TERMS OF REFERENCE

Consultancy Services
For Development of
Preliminary Design, Final Design for and Conducting the Supervision of rehabilitation and modernization of irrigation and drainage schemes in (Tashiskari, Tiriponi, Zeda Arkhi, Zemo Alazani, Phase I, Narekvavi, Shavgele Massif)

Project Background

1. The Georgia Resilient Agriculture, Irrigation and Land (GRAIL) project is co-financed by the World Bank and Government of Georgia. The total project cost is USD 150.00 million comprising of an equal share of USD 75.00 million by each co-financer. The project development objectives are to: (a) improve irrigation, and drainage services, and agricultural production in project areas; and (b) strengthen national irrigation and land management institutional capacity for climate resilient planning.

2. These Terms of Reference are developed for consultancy services required for the implementation of the Sub-component 1.1, Irrigation and Drainage Infrastructure Rehabilitation and Modernization. The Sub-component is designed to finance rehabilitation and modernization of irrigation and drainage systems at main, secondary, and tertiary canal, collector and drain levels selected and shortlisted during the project preparation based on technical feasibility, economic viability and importance of irrigation and drainage to the agriculture production in the relevant command areas. The shortlisted schemes cover a command area of 26,687 ha and include: 1) Tashiskari (12,615 ha) and 2) Tiriponi (5,210 ha) in Shida Kartli region, 3) Zeda Arkhi (1,490 ha) in Kvemo Kartli region, 4) Zemo Alazani (6,110 ha) in Kakheti region, and 5) Narekvavi (655 ha) in Mtskheta-Mtianeti region, and a drainage scheme 6) Shavgele Massif (807 ha) in Samegrelo region. Currently all managed by "Georgia Amelioration" LTD State Company (GA).

3. Scope of works supported by GRAIL project will include rehabilitation, and modernization of headworks, main canals, distribution networks, collectors, and on-farm network. The existing system was designed and built for large and monocrop production areas of former *kolkhozes* and *sovkhozes*, while the modernized system shall consider the actual land distribution and potential cropping pattern. The following structures will be considered for rehabilitation and/or modernization across the five irrigation schemes: headworks; galleries; tunnels; inverted syphons; secondary and tertiary network (pipeline or lined); water control/distribution; outlets; mudflows; flood protection; flow and/or volumetric measurement structures, bridges, and other required ancillary structures. Works for drainage system include reshaping of the main collector, drainage network, rehabilitation/construction of required ancillary structures such as culverts and a pumping station.

4. Sub-component 1.1 will restore mainly previously irrigated and drained areas, and not build new schemes. While a large part of the rehabilitation will involve reconstruction of original systems, the preliminary and detailed design studies will systematically examine the opportunities to modernize water control and delivery structures, including automation of headworks or introduction of Supervisory Control and Data Acquisition (SCADA) to monitor and control water distribution in some of the larger canal systems. Wherever the adjacent topography allows for conversion of secondary and tertiary networks to pressurized systems, it will be considered for application of modern irrigation techniques (drip, sprinkler, etc.).

5. The project will also finance provision of a pontoon with submerged pump for sediments removal (dredging) from the Narekvavi reservoir.

Schemes shortlisted for development of engineering designs

Irrigation/Drainage Scheme	Area considered under the project (ha)	Headworks to be rehabilitated	Main canal to be rehabilitated	Network rehabilitation[1]
Tashiskari (irrigation)	12,615	Minor repair works + SCADA	YES	Full rehabilitation and modernization.
Tiriponi (irrigation)	5,210	No works + SCADA	Rehabilitation of dilapidated sections	Full rehabilitation and modernization.
Zeda Arkhi (irrigation)	1,490	Rehabilitation works + possibility for SCADA	YES	Full rehabilitation and modernization.
Zemo Alazani, Phase I (irrigation)	6,110	Necessary repair works for as it would be required + SCADA	YES, section of the main canal supplying water to selected command area. The design, however, shall consider assessment of technical conditions and cost estimation of the entire main canal.	Full rehabilitation and modernization of 12 secondaries (D-6, D-7, D14, D-29, D-34, D-39, D-42, D-58, D-61, D-75, D-90, D-93) and related tertiaries supplying water to the selected command area.
Narekvavi reservoir and respective irrigation system.	655	Complete reconstruction	YES	Full rehabilitation and modernization of irrigation system fed by Narekvavi reservoir. Provision of a pontoon with submerged pump for sediments removal (dredging) from the Narekvavi reservoir.
Shavgele Massif (drainage)	807	0	YES + a pumping station in intake basin on the main collector.	Full rehabilitation of the drainage network.

[1] This includes secondary and tertiary network down to farm gates. Secondary canals need to be rehabilitated and modernized, wherever feasible convert to pipelines for pressurized irrigation. Tertiary network is mainly unshaped earth ditches without engineering structures and need to be fully redesigned and built based on actual land distribution, current and potential cropping pattern.

Objectives of the Assignment and Scope of Services

The services are included the (i) development of preliminary design for the selected 6 schemes, (ii) development of the final design for the selected 6 schemes; (iii) assessment of existing design documents for Kvemo Samgori and recommendations on further implementation of rehabilitation works ; (iv) supervision of the civil works to be implemented based on the selected designs.

(A) preparing preliminary design for shortlisted schemes. The approach shall consider conversion of existing scheduled and low performing irrigation water supply systems towards modern, flexible and easy-to-operate systems. The new systems shall partly be downstream-controlled and operated according to the needs of a growing number of high value crops cultivating farmers, who can be enabled to adopt modern irrigation technologies such as drip and sprinkler. The new systems shall provide water measuring facilities from main to secondary and tertiary levels, currently operated by GA and in the future jointly by GA and Water Users Organizations (WUO). The preliminary design shall include technical inventory of current condition of the systems including schematic and detailed drawings of facilities, situational plan for the existing and new facilities with appropriate details, information on existing visible and registered facilities such as power supply, telecommunication, gas and water supply pipelines, etc. together with required technical conditions for passing them obtained from the relevant institutions owning such infrastructure, required technical surveys (hydrological-water balance, water quality, topographical, agricultural, land), rehabilitation and modernization plans/options that would allow for cost estimation and economic analysis (financial rate of return, IRR) for each option, social, environmental and land acquisition and resettlement assessment. The water balance should consider current and future climate conditions impacting water availability in the source to assess future risks to the scheme operation. Following through thorough discussions with GA and groups of farmers the final option for each scheme shall be identified and schemes ranked accordingly based on IRR, command area and number of benefitting smallholders farmers;

(B) developing detailed engineering designs for all the shortlisted schemes. Based on the budget availability, the schemes with highest ranks will be rehabilitated under the GRAIL project. Technical part of the Bidding documents for procurement of rehabilitation works will be developed for all shortlisted schemes, but these three should be considered for implementation on early stage of design phase, out of the ranks: Design for Shavgele Massif drainage scheme, Kvemo Samgori ready design review and update, if nessecary, and detailed technical specifications of pontoon submerged pump and all the other nessecary equipment for Narekvavi reservoir.

(C) providing technical supervisory services and taking the role of the Contract/Project Manager (on behalf of the Employer) under Civil works contracts to be signed by the Client .

Accordingly, the requested consultancy services consist of three main assignments:

Assignment A: Preparation of preliminary designs for shortlisted schemes, and final selection of schemes to be implemented in the framework of GRAIL project.

Assignment B: Preparation of detailed designs for the shortlisted schemes and technical part of bidding documents for the schemes selected to be implemented under GRAIL project. The key areas of required expertise for Assignments A and B include assessment of design for Kvemo Samgori, engineering planning, studies, surveys, investigations, development of technical specifications for pumps and all the other nessecary equipement for Narevkvai rservoir, design, cost estimating, economic and financial analysis, social, environmental and land acquisition and resettlement assessment, technical part of bidding documents preparation.

Assignment C: Construction supervision for ensuring quality, quantity, timeliness, and regulatory compliance of works. Estimated duration of this assignment is about 5 years starting from the second year of project implementation.

Assignment A: Preparation of preliminary designs and final selection of schemes.

General

This assignment covers the preparation of irrigation system modernization plans and preliminary designs, through a Consultative Design Process of improving and enhancing existing irrigation and drainage schemes to meet new performance criteria, cost estimation and economic benefits assessment and final selection of schemes to be considered under the GRAIL project. The purpose of system modernization plans is to lay out the main engineering design principles. They provide the foundation for investment decisions into the upgrading of irrigation systems and their associated components capturing changes in existing facilities, operational procedures, as well as management and institutional aspects. Modernization plans will be annexed by preliminary designs, and calculations, which underpin the proposed design principles and criteria. The Consultant shall conduct a close consultation process with GA staff, local authorities and water users at all levels and stages of the technical and operational engineering design process. The assignment includes all the required surveys and studies (hydrological-water balance, topographical, hydraulic, geological, agricultural, land, social, environmental, land acquisition and resettlement, etc.), the preparation of preliminary design options with required maps, drawings, cost estimation and economic and financial analysis for each option.

Irrigation Modernization Plans and Preliminary Designs

The Consultant shall develop Irrigation System Modernization Plans through a Consultative Design Process, which is stakeholder-inclusive and through which key technical, managerial, institutional, and other design issues shall be discussed and mutually agreed upon.

The following specific tasks and deliverables shall be considered:

(i) Conduct reconnaissance field visits to shortlisted schemes to obtain an updated in-depth understanding of the status of the systems.

(ii) Collect geo-referenced system data and information and store them in an Irrigation Information System, which is compatible with existing GA terminology, standards, and definitions, and regularly updated. Proposed layers or groups of layers shall include:

- Longitudinal profile of main canals, their service tracks, banks, and slopes of banks.
- Review and update all existing typical hydraulic structures of main canals, as surveyed: (structures for conveyance, control, safety, local road, drain, gas and drinking water pipelines, power transmissions and railroad crossings, etc.).
- Existing secondary and tertiary canals: all alignments of existing canals and drains as surveyed if canal and drain to be maintained or rehabilitated and all related hydraulic structures.
- The drainage systems and all related hydraulic structures including collectors (dug drains), natural drains, ponds, any existing reservoirs as surveyed or observed on orthophoto's and local road, gas and drinking water pipeline, power transmissions and railroad crossings, including the drainage catchment areas.
- Land holding situation: combine the geodatabases of registered plots (Cadaster database) , assuming that all agricultural plots will be irrigated.
- General layers with roads, rail roads, pipeline alignments, topographic map 1/10000, satellite images, available orthophoto coverages, additional topographic maps, selected existing land use (industrial area, built areas, cemeteries, forests, etc.).

Deliverable 1: Irrigation system database meeting GA Geographical Information System (GIS) standards, structure, and specifications; including existing topographical information provided by the Client, if any. If no topographical information is available the consultant will conduct it.

(iii) Produce base maps at a workable scale showing topography, ownership or subdivision boundaries, and a soil survey map by means of Geographical Information System:

- Produce overlays of a preliminary irrigation layout of main, secondary, and tertiary networks.
- Delineate proposed layout of farms and proposed irrigation services areas.
- Identify preliminary irrigation services areas at tertiary and secondary levels; based on principles of hydraulic consistency, operational simplicity, and effectiveness of irrigation service delivery.
- Identify coherent agricultural water management zones and characterize them based on existing and future cropping patterns based on climate change predictions, farm typology and socio-economic conditions.

Deliverable 2: Thematic atlas of irrigation and drainage systems including agricultural water management zones and irrigation service areas and congruent with identified farm boundaries.

(iv) For each agricultural zone,

- Determine irrigation service needs and system duties including peak irrigation supply needs to meet calculated crop water requirements (ETc) considering field irrigation technology-specific efficiencies and irrigation service standards that are considered by GA for institutional development provided by the Client and acceptable to water user and other stakeholders).
- Develop options for on-farm water application for the farmers. Suggestions for on-farm water measurement facilities such as portable weir or flume, other relevant devices, as well as introducing renewable energy booster pumps (i.e., solar) options for farmers to reduce their energy cost when applying modern irrigation techniques.
- Assess service delivery constraints based on a full review of the discharge capacity of the main, secondary, and tertiary systems.

(v) Define quality of water delivery services (reliability and flexibility) at the “handoff point” where the GA relinquishes control of the water; define of the service needs in terms of adjustable water deliveries by turnout; advance request time for flow rate changes,

- Define irrigation peak flow rate and service delivery plan including any aggregated supply and demand projections based on the monthly hydrological (water balance), precipitation and climate data of at least for last 15 years assuming reliability of 80% and delivered within 10% accuracy of what is promised.
- Determine the volumes of water delivery needs at the "handoff point" based on the assessed hydraulic discharge capacity of the main and secondary system.

(vi) Topo- geological studies,

- Prepare full topography survey of the whole area in all necessary scales which will be usable on detailed design stage.
- Evaluate geological condition of the whole area which will be scaled up with details on the detailed design stage.

(vii) Propose technologies for physical components of main canal water delivery modernization considering,

- Water level control with long-crested weirs.

- Flow measurement at different levels using Replogle flumes, meter gates, and re-designed sluice gates, flow gauging equipment , if required.
- Possible telemetry for remote monitoring. Remote operation and control of gates wherever possible shall be considered.

(viii) Establish minimum permissible irrigation performance standards for farm level irrigation technology and associated system components.

(ix) Prepare preliminary designs and layout maps of main, secondary and tertiary irrigation system levels and field irrigation systems. Specifically,

- Drip systems - orchard and vine systems (emitters type pressure compensating, non-pressure compensating, design flow rate, pressure difference between emitters throughout a field; minimum wall thickness of tape; minimum field uniformity; maximum hole spacing; chemical and fertilizer injection system, filtration, easy flush out capability, etc.
- Center Pivot sprinkler systems (filtration, minimum clearance above the crop, sprinklers equipped with individual pressure regulators, with a discharge pressure no higher than 1.7 bars, pump discharge pressure, etc.).
- Improved and preparation of surface (furrow) irrigation (maximum slope, maximum lengths of furrows, spacing, maximum irrigation depth and time, cut-off, etc.).

Deliverable 3: Irrigation modernization plans and basic service delivery plans by irrigation zone and aggregated to scheme level.

(x) Develop alternative solutions for rehabilitation and modernization works in a technically sound and cost-effective manner, considering the most likely socio-economic development and modernization scenarios in the system. This shall include different options for canal lining including the use of geo-membranes and other global technologies that can be adopted in Georgia context. This shall consider analysis of lifetime and maintenance opportunities of such proposals. Discuss the preliminary ideas with all relevant institutions (GA and MEPA) in Design Meetings (commissioned by the Client) through a structured process using maps and other aids. Assess and discuss the pros and cons of each alternative. The design shall consider the need for low cost, robust construction that is simple to implement and to operate and maintain. The final choice for proposed rehabilitation/construction shall be based on technical and financial analyses of alternative designs and, most importantly, on the opinions of the beneficiaries, obtained by thorough discussion with them.

(xi) Develop technical specifications for procurement of pontoon submerged pump and ancillary equipment for the Narekvavi reservoir sediment removal. Technical parameters of pump, required training for operation of GA staff, and need for spare parts for at least 5 years reliable operation need to be discussed and agreed with the GA[2].

(xii) The design documents for Kvemo Samgori irrigation scheme shall be reviewed and recommendation for considering it in the frameworks of GRAIL provided

Deliverable 4: Alternative solutions report.

(xiii) Produce irrigation system designs including principles of operation, in line with the indicated respective operators: GA, farmer (WUO in the future) and including the determination of the flow rate, flow control on the level of the main canal, secondary and tertiary blocks and

[2] Documents for development of bidding documents for pontoon pump, installation, spare parts and training shall be completed and handed over to PIU for proceeding with procurement.

proposal for the use of proportional distribution and the transition from proportional to rotational distribution. This includes the hydraulic modelling of the main canal based on design survey data. Together with the deliverable #6 the consultant should submit the minutes of the meetings with farmers and GA.

(xiv) Draft typical designs for:

- For all 6 schemes, All main, secondary, and tertiary irrigation and drainage (if needed) channel sections, headworks, access, control and feeder roads, distribution, and other hydraulic works, cross sections, road cross-sections, drainage cross sections and bridges–based on participatory tertiary infrastructure rehabilitation and modernization plan.
- For all 6 schemes, All on-farm irrigation inlet, drainage outlets, plot levelling works and erosion control measures.
- Sample drawings and operation manual for portable weirs or flumes that might be financed and provided to farmers group for on farm water measurement under the Sub-component 1.2.

Deliverable 5: Preliminary system design report including system layout GIS layers "As Designed", the hydraulic model files of the main canal.

(xv) Prepare site-specific environment and social management documents for construction and operation phases of schemes selected for rehabilitation. Based on the environmental and social screening of individual investments undertaken by Clinet and identification of the types and cope of environmental and social management documents required for each investment, the Consultant shall undertake field assessment of the expected environmental, social, health and safety impacts of the designed works, work out site-specific measures for mitigating negative impacts, and draft Environmental and Social Impact Assessment (ESIA) report along with an Environmental and Social Management Plan (ESMP) or a self-standing ESMP and a Resettlement Action Plan (RAP) as need may be in accordance with the Clinet's Environmental and Social Framework and Environmental and Social Commitment Plan of the GRAL project, the World Bank's Environmental and Social Standards applicable to the project, and the relevant national legislation of Georgia. Assist the Clinet in organization and conduct of public consultation on draft ESIAs, ESMPs, and RAPs unless the consultation process is led by the National Environmental Agency (NEA) for activities requiring issuance of an Environmental Decision. Incorporate feedback received through the public consultation process and the Client into the environmental and social documents and finalize them thereafter by attaching detailed account of the consultation process, including dated photo documentation from the consultation meetings. The detailed outline of an ESIA report, a self-standing ESMP and a RAP are given in the GRAIL project ESMF.

Deliverable 6: An ESIA report including ESMP or a self-standing ESMP and, if required, the RAP for all individual schemes selected for the GRAIL project intervention finalized through the public consultation process.

(xvi) Prepare and agree on all design principles with GA and farmers following the philosophy of ensuring water service reliability at agreed accuracy, optimizing economic benefits, social acceptance, and ensuring environmental compliance and "no regrets" solutions.

(xvii) Discuss all the pros and cons of each alternative and include it in the presentation. The consultant is to obtain a formal selection and approval of the design to be applied through a structured process.

(xviii) Estimate cost of proposed works and economic analysis (Financial IRR) for each alternative, if significantly different, for each shortlisted scheme.

(xix) Rank investment proposals by the set of prioritization criteria. The table below suggests scoring and ranking of shortlisted schemes based on the outcomes of the preliminary design stage.

Value	Reference Points	Score
Financial Internal Rate of Return (IRR)		
10-15%	10	
15-20%	30	
More than 20%	50	
Command Area		
Less than 5,000 ha	10	
Between 5,000 and 10,000 ha	20	
More than 10,000 ha	30	
Number of benefitting households (smallholder farmers with less than 5 ha land)		
Less than 30% of total number of farmers	10	
Between 30% and 50% of total number of farmers	15	
More than 50 % of total number of farmers	20	
TOTAL (max. 100)		

Deliverable 7: Summary report of preliminary designs, typical designs, scoring and ranking of shortlisted irrigation schemes[3], based on budget availability proposals for schemes final selection and statements of approval by Client.

Assignment B: Preparation of detailed designs for selected schemes.

General

This assignment includes preparation of detailed designs for the agreed options for shortlisted schemes and bidding documents for schemes selected to be implemented under the GRAIL, additional investigations, civil and electro-mechanical works, construction plans and implementation schedules.

Detailed Design

The civil works will be procured in accordance with the FIDIC Red Book Standard. Thus, the detailed design shall be prepared in accordance with the Resolution No. 57 dated 24.03.2009 on the Rule of Issuing Construction Permits and Permit Conditions of the Government of Georgia and terms of use for

[3] Shavgele Massif drainage scheme shall pass the detailed design and implementation phase without ranking if it is proved to be economically viable during the preliminary stage study.

the construction of the land plot, in compliance with the existing design guidelines (SNiP 2.06.03-85 for amelioration systems and structures), other relevant standards and updated Government resolutions on design documents contains. Final design documents shall pass independent expertise review as per the applicable law of Georgia.

6. Towards preparation of detailed designs for civil works, including mechanical and electrical components:

(i) Verify the hydraulic calculation of the main canal starting from the trash racks of the intake gates including proposed modifications, and propose sediment traps, flow and level regulating and measuring structures, flow partitioning structures with flow meters at major secondary canals, modification of the outlets for piped systems.

(ii) Consider open canal systems as applicable for secondary and tertiary blocks and all flow control, partitioning, conveyance, and safety structures. This includes hydraulic calculations, with the insertion of flow, water level control and flow measurement according to the approved system principle of operation. These designs are based on terrestrial surveys.

(iii) Design of pressurized pipe systems for secondary and tertiary blocks and zones for hose, drip and sprinkler irrigation as applicable including filters, escapes and flushing provisions, based on topographic map 1/10000, verified on accuracy of contour lines.

(iv) Consider pipe systems for low pressure and free surface flow in combination with concrete structures including filters and flushing provisions, as above, based on topographic map 1/10000, verified on accuracy of contour lines.

(v) Take into account the service track rehabilitation required for operation and maintenance of canals and the associated canal and drain crossings.

(vi) Consider the drainage system and associated road crossing structures, chutes and stilling pools including tail drains of canal and pipe systems, interceptor drains and stabilization of erosion gullies, will require additional site surveys.

(vii) Consider all tertiary irrigation canals and drains, access, service and feeder roads, distribution and other hydraulic works, cross sections, road cross-sections, drainage cross sections and bridges. These will be based on the participatory tertiary infrastructure rehabilitation plans developed on participatory manner and based on modular interventions (one of the typical irrigation systems, access tracks, wind breaks, drainage systems).

(viii) Consider all irrigation outlets with flow measurement structures wherever required as per the agreed operational plan.

(ix) Consider all other infrastructure crossings (gas and potable water pipelines, railway, roads, power lines, internet, etc.) and get relevant technical permissions and technical solutions.

(x) <u>Propose SCADA system for monitoring (where feasible also controlling) flow rates water levels.</u> This includes:

(i) Providing the corresponding GIS/AutoCAD layers “as designed”, using approved symbols and attribute table formats:

i. Intake structure and main canals and each of its typical structures
ii. Secondary canals and each of its typical structures
iii. Tertiary canals and each of its typical structures

iv. Tertiary infrastructure such as service tracks, wind break areas, drains and collectors and the associated structures.

(ii) Providing a design manual describing the applied design methods, criteria, and parameter values.

(iii) Routine hydraulic calculations for canals (excel spreadsheet).

(iv) Pipe networks (one EPANET or other similar software project for each pipe system).

(v) Structural calculations, "statics".

(vi) Typical datasheets for all proposed materials.

(vii) Technical specifications. Elaborate the technical specifications, as per Georgian and International Standard Technical Specifications, for construction for quality control of each of the constructions works in the cadaster of works:

- Purpose and brief description of the works.
- Location of the site.
- General meteorological information
- Site specific/precise geological study
- Access to the site.
- Drawings and calculations.
- Required groundwork and all other materials included in the design.
- Conditions, norms and tolerance under which the works will be implemented.
- Specific conditions of the construction site. Standard of workmanship, materials and performance of the goods to be procured or constructed.

Deliverable 8: Detailed design report, supported by detailed design files (in English and Georgian) and drawings (bilingual) as described above.

Bill of Quantities (BOQ)

Prepare the detailed Bill of Quantities (BOQ) and confidential designers estimate. The BOQ shall be produced in a standard format provided by the Client with BOQ per structure with GIS index numbers referral.

Deliverable 9*:* Detailed BOQ and confidential designers cost estimate report.

1.Prepare the Operation and Maintenance Plan for each level of operation of the system including cost estimates, define the standard maintenance procedures, schedule of routine and periodic maintenance procedures, determine the requirements for maintenance personnel including job descriptions and required qualifications and machinery for GA and planned/suggested WUO in the future.

2.The final version of the O&M manual shall be prepared outlining separately operation and maintenance activities.

3.The O&M manual shall give the nature of periodic inspections to be made, physical interventions to be made by way of preventive and curative maintenance to be carried out every year, data to be collected, and records maintained.

4. The O&M procedures should be detailed (separately outlining O&M activities and periodicity) and those should be doable to maintain integrity of the structures for their design life.

Deliverable 10*:* Operation and Maintenance Plan and relevant Manual.

Prepare technical part of Bidding Documents and submit five hardcopies (for each language) and corresponding electronic versions in Georgian and English languages, in pdf and Word, Excel, AutoCAD or ArcGIS 10.2 or other formats as agreed).

- Explanatory note including brief annotation of the design, hydrology and design solutions, hydraulic and all the engineering calculation, construction schedules[4], necessary machinery.
- Maps.
- Drawings (detailed construction and engineering drawings).
- General and Technical specifications.
- BOQ with items definitions.
- Results of preliminary design research - inventory - topogodetic, alienation area, engineering communications, preliminary permit (permission) documentation, evaluation of previously processed technical documentation and etc.
- Recommendations for construction organization and technology.
- indicative calendar plan for the production of works, taking into account the implementation of the construction stage;

Deliverable 11: Full set of the technical part of bidding documents as Final Deliverables.

Deliverables and Reporting

The Consultant shall report to the Client and submit draft and final deliverables in English and Georgian (5 hard copies of each and electronic versions) on dates indicated below:

Deliverable	Submission Dates
Deliverable 1: Irrigation system database meeting GA Geographical Information System (GIS) standards, structure and specifications;	Within 5 days after completion of the first month of the commencement of the Consultancy services.
Deliverable 2: Thematic atlas of irrigation systems including agricultural water management zones and irrigation service areas and congruent with identified farm boundaries. Detailed topographical survey.	Within 5 days after completion of the second month of the commencement of the Consultancy services.
Deliverable 3: Irrigation modernization plans and basic service delivery plans by irrigation zone and aggregated to scheme level	Within 5 days after completion of third month of the commencement of the Consultancy services.

[4] During preparation of construction schedule the Consultant should take into consideration the fact that the intended civil works are mainly rehabilitation and improvements of existing systems and that some of these systems should be kept operational during the irrigation season (May – September). Thus, during the irrigation season, it should be considered that irrigation water continues to flow to the beneficiaries and there will be no interruption in irrigation service provision. Accordingly, the works shall be planned considering the irrigation season constrain.

Deliverable 4: Alternative solutions report. Review of design documents for Kvemo Samgori irrigation scheme and recommendation for considering it in the frameworks of GRAIL provided to Client	Within 5 days after completion of fifth month of the commencement of the Consultancy services. **Revised detailed design and technical part of bidding documents provided to MEPA within 4 (four) months from the commencement of the Consultancy services.**
Deliverable 5: Preliminary system design report including system layout GIS layers "As Designed", including the hydraulic model files.	Within 5 days after completion of seventh month of the commencement of the Consultancy services.
Deliverable 6: ESIA reports including ESMPs or self-standing ESMPs and RAPs as required, for each individual scheme selected for investment under the GRAIL.	**The details of this deliverable is provided in the GRAIL project ESMF.** Within 5 days after completion of eighth month of the commencement of the Consultancy services.
Deliverable 7: Summary report of preliminary designs, typical designs, cost estimations, financial and economic analysis, scoring and ranking of shortlisted irrigation schemes. Based on budget availability proposals for schemes final selection and statements of approval by the Client	Within 5 days after completion of thirteenth month of the commencement of the Consultancy services.
Deliverable 8: Detailed design report, supported by detailed design files and drawings as described above.	Within 5 days after completion of fifteenth month of the commencement of the Consultancy services.
Deliverable 9*:* Detailed BOQ and confidential designers cost estimate report.	Within 5 days after completion of fifteenth month of the commencement of the Consultancy services.
Deliverable 10*:* Plan of Operation and Maintenance including training plan for the GA district level staff and farmers.	Within 5 days after completion of sixteenth month of the commencement of the Consultancy services.
Deliverable 11: Full set of technical part of the bidding documents.	The full set of technical part of the bidding documents for schemes selected for implementation under the GRAL project as Final delieverables. It shall be submitted no later than within 5 days after completion of twentieth month of the commencement of the Consultancy contract. The documents set for each selected scheme shall be submitted separately when ready. The highest priority shall be given to the

	documents for drainage scheme (Shavgele Massif) and TS for pontoon submerged pump for Narekvavi reservoir. For the schemes that are not selected, the design documents shall be submitted within 5 days after completion of twenty forth month of the commencement of the Consultancy services. within one week after receiving comments from the Client.

Additions to Deliverable 1:

1. All data must be submitted in a soft copy both raw data files and as ACAD point files.
2. All drawings must be presented only in A3 format and must be submitted as a hard copy, as soft copy in pdf and in dwg format and in Arc-gis compatible format.
3. The Consultant shall submit a proposed layout of drawings for approval.
4. The Consultant shall submit:
    - An ACAD file with the center line of the canal being a continuous 3D polyline and showing the spot elevations (point lists included) and the 3-d model generated to extract the cross sections.
    - An overview map of the alignments of all main and secondary canals and pipelines in ACAD and GIS compatible format.
    - Canal alignments: drawings in dwg format, ArcGis compatible format and pdf format (in separate files and in one binder) in A3 format, both digital version and one hard copy print out of the pdf format.

      These drawings should show from top to bottom:

        (1) The plan view of the canal alignment at the scale of 1:2000 (one drawing on an A3 sheet representing about 750 m of canal per drawing). The drawing should reflect reference points with coordinates, the centerline, bed and side slopes, the location of the cross sections (with coordinates of the point on the center line of the canal, the spot elevations taken, the associated structures in top view (derived from the sketches). The above should be shown on a strip of the official topographic map 1:10000, 100 m wide, (50 m on either side of the center line of the canal), presented at a scale of 1:2000 as transparent on background. The Consultant can present alternatively to present a strip of areal or satellite imagery of equal width. The required resolution of the imagery must be 0.5 m or better.

The Consultant is required to present a sample for approval prior to preparing the drawings.

(2) The corresponding longitudinal profile at a scale 1:2000 H and 1:100 V (or other scale if required), showing top banks, the bed elevation, the location of structures with their ID reference connected with drop lines to the canal design table.

Assignment C: Technical Supervision Services

This assignment covers the provision of Construction Technical Supervision Services and includes support to the Client under Sub-component 1.1 and civil works contracts management, communication with respective local authorities and other stakeholders.

Objective of Consulting Services

The overall objective of construction supervision is to provide professional control over the rehabilitation/construction works ensuring high quality of works, adherence to the terms of construction execution provided in the works contracts, compliance with the relevant environmental, social, health and safety requirements of the national legislation of Georgia and the World Bank as well as ESCP, ESMF, site-specific environmental and social managements documents of the Client, and compliance with the detailed design and specification requirements which, in its turn, will result in reliability, long-term sustainability, and efficient operation of the rehabilitated/constructed assets.

The Consultant shall supervise the rehabilitation works for selected schemes, and act as the Project Manager (PM) on behalf of the Client (GA and MEPA) in accordance with the provisions of the above-mentioned contracts signed between the Client and the Contractors to ensure:

(i) Adherence to the requirements of valid final design, specifications and performance standards by implementation of the provisions of the technical specifications and PM functions specified in Civil Works contracts.

(ii) High quality of construction in adherence to the valid standards, regulations and laws of Georgia and international standards and best practices.

(iii) Completion of works in accordance with the construction schedules and contract prices of the works contracts.

(iv) Adherence to the national environmental, social, health and safety legislation of Georgia, Environmental and Social Standards of the World Bank applicable to the GRAIL project, ESCP and ESMF of the Client, site-specific environmental and social management instruments prepared by the consultant and approved by the Client, and Contractor's ESMPs.

Scope of Consulting Services

Organization

1. The overall administration, execution, and oversight of the civil works to be implemented under the GRAIL will be undertaken by three entities which will fulfill the roles of (i) Client, (ii) Contractor, and (iii) Technical Supervisor (Consultant) respectively. The Client will assume the contractual role of Client, on behalf of the Borrower, and act as the Implementing Agency, to perform day-to-day administration of the Project. The Project Manager shall be the Client's legal representative, as identified in the contract between the Client and Contractor and assumes the overall responsibility for professionally supervising the activities and works undertaken by the Contractor– on behalf of the Client. The Consultant shall provide the services described in these terms of reference.

2.The Consultant shall supervise the construction contract and ensure that the works are constructed in accordance with the provisions of the work contract. In the function of the Project Manager the Consultant shall make all engineering decisions required for the successful and timely implementation of the civil works contracts and have all powers, which are assigned to the Project Manager, according to the Client - Contractor Agreement and the Client - Consultant Contract.

3.The Consultant shall be directly responsible for day-to-day supervision and immediate contacts with the works contractor. The Consultant shall closely liaise with the Client to solve any issues that may arise during civil works implementation. GA will facilitate implementation of irrigation schemes rehabilitation/modernization through its Headquarter and regional service offices. GA engineers will review and endorse design documentation submitted by the international consultant related to modernization of the irrigation and drainage schemes as well as the quality of works implemented. GA engineers will also be involved in the assessment any design adjustments proposed by the construction supervising company or contractor company, and actively participate in the discussions with farmers on proposed design changes.

4. The Consultant shall ensure strict adherence of contractor to the requirements of the detailed designs, technical specifications, the Client's ESMPs and RAPs and the contractor's ESMPs.

5.The Consultant is responsible for mobilizing a team in compliance with the requirements and phases outlined in these TOR. The Consultant shall undertake the general and specific tasks for supervision of works, inspection and installation of the equipment, testing of construction materials, and monitoring the implementation of ESMPs and RAPs in order to ensure terms of works and the goods supplied in accordance with calculations, specifications, terms and conditions of civil works, as well as assist in the start-up of the new works, monitor the facilities for defects during the liability period and confirm that defects are remedied.

6.Should the works contract require a change/adaptation/amendment, the Consultant (in the function of PM) shall prepare the relevant amendment to the design, a "variation order", agree a price for the change with the contractor, draft an amendment to the Bill of Quantities, and submit all to the Client for approval. This shall be done over a ten-day period after receiving the relevant request.

General Tasks

7.The Consultant shall ensure that works are undertaken in accordance with the quality requirements specified in the works contracts including detailed technical specifications, the Client's ESMPs and RAPs, and the contractors' ESMPs and as required by the quality assurance system. As necessary, the Consultant shall assist the Client in overall contract management and approval of the "as built" drawings prepared by contractors.

8.Prepare a construction supervision program to be undertaken at the early stage of service delivery.

9. Prepare construction supervision manual and check lists to be used for supervision and use field Environmental and Social Monitoring Checklist included in the Client's ESMF.

10. Ensure that (i) works are undertaken in a safe environment, (ii) contractors undertake and document construction site risk assessment in a meaningful manner and enforce compliance with occupational health and safety (OHS) rules by their personnel, and (iii) OHS training and toolbox talks are delivered on regular basis.

11. Ensure that the construction methods and materials used by the contractor meet the technical requirements specified in the works contracts. Carry out technical inspection by making measurements to check work quantities, recording, and keeping relevant files of rehabilitation works and certify in accordance with the typical forms (including daily, weekly, monthly recording and reporting tables) elaborated by the Consultant and approved by the Client.

12. Conduct practical training for GA district level staff and farmers as per the agreed Operation and Maintenance Plan.

13. Make a daily technical supervision register of works, implemented by the contractor and information on arrangements for correcting defects (if any) together with notes and photo/video materials regarding construction quality. Obtaining and concluding the phases of completed works with proper documents (certifications for covered/hidden works, tests, and other documentation).

Specific Tasks for Construction Supervision

14. The main, but not limited, tasks that the Consultant shall carry out under the direct guidance of the Client are:

(i) Inspect quality and quantity of earthworks: trench's cross sections, sand bedding, backfilling, quality of compacted fills, etc.

(ii) Supervise progress of concrete and reinforced concrete works. Inspect formwork dimensions, installation accuracy, quality, location of reinforcement and embedded parts, review of mix design, proper placement of concrete and testing resultant concrete strength.

(iii) Supervise installation and repairs to the precast reinforced concrete constructions as well as inspection of dimensions, quality and placement of reinforced concrete elements, joint fillers, pads, water stops and other materials.

(iv) Supervise pipelines and structures site testing in accordance with Georgian and internationally accepted procedures.

(v) Inspect certificates of construction materials and equipment used during construction (reinforcement steel, metalware, pre-cast reinforced concrete elements, wooden materials, etc.); correspondence of data on sample analysis (carried out by the manufacturer in the factory) and laboratory tests to the requirements of the technical specifications.

(vi) Check the compliance certifications of the construction material, consumed in construction (cement, aggregates, additives, reinforcement, metal constructions, precast concrete etc.), check compliance of entrepreneur's factory sample analysis and laboratory testing data with requirements of technical specifications.

(vii) Review and approve shop drawings of equipment and fabrications to be provided as required by the technical specifications and ensure that installed equipment meets the specifications.

(viii) Furnish all revisions and detailed drawings as necessary during the implementation of the contract.

(ix) Check "as built" drawing prepared by the contractors for all works as construction processes.

(x) Provide regular oversight on environmental, social, health and safety performance of contractors, advise contractors on good environmental and social performance and application of the prescribed impact mitigation measures, identify and document infringements of ESMP requirements and provide contractors instructions for corrective action, report tangible or persisting violations of environmental, social, health and safety requirements by contractors to the Client and facilitate written communication to contactor's administration on these issues, advise the Client on the need to apply remedial actions in case of persisting incompliance by contractors, fill out field Environmental and Social Monitoring form at least once month for each active worksite and supplement it with photo documentation.

(xi) Ensure strict adherence of contractors' performance to the national OHS legislation and the alignment with the World Bank's Environmental and Social Standard . Advise and supervise contractors on the assessing and documenting construction site risks; request contractors to update risk assessments as required; guide contractors in creation and maintenance of safe environment at worksites; provide recurrent control over strict adherence to OHS rules; identify incompliances with OHS rules and instruct contractors on the corrective action; recommend the Client on a need for suspending works in case of high danger and significant health and life hazards emerging at worksites; discuss and agree with contractors plans for OHS training for personnel and ensure delivery of this training; ensure delivery of OHS toolbox talks at the beginning of each work shift. Work closely with contractors and the Client on the preparation of Root Cause Analyses and Corrective Action Plans (CAPs) on any OHS incidents that may occur at worksites and follow up on the implementation of CAPs.

(xii) Ensure that contractors and their subcontractors have concluded work agreements with all their personnel and have each employee sign and understand the contractors' Code of Conduct. Follow up on the adherence to the Code of Conduct by contractors and their personnel. Ensure that contractors have established Grievance Redress Mechanism for workers and keep it operational.

(xiii) On a regular basis to update local community and water users about the progress of construction works and if any concerns are raised duly report them to MEPA/PIU with written and documented notes and work with GA and MEPA to resolve emerging issues raised by the communities.

(xiv) Ensure that any changes in design or new social, environmental, health and safety impacts arising because of conducted works are reflected in amended ESMPs and RAPs, if applicable, and the amended Environmental and Social documents are forwarded to Client and World Bank for approval.

(xv) Monitor implementation of RAPs (in case of RAP). Ensure that no civil works that entail impacts on private land, assets, or incomes begin prior to implementation of RAP and adequate compensation to affected persons. Notify Client in case civil works are initiated without implementation of the RAP. Notify Client about any social issues that might emerge during the construction period, like grievances/complaints from communities, construction impacts on third-party structures, etc. and ensure mitigation measures are applied timely and aligned with the World Bank' Environmental and Social Standard 5. Ensure any damages caused by civil works are adequately restored prior to commissioning of works.

(xvi) Ensure that all project-related grievances are adequately recorded, tracked, and addressed, or referred to the Client if they cannot be resolved locally.

(xvii) Keep an engineering supervision book (which would include a file of digital images) including daily registering works executed by the contractor as well as remarks related to the construction quality and elimination of defects. Certifying the phases of completed works in compliance with the form worked out by the Consultant and approved by the Client.

(xviii) Review and confirm of contractor's payment certificates prior to submission to the Client.

(xix) Review, verify and make recommendations to Client for any requests for variation or change orders, and contractor's claims.

(xx) Prepare Final Payment Certificates, taking Over Certificates, and Performance Certificates, to the timing of, and as required by, the contracts, and advising the Employer on the release of all contractors' securities and retentions; and monitor performance of the Contractor during the Defects Notification Period.

(xxi) Assist in the resolution of disputes, as necessary.

(xxii) Submit periodic reports to the Client in accordance with the requirements outlined below.

Reporting

1. Inception Report – indicating initial progress, course of activities and any proposed changes to the supervision work plan, including a construction supervision manual (program of supervision works) - 2 months after Contract commencement.

2.Monthly Construction Progress Report summarizing progress with the construction activities, problems encountered, updated planning, status of environmental, social, health and safety compliance documented by filling out of the monthly Field Environmental and Social Monitoring form and supplemented with photo documentation, and any outstanding issues deemed important by the consultant - within 7 days of each month. These reports would have appended to them the daily technical supervision register of works, act on hidden works and filled out monthly environmental monitoring forms.

3.Special reports as may be required if there are one or more problems that require immediate attention of the Client.

4.Immediate reports to the Client on any OHS accidents that have resulted in damage to the health and wellbeing of workers and project-affected communities.

5.Quarterly report on the period of work indicating progress on each subproject, course of activities, implementation of the Client's ESMPs and RAPs and contractors' ESMPs, and grievances/complaints from communities, construction impacts on third-party structures, etc. and any proposed changes to the work plan - within 7 days of each quarter.

6. "As built" drawings prepared by Contractor and confirmed by the Consultant.

7. Final Project Completion report including certification that all equipment and works conform to the specifications and volumes identified in the contract and meet the performance guarantees and the analysis of the negative residual environmental and social impacts - Within 30 days after receiving of signed civil works' hand over agreement.

Note: All deliverables shall be submitted separately for each selected system in 5 (five) hard copies and the soft copies in Georgian and English languages in pdf and original format with most functional content.