommunications
  - 5 x 500k barrel crude oil storage tanks
  - Marine Terminal with capability of exporting 1,000,000 barrel in 24 hours export to SUEZMAX class tanker
  - 2 KM Offshore Jetty & Crude Oil Load-Out Platform

ACCESS ROAD REQUIREMENTS LOT 2

- The map below indicates the temporary (for camps) and permanent (for AGI's) that will be part of the Early Civil Works (ECW).

ACCESS ROAD REQUIREMENTS LOT 3

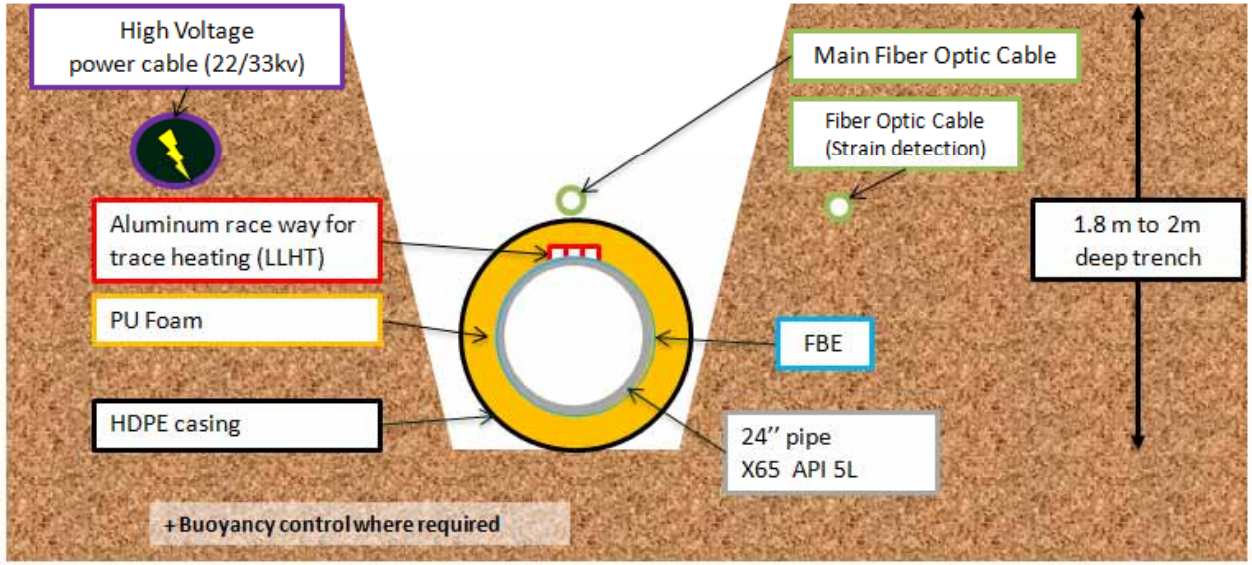
- Temporary and Permanent Access Roads to camps and AGI's will be part of Lot 3 ECW.



GULF INTERSTATE ENGINEERING

PIPELINE CHARACTERISTICS

- Pipeline will be insulated with 70mm of Polyurethane foam (PUF) material for heat retention
- The pipeline will have a heating system designed to maintain the temperature of the waxy crude oil above 50^{o} C so that the wax remains in solution.
- The heating system consists of Electrical Heat Trace (EHT) cables powered through a buried High Voltage cable (33 kV) that feeds EHT substations and Mainline Valve sites along the route. The EHT cables (6.6 kV) provide up to 30 W/m of heat.

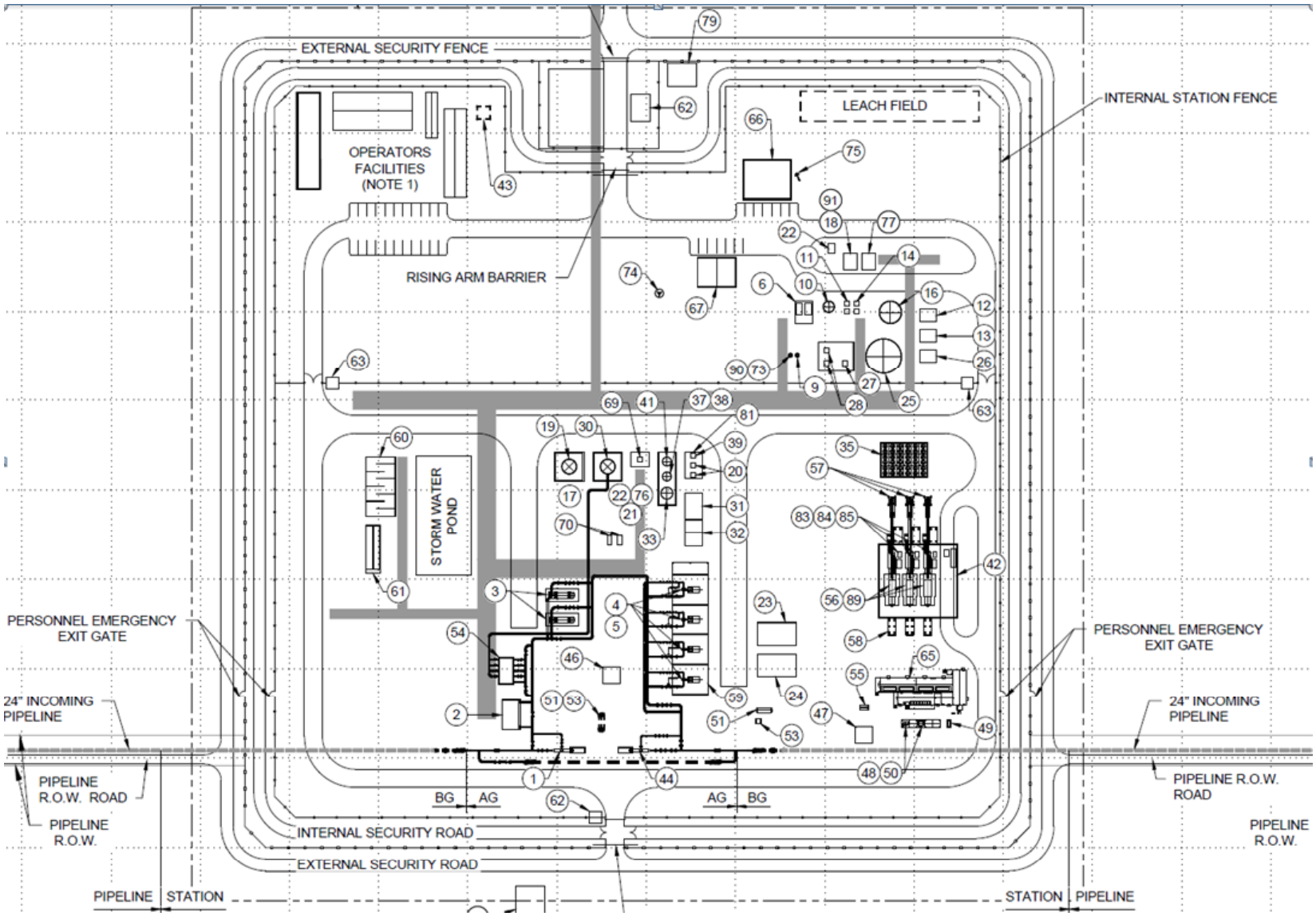


EACOP TANZANIA ROUTE CHARACTERISTICS

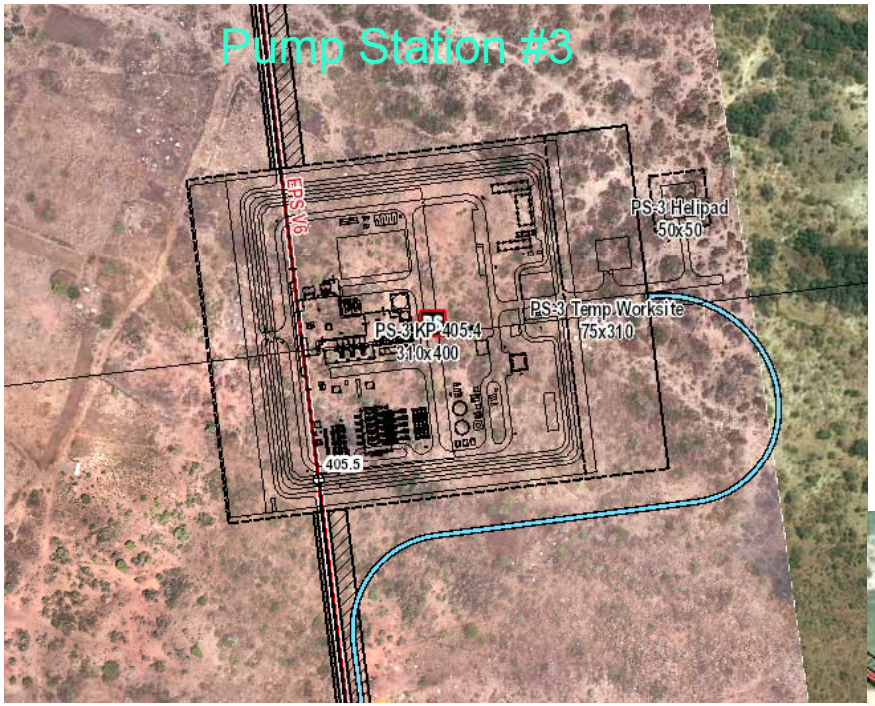
- Along the Tanzania route portion, the EACOP Pipeline will encounter approximately 600 crossing, per the table below, and reaches a maximum elevation of 1738 m above sea level when crossing the East Africa Rift zone.

TYPE OF CROSSING	#	Length (M)
Air Strip	1	12
Borrow Pit	1	10
Dirt Track	273	13,008
Ditch	20	1,228
Murram Road	108	18,337
Powerline	25	4,520
Railway	1	145
River Perennial	2	71
River Seasonal	2	1,498
Stream Perennial	7	2,050
Stream Seasonal	84	20,862
Tarmac Road	6	166
Waterbodies	5	58
Wetland Farmed	27	416
Wetland Permanent	6	68
Wetland Temporary	33	1,869
TOTAL CROSSINGS	**601**	**64,318**

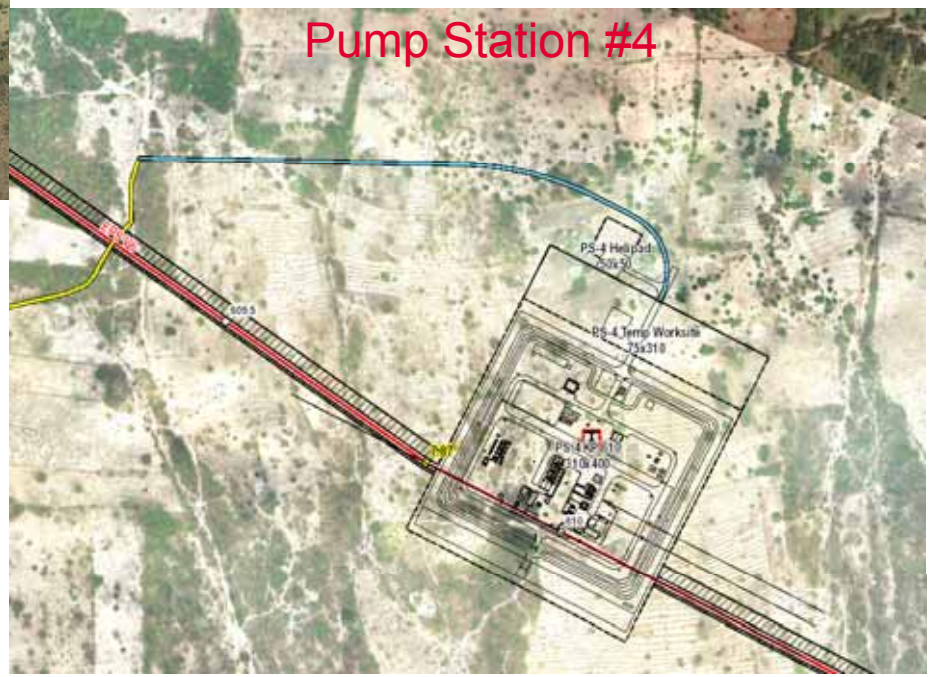
PUMP STATIONS 3-6 LAYOUT



GIS VIEW OF PUMP STATION 3 & 4

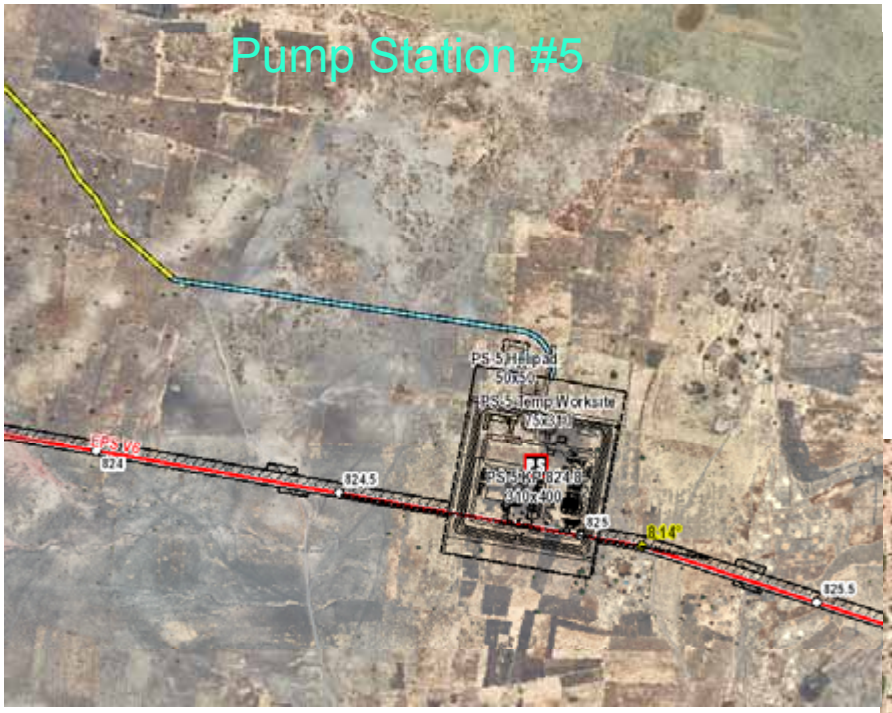


Pump Station #3 is approximately 105km from the Uganda Border and requires the 7km access road be built adjacent to the Pipeline ROW.

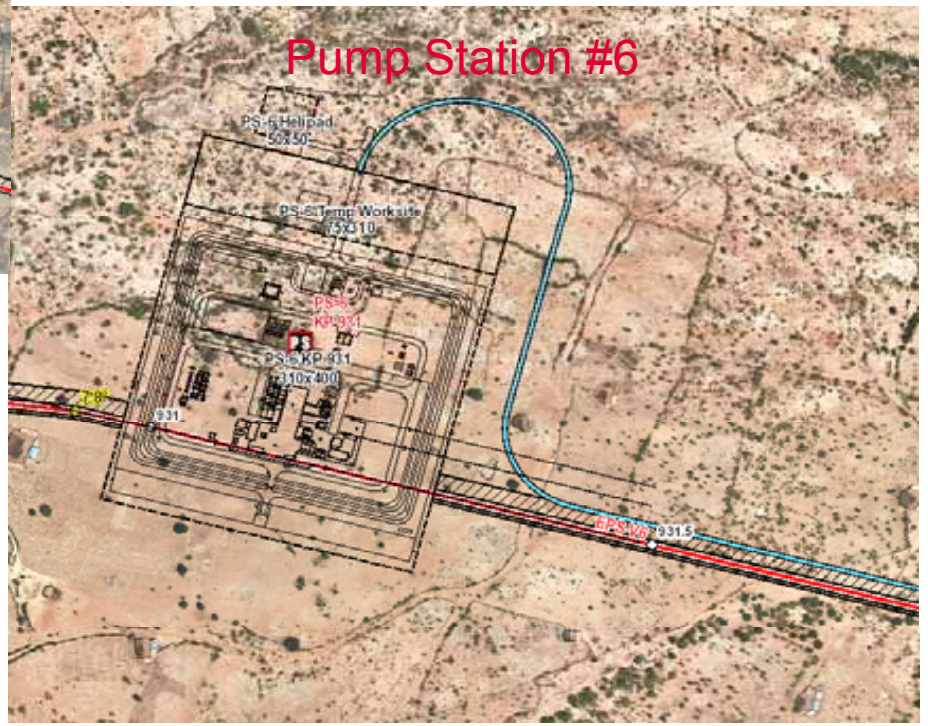


Pump Station #4 is 205km from PS#3 and 214km from PS#5. Hydraulic spacing is due to gradual elevation descent of 143m over the 419km distance

GIS VIEW OF PUMP STATION 5 & 6



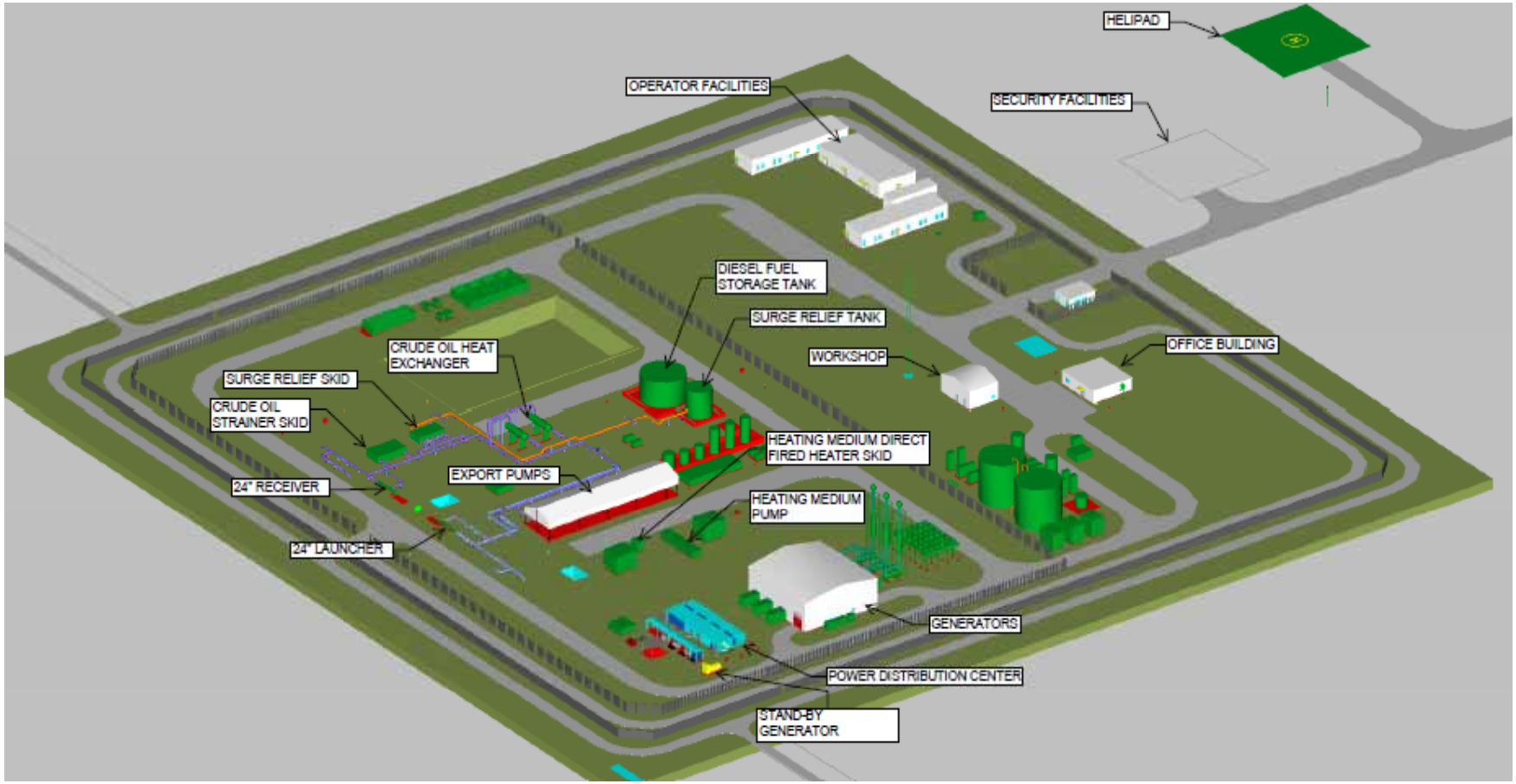
Pump Station #5 elevation is the lowest of all four stations, with an elevation ascent of 454m before reaching PS#6. The permanent access road of approximately 800m is also the shortest of the all Tanzania facilities.



Pump Station #6 is located at the highest elevation (1527m) of all facilities and is approximately 24km west of the East Africa Rift with an elevation ascent of 210m. Gaining access will require a 2km permanent access road from a 7km existing road that will require minor upgrades.

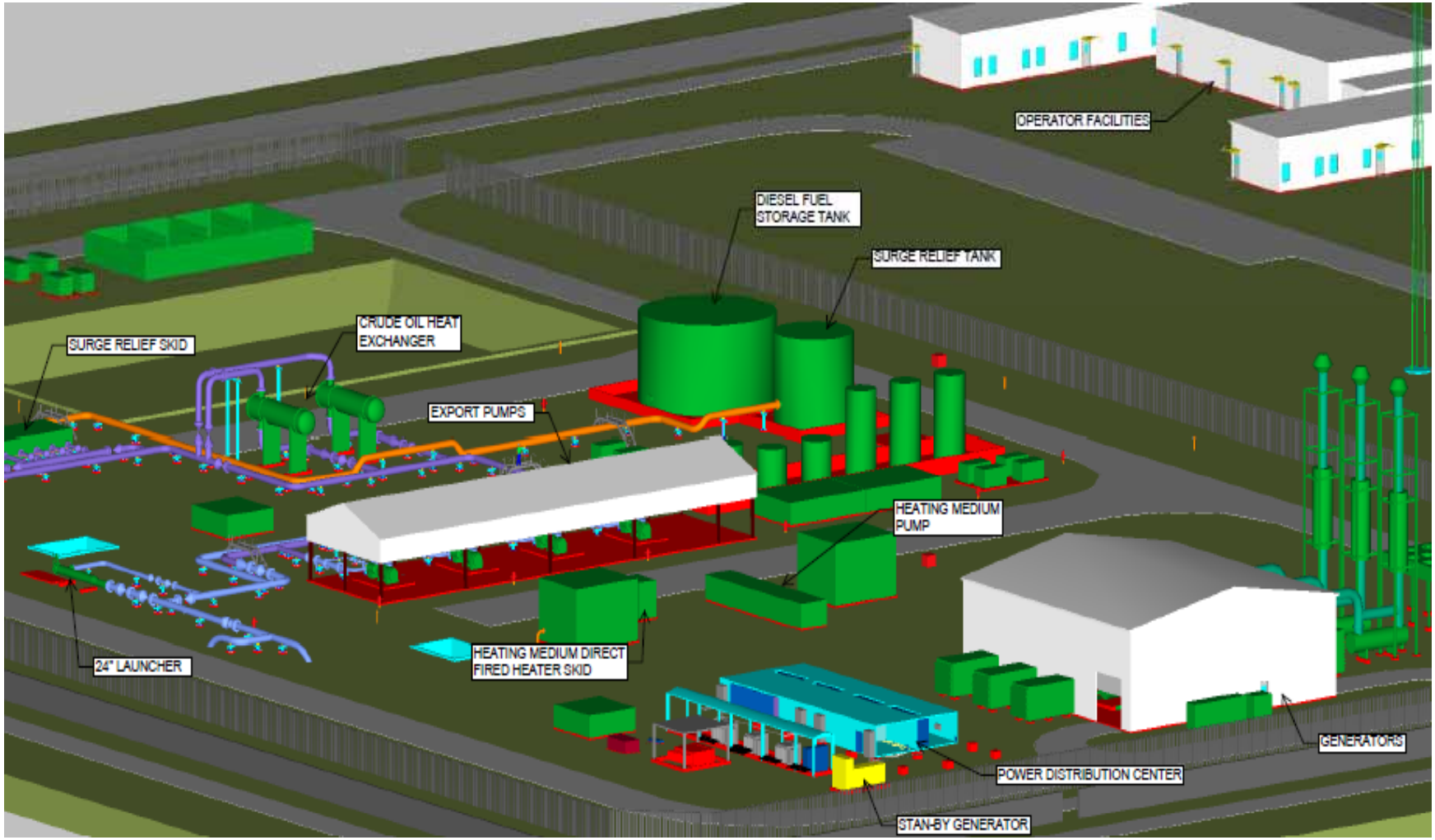
GULF INTERSTATE ENGINEERING

PUMP STATIONS 3-6 PLOT 3D MODEL VIEW

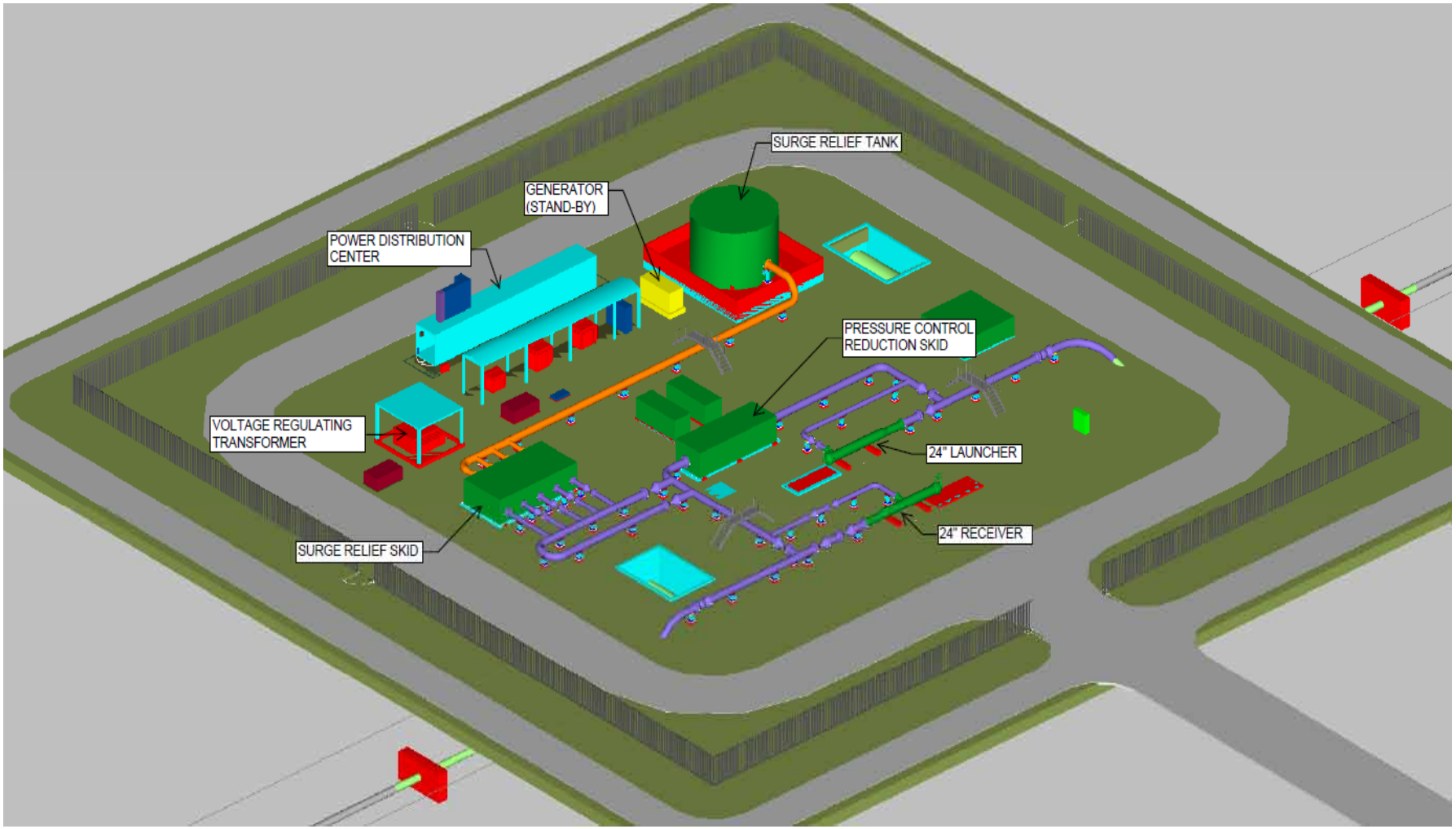


Each Pump Station is self-contained with its own power generation.

PUMP STATIONS 3-6 3D MODEL VIEW

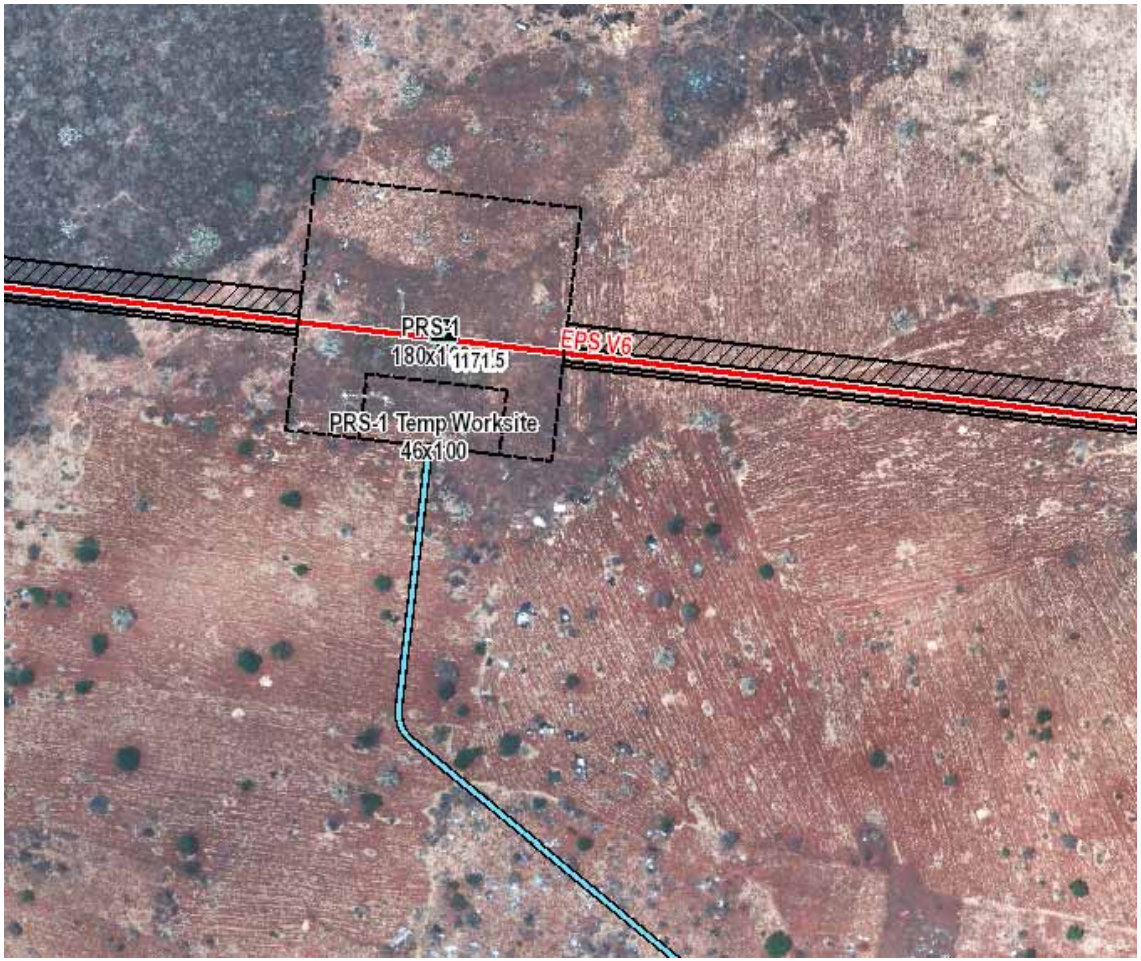


PRESSURE REDUCTION STATIONS 1 & 2 3D LAYOUT



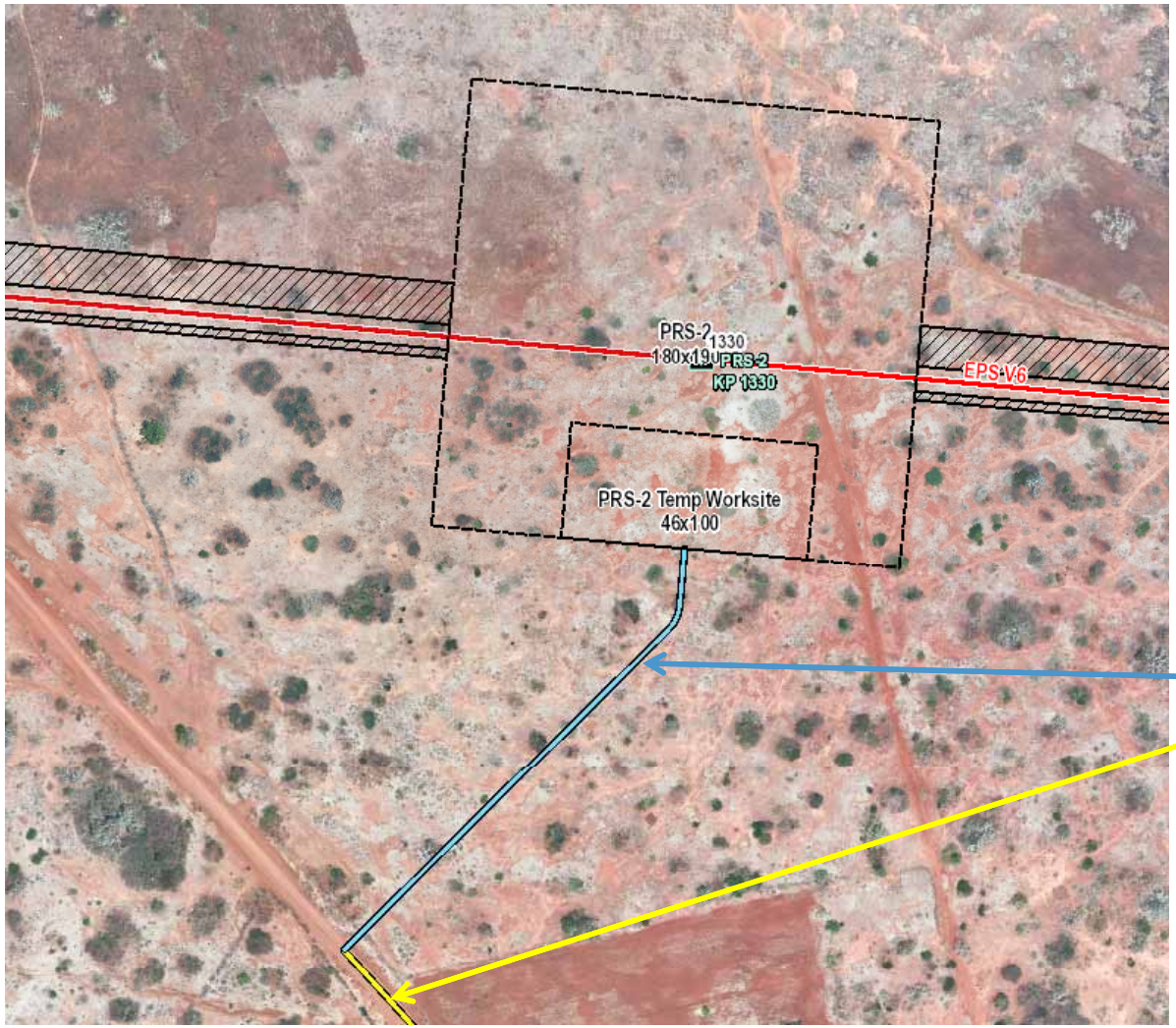
This type of facility controls increased pressure within MAOP limits during descent to MST

GIS VIEW OF PRESSURE REDUCTION STATION #1



Elevation is 1094 m above sea level – 644 m descent from PS#6 in 214km

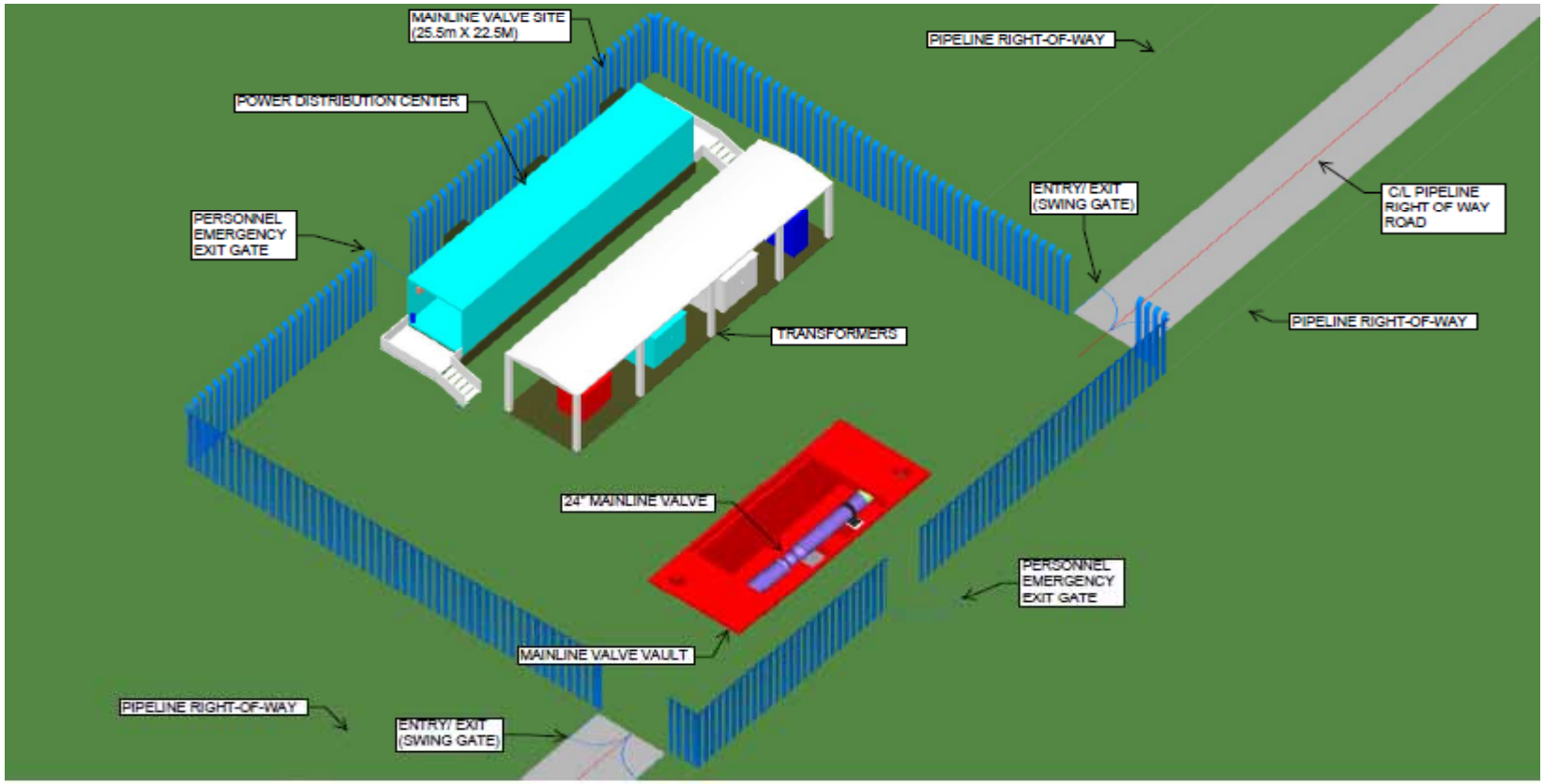
GIS VIEW OF PRESSURE REDUCTION STATION #2



Located 501 m above sea level – 455 m descent since PRS1 and only 118 km from Marine Terminal

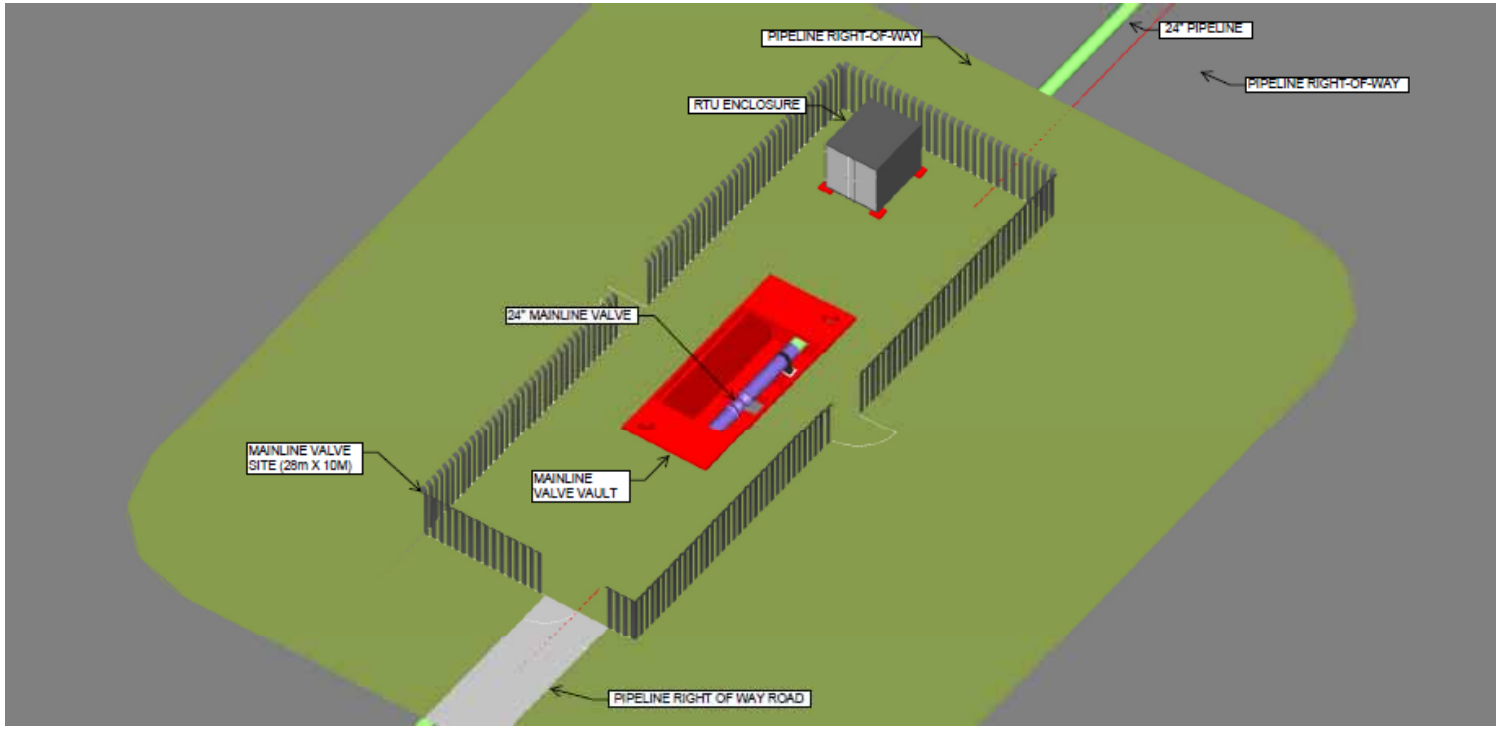
Note the new permanent (blue) access road from existing (yellow) upgrade

ELECTRICAL HEAT TRACE SUBSTATION 3D MODEL VIEW



- *Each of the fifteen (15) Electrical Heat Trace Substations are required to provide power input to the heat trace cables on the pipeline.*
- *Power distribution centers to be pre-fabricated*

MAIN LINE BLOCK VALVES



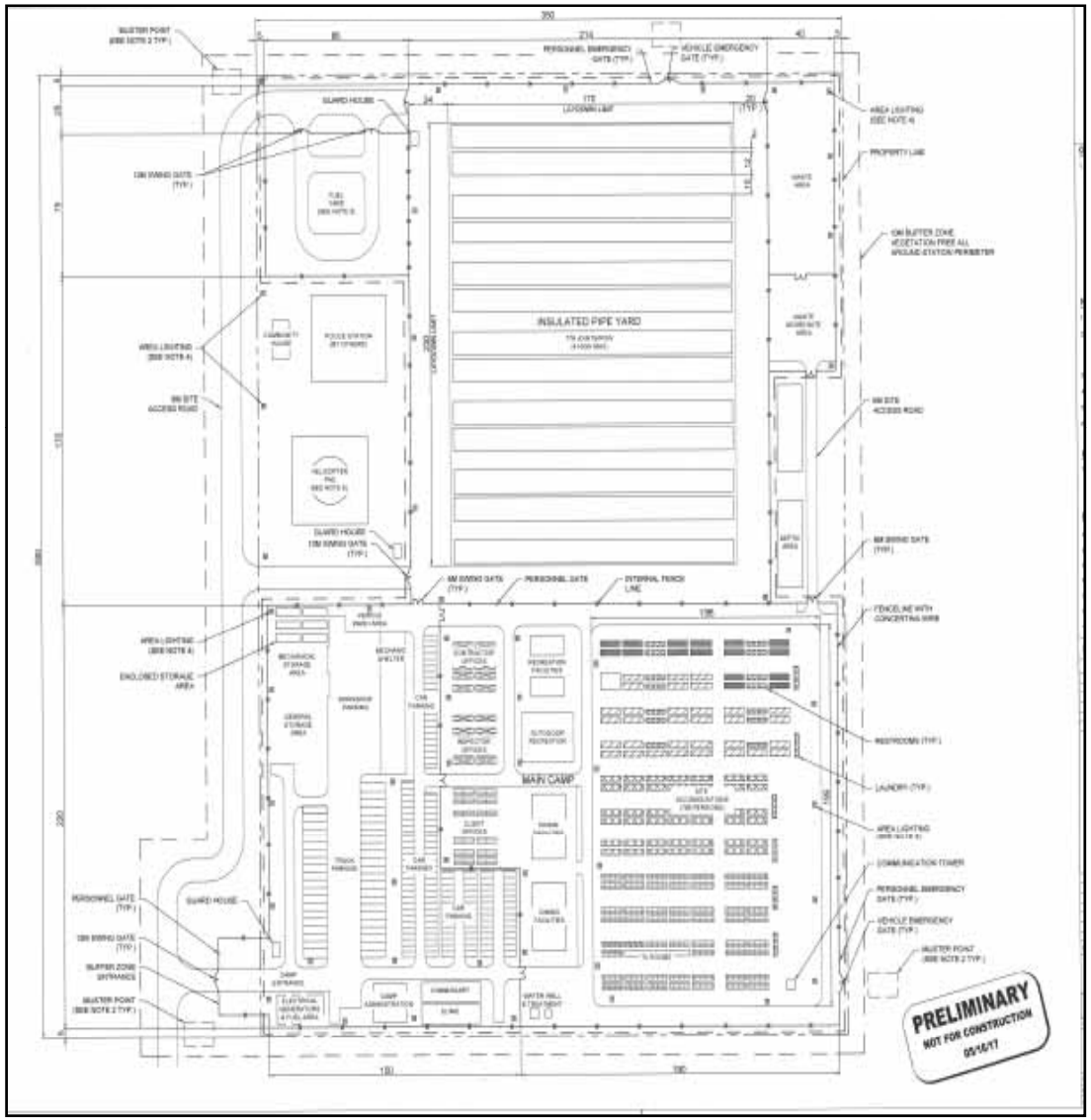
- *Main Line Block Valves (MLBV) are specialty fabricated items that are electronically activated and used to isolate pipeline sections*
- *MLBV's will be vaulted underground with fencing & pre-fabricated RTU cabinet for remote control operations (open/close)*
- *Tanzania will have 60 MLBV's to be installed by the epC Pipeline Contractor*

VIEW OF CONSTRUCTION CAMP/PIPE YARDS

- *Construction & Pipe Yard Camp #7 - Typical*
  - ✓ *Clearing & Leveling Will be part of Early Civil Works*
  - ✓ *350m x 500m grading/backfill = 132,000 cm*
  - ✓ *Most located near existing roadways*
  - ✓ *24 hours per day 7 days per week security*
  - ✓ *Site restored after project completion*

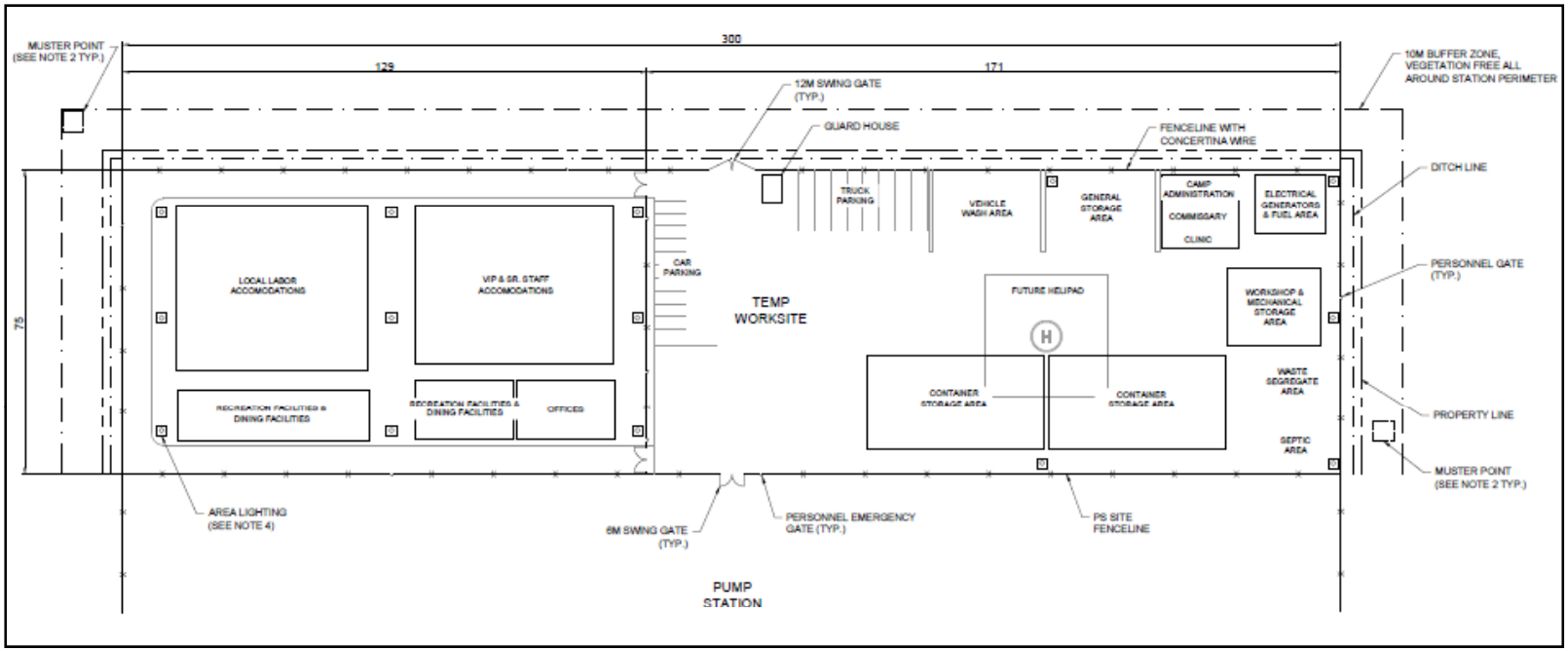
- Preparation for Pipeline Construction Camps
  - Create Temporary Access Roads
  - Drill Temporary Water Wells
  - Grade and backfill sites plus establish storm water runoff retention areas
  - Segregate areas for storage, maintenance, tools/consumable warehouses, housing and fuel storage, waste treatment and pipe storage/berms

PIPELINE CONSTRUCTION CAMP LAYOUT



- Camps:
  - Accommodates up to 1,000
  - Self contained power generation & water treatment
  - Areas designated for housing, recreation & medical
  - Canteens include dietary restriction foods
  - Offices for Contractor, EPcm and TEAM employees
  - Consumption of over 6000 liters per day of potable water
  - Warehouse for small tools, equipment, maintenance, consumables & PPE
  - Provides fabrication shops
  - Daily transports of workers to pipeline construction sites
  - Training & education centers for skill trades and testing centers
  - Daily food & fresh produce supply opportunity for local content

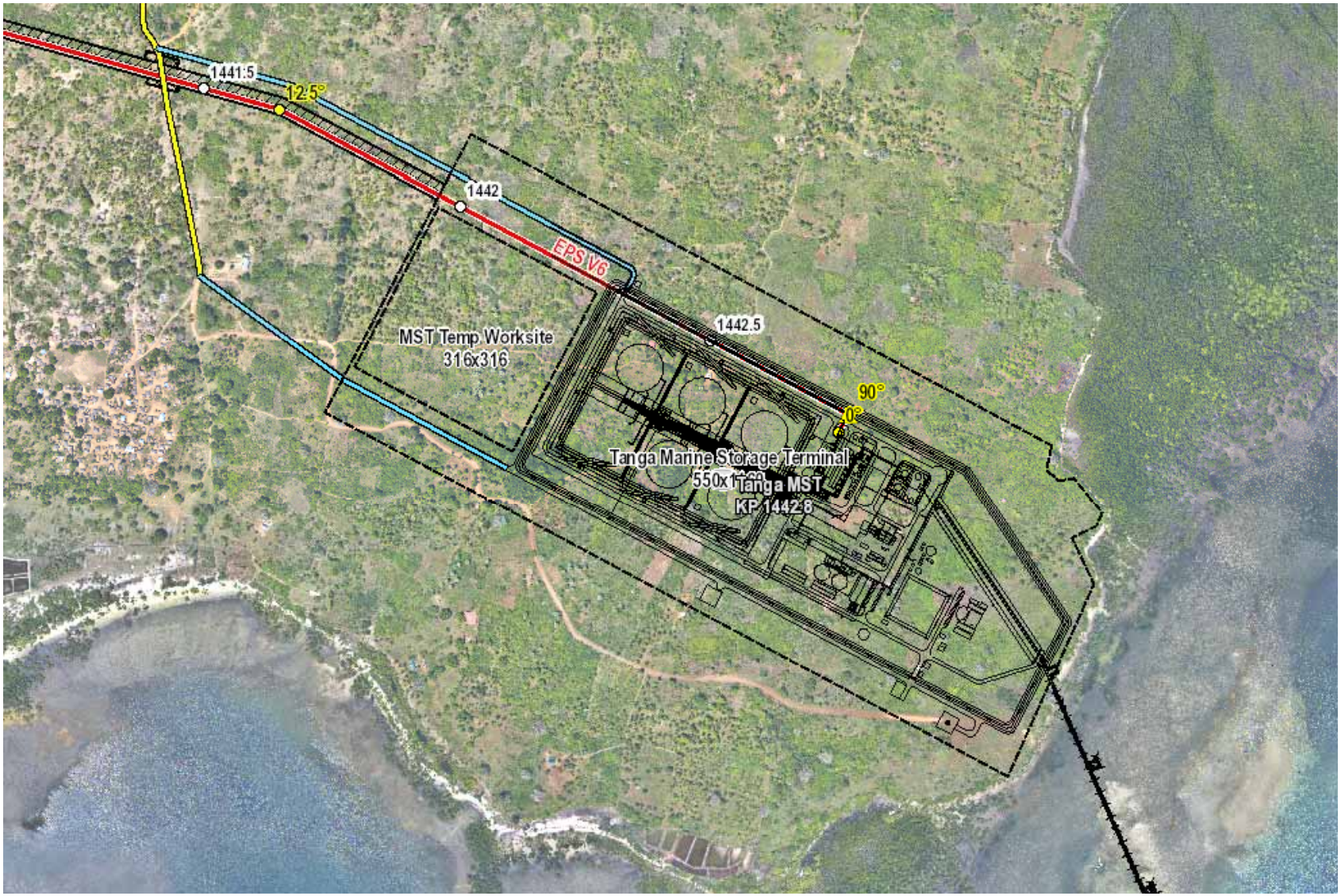
PUMP STATIONS 3,4,5 & 6 CONSTRUCTION CAMPS



- *Intended to accommodate up to 150 personnel*
- *Identical attributes as Pipeline Camps but scaled back due to phased construction and less material to stage*
- *Pump Stations 3 thru 6 will have permanent roads built*
  - *Roads will be part of Early Civil Works*

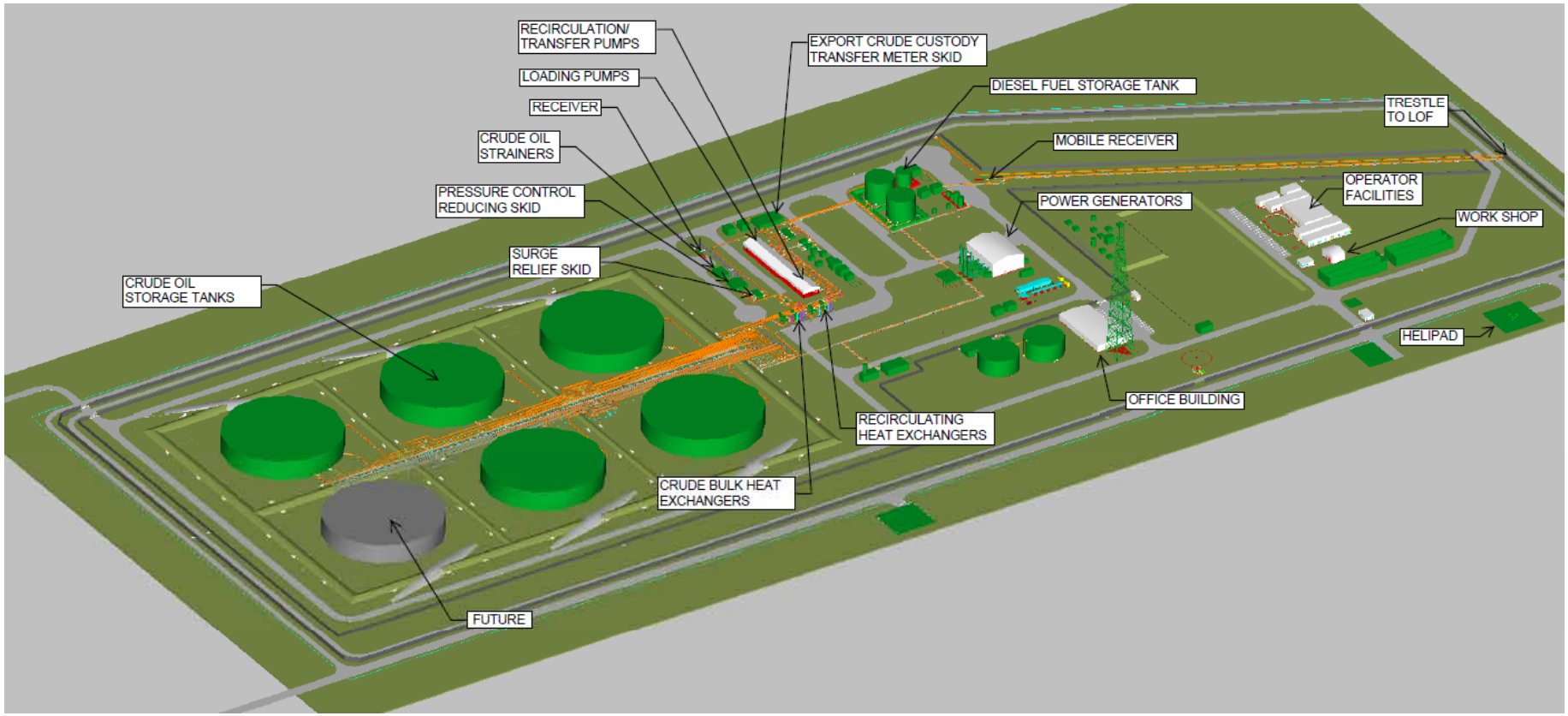
GULF INTERSTATE ENGINEERING

GIS VIEW OF MARINE STORAGE TERMINAL



GULF INTERSTATE ENGINEERING

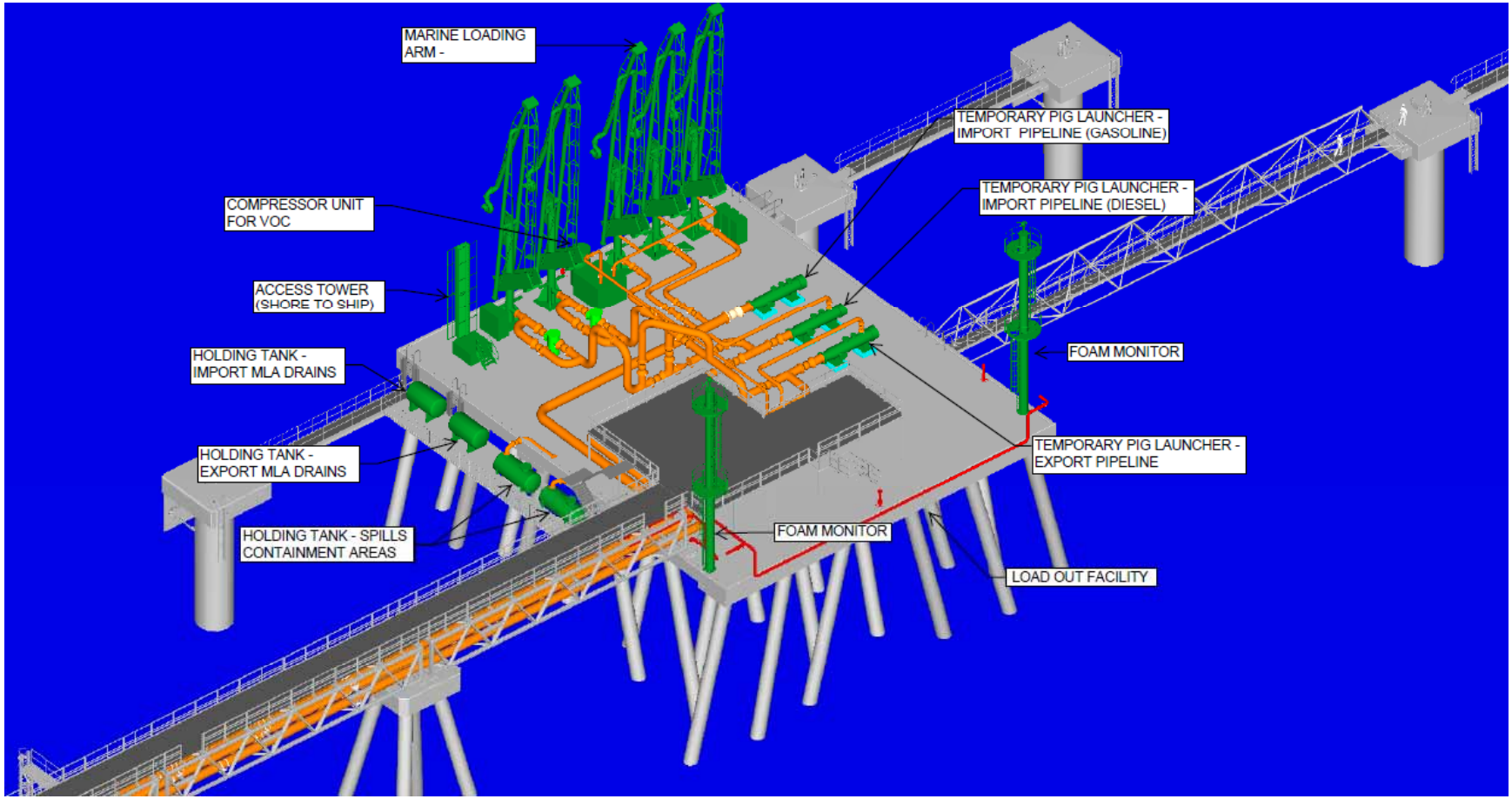
MARINE TERMINAL 3D LAYOUT VIEW



The Marine Storage Terminal is also self contained with power generation with additional area for future 500k barrel tank.

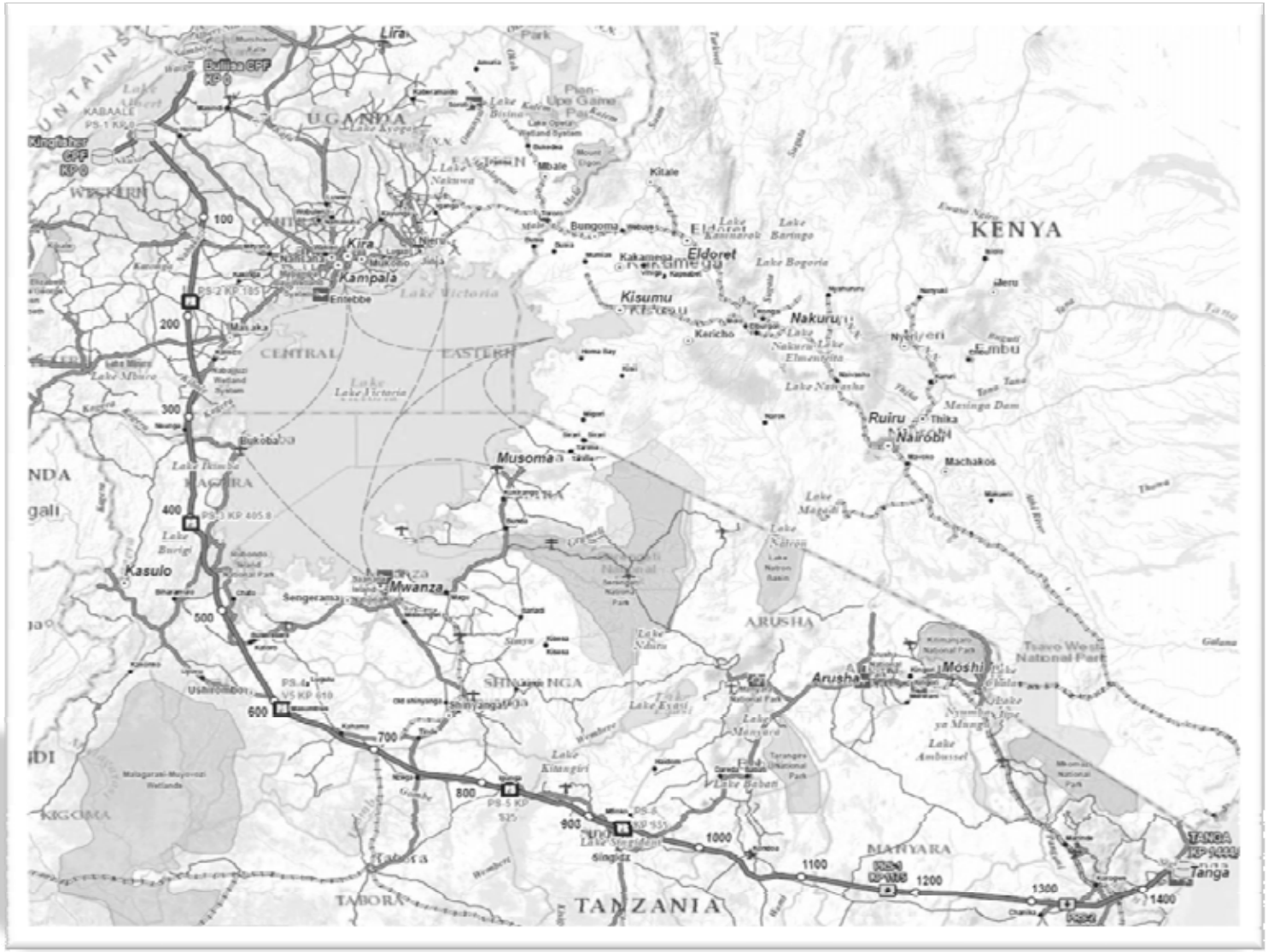
RENDERING OF JETTY & LOAD-OUT PLATFORM

3D MODEL VIEW OF LOAD-OUT PLATFORM EQUIPMENT



OCEAN VIEW TO MARINE TERMINAL

CODES AND STANDARDS REQUIREMENTS FOR THE EACOP MATERIAL, SERVICES AND CONSTRUCTION



GULF INTERSTATE ENGINEERING

CODES AND STANDARDS REQUIREMENTS;

TANZANIA STATUTORY REQUIREMENTS

Tanzania 1 - Environmental Management Act 2004
Tanzania 2 - National Health Policy 2003
Tanzania 3 - Occupational Health and Safety Act N°5 of 2003
Tanzania 4 - Public Health Act N°1 of 2009
Tanzania 5 - Surface and Marine Transport Regulatory Act N°9 of 2001
Tanzania 6 - Road Traffic Regulations 2001
Tanzania 7 - Ports Act N°17 of 2004
Tanzania 8 - Ship and Port Facility Security Regulations 2004
Tanzania 9 - Road Act N°13 of 2007
Tanzania 10 - Port Terminal Operators Regulations 2011
Tanzania 11 - Petroleum Act 2015
Tanzania 12 - Marine Parks and Reserves Act 1994
Tanzania 13 - National Environment Policy 1997
Tanzania 14 - Plant Protection Act N°13 of 1997
Tanzania 15 - National Forest Policy 1998
Tanzania 16 - Forest Act N°7 of 2002
Tanzania 17 - Industrial and Consumer Chemicals Act 2003
Tanzania 18 - Environmental Management Act N°20 of 2004
Tanzania 19 - EIA and Audit Regulations N°349 of 2005
Tanzania 20 - Air Quality Standards Regulations 2007
Tanzania 21 - Noise and Vibration regulations 2011
Tanzania 22 - Soil Quality Standards Regulations 2007
Tanzania 23 - National Land Policy, 1997
Tanzania 24 - Land Regulations 2001
Tanzania 25 - Land Act 2004
Tanzania 26 - Water Works Regulation N°371 of 1997
Tanzania 27 - National Water Policy 2002
Tanzania 28 - Water Quality Standards Regulations 2007
Tanzania 29 - Guidelines for Management of Hazardous Waste 2013
Tanzania 30 - Solid Waste Management Regulations 2009
Tanzania 31 – 2017 Local Content Policy of Tanzania for Oil and Gas Industry

IFC PRINCIPLES

IFC 1 - Policy on Environmental and Social Sustainability - 2012
IFC 2 - EHS General Guidelines - 2007
IFC 3 - EHS Guidelines for Onshore Oil and Gas Development - 2007
IFC 4 - EHS Guidelines for Crude Oil and Petroleum Product Terminals - 2007
IFC 5 - EHS Guidelines for Themal Power Plant - 2008
IFC 6 - EHS Guidelines for Ports, Harbors and Terminals - 2007
IFC 7 - EHS Guidelines for Waste Management Facilities - 2007
IFC 8 - Workers Accommodation Processes and Standards - 2009
IFC 9 - Guidelines for Performance Standards - 2012

CODES AND STANDARDS REQUIREMENTS;

- International codes and standards related to equipment, material and construction, consisting of:

Standard	Title
American Petroleum Institute	
API 560	Fired Heaters
API 610	Centrifugal Pumps
API 650	Welded Tanks for Oil Storage
API 660	Shell and Tube Heat Exchangers
API 1104	Welding Pipelines and Related Facilities
API 6D	Pipeline Valves
API RP5L	Recommended Practice for Railroad Transportation of Line Pipe
API MPMS CH. 6.6	Metering Assemblies: Pipeline Metering Systems
American Society of Mechanical Engineers	
ASME B16.5	Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch
ASME B16.9	Factory Made Wrought Buttwelding Fittings
ASME B16.20	Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-Wound, and Jacketed
ASME B16.34	Valves Flanged, Threaded and Welding End
ASME B16.49	Factory-Made, Wrought Steel, Buttwelding Induction Bends for Transportation and Distribution Systems
ASME B31.3	Process Piping
ASME B31.4	Pipeline Transportation Systems for Liquids and Slurries
ASME BPVC	Boiler & Pressure Vessel Code
ASTM A370	Standard Test Methods and Definitions for Mechanical Testing of Steel Products

Standard	Title
American Welding Society	
AWS D1.1 & 1.8	Structural Welding Code - Steel & Seismic Supplement
AWS A5	Carbon Steel Electrodes for Shielded Metal Arc Welding
British Standards Engineering	
BS EN 1337	Structural Bearings. Elastomeric Bearings
BS EN 1990	Basis of Structural Design
International Electrotechnical Commission	
IEC 60034	Rotating Electrical Machines
IEC 62271	High-Voltage Switchgear and Controlgear
IEC 61800	Adjustable Speed Electrical Power Drive Systems
IEC 60794	Optical Fibre Cables
International Organization for Standardization	
ISO 10816	Mechanical Vibration
ISO 8528	Reciprocating Internal Combustion Engine Driven Alternating Current Generating Sets
International Society of Automation	
ISA 5.4	Instrument Loop Diagrams
ISA 20	Instrument Specification
NFPA 37	**National Fire Protection Association -** Installation and Use of Stationary Combustion Engines and Gas Turbines
PRC1-PR-227-9424	Installation of Pipelines by Horizontal Directional Drilling
MSS SP-75	High-Test Wrought Butt Welding Fittings
CSA Z245.22-14	**Canadian Standards -** Plant-Applied External Coatings for Steel Pipe
DNV – OS-C201	**Det Norske Veritas -** Structural Design of Offshore Units (WSD Method)

Pipe, valves and fittings must have mill certificates for verification of compliance to metal and ratings.

CODES AND STANDARDS REQUIREMENTS

Major Equipment & Materials	Primary Codes & Standards
Line Pipe	API RP 5L
Piping, Fittings, Flanges, and Valves	ASME B16.5, B16.20, B16.34, B31.3, B31.4, API STD 1104 Section 4.2.2.1.
Pig Receivers and Launchers: 24" X 30”	ASME B31.3, BPV Code Section VIII, Division 1
Export Crude Custody Transfer Meter	API MPMS Ch. 6.6, ISO 5168, ASTM A370 metal tensile test
Crude Oil Bulk Heat Exchangers – Shell and Tube, Hot Oil/Crude Oil	API STD 660
Direct Fired Hot Oil Heaters for Crude Oil Bulk Heating	API STD 560
Export Pumps	API STD 610
Power Generator Engine, Crude Oil Fueled, Continuous Duty Generator Package Including Fuel Treatment, Heat Exchangers, Intake/Exhaust System, Lube Oil System, Air Starters, Skids, Controls And Other Equipment Required For A Complete Package	IEC 60034, ISO 10816, ISO 8528, NFPA 37
Crude Oil Storage Tank	API STD 650
Step-Up Transformer	IEC 60076
Pad mounted Transformer	IEC 60076
MLBV	API 6D
High Voltage Switchgear	IEC 62271
High Voltage Variable Speed Drive	IEC 61800
LLHT In-Station Heat Tracing Controller	IEC 60947
LLHT Cable	IEC 60502
HV Cable	IEC 60502
Instrumentation – P, T, Flow	ISA 5.4, ISA 20
Telecommunication – Fiber Optic Cable	IEC 60794
Civil / Structural	BS EN 1337, BS EN 1990, DNV-OS-C201, AWS D1.1 and 1.8

CODES AND STANDARDS REQUIREMENTS

Pipeline Material	Applicable Code	Title
Pipe	API RP 5L	Specification for line pipe
Flanges	ASME B16.5	Pipe Flanges
	MSS SP-44	Steel Pipeline Flanges
Fittings	ASME B16.9	Factory made wrought steel butt welding fittings
	MSS SP-75	High test wrought butt welding fittings
HIB	ASME B16.49	Factory made wrought steel butt welding induction bends
Pipe Insulation coating	CSA Z245.22-14	External polyurethane foam insulation coating for steel pipe
Pipeline Construction	AWS A5 series of specifications in API ST	All welding consumables
	ASTM A370	metal tensile test
	UT-MID-60-0100-200003,	Installation onshore pipelines, OR
	API Std 1104	Welding of Pipelines & related facilities
	PRCI-PR-227-9424	Installation of pipelines by HDD
	ASME BPVC Section II Part C	Specifications for Welding Rods, Electrodes, and Filler Metals

Construction ETICB or Equivalent Qualifications	
Civil Works	Level 2/3 Machine Operation
	Level 2 Formwork Carpentry
	Lvel 2 Concrete Finishing
Electrical	Level 2/3 Electrical Installations
	Level 3 HV Electrical Installations
	Level 3 Instrument & Control
Scaffolding	Level 3 Scaffolding
Piping	Level 3 Pipe Welding plus ASME Pipiing 2G, 5G, 6G
	L3 Plate Welding Plus ASME Plate 3G, 4G
	L3 Pipe Fitting
	L3 NDT
Structural & Mechanical	L3 Mechanical Fitting
	L3 Steelk Erecting
	L3 Rigging

GULF INTERSTATE ENGINEERING

QUALITY-HEALTH-SAFETY-ENVIRONMENTAL STANDARDS

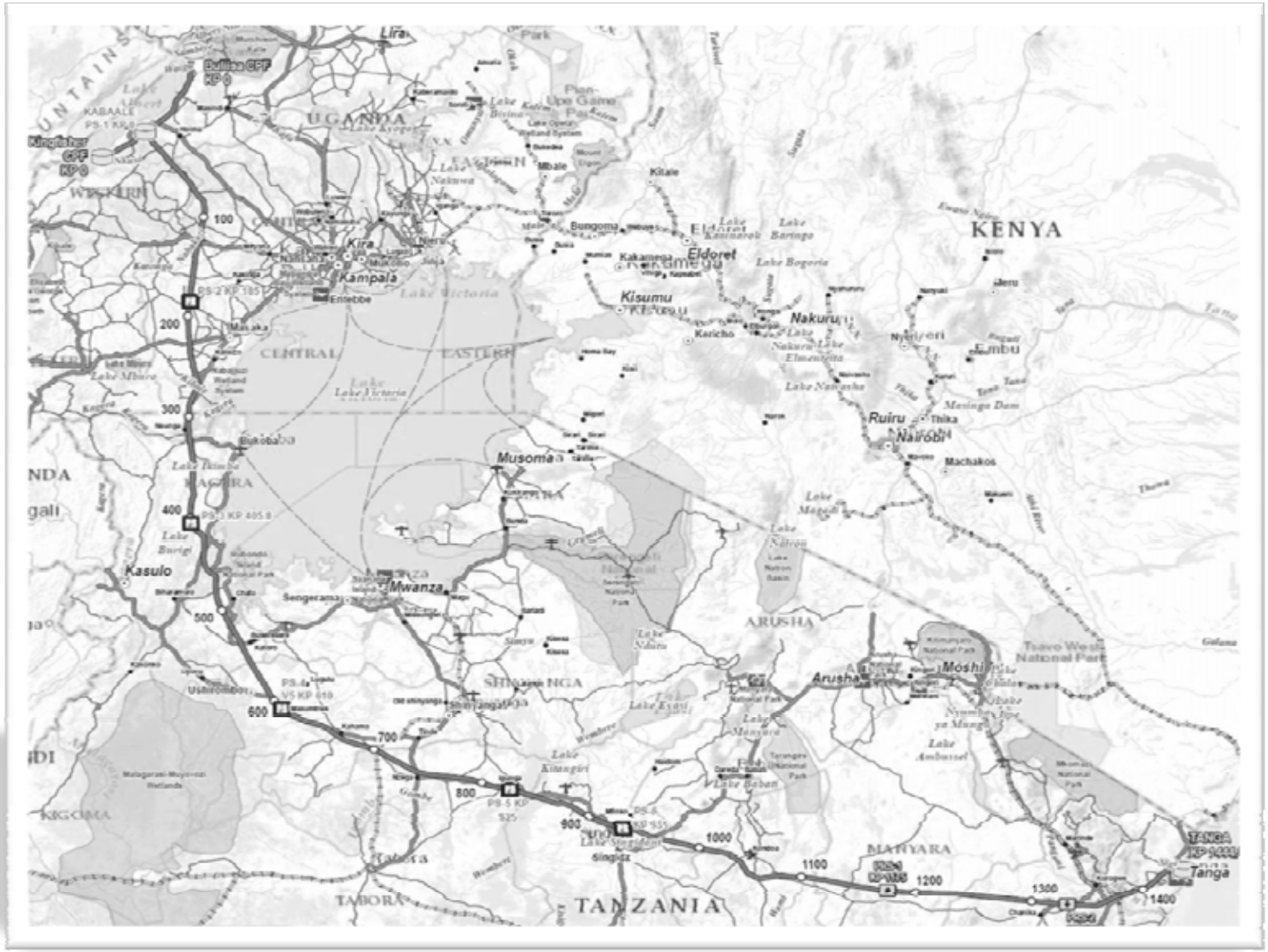
- Service & Goods Suppliers will be required to meet Quality-Health-Safety-Environmental (QHSE) standards
  - **QHSE - ISO 9001 - Quality Management Systems**
    - ISO 9001 defines quality management by establishing criteria for quality management systems. The ISO 9001 criteria can be used by any type of organization, without regard to size. The objective is to ensure customers consistently receive products and services of good quality.
  - **QHSE - ISO 14001 - Environmental Management Systems**
    - ISO 14001 provides a framework for environmental management. By providing practical tools for identifying and controlling an organization's environmental impact, and for constantly improving environmental performance, ISO 14001 results in an effective environmental management system, with benefits of:
      - Protection of the quality of the environment
      - Reduced cost of waste management and disposal
      - Reduced consumption of energy and raw materials
      - Reduced distribution costs
      - Improved corporate image
  - **QHSE - OHSAS 18001 - Occupational Health and Safety Management Systems**
    - OHSAS 18001 uses the same approach as ISO 14001, but with the objectives of identifying safety and health hazards, reducing the potential for accidents, and creating a safe and healthy working environment. In addition, it provides guidelines for integrating the management of health and safety into the overall business management system. Some of the requirements of the OHSAS 18001 include:
      - Identifying health and safety risks, and associated legal requirements
      - Understanding the health and safety issues faced by employees, and their potential impacts
      - Establishing health and safety goals and targets
      - Creating a formal health and safety policy
      - Communicating the policy and its implementation to employees
      - Monitoring and auditing the activities that control health and safety risks

GULF INTERSTATE ENGINEERING

QHSE REQUIREMENTS PER SERVICES/GOODS

SERVICES/GOODS	QHSE STANDARDS	SERVICES/GOODS	QHSE STANDARDS
Backfill Soils and Excavated Soils Transport	14001, 18001	Civil Construction Works	14001, 18001
Civil Engineering Services	9001, 18001	Construction Camps Catering Services	14001, 18001
Construction Camps Medical Operations	14001, 18001	Construction Camps Operations	14001, 18001
Environmental Monitoring	9001, 14001, 18001	Helicopter and Fixed Wing Transport	14001, 18001
Fuel Supply & Depot Operations	14001, 18001	Heavy Lift Cranes & Operators	14001, 18001
International Freight Forwarding	9001, 14001	Lab Testing Soils, compaction, compression	9001, 18001
Logistic Services	9001, 14001	MEDIVAC Services	14001, 18001
OEM Vehicle Replacement Parts	9001	Vehicle Rentals, Operators & Drivers	14001, 18001
Portable Concrete Batch Plant	14001, 18001	Portable Generators Supply & Maintenance	14001, 18001
Portable Tarmac Unit	14001, 18001	Portable Water & Waste Water Treatment Units	9001, 14001, 18001
Road Boring Equipment	14001, 18001	Road Construction (Permanent & Temporary	9001, 14001, 18001
Road Maintenance and Repair	14001, 18001	Safety Inspectors	14001, 18001
Security (7/24)	18001	Shipping Containers and Crating	9001, 18001
Solid Waste Disposal	14001, 18001	Survey Services	9001, 18001
Temporary Warehousing	14001, 18001	Transport Vehicles - Material & Equipment	14001, 18001
Water Trucks (Dust Control)Services	14001, 18001	Water Well Services	14001, 18001

TIER 1 CONTRACTS SCOPE OF WORK



GULF INTERSTATE ENGINEERING

TIER 1 CONTRACTS

- EPcm Contract TIER 1:
  - Advance the detailed engineering and design of the FEED preliminary design to Approved for Construction:
    - Local hiring of engineering professionals for exchange of technology and operational aspects in preparation of construction and commissioning support;
    - Oversee Civil Surveys for ground proofing of approved Pipeline Right of Way, Pump Stations, Electrical Heat Trace Substations and Camps;
    - Preparation of Pipeline Alignment Sheets for epC Contractors;
    - Procure major engineered equipment and specialty materials – provide expediting and factory inspections for procured equipment/materials;
    - Interface with Logistics provider for scheduled deliveries of material & equipment;
    - Receiving inspections of major pre-engineered material and equipment upon arrival;
    - Organizing of pre-engineered material and equipment to respective warehouses and marshalling camps
    - Develop epC Construction Bid Documents for competitive pricing;
    - Support TEAM in bidding & award of epC Contracts.

TIER 1 CONTRACTS

- EPcm Contract TIER 1:
  - Establish construction management and field inspection operations;
  - Provide training for field inspectors;
  - Pre-Construction Activities of epC Contractors;
    - Monitor establishment of construction camps;
    - Reporting of National Content Tiers 2,3,4 subcontracting contents & values
    - Qualification testing of skilled labor (Welders, HV electrical, Operators, etc.)
    - Pipeline ROW survey staking
    - Out Reach meetings with local towns and participation w/ESHIA Consultant
  - Monitor and report all construction related activities and Local Content Participation Status;
  - Assist in the commissioning of the Pipeline Systems
  - Prepare As-built drawings and final Project Close-out

GULF INTERSTATE ENGINEERING

TIER 1 CONTRACTS

- Pipeline epC Contract TIER 1:
  - Establish Construction Camps & Pipe Yard Marshalling Camps
  - Training for skilled trades (welding, HV Electrical, Operators, etc.)
  - Pre-Construction Surveys for ROW and Areas of Disturbance Staking
  - Clearing & Grubbing of Pipeline Right of Way
  - Stringing, Trenching,
  - Welding, Heat Trace Cabling Pulling, Field Coating, Testing and Commissioning Support
- Pump Stations epC Contract TIER 1:
  - Establish Construction Camps at each of the two locations
  - Civil Works for Pump Stations
  - Concrete & Compaction Testing subcontracts
  - Mechanical/Electrical/Instrumentation Construction
  - Pre-Commissioning & Commissioning Support
- Electrical-Instrumentation-Telecommunications Systems TIER 1;
  - Supply all engineered electrical, instrumentation & telecommunication equipment, materials and integrated systems
  - Provide installation monitoring and technical support
  - Commissioning of SCADA/ICS & Telecommunications Systems

TIER 1 CONTRACTS

- MARINE TERMINAL STORAGE TANKS EPC TIER 1:
  - Detailed design for the 5 crude oil tanks, foundations and berms
  - Procurement for tank steel, insulation, internal mixers, PVF within the berms
  - Site development for grading, leveling and staging for steel rings lay down
  - Establishing of construction camp and supporting facilities
  - Receiving of all tank steel, PVF's, external insulation and internal coils/mixers
  - Erection and testing of each 500k barrel tank
- TRESTLE & LOAD-OUT PLATFORM EPC TIER 1:
  - Detailed design for the offshore Trestle and Load-Out Platform piling and super-structures
  - Fabrication and delivery of piling and super-structure sections
  - Barge Crane installation of piling for Trestle and Load-Out Platform
  - Marine installation of Trestle & Load-Out Platform super-structures sections

TIER 1 CONTRACTS

- Early Civil Works Construction:
  - 2 Specific Contracts
    - #1 - Civil Surveys for access roads and temporary construction camp
    - #1 - Detailed Engineering for Temporary and Permanent Access Roads
    - #2 - Construction of Temporary & Permanent Access Road, clearing, leveling and grading of Temporary Construction Camps
- Early Civil Works will require final Civil Surveys and Detailed Engineering for access roads listed in following table before commencement of construction. Tanzania Civil Engineering Firm to provide this service.
- The first focus for ECW will be the access road and site leveling for the line pipe insulation yard.

ACCESS ROADS

ACCESS ROAD DESCRIPTION	PURPOSE	LENGTH (M)
EXISTING ROAD UPGRADE	MCPY 5	329
NEW TEMPORARY ACCESS ROAD	MCPY 6	584
NEW PERMANENT ACCESS ROAD	PS3	7169
EXISTING ROAD UPGRADE	PS3	6863
NEW TEMPORARY ACCESS ROAD	MCPY 6	884
NEW TEMPORARY ACCESS ROAD	MCPY 7	875
EXISTING ROAD UPGRADE	MCPY 8	1972
NEW TEMPORARY ACCESS ROAD	MCPY 8	595
NEW PERMANENT ACCESS ROAD	PS4	737
EXISTING ROAD UPGRADE	PS4	1011
NEW TEMPORARY ACCESS ROAD	MCPY 9	23
NEW TEMPORARY ACCESS ROAD	MCPY 9	457
NEW TEMPORARY ACCESS ROAD	MCPY 10	1288
EXISTING ROAD UPGRADE	PS5	1114
NEW PERMANENT ACCESS ROAD	PS5	753
NEW TEMPORARY ACCESS ROAD	MCPY 11	113

ACCESS ROAD DESCRIPTION	PURPOSE	LENGTH (M)
NEW PERMANENT ACCESS ROAD	PS6	2031
EXISTING ROAD UPGRADE	PS6	4752
EXISTING ROAD UPGRADE	MCPY12	8644
NEW TEMPORARY ACCESS ROAD	MCPY12	625
EXISTING ROAD UPGRADE	MCPY13	14981
NEW TEMPORARY ACCESS ROAD	MCPY13	34
NEW PERMANENT ACCESS ROAD	PRS 1	11361
NEW TEMPORARY ACCESS ROAD	MCPY 14	783
EXISTING ROAD UPGRADE	MCPY 14	16747
NEW TEMPORARY ACCESS ROAD	MCPY 14	81
NEW TEMPORARY ACCESS ROAD	MCPY 15	81
NEW PERMANENT ACCESS ROAD	PRS 2	1856
EXISTING ROAD UPGRADE	PRS 2	1033
NEW PERMANENT ACCESS ROAD	MST	2833
NEW PERMANENT ACCESS ROAD	MST	633
EXISTING ROAD UPGRADE	MST	6491

TIER 1 CONTRACTS

- Logistics & Inland Transportation:
  - Primary Scope of Work
    - Freight Forwarder for engineered equipment and materials delivery for international fabrication location to the Tanzania Port of Call
    - Customs Clearance of received equipment and materials
    - Temporary Staging prior to transport
    - Inland Transportation of pipe, cabling, equipment and materials to strategic marshalling yards
  - Tanzania Related Scope of Work
    - Transport of 96,250 joints of 12M bare & insulated line pipe over14 month period
    - Transport of 936km (1KM) spools of 33 kVA Cabling
    - Transport of 1155km (8KM) spools of Fiber Optic Cabling
    - Transport of 3465km (1KM) spools of single phase 6.6 kVA Heat Tracing Cables
    - Transport of nineteen (19) Crude Oil Pumps (16.2 MTN each)
    - Transport of fifteen (15) power generation units Pump Stations 3,4,5,6, MST – (52MTN each)
    - Transport of approximately 1470 MT (8640 CM) of mechanical and electrical engineered equipment (not including MST tanks)
    - Transport of 15 pre-fabricated Electrical Heat Trace Substation Modules (5m x 3m)

TYPES OF TRANSPORTS REQUIRED

Multiple axle trailers for transport of:

Fifteen (15) Power Generation Units
Four (4) direct fired heaters

Bare Pipe from Port to Insulation Yard	
KM of Pipe	1155
Pipe Joints	96,250
Distance 2-Way	1,920
Truck 12 Joints per Load	8,021
Driving KM Total	15,400,000
Dirving Hours 50kmph	308,000

TYPES OF TRANSPORTS REQUIRED

Standard 12m Container

- Minimum 150 container per PS pump station and 85 containers per PRS for pre-engineered material & equipment
- When emptied, must be returned to port of call
- Contractors potential double quantity for their equipment

Heat Trace, Fiber Optic & HV Power Cabling

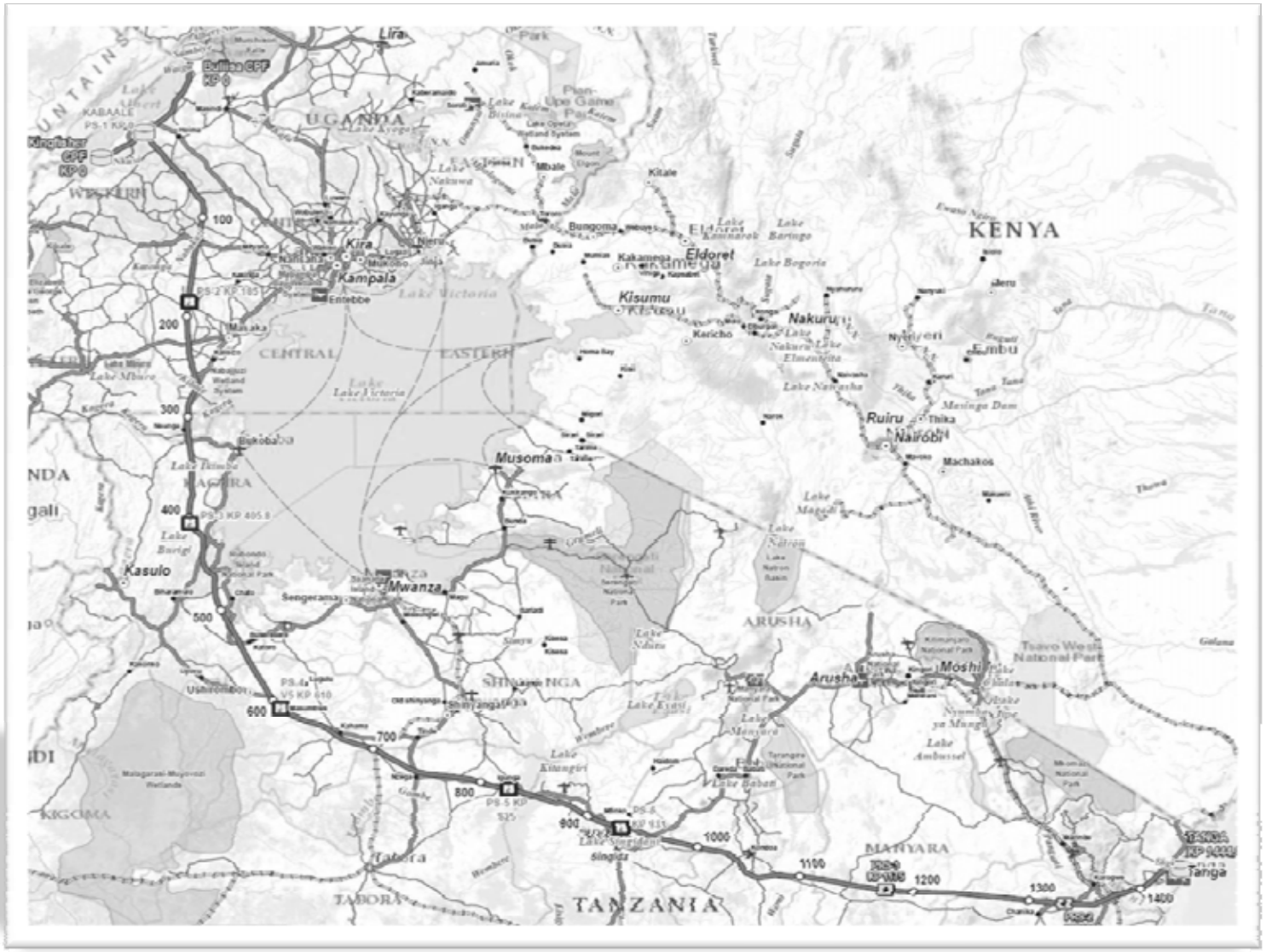
- **4572** spools @ 1km cables for HV & Heat Trace & 8km for fiber optic per spool
- 2 spools per truck load
- Empty spools must be returned after cable installed

PIPELINE CONSTRUCTION MAJOR EQUIPMENT

PIPELINE EQUIPMENT	Quantity
Access Road 2 Crews	
Backhoe Loader 416C /428C	2.00
Dozer D9 Cat	2.00
Grader 160 H	4.00
Loader 966	2.00
Silindir 323/Bomag 213 PHD-2	2.00
Low bed 80 + 6x4 trailer	2.00
Kamyon 6X6 + damper	10.00
Tanker 10t	4.00
ROW 2 Crew	
Dozer D9 Cat	2.00
Grader 160 H	4.00
Silindir 323/Bomag 213 PHD-2	2.00
Loader 966	2.00
Bcckhoe Loader 416C /428C	2.00
Low bed 80 + 6x4 trailer	2.00
Tanker 10t	4.00
Stringing 1 Crew	
Hi-ab 6x6	2.00
6x4 Trailer & flat-Bed	10.00
Sideboom 583	3.00
Welding 1 Crew	
Paywelder 953D	6.00
Hi-ab 6x6	2.00
Sideboom 583	2.00
Tie-in 4 Crews	
Çadırlı Hi-ab 6x6	4.00
Hi-ab 6x6	4.00
Sideboom 583	4.00
Coating 1 Crew	0.00
Hi-ab 6x6	3.00
Dirch 1 Crew	0.00
Cat 345	10.00
Hi-ab 6x6	1.00
Lowering-in 1 Crew	0.00
Sideboom 583	8.00
Hi-ab 6x6	2.00
Dozer D9 Cat	1.00
Loader 966	1.00
Hydrotest 1 Crew	0.00
Hi-ab 6x6	2.00

GULF INTERSTATE ENGINEERING

SERVICES AND SUPPORT REQUIRED DURING THE CONSTRUCTION PHASE OF THE PROJECT



SERVICES AND SUPPORT REQUIRED DURING THE CONSTRUCTION PHASE OF THE PROJECT

ESTIMATE OF QUANTITIES

Civil Works	Unit	Quantity
Pipeline ROW Clearing	CM	2,310,000
Pipeline Trenching	CM	2,079,000
Pump Stations 3,4,5,6 Site Grading & Backfill	CM	210,000
PRS 1 & 2 Site Grading & Backfill	CM	12,805
LLHT Site Grading& Backfill	CM	141,450
Marine Terminal Grading & Backfill	CM	76,829
Pump Stations 3,4,5,6 Foundations Excavations	CM	2,147,640
PRS 1 & 2 Foundation Excavations	CM	268,455
Marine Terminal Foundation Excavations	CM	951,572
Construction Camps	CM	308,890
Access Roads	CM	95,497
TOTAL EARTH WORKS	**CM**	**8,602,138**

Pipe, Valves & Fittings	Unit	Quantity
Pump Stations 3,4,5,6 Piping	M	6,152
Pump Stations 3,4,5,6 Valves & Fittings	EA	2,480
PRS 1 & 2 Piping	M	100
PRS 1 & 2 Valves & Fittings	EA	55
Marine Terminal Piping	M	8,613
Marine Terminal Valves & Fittings	EA	3,472
Pipeline Main Line Block Valves	EA	50
TOTAL PIPING	**M**	**14,865**
TOTAL VALVES & FITTINGS	**EA**	**6,057**

Foundations	Unit	Quantity
Pump Stations 3,4,5,6	CM	89,105
LLHT 15 Substations	CM	375
PRS 1 & 2	CM	15,100
Marine Terminal	CM	54,333
MLBV Vaults	CM	240
Heat Trace Substations	CM	63
TOTAL FOUNDATIONS	**CM**	**159,215**

Electrical Cabling	Unit	Quantity
Pump Stations 3,4,5,6	M	3,600
PRS 1 & 2	M	1,260
Marine Terminal	M	7,200
Heat Trace Cables	M	3,450,000
HV Cables	M	936,000
Fiber Optic Cabling	M	1,155,000
TOTAL CABLING	**M**	**5,553,060**

SERVICES AND SUPPORT REQUIRED DURING THE CONSTRUCTION PHASE OF THE PROJECT

MATERIALS & EQUIPMENT LISTING

In Country Materials
Aggregate
Bulk Cement
Concrete Batch Plants
Concrete Blocks Fence & Bricks
Concrete Delivery Trucks
Construction Camp Furnishings
Construction Camp Canteen Equipment
Construction Camp Catering Services
Construction Camp Temporary Fencing
Construction Equipment Fuel
Construction Equipment Spare Parts
Cranes for AGI Heavy Lifts >40t
Cranes for AGI & Pipeline Equipment <30t
Dragline Mats
Engineered Backfill Soils
Fencing (Pipeline MLBV & EHT Substations)
Fencing Concrete

In Country Materials
Fencing Wrought Iron
Foundation Re-Steel
Geotextile Materials
Lumber - Temporary Formwork
Lumber - Permanent Buildings
Murram Materials
Office Supplies & Furnishings
Pipe Spool Fabrication
Pipe Supports
PPE Equipment (Safety Glasses, Rain Gear, Hard Hats)
Portable Power Generators
Portable Pumps & Lighting Units
Signage
Small Tools
Structural Steel (Ladders, Grating, Pipe Racks)
Tarmac Asphalt
Temporary Storm Water runoff (Erosion Control) Tiles Hay, Silt Fence, Sediment Logs, Erosion control matting
Temporary Warehousing

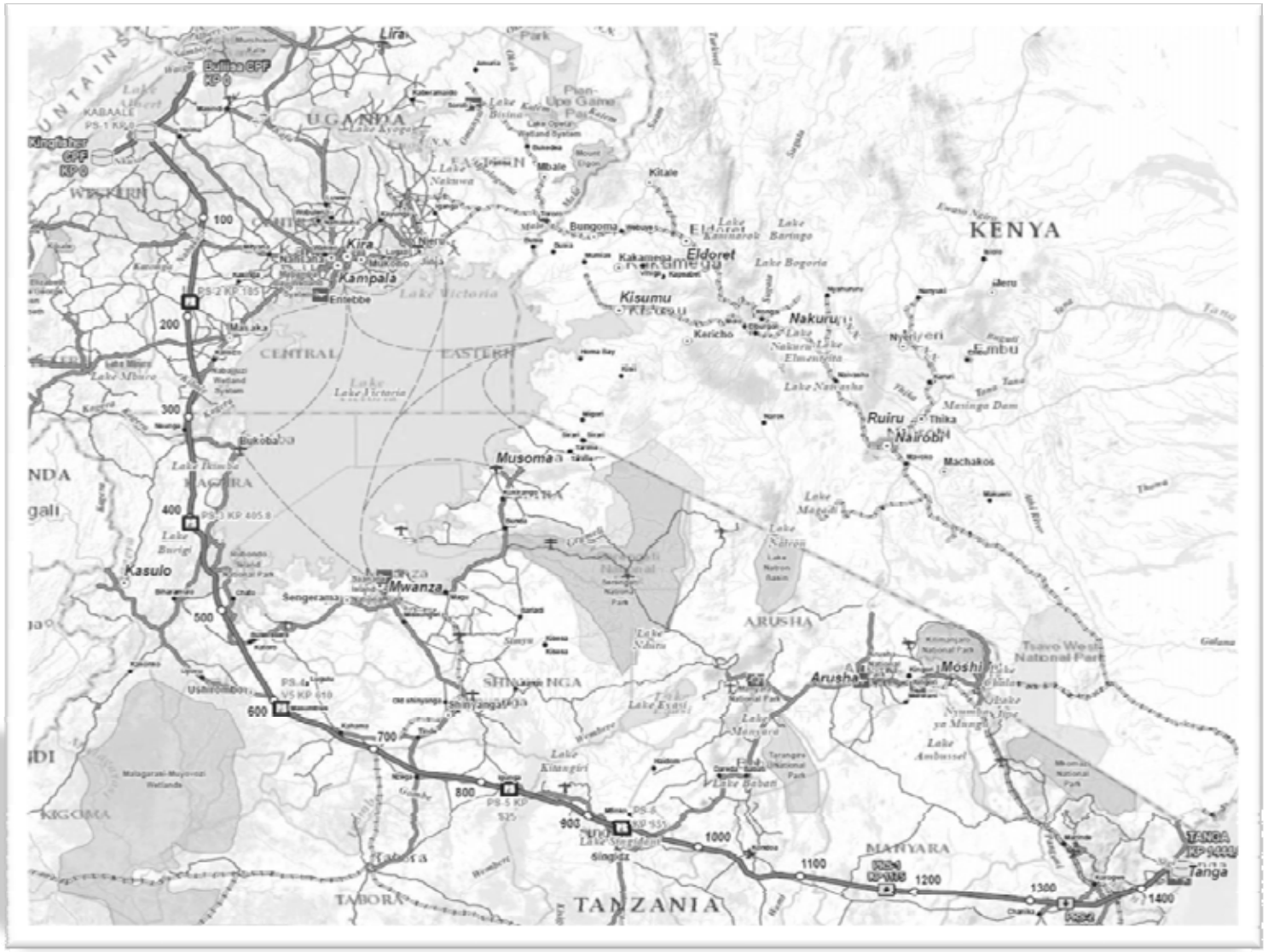
SERVICES AND SUPPORT REQUIRED DURING THE CONSTRUCTION PHASE OF THE PROJECT

SUPPORT SERVICES REQUIRED LISTING

In Country Services
AGI Construction Labor
ATV Rentals
Catering Supply & Delivery Services
Civil Engineering
Civil Works (Grading, Levelling, Spoils Removal)
Construction Camps Maintenance Support
Construction Camps Administrative Personnel
Construction Camp Food Preparation Personnel
Construction Camp Medical Personnel
Crew Personnel Transport (Buses)
Customs Clearance
Environmental Monitoring
Equipment Specialty Mechanics
Equipment Maintenance
Equipment Operators
Escort Vehicle Services
Field Engineers (ME, CE, IE, EE)
Field Inspectors (welding, electrical, civil, etc.)
Foundations Labor (Rodbusters, Formwork, Concrete)
Helicopter and Fixed Wing
In Country Equipment Rentals
International Freight Forwarding
Lab Testing Soils, compaction, compression
Logistic Services

In Country Services
Masons
MEDIVAC
Pipeline Labor
Portable Generators Maintenance
Portable Tarmac Unit
Portable Water & Waste Water Treatment Units
Road Boring
Road Construction
Road Flagmen
Road Maintenance and Repair
Safety Inspectors
Security (7/24)
Shipping Containers and Crating
Soils and Asphalt Transport
Survey Crews
Tanks (<50kcm) Plate Welders
Temporary Office Personnel
Transport Vehicles
Vehicle Parts
Vehicle Rentals
Waste Disposal
Water Trucks (Dust Control)
Water Well Services
Welder Qualification

ESTIMATED LABOR REQUIREMENTS



GULF INTERSTATE ENGINEERING

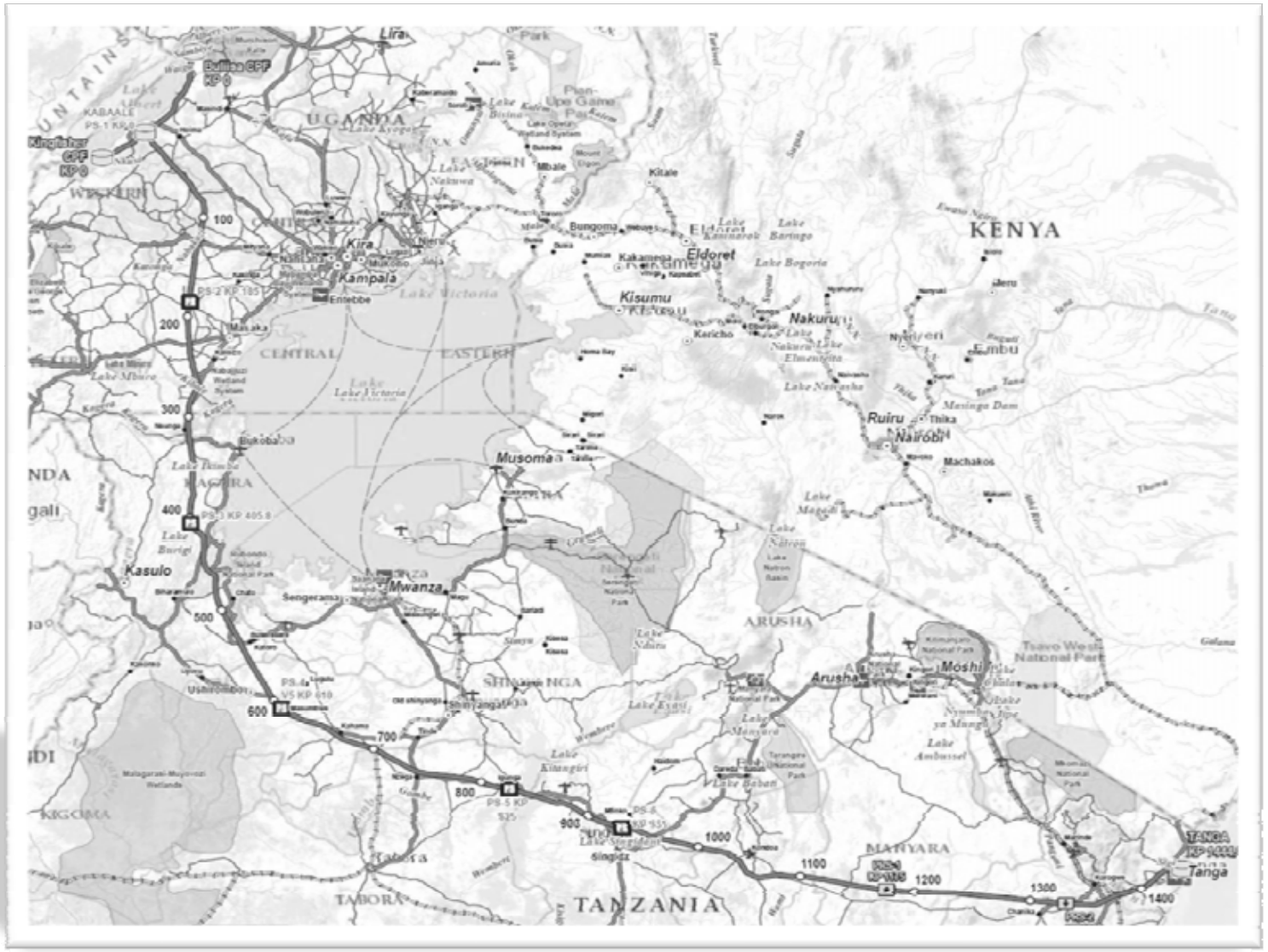
PIPELINE CONSTRUCTION LABOR ESTIMATES

GENERAL FIELD SUPPORT (epC)
As-Built Survey
Camp Operational Support
Camp Set-Up & Support
Catering
Environmental Compliance/Inspections
Field Warehouse
PM SUPPORT
Precommissioning
Project Office
QA/QC
Supervision & Admin.
Survey
X-Ray (or UAT)

Pipeline and AGI Construction is more than welding line pipe together, constructing of foundations/buildings, installing equipment, testing and putting it in the ground. A significant amount of workers are required to prepare the ROW, transfer material and equipment, support the operations and keep the camps operating. Conclusion of construction involves restoration of AWS and ROW.

CONTSTRUCTION (epC)
Accept PUF Pipe at Yard
Access Roads (Along ROW)
Aerial Markers Install/Maintain
Backfill
Bend & Set-up
Camp Moves
Civil Works (MLV/LLLHT FDNS)
Cleanup
Dewatering Ponds
Ditch
Electrical/Instrumentation
Equip. Rig-Up
Fabrication
Field Joints
Haul & String Pipe
Haul Perm. Mat'ls.
Heat Trace Cable Pulling
HV Cable Install (In Trench)
Hydrostatic Test
K. P. Markers Install/Maintain
Lower-In
Mainline Valves
Maint. & Service
Move In/Out (Inland Transport)
Pipe Laying
Right-of-Way Grade
Set up Mob/Demob Equip
Tie-In
Warning Signs Install/Maintain
Welding Support

TIER 1,2,3 STRUCTURE FOR SERVICE PROVIDERS AND



BASIS OF MULTIPLE TIER OPPORTUNITIES

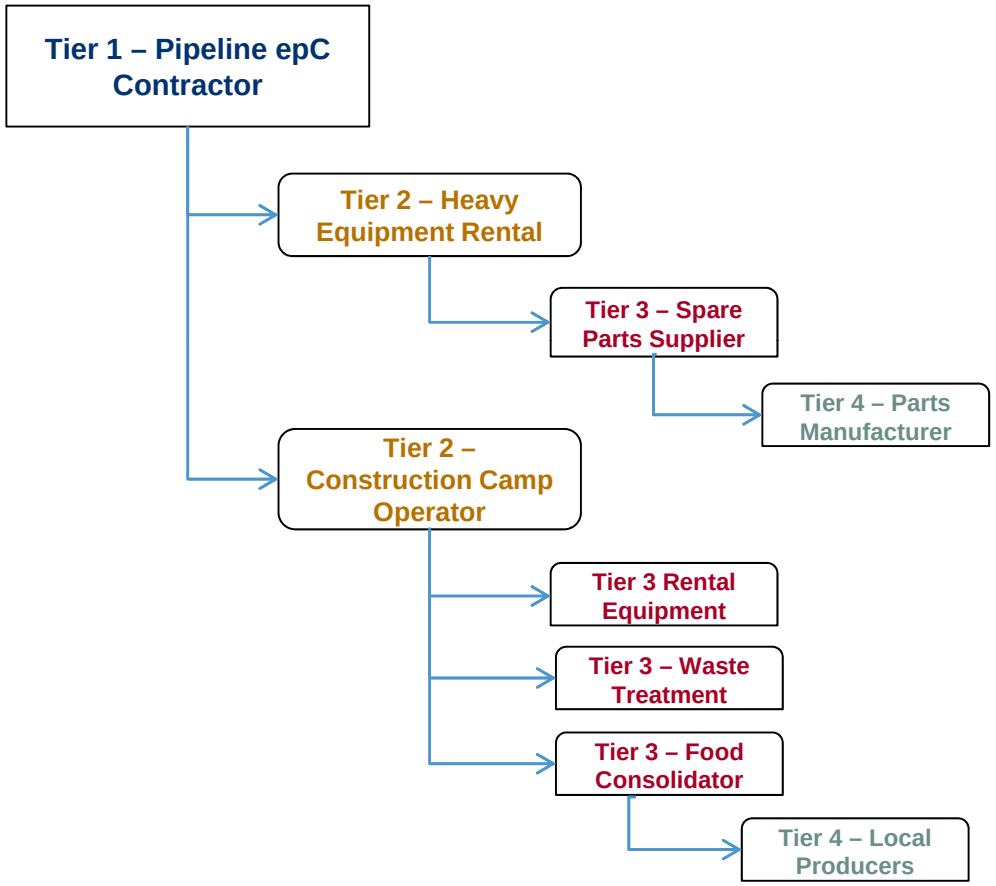
- EACOP will issue a number of Tier 1 Contracts related to the engineering, procurement, manufacturing, logistics, construction and testing of the pipeline and pipeline facilities.
- Tier 1 Contractors will require common sub-contracted services and goods from multiple Tier 2 Tanzanian Companies and Tanzanian Citizens.
- Some of the Tier 2 Sub-Contracts may require further Tier 3 sub-contracts to complete the required services and/or goods supply.
- Tier 3 Sub-Contractors may elect to further sub-contract items if the requirements and competitive pricing requires further out-sourcing based on locations and/or specialty items.
- Regardless of contractual Tier – all involved are responsible to meet the same requirements regarding National Content.

EXAMPLE OF PRIME AND SUBCONTRACTED SERVICES

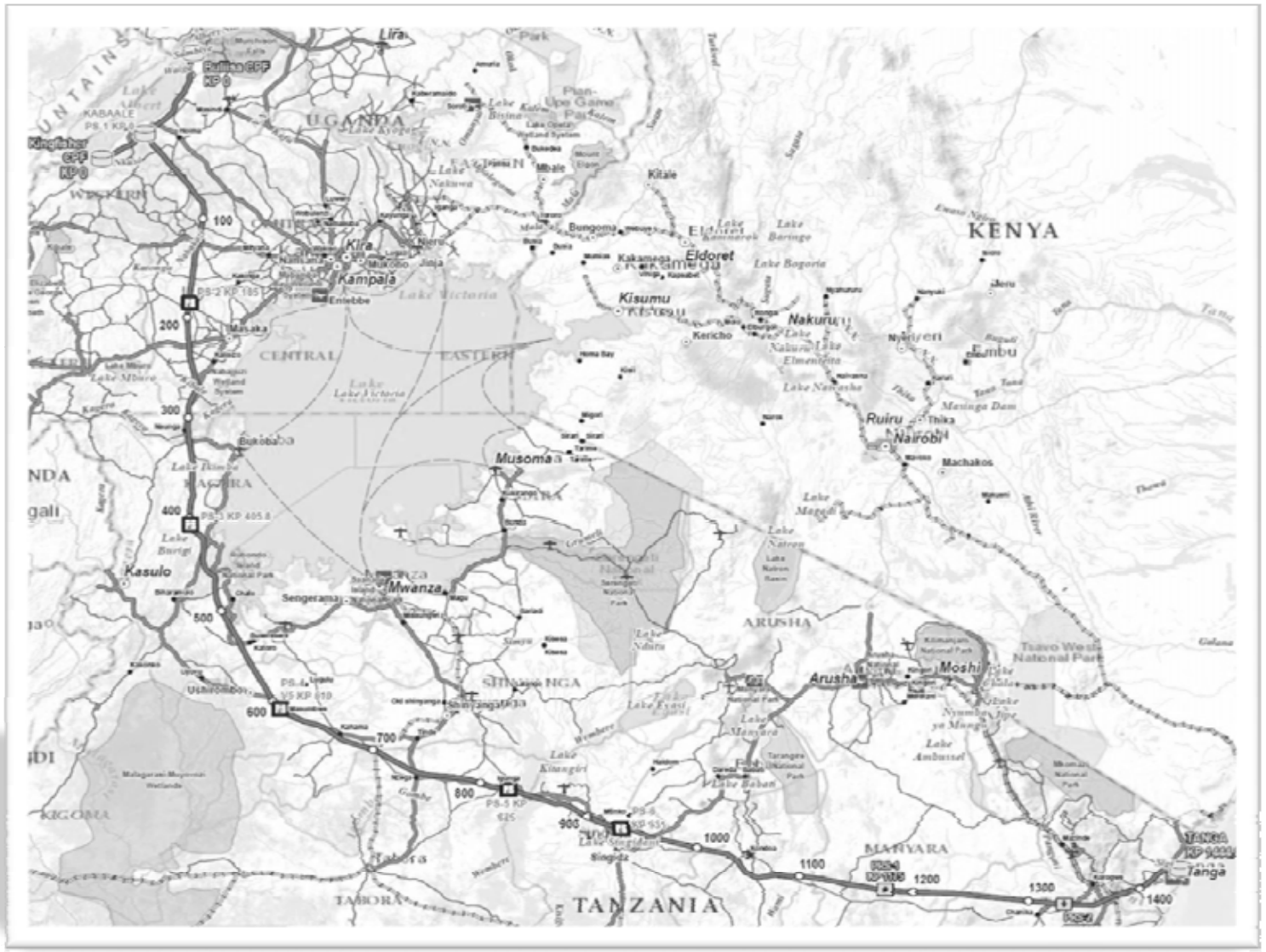
GOOD & SERVICES OPPORTUNITIES	Epcm	EITS	Logistics	Early Civil Works	Pipeline epC	AGI epC
Engineering Consultants	Tier 2					
Personnel Transportation	Tier 2					
Communications/information technology	Tier 2					
Human Resource Management	Tier 2					
Offices & Warehouses	Tier 2				Tier 2	
Security			Tier 2			
Foods and Beverages				Tier 2		
Office Supplies	Tier 2				Tier 2	
Fuel Supply			Tier 2			
Land Surveying	Tier 2 or 3			Tier 2 or 3		
Clearing and Forwarding			Tier 2 or 3			
Construction Equipment Rentals			Tier 2			
Crane Hire			Tier 3		Tier 3	
Civil Works Graders, loaders				Tier 3		
Pipeline trencher, water trucks, etc.					Tier 3	
Repair Parts & Service					Tier 3 or 4	
Locally available construction materials				Tier 2 or 3		
Consumables				Tier 3		
Foundation Formwork					Tier 3	
Concrete Batch Plant					Tier 3	
Cement Supply					Tier 3	
Delivery Trucks					Tier 3	
Fencing & Gates						
Civil Works Subcontractor(s)					Tier 2	
Waste management, where possible					Tier 2	
Water Treatment					Tier 2 & 3	
Hydro-Test Water Mobile Unit					Tier 3	
Waste Treatment & Removal					Tier 2	
Construction Camps					Tier 2	
Catering					Tier 3	
Operations& Maintenance Personnel					Tier 3	
Food Goods					Tier 3 & 4	
Inspections & Testing	Tier 2			Tier 2		
Environmental Monitoring	Tier 1 Interface			Tier 2		

GULF INTERSTATE ENGINEERING

TIER 1,2,3,4 STRUCTURE FOR SERVICE PROVIDERS AND EXAMPLES



LOCAL TANZANIA COMMUNITIES IN CLOSE PROXIMITY OF THE EACOP PERMANENT INSTALLATION.



GULF INTERSTATE ENGINEERING

LOCAL TANZANIA COMMUNITIES IN CLOSE PROXIMITY OF THE EACOP PERMANENT INSTALLATION.

The EACOP Pipeline Route will be constructed near villages, towns and cities. Local communities will have the opportunities to be involved with the supply of goods and services referred to as "local content" based on meeting mandatory standards.

In certain areas temporary and permanent facilities will be constructed in support of construction and eventual operations.

SITE	Nearest City	Approx. KM to City
MCPY 5	Misenyi	10
MCPY6 & PUMP STATION 3	Muleba	10
MCPY 7	Chato	10
MCPY 8 & PUMP STATION 4	Bukombe	20
MCPY 9	Kahama	35
MCPY 10 & PUMP STATION 5	Igunga	25
PS 5	Igunga	10
MCPY 11 & PUMP STATION 6	Singida	25
PS 6	Singida	25
MCPY 12	Kondoa	20
MCPY 13 & PRS 1	Kibaya	25
MCPY 14	Kiberashi	20
MCPY 15 & PRS2	Sindeni	20
Marine Terminal	Tanga	15

EACOP PIPELINE PROJECT