

**SAMOA CLIMATE RESISTANT TRANSPORT PROJECT (SCRTP)  
TERMS OF REFERENCE FOR DESIGN AND SUPERVISION SERVICES OF RIVER CROSSING  
REPLACEMENTS AT AFEGA BRIDGE, UPOLU & LANO FORD, SAVAI'I**

**A. PROJECT BACKGROUND**

The Independent State of Samoa (Samoa) is a small and remote Pacific Island Country (PIC) with a population of approximately 197,000 people. Samoa consists of the two large islands of Upolu and Savai'i, and eight smaller islands, and has a total land area of approximately 2,935 km. Like many PICs, Samoa is vulnerable to extreme weather events. The Pacific-Australia Climate Change Science and Adaptation Planning Program (PACCSAP) has suggested that the frequency and intensity of extreme weather and climate events, such as heavy rainfall, strong winds and storm surges is increasing, a trend projected to continue throughout the region.

In 2013, Cabinet approved a plan to strengthen the climate resilience and longevity of road assets throughout the country and is taking steps to strengthen the resilience of Samoa's economic assets to extreme climatic events. Building on this, in late 2017 the Government adopted the Vulnerability Assessment (VA) and Climate Resilient Road Strategy (CRRS) prepared under the Pilot Program for Climate Resilience of the Strategic Climate Fund financed Enhancing the Climate Resilience of the West Coast Road (CRWCR) project, which identified hazards and prioritized areas for investment in the transport sector.

**The Samoa Climate Resilient Transport Project (SCRTP):** will help support the Government of Samoa (GoS) to improve the climate resilience of the road network and in the event of an Eligible Crisis or Emergency, to provide an immediate response to the Eligible Crisis or Emergency. The support envisaged through the financing takes into consideration the identified sectoral strategies to help improve the climate resilience of the road network. The project will also support key assistance required to contribute towards effectively managing climate resilient road sector assets.

**Component 2:** of SCRTP involves the study, design and construction of identified priority road and bridge assets to improve their resilience to climate-related hazards and/or events using the recommendations of the VA and CRRS. The VA and DFAT-funded Bridge Condition Assessments<sup>1</sup> have highlighted the vulnerability of several bridges, culverts and fords on both Upolu and Savai'i due to aging, poor condition and climate change impacts. ERAP is funding improvements to a total of six major and minor crossings, but there is an urgent need to continue the program of replacing crossings that are no longer fit for purpose. SCRTP sub-component 2.3 will finance the replacement two crossings.

**B. AFEGA BRIDGE AND LANO FORD REPLACEMENT**

**Afega Bridge, Upolu:** Afega Bridge is the only bridge along the WCR, and crosses the Aleisa River. The existing bridge is a 15m long single span reinforced concrete structure comprising an in-situ concrete deck on 15 precast concrete beams on concrete abutments with shallow foundations. Several reports have commented on the deteriorating bridge condition and its low level, and have variously recommended repairs, replacement and/or raising the deck level. The 2017 CRWCR Design Completion Report specifically noted that the freeboard is inadequate, and that the bridge should be completely replaced with a new structure. This work would complement the CRWCR which will be improving and raising the road sections on both sides of the bridge in 2018 / 2019.

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<sup>1</sup> Bridge Conditions Assessment and Maintenance Design (Samoa), Completion Report. Department of Foreign Affairs and Trade, 2016.

**Lano Ford, Savai'i:** Lano ford is located on the East Coast Road of Savai'i, very close to the shoreline. The ford is very low lying. The crossing is generally dry but the river is subject to dramatic flash flooding which caused a fatal accident in 2013 when a bus was washed off the ford. The CRWCR Vulnerability Assessment includes replacement of the ford with a bridge as a high priority, primarily for safety reasons but also because the crossing and its approaches are highly vulnerable to hazards resulting from sea level rise. The options for replacing the ford should include a high-level bridge or multiple culverts, either at the current location or further inland.

### **C. OBJECTIVES**

**Project Development Objective (PDO):** The SCRTP development objective is to Improve the climate resilience of Samoa's road network and in the event of an Eligible Crisis or Emergency, to provide an immediate response to the Eligible Crisis or Emergency.

#### **Assignment objectives:**

The specific objective of this consulting assignment is to complete construction and hand over new bridges on Upolu and Savai'i that meet national and international design and construction standards as applicable, through provision of highest quality professional inputs and deliverables on options analysis, field investigations, preliminary and detailed design, procurement assistance and construction supervision.

### **D. SCOPE OF SERVICES**

The purpose of this consulting assignment is to undertake options analyses, field investigations design and bid documentation, procurement assistance and construction supervision of two replacement bridges. The services to be provided by the Consultant will be undertaken in a 2-stage approach as follows:

- **Stage 1 – Design**
  - 1.1: feasibility / options analysis to determine the most cost-effective option for each bridge
  - 1.2: fieldwork, surveys and site investigation, preliminary design (including preparation of a Land Acquisition and Resettlement Plan and preparation of Planning & Urban Management Agency (PUMA) application for the preferred option)
  - 1.3: detailed design and documentation ready for construction procurement for the two bridges and their approaches
  
- **Stage 2 – Construction**
  - 2.1: provision of assistance to LTA during the procurement process
  - 2.2: supervision of construction and administration of contract(s)

### **E. DESCRIPTION OF TASKS – STAGE 1**

Detailed tasks for each stage will include but not be limited to:

#### **Stage 1.1 – Feasibility / Option Analysis**

An early and important part of the investigations will be to identify and report on the various options for bridge and road locations so that Government can decide which to adopt. Potential options for consideration include:

- Afega bridge: the options involve dimensional characteristics - assessing the optimum elevation, length and width of the bridge deck - and the materials characteristics and type of each element of the replacement bridge – foundations, abutments, beams, decking, surfacing, pipe service support and handrails. Careful consideration will need to be given at this stage to the most

effective option for traffic management during construction – half width working or temporary bridge etc. – and the implications of each option on traffic flows, temporary land acquisition etc.

- Lano: potential options involve locational characteristics - relocating the crossing at a suitable point further inland, or a new bridge at or near the existing ford – and resilience characteristics – providing a high level or low-level bridge at the preferred location.

The consultant will be required to undertake an assessment and feasibility-level analysis of all practical options for both crossings. Careful consideration will be given to the comparative social and economic costs and benefits, including any land acquisition / loss of use, as well as the financial cost/benefit of alternative options. The outcome of this analysis, its recommendations and Government's final decision will determine the subsequent stages of the assignment.

The assessment should include research, analysis, determination and recommendations as to the appropriate flood resilience/immunity level for each crossing, in terms of the Annual Recurrence Interval (ARI) of floods that would inundate the bridge sufficient to cause serious traffic disruption or risks to road users' safety. In determining the level, the analysis should consider vehicular and pedestrian traffic forecasts, the effects of riverine flooding due to inland rainfall, and marine flooding due to king tides, or a combination storm surge, likely duration of disruption / flooding, and the resultant economic and social cost to activities in the crossing's hinterland. It is expected that the design flood ARI for Afega, with its higher population and heavier traffic, will be considerably greater than that assessed for Lano.

### **Stage 1.2 – Fieldwork, surveys and site investigation, preliminary design (including preparation of a Land Acquisition and Resettlement Plan and preparation of Planning & Urban Management Agency (PUMA) application for the preferred option)**

#### **Surveys and Site Investigations**

**Topographic Survey:** The Consultant shall carry out a detailed topographic survey of the existing road and bridge reserve corridors and adjoining properties, and detailed site survey of the preferred bridge sites. The survey should be sufficiently thorough for detailed engineering design purposes, and should clearly identify all structures, fences, hedges, trees and crops for possible future compensation negotiations. The survey area will be extended beyond the bridge corridor as required for upstream and downstream river hydraulic modelling and coastal / river bank protection design purposes.

**Cadastral Survey:** The Consultant shall also carry out research at the Ministry of Natural Resources and Environment (MNRE) to determine the status of all land within the surveyed corridor, and prepare a cadastral plan showing land ownership that may be affected by the proposed works.

**Geotechnical Survey and Testing:** The Consultant shall be fully responsible for all geotechnical and materials survey, sampling and laboratory testing required for detailed design purposes. The Consultant shall also make use of available geotechnical information from Ministry of Natural Resources and Environment (MNRE) and expand on this as necessary, and shall be responsible for these geotechnical studies to provide a competent foundation design to ensure that the structure can comply with the specified design code, including loading from seismic action, scour, differential settlement and potential landslips.

The Consultant may make arrangements with LTA to use its geo-laboratory facilities, which is able to carry out limited materials testing (refer **Appendix 2**). Before any testing or sampling is carried out at the bridge site or at potential quarry/borrow pit sites, the Consultant will request LTA's assistance in consulting with landowners and obtaining permission to excavate and remove materials for testing.

**Construction Materials:** The Consultant shall carry out a materials search to ensure that an adequate quantity of suitable and economically viable construction materials conforming to likely design specifications will be available for construction of bridge and road works. This search should include an investigation into availability and suitability of materials from all known quarries as well as possible sources close to the works site.

**Existing and Future Services:** The Consultant will liaise with the service authorities to obtain all available information on the type, location and level of all overhead and underground services (including proposals) which may cause a potential conflict with the proposed construction activities. Where any uncertainty exists, the Consultant shall arrange for underground services to be proved by dipping.

**Hydraulic and Hydrology, Tidal Fieldwork & design:** The Consultant will be responsible for accurate determination of the catchment area, catchment hydrology, and hydrography, waterway gradient, velocities, design flood flows at the proposed structure for various recurrence interval storm events. As both crossings are located close to the shoreline, the analysis will also include the effects of king tides and storm surges.

#### **Access Audit**

- Carry out an access audit to ensure that designs are inclusive of the needs of persons with disabilities, and that features of accessibility, such as ramps and signage are considered during the design phase of bridge and its access roads and prior to construction.
- Organize and conduct a workshop during the early stages of design activities to increase awareness and train key stakeholders in compliance with access guidelines.

#### **Preliminary Design and Documentation**

- For the preferred option, and based on the detailed site investigations, survey data collection, prepare preliminary design plans and prepare an estimate of quantities and a cost estimate for physical works to a level of accuracy +/- 20%.
- Review and determine appropriate engineering standards in consultation with LTA. Consideration shall include, but not be limited to, the following:
  - Appropriate Design standards (consider national and international design standards, criteria and parameters currently adopted by LTA)
  - Approach road pavement design (including the subgrade)
  - Appropriate formation and sealed widths
  - Appropriate side slopes where cutting into embankments is required
  - Drainage concepts, if required
  - Access to premises, if required
  - Lighting if required
  - Approach road furniture
  - Utility services relocation, if required, and future needs
  - Safety considerations
- In consultation with all service utility providers identify, locate and survey any underground and/or above ground services that may be affected by the proposed bridge and its approach road works. Include any utility work required in design documents.
- Prepare draft objectives and scope of services for the detailed design services for LTA to consider for approval. The scope shall include (but not be limited to) the following:
  - enhance and promote safety as a priority
  - be cost effective and consider option with best economic return
  - sub-structure and superstructure elements that are resilient, durable, accessible and maintainable

- promote environmentally friendly detailed design
- provide a template in managing potential environmental impacts, to minimize or avoid before, during and after construction works for relevant organizations
- close liaison with utility services providers in identifying and preparing plans for service relocation, if required.

### **Safeguards**

#### ***Preliminary Environmental Assessment Report (PEAR)***

The Consultant shall prepare a Preliminary Environmental Assessment Report (PEAR) for the project (approved design option) to determine the possible impacts during construction and long-term impacts, constraints that need to be applied during planning and construction, and mitigating actions. The environmental evaluation should contain the following as a minimum:

- A description of the proposal/project
- A description of the area affected
- Discussion on the nature of proposed changes to the affected area
- Justification for the proposal/project
- Discussion of the potential adverse effects
- Discussion on the alternatives to mitigate any adverse impacts
- Items to be considered for inclusion in the *environmental management plan*, including construction procedures to be avoided, and monitoring procedures.

In carrying out this activity, the approved *Code of Environmental Practice (COEP) dated August 2000*, which presently mandates LTA's activities in carrying out environmentally-sound practices included in the environmental management plans of the design, construction and maintenance phases of a road project, and the Environmental and Social Screening Assessment Framework (ESSAF) developed for the ERAP, should be consulted. The COEP and ESSAF outline general methods and standards to be achieved, which will avoid, remedy or mitigate environmental impacts of activities, such as road works and provision of services/infrastructure. An understanding of this basic framework for environmental management is assumed. The Consultant should liaise closely with personnel of MNRE – PUMA (The Planning & Urban Management Agency of MNRE) office to avoid surprises when submitting development consent early in the project.

#### ***Land Acquisition and Resettlement Plans***

A Land Acquisition and Resettlement Plan (LARP) will be prepared and detail any necessary land acquisition of the bridge approach road alignments. In carrying out this activity, the Consultant will:

- Prepare affected land and affected property acquisition drawing plans that will minimize land to be acquired by Government for this project.
- Work in consultation with MNRE to prepare plans clearly labelled with the respective parcel number, it's identified registered owner and show affected structures.
- Assist LTA in facilitating public consultation with affected land owners' to better understand the technical part of the acquisition process.
- Prepare a legal survey of boundaries of the bridge approach road reserve and affected adjoining properties and to place pegs to sufficiently define the bridge approach road boundary reserves.
- Work in consultation with MNRE to show affected families established boundaries marked on site.
- Prepare a Valuation in consultation with MNRE for reasonable estimate rates for compensation of affected land areas to include all affected structures and plants.

The LARP will be prepared using World Bank templates to accurately record all complete valuation of affected assets for compensation.

### **Stage 1.3 – Detailed design and bid documentation ready for construction procurement for the bridge and approach roads, engineer’s estimate, and works implementation program**

#### ***Detailed design, construction drawings, specifications, and bid documentation***

##### ***General***

The consultant shall undertake the detailed engineering design of the bridge, road approaches, drainage and ancillary works. This will follow review of the preliminary design and report by relevant stakeholders, and accommodating any comments/revisions to the scope that may arise following this review. In carrying out the detailed design the consultant will utilize data obtained from site investigations, data collected from surveys, materials testing and consultations.

Where significant gaps in data are identified from earlier site investigations, such as uncertainty in ground conditions at particular locations, then additional work may be required (such as additional geotechnical investigations, for example). Any such additional work shall be discussed with and approved by the LTA.

In addition to paper and transparency copies of survey data and road design plans, the road design and topographic survey data collected should be submitted to LTA in a digital form which is suitable for direct input to Civilcad, and/or Autocad, using such format as mutually acceptable to both parties.

##### ***Design and Documentation***

The Consultant must follow an acceptable design approach by which all the identified stages outlined in this ToR are reviewed for full incorporation into the final design and should encompass the following:

- The Consultant is expected to be reasonably familiar with the Land Acquisition and Resettlement Plan (LARP), IDA template if grievances may have to be addressed. If required, all costs and negotiations associated with these grievances will be met directly by the LTA while the Consultant is expected to provide a full report of these activities to the World Bank.
- Environmental and Social Safeguards impact assessment must be carried out in close consultation with the LTA, MNRE and other Government departments using the Environmental and Social Assessment Framework (ESSAF) whereby each activity will be screened by LTA using the ESSAF.
- Following approval by PUMA, the EMP must be incorporated as part of the bid documentation. The Specification must require the Contractor, with reference to the EMP, to set out the mitigation measures and management procedures that will be implemented during construction. Approval of the Contractor’s environmental mitigation plan (CEMP) by the Client shall be one of the conditions for the granting of possession of site. The EMP must be followed to the satisfaction and approval of the LTA throughout the construction period with a Special Condition of Contract that should allow the LTA to suspend the works if the agreed EMP is not adhered to. The Consultant will monitor the contractor’s compliance with the approved EMP.
- If required, carry out additional site investigations and tests to ensure the adequacy of bridge foundation designs and approach road pavement designs and to confirm that technical specifications are suited to the properties of local materials. Reinstatement any disturbed or damaged areas during site investigations to the satisfaction of the LTA.
- Undertake additional survey required to enable accurate design of preferred bridge option, road approaches, drainage and ancillary works. Survey should capture features encroaching into road reserve as well as boundaries of private and/or customary land.

- Ensure that the existing road is married to the proposed bridge in accordance with specified standards and good practice to promote safety for all road users.
- Investigate and develop detailed hydrological and hydraulic analyses including any modeling required. Design to improve hydraulic capacity of river crossing as well as addressing bridge and approach drainage. No new drainage outfalls across private land are permitted.
- Allow for independent road safety audits of all preliminary and final designs.
- Include the preparation of safety audit reports, draft and final bid documentation for the works including engineering drawings, detailed Engineer's estimates and technical specifications. Standard LTA formats and specifications are to be used where appropriate.

### ***Design standards and parameters***

The design shall be carried out using applicable design standards used in Samoa [generally Australian / New Zealand standards for Roads and Bridgeworks as appropriate] and shall include the following:

- The Bridge structure and pavement type, strength, and details (including foundations);
- Appropriate formation and sealed widths for both road approaches and bridge where necessary;
- Acceptable formation details where the standard width cannot be achieved;
- Appropriate side slopes where cutting into embankments is required;
- Design of drainage concepts (both surface and sub-surface);
- Any retention structures to support the bridge structure, pavement, side slopes, or upstream and downstream river entry and exit;
- Hydrology/hydraulic/tidal modeling;
- Road furniture and markings, primarily to address any potential road safety issues;
- Utility services relocation; and
- Construction material availability, whether existing features can be re-used, or fresh materials need to be imported (if so – detail material requirements and potential sources)

### ***Design Standards to Apply:***

#### ➤ **Bridge Structural Design**

Structural Design and loadings shall conform to the requirements of the current New Zealand Transport Agency Bridge manual. Design loadings shall be for T44 traffic loading, with an appropriate allowance for vehicle overloading and impact. Seismic Design shall be in accordance with the NZ Standard NZ2403 and the Road Research Unit Bulletin 56 – Seismic Design of Bridges, published by the New Zealand Transport Agency (NZTA). Carry out comprehensive geotechnical investigations to enable confident sub-strata predictions and for the design of the foundations of the new (bridge) structure. Note that the bridge superstructure and substructure design should also allow for impact of massive floating or submerged debris during severe floods.

#### ➤ **Vertical and Horizontal Alignment**

Geometric design shall generally be in accordance with the relevant AustRoads / Australian Road Research Board (ARRB) design standards and as modified by LTA as Standard Specifications for Roads and Bridgeworks. Nonetheless these standards shall be used as a guideline only and rigid compliance is not required so as to create the greatest cost effectiveness. Where compliance is not economically practical the design shall still ensure safe travel for all vehicles at all times.

Insofar as it is practical the design approach should aim to minimize the risks of geotechnical instability. The carriageway widths to be adopted will be recommended in the Feasibility /Options Analysis Report as approved by the Client.

➤ **Road Pavement Design**

The design of the road approach pavements shall be undertaken based on forecast traffic volumes over a 20-year period and an analysis of existing and extra fill for pavement strengths and conditions as determined by the geotechnical / materials investigation and testing program to be proposed by the Consultant.

Pavement design shall be based on the methodology provided by the Transport and Road Research Laboratory United Kingdom, Road Note 31 (TRRL Overseas Road Note 31 – “A Guide to the Structural Design of Bitumen Surfaced Roads in Tropical and Sub-Tropical Countries”– ORN 31). Note the requirement of ORN 31 for heavy vehicle axle load surveys to be carried out as part of the design, in accordance with ORN 40. The final road pavement must be suitable for the local climate and drainage conditions, which could cause saturation of the subgrade or pavement materials. Provide details of sub-surface drains and porous drainage layers required for the control of pavement drainage.

➤ **Longitudinal Road Drainage**

Design where necessary any table drains, kerb and gutter, pipe drains or channels, subsoil drainage pipes as appropriate to drain the carriageway and to intercept upstream catchment runoff and prevent it from causing a safety or nuisance problem for road users. The minimum design standard for such longitudinal drainage shall be the 1 in 10-yearARI rainfall event with the added criteria that the central 3m of the road formation shall remain un-submerged by any excessive longitudinal flow during or after the 10-yearARI rainfall event. Design the road drainage system to prevent ponding on the pavement at sag curves greater than 250mm. There shall be no ponding (i.e. still water) on any part of the road pavement, including the table drains or shoulders 30 minutes after the cessation of rain.

➤ **Scour Protection**

This section includes river bank and bed protection both upstream and downstream of the bridge site and protection of the road embankment at the river crossing. The aim of providing scour protection is to protect:

- Government’s investment in the bridge and road infrastructure;
- The environment from the danger of accelerated erosion and sedimentation processes near the bridge abutments;

In all cases, the road pavement adjacent to the bridge should remain in a trafficable condition with only minor maintenance requirements after either the 20-year discharge or the applicable design storm. Some scouring and/or damage from rarer runoff events can be tolerated. However, for extreme events, damage should be confined to the road embankment/approaches, if significant asset damage is unavoidable, rather than severe damage to, or loss of, the structure asset. Consideration should be given to armouring approach embankments to prevent washout in extreme events.

It is generally uneconomic to provide scour protection for conditions rarer than the 20-yearARI runoff event. Minor damage requiring repair to upstream and downstream scour protection works can be tolerated. However, care should be taken to ensure that the failure of downstream scour protection does not accelerate the failure of the road structure, which is required to remain trafficable after the twenty-year runoff event.

➤ **Slopes and Batters**

The cross falls of any road shoulders and batters to side drains should be consistent with the function of the road, drainage requirements, and safety and land availability.

Any sealed shoulders should have a minimum cross fall of between four percent and six percent. Cut slopes shall be shaped and benched to form a stable self-draining formation which does not pose a safety risk due to fretting, slippage, landslide or rock-fall. Suitable protective measures should be incorporated to provide the long-term stability of cut batters. Fencing, benching, cut off drainage and/or retention structures should be designed and detailed in areas where there is a history of slope instability.

Fill slopes should be as flat as possible for safety and maintenance reasons depending on embankment height and land requirements. Batter slopes steeper than 4 horizontal to 1 vertical pose a safety risk and may cause overturning if a vehicle leaves the road, and slopes steeper than 3 horizontal to 1 vertical may require special treatment to prevent scour before re-vegetation occurs. Proposals for batter slopes steeper than 2 horizontal and 1 vertical should be referred to the LTA, supported by a geotechnical report on the likely stability of the batter, for approval.

➤ **Construction Materials**

As far as is practical, materials readily available in Samoa should be used in the bridge and approach roads construction.

The design should consider the availability of local construction materials, methods of construction, and the suitability of imported materials to the project. Whenever possible, without compromising applicable design standards, innovation, quality of workmanship or maintenance requirements, consideration should be given to locally fabricated products or materials, particularly where high maintenance costs may result from the use of imported products

➤ **Property Access**

The work should be designed so that access to adjacent property and intersecting roads is maintained in so far as is possible at all times. Where the proposal involves demolition of an existing structure, allowance for a temporary bypass should be considered as part of the design, unless an alternative route is available.

➤ **Services**

All information on type, line and level of existing services shall be shown on the construction drawings. Standards are to meet the utility authorities' requirements in all cases.

For new bridges, culvert structures and sea walls, determine what services need to be accommodated and provide for the attachment of such services to the new structure. Where such provision is to be by bolting brackets to the structure, allows for such fittings to be fabricated and cast into or fixed to the structure during construction. Where inserts are cast in place in concrete or fixed steelworks, such fixing points should be clearly identified by bolting stamped metal plates to such fixing points so that they can be easily recognized in the future. Fitting of services to structures must be allowed for in the design, and the certification of designs should state the loads assumed for the fixing of services.

Wherever possible, new or relocated services should be fixed to the structure by, or under the supervision of the construction contractor during the construction contract.

➤ **Street Lighting**

The Consultant shall make recommendations for any street lighting that is considered necessary in liaison with PUMA and Electric Power Corporation (EPC) to AS 1158 or equivalent New Zealand Code.

➤ **Road Furniture**

Standards for markings and signs will comply with LTA standards. Provision for and detail road signs, and guide posts and guard rails is in accordance with AS 1743 and AS 1742 respectively. All road furniture should be located and installed such that the furniture itself does not pose a safety risk or impede the safe and free movement of vehicles or pedestrians.

➤ **Road Safety**

In all aspects of the road design the Consultant shall carefully consider the safety of all road users through the road safety audits. Where feasible, incorporate mitigation measures into the works to maximize road safety. Recommendations of the WCR Road Safety Audit (RSA) in 2011 should be used as a template for measures on this assignment.

➤ **Worksite Traffic Management**

The Consultant shall prepare construction documents that draw attention to the location and type details for regulatory signs, permanent and temporary, and the location of any temporary traffic-management devices, required during construction. Traffic management and facilities shall comply with recognized international standards such as the Australian Standard A.S. 1742.3 *Manual of Uniform Traffic Control Devices - 1996*, (or an equivalent NZ standard). The Bid document shall also require the Bidder to submit an appropriate Traffic Management Plan and nominate traffic-controllers who have participated in an accredited course in Basic Traffic Management. The approval of the Plan by the Engineer is to be a necessary condition for possession of site and the Works contract must contain a Special Condition that allows the Engineer to suspend the Works if the Plan is not adhered to during construction.

***Bidding Documents***

In addition to the detailed design, the Consultant will prepare all necessary bidding documents including Specifications and Performance Requirements, engineering design drawings, Bill of Quantities, engineer's detailed estimate, works implementation program, and other documentation as required (see *I.Reporting Requirements* below).

**F. DESCRIPTION OF TASKS – STAGE 2**

**Stage 2.1 – Procurement Assistance**

Following acceptance / approval of the Design Completion Report and Bidding Documents, and the Client's decision to proceed with the works contract(s) bidding, the consultant shall assist LTA with procurement of the works contractor(s), during and after the bidding period.

Assistance will include but not be limited to:

- Assisting with the preparation of invitation for bids;
- Attending and acting as technical assistant at the pre-bid meeting or any meetings with bidders as required;
- Assisting with responses to bidders' written queries and preparation of addenda to the bid document if required
- Carrying out the detailed bid evaluation and submitting a Bid Evaluation Report (BER) all in full accordance with the World Bank Guidelines
- Assistance with preparation of contract documents and contractor mobilization.

## Stage 2.2 – Construction Supervision & Contract Administration

### **General**

The consultant will be fully responsible to the client for construction supervision and administration of the works contract(s). The consultant will be required to monitor, audit and perform independent testing of materials and systems put in place by the works contractor to verify their compliance with the required standards in accordance with the specifications. The consultant's roles and responsibilities will include the following:

- Provision of a suitably-qualified and experienced engineer who is capable of carrying out the duties of the Employer's "Project Manager" as defined in the World Bank Standard Procurement Document (WB SPD) for Procurement of Small Works (1 Envelope), Conditions of Contract(October 2017);
- Ensuring that the contractor is at all times in possession of all data required for it to meet the contractual works program, through the timely issuing of contract documents, initial, updated and revised construction drawings as required;
- Familiarization with the contract documents, and the Contractor's methodology with attention to the bridge and pavement construction methodology. Seek additional information on methodology, as may become necessary during the execution of the works;
- Establishment of a positive and amicable liaison with the Contractor;
- Regular site visits and overview of progress, with attention to ensuring contractors' adherence to the design and construction drawings and Specifications. Maintain daily records of the activities on the site, site conditions and Contractor's resources;
- Review and comment upon the Contractor's Works Program;
- Visits as required to any off-site works compounds (e.g. pre-casting yards, fabrication workshop etc.), to ensure all matters relating to off-site fabrication and materials handling and storage etc., are in accordance with best industry practice, the design and construction drawings and specifications;
- Random (but at least fortnightly), review of the contractors' daily records, material-testing results, batch records, setout survey records etc. and report to the Client;
- Random independent sampling and testing of Contractor's materials to ensure compliance with the Specifications. The consultant can make use of the Client's Lab facilities at no cost, but test equipment that is considered necessary but not available from the Client will have to be provided by the consultant;
- Review and monitor contractor's adherence to the Environmental Management Plans and Traffic Management Plan;
- Advise the Project Management Division (PMD), the Transport and Infrastructure Sector Coordination Division (TISCD), the Centralized Technical Services Support Unit (CTSSU), and the Client of matters of concern;
- Prepare monthly supervision reports with support photos for PMD, TISCD and CTSSU on behalf of the Client. Review and make recommendations on any claims submitted by the Contractor for additional payments and extensions of time;
- Conduct formal Site Meetings with the Contractor and keep Minutes of matters of concern;
- Guide the contractor on critical elements of construction, including but not limited to:
  - Interpretation of drawings and technical specifications;
  - Matters relating to worksite safety and traffic management;
  - Construction methodology;
- Measure the actual quantities of work carried out and agree these with the Contractor. Keep appropriate records of measured work;
- Receipt and checking of contractor's Monthly Statements, preparation of Interim Payment Certificates in the format prescribed in the contract and forwarding to the LTA in a timely manner for due payment etc.;

- Confirm that substantial completion has been reached, and advise the PMD, the TISCD, and the CTSSU and Client in writing accordingly;
- Prepare cost estimates and designs to accommodate any variations that may arise out of this contract.

**Power and Authority:** the consultant's staff nominated for the position will be appointed as Employer's "Project Manager". The *Letter of Delegation* will stipulate those clauses of the WB SBD for Small Works contracts to be delegated. It is to be expected that the Client (Employer) will not delegate the full authority under the following clauses:

- 7.1 (Sub-contracting)
- 27.0 (Extension of the Intended Completion Date)
- 28.0 (Acceleration)
- 37.0 (Changes in the Contract Price)
- 38.0 (Variations)
- 41.0 (Payments)

The above listed clauses are in accordance with the World Bank Standard Bidding Document for Small Works template, 2012.

If any action is required under any of these clauses the Project Manager will provide a written report to the PMD and copied to the TISCD and CTSSU describing the situation that has arisen and the circumstances that led to it with recommendations for the action that the PMD, TISCD, and CTSSU to consider and LTA to approve for implementation.

**Operations:** the consultant's staff will operate from the respective site offices, in which the works contractor will provide office furniture and other facilities as necessary, as well as their own office in Apia, Samoa, and provide all supplementary facilities and equipment necessary for the services, including:

- Measuring equipment
- Basic field survey equipment, including dumpy level, staff and theodolite (may be available ex-Contractor)
- PC and peripherals
- Word-processing, copying and report-binding resources
- Telecom including e-mail
- Photographic (preferably digital) equipment
- Personal safety apparel and equipment

The consultant must be able to provide a continuity of services outside normal hours when necessary, and over a protracted period, as necessary, to cover critical, on-site operations and therefore provide a fully effective supervision service.

**Required Outputs:** the consultant is required to provide the following deliverables:

- Daily Site Records (copies to be safely stored in the Project Manager's Office)
- Inspection Reports (copies to be safely stored in the Project Manager's Office)
- Issues Reports
- Site Meeting Minutes/Reports
- Monthly Progress Reports
- Project Completion Report

### Stage 2.3 - Defects Liability Period

The Consultant is required to carry out periodic inspections on a quarterly basis for the duration of the defects liability period stipulated in the construction contract. The following should be the responsibility of the Consultant:

- Provide reports to the PMD and copied to TISCD and CTSSU on outcomes of these quarterly inspections
- Ensure that any defects arising out of poor workmanship are remedied in accordance with stipulated technical specifications
- Draft reports to the Client if necessary depending on the size and effects of the defect including remedial actions taken and follow up actions if necessary

### Final Report

The Consultant will provide a full report at the end of the defects liability period to the Client.

## G. TEAM COMPOSITION & QUALIFICATION REQUIREMENTS FOR EXPERT SERVICES

### *Options Analysis, Feasibility Study, Detailed Designs, Bidding Documentation*

Position	Qualification and Experience Requirements
<b>Key Experts</b> K-1: Senior Bridge Engineer as Design Team Leader	The person shall be a professionally qualified engineer with a degree in civil engineering majoring in structural engineering and broad recent experience of 10 years in bridge and road design, preparation of bidding documents, specifications and bill of quantities, cost estimation, report writing, and management or leadership of comparable projects, preferably 5 years of experience similar to the Pacific Region.
K-2: Economist	The person shall be a qualified economist and with a relevant degree in the field of economics and experience of 10 years in infrastructure feasibility studies, out of which at least recent 5 years in the road sector feasibility studies performing economic and financial analysis, preferably 3 years of experience similar to the Pacific Region.
K-3: Hydrologist/Hydraulic Engineer	The person shall be a professionally qualified engineer with a relevant degree and should have proven recent experience in the design of hydraulic structures for road projects in the recent 8 years, preferably 3 years of experience similar to the Pacific Region.
K-4: Geotechnical / Materials Engineer	The person shall hold a relevant degree and should have proven experience of recent 8 years in geotechnical investigations and materials testing for roads and bridge projects, preferably 3 years of experience similar to the Pacific Region.
K-5: Bridge / Drainage Structures Engineer	The person shall be a professionally qualified engineer with a degree in civil/structural engineering and proven recent experience of 5 years in detailed design of road bridges and/or large drainage structures, preparation of drawings, specifications and BOQ of comparable projects, preferably 3 years of experience similar to the Pacific Region.
Resident engineer	Minimum 10 years' experience in bridge construction supervision, of which at least 5 in region. Pacific Island experience an advantage. Degree in civil engineering and CPeng, IPES and/or equivalent

	membership
<b>Non-Key Experts</b> NK-1: Land & Engineering Surveyor	The person supervising detailed cadastral and topographical surveys shall be a Registered Surveyor and should have proven experience in Samoan land definition procedures. Prepare Plans detailing any necessary additional land acquisition of the bridge approach alignment, etc. He/she shall have recent 5 years relevant experience, preferably 3 years of experience similar to the Pacific Region.
NK-2: Social Specialist	The person shall hold a relevant degree and should have proven recent 10 years of experience in conducting social impact assessments. Out of which at least 5 years of experience in community consultations for infrastructure projects and LARAP preparation. Preferably Samoan speaking and with 3 years of experience similar to the Pacific Region.
NK-3: Environmental Specialist	The person shall hold relevant degree and should have proven experience in environmental assessment taking into consideration direct and indirect impacts during pre-construction, construction and operation, and identifying costs of mitigation measures and implementation of a monitoring plan and report preparation. He/she shall have 8 years relevant experience, including recent 3 years, preferably experience similar to the Pacific Region.

#### ***Administrative Personnel and Technical Staff***

The Consultant shall have its own office and field staff to assist in all stages of the assignment. The staff provided shall be experienced and capable of performing their allotted duties, in particular for:

- office administration and clerical personnel
- enumerators for the “Social Assessment”
- field assistants for geotechnical investigations
- material testing and laboratory assistants

It is expected that the consultant will obtain the services of a registered surveying firm in Samoa to conduct detailed cadastral and topographical surveys, including the detailed survey at the preferred bridge site.

#### **H. REPORTING REQUIREMENTS AND TIME SCHEDULE FOR DELIVERABLES**

##### ***Inception Report***

Within *two (2) weeks* after the effective date of the assignment the Consultant shall submit four (4) copies of the Inception Report confirming the detailed methodology for the provision of the services and including a detailed programme, manning schedule, Consultant’s organization chart and channels of communication for the project team. The report should also clarify any ambiguities or agreed amendments to the Terms of Reference and identify any perceived risks or potential constraints to the timely delivery of the services. It should include an agreed schedule for project progress meetings between LTA, the Consultant and other relevant parties.

##### ***Options Report***

The report should contain a systematic assessment and evaluation of all possible alternative approaches available for achieving the project objectives to figure out which option appear to be most effective and providing the best solution for the project. The feasibility for the proposed bridge shall describe the location, existing conditions with sketch plans, elevations and sufficient details to describe the scope of proposed works.

The report should also contain economic and financial analyses of the option and proposed design solution, cost estimates and a risk analysis and design solution with brief discussions on likely social and environmental impacts, which should include an account of consultations undertaken with affected stakeholders during the field investigations.

The outcomes of these options and feasibility analyses shall be clearly described and well documented with its recommendations to the Government to take a final decision to determine the best design option for the bridge and the road.

This report should be submitted within *one and half (1.5) months* after the effective date of the assignment.

### ***Design Progress Reports***

The Consultant shall provide copies of brief progress reports as requested by the LTA. Such reports will normally be given verbally at project meetings with the LTA, but shall be followed up with signed-off, summary hard copies within *one week* of relevant meetings or if so requested by the LTA. Project meetings may also be called, ad hoc, by the LTA (or Consultant) for critical, emerging issues.

### ***Preliminary Design Report***

The Consultant shall submit within *two and half (2.5) months* after the effective date of the assignment, four (4) copies of the *Preliminary Design Report* including a plan of the existing features including cadastral, road and bridge overlaid with the proposed layout. The preliminary drawings and principal specifications shall be submitted to the LTA for approval prior to finalization.

The Report shall include, but not be limited to, addressing the following issues:

- Presentation of various options for bridge and road together with recommendation of preferred design solution for consideration by LTA;
- Geotechnical investigations and findings;
- PEAR for MNRE and LTA to review;
- Environmental impact of the recommended preferred design solution and appropriate mitigation measures;
- Detailed Land Acquisition Plan;
- Draft Bid Documentation;
- Draft Standard Contract Documentation;
- Proposed bridge approach roads and their Drainage;
- Safety Audit Results and recommendations;
- Design standards adopted;
- Design criteria statement
- Constructability assessment of each option, bridge and road locations (materials and equipment)
- Design Centre Line (bridge approach roads) including longitudinal and cross sections
- Traffic loading – present and projected;
- The likelihood (risks) of encountering underground services;
- Environmental Impact Mitigation Measures;
- Anticipated Engineer's Cost Estimate of all project options considered; and
- Anticipated Time Program for Construction

### ***Design Completion Report***

Submit four (4) copies of the Design Completion Report within *four and half (4.5) months* after the effective date of the assignment, to the LTA. The Design Completion Report (which is expected to be a more detailed extension of the Preliminary Design report) will mark the completion of the Stage 3 (design phase) of the services.

The Design Completion Report shall address the following aspects:

- Problems encountered (if any) and how they were overcome
- Comments on the design standards adopted, with details of any area where they could not be met, with reasons
- Technical matters concerning the design
- Comments on the design approach and methodology adopted, and justification of the rationale behind any decisions
- A schedule of Construction Quantities for the Bridge, bridge approach roads and ancillary works
- An estimate of construction costs, including preliminaries, and provisional sums
- An estimate of the time required to construct the works
- A discussion of the preferred construction methodology for the bridge
- Details of any discussions with free-hold and customary land owners likely to be affected by the works
- A copy of all design calculations
- A copy of safety audit final report
- A copy each of the Certificate of Design
- A copy of the Certificate of Design Review/Check
- A copy of all survey data and any relevant reports prepared by the Consultant or by any third party as a result of the commission.

### ***Design Drawings***

Design drawings for construction will form part of the:

- Preliminary Design Report and Design Completion Reports (A3 / A4 size to suit legibility)
- Draft and final Bidding Documents (a bound set of A3 construction drawings should form a separate volume of the documents)
- Works construction contract(s) (A0 / A1 to suit)

As they may bear on the design and construction, the following details shall be included in the drawings:

- Full set of working drawings for bridges including plans, sections, elevations and details of foundations, substructure and superstructure elements
- Road boundaries of road reserves, pathways, public reserves, lots and easements
- Limits of work
- Encroachment structures, properties, plants on Government road reserve
- Existing site features such as watercourses, swamps, dams, bathing-pools, and structures etc.
- Location and type of utility services
- Survey lines and sections, bench marks, datum and ties to existing boundaries and survey control marks
- Setting-out data
- Site plan of proposed bridge, bridge approach roads and drainage
- Longitudinal sections with Existing and Design levels
- Cross-sections with Existing and Design levels
- Storm water drainage – existing and proposed with catch pit / manhole schedules
- Schedule and details of subsoil drainage lines if applicable
- Notation regarding provision of guide posts and guard rails
- Pavement detail, surfacing detail, pipe types and classes, drainage structure types, kerb types, concrete strengths, pipe bedding types
- Road furniture (e.g. street signs, regulatory signs, guide posts, guard-rail etc.)
- General specifications for construction

- Scale of Plan is to be 1:500 with cross-sections at 1:5
- Key reference points

### ***Technical Specifications for Construction***

The Consultant shall submit four copies of the technical construction specification (including bound sets of drawings) and computer CDs containing the construction specification in a format suitable to both parties, or transmit in e-format, as may be agreed.

The Consultant will prepare and include detailed general, special and project technical specifications as part of the draft and final Bidding Documents (the specifications may form a separate volume of the documents)

The technical specifications shall be based on the layout of the LTA *General and Special Conditions of Contract* and the current version of the Standard Specifications for Road works, Bridgework and Drainage structures.

The Consultant should ensure that any project-specific requirements not covered in the general and special conditions of contract and/or the Standard Specification are noted on the drawings or in the Section entitled, "Project Specific Requirements" and do not conflict with the written specification.

### ***Bills of Quantities***

The Consultant will prepare and include detailed Bills of Quantities (BOQ) in general accordance with the standard method of measurement for civil engineering quantities, as part of the Engineer's Estimate, bidding documents and works contract documents.

The Format shall be agreed with the LTA but should contain separate Bills or Schedules for the following categories.

- General and Preliminaries
- Drainage
- Earthworks
- Pavement
- Bituminous Surfacing
- Ancillary Works
- Road Furniture and Line Markings and Road Furniture
- Bridgeworks
- Landscaping and environmental mitigation measures

The BOQ will include day works schedules for nominal quantities of materials, labour and equipment likely to be used in the works, to be included in the total cost.

The general and preliminaries Bill should include all fixed and time-based costs relating to the contractor's overheads including mobilization and establishment costs, demobilization, insurances, compliance with the requirements of the traffic management plan, environmental mitigation plan, health and safety plan, quality management plan, inspection test plan etc. This Bill should also include any provisional sums for unforeseen and contingency for works items which are unable to be measured at the time of issuing bidding documents.

Pay items should be cross-referenced to clauses in the Technical Specification describing how items will be measured and paid.

### ***Engineer's Estimate***

As part of the Design Completion Report the consultant will prepare and provide an Engineer's Estimate for individual components for the whole of the works. This estimate shall be prepared by entering a unit rate against each item in the detailed Bills of Quantities. Unit rates should be based either on recent bid prices for similar work, current ruling contract rates for major works items, or built up from individual current prices of material, plant, fuel and labour that make up the Bill item. This estimate should also include any provisional sums for unforeseen and contingency for works items which are unable to be measured at the time of issuing bidding documents.

**Project Risk Analysis**

The consultant shall undertake a basic Risk Analysis in accordance with AS/NZS 4360 – 1999: *Risk Management*, which is to include, but not be limited to, an evaluation of the following risks/issues likely to arise during the works phase:

- Supply of materials
- Capabilities (skills and resources), of local civil contractors
- Land-use and/or acquisition issues
- Climatic influences
- Material haulage to and from the site
- Time over-runs
- Cost blow-out
- Damage to services
- Un-located services

The Risk Analysis Report shall be included as part of the Project Completion Report.

**Final Design Completion Report** shall be submitted to LTA, incorporating comments on the *Design Completion Report* from LTA and other authorized personnel, within *one (1) month* after receiving such comments.

**Draft Bidding Documents**

The Consultant shall submit within *four (4) months* after the effective date of the assignment, three (3) copies of the *Draft Bidding Document* to LTA. The Bidding Document shall include, but not be limited to the following:

- Invitation to Bid
- Bidding Procedure, including Instructions to Bidders and bill of quantities
- Requirements including technical specification general and specific
- Conditions of Contract and contract forms: WB SBD for Smaller Works Conditions of Contract, January 2017 version.
- Environmental Management Plan, including mitigation measures
- Drawings
- Engineer's cost estimate, including unit rates analysis

**Final Bidding Documents for the Design approved by the LTA** shall be submitted to LTA, incorporating comments on the *Draft Bidding Document* from LTA and other authorized personnel within *two (2) weeks* after receiving such comments.

**Table of Deliverables**

The Consultant shall prepare and physically submit all reports listed below in four hard copies (A4 / A3 size), and one electronic format (the latter in commonly available software).

No.	Description	Target Date
1	<i>Inception Report</i>	<i>Two (2) weeks after the effective date of the assignment</i>
2	<i>Feasibility Report</i>	<i>Within one and half (1.5) months after</i>

		<i>the effective date of the assignment</i>
3	<i>Design Progress Reports</i>	<i>Monthly, one week after meetings</i>
4	<i>Preliminary Design Report</i>	<i>Within two and half (2.5) months after the effective date of the assignment</i>
5	<i>Design Completion Report</i>	<i>Within four and half (4.5) months after the effective date of the assignment</i>
6	<i>Final Design Completion Report</i>	<i>Within one month after receiving comments on Design Completion Report</i>
7	<i>Draft Bidding Documents (DBD)</i>	<i>Within four (5) months after the effective date of the assignment</i>
8	<i>Final Bidding Documents</i>	<i>Within one week after receiving comments on the DBD</i>

### **Hold Points**

The following Hold Points will apply:

- **First:** At submission of alternative bridge / approach road options including recommendations for preferred option and optimal design solution, allow fifteen (15) working days for the LTA review, and approval.
- **Second:** At submission of the Preliminary Design Report allow fifteen (15) working days for the LTA and IDA review.
- **Third:** At submission of Design Completion Report and Bidding Documents allow a period of four (4) weeks for the LTA review and submit a Development Consent submission for a response from MNRE on the PEAR. The response from MNRE should be incorporated where appropriate in the final documents.
- **Fourth:** After submission of Final Draft Bidding Documents allow a two (2) weeks period for the LTA and IDA review and no objection letter.

### **I. DURATION AND LEVEL OF EFFORT**

The estimated duration and indicative level of effort for each stage of the assignment is as follows:

<b>Stage of the Assignment</b>	<b>Duration (months)</b>	<b>Key staff input (months)</b>
<b>Stage 1.1</b> – Option analysis and feasibility, optimal design option, Client review and approval	1	2
<b>Stage 1.2</b> – Surveys, fieldwork, preliminary designs, and drawings, Client review and approval	2.5	3
<b>Stage 1.3</b> – Prepare detailed design, construction drawings, specifications, bid documents for construction works of the bridge and approach roads, Client review and approval	2	3
<b>Stage 2.1</b> – Procurement assistance during and after the bid period	3	0.5
<b>Stage 2.2</b> – Construction supervision and contract administration	9	11
<b>Stage 2.3</b> – Services provided during Defects Liability Period	12	0.5
<b>Total</b>	29.5	20

### **J. CONSULTANCY CONTRACTS**

LTA proposes that two consulting services contracts will be signed between the parties to cover this assignment; a lump-sum contract to cover the full Stage 1 services as described above, and a separate time-based contract to cover the full Stage 2 services. Both contracts will be based on the contract forms included in the World Bank Standard Request for Proposals (SRFP) – Selection of

Consultants (October 2017). Templates of both contract forms are provided for information in Section 8 of the SRFP.

For the lump-sum Stage 1 contract, technical and financial proposals are expected to include all anticipated staffing and related costs required to cover the activities described and/or required during Stages 1.1, 1.2 and 1.3 to successfully fulfil the assignment objectives, irrespective of the chosen design options for either bridge / crossing.

Similarly, for the time-based Stage 2 contract, the proposals will be expected to include all the consultant's costs associated with executing the procurement and supervision duties described for Stages 2.1, 2.1 and 2.3 above.

#### ***Schedule of Payments***

- Stage 1 and 2 payments will be made in accordance with Section F "Payment to the Consultant" respectively of the General Conditions of Contract for lump-sum and time-based contracts.
- Payments due to the Consultant shall be withheld if the Consultant's stipulated reporting obligations (*Deliverables*) are not met, unless revised timelines have been agreed with the Client through a Contract Amendment.

#### **K. COUNTERPART FACILITIES & INPUT**

##### ***Counterpart personnel***

LTA will provide a local liaison officer, who will liaise with local communities and landowners on matters concerning the project design, design activities.

##### ***Office accommodation and logistics***

The consultant shall be responsible for providing all accommodation, computing, survey and drafting equipment and software etc. The consultant will be responsible for all land transportation arrangements during the project.

##### ***Data to be made available to the Consultant by LTA:***

- Approved COEP Document published in August 2000
- If applicable, submit letter of request to MNRE for latest CIM Plans
- Available Updated Traffic Data to be provided by the LTA Road Use Management
- LTA will provide unimpeded access to relevant information that it may hold to assist the Consultant in this project on "as available" basis

##### ***Services, facilities and property to be made available to the Consultant by LTA:***

- Use of LTA Soils Testing Laboratory (subject to Appendix 2)