Cadastre Limited, **New Zealand**

Feasibility Study

for the

OSCAR Pilot in Samoa

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Version	[1.1]
Status	[FINAL]
Version date	[04/10/2009]
Document Id	Feasibility Study Report - Samoa

Document Control

Version Summary

Version	Date	Author	Change summary
1.0	20/08/2009	Neil Pullar	Initial draft
1.1	04/10/2009	Neil Pullar	Finalise report (status, date, resolve outstanding items)

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Table of Contents

Feasibility Study Report

1 Introduction

1.1 Purpose

This document describes the proposed Samoa pilot of the Open Source Cadastral and Registration (OSCAR) implementation. It is intended to capture and convey the significant aspects of this proposed pilot implementation, the associated issues and key implementation recommendations. It serves as a communication medium between all key stakeholders including donors, the recipient (the Samoan Ministry of Natural Resources and Environment (MNRE) and the consultants who will be involved in the design, development and implementation of the OSCAR shell software application and its customisation for use in MNRE.

1.2 Scope

This Feasibility Study applies to the proposed customised implementation in the MNRE of the OSCAR Shell software application.

1.3 Definitions, Acronyms and Abbreviations

Refer to Appendix 1

1.4 References

Title	Date / Version	Prepared by
OSCAR Project Document	13 February 2009 (version 1.5)	NRLA, United Nations Food and Agriculture Organisation
Land Information Integration Software Descriptions	June 2009	Land Equity International
DCDB Manual	March 2008	Land Equity International

2 Key Findings

2.1 Approach

This feasibility study is based on a 10 day visit to Samoa (29 July – 7 August 2009) and an approach followed that was similar to the terms of reference prepared by UN FAO for a similar study in Nepal. The Nepal terms of reference asked for certain work products being descriptions of the background environment, the local requirements, a proposed implementation plan, the identification of key training needs and a risk analysis. Many of these work products were able to be compiled from the technical documentation on the Samoan (computerized) land registration system and cadastral mapping system (called "Samoa View") supplemented by the consultant's knowledge and experience of these systems over the last 4 years. The other main source of information was the working group nominated by the Ministry of Natural Resources & Environment Chief Executive Officer. He made a point of nominating young, computer literate staff from across all divisions of the ministry to the working group to work with the consultants rather than just cadastral and registration experts. His reasoning was based on his strong conviction that the adoption of open source software within the ministry and the building up of software development and support expertise was too important to limit to just two sections in the ministry. He wanted the open source "message" to be adopted across the ministry, particularly where GIS was being used and also for staff who have shown some aptitude in software development to be encouraged.

A complication in assessing the effort and complexity of the work to customize the generic OSCAR shell software for Samoan requirements is that the scope of the generic OSCAR shell software has not yet been defined and so some assumptions were made. These assumptions were strengthened by a comparative study undertaken by a property registration expert from Albania who attempted to identify the common elements of the registration and cadastral business processes in two quite different countries; Samoa and Albania. It was then assumed that these common business process steps were likely to be included in the generic OSCAR shell software.

2.2 Critical Issues

A number of issues need to be addressed as the planning for the OSAR pilots progresses:

1. There is a need to keep the interest and momentum for the OSCAR pilot in Samoa alive. It is unlikely that any OSCAR software that can be used in an operationally will be available in Samoa until at least June 2011. This means that the MNRE will need to continue to support and enhance the current registration and cadastral systems for at least another year before they can be migrated into OSCAR. The World Bank project that supported the development, implementation and support of these systems has now finished and there is not any software support within the MNRE. There was an expectation that OSCAR would provide the solution to this support and enhancement function and, although it will eventually, there will be a period of a year when MNRE is unsupported unless a development assistance partner can be found. MNRE are actively looking for such a partner. It would be useful if OSCAR could provide some early benefits to the MNRE and some assistance to moving to an open source database management system (such as Postgre SQL and POSTGIS) and GIS tools (such as uDig or Quatum GIS) would be viewed very positively and put in place two important ITC infrastructure elements that will be utilized by OSCAR when it is implemented. Another possible area of support would be in training including in the use of open source software development tools that will be used by OSCAR and applying this training in some simple land administration functions including the migration of simple existing applications that currently use Microsoft Access or Excel.

2. Software development expertise within Samoa and in particular within government agencies is quite limited. It is taught at a bachelor degree level at the National University of Samoa and also by the regional university, the University of the South Pacific. Typically software development is done by overseas consultants although there are one or two local consulting firms who offer software development services. It is most likely that the two local "project consultants" to be recruited by the OSCAR project will be graduates in their first job with experience only in an academic environment. Mentoring of these consultants is likely to be very important. Likewise the retention of these consultants will be a problem as salaries within the public service are not high. The initiative of the MNRE CEO to involve existing MNRE staff who have some software development experience is one way to broaden and ensure the OSCAR expertise remains within the MNRE.

3. There are a number of land administration related initiatives that have been identified for implementation in the coming year and it is recognized by MNRE that they could effectively use international technical assistance support in an advisory role in the planning and implementation of these initiatives. MNRE is actively canvassing for this type of technical assistance from development donors. If support is not forthcoming for these initiatives then the OSCAR Samoa pilot may find that certain prerequisite tasks are not completed to a level completely satisfactory for the OSCAR Samoa pilot. Or some of the tasks that are not "pre-requisites" but do allow certain improvements which would make OSCAR work better will not be completed.

   Some of these other land administration related initiatives are:

   - Densification of GPS control and connections to cadastral surveys
   - GPS coordinates on new benchmarks
   - Unit Plan training for surveyors
   - Land Registration System support and enhancements for Unit Titles and improved reporting (including valuation extracts, requisitions)
   - Samoa View Quality Improvement
   - Land Registration System computer folio (title) to Samoa View parcel matching

2.3 Recommended Actions

Prerequisite Tasks

That MNRE, with appropriate technical assistance, complete the following actions prior to October 2010:

- to adopt Postgre SQL (& POSTGIS) as the standard database management system for all new software applications in MNRE and plan for the migration of existing applications to this standard
- to identify an Open Source GIS tool (such as Quantum GIS or uDig) as the standard GIS tool for all new software applications in MNRE and plan for the migration of existing GIS applications to this standard
- to seek support (and funding) for comprehensive training in the adopted standard Open Source GIS tool for all MNRE staff using GIS
- to establish a Central Map Repository (based on POSTGIS) for all MNRE Sections using spatial data that are located in the Development Bank of Samoa building
- to complete the Samoa View quality improvement work as identified in the (SIAM 2) Land Information Integration Advisor's final progress report (July 2009)
- to undertake initial parcel matching between the parcel tables in the LRS database and the Samoa View database (software would need to be written)

Priorities for OSCAR functionality in Samoa

That the FAO OSCAR design and development team note the following priorities for OSCAR functionality in Samoa:

- the migration of Samoa View (DCDB) to the OSCAR environment (POSTGIS) with the functionality to perform cadastral mapping functions, the processing of lodged cadastral survey plans and cadastral map and survey plan searches
- the migration of the Land Registration System software to the OSCAR environment (Postgre SQL) with all the existing functionality to process registration dealings and provide computer folio (title) certificates and other search products
- the incorporation of a Digital Archive of Scanned Registration Documents into OSCAR
- the inclusion of an OSCAR component that provides Cadastral Survey Calculation

OSCAR Shell Development

That the FAO OSCAR Design and Development team consider the following in the design of the initial OSCAR shell software:

- that the current Samoa Land Registration System be used as prototype (with respect to the registration functionality it provides) for the initial registration component of the OSCAR Shell (this would accelerate the tangible project deliveries from OSCAR in MNRE)
- that the Cadastral Map Functionality should include search, zoom, A4 & A3 printout and simple parcel maintenance (split parcel, merge parcel, fix topology), import/export (using the LandXML format)
- that the general Cadastral Functionality should include the support of business processes associated with mechanisms (such as cadastral survey plans) that initiate change to the cadastral map and/or provide the authoritative basis for property boundaries
- that the Cadastral and Registration components should include support for strata estates in property (referred to as Unit Titles in Samoa)
- that there is a potentially "self contained" component which provides basic cadastral survey calculations and the generation of a digital dataset (ideally in LandXML format) capable of being used for digital lodgement (refer to SDRmap software Traverse Sheet and Graphic data entry functions for guidance on data entry and calculation requirements)

Software Development Methodology

That Rational Unified Process (RUP) software development methodology be adopted for OSCAR customisation work in Samoa (no other methodology is used in Samoa and training will be required as part of the OSCAR project support to MNRE)

Proposed Project Organisation

That FAO consider the following proposal for the project organisation within Samoa for the OSCAR Samoa Pilot:

- Project Sponsor – CEO MNRE
- Steering Committee – ACEO (Technical Division), ACEO (Land Management, Principal IT Officer, OSCAR Project Coordinator)
- Project Coordinator
- Working Group
- MNRE Software Development Team (including the two local OSCAR project consultants (software developers)

3 Existing Environment

3.1 Land Tenure in Samoa

The Independent State of Samoa gained independence in 1962 having been administered by Germany (1900 – 1914) and then New Zealand (as a United Nations Trust Territory from 1945 – 1961). It has a population of 181,000 (2006 Census) and a land area of 2,831 square kilometres. Agriculture (primarily coconut based products), fishing, tourism and remittances from Samoans working overseas are the main contributors to the Samoan economy. All government cadastral and registration services are provided by the Ministry of Natural Resources and Environment (MNRE) whose offices are all located in the capital Apia (on the island of Upolu). Apia is also the main commercial centre of Samoa and most of the private sector surveyors licenced to undertake cadastral surveys are based there too.

80 percent of the land in Samoa is held under customary ownership and this land is protected under the constitution. Samoan society is still strongly focussed on village life and the associated traditions. Customary land is not owned individually but communally with most land being associated with a chiefly (matai) title. The matai has authority (pule) to decide on the permitted uses for that land by other members of his family group. One forum for the resolution of disputes concerning customary land is the Land and Titles Court (but it should be noted that "Titles" in this case mean chiefly titles).

The remaining non-customary land consists of 4 percent of freehold land and 16 percent of public land. Cadastral and registration records of parcels of land within these non-customary categories of land are recorded within the formal cadastral and registration systems. A small number of blocks of customary land subject to a lease are also with the formal systems. The computerised cadastral mapping system, known as Samoa View, has 21,000 parcel records (July 2009). The computerised Land Registration System holds 12,000 current titles.

3.2 Legal Framework

3.2.1 Current Cadastral Arrangements

Currently (July 2009) cadastral surveys are undertaken under the Survey Ordinance 1961. New legislation for cadastral surveys is currently under consideration by Parliament.

Any change in boundaries for freehold or Government land (or for the registration of a lease over customary land) requires a cadastral survey signed by a registered surveyor. Most of these surveys are performed by private sector surveyors. A survey plan is lodged with the MNRE where it is checked by the Quality Assurance Section of the Technical Division. Once the survey is considered to meet all requirements (including the standards described in the Survey Regulations) the survey is approved by the Chief Executive Officer. The survey is then able to support registration actions including the issuance of new titles. Once the survey is approved the new boundaries are recorded in the (computerised) Samoa View mapping system.

3.2.2 Current Registration Arrangements

Samoa moved to a system of title registration with the implementation of the Land Title Registration Act 2008 on 2 March 2009. This change was accompanied by the introduction of standardised forms, the

implementation of a computerised system and the legal recognition of the computer based records, in particular the "computer folio".

Although it is possible for individuals to complete their own documents for registration, it is common practice for people needing to register a land transaction to engage the services of private lawyer to prepare and lodge the necessary documents with the MNRE. Details are entered into the computerised system at the time of lodgement. Staff from the Registration Section scan all lodged documents and associate them with the lodgement record, which has also been referenced to the appropriate computer folio (title) at the time of lodgement data entry. Registration staff then check that the lodged documents are able to registered. Once these checks are done the Registrar registers the transaction and the computer folio is automatically updated to reflect the new registration.

The public and MNRE staff can also request various computer folio search products and these are produced by the computerised system. Likewise the computerised system creates new computer folio certificates when a new survey plan is registered (as well as cancelling the superseded computer folios).

3.3 Data Communication

In Samoa, the reliability and speed of internet connections has improved dramatically in the recent year. There are now a number of high speed wireless internet hotspots in hotels and cafes in Apia. Similarly high speed fibre optic connections are available but the cost of these services limits their use by government agencies. For instance, a new Personel and Payroll system developed by the Public Service Commission for all government agencies was only implemented when the Ministry of Finance decided that they would cover the cost of the fibre optic data communication channel for participating agencies. The participating agencies considered that they could not cover the cost under their current operating budgets.

3.4 Applicable Government of Samoa Policies

There are no government policies specifically dealing with the adoption of open source software.

The main government IT initiative spanning government agencies concerns the Government of Samoa's E-government (internet) portal – www.samoa.gov.ws . It will ensure that internet searches for Samoan government agencies are more effectively "trapped" and directed to the relevant agency's website. It also attempts to ensure there is more consistency and control over the content published in individual agencys' websites.

The Ministry of Education has plans to use open source software solutions for IT support to schools.

Within the MNRE, the proposed ICCAS Project within the Metereological Division plans to use Postgre SQL database management system.

4 Samoan Land Adminstration Priorities

4.1 Future Land Administration Modernisation Initiatives supported by OSCAR Project

The following initiatives were identified as possible inclusions within the OSCAR Pilot in Samoa and an initial prioritisation made to assist with the planning process.

Priority	Land Administration Modernisation Initiative	Comments
1	Samoa View Migration	From Mapinfo / Spatialware / MS SQL Server environment
2	Land Registration System Migration	From MS Visual Basic / MS SQL Server environment
3	MNRE wide limited, read-only access to Samoa Viewer (GIS viewer)	
4	MNRE wide limited, read-only access to Land Registration System	
5	Cadastral & Registration Digital Archive	Currently scanned images are held in network folders and where appropriate referred to by the Land Registration System through links stored in the LRS database
6	Central Map Repository	Currently most digital map data (except cadastral mapping) are held in Mapinfo TAB files on various desktop computers within MNRE
7	Cadastral Survey Calculation	Currently these calculations are made on a DOS based application, SDRmap (within MNRE and also by private surveyors
8	Digital Lodgement for Registration Dealings and Cadastral Surveys	For cadastral surveys the LandXML format maybe an appropriate approach Registration Dealings could possibly use “structured” data within the pdf format used currently for the standard registration forms. Alternatively, some form of XML format.

4.2 Other Future Land Administration Modernisation Initiatives

The following initiatives were identified as being related to the OSCAR Pilot in Samoa but outside the scope of the OSCAR pilot. Some of these initiatives will require development donor support as the MNRE does not have all the necessary expertise or the operating budget to fund them on their own.

Priority	Land Administration Modernisation Initiative	Proposed Key Responsibility
1	Land Registration System (software) support including enhancements for proposed Unit (Strata) Titles legislation, valuation dealing extracts and requisition notices	MNRE through some future development technical assistance
2	Samoa View (cadastral mapping) quality improvements (parcel and road related tables)	Quality Assurance Section, MNRE
3	Land Registration System parcel record matching with Samoa View parcel record	MNRE through some future development technical assistance
4	Unit Plan training for surveyors and MNRE Quality Assurance Section staff	MNRE through some future development technical assistance
5	Up to date orthophotography for all of Samoa	MNRE through some future development assistance funding and technical assistance
6	Densification of SGRS 2005 survey control (particularly within Apia) and connections from this control to cadastral surveys	Survey Section, MNRE
7	Position fixing of all new benchmarks in terms of SGRS 2005 datum	Survey Section, MNRE

4.3 Prerequisite Tasks

There are a number of tasks that should be completed before the OSCAR customisation work begins in Samoa.

Priority	Task	Proposed Key Responsibility
1	Adoption of Postgre SQL and POSTGIS as the MNRE standard database management system	IT Section, MNRE
2	Identification of an open source GIS (such as Quantum GIS or uDig) as the standard GIS tool for MNRE	Mapping Section, MNRE with some future development technical assistance
3	Comprehensive training for MNRE staff using GIS in the identified MNRE standard GIS tool	MNRE through some future development technical assistance
4	Implement MNRE open source Samoa View GIS viewer	MNRE through some future development technical assistance
5	Conduct introductory training in software	Suggestion for early training

Priority	Task	Proposed Key Responsibility
	development within proposed OSCAR software development environment	supported through OSCAR pilot

4.4 Digital Data Issues and Initiatives

Although both registration and cadastral mapping data is now held and maintained within a digital environment, both these sources of data will need to be migrated to the open source OSCAR compatible DBMS.

There are also a number of data initiatives that will need to be completed before or as part of this migration:

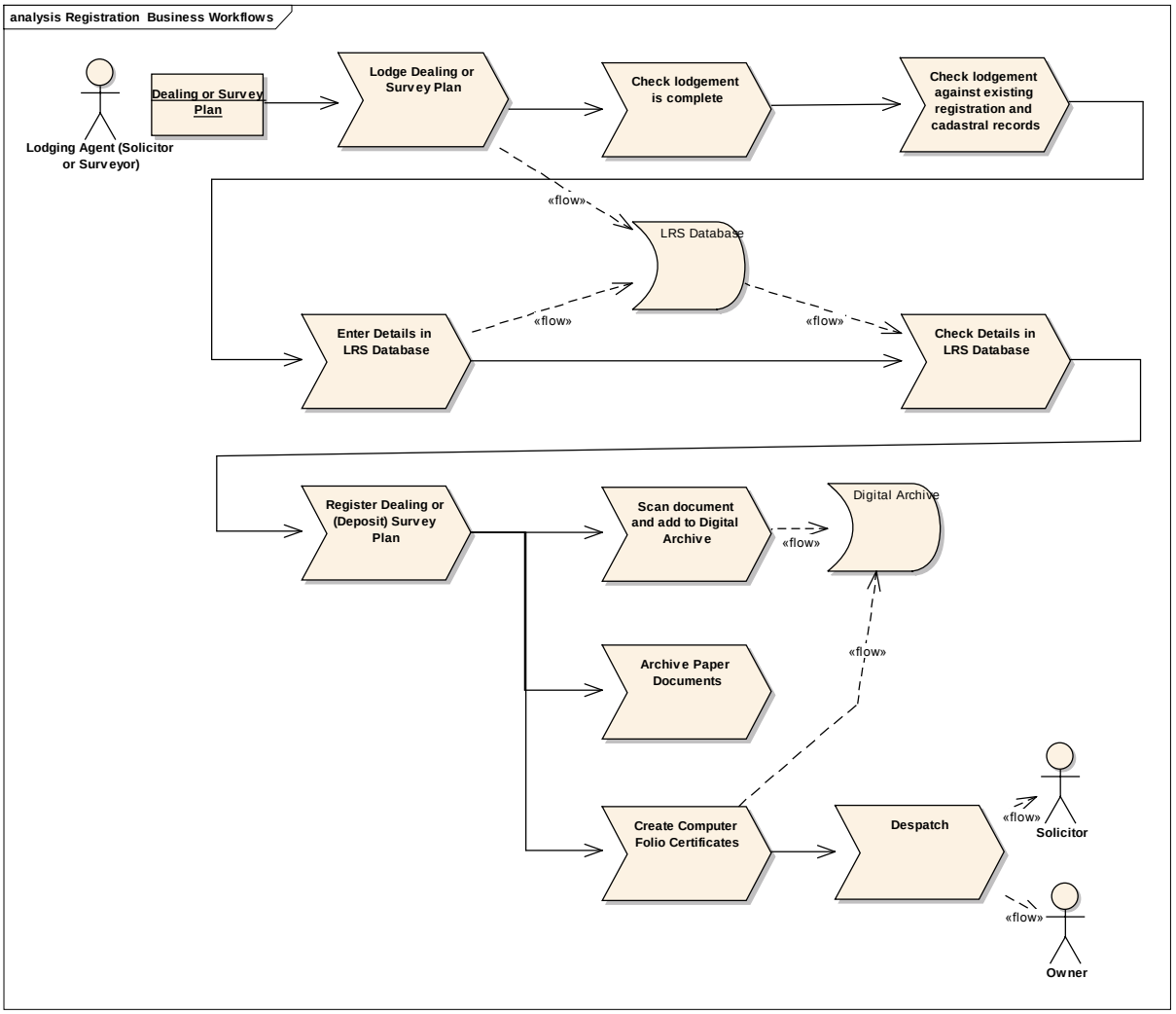
1 Quality improvement of the parcel and road related tables in Samoa View remedying both incomplete and incorrect attribute details and spatially related inconsistencies. This work is currently underway but because of staff shortages is unlikely to be completed until 2010.

2 The migration of scanned registration documents from network folder locations into database storage (plus a corresponding change to the Land Registration System software to deal with the change in the linkages (from network folder locations to database locations)

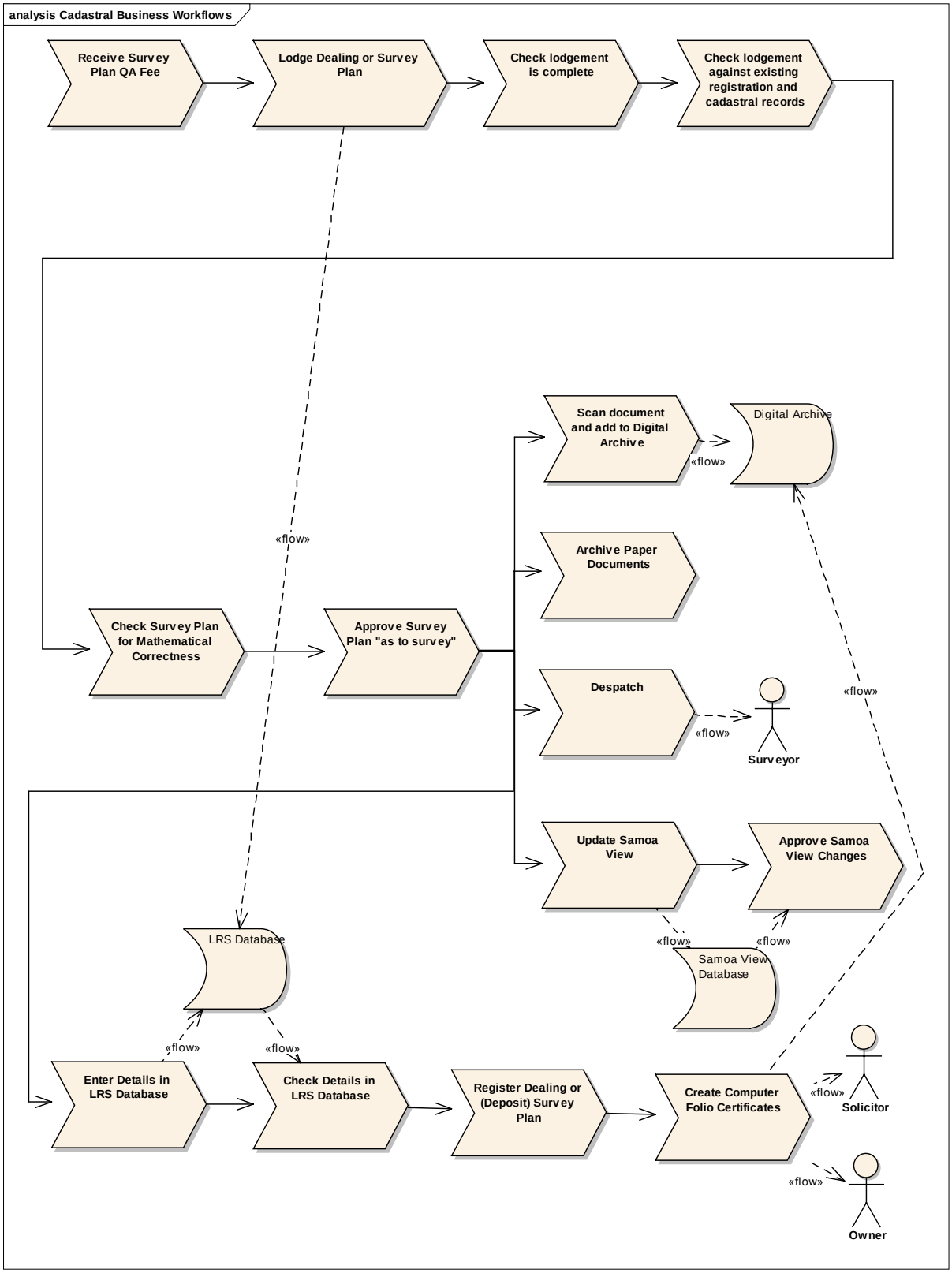
3 The matching of the equivalent parcel records within the Land Registration System and Samoa View

4.5 Business Process Descriptions

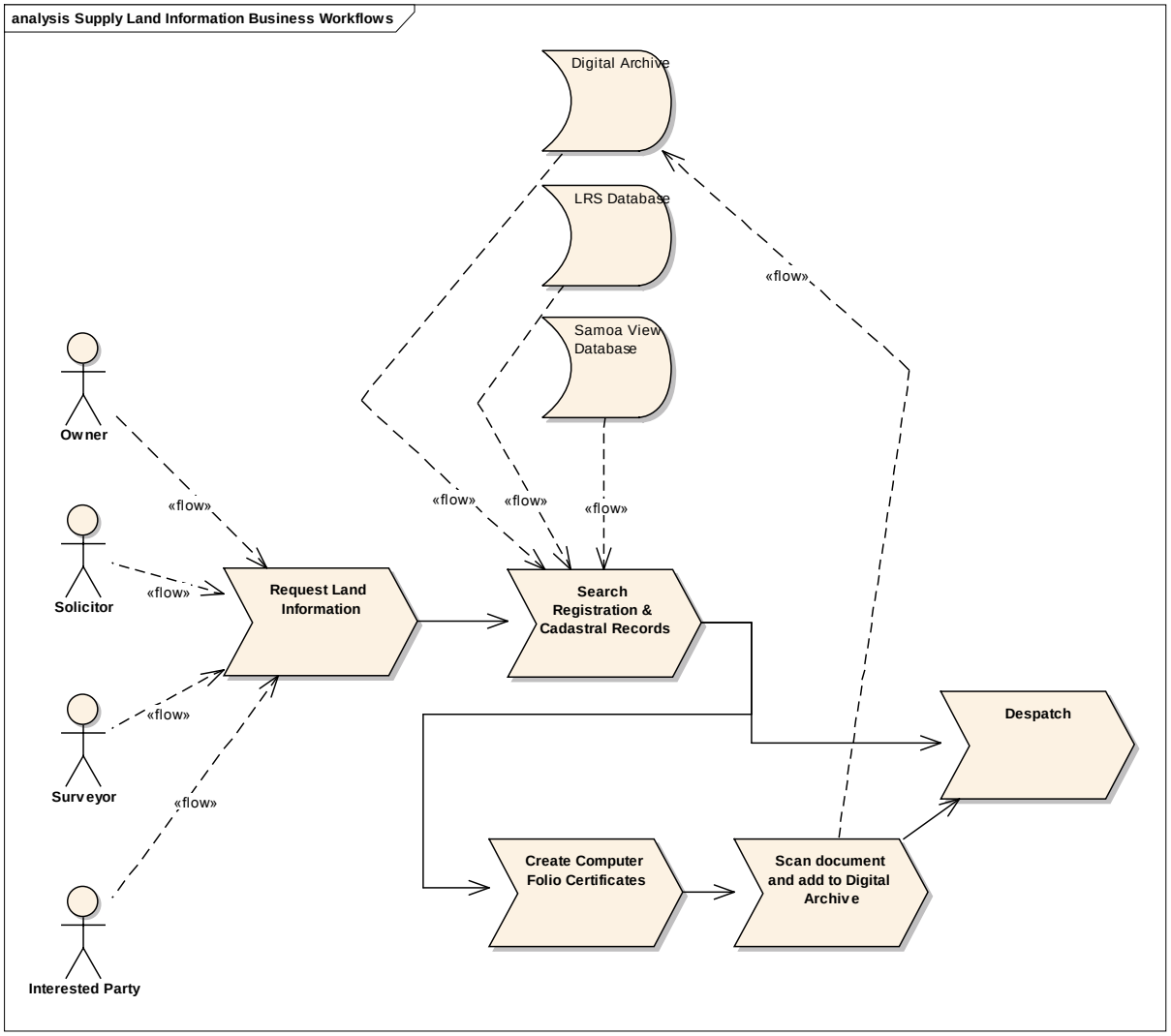
4.5.1 Registration Process Steps



4.5.2 Cadastral Process Steps



4.5.3 Providing Land Information



5 Statement of Requirements

5.1.1 Business Needs

ID	Business Need
BN - 1	To reduce processing times for registration dealings, survey plan approvals and the updating of the cadastral map (Samoa View)
BN - 2	To provide better access and improved delivery of registration, survey plan and cadastral mapping related services
BN - 3	To ensure an acceptable quality standard is maintained with registration, survey plan and cadastral mapping transactions
BN - 4	To reduce the processing effort for registration, survey plan and cadastral mapping updating
BN - 5	To produce Performance Statistics Reports
BN - 6	To incorporate audit traceability for changes to key fields in the computer folio (title) and Samoa View (cadastral map)
BN - 7	To enable system recovery (dealings, computer folio, Samoa View and scanned documents) in the case of a disaster involving damage or destruction of property records
BN - 8	To provide a high level of security against unauthorised access and changes to key title and survey plan records

5.2 Business Requirements

5.2.1 Key Stakeholder Summary

Stakeholder	Role
MNRE Clients	All people who are either parties to registration dealings or survey plans that are presented for registration or who require land information.
Ministry of Natural Resources & Environment	The Samoan Government agency responsible for land title registration, survey plan approval and cadastral mapping
Donor organization	UN FAO.

5.2.2 User Environment

Street Address	Ministry of Natural Resources and Environment Levels 3 & 5 Development Bank of Samoa Building Savalalo Apia
Phone	+685 23800
Fax	+685 23176
Number of Staff	7 in Registration Section (Land Management Division) 7 in Quality Assurance Section (Technical Division) 3 Licensed or Graduate Surveyors in Survey Section (Technical Division)
Annual number of transaction (2008)	2,158 dealings Number of survey plans not known
Annual number of information requests (2008)	10,000 approximately (figures possibly inflated through title conversion work)

Samoa OSCAR System	
Hours of Operation required for Computerized Property Registration System	Normal Office Hours (8.30 am – 4.30 pm Monday – Friday excluding public holidays)
Required response times	Maximum response time of 5 seconds on a typical desktop workstation
Required Access Control	Individual User Accounts with passwords and comprehensive firewall protection on any connections outside of the Local Area Network.
Data Protection	Inserts, deletions and changes to key fields to be logged to support Internal Audit function Rigorous backup regime which would allow the Samoa OSCAR System to be reconstituted with the maximum loss of 1 days transactions in the case of a disaster
Acceptable Maximum Interruption in Service	2 days
Users Location	Levels 3 & 5 Development Bank of Samoa Building, Apia
Potential Systems to be linked to Computerized Property Registration System (in the future)	None planned in the immediate future

5.2.3 Key Stakeholder Needs

5.2.3.1 Stakeholder Group: MNRE Clients

Priorities, goals and interests:	• That registration of their property interests safeguards these interests • Property registration process should be simple, timely and affordable
Previous involvement in computerized land related applications	• Private solicitors through lodging dealings that were processed using the Land Registration System • Surveyors through their use of the same survey calculation package as is used within the Quality Assurance Section, MNRE
Resources required from this group during the project:	Patience to cope with short term delays and breaks in MNRE service while new computerized Samoa OSCAR System is implemented
Expects Solution to involve:	• Less time spent at the MNRE main office • Quicker turn-around times for registration dealings and survey plan approvals

Supporting System Capability	• Title and survey searches (including spatial searches using Samoa View) • Email notices (eg approval, registration, requisition)
Likely benefit(s):	• Improved levels of service from the MNRE Registration Section & Quality Assurance Section

5.2.3.2 Stakeholder Group: Ministry of Natural Resources & Environment (MNRE)

Priorities, goals and interests:	• To meet its obligations with respect to the Land Title Registration Action 2008, Survey Ordinance 1961 and other proposed legislation including the Unit Titles legislation • To be more efficient • To provide a service to MNRE Clients that is considered comparable to international "best practice"
Previous involvement in computerized land related applications	In the past 3 years both the Registration Section and Quality Assurance Section have been involved initially in the conversion of paper based records (including the cadastral maps) into digital records within a database. More recently they have used these computerised systems (Land Registration System and Samoa View) to process new registration dealings and survey plans and to update the digital computer folio and cadastral map (Samoa View) data.
Resources required from this group during the project:	Additional work effort to cover the special one-off tasks associated with the migration from one computerized system to another as well as maintaining regular services at the same time. This change will require MNRE staff to re-train in the use of the open source based system.
Expects Solution to involve:	• Staff training • Existing computerised functionality is improved • Improved measures to prevent fraud
Supporting System Capability	• Local Area Network • Desktop access to key title and survey records • Workflow management • Sustainable technical support for Samoa OSCAR System • (Ultimately) digital submission of registration dealings and survey plans
Likely benefit(s):	• Reduced software licence costs

	• In-house software development and support expertise • Improved access to land information • Reduced vulnerability to MNRE operations when there is a disaster • Reduced likelihood of fraud affecting land title registration

5.2.3.3 Stakeholder Group: Project Donors (UN FAO)

Priorities, goals and interests:	The successful completion of the Samoa OSCAR Pilot on time and on budget Improved sustainability of computerised systems supporting land tenure security.
Previous involvement in computerized property registration	UN FAO has been involved in similar land related computerisation projects in other countries throughout the world. There are plans for OSCAR to be piloted in Nepal and Ghana in the same timeframe as in Samoa.
Resources required from this group during the project:	• Capital funding • Funding of technical assistance including the recruitment of two local software developers • Project oversight and technical support and mentoring
Expects Solution to involve:	• Staff training • Software support capability within MNRE • A version of OSCAR customised for use in Samoa
Supporting System Capability	• Local Area Network • Existing MNRE server to host operational database • Software development and testing environment (including a new development server) • Performance (service standards) monitoring • Scanning of key title and survey records and disaster recovery plan
Likely benefit(s):	• More robust systems supporting land tenure • Fully operational nationwide example of OSCAR • Samoa committed to ongoing contributions to the OSCAR

	open source community

5.3 Functional Requirements

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
Lodgement				
FN - 1	Lodge. transaction	Registration Officer initiates new dealing (including survey plan), identifies the lodging agent and the system allocates the next unique sequential number applicable to the dealing (different number sequences for dealings, survey plans and powers of attorney)	10	BN – 1 BN – 5
FN - 2	Calculate.Fees	The system shall calculate the fee applicable to the transaction. (future function)	1	BN – 1
FN - 3	Generate. Lodgement Notice	Registration Officer to initiate the printing or email of a system generated lodgement notice.	1	BN – 1
Register Dealing				
FN - 4	Record. Dealing. Identify Title	Registration Officer to enter computer folio identifier for the affected title(s).	10	BN – 1, BN – 3 BN - 4
FN - 5	Record. Dealing. Details	System to present Registration Officer with a series of linked screens and, where practical, selection of values from a list of controlled values and default values to capture all the details describing the dealing.	10	BN – 1, BN – 4
FN - 6	Record. Dealing. TitleChanges	System to present Registration Officer with a series of linked screens and, where practical, selection of values from a list of controlled values and default values to capture all the	10	BN – 1, BN – 4

[1] Refers to business need identified in Section 5.1.1

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
		changes to the title caused by the new dealing.		
FN - 7	Record. Dealing. Payment of Fees	Registration Officer records details of receipt presented to demonstrate all necessary fees have been paid	10	BN – 1, BN – 4
FN - 8	Register. Dealing	Registrar to review dealing and title dealings and, if satisfied, register the dealing and confirm changes to title. System generates a registration notice that can be printed or emailed to lodging agent.	1	BN – 1, BN – 4
FN - 9	Scan. Documents	Registration Officer scans dealing documents and these are linked to the dealing record	10	BN – 1, BN – 4 BN - 7
FN - 10	Despatch. Registration Notice	Registration Officer notes how and when the registration notice, a new computer folio certificate and any documents that need to be returned are returned	1	
Record Survey Plan				
FN - 11	Record. Survey. Details	System to present Quality Assurance Officer with a series of linked screens and, where practical, selection of values from a list of controlled values and default values to capture all the details describing the survey plan (including the new parcels).	10	BN – 1, BN – 4
FN - 12	Record. Survey. Supporting Documents	Quality Assurance Officer scans any supporting documents lodged with the survey plan, or, if digital images of these documents have been supplied, to upload these image files. System to store and link these images to the survey plan record.	10	BN – 1, BN – 4
FN - 13	Record.Survey. Upload LandXML file	System provide the means to import a LandXML file for the survey and store the import file against the (survey) transaction file and from the LandXML to generate a TIF image file of all new property polygons defined in the survey annotated with the	10	BN – 1, BN – 4

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
		boundary dimensions.		
FN - 14	Examine. SurveyPlan. AreaCheck	System to compare the total of the new parcel areas from the Survey Plan with the area of the underlying parcel polygon in the digital Samoa View Map and report if the difference exceeds allowable tolerance.	10	BN - 3
FN - 15	Examine. SurveyPlan. Checklist	System to present Quality Officer with a checklist of checks to be performed which, when complete (or marked "not relevant") assigns the new survey plan to the (Surveying) Approving Officer's Current Work workspace (for survey approval)	10	BN - 3
FN - 16	Examine. SurveyPlan. Automated Checks	System undertakes various automated checks or the Quality Officer performs a series of guided checks concerning mathematical and topological correctness checks of the new survey plan[Future function]	1	BN - 3
FN - 17	Examine. SurveyPlan. Approve	(Survey) Approving Officer reviews survey plan checks, reassures themselves on the correctness of boundary definition and if satisfied, approves the survey plan. System generates survey plan approval notice and either prints the notice or sends it by email to lodging surveyor.	10	BN - 3
FN - 18	NewSurvey Plan. Prepare NewTitles	Registration Officer brings forward owners, encumbrances and rights from underlying computer folio(s) onto new draft titles resulting from the new survey plan	10	BN - 3
FN - 19	NewSurvey Plan. NewTitles Release	Registrar review new survey plan and the draft titles and, if satisfied, 'deposits' the new survey plan, releases the new titles and cancels the underlying titles	10	BN - 3
FN - 20	NewSurvey Plan. Scan	Quality Assurance Officer takes new survey plan with all the necessary signatures and scans the plan using the wide format scanner. System stores and links the image to the survey plan database record.	10	BN - 3
FN - 21	UpdateMap. SurveyPlan. SpatialImage	System to provide Quality Assurance Officer with a spatial window. Quality Assurance Officer spatially references the new survey	10	BN - 3

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
	Register	plan (scanned image) by identifying common points on both the survey plan and Samoa View map. (Alternatively, where there are no obvious common points, system will display a window where by the Quality Assurance Officer can enter coordinates of points on the new survey plan that will be used as an alternative means of spatial registration. System to display the residuals of the spatial registration (assuming more than 4 points are used for the spatial registration).		
FN - 22	UpdateMap. Correct Topology	Registration Officer to delete and add boundary nodes on the underlying parcel where the new survey plan reveals differences with the current boundaries stored in Samoa View. System to ensure all new nodes are initially created on existing boundary lines before being positioned more correctly in terms of the scanned image. Likewise the system will check to ensure that the new positions of the new and revised boundary nodes do not cause gaps or overlaps or other topological problems	10	BN - 3
FN - 23	Update.Map. SpatialEdits	System to provide a spatial window and series of GIS layers (including the temporary spatially referenced scanned image of the new survey plan) and tools to record new boundaries and other map features RELATIVE to existing Samoa View map features and to define new property polygons. Where new boundaries do not follow any existing boundary, boundary vectors should define the new points (boundary vectors to be "run" between two identifiable boundary points, a misclose calculated and displayed and then new boundary points created in their adjusted positions. Underlying parcels to be identified and marked for "retirement" upon approval of the map edits. System to provide similar tools and routines to add and amend other Samoa View features affected by the new survey plan (survey plan, road, topographical feature)	10	BN - 3

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
FN - 24	Update.Map. AttributeEdits	System to provide ability to edit attributes of spatial features of all new and affected features including the parcel, survey plan and	10	BN – 1, BN – 4
FN - 25	Update.Map. Validate	Series of automated business rules used to validate the map update edits including polygon topology. These validation checks can be initiated by Quality Assurance Officer (and the Principal Quality Assurance Officer) at any time while making the map changes. Once the Quality Assurance Officer is satisfied that the map changes have been made correctly, they forward it to the Principal Quality Assurance Officer	1	BN - 3
FN - 26	Update.Map. Approve	Principal Quality Assurance Officer reviews map changes and, if satisfied, approves the changes. System removes temporary scanned image of the survey plan from the spatial window and changes status of proposed changes to "current" and "historic"	10	
Supply Information				
FN - 27	Search. TitleRecords	System to present user with a sequence of screens starting with the search criteria, followed by a list of records meeting the search criteria and finally a full display of the search target record with links to the corresponding view of Samoa View and the scanned image of the survey plan that created the parcel(s) for the title.	10	BN – 1 BN – 2
FN - 28	Search. Dealing Records	System to present user with a sequence of screens starting with the search criteria, followed by a list of records meeting the search criteria and finally a full display of the scanned image of the dealing with links to the corresponding title(s) records against which this dealing is recorded and another link to the view of Samoa View of the parcel(s) for the title(s).	10	BN – 1 BN – 2
FN - 29	Search. Survey Plan Records	System to present user with a sequence of screens starting with the search criteria, followed by a list of records meeting the search criteria and finally a full display of the	10	BN – 1 BN – 2

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
		search target record with links to the corresponding view of Samoa View and the scanned images of any supporting documents lodged with this survey plan.		
FN - 30	Search. Map	System to present user with a sequence of screens starting with the search criteria, followed by a list of records meeting the search criteria and finally a full display of the area of Samoa View zoomed into to display all parcel records meeting the search criteria. In this Map Display screen there should be the ability to select parcel/title and survey plan features and display the Display Title form or Display Survey Plan form that display the results of non-spatial searches.	10	BN – 1 BN – 2
FN - 31	Print.Title (UC – 3)	While viewing the Title Display form, the Registration Officer can request a print in the standard "Staff Search", "Historic Search" and "Computer Folio" title products. System to note prints have been made. Note later requirements concerning Certified Certificates (applicable to "Computer Folio Certificate")	10	BN – 1 BN – 2
FN - 32	Print. Scanned Document SurveyPlan	While viewing a scanned image of a dealing document, supporting document or survey plan, Registration Office can request a print. System to note prints have been made		BN – 1 BN – 2
FN - 33	Export. DefineAreaOf Interest	System to provide a Map Window and tools for a user to define a closed polygon representing the spatial extent of a data export. System to log this action	10	BN - 2
FN - 34	Export.Title	User to initiate an export file for all current details for all titles within the defined Area of Interest. Standard for export will be an XML data file compliant with the OSCAR export schema (to be defined). System to log this action	10	BN - 2
FN - 35	Export. Map	User to initiate an export file for all current details for all map features within a defined Area of Interest. Standard for export will be a LANDxml compliant data file. System to	10	BN - 2

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
		log this action		
FN - 36	Export. Survey Plan images	User to initiate the export of a series of survey plan image files for all survey plans recorded within a defined Area of Interest. System to log this action	10	
Certify Certificate				
FN - 37	Certify.Scan	Registration Officer takes print of the title certificate (Computer Folio Certificate) signed by Registrar and scans signed certificate. System links this to the applicable title record.	10	BN – 1 BN - 2
Monitor Work				
FN - 38	Note.Actions	System to note the time and date, action completed and actioning user automatically on the completion of a system enabled action. User is also able to manually note that the user has completed a specific action (selected from a list of controlled values) with the current date and time being the default but editable value for the date time field.	10	BN –5 BN – 6
FN - 39	View.WorkIn Progress	System to generate a listing of all work – in – progress (Current Work Workspace). Each row to represent a dealing (including survey plan and power of attorney).	10	BN –5 BN – 6
FN - 40	View.WorkIn Progress. Workspace Listings	System to enable user to sort the Current Work Workspace on any column heading and filter by record type and transaction type	10	BN –5 BN – 6
FN - 41	View.WorkIn Progress. dealing	Registration Officer to select a specific row in the Current Work Workspace and request the system to display the full details of the selected record	10	BN – 1 BN –5 BN – 6
Audit Transaction				
FN - 42	Audit.Process Trace	Internal Auditor and Registrar to request system to list all processes undertaken on a specified dealing (including changes to the	10	BN –5

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
		cadastral map) including dates and staff member responsible for each process step		BN – 6
FN - 43	Audit.KeyData FieldTrace	Internal Auditor, Registrar and Chief Registrar to request system to list all changes made to any key data field on a specified dealing, title, survey plan or map parcel polygon including dates and staff member responsible for each change to a key data field.	10	BN –5 BN – 6
FN - 44	Registrars Correction. Initiate	Registrar to be able to lodge a Registry Dealing and assign it to a Registration Officer for action	10	BN – 3 BN –5 BN – 6
Report on Performance				
FN - 45	Report. Performance	Registrar to request system to compile a standard format performance statistical report for a user specified period of time	10	BN – 5
FN - 46	Report Performance. Review	System to display results of a request for a performance statistical report and prompt the user as to whether a hardcopy version is required.	10	BN – 5
FN - 47	Report Performance. Print	Registration Officer to request printout of Performance Statistical Report	10	BN – 5
FN - 48	Report. FeesCollected	Cashier to request system to one or a series of financial reports for a specified period of time concerning the fees collected (future requirement)	10	BN – 5
FN - 49	ReportFees Collected. Review	System to display results of a request for the fees report and prompt the user as to whether a hardcopy version is required. (future requirement)	10	BN – 5
FN - 50	Report Financial. Print	Cashier to request printout of Fees Reports. (future requirement)	10	BN – 5
Create New Title (Computer Folio)				

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
FN - 51	Verify.Draft TitleDetails	Registration Officer to identify approved survey plan. System to bring forward all current ownership, live encumbrances and other registered rights from current title onto each new draft title for a parcel defined on the approved survey plan. Registration Officer to edit the draft title details for ownership, encumbrances and registered rights to describe correctly these new draft new titles.	10	BN – 1 BN – 3
FN - 52	Record.Special Estates	Registration Officer to enter details on draft titles describing special estates such as Life Estate and Remainder Estate, if applicable.	10	BN – 1 BN – 3
FN - 53	Register.New SurveyPlan	Registrar to review the proposed new title details and, if satisfied, register ("deposit") the survey plan	10	BN – 1 BN – 3
FN - 54	Change.Title Status	Registrar changes the status of the current title to "historic" and the draft title(s) to " current"	10	BN – 1 BN – 3
Scanned Images				
FN - 55	Link.Scanned Image.Add	Registration Officer must be able to store and link a scanned image with the appropriate dealing, title or survey plan.	10	BN - 7
FN - 56	Link.Scanned Image.Update	Registration Officer must be able to replace the scanned image and update the link where this applicable	10	BN - 7
FN - 57	Link.Scanned Image.Remove	Registration Officer must be able to delete a scanned image and the link where this is applicable	10	BN - 7
Workflow & Business Rule Definition				
FN - 58	Modify. Workflow	Central Office System Administrator to add, delete or re-order a process step in a workflow sequence.	10	BN – 1 BN - 4
FN - 59	Add.Workflow	Central Office System Administrator to be able to add new workflow sequence	10	BN – 1 BN - 4

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
FN - 60	Add. Business Rule	Central Office System Administrator to be able to add new business rule	1	BN – 1 BN - 3 BN - 4
FN - 61	Delete. Business Rule	Central Office System Administrator to be able to delete an existing business rule	1	BN – 1 BN - 3 BN - 4
System Administration				
FN - 62	Manage.User. Privileges	System Administrator (any user for password change) to be able to change system settlings such as controlled value lists (codelists) and user privileges.	10	BN – 58
FN - 63	Manage.User. Change Password	Any user to be able to change their own password to a new value. New password to be double entered to validate its correctness	10	BN – 8
FN - 64	Manage.User. Privileges.Roles	System Administrator to be able to add, modify or delete different roles and associate certain permitted actions with each role.	10	BN – 8
FN - 65	Manage.User. Privileges. Accounts	System Administrator to be able to add, modify, suspend or delete individual user accounts for the system	10	BN – 8
FN - 66	Manage.SystemSettings	System Administrator to be able to add, modify or retire values in lists of controlled values (codelists)	10	BN – 8
Backup				
FN - 67	Backup. Database	System Administrator is able to schedule automated database backups. System is able to perform these automated backups and to report on all database backup, restore and maintenance tasks undertaken.	10	BN – 7 BN - 8
FN - 68	Backup.Server	System Administrator (or deputy) is able to initiate both automatic and manual backups of all active folders on the server required to restore the system in the event of a disaster.	10	BN – 7 BN - 8

Identifier	Capability	Feature	Priority 1 – Neutral 10 - Vital	Traces To[1]
		Backups to be made to media that can be stored in a safe location away from the system itself.		
FN - 69	Restore.System	System is able to be restored from backup media (software and data)	10	BN – 7 BN - 8
FN - 70	Backup. Database	System Administrator is able to define and schedule automated routine background system tasks. System is able to perform these automated tasks and log all activity undertaken in this mode.	10	BN – 7 BN - 8
Cadastral Survey Calculations				
FN - 71	SurveyCalcs	To follow the functionality provided in the DOS based SDR Mapping and Design v6.5 survey calculation package – the job setup, spatial display, and the Calculation Tools Graphical Calcs, Data Entry and Traverse spreadsheet. Plus additional functions (not in SDR Map) to provide for Data Export and Import using LandXML and sufficient functionality to compile a complete LandXML file with survey, measurements, coordinates and parcel details (refer to SDR Transfer software, www.focussurveying.co.nz/trig/sdrtransfer.html) . An additional output to the LandXML file should ideally be a metadata/ survey report file in a standard format (ISO 19115 is suggested) and a series of scanned images of supporting documents associated with the survey.	5	BN – 1 BN – 2 BN - 4

5.4 Non-functional Requirements

5.5 Non-Functional Features

5.5.1 Quality Ranges

Identifier	Feature	Priority

Identifier	Feature	Priority
Performance		
QL – 1	The system is available 8am – 5 pm on every work day	9
QL – 2	The system is available only within the main MNRE office where up to 50 users may be connected in the MNRE Development Bank of Samoa main office.	9
QL – 3	The system has a maximum response time of 5 seconds on a client desktop workstation	6
Reliability		
QL – 4	The mean time between failures is more than 4 months in a year of operating	9
QL – 5	Mean time to repair is 2 working days	7
Usability		
QL – 10	A trained user shall be able to complete a dealing lodgement in a maximum of 5 minutes (Registration Officer); make a typical update to the Samoa View cadastral map in a maximum of 15 minutes (Quality Assurance Officer) and create a new user in 5 minutes (System Administrator)	7
QL – 11	Where Exceptions occur, these should be logged (Event Log) and reported to the user in a constructive and understandable way	8
QL – 12	On-line help including user documentation must be available to users	8
QL - 13	Context sensitive help should be available to users	4

5.5.2 Other Requirements

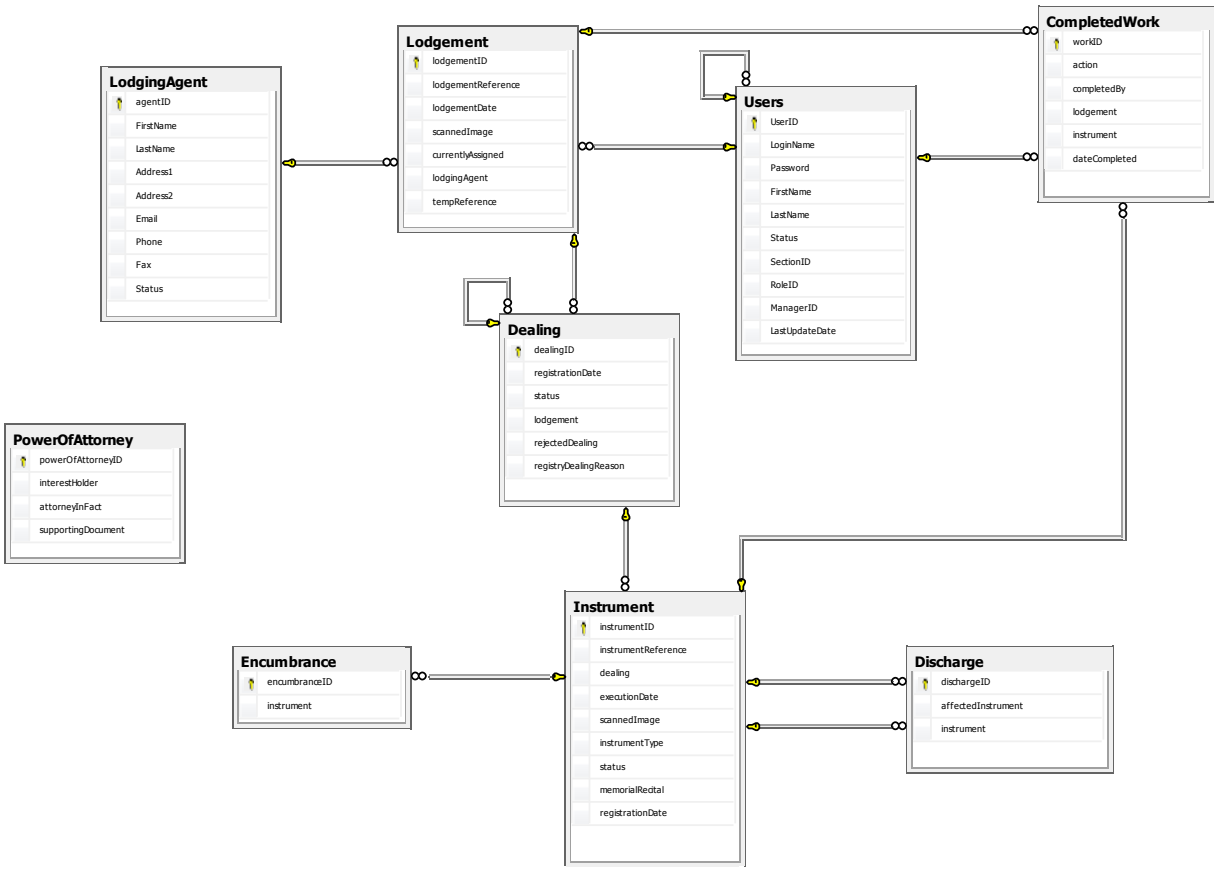
Identifier	Feature	Priority
Workstation Requirements		
WK - 1	OSCAR software should be able to run on desktop workstations running Windows Vista operating system	10
WK - 3	All client workstations to have access (direct or through network) to at least one laser printer that can print both A4 and A3 size formats.	10
WK - 4	All client workstations to have access (direct or through	10

Identifier	Feature	Priority
	network) to a desktop scanner (with ADF functionality) capable of scanning multi-page A3 sized documents	
Solution		
SO - 1	The system to support Samoan language, (possible future requirement)	1
System Administration		
SA - 1	The system keeps a log of any changes to key data fields (to be identified during design)	6
SA - 2	The system to keep the log of changes for at least 6 months and then archived	6
SA - 3	No user can change the log of changes, not even the System Administrator	9
SA - 4	Minimal overhead for database administration and maintenance	6

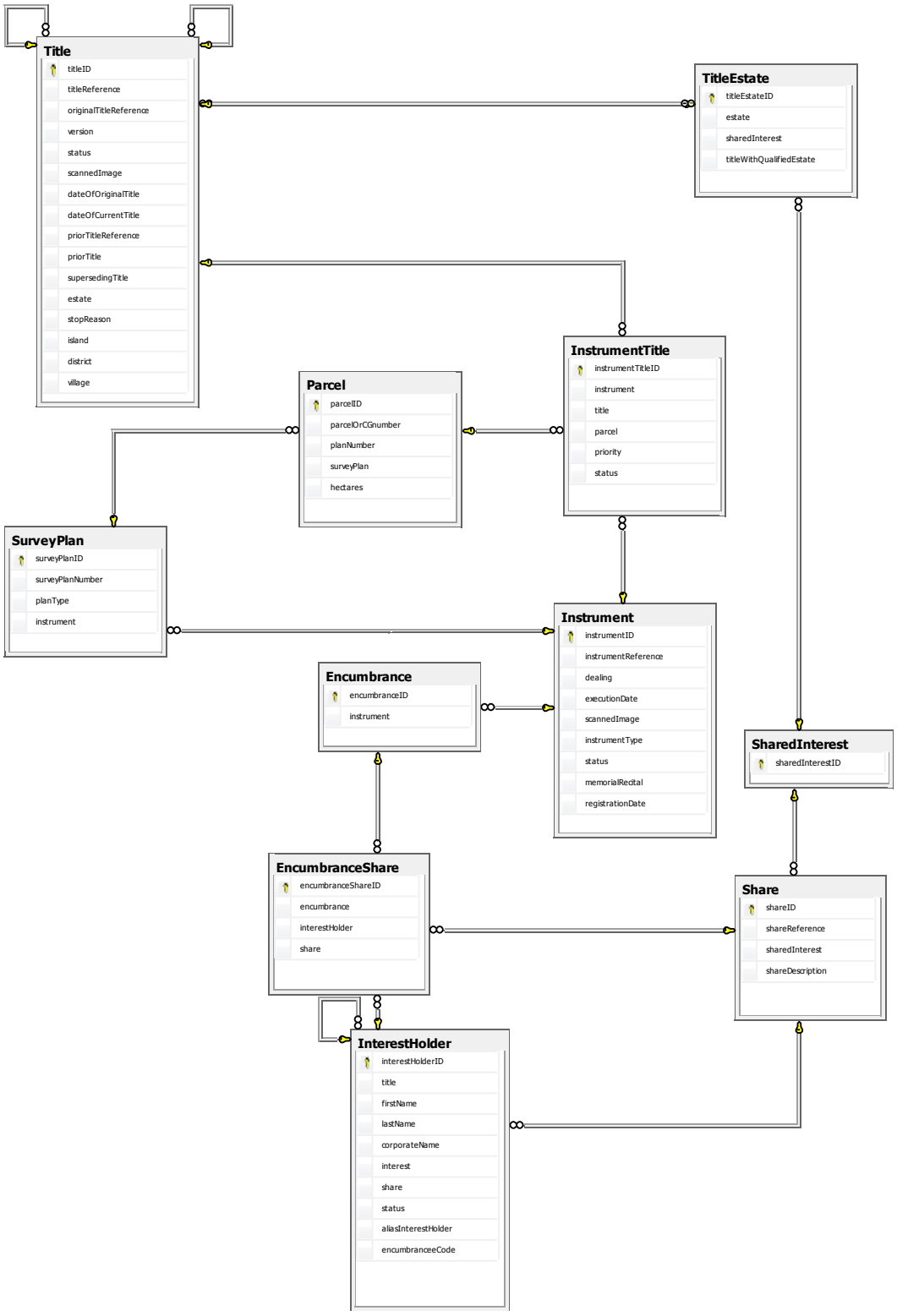
5.6 Land Registration System Database Definition

The following diagram represents the main tables and their attributes in the current Land Registration System:

5.6.1 Lodgement Component Database Schema



5.6.2 Title Component Database Schema



5.6.3 Land Registration System Data Dictionary

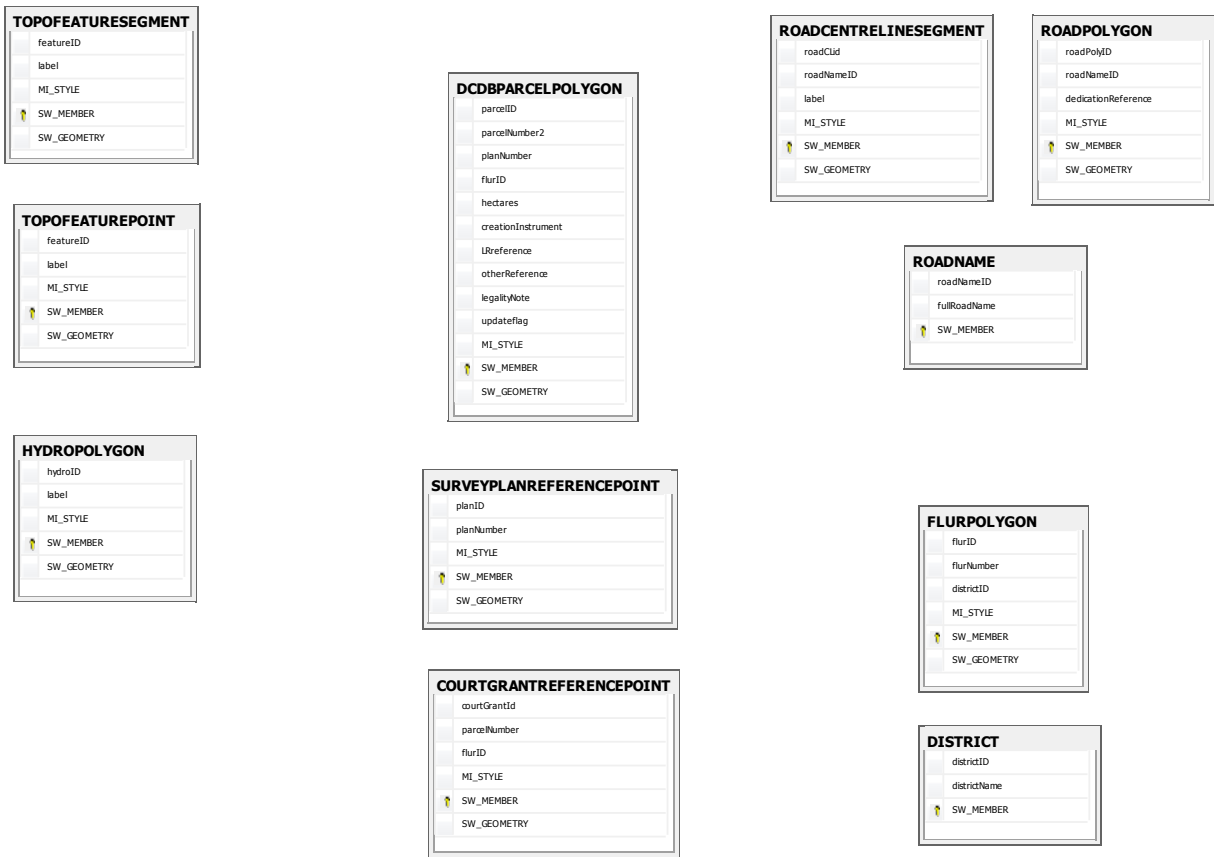
Tables

Table Name	Description
Title	Defines the key characteristics (including those guaranteed by the State) of a property either by way of attributes or by links to other tables. Also includes links to tables used in business processes within the Registration Office to ensure the title reflects the current, most up to date information.
Title Estate	Describes the nature of the ownership rights described in a title (eg freehold, leasehold, life estate/remainder estate, customary land)
Shared Interest	Describes the collection of shares held in a particular in an instance of a particular ownership title estate
Share	Describes a defined share in an ownership interest
Interest Holder	Describes an individual person or a corporate body that holds an interest in a property (including ownership and also mortgage holder)
Instrument	Describes a document that is lodged with the registration office in order to create a new right or encumbrance or to remove or modify an existing right or encumbrance
Encumbrance	Describes an instrument which limits an owner's rights in their property
Encumbrance Share	Resolves a potential many to many relationship and defines the various shares an encumbrance may affect
Instrument Title	Resolves a potential many to many relationship and defines the various titles an instrument may affect
Parcel	Describes an area of land described that is / can be / has been used to describe the extent of a property
Survey Plan	Describes a survey plan prepared by a licenced surveyor for cadastral purposes including the definition of the boundaries of new parcels.
Lodgement	Describes the process of submitting a new dealing or survey plan for registration
Dealing	Describes a bundle of instruments that are lodged together and need to be registered together

Table Name	Description
Discharge	Describes the instrument that removes an encumbrance
Lodging Agent	Describes the person / company lodging a dealing
Completed Work	Describes the completion of a process step associated with registration
Power of Attorney	Describes an instrument not necessarily associated with a title that empowers someone to act on behalf of someone else.

5.7 Samoa View Database Definition

5.7.1 Samoa View Database Schema



5.7.2 Samoa View Data Dictionary

Tables

Table Name	Description
DCDB Parcel Polygon	A polygon defining a parcel (being an area of land described that is / can be / has been used to describe the extent of a property)
Survey Plan Reference Point	A point defining the general location of a survey plan
Court Grant Reference Point	A point defining the general location of a Court Grant (that defines a parcel)
Road Centreline Segment	A segment that defines a road centerline from one intersection to the next
Road Polygon	A polygon defining an area that is legal road
Road Name	A listing of authoritative road names (referenced by the Road Polygon and Road Centreline Segment tables)
Hydro Polygon	A polygon defining a hydrological feature of river bed or ocean
Topo Feature Segment	A segment describing some topographical feature
Topo Feature Point	A point describing some topographical feature
Flur Polygon	A polygon describing a flur (sub-district)
District	A listing of administrative district names

5.8 System Architecture Constraints

This section describes the requirement and risks that will influence the architectural mechanisms to be specified in design:

5.8.1 Architectural Requirement

	Requirement	Category	Priority
1	Maximum 5 second response time	Performance	H
2	User Accounts with passwords to access system	Security	H
3	System available 8 am – 5 pm working week	Availability	H
4	CRUD operations logged	Audit ability	H

	Requirement	Category	Priority
5	Maximum downtime	Availability	H
6	Email notifications	Interface	L
7	Samoa View (cadastral mapping) integration	Interface	M
8	Immediate printing of completed application, contract and ownership certificate	Functionality / Performance	H
9	Workflow Management	Functionality / Configurability	H
10	Scanning of key land records	Interface	H
11	PC workstations in LAN configuration	Constraint	H
12	the system shall provide context-sensitive online Help	Usability	M
13	Open Source-like development (eg technical documentation) to facilitate future enhancement and re-use in other countries	Implementation	M
14	Integration with generic queue system	Interface	M
15	Registration process driven business rules	Configurability	H
16	User roles	Security	H
17	Error trapping and messages	Functionality	H
18	Email Error reporting	Interface / Functionality	L
19	All components available through open source licences and no fees	Licensing	M
20	Multilingual (Samoan and English)	Localization	H
21	Minimise complexity and maximise integration of development environment (including DBMS)	Implementation / Maintainability	H
22	Windows Vista “Look and Feel”	Consistency	H
23	Currency values rounded to nearest cent, Shares to total to “1”	Accuracy	H
24	Down time no more than 2 working days	Recoverability	H
25	Ability to handle 5-10X current transaction loads	Scalibility	M
26	Ability to run on workstations with Windows Browsers	Implementation / Interface	H

	Requirement	Category	Priority
27	Screen resolution should assume current (2009) standard workstation monitor	Interface	H
28	Multi-page Scanning of documents	Implementation	H
29	Spatial editing operations (subdivide parcel, merge parcel, attribute input and editing and parcel topology corrections) to be controlled by wizards where possible	Implementation	H
30	Discretionary spatial operations to be limited to spatial searching, viewing (zooming, set scale, layer on-off control, with-without standard feature labeling control), printing and image file extract	Implementation	H

5.8.2 Architectural Risks

	Risk	Impact 0 – 10	Likelihood 0 – 10	Overall Exposure	Category	Confidence in Resolution	Notes
1	Un-authorised access to sensitive data (malicious)	10	1	10	Low	High	
2	Inappropriate sharing of user ids and passwords	4	5	20	Moderate	High	Require logins for key processes
3	Unable to maintain data integrity in the case of power outage	10	6	60	High	High	Use of UPS
4	Scanned documents can be tampered with	10	1	10	Low	High	Use PDF format
5	Cannot handle multi-page scans satisfactorily	10	2	20	Moderate	Moderate	Network scanners with images saved to user specific network folder
6	Cannot meet response time requirements	10	1	10	Low	High	
7	Unable to implement configurable workflow system	2	5	10	Low	Moderate	Alternative is to incorporate within application software
8	Unable to implement system with configurable business rules	2	5	10	Low	Moderate	Alternative is to incorporate within application software

	Risk	Impact 0 – 10	Likelihood 0 – 10	Overall Exposure	Category	Confidence in Resolution	Notes
9	Unable to scale to projected transaction throughput whilst retaining satisfactory response times.	8	2	16	Moderate	Low	
10	Software support requires "international" expertise	10	4	40	Moderate	Moderate	Access (copy where possible) of data within Windows Development Environment

6 Pilot Implementation

6.1 Issues for initial OSCAR Shell Development

6.1.1 Timing

MNRE has an operational computerised system that is an integral part of the newly implemented title registration system (resulting from the Land Titles Registration Act 2008). With the end of the Land Administration component of the SIAM 2 project, software support with the developers of the software, Land Equity International, has ended although there is a possibility that software support for this software application may continue under a new development assistance arrangement. As is often the case, now that the registration staff are familiar with the software, they have begun to realise its potential to support other aspects of the registration function and other land administration functions performed by the MNRE. There is also new unit (strata) title legislation before Parliament and this is likely to become law later in 2009. With the implementation of the unit title legislation, there is a clear need for enhancements/extensions to the Land Registration System software application to accommodate this new form of title registration.

Ideally, MNRE would prefer that the migration of the Land Registration System software to an OSCAR environment occur in the next 6 months (before February 2010) and to include the proposed enhancements/extensions to the Land Registration System software within the OSCAR implementation. However, this is impossible within the currently proposed timeframes of the OSCAR pilot implementations in Samoa, Ghana and Nepal. It should also be noted that all prerequisite tasks for the Samoa OSCAR pilot could be completed before the end of 2009.

The issue associated with the high degree of readiness of MNRE for the OSCAR pilot is that the momentum and enthusiasm for OSCAR may wane in the year (2010) as the shell OSCAR software is developed. In the course of the year, the investment in the current Land Registration System software will increase and the software modifications will become more complex thus making the migration to an OSCAR environment more difficult.

For these reasons, an early start to the Samoa OSCAR customisation work would be advantageous.

6.1.2 Business Process

The Samoan cadastral and registration business processes were compared with similar processes known to the consultants namely, Albania, Palestine and New Zealand.

The main conclusion is that despite there being quite different legislation in each country the business processes are very similar to those adopted in Samoa (described in Section 4.5) . The main differences in Samoan business processes from the business processes in some of the other countries identified above are:

- the importance of the survey plan as the authoritative definition of boundaries and the processes associated with ensuring its correctness (plan examination)

- the business processes associated with fee payment (including stamp duty) – both whether they are supported within the computerised system and at what task step they occur (OSCAR shell will need to have the ability to configure work flow sequencing)

- each business process step potentially has business rules associated with it (potentially different for each country) and in particular different supporting documents that must be present before progressing to the next business process step

- there may be additional business process steps (and / or associated business rules) required to identify and correct potential deficiencies in the existing records before registration or cadastral processes can be concluded. These deficiencies in the existing records will be different for each country.

- The need for a business step to manually fix the seal and / or Registrar's signature on certain computer generated certificates and to scan and archive the sealed and/or signed certificate

6.1.3 Legacy Software Applications

6.1.3.1 Land Registration System

The Land Registration System (LRS) application currently supports the operation of the Land Registration Section of the Ministry of Natural Resources & Environment, Samoa and is an integral part of the registration process.

This software application was developed by Land Equity International, as part of the World funded Technical Assistance provided in the C5 Land Administration and Surveying Component of the SIAM2 Project. It was developed from May 2005 – January 2006. There have been a number of further releases / versions since that time with the current version be 5.07 (8 August 2009).

The impetus for the development of this software application was new legislation to implement a "Torrens" land title registration system such as exists in Australia and New Zealand. As there were delays in the passing of this new legislation, the original design was modified to allow the software to support previous (deeds registration) registration law and, at the same time, to facilitate the transition to the title registration system as defined in the Land Title Registration Act 2008.

The LRS software application was developed as an in-house desktop/client application requiring a connection to the LRS database hosted on the MNRE02 server through the MNRE network in the Development Bank of Samoa building.

The LRS application was developed in Microsoft Visual Basic 2008 and utilizes a Microsoft SQL Server 2005 database (including stored procedures).

The LRS software is implemented in three tiers and hence three separate MS Visual Studio.NET projects. Generally there is a one-to-one relationship between objects in these three projects. These projects are:

1. **Object Classes (Land Registration –** the startup programme)

   Objects are outlined in the table below

2. **Business Logic (LRBusinessLogic)**

   Includes XML schemas of all data structures accessed in the application

3. **Data Access (LRDataAccess)**

   Includes cryptification routines to safeguard LRS users passwords and access to the LRS SQL Server database. These routines provide the links to over 250 LRS specific SQL Server Stored Procedures (relatively short stored SQL routines stored within the LRS database). For each database table there are stored procedures to Insert (new values), Delete (individual records), Select both individual records (using the key record value) and all records in the table and Update records. There are also specialized search routines for some LRS database tables

Main LRS Objects

Form	Associated Database Tables	Description
About	-	Typical high level description of LRS
AddAgent	LodgingAgent	Adds details on Lodging Agents
ConvertEncumbrance	Instrument Encumbrance	Used to capture encumbrance details for title conversion
ConvertTitle	Title Parcel	Used to capture and release title details for title conversion
CreateProprietors	Share InterestHolder	Captures ownership details for both title conversion and dealing registration
DraftNewTitles	Title Parcel Plan	Prepares new titles from a lodged survey plan
EditEncumbrance	Instrument Encumbrance	Used to capture encumbrance details in dealing registration
EditTitle	Title Parcel	Used to capture title details in dealing registration
LodgeDealing	Instrument Dealing Lodgement	Used to capture initial details of instruments presented for registration
LodgeOtherDocuments	PowerOfAttorney Dealing Lodgement	Used to capture details of documents lodged with Land Registration Section but not to be registered against a title (currently only Power of Attorney and Revocation of Power of Attorney)
LodgeSurvey	SurveyPlan Instrument Dealing Lodgement	Used to capture details of survey plans lodged with MNREM
Login	-	Collects User name and password details to authorize access LRS software application
Main	-	Main form for the LRS application – no functional use apart to "hold together" other LRS functions.
PrepareReport	Various	Prepares statistics on lodgements and registrations
PrepareTitle	Title	Collates information from the LRS

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Form	Associated Database Tables	Description
		database to display summary of current details. Generates a series of printed output products
ReceiveDealing	Lodgement Dealing	Collects details from various database tables as a preliminary stage to accessing the registration forms
RecordDealing	Instrument SurveyPlan Dealing Lodgement	Main form for the registration processes including database edits to reflect the changes to the title caused by lodged instruments and the addition of links to scanned image links
SearchDocument	PowerOfAttorney	Entry of search criteria and subsequent searches for Powers of Attorney (and revocations)
SearchInstrument	Instrument	Entry of search criteria and subsequent searches of instruments and dealings
SearchTitle	Title	Entry of search criteria and subsequent searches of titles
Workspace	Dealing Various Codelists	Dealing – display in tree structure of all currently lodged but not yet registered dealings Codelists – Maintenance forms for most system codelists (only accessible by LRS user, Admin)

Module	Description
mShellAndWait	A routine to allow calls to external applications such as Adobe Acrobat (to view, print etc scanned images)

Typical Subroutines for Major Forms

Subroutine ActionAdd

Subroutine ActionDelete

Subroutine ActionUpdate

Subroutine ClearFieldsInForm

Subroutine DockPanel

Subroutine LoadNnnnnn (where Nnnnnn is the name of each codelist referred to in form)

Subroutine Navigate

Subroutine NavigateWindows

Subroutine PopulateNnnnnn (where Nnnnnn is the name of the form)

Subroutine UnDockPanel

Subroutine UserFormViews

Use of Microsoft Word Templates

A series of templates have been designed to work with the software to create standard documents and reports. These are during installation into the C:\Program Files\SLIS\Land Registration \Templates directory. An integral (and very critical) part of these templates are the defined Bookmarks that can be identified through the use of an italic font if these templates are opened directly (not through the software). Changes to wording and format of these templates must maintain these Bookmarks if the software is to continue to work properly.

These templates are used when Certificate Printing is invoked (Certificate Form) or as a menu option from the Completed Work Panel within the Instrument Form.

Template Name	Purpose
ComputerFolio	Proposed new Certificate with "Torrens" legislation
ConvertCheck	Report to Check conversion details of a Folio
Historical	Standard Search product including all instruments lodged against a title plus encumbrances
Lodgement	Management Report detailing lodgements and registrations over a period of time
NewForm	New form of Certificate for a folio following conversion (for the period before the Title Registration Act is implemented) with ACEO (Land Management) scanned signature (as of 2 October 2008)
StaffSearch	The current details for a folio (or title)

Links to Scanned Images of Land Registration Documents

The LRS software has a simple method of linking and viewing scanned images of land registration documents. The scanning occurs independent of the LRS software but expects:

- dealings to be saved in the T:\Instruments\Lodgement or the T:\Instruments\Registration folders
- New Form (and similarly Computer Register) folios to be saved in the T:\Instruments\NewForm or the T:\Instruments\ComputerRegister folders
- documents to be saved as multi-paged pdf files (one pdf file for each document)
- scanned image documents to be named with the allocated Document Reference

The LRS software links the scanned image to the appropriate LRS database record by storing the full file name (including drive and directory) in a scannedImage field of the corresponding database record.

The LRS (Image) View function is reliant on the installation of Adobe Acrobat or Acrobat Reader on the LRS users workstation so the pdf file type is associated with the Adobe Acrobat software application. (Similarly, the LRS view function will display scanned images stored in tif and other graphics file formats, if there is a graphic image view software application installed on the workstation that associates the specific graphics file format to a graphic image view application.)

6.1.3.2 Samoa View (DCDB)

Samoa View is an operational computerized cadastral mapping system used by the Quality Assurance Section of MNRE to record changes to cadastral boundaries resulting from the approval of a new survey plan.

Samoa View (previously known as DCDB) was created using the commercial Mapinfo Professional GIS software (current version 9.5) with data stored in a Mapinfo Spatialware (version 4.9.2) modified Microsoft SQL Server 2005 database. The data was converted by on screen digitising of scanned images of the original manuscript cadastral record sheets. As part of this data conversion the old Lemuta map project coordinates (shown on these maps) were transformed to the new Samoa Map Grid based on the SGRS2005 geodetic datum (a UTM projection based on Zone 2 southern hemisphere and the SGRS 2005 geodetic datum closely approximates to the WGS 84 geocentric datum).

The maintenance / updating process is also based on on-screen digitising of survey plans following their "approval as to survey". These scanned images of survey plan are spatially registered relative to current spatial definitions of the underlying parcels and no attempt is made to incorporate the coordinate values of boundary positions as determined on these new surveys ie relative accuracy is maintained.

All Samoa View maintenance / updating functions utilise standard Mapinfo functionality and none of these functions have been automated or made subject to a wizard-like process. These processes depend on the GIS operator being competent in the use of Mapinfo Professional.

Samoa View Feature / Table	**Description**
Updated Record Sheet Outline Polygon	The rectangular polygon defining the extents of the original manuscript cadastral record sheet
District	A lookup table (non spatial) that records all the District names
Flur	A lookup table (non spatial) that records all the Flur (block of a District) identifiers (roman numerals)
Road Name	A lookup table (non spatial) that records the names of all roads defined in Samoa View
Hydro Polygon	A polygon defining hydrological features such as rivers and the Pacific Ocean
DCDB Parcel Polygon	The main Samoa View feature defining the polygons representing the current parcel definition
Road Centreline Segment	A segment line defining the centreline of a road from one intersection to another intersection
Court Grant Reference Point	A point feature defining the general location of a Court Grant that creates certain older parcels (in the same way as a survey plan creates all new parcels)
Survey Plan Reference Point	A point feature defining the general location of an approved survey plan
Topo Feature Segment	A topographical feature best defined as a line segment. Has no legal basis but is added to assist the Samoa View user to locate themselves
Topo Feature Point	A topographical feature best defined as a point. Has no legal basis but is added to assist the Samoa View user to locate themselves

6.1.4 Database Schema Considerations

Decisions on the data model and database schema to be used by OSCAR have yet to be finalized. However, it is safe to assume that the OSCAR data model will be influenced by both the international data models supported by FIG; the Land Administration Data Model (Draft version of ISO 19152 and the Social Tenure Domain Model (that is also supported by UN Habitat). The Social Tenure Domain Model is a specialization of the Land Administration Data Model.

Both the LRS database and the Samoa View database can be mapped to the Land Administration Data Model but there are some tables in the LRS database that contain additional details which appear to be outside of the scope of the Land Administration Data Model:

1. The monitoring and recording of the workflow history and the progress of dealings lodged for registration during the registration business process

2. Noting the existence of two estates in one title such as “life estate” and “remainder estate”

3. Survey plan details.

These details are in important in Samoa and will need to be accommodated in the OSCAR database schema for Samoa and the associated database migration scripts.

Other items that are distinctly Samoan such as the general location fields (Island, District, Village), some parcel and title details will need to be also accommodated presumably by simple specializations in the data model of the generic Parcel and Title objects.

6.2 Software Development Methodology

There is very little software developed in Samoa and within government agencies it is typically through individual staff members who follow no formal methodology.

For this reason, it would seem like the current internationally widely used Rational Unified Process (RUP) methodology for software design and development should be adopted for OSCAR customization work in Samoa. Care will need to be taken to ensure an appropriate level of RUP is identified for use in Samoa and that training in its use is provided as either part of the Samoan OSCAR pilot or as a prerequisite activity.

6.3 Project Organisation

6.3.1 Project Management Arrangements

Once the implementation of the OSCAR pilot studies gets underway, the following items will need to be prepared and approved by both MNRE and UN FAO:

1. Detailed Project Plan

2. Samoa Pilot Risk and Issues Log

3. Progress Report template

4. Software Test Plan
5. Software Quality Plan

6.3.2 Roles and Responsibilities

The following project organization is proposed for the Samoa OSCAR Pilot:

Project Role	Person	Responsibilities
Sponsor	Tu'u'u Dr Ieti Taule'alo CEO-MNRE	To provide high level strategic support to the project
Steering Committee	Safuta ?? ?? ACEO (Technical Division0 Patea Malo Setefano ACEO (Land Management) Ieti Taule'alo Principal IT Officer	To monitor progress of the project against the detailed project plan and to provide direction to the project on critical decisions
Project Coordinator	To be decided	To prepare progress reports and to monitor project risks and issues
Working Group		To work with the software development staff and international consultants and to become the advocate/champion for open source software development and OSCAR, in particular, within their own section.
	Ieti Taule'alo Principal IT Officer	ietitaia.taulealo@mnre.gov.ws
	Charles Pritchard IT Officer	charles.pritchard@mnre.gov.ws
	Lydia Ah Kuoi IT Officer	lydia.ahkuoi@mnre.gov.ws
	Petania Tuala Senior Mapping Officer	petania.tuala@mnre.gov.ws
	Levei T Auelua Integration Surveyor	levei.tanoi@mnre.gov.ws
	Iosefa Aiolupotea PUMA Officer	iosefa.aiolupotea@mnre.gov.ws
	Malaki Iakopo Water Division	malaki.iakopo@mnre.gov.ws
	Tile Tofaeono Meteorology Division	tile.tofaeono@mnre.gov.ws
	Tuaena Faasalaina Land Registration Officer	tuaena.faasalaina@mnre.gov.ws

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Project Role	Person	Responsibilities
	Iosefatu Reti DEC Officer, Vailimia	joe.reti@mnre.gov.ws
	Patea Malo Setefano ACEO Land Management	patea.setefano@mnre.gov.ws
	Vitaoa Pele Fua'ta'i Project Component Manager)SIAM-2	vitao.fuatai@mnre.gov.ws

6.4 Pilot Project Plan

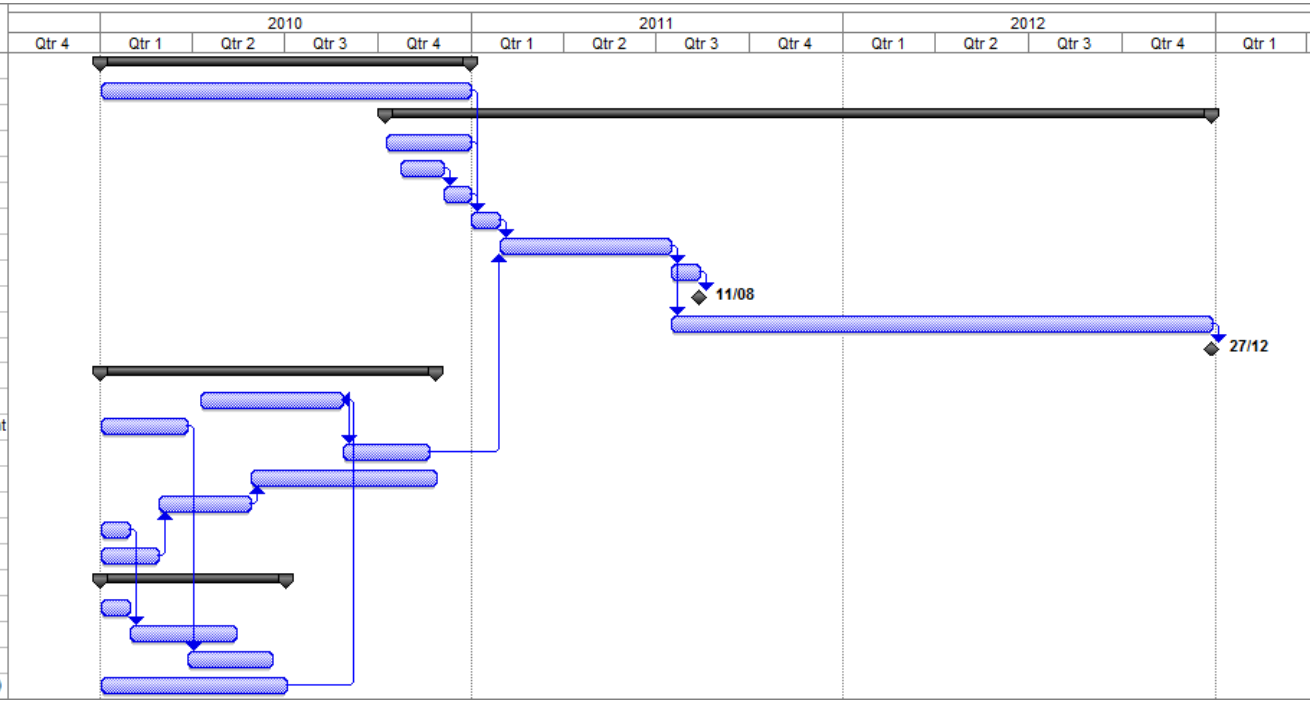
6.4.1 Timeline

The following timeline is aligned to the OSCAR Project Document and focuses on the pre-requisite and preparatory tasks that need to be completed before the Samoa OSCAR software customization work begins. Although the preference for any early start to the customization work has been noted, this timeline has not rescheduled this work and has remained consistent with the timeline in the OSCAR Project Document.

As has been noted, a Detailed Project Plan will need to be prepared for the Samoa OSCAR Pilot but it is considered a little early to attempt such a project plan.

DRAFT

ID	Task Name
1	**OSCAR - Central**
2	OSCAR Shell Development
3	**OSCAR - Samoa**
4	Procure Hardware & Equipment
5	Recruit Software Developers
6	Training in RUP Software Development Methodology
7	OSCAR Development Training
8	OSCAR Initial Samoa Development
9	OSCAR Initial Samoa Implementation
10	OSCAR Initial Samoa Operation
11	OSCAR Further Samoa Development
12	OSCAR Project Ends
13	**Samoa - OSCAR Prerequisites**
14	Cadastral Map (Samoa View) Quality Improvements
15	Land Registration System (LRS) Strata Title Enhancement
16	Cadastral Map Parcel to Title Match
17	Open Source GIS tool training
18	Establish MNRE Open Source Map Repository
19	Basic OS Software Development Training for MNRE
20	Implement MNRE OS Samoa View GIS Viewer
21	**Samoa Related Activities**
22	Surveyor Strata Title Plan Training
23	Migrate Land Admin MS Access apps to OS
24	LRS Report & Extract Enhancement
25	Survey Control densification (incl cadastral connections)



6.4.2 Task Descriptions

ID	Task Name	Task Description
2	OSCAR Shell Development	Development of the generic OSCAR software (to be done centrally, not in Samoa)
4	Procure hardware & equipment	Procure hardware and equipment required to establish a dedicated software development and testing environment
5	Recruit Software Developers	Recruit two software developers in Samoa to work within MNRE for the duration of the OSCAR pilot
6	Training in RUP Software Development Methodology	Software development methodology training for software development team and those members of the OSCAR working group who are interested
7	OSCAR Development Training	Training for the software development team (and any OSCAR working group members who are interested) in the development tools and the specific development standards that will be adopted for all the OSCAR pilots
8	OSCAR Initial Samoa Development	The software development to migrate the current Land Registration System and Samoa View functionality into an OSCAR environment
9	OSCAR Initial Samoa Implementation	The implementation of the first version of OSCAR in Samoa
10	OSCAR Initial Samoa Operational	The milestone when the first version of OSCAR in Samoa is operational
11	OSCAR Further Samoa Development	The software development of further functionality (eg Cadastral Survey Calculation functionality) into the Samoa OSCAR environment
14	Samoa View Cadastral Map Quality Improvement Work	Various quality improvement work including Parcel and Road attribute data and various spatial data improvements
15	Land Registration Strata Title Enhancements	The enhancement of the existing Land Registration System application so that it can support the new unit (strata) title legislation
16	Cadastral Map Parcel to Title Match	The match of the equivalent parcel records so as increase cadastral map based searches, map display and quality improvement
17	Open Source GIS training	Training in an open source GIS tool so as to allow the adoption of an open source GIS tool in preference to the commercial Mapinfo Professional GIS application
18	Establish MNRE Open Source	The MNRE Mapping Section should migrate the current

ID	Task Name	Task Description
	Map Repository	Mapinfo TAB files into a central POSTGIS database
19	Basic Open Source Software Development Training for MNRE	Basic open source software development training for OSCAR Working Group members who have been involved in simple Microsoft Access land administration applications
20	Implement Open Source Samoa View GIS Viewer	To migrate Samoa View to a POSTGIS database and provide simple read-only GIS viewer to MNRE staff
22	Surveyor Strata Title Plan Training	To train surveyors (MNRE and private) in the preparation of survey plans in support of the new unit titles legislation
23	Migrate Land Administration Microsoft Access applications to Open Source	To migrate existing (simple) Microsoft Access (and SQL Server) based applications to open source environment compatible with OSCAR
24	Enhance Land Registration System Reporting & Export/Extract Functionality	Enhance the existing Land Registration System application to produce requisition notices and extraction of sales dealings for valuation purposes
25	Survey Control densification with cadastral connection work	To complete further survey control work (in terms of the new SGRS2005 geodetic datum) including connections to existing cadastral surveys so as to encourage surveyors to use the new datum and to provide measurements that will allow spatial accuracy improvement of Samoa View (cadastral map)

6.5 Staff

Although there is provision within the OSCAR project budget for the recruitment of software developers for the duration of the project, there are a number of existing MNRE staff who have computer science degrees (within the IT Section) or have shown some aptitude in developing simple software applications mainly using Microsoft Access. It is hoped to include these existing staff in the OSCAR related training and, if feasible, the OSCAR software customization work.

6.5.1 Recruitment

In line with the OSCAR project document, two software developers will be recruited in Samoa. In Samoa, it is not feasible to recruit "GIS Developers" or "Database Developers" as local computer science graduates do not specialize along these lines. For this reason it is proposed that generic software developers, probably recent computer science graduates will be recruited. Experience in GIS development or database development will be identified as "desirable" expertise not a "required" expertise.

The Public Service Commission suggests that they be contacted at the time of the OSCAR recruitment process as there are a number of Samoan computer science graduates on government scholarships returning from New Zealand and Australian universities each year and with the current economic recession the Public Service Commission is not able to guarantee employment for them within a government agency. These scholarship graduates are bonded to the Samoan government and so could be directed to work within the MNRE on the OSCAR customization.

6.5.2 Training

There is a need for considerable training delivered through either the OSCAR project or through various development assistance programmes that are working with MNRE.

The proposed "Open Source" training will remedy skill deficiencies in the OSCAR software development team as well as providing mentoring like support to what are likely to be relatively inexperienced software developers. Also open source related training to a wider group of MNRE staff will assist the long term sustainability of OSCAR in Samoa by ensuring there are other MNRE staff who are competent in open source software development and also an even wider group who are competent and confident in the use of open source GIS tools similar to what will be incorporated into the OSCAR software.

Training Initiative	Training Target Group
Basic Open Source Software Development Training (development environment, tools, standards, approach/methodology)	MNRE OSCAR Working Group and any other MNRE staff who have an interest and some experience in simple application development
Open Source Software Development Tutorials (based on simple MNRE land administration applications)	
Open Source GIS tool training	MNRE staff across all divisions currently working with Mapinfo Professional or who are planning to use GIS. Potentially this could be widened to include all other Samoa GIS users
Rational Unified Process (RUP) Software Development Methodology training	Samoa OSCAR software development team plus interested members of OSCAR working group
OSCAR Open Source Software Development Training (development environment, tools, standards, OSCAR shell software)	

6.6 Risk Assessment

The following assessment was confirmed by the Working Group at the briefing of the key findings of the feasibility study on 8 August 2009.

6.6.1 Strengths

- Strong CEO support
- Compatible with Government of Samoa IT and eGovernment plans
- Open Source is accepted as a good and appropriate approach for Samoa
- Other development donors are planning to use open source software in Samoa and there is dialogue between development donors on this topic

6.6.2 Weaknesses

- There are not many software developers in Samoa
- Local computer science graduates do not appear to be strong in software development

- Internet and power connections are not reliable
- MNRE computing infrastructure is "tentative" but improving
- MNRE priorities maybe "ahead" of the proposed OSCAR implementation plan
- Data quality issues may require special data improvement work

6.6.3 Opportunities

- There are other land administration development assistance projects being planned which are likely to be able to support the parallel related activities to the OSCAR Pilot
- Land Registration System (LRS) and Samoa View could provide a prototype for the initial generic OSCAR Shell
- Samoa customised OSCAR is highly applicable in other Pacific countries

6.6.4 Threats

- The loss of the (project funded) software developers during or at the end of the OSCAR project

6.6.5 Risk Mitigation Actions

Risk	Mitigating Action
Difficulty recruiting or the loss of software developers during the Samoa OSCAR Pilot	Encourage interested existing MNRE staff to acquire open source software development skills
Available software developers have limited software development skills	Standardise software development practices as far as is possible
	Plan a comprehensive training programme in open source software development skills to start as soon as possible
Internet connections are unreliable	Identify this as a system architecture constraint (Samoa OSCAR pilot be a desktop or intranet web based application)
Power supply is unreliable	UPS must be procured with any computer desktop or server procurement
MNRE computing infrastructure is weak	OSCAR Pilot equipment procurement should address any critical weaknesses
MNRE priorities maybe "ahead" of the proposed OSCAR implementation plan	Commence OSCAR related training in 2010
	Develop some simple land administration applications (eg Geodetic Database, Development Consents (PUMA)) in an open source environment identical to the environment to be used for the OSCAR shell and as an applied part of the OSCAR related training (in 2010)
	Adopt LRS software application as the prototype for the registration component of the generic OSCAR shell software

Data quality issues may require special data improvement work	Schedule critical data improvement work to finish before Samoa OSCAR Pilot is implemented

Appendix 1

Acronyms

Acronym	Full Name
DBMS	Database Management System
DCDB	Digital Cadastral Database
FAO	Food and Agriculture Organization
FIG	International Federation of Surveyors
FLOSS	Free / Libre Open Source Software
GIS	Geographic Information System
GNU GPL	GNU General Public License
GNU LGPL	GNU Lesser General Public License
GUI	Graphic User Interface
ICCAS	Integrated Climate Change Adaption in Samoa (Project)
ISO	International Standards Organisation
IT	Information Technology
LRS	Land Registration System
NRLA	FAO Land Tenure and Management Unit
OSCAR	Open Source Cadastre and Registration
OSGEO	Open Source Geospatial Foundation
OSS	Open Source Software
SDK	Software Development Kit
SIAM	Samoa Infrastructure and Asset Management (Project)
SGRS 2005	Samoa Geodetic Reference System 2005 (Datum)
uDIG	User-friendly Desktop Internet GIS

Acronym	Full Name
UN	United Nations

Appendix 2

Terms of Reference – Project Consultants (Samoa)

The Role

This role is to undertake the design, development and implementation of a customised version of the generic Open Source Cadastral and Registration (OSCAR) software that has been developed for international use. The customised version of OSCAR will support the main registration and cadastral functions the Ministry of Natural Resources & Environment (MNRE). The two project consultants will be part of a team of MNRE staff consisting of both IT and various land administration sections. This team will supported by international consultants based in Rome (including consultants who will be responsible for the core OSCAR development) who will visit Samoa from time to time during the project.

Required Skills & Expertise

It is essential that the project consultants have:

- A minimum of a bachelor level degree with final year papers related to software development
- Experience in software development using the java programming language
- Have excellent English language skills in a software development work environment where technical documentation will need to be written in English (and similarly reference material will be provided in English)

It is highly desirable that Software Developers:

- Have experience in web based software development
- Have software development experience involving open source database management systems such as Postgre SQL
- Have some familiarity with GIS and preferably with software development within a GIS environment
- Have experience in software development with a 3 tier system design (user interface, business processes and data access)
- Have experience in working as part of a software development team
- Is able to provide examples of their work (software code, forms/pages, documentation)

Scope of Work and Tasks

The project consultants will report to the MNRE Manager IT Services.

The responsibilities of the project consultants will be to develop software that:

1. Complies with the system design as described in the Software Architecture Document, User Interface definitions, the use case definitions and the relevant use case realisations (to be prepared by the international consultants based in FAO headquarters, Rome)
2. Meets the requirements as specified in the Statement of Requirements
3. Complies with the coding practices and structures as specified for the OSCAR pilot projects (to be prepared by the international consultants based in FAO headquarters, Rome)
4. Includes appropriate comments to explain the logic of software code
5. Complies with any additional instructions provided by the FAO core OSCAR development team
6. Meets all the specified module and system tests

At the completion of each software module, the project consultants will provide a short report that identifies any special features of the module that need to be described in the User Manual or Software Reference Guide and record how long it has taken to complete.

Specific Tasks and Outputs

- Develop software (as outlined above)
- Make refinements to the OSCAR database required for the Samoa customisation of OSCAR
- Develop routines and processes to migrate existing digital data from the legacy Land Registration System and the Samoa View (cadastral map of Samoa) into the refined Postgre SQL/PostGIS database for the Samoa customisation of OSCAR
- Participate in team meetings to discuss issues arising in the software development process
- Assist in the preparation of documentation including user manual, online help, technical reference guide
- Assist in system testing (according to the OSCAR Test Plan)
- Assist in user training, where requested
- Assist in implementing maintenance and support arrangements for the Samoan implementation of OSCAR

Duration

24 months full time effort

Appendix 3

Draft Technical Specification for Required Hardware and other Equipment

Currently, MNRE does not have a spare server or the associated hardware required to establish a software development and testing environment. To remedy this deficiency it is proposed that a workstation with a high-end specification be used as the "Development and Testing" server. This server would be located in the MNRE server room (air conditioned) and connected to the other MNRE servers and be able to use the existing tape backup arrangements. Other server related hardware devices would be a network switch and a KVM switch to enable the easy operation of all the MNRE servers including the new "Development and Testing" server.

In addition to the server, 3 workstations will be required and it is suggested that these have a similar specification to the server except a reduced amount of hard disk space. These will be located in the IT Services room but there is a need for 3 desks and ergometric seats for the software development team. A networked A3 Laser printer is also required (there is a spare A3 scanner within the MNRE that can be used for development work associated with the scanning of documents).

These are the essential minimum requirements for the software development team and are the basis for the specification and cost estimates included in this appendix.

The OSCAR pilot project may also consider the funding of the following items:

Hardware Item	Proposed Use
Laptop	For use by the project coordinator (Samoa)
Network Switches (1 Gigabits per second)	To upgrade the speed (so as to effectively use spatial/GIS applications (as a result of OSCAR) provided over the network) from that currently provided (100 bits per sec) and to increase the number of network connections. MNRE building has CAT 6 network cabling
Hardware Firewall device	So that MNRE can provide internet based services (as a result of OSCAR) and not jeopardise internal network security

Specification & Cost Estimates

Item No.	Item	Description	Quantity	Estimated Cost
1	**PC Workstation** **(Development**	- Brand Name Computer. - Minitower configuration - Processor : Intel Quad-Core	1	T$13,000

Item No.	Item	Description	Quantity	Estimated Cost
	Server)	(minimum) 2.3 GHz, (minimum) 12 MB L2 Cache, (minimum) 1 GHz FSB - Memory : minimum of 4 GB Quad-channel DDR2 - Hard drive controller: support for RAID 1 - Hard drive: 500GB SATA with 16MB Cache, 7200 rpm - Display : 17" Widescreen monitor (1280X1024 resolution) - Graphics : Integrated Controller with minimum of 16MB of SDRAM - Ports: 1parallel, 1 serial - Minimum of 4 USB ports. - Single Port Gigabit NIC - CD-Rom : DVD RW 20X - Original A/E Keyboard. - PS2/USB2 Original Laser mouse. - Licensed Windows Server 2003?? (Version to be specified at time of procurement) R2 Standard Edition for 5?? CAL with latest service pack included. - At least 3 year full warranty.		
2	**KVM Switch**	- Share 1 Keyboard, Video, Mouse with minimum of 6 Ports. - Compatible with existing MNRE servers & the Server in this specification (Item 1 above)		
3	**PC Workstations** **(Developers Workstations)**	- Brand Name Computer. - Minitower configuration - Processor : Intel Quad-Core (minimum) 2.3 GHz, (minimum) 12 MB L2 Cache, (minimum) 1 GHz FSB - Memory : minimum of 4 GB Quad-channel DDR2 - Hard drive controller: SATA 2.4 Gb/s (minimum) controller 5 with support for RAID 0, 1 and 5 - Hard drive: 150 GB SATA with 16MB Cache, 7200 rpm - Display : 17" Widescreen monitor (1280X1024 resolution) - One parallel Port ECP/EPP). - USB ports on front and back	3	T$12,000

Item No.	Item	Description	Quantity	Estimated Cost
		sides. - Fast Ethernet 10/100/1000 MBPS, PCI LAN adapter. (RJ-45) connector. - CD-Rom : DVD RW 20X - Original A/E Keyboard. - PS2/USB2 Original Laser mouse. - Licensed Windows XP/Vista/?? Professional (Version to be specified at time of procurement) with latest service pack included. - At least 3 year full warranty.		
4	**UPS**	- 1KVA	4	T$4,000
5	**Antivirus Software including 3 year subscription for virus definition updates**	- Antivirus software for 1 server & 5 PC workstations (connected to server) - Automated virus definition updates	1	
6	**A3 B&W Laser Network Printer**	- Brand Name Printer. - Type: Laser - Black & White - Print rate : minimum 20 ppm - Ports: USB2 & Ethernet (for direct connection to network) - Maximum Print Resolution: at least 1200 X 600 - Max paper size : A3 - At least 1 year full warranty.	1	
7	**Workstation Desk**	- 1.2 X 0.75 (0.75 high) with one locked drawer	4	
8	**Ergometric chair**	- Comprehensice ergometric adjustment - With arms	4	

Appendix 4

Terms of Reference for Feasibility Study

Land Information System Consultant

1. INTRODUCTION

The project falls under the FAO NRLA's normative work, which supports the introduction of sustainable and affordable systems for land tenure security. Open source software (OSS) is seen as an alternative and arguably, in a scarce resources situation, a more sustainable alternative to proprietary software products, due to the initial and annual savings in costs as well as the high adaptability ensured by the open source code. FAO-NRLA has reviewed available OSS options for land administration systems and found several of the available database and GIS products to be of good value.[2] To be useful in settings with limited technical resources, open source GIS software for land administration systems must have the basic graphical (cadastral) functions that are needed for land administration systems. The general dearth of such tools has made it difficult for individual land administration agencies to opt for OSS-based land registration systems. Consequently the introduction of OSS for land administration systems requires a common, initial, effort.

As the next step, FAO intends to support an OSCAR OSS development project and associated community in the Web (more specifically most probably in OSGeo, which is the leading OSS community for geospatial applications). This will allow a peer production development effort of source code for the OSCAR software that is made available for public collaboration. The product will be tested through its real operational implementation (including appropriate customisation to meet local requirements) in three differing FAO member countries. The outcome, namely a fully functional OSCAR shell with an active user community, will lower the barriers for entry level of developing countries to use IT for improving land registration systems and the security of tenure.

FAO has prepared a project description for "Support to the Development and Piloting of the OSCAR Shell" (February 2009) and this document describes the framework for this consultancy to plan the proposed piloting of the OSCAR Shell in Samoa.

The land administration domain in Samoa falls under the Ministry of Natural Resources and Environment.

81 percent of the land in Samoa is held under customary ownership and this land is protected under the constitution. Samoan society is still strongly focussed on village life and the associated traditions. Customary land is not owned individually but communally with most land being associated with a chiefly (matai) title. The matai has authority (pule) to decide on the permitted uses for that land by other members of his family group. One forum for the resolution of disputes concerning customary land is the Land and Titles Court (but it should be noted that "Titles" in this case mean chiefly titles).

The remaining non-customary land consists of 4 percent of freehold land and 15 percent of public land. Cadastral and registration records of parcels of land within these non-customary categories of land are

[2] See FAO Scoping paper on FLOSS for cadastre and land administration systems. See http://www.fig.net/commission7/news/2007-10-ScopingPaperFinal.pdf

recorded within the formal cadastral and registration systems. A small number of blocks of customary land subject to a lease are also with the formal systems. The computerised cadastral mapping system, known as Samoa View, has 21,000 parcel records (July 2009). The computerised Land Registration System has 12,000 current titles.

Over the past four years, the MNRE has been supported by the World Bank's Samoa Infrastructure Asset Management (SIAM) Project to modernise key components of the formal land administration system including the computerisation of the cadastral mapping system and the introduction of a new system of computer supported title registration.

Both these computerised systems are dependent on proprietory commercial software and software support from New Zealand and Australian companies. MNRE would like to have the ability to extend these systems so as to further modernise land administration in Samoa, to reduce the dependency on expensive proprietory commercial software and international software support and to ensure computerised systems within MNRE are more sustainable.

The general task of the Consultant is to perform an initial identification study on how the FLOSS project could support the further modernization of land administration in Samoa. The consultant will start from reading the DRAFT trust fund project document 'Support to the Development and Piloting of an Open Source Cadastre and Registration (OSCAR) Shell' and get acquainted with the FAO FLOSS initiative and outcomes.

Specifically the consultant will:

(i) Identify together with the (MNRE) the needs and immediate priorities for software applications and databases required to support the further modernization of the land administration in Samoa;

(ii) Identify the associated data migration, data digitalization, data quality improvement initiatives required and outline how these initiatives will be completed;

(iii) Document any issues that need to be addressed during the phase of initial development of the "core" OSCAR software (as distinct to the customisation of the software in Samoa);

(iv) Prepare a risk analysis of the tasks to be completed within the Samoa OSCAR pilot including the identification of any pre project work required;

(v) Identify appropriate project management arrangements;

(vi) Prepare a draft implementation plan for the Samoa OSCAR pilot;

(vii) Propose amendments to the to the 'Support to the Development and Piloting of an Open Source Cadastre and Registration (OSCAR) Shell' trust fund project proposal with respect to the details describing the Samoa involvement.

2. PROJECT OBJECTIVES

To perform an initial assessment and prepare a detailed plan for the implementation of the Open Source Cadastre and Registration (OSCAR) Shell in Samoa.

3. SCOPE OF WORK

The international consultant will work closely with the beneficiary project coordinator and be ultimately responsible for delivery of the final products.

Specifically, the consultant will:

A) Review of **Existing Environment**:

- ✓ The DRAFT trust fund project document 'Support to the Development and Piloting of an Open Source Cadastre and Registration (OSCAR) Shell' and other background material on OSCAR and get aqcuainted with the FAO FLOSS initiative and outcomes;
- ✓ Legal framework, related to the OSCAR system implementation in Samoa;
- ✓ Existing communication environment in Samoa;
- ✓ The government of Samoa's policies, plans and standards to do with land and ICT (with particular reference to any that might impact on the use of OSS products in land administration).

B) Develop a **Statement of Requirements** for the implementation of the OSCAR Shell in Samoa's MNRE, including:

- Identify together with the MNRE the needs and immediate priorities for the modernization of the Land administration;
- Identify the associated data migration, data digitalization, data quality improvement initiatives required and outline how these initiatives will be completed;
- Document any issues that need to be addressed during the phase of initial development of the "core" OSCAR software (as distinct to the customisation of the software in Samoa);
- Describe future business processes (work flows) to be supported by the OSCAR shell;
- Document functional requirements and expected non-functional qualities and prioritise these needs;
- Describe system architecture constraints for the OSCAR shell (including technical platform definitions).

C) Develop **Implementation Recommendations** for the OSCAR Shell in Samoa including:

- Milestone plan and Indicative project plan, within the frame of the FAO Project plan;
- Appropriate project management mechanisms for the implementation of the OSCAR Shell in Samoa;
- Any skill and expertise shortcomings that will need to be addressed through training initiatives during the FAO project;
- Describe all pre project activities that need to be completed before the software developers are recruited and the FAO project begins in Samoa (including responsibility for activity, the nature of the task and the expected duration of the activity).

D) Develop **General Input Requirements for the design of the "core" OSCAR Shell Software**. In order to define the extent of the work involved in the OSCAR Shell implementation in Samoa, certain assumptions will need to be made in terms of the functionality of the "core" OSCAR Shell software. These assumptions will need to be documented and are likely to include:

- System architecture issues
- Generic cadastre and registration workflows that will be supported by OSCAR
- Generic data model required to support the "core" OSCAR Shell
- Software development methodology.

E) Develop **Implementation Plan for the OSCAR Shell in Samoa** within the frame of the FAO project plan;

F) Develop **Risk Analysis** of the implementation of the OSCAR Shell in Samoa's MNRE, including the identification of strategies to mitigate the impact of all significant risks;

G) Outline an appropriate **Skills Transfer & Training** policy and identify critical skill deficiencies.

H) Develop **Terms of Reference for Project Consultants (Samoa)** to be recruited through the FAO project for the OSCAR Shell implementation in Samoa and the identification of counterparts within the Samoa's MNRE. To date it is envisaged that the consultants will be software developers with knowledge of land registration systems, but in the case that additional expertise is recommended (from what was proposed in the FAO OSCAR project document) a proposal for these extra consultants will need to be made including terms of reference. In case additional expertise needed than the one envisaged in the FAO OSCAR project document a proposal has to be made.

I) Develop **Technical Specifications** for the required hardware and other equipment together with cost estimation.

J) Organize a **Work Shop** in Samoa at the end of the mission to Samoa to present the main findings, first draft of the work products, receive comments and agree with the beneficiary the frame of the final work products.

K) Propose amendments to the to the 'Support to the Development and Piloting of an Open Source Cadastre and Registration (OSCAR) Shell' trust fund project proposal with respect to the details describing the Samoa involvement.

4. WORK PRODUCTS

A) Review of Existing Environment

B) Priorities for inclusion in the implementation of OSCAR Shell in Samoa's MNRE;

C) Statement of Requirements

D) Implementation Plan for the OSCAR Shell in Samoa

E) Risk Analysis of the implementation of the OSCAR Shell in Samoa

F) Skills Transfer & Training Policy (including the identification of critical skill deficiencies).

G) Terms of Reference for Project Consultants (Samoa)

H) Technical Specifications for the required hardware and other equipment together with cost estimation.

I) Propose amendments to the 'Support to the Development and Piloting of an Open Source Cadastre and Registration (OSCAR) Shell' trust fund project proposal with respect to the details describing the involvement of Samoa.

5. PERIOD OF PERFORMANCE

This assignment is being independently undertaken and funded by Cadastre Limited (New Zealand) in support of FAO NRLA's OSCAR OSS project.

A mission to Samoa has been scheduled for the period 29 July 2009 to 8 August 2009. Final work products are expected to made available to interested parties (such as FAO NRLA) by the end of August 2009.

6. PROFESSIONAL EXPERTISE REQUIRED

Team Leader

- Experience in IT Project Management;
- Understanding at least one IT project management and development methodology;
- Knowledge of land administration and cadastre systems;

- Previous experience in Pacific region;
- Good communication skills with fluency in English.

7. REPORTING REQUIREMENTS

The Consultant must submit the following management and technical reports and documentation:

1. **Final report**

   A final report will be provided with the other specified work products describing activities undertaken, major outputs and critical analyses of any major problems experienced during this feasibility study. The Final Report shall include as annexes all previously approved technical reports and other documentation, requested in section 4. Work Products.

2. **Technical documentation.**

   All technical documentation, requested in section 3. Scope of work and in section 4. Work products, will be submitted in electronic format.

DATES OF SUBMISSION

The schedule of the submission of all required deliverables is as follows:

Work products	Version	No Later Than
Review of Existing Environment	**Final Version**	**31 August 2009**
Statement of Requirements for OSCAR implementation in Samoa's MNRE	**Final Version**	**31 August 2009**
Implementation Recommendations	**Final Version**	**31 August 2009**
General Input Requirements for the design of the"Core" OSCAR Shell	**Final Version**	**31 August 2009**
Implementation Plan for OSCAR Shell in Samoa	**Final Version**	**31 August 2009**
Risk Analysis	**Final Version**	**31 August 2009**
Know-how transfer and training policy. Training requirements.	**Final Version**	**31 August 2009**
Terms of Reference for the Project consultants and counterpart requirements.	**Draft Version**	**31 August 2009**
Technical Specifications for the required hardware and other equipment together with cost estimation	**Draft Version**	**31 August 2009**

Work products	Version	No Later Than
Final Report	**Final Version**	**31 August 2009**

8. LANGUAGE

The official language shall be English. All documents and reports produced by the Consultant for this assignment shall be made available to the beneficiaries in English language.

Registration Consultant

Background

Support for the adoption of a FLOSS[3] approach to the development of land administration IT systems, particularly in support of the property registration and cadastral functions, has grown in recent years. One such initiative has been the FAO supported OSCAR[4] initiative and currently[5] the FAO have prepared a project proposal that would support the piloting of OSCAR software in 3 different regions. Funding is being sought for this piloting initiative. Samoa has been identified as being one country well placed to be the country where OSCAR could be piloted. Hence the need to undertake a formal feasibility study to verify that Samoa is a suitable country to be a partner in the proposed FAO OSCAR pilot.

In parallel to the FAO OSCAR initiative, Cadastre Limited (New Zealand) has been in discussion for the past 2 years with other organisations with an interest in open source solutions in the land administration domain to look at ways whereby they could use the Land Registration System software developed in Samoa, with customisation, in other land administration projects. A key principle behind the future customised use of the Land Registration System would be the waiving of any licence fee for the acquisition or use of the intellectual property residing in this software and subsequent enhancements or customisations. Another principle would be to maximise the sustainability of any implementations of this software by providing open access to source code for future developments by countries using this software and in reducing dependency on international consultants for the support of the software. This would involve the training of local software developers as part of any customisation or enhancement work undertaken in projects where Cadastre Limited is involved in land administration computerisation. The Cadastre Limited approach is very similar to the FAO OSCAR initiative; the main difference being the FAO OSCAR focus on 'pure' open source related avenues, to the extent that all components of a FAO OSCAR solutions would be open source and not just the registration and cadastral software.

Study Objective

1. To describe the generic 'basic cadastral and registration functions' that should be supported in the proposed OSCAR pilots through reference to cadastral and registration processes in use in Albania and Samoa (2 countries from different regions that participated in the OSCAR User Requirements workshop held in Dunedin in May 2008);
2. To identify the functions in Samoa that would need to be supported through a customization or enhancement of the generic OSCAR software (assuming that the initial 'generic' OSCAR software will support all 'basic cadastral and registration functions').

Study Constraints

This study should be undertaken at the same time and in close collaboration with the 'Feasibility Study on the proposed Samoan OSCAR Pilot (to be undertaken by the Cadastre Limited LIS consultant)

Study Deliverables

The Registration Expert will provide a report that describes in diagram form with brief process descriptions the registration and cadastral processes in:

[3] Free/Libre Open Source Software

[4] Open Source Cadastral and Registration

[5] March 2009

1. Albania
2. Samoa

The report will include the Registration Expert's recommendation of the 'generic' registration and cadastral processes that should be supported by the initial OSCAR software. Reasons are to be provided for the inclusion and exclusion of processes or process steps that are followed in only one of the two countries mentioned above.

The second part of the report will study and describe in greater detail the Samoan cadastral and registration processes not included in the recommended 'generic' processes identified in the first part of the report. The aim of this part of the study is to assess the magnitude and complexity of the likely Samoan OSCAR software customisation effort (assuming the recommended scope of the 'generic' functions to be supported by the initial OSCAR software is agreed to by key stakeholders).

Draft report to be provided to the Cadastre consultant within 1 month of the field visit to Samoa.

Appendix 5 – Feasibility Study Activities

Date	Activity
29 July 2009	Preliminary meetings with Vitaoa Pele Fuatai Component Project Manager for SIAM2 Project (World Bank); Ieti Taulealo Principal IT Officer; Filisita Heather Principal Registration Officer & Elisapeta Principal Quality Assurance Officer (all MNRE) Met with Tu'u' Dr Ieti Taulealo CEO MNRE
30 July 2009	OSCAR Pilot Working Group Meeting – project briefing Met with Ieti Taulealo Principal IT Officer (about technical specifications and project consultant TOR) Review Registration and Cadastral business processes and related activities
31 July 2009	Met Iosefa Aiolupotea PUMA Officer (MS Access Development Applications database) Review of LRS software Review Registration and Cadastral business processes and Valuation Section requirements from LRS
3 August 2009	Met with Josephine Stowers – Fiu, Legal Consultant, Assistant CEO, MNRE (Unit Titles Bill implications) Met with Filisita Heather Principal Registration Officer & Elisapeta Principal Quality Assurance Officer (initial Registration & Cadastral Business Process findings) Reviewed outstanding LRS change requests & software bugs
4 August 2009	Met with Tile Tofaeono, Metereological Division (proposed ICCAS project) Met with Iosefatu Reti, DEC Officer (MS Access & GIS applications) Upgrade test Postgre SQL implementation to version 8.4.1 Developed new version of LRS software to overcome processing problem with caveats
5 August 2009	Met with Sita Matalavea IT Manager at the Alafua Campus (Apia) of the University of the South Pacific Implemented new version of LRS software Met with Steve Brown, ACEO (GEF), MNRE (various projects within MNRE and other open source initiatives within Samoa)

Date	Activity
	Met with Dan Aiafi, Manager Human Resources and MIS, Public Service Commission (IT in government agencies and the placement of PSC Scholarship students (with Computer Science degrees)

Date	Activity
6 August 2009	Attended eGovernment briefing for government CEOs Met with Aru Mathias, FAO Regional Office, Apia Reviewed survey calculation packages Met with Josephine Stowers – Fiu, Legal Consultant, Assistant CEO, MNRE (Unit Titles Bill review)
7 August 2009	Discussed progress on Samoa View data quality improvement work with Tufi Aeulua, Quality Assurance Officer Test implementation of POSTGIS database on MNRE server Met with OSCAR Pilot Working Group – key findings of feasibility study