NORWEGIAN REFUGEE COUNCIL

Scope of work & Building specifications:
Construction of Infiltration Gallery in Um Koaro Village - AL-Leri Locality & Accompanied of One Water Yard and installation of Solar powered pumping system

To reach the standard construction of Infiltration Gallery, tower elevated water tank and water point distribution. All necessary temporary works required to provide access to the site, secure storage of materials and to facilitate construction in a safe manner. All necessary site preparation works including the construction of a concrete foundation, the removal of top soil and subsequent backfilling, and all other ground and works that may be necessary. The Scope of Works shall also be deemed to include anything that is not listed here but may reasonably be inferred to be necessary for the completion of the Works.

Description:
This is a scope of work document for Construction of Infiltration Gallery and accompanied of one water yard and installation of solar powered pumping system, water point distribution, Animal trough, and water irrigation channels in Um Koaro Village - AL-Leri locality - South Kordofan according to the specification and BOQ attached. Contractor shall supply all adequate and competent labours, supervision, tools and, equipment, installed and consumable materials, services, testing devices, and each and every item of expense necessary for Supply management.

Specification

In general, the contractor shall provide and maintain work environments and procedures which will safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to contractor operations and activities; avoid interruptions of Government operations and delays in project completion dates; and, control costs in the performance of this contract. For these purposes, the contractor shall consider several factors of safety during implementation:

Health & Safety:

- Laborers shall wear overalls and all the equipment safety measure for labors and must get instruction on the use of this equipment
- Laborers shall have enough and appropriate tools and Keep maintenance materials back at least 600 mm (2 ft.) from the edge of any trench excavation and 1.2 m (4 ft.) from any other excavation.
- The water tank shall be protected from sunlight and covered at all the times.
- Laborers shall make safe passageway to prevent slipping and tripping hazards.
- All safety measures should be undertaken during COVID-19 pandemic.

Site preparation and planning:

- Contractor shall coordinate with NRC WASH team, community representatives of Al-Leri urban area and Um Koaro village and the representative of Ministry of Infrastructure and Urban Development – Water Resource Sector to present the work plan include the supply materials and determination the site location for all the interventions.
- Contractor shall advise on site use and improvements, selection of materials, water Yard system and equipment, as well as provide recommendation on construction feasibility, availability of materials and labor, time requirements for installation and construction
- Contractor shall manage the activities of all interdisciplinary interfaces for the Work, including civil, structural, architectural, mechanical, piping, electrical, and instrumentation and controls.
- Contractor shall provide construction site safety notices.
- Contractor shall Breaking out hard material contained and cleaning the site.

Excavation and foundation work:

- The contractor is responsible for digging the foundation plan area for Infiltration Gallery according to the BOQ.
- The contractor is responsible for digging the foundation plan area for elevated tank according to the BOQ.
- The contractor is responsible for planning before digging the foundations to conduct the centres of steel tower by accurate tools.
- Contractor shall provide construction site safety notices.
- The contractor digging the foundation properly until reach stable layer or add a compacted soil material.
- The contractor shall provide bed sand for pipes and backfill the trenches and foundations after implementation.
- The reinforce concreate should watering 2 times /day for 3 days.
- The excavation shall be levelled properly, and compaction shall be by layers every 10 cm with compactable crushed granite, gravel, and aggregates coarse material.
- Clean the area after the excavation and refill any loose soil around the foundation with improved soil.

Concrete specification for foundation work:

- Carry out the layout, dimension according to the dimension, which specified in BOQ.
- Fix the footing of the steel foundation under the ground according to the specification in BOQ.
- Treatment the concrete footing with water for at least 3days to achieve minimum of 30 N/mm2 after 28 days. The formwork shall be clean and fixed properly to ensure the stability of concrete.
- Concrete shall be mixed properly to prevent segregation of concrete material. And infiltration of water or soil to the concrete material.
- The surface of the reinforced concrete shall be smooth. The contractor shall be checking the foundation and materials before starting the reinforce concreate.
- The Contractor should be aware about soil bearing capacity to ensure that the soil is able to carry the loads.
- The Reinforce concrete cement ratio 1:2:4 with good watering (3 days).

Elevated stand steel foundation for vertical water tank:

- Supply material and install the elevated steel tower with stair to be fixed on Reinforce concreate base, the steel tower includes six main columns, Height 3 m. The tower shall relate to slope members made from angle steel on top, center and down. The tower should be supporting a total Weigh of 10,000 liter capacity and all loads. The surface of stand steel shall be made from smooth material to prevent cracking of the water tank. The tower includes Nuts, Bolts and painting the steel with anti-corrosive primer coat material.
- Provide good quality Paint for steel tower unit, the painting will be done in two to three coatings to ensure clean and adequate finishing.

Water tanks:

- The contractor shall provide and install two plastic water tanks (5000 liters) good quality.
- The water tanks shall be made from plastic material and shall be covered well and protected.
- The water tanks shall be fixed on the top of the stand steel with 3.0 m height and shall be in a vertical form.
- Water tank shall be made from Non-toxic material and the top cover of tank should not allow sunlight to enter the tank.

- The Contractor should paint the tanks with orange color and NRC logo on the two side of tanks according to direction of the site engineer.

Pipelines:

Pipelines need to be laid: a supply line to convey water from borehole in Infiltration Gallery to the storage reservoir and distribution line to take the water from storage reservoir to the distribution points.

The pipeline needs to be protected to ensure a lifespan of 20 – years. Recommendations for laying pipelines include:-

a) Preparing the trench: the nature of the ground will determine the choice of flexible or rigid jointed pipes .Flexible joints are preferred to rigid joints to allow for settlement which is likely .It is very important to ensure the alignment and bottoming up of the trench .Larges stone must be removed from the bed of the trench.

b) Back filling all the trenches in hard formation need to be backed filled with 200 mm of sand or any soft materials especially where the ground is stony, the materials of the back filling must be soft and cannot contained lumps of rock or large stones .The pipe should be covered with a minimum cover of soft materials.

c) Handling and laying of pipes: pipes must be handled with rope slings to preserve to protective coating and prevent puncturing which could lead to corrosion. Care must be taken, to ensure that the pipe ends ratline their circular shape. Upon delivery, every pipe must be inspected and rechecked before it is lowered into the trench.

d) Testing pipes: Pipeline should be tested in reasonable length leaving the joints exposed to view. The test involves filling the pipeline with water under pressure, which exerts pressure of about 50% in excess of the working pressure. it could also be of extra pressure of known value say 30m to 50 water head

Galvanized iron (GI) Pipes

GI are usually supplied with tapered threads at the ends with one straight connector per pipe. It is preferable to cut the pipe to length with a pipe cutter rather than hacksaw.

To enable pipes and fittings to be removed for repair, threaded GI pipes should be joined with screwed unions on at least one side of a valve or fitting and in long length (>100m) GI pipes have flinched joints . Flinch dimensions can vary widely so new fitting must be carefully matched to existing pipe work. Ensure that there are sufficient gaskets for each flange joint. GI pipes can be welded, but this should be reserved for critical joints and for making up adaptors and special fitting.

Firmly anchor exposed GI pipes using pipe anchors of steel and concrete .Exposed empty GI pipes can became very hot in a warm and sunny climate. Care must be taken when filling hot pipes with cold water as the sudden contraction can damage threaded joints causing them to leak.

The following precautions should be taken when handling and storing GI pipes:

- Protect the threads in transit and when loading and unloading as they can be easily damaged. A new GI pipe is normally bundled with a straight connector on one end and thread protector on the other
- In transit ensure connectors are firmly screwed on each pipe as they can vibrate loose.
- In hot, sunny conditions, store a GI pipe under cover as pipe may become too hot to handle.

Installation of submersible pump unit:

- The contractor will be responsible for providing expert Engineers and technicians for installing submersible pump.
- The contractor shall Provide and check truck Crane and all accessories before installing submersible pump unit in suitable depth, based on the attached pumping test report and the materials should be test before installing.
- The contractor shall secure the Borehole after installing submersible pump unit by covering the top of well.
- The contractor provides on-going report engineering support through completion of the Work.

Construction of distribution point:

- Distribution point should be able to accommodate Um Koaro water users, humans, and small livestock. Arrangement of all these to distribution points should facilitate water collection for the users and water supply provider. Distribution points are demonstrated.
- Maxing ratio of concrete according to BS.
- The contractor should construct one water stand for humans with wall and concrete slap and raised at 1.0 m wall with 10 taps I inch, 5 taps in each side with high quality according to attached BOQ and direction of site engineer.

- The contractor shall install a drainage system and plain concrete around water distribution points if needed.

Installation of solar system:

- The contractor shall provide a total of xx Solar PV-Module poly crystalline of 180 -200 Watts, or equivalent to the total power demand with junction box. The panel should have a period of warranty of up to 10 years.
- The contractor should provide inverters with good quality and warranty for at least 2 years.
- The solar panels should be placed, and spot welded in an elevated position with a height of at least 4-5m of the generator room to avoid stealing and damaging using beams 14 mm and heavy angles, 15-tilt angle with high stand and high wind speed (50km/h) the support fixed into line.

Construction of the Generator room and fencing:

- Size 3x3x2.5, the contractor shall fabricate and install 2 windows made with both expanded good quality metal and 30-gauge zinc sheet. The generator room should have one steel door and plain concrete floor (1:2:4) 10 cm thick. The room should be constructed for simple assembling and dismantling, and the generator should place on foundation 20 cm above the floor level**.**
- The solar panels should be in the top of the generator room according to BOQ and instruction of site engineer.
- The contractor should ensure that the generator room would be able to carry the loads of the solar panels stands, using beams on the four angles and heavy angle for solar panels stand.
- Construction of fencing for the Water Yard and the three Water distribution points.

A) GENERAL NOTES:

A1) MATERIALS AND WORKMANSHIP

All the work noted in this specification must be carried out to the highest standard which is normally possible, using only the best materials and most skilled workmen. Samples of all construction materials must be shown to a representative of NRC for written approval before starting construction. The contractor should pay his team and NRC will not be answerable to contractor's failure to meet his contractual obligations with his employees.

A2) SITE IN CHARGE

The CONTRACTOR must employee an experienced site-in-charge who must be on site to supervise the work at all times when work is Generally leave the whole area of the site clean, washed, tidy and ready for use.

B) BASIC MATERIALS:

B1) CEMENT

The choosing of cement brand must agree with a representative of NRC. All cement brought to the site must be fresh (manufactured within previous three months) and in perfect condition for use. All cement brought to the site must be stored carefully so that it remains in perfect condition. Storage must be a totally dry place with a platform of planks or bamboo to keep all cement 6" minimum height above the ground.

B2) COARSE AGGREGATE FOR CONCRETE

The first choice of coarse aggregate chosen by NRC is graded mountains gravel of suitable type and strength. The second choice of aggregate is broken stone of suitable type and strength. The source of aggregate should be clean and free from impurities and plant material. The shape of the aggregate should be mostly rounded with a small number, which are long or flat. If this type of aggregate is not available the CONTRACTOR must agree with a representative of NRC which other type to use.

B3) SAND

The sand must not contain mud, dust, or pieces of plants. The CONTRACTOR must make all efforts to obtain coarse sand (with zero fines). A sample of sand must be shown to a representative of NRC. For plastering, the sand must be sieved according to the NRC site Engineer's additional specification.

B4) WATER

Clean water should be used in all construction works especially for plaster or mortar. The CONTRACTOR must inform a representative of NRC as to the source of water used in all construction works.

C) WORKMANSHIP:

C1) CONCRETE WORKMANSHIP

All materials for concrete (cement, sand, aggregate and water) must meet the quality specifications set out in Section B above. The proportions of cement, fine river sand and aggregate must be determined by volume according to the following table:

Concrete Mix ($1m^3$)	Cement	River Sand	aggregate
1:2:4	kg	m^3	m^3
1:3:6	kg	m^3	m^3

Water/cement ratio quantity of water must not to exceed the following:

Concrete Mix	Amount of water
1:2:4	32 litres per 50kg cement
1:3:6	25 litres per 50kg cement

C2) WELDING WORKMANSHIP

- Contractor should provide the suitable welding machine and the machine shall be in adequate capacity to support the energy requirement for the work. Filler materials, electrodes, and wire should be provided by the welder and it should achieve the standard quality. The Welded area should be contoured to permit complete fusion at the sides of the bevel and to minimize slag inclusions. Flux and slag should be completely removed from weld beads by policing and from the surface of completed welds and adjoining base material. The flux removal should be done in a manner that will not contaminate or overheat the weld or adjoining base material. Weld reinforcement and finish with appropriate paint should be as required by the NRC representative. Undercutting of the base metal or roof material is not permitted. Welding process shall be free of cracks, cold lap, excessive porosity, slag inclusions, and other defects indicative of poor workmanship.